

# BANDON STATE NATURAL AREA



Photo credit: Kathy Castelein



Nature  
Discovery

Western Snowy Plover  
Site Management Plan

June  
2012





Western Snowy Plover Site Management Plan  
Bandon State Natural Area  
June 2012

Oregon Parks and Recreation Department: Salem, Oregon

The mission of the Oregon Parks and Recreation Department is to provide and protect outstanding natural, scenic, cultural, historic and recreational sites for the enjoyment and education of present and future generations.

Oregon Parks & Recreation Department

725 Summer St. NE, Ste C

Salem, OR 97301-0792

Info Center: 1-800-551-6949

[egov.oregon.gov/OPRD/index.shtml](http://egov.oregon.gov/OPRD/index.shtml)

Title: Bandon State Natural Area: Western Snowy Plover Site Management Plan.

Publication Rights: Information in this report may be copied and used with the condition that credit is given to Oregon Parks and Recreation Department. This report has been prepared for in-house use and will not be made available for sale. Photographs and graphics may not be reproduced for reuse without permission of the owners or the repositories noted in the captions.

Cover Image: Snowy plover image courtesy of Kathy Castelein, ORBIC. Bandon SNA fencing image, OPRD.

# Executive Summary

---

The Pacific coast population of the western snowy plover (*Charadrius nivosus nivosus*) is a state and federally listed (threatened) small shorebird that lives on sandy beach areas along the west coast of the United States and Mexico. In Oregon, the beaches are managed by Oregon Parks and Recreation Department (OPRD) as the Ocean Shore State Recreation Area (Ocean Shore). Management of the Ocean Shore, including recreation management, general beach management, and management of natural resources may negatively affect snowy plovers and their habitat resulting in take of the species as defined under the Endangered Species Act (ESA).

OPRD completed a Habitat Conservation Plan (HCP) in August 2010 as part of the requirements to obtain an incidental take permit (ITP). The ITP (#TE30687A-0), issued in December 2010, provides OPRD with the long-term regulatory assurance that implementation of its coastal management responsibilities would comply with the ESA, while providing protection for snowy plovers (ICF International, 2010a).

The HCP requires OPRD to complete a site management plan, in cooperation with and approved by the USFWS, for all of its Snowy Plover Management Areas (SPMAs). A draft plan for Bandon State Natural Area (SNA), the only currently occupied SPMA managed by OPRD, must be completed within one year of ITP issuance. The goal of the site management plan is to provide guidance for day-to-day activities that will lead to the conservation and recovery of western snowy plover and their habitat in a manner that balances this effort with human use of the Ocean Shore. Under the HCP, the Bandon SPMA is identified as the habitat restoration area (HRA) and the area extending north to the south end of the China Creek access point parking lot in Bandon SNA. Active management of the Bandon SPMA will begin March 15<sup>th</sup>, 2013. This plan outlines OPRD's activities to protect plover nesting areas; reduce recreational disturbance; and implement natural resource management activities, including habitat restoration. A summary of the proposed actions described in this plan is provided on the following page.

## Summary of Proposed Management Actions at Bandon SPMA

- **Seasonal Recreation Restrictions** (March 15 – September 15)
  - Post access routes and the extent of beach use restrictions within the SPMA.
  - Prohibit vehicles (motorized and non-motorized) on the Ocean Shore (except for administrative use), or as otherwise restricted by existing Oregon Administrative Rule (OAR).
  - Prohibit dogs in the SPMA during nesting season.
  - Prohibit flying kites in the SPMA during nesting season.
  - Direct recreational activities to the wet sand. Fences, ropes, and/or signs will define the dry sand breeding areas to be avoided.
  - Possibly lift restrictions early if no nesting occurs by July 15.
  
- **Other Site Management Plan Commitments**
  - Provide habitat restoration and maintenance. The location and size of the restoration area, when such efforts will be accomplished, and how they will be accomplished is outlined in the plan.
  - Implement predator management efforts, species to be targeted, and the types and frequency of monitoring.
  - Conduct detect/non-detect (for unoccupied sites), breeding population monitoring, and wintering and breeding window surveys during the nesting season. Report findings to USFWS annually and work with snowy plover partners to evaluate the effectiveness of the HCP.
  - Provide public interpretation and education efforts (e.g., interpretive staffing, signage, and brochures).
  - Provide one full-time beach ranger, State Park staff, local law enforcement, and additional senior State troopers, as needed, to facilitate enforcement activities.
  - Review the program every five years.

# Contents

---

Executive Summary .....	i
Contents .....	iii
Figures .....	iv
Tables.....	v
Acronyms and Abbreviations .....	v
Acknowledgments .....	vii
<b>Section 1. Background .....</b>	<b>1</b>
1.1 Landownership and Management History .....	2
1.2 Legal and Site Description.....	3
1.3 Regulations.....	10
1.4 Historical and Current Status of Plovers.....	10
1.5 Human Use of the Site .....	18
<b>Section 2. Management Issues.....</b>	<b>21</b>
2.1 Human Disturbance.....	21
2.2 Habitat .....	24
2.3 Predation .....	25
<b>Section 3. Conservation Measures .....</b>	<b>27</b>
3.1 Habitat Restoration and Maintenance .....	27
3.2 Predator Management.....	30
3.3 Monitoring .....	33
<b>Section 4: Recreation Management .....</b>	<b>35</b>
4.1 Recreation Restrictions .....	35
4.2 Signage.....	37
4.3 Outreach and Education.....	40
4.4 Enforcement .....	41
<b>Section 5. Adaptive Management.....</b>	<b>43</b>
References .....	50

# Figures

---

Figure 1. Boundary of the Ocean Shore State Recreation Area.....	3
Figure 2. SPMA boundary at Bandon State Natural Area overlain on 2011 aerial imagery.....	6
Figure 3. SPMA boundary at Bandon State Natural Area overlain on USGS topographic map .....	7
Figure 4. Western snowy plover HRA at Bandon Snowy Plover Management Area (SPMA) .....	9
Figure 5. Snowy plovers roosting on dry sand .....	11
Figure 6. Snowy plover nest near China Creek .....	13
Figure 7. Snowy plover habitat and fencing at Bandon SPMA .....	17
Figure 8. Snowy plover interpretive sign .....	38
Figure 9. OPRD beach rangers install plover signage at Bandon SPMA.....	40

# Tables

---

Table 1. Total nest numbers on the Oregon Coast 1990-2010 .....	13
Table 2. Reproductive success of snowy plovers at Bandon Beach (1992-2010). .....	16
Table 3. Face Rock to New River Beach Use Levels and Recreational Activities .....	19
Table 4. Causes of snowy plover nest failure at Bandon Beach (2003-2010).....	26
Table 5. Western Snowy plover management plan implementation schedule: Bandon SPMA.....	45

# Acronyms and Abbreviations

---

ACOE	U.S. Army Corps of Engineers
APHIS-WS	Animal and Plant Health Inspection Service (Wildlife Services)
ATV	All-terrain vehicle
BLM	United States Bureau of Land Management
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
DLCD	Oregon Department of Land Conservation and Development
DSL	Oregon Department of State Lands
FESA	Federal Endangered Species Act
HCP	Habitat Conservation Plan
HRA	Habitat Restoration Area
GLO	General Land Office
ITP	Incidental Take Permit
OAR	Oregon Administrative Rule
Ocean Shore	Ocean Shore State Recreation Area
ODFW	Oregon Department of Fish and Wildlife
OESA	Oregon Endangered Species Act
OPRD	Oregon Parks and Recreation Department
ORBIC	Oregon Biodiversity Information Center
ORNHIC	Oregon Natural Heritage Information Center
ORS	Oregon Revised Statutes
Recovery Plan	Western Snowy Plover Pacific Coast Population Recovery Plan
RMA	Recreation Management Area
Services	U.S. Fish and Wildlife Service and National Marine Fisheries Service
SNA	State Natural Area
SPMA	Snowy Plover Management Area
SVL	Statutory Vegetation Line
USDA	U.S. Department of Agriculture
USFS	USDA U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

# Acknowledgments

---

## **OPRD Director:**

Tim Wood, Director  
John Potter, Assistant Director, Operations

## **OPRD Staff:**

John Allen, Coastal Region Manager  
Larry Becker, South Coast District Manager  
Vanessa Blackstone, Wildlife Biologist  
Ben Fisher, Bullards Beach Management Unit  
Laurel Hillmann, Ocean Shore Planner  
Jim Morgan, Park Stewardship Division Manager  
Calum Stevenson, Ocean Shore Natural Resource Specialist

Thanks also to other OPRD staff who contributed information, insight and ideas including Brady Callahan, Noel Bacheller, Chris Havel, Tony Stein, Alice Beals, Terry Bergerson, Carrie Lovelette, David Quillin, Mark Davison, and Trisha Wymore

## **Contacts:**

Vanessa Blackstone, Wildlife Biologist, 503-986-0742  
Jim Morgan, Park Stewardship Division Manager 503-986-0738

# Section 1. Background

The Pacific coastal population of the western snowy plover (*Charadrius nivosus nivosus*) is a small shorebird that lives along the west coast of the United States and Mexico. The Pacific coast population of the western snowy plover was listed as threatened under the Federal Endangered Species Act (FESA) in 1993. The species was noted as threatened by the Oregon Fish and Wildlife Commission in 1975 and reaffirmed under Oregon's Endangered Species Act (OESA) in 1989.

In Oregon, the beaches are managed by Oregon Parks and Recreation Department (OPRD) as the Ocean Shore State Recreation Area (Ocean Shore). Snowy plovers forage, roost, nest, and raise chicks on sandy beach areas, which often fall within the boundaries of the Ocean Shore. Management of the Ocean Shore, including recreation management, general beach management, and management of natural resources may negatively affect snowy plovers and their habitat resulting in take of the species as defined under both state and federal ESAs (ICF International, 2010a).

OPRD completed a Habitat Conservation Plan (HCP) in August 2010 as part of the requirements to obtain an incidental take permit (ITP). The ITP (TE30687A-0), issued in December 2010, provides OPRD with the long-term regulatory assurance that implementation of its coastal management responsibilities would comply with the ESAs, while providing protection for snowy plovers (ICF International, 2010a).

The HCP requires OPRD to complete a site management plan, in cooperation with and approved by the USFWS, for all of its Snowy Plover Management Areas (SPMAs). A draft plan for Bandon State Natural Area (SNA), the only currently occupied SPMA managed by OPRD, must be completed within one year of ITP issuance. Under the HCP, the Bandon SPMA is identified as the habitat restoration area (HRA) and the area extending north to the south end of the China Creek access point parking lot in Bandon SNA. Active management of the Bandon SPMA will begin March 15<sup>th</sup>, 2013. This plan outlines OPRD's activities to protect plover nesting areas; reduce recreational disturbance; and implement natural resource management activities, including habitat restoration.

## **1.1 Landownership and Management History**

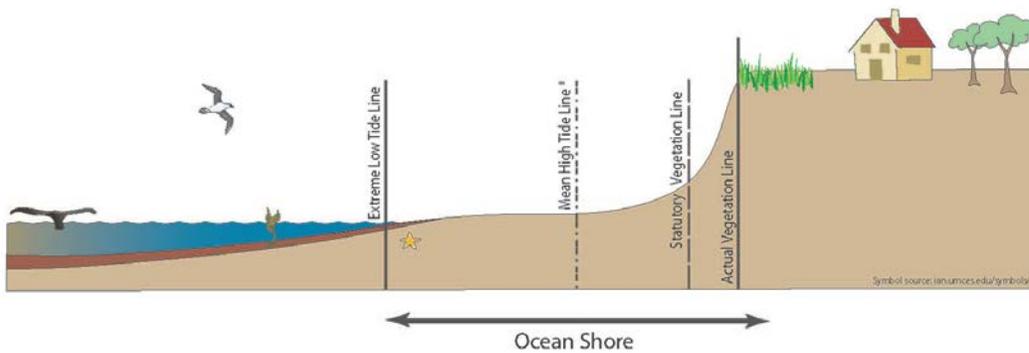
### **1.1.1. Landownership History**

The approximately 879-acre property known as Bandon SNA is currently owned and managed by OPRD. The various parcels that make up the current park property were acquired by the state between 1954 and 1970 through a combination of purchases and acquisitions from private landowners (~240 acres) and a grant (~639 acres) from the Bureau of Land Management (BLM) in 1968. The grant from the BLM stipulates the property be used for park purposes only. The property was transferred from the Oregon Department of Transportation to OPRD in 1995 through a quitclaim deed. OPRD ownership of the parcels goes to mean high water, below which the land is owned by the state through the Department of State Lands (DSL). However, OPRD manages these lands as part of the Ocean Shore State Recreation Area to extreme low water (Figure 1).

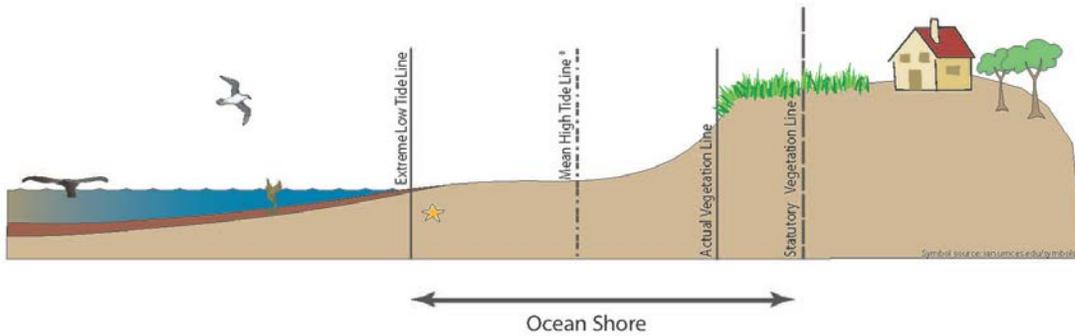
### **1.1.2. Management History**

The upland property is currently zoned for recreational (REC) park uses. The REC designation accommodates recreational uses of areas with high recreational or open space value (OPRD, 1986). Prior to completion of the acquisitions that make up the current property through today, it has been managed (as a SNA) for low-intensity recreational use, namely beach access by OPRD.

The Ocean Shore State Recreation Area (Figure 1) includes the land lying between extreme low tide to either the statutory vegetation line or established line of upland vegetation, whichever is furthest inland (ORS 390.605). The Ocean Shore is managed by OPRD for public recreational use, along with scenic, historic, natural and cultural purposes. The Oregon Coast Trail is a 382-mile trail that winds down the entire length of the Oregon coast. Most of the route is on the beach (including at Bandon SNA), although some segments wind through state parks or public lands. Generous landowners provide trail easements for portions of trail on private property.



Defined boundary of the Ocean Shore when the actual vegetation line is further landward than the statutory vegetation line.



Defined boundary of the Ocean Shore when the statutory vegetation line is further landward than the actual vegetation line.

\*OPRD's permit jurisdiction on the Ocean Shore extends landward from the low tide line to the mean high tide line on Federal lands and from the low tide line to the statutory or actual vegetation line, whichever is most landward, on all other lands.

Figure 1. Boundary of the Ocean Shore State Recreation Area

## 1.2 Legal and Site Description

### 1.2.1. Legal Description

The Bandon SPMA falls within the boundaries of Bandon SNA and the Ocean Shore State Recreation Area and is located within the east ½ of Sec 11, 14, 23 and 26 in T29S, 15W, W.M. (Figure 2). Figures 2 and 3 show the boundary of the SPMA (and a portion of the RMA to the south) superimposed on aerial photography

and a USGS topographic map, respectively. It is important to note that the hydrographic features shown on these maps are highly dynamic and change seasonally and from year-to-year. Several of the features noted in the figures are likely to move over time and the dates that the maps are based on are noted in the captions.

### 1.2.2. Site Description

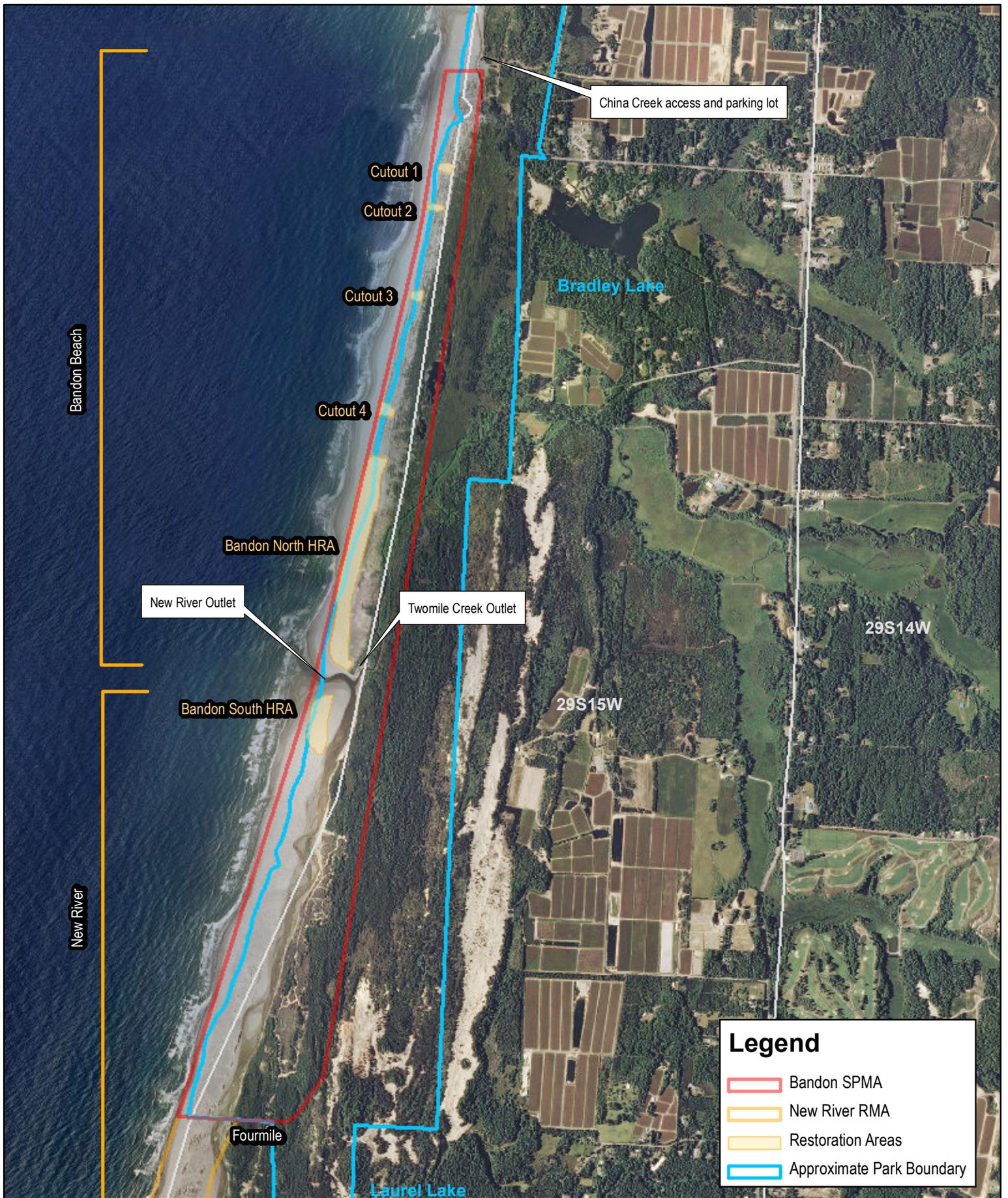
The Bandon SPMA includes sandy ocean shore beaches, including the foredune and some inland vegetative dunal areas from the southern end of the China Creek beach access parking area to the southern boundary of the park property, approximately three miles south (Figures 2 and 3). Bandon SPMA is used by the recreating public for beach recreation which is described in more detail in Section 1.5. The only official beach access point within the SPMA is the China Creek beach access parking area. Anecdotally, there may be some limited use of the China Creek parking lot for drop-off/pick-up of Oregon Coast Trail hikers and campers; trail hikers may also access the SPMA by walking along the beach from the north, bypassing the China Creek parking lot. In the past, Bradley Lake camp has had a trail that lead directly to the beach within the SPMA, however, that trail has been closed and re-directed to the China Creek beach access. There are no other public beach accesses within the SPMA because dense gorse coverage prevents human use from China Creek to New River. South of the mouth of New River, there is the potential for beach access by private landowners when the river is low enough to wade.

#### *Historic conditions*

The General Land Office (GLO) surveys conducted in the mid-1800's included the area now designated as the SPMA and made note of un-vegetated sand-dunes ("sandy barrens") with some scattered vegetation (ORNHC, 2008). Historically, beaches in this area were characterized by much lower foredunes or undulating low and relatively flat sand drifts and mounds. Most areas probably consisted of low rounded mounds built up by native sand stabilizing plant species such as American dunegrass (*Leymus mollis*), yellow sand verbena (*Abronia latifolia*) and silver beach-weed (*Ambrosia chamissonis*). On Oregon's sandy beaches, vegetation cover greater than 20% was uncommon (Wilson, 1980). More densely vegetated sandy areas formed low dunes that were generally oriented perpendicular to the coast, rather than parallel to the coast as is now generally the case.

Other species commonly present in these sandy barrens include seashore bluegrass (*Poa macrantha*), beach morning glory (*Convolvulus soldanella*), red fescue (*Festuca rubra*), seaside lupine (*Lupinus*

*littoralis*), beach silvertop (*Glehnia littoralis*), yarrow (*Achillea millefolium*), pearly everlasting (*Anaphallis margaritaea*), beach evening primrose (*Camissonia cheiranthifolia*), beach knotweed (*Polygonum paronychia*), beach strawberry (*Fragaria chiloensis*), salt rush (*Juncus lesueurii*), seaside tansy (*Tanacetum camphoratum*), beach pea (*Lathyrus japonicus*), gray beach pea (*Lathyrus littoralis*), and seaside dock (*Rumex maritima*). At-risk plant species that may be found in this habitat include the state- endangered pink sand verbena (*Abronia umbellata*) and state-threatened silvery phacelia (*Phacelia argentea*), and Wolf's evening primrose (*Oenothera wolffii*), and. All three are considered FWS species of concern. In addition, beach sagewort (*Artemisia pycnocephala*), is ranked as List 2 (imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction) by ORBIC, and only occurs in two counties in Oregon. These four plant species are currently rare species that were more abundant and which may have even been relatively common in this area prior to widespread colonization by European beachgrass (*Ammophila arenaria*).



**Legend**

- Bandon SPMA
- New River RMA
- Restoration Areas
- Approximate Park Boundary

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Oregon Lambert Projection  
Datum NAD83  
2011 Aerial Imagery

Path: N:\Bioscience\Wildlife\Birds\Western Snowy Plover\Site Management Plans\BandonSPMA Fig 2.mxd

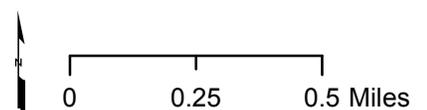
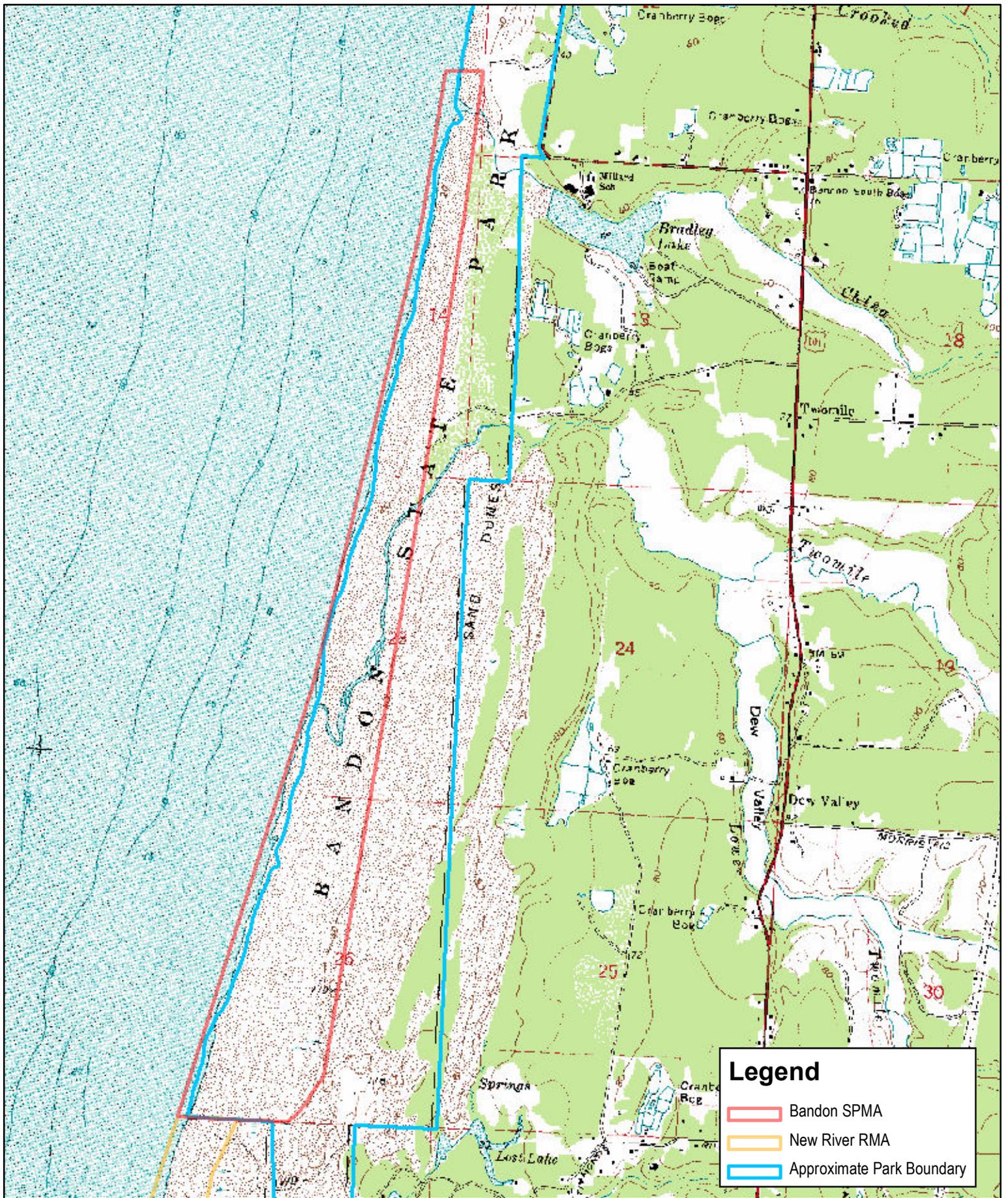


Figure 2. SPMA Boundary at Bandon State Natural Area overlain on 2011 aerial imagery



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Oregon Lambert Projection  
Datum NAD83  
1988 USGS Bandon Quad

Path: N:\Bioscience\Wildlife\Birds\Western Snowy Plover\Site Management Plans\BandonSPMA Fig 3.mxd

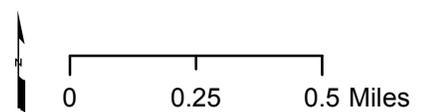


Figure 3. SPMA Boundary at Bandon State Natural Area overlain on a USGS topographic map

### *Current conditions*

Introduced to the U.S. west coast in the late 1800's, European beachgrass has since fundamentally changed the nature of Oregon's coastal sand dunes (Cooper, 1958; Green, 1965; Franklin and Dyrness, 1973, Wilson, 1980; Zarnetske et. al., 2010). A sand stabilizing species, European beachgrass has created foredunes not previously evident on the Oregon coast dominated in large part by that species (Wilson, 1980). Beachgrass has generally decreased beach width, increased slope, reduced the amount of un-vegetated areas above high tide line and provided more cover for snowy plover predators (Wilson, 1980; Zarnetske et. al., 2010; ICF International, 2010a). In the general area of the SPMA, there is currently increased shrubland compared to historic conditions due to beachgrass stabilization. Shrubland varies from primarily introduced gorse (*Ulex europaea*) to more native communities characterized by hooker willow (*Salix hookeriana*), black twinberry (*Lonicera involucrata*), coyote brush (*Baccharis pilularis*), salal (*Gaultheria shallon*), wax myrtle (*Myrica californica*) and evergreen huckleberry (*Vaccinium ovatum*). Where shrubs are absent, cover is generally dominated by European beachgrass. There are some small areas of deflation plane wetlands in low areas between dunes. Those wetland areas are characterized by slough sedge (*Carex obnupta*), Pacific silverweed (*Argentina egedii*) and likely a variety of sedges and rushes.

Inclement stormy weather is relatively common at Bandon SNA, especially during late October through May. Storms coming out of the southwest form relatively warm fronts and may create higher tides than predicted in tide tables. From June through August, frequent strong winds come in from the north. There is often a wrack line along much of the shoreline at Bandon SNA. The exact amount of wet sand and wrack material available varies a great deal depending on weather, tides and other environmental factors.



**Figure 4.** Western snowy plover HRA at Bandon SPMA

Plovers prefer open sandy habitat for breeding. Habitat modification that has occurred largely due to the introduction and spread of European beachgrass has reduced the amount of nesting habitat available, including within the Bandon SPMA (USFWS, 2007). The steep foredunes prevent overwash and scour that naturally maintained plover's preferred habitat (ICF International, 2010a). Beginning in 2002, OPRD has worked to restore approximately 50 acres of habitat for plovers near the mouth of Twomile Creek. This work has involved removing European beachgrass, gorse, and grading the upper beach to allow more storm wave overwash to occur. Recently, the outlet of New River moved north and joined with the Twomile Creek outlet (Figure 2). This has created more overwash in the area and appears to have improved nesting at the site (Lauten et. al., 2010). OPRD plans to continue to maintain 50 acres of habitat for plovers within the SPMA.

Plovers nest and raise their young along much of the Bandon SPMA. Nests and broods are often found along the foredune throughout the SPMA, including near China Creek, in the China Creek overwash area (Figure 2), within the HRAs, and along the low-lying foredunes south of the maintained HRA (both north and south of the New River mouth). The HRAs are generally flat sandy beaches with little vegetation. Areas along the foredune that plovers tend to nest in are made up of a summer build-up of sand on the front side of the foredune. The China Creek overwash is a historic flow of China Creek. Areas south of the Bandon North HRA are overwashed by storms, creating open beach areas. These areas currently require no additional

management to maintain suitable plover nesting habitat. Some maintenance actions along the southern boundary of the SPMA may be required if winter storms do not maintain the open sand.

### **1.3 Regulations**

An U.S. Army Corps of Engineers (ACOE) Section 404, Clean Water Act (CWA) permit is required for discharge of dredged or fill material into waters of the United States. This includes bulldozing sand west of the high tide line on the beach at Bandon SPMA. An ACOE Rivers and Harbors Act Section 10 permit is also required for actions that occur in, under, over or would impact navigable waters (including the Pacific Ocean). Discharges subject to federal permitting must also comply with state water quality standards (CWA Section 401) which are regulated by the Oregon Department of Environmental Quality (DEQ). Currently, OPRD activities are covered by nationwide permit(s).

OPRD issues permits for activities on the Ocean Shore, including the construction of shoreline protective structures, beach access, dune grading and various removal and fill activities, the routing of pipelines and cables beneath the Ocean Shore, and natural product removal. OPRD also regulates vehicle use on beaches closed to driving, beach salvage activities, and other activities conducted on the Ocean Shore. OPRD has had an alteration permit for the habitat restoration work conducted at Bandon SPMA.

Oregon's statewide planning goals (namely, Goal 17: Coastal Shorelands and Goal 18: Beaches and Dunes) are relevant to the actions proposed in this site management plan. The goals are achieved through local comprehensive plans completed by counties. Coos County has a dune management plan and local ordinances which have been approved by the coastal program of Oregon's Department of Land Conservation and Development (DLCD). The HCP and its provisions have been reviewed by DLCD and have been determined to be consistent with the Coastal Zone Management Act (CZMA).

### **1.4 Historical and Current Status of Plovers**

Overall, snowy plover numbers and breeding locations have declined on the U.S. Pacific coast over the past century (ICF International, 2010a). Between 1977 and 1980 there were an estimated 2,300 breeding snowy plovers along the coasts of Washington, Oregon, and California (Page et. al., 1991). In 1988–1989 this

number was estimated to be 1,900 (Page et al. 1991). In 2006, the estimated maximum population was slightly under 2500 adult birds spread out between the Washington (70), Oregon (177-179) and California coasts and San Francisco Bay (2,231; USFWS, 2007). For this west coast bird, the recovery bar has been set at an average of 3,000 breeding adults per year for 10 years. Oregon and Washington combined need to support 250 breeding plovers (USFWS, 2007). In 2010, the number of resident plovers in Oregon was estimated at between 232-236 birds, with 175 confirmed breeding adults (Lauten et. al., 2010). During Washington's 2010 breeding window survey, only 38 adult plovers were found, the lowest in the past five years (Pearson et. al., 2010).

### 1.4.1. Population Status at Bandon SPMA

In 1990, intensive monitoring of the distribution, abundance, and productivity of the snowy plover coastal population in Oregon began. Currently, snowy plover monitoring is conducted through the Oregon Biodiversity Information Center (ORBIC) as a joint task between BLM, USFS, USFWS, ODFW, and OPRD. Distribution and abundance monitoring efforts include breeding season and winter window surveys as well as productivity monitoring. Productivity monitoring is described in Section 1.4.2. Survey methods are described in Castelein et al. 2000a, 2000b, 2001, 2002, and Lauten et al. 2003.



Figure 5. Snowy plovers roosting on dry sand

## *Wintering*

Plovers mainly overwinter in coastal areas between southern Washington to Central America (Page et al., 1995), with less than 3% of the total population wintering in Oregon (USFWS unpublished data). Approximately 80% of the Oregon breeding plover population is believed to overwinter on the Oregon coast (ICF International, 2010a). The Bandon SPMA-New River area is one of eight overwintering sites along the Oregon coast (ICF International, 2010a). Numbers of snowy plovers counted during winter window surveys at Bandon SPMA-New River vary widely from year to year. Between 1991 and 2010, overwintering counts at Bandon range from a low of zero birds (1994, 2003 and 2004) to a high of 41 birds in 2008 (USFWS unpublished data). Winter window surveys are intended only to provide a range-wide index of the plover population over many years and help inform managers about large-scale trends. Wintering data is not meant to be used to look at site specific plover conditions or trends.

## *Breeding Season*

In the early 1970's, the estimated coast wide population estimate was about 300 birds with 216 observed at 19 beaches in Oregon (Wilson, 1980). In 1978, annual breeding window surveys began and ranged between 139 in 1981 and 30 birds in 1992 (USFWS, 2007). In 2010 the snowy plover breeding population in Oregon was estimated at 175 birds (Lauten et. al, 2010).

In addition to lower numbers of breeding pairs when compared to historical data, there are also fewer breeding sites. Snowy plovers historically bred at over 20 locations on the coast (USFWS, 2007). By 1978, evidence of nesting activity was present at only 12 of these beach sites in Oregon (Wilson, 1980). Currently, Bandon is one of only seven documented breeding sites in Oregon (USFWS, 2007; ICF International, 2010a).

Between 1991 and 2010, counts of snowy plover nests observed during the breeding season fluctuated widely, both at Bandon and along the Oregon coast (Table 1). Numbers of nests at Bandon ranged from a low of zero nests in 1990 to a high of 31 in 2005 and 2009 (Table 1).

Table 1. Total nest numbers on the Oregon Coast 1990-2010

Year	Nests at Bandon Beach <sup>a</sup>	Nests for all Oregon Coast sites <sup>a</sup>
1990	0	36
1991	14	36
1992	8	36
1993	10	41
1994	5	51
1995	9	76
1996	3	89
1997	4	93
1998	1	78
1999	2	78
2000	2	100
2001	6	111
2002	5	89
2003	5	91
2004	17	117
2005	31	144
2006	23	147
2007	30	202
2008	28	196
2009	31	236
2010	26	261
<b>TOTAL</b>	<b>260</b>	<b>2308</b>

<sup>a</sup>Not all nests were located prior to hatching; approximately 6 nests at Bandon Beach and 89 nests for the Oregon coast could be inferred based on brood presence.; these broods are not tallied in the total number of nests.  
Source: Lauten et.al., 2010



Figure 6. Snowy plover nest scrape near China Creek

### 1.4.2. Nest Success and Productivity

Productivity monitoring includes locating nests and tracking the outcomes, banding young, and tracking fledgling survival. This monitoring helps determine estimates of nest abundance, nest fate, fledging success, use of habitat restoration areas, adult populations through marked individuals, and efficacy of predator management methods. Survey methods are described in Castelein et al. 2000a, 2000b, 2001, 2002, and Lauten et al. 2003. Tracking nest success, brood success, and hatch-year returns can help identify factors affecting the recovery of the species and guide management decisions. Reporting has considered Bandon Beach separately from the area south of New River (Bandon New River, Figure 2), and Bandon New River data has been pooled with the New River RMA. Since New River has moved north, older data represents a larger acreage of Bandon Beach. Data presented here summarizes Bandon Beach, and not data pooled with other ownership.

#### *Nest Success*

Nest success in this site management plan is defined as the number of successful nests divided by total number of nests (apparent nest success; *from* Lauten et al., 2003). While overall nest success at Bandon SPMA has varied, snowy plover nest success at this site averages about 34% from 1993-2010 (Lauten et. al., 2003-2010 and Castelein et. al., 1999-2002). Nest success appears to rely on effective predator management, recreation management, and various environmental factors.

**Predator Management:** Nest success at Bandon SPMA is bolstered by lethal and non-lethal predator management methods combined with effective use of exclosures. Predator management is described in more detail in Section 3.2.

**Disturbance and Recreation Management:** People recreating in the area have the *potential* to impact nest success including people walking near symbolic fences, illegal fireworks, dogs-off leash and kite-boarders. There have been very limited incidences of deliberate destruction and vandalism of exclosures at Bandon SPMA. Recreation disturbance is discussed in more detail in Section 2.1. Recreation management is described in Section 4.

**Habitat variables:** The encroachment of vegetation into suitable nesting habitat areas can render sites unsuitable for nesting may provide cover to predators, and have an indirect effect on nesting success. Habitat

restoration efforts may enhance the success of nests. Habitat management is described in Section 2.2 and 3.1.

**Environmental Conditions:** Other factors that may limit nest success at Bandon SPMA include weather, high tides, and weather events (e.g., storms and strong winds that lead to sand inundation).

### *Productivity*

In addition to nest success, the number of young that survive is another important component of snowy plover productivity and imperative to the recovery of the species. Reproductive success, the number of young fledged per adult male, is based on males because they provide post-hatching parental care, and females lay clutches for multiple males (Warriner et. al., 1986). Reproductive success provides an index for comparing productivity between sites and years. Fledgling success, the percentage of hatched young that reach flying age, is not affected by exclosure use since hatched birds quickly vacate the nest area (Lauten et. al., 2010).

Food availability, weather, predation, human disturbance, and other unknown potential effects are factors that can influence fledgling success. At Bandon SPMA snowy plovers forage in the wet sand and wrack line on invertebrates (USFWS, 2007). There is often a wrack line along much of the shoreline at Bandon SNA. The exact amount of wet sand and wrack material available varies a great deal depending on weather, tides and other factors. Inclement, stormy weather is relatively common at Bandon SNA during the nesting season, especially during the early portion of the season. Storms coming out of the southwest form relatively warm fronts and may create higher tides than predicted in tide tables. Later on in the plover nesting season, frequent strong winds from the north occur and may impact fledgling success. Issues related to predation at Bandon are described in Section 2.3.

Currently, management techniques to improve fledgling success at Bandon SPMA consist of predator management (Section 3.2), habitat management (Section 3.1) and recreation management (Section 4). At Bandon SPMA, hatch rates pre- and post- predator management activities have remained similar, but fledgling success rate and reproductive success have increased (Table 2). OPRD has requested the biological monitoring team to utilize statistical analyses including covariates such as weather and climactic

conditions (e.g., el nino, la nina) to determine if these increases and other changes are significant, and to evaluate the efficacy of predator management and other management actions.

**Table 2.** Reproductive success of snowy plovers at Bandon Beach (1992-2010).

Year	Hatch Rate <sup>1</sup>	Fledgling Success Rate <sup>2</sup>	Reproductive Success <sup>3</sup>
2010	52%	19%	0.75
2009	17%	50%	0.75
2008	7%	40%	0.18
2007	33%	54%	1.63
2006	36%	42%	1.16
2005	46%	30%	0.92
2004	66%	45%	1.40
2003	46%	33%	0.50
2002	0%	0%	0.00
2001	46%	17%	0.33
2000	0%	0%	0.00
1999	75%	33%	0.50
1998	0%	0%	0.00
1997	0%	0%	0.00
1996	67%	17%	0.50
1995	18%	0%	0.00
1994	100%	33%	1.25
1993	48%	30%	0.60
1992	30%	14%	0.25
<b>Pre-predator management ('92-01)</b> Average +/- St. Dev.	38.4 +/- 35.0	14.4 +/- 14.1	0.34 +/- 0.40
<b>Post-predator management ('02-'10)</b> Average +/- St. Dev.	33.7 +/- 21.8	34.8 +/- 16.8	0.81 +/- 0.54

1 Hatch rate: number of hatched eggs/total number of eggs

2 Fledgling success: number of fledged young/total number of hatched eggs

3 Reproductive success: number of fledged young per male

Source: Lauten et. al., 2010.

Note: The primary purpose of Table 2 is to show reproductive success of snowy plovers at Bandon Beach over time. However, pre- and post-predator management information is also included. For a detailed description of the comprehensive predator management activities conducted at Bandon SPMA see section 3.2.

### 1.4.3. Survival

A final component to recovery of western snowy plover is survival. Adult survival is important to population dynamics and is addressed in the HCP by focusing on reduction of the identified threats to the snowy plover, discussed in the Recovery Plan (USFWS, 2007). Adult survival can vary by site (Mullin et al., 2010), and has not been analyzed for Bandon SPMA. Efforts to assess adult survival on the Oregon coast are in process (E. Gaines, pers.comm). In the absence of site-specific adult survival data, strategies to minimize these threats (outlined in this plan) may help improve and maintain survival at Bandon SPMA.



**Figure 7.** Snowy plover habitat and fencing at Bandon SPMA

## 1.5 Human Use of the Site

### 1.5.1. Recreation

Participating in beach-related activities is one of the top ten outdoor recreational activities for Oregonians and out of state visitors (OPRD, 2003). Approximately six million annual beach visits are estimated to occur to coastal regions every year, with over half of those visits (4.2 million) by Oregon residents (OPRD, 2003). Non-coastal Oregonians made up the majority of the visits; however, a smaller number of coastal residents visit the beach many more times than those who travel from elsewhere (OPRD, 2003; OPRD, 2005). There are more than 40 different recreation-related activities that occur on Oregon's Ocean Shore, of which 29 are the primary reason people go to the beach (Shelby and Tokarczyk, 2002; OPRD, 2005). Of course, activities vary seasonally and along the coast.

The Bandon SPMA falls within the south coast region, and more specifically in beach segment five (Umpqua River to Blacklock Point) in the 2002 Ocean Shore Recreational Survey conducted by OPRD (Shelby and Tokarczyk, 2002). Some types of recreation are limited seasonally near and in plover habitat and nesting areas at Bandon. The most popular activities noted in segment five were walking (93.2%), scenic enjoyment (81.9%) and picnicking (56.7%) (Shelby and Tokarczyk, 2002).

Compared to other beaches in the state, particularly on the central and north coast, the Bandon beaches receive relatively few visitors on average (90/weekend day) and most of those that visit do not experience crowding (88%; Table 3). SPMA's were chosen, in part, because the areas receive relatively lower levels of visitation during peak summer months than adjacent or nearby beaches (ICF International, 2010a). The estimated yearly visitation for the Ocean Shore between Face Rock near the Coquille River and Blacklock Point is 32,656 visits (Shelby and Tokarczyk, 2002). This estimate includes a larger section of beach than the target SPMA, so is likely greater than actual use for the specific area of interest (ICF International, 2010b).

The most common activities noted at the beach between Face Rock and New River, which encompasses the Bandon SPMA, are walking/other exercise (47%) followed by relaxing/scenic enjoyment (27%; Table 3). Other activities that are not as common but have the potential to impact plovers include dog walking (7%) and kite-flying (3%). Some wind and kite surfing does occur in the area, including the China Creek access point on the north end of the SPMA. Although not noted in the survey, limited camping (potentially associated with Oregon Coast Trail use) has been anecdotally observed within and adjacent to Bandon SNA. Firework use has been observed near the China Creek parking lot. Recreational activities that occur at and have the potential to cause disturbance to plovers at Bandon are described in more detail in section 2.1.1.

**Table 3.** Face Rock to New River Beach Use Levels and Recreational Activities

<b>Recreational Activity</b>	<b>Percentage</b>
Walking/other exercise	47
Nearshore Activities	1
Camping	0
Kite-flying	3
Dog Exercising	7
Relaxing/Scenic Enjoyment	27
<b>Average Number of People/Weekend Day</b>	90
<b>Average Number of People/Week Day</b>	71
<b>Percentage reporting some crowding</b>	12

Other Activities: Beachcombing, horseback riding, fishing from beach, family activities, clamming. Source: Shelby and Tokarczyk, 2002.

### 1.5.2. Non-recreation uses

#### *Beach Management*

The Ocean Shore is a dynamic ecosystem, with constant change brought about by the Pacific Ocean, both naturally and as a result of the interface between humans and nature. OPRD is responsible for managing other types of non-recreational activities that occur on the Ocean Shore

such as marine mammal strandings/removal, boat strandings/salvage operations, public safety, and law enforcement. These activities may require beach disturbance, walking and driving for beach access (including ATVs), operating machinery, and occasionally crowd-control. These activities will be implemented in a manner that minimizes impacts to plovers as described in the HCP (Section 3.3.2: Beach Management Activities).

Marine mammals, boats, and other items wash up on the Ocean Shore and sometimes, depending on the situation, require intervention by park and other agency staff (e.g., removal/burial of marine mammals and other items). In order to help preserve the public's safety while recreating on the beach, OPRD staff also engage in a variety of safety/maintenance activities such as maintaining emergency access points; investigating/removing unsafe drift logs; and investigating/facilitating the removal of hazardous materials on the beach (ICF International, 2010a). Law enforcement activities by both OPRD staff and other law enforcement personnel involve investigating crimes and enforcement of rules on the beach.

### *Natural Resource Management*

A variety of natural resource management activities are conducted by OPRD, including snowy plover management and habitat restoration activities for other sensitive species on the Ocean Shore. Snowy plover management activities at Bandon SPMA include predator management, managing volunteers who conduct public outreach and education to beach users, habitat restoration and maintenance work, and monitoring and reporting activities (ICF International, 2010a). Habitat restoration for other species, such as the state listed pink sand verbena and silvery phacelia (which is also a USFWS "species of concern"), may also involve dune management or other activities (e.g., removal of exotics, planting native species) to restore native conditions. While these efforts are likely to also benefit the snowy plovers, some incidental impacts may occur (ICF International, 2010a).

## Section 2. Management Issues

### 2.1 Human Disturbance

#### 2.1.1. Recreation

Human recreation is often cited as one of the major threats to the breeding success of the snowy plover (ICF International, 2010a). On the Oregon coast, human recreation may contribute to snowy plover reproductive failures and disturbance (ICF International, 2010a).

Recreational activities that occur at and have the potential to cause disturbance at Bandon SPMA include:

- Disturbance by humans (e.g., hiking, walking, jogging) and/or pets getting too close to incubating or brooding birds. Dogs are currently required to be on-leash within and adjacent to Bandon SNA. Off-leash dogs are the most frequently noted illegal activity related to plovers in the Bandon SPMA. Occasionally visitors and dogs have been seen walking near and behind closed roped areas.
- Surf fishing and beach camping can result in prolonged disturbance to nesting and brooding snowy plovers (ICF International, 2010a). Beach camping is not allowed on the Ocean Shore adjacent to Bandon SNA or within any roped areas. Infrequent illegal beach camping occurs, mainly near the current mouth of New River.
- Recreational users, including picnickers and campers, may leave behind food or trash, which can attract predators (ICF International, 2010a). Human disturbance can also cause adults to flush from nests, increasing nest exposure and the likelihood of nest failure. There is some picnicking near the China Creek beach access parking lot.
- Driftwood removal for fire building can disturb incubation, cause accidental crushing of eggs or chicks and remove important components of plover habitat (ICF International, 2010a). This is not a location where people tend to go to collect driftwood since it is generally sparse (except by the river) and is a long walk back to a parking lot. Occasional

collection may occur by illegal campers or by day-users for small beach fires, likely relatively close to the China Creek access.

- Illegal use of motorized vehicles on closed beaches can harass nesting plovers, crush nests and young chicks, and destroy sensitive native dune vegetation (ICF International, 2010a). This activity occurs very infrequently at Bandon SNA. In the past, ATV's have been observed at the southern end of the SPMA during the nesting season and may have the potential to disturb nesting plovers (ICF International, 2010a). However, currently due to the depth of the river, access to the SPMA is very limited.
- Some kite-flying, kiteboarding/wind-surfing occurs at Bandon SNA. Plovers may perceive kites as avian predators and temporarily or permanently abandon nests. The sudden movement of an adult leaving the nest may also attract the attention of corvids or other predators that will then depredate the nest.
- Equestrian use of the beaches can disturb plovers and potentially crush nests and young chicks. Horses occasionally have been seen crossing into the roped area across from China Creek.
- Illegal use of fireworks has been observed near nesting plovers on the beach near the China Creek parking lot.

These activities will be managed in a manner that minimizes impacts to plovers as described in the HCP (Section 5.4.2: Public Use/Recreation Management) and this plan (Section 4: Recreation Management). For illegal activities, law enforcement (e.g., beach rangers) will respond to minimize impacts to plovers.

## **2.1.2. Non-recreation disturbance**

### *Beach Management*

OPRD is responsible for managing other types of non-recreational activities that occur on the Ocean Shore such as marine mammal strandings/removal, boat strandings/salvage operations of boats and other items, public safety, and law enforcement. At Bandon SPMA, the more frequent activities are routine enforcement of beach regulations, primarily snowy plover restrictions, followed

by animal strandings. Beach management activities will continue to be conducted in a manner consistent with the requirements of the HCP. OPRD will consult with USFWS regarding these activities, as necessary, within the Bandon SPMA prior to conducting the activity. Emergency situations, such as fires (there have been two gorse fires upland of the SPMA in the past two years) may require immediate actions. Emergency situations are considered to be an unforeseen circumstance, which are addressed in the HCP.

**Marine Mammal Strandings and Removal:** Marine mammal strandings involves the investigation, reporting, and either burial or removal of the mammal from the Ocean Shore. Activities may involve beach disturbance (in the case of a burial), driving and operating machinery by OPRD staff, and often involves groups of people and vehicles gathered on the beach. These activities may necessarily occur inside, as well as outside, the SPMA. Large animal strandings (e.g., sea lion, whales) occur approximately six times per year and smaller animal strandings (e.g., birds, seals) are more frequent; the carcasses are generally buried. These activities will be implemented in a manner that minimizes impacts to plovers as described in the HCP (Section 3.3.2: Beach Management Activities) and as follows.

If a marine mammal carcass is found, the Marine Mammal Stranding Network (MMSN) will be contacted as soon as possible. If a carcass must be buried immediately, the following information will be collected and conveyed to the MMSN: a photo of the carcass and a record of the date, time, and GPS coordinates. In some cases (e.g., fresh dead small cetaceans), the MMSN will want to retrieve the carcass. As a temporary measure, the carcass will be buried in a shallow pit in order to reduce the threat posed to plovers and prevent scavenger damage until MMSN can arrive at the site. The site will be well-marked to ensure MMSN retrieval. It may be necessary to relocate a large marine mammal carcass (e.g., elephant seal) off-site until MMSN can arrive at the site. Relocations will be coordinated between MMSN and agency representatives (e.g., ocean shore natural resource specialist and/or beach ranger(s)).

**Public Safety:** This activity involves OPRD staff maintaining emergency access points; investigating reports of unsafe drift logs, and where necessary, the removal of those logs;

monitoring, photographing, and documenting erosion and storm damage; investigating reports of hazardous materials on the beach; and closure and coordinated cleanup of spilled hazardous materials.

**Law Enforcement:** This activity involves OPRD staff members supervising and enforcing OPRD rules that include implementing SPMA recreational restrictions, monitoring and checking for valid permits and illegal taking of natural resources, patrolling beaches, compliance monitoring, and conducting outreach. One full-time Beach Ranger conducts these activities at Bandon SPMA. However, certain employees at State parks have citation authority, and occasionally patrol State park beaches and beach access sites. OPRD personnel may also assist law enforcement personnel with injury/death or other crime-related investigations as requested. It involves OPRD staff accessing and moving along the beach by walking, riding horseback, or driving a motor vehicle (including an ATV).

## 2.2 Habitat

Habitat modification that has occurred largely due to the introduction and spread of European beachgrass and other non-native vegetation has reduced the amount of nesting habitat available within the Bandon SPMA.

Build-up of driftwood/drift-logs within the SPMA may impact plover habitat. Currently, driftwood tends to build up near the mouth of New River during the winter through early June. Since most of the piles front the HRA, birds are able to nest upland of the driftwood. However, if the wood piles up substantially in front of higher foredune areas, nesting may be limited and the driftwood could potentially aid in the formation of even steeper foredunes. Driftwood removal activities have been identified as a threat to plovers during the nesting season (USFWS, 2007). Not all driftwood is detrimental; smaller amounts can provide plovers protection from the weather and predators (USFWS, 2007; ICF International, 2010). Managing the beach to maintain suitable levels of driftwood will be an annual task.

## *Natural Events*

Non human-mediated events such as those related to weather (e.g., high tides, strong winds) also lead to nest failure (ICF International, 2010). While these occur naturally, cumulative impacts to the plovers, including habitat alteration, increased predation due to introduced species and attraction by human activities, and human recreational activities, plovers have a harder time coping (ICF International, 2010). At Bandon SPMA, storm run-up on the beach may destroy nests and also has management implications for OPRD. Fencing installed early in the season (March-early June) may get inundated and need to be replaced resulting in nests that are temporarily unprotected from pedestrians as well as additional disturbance when fencing is reinstalled.

## **2.3 Predation**

Predation appears to be the main cause of nest failure at Bandon, responsible for 59% of failed nests from 2003-2010 (Table 4). Predation by corvids (29%), unknown predators (21%), and nest loss to unknown causes (19%) are the highest sources of failure. Nest failure from mammal predation, such as red foxes and rodents (6%) contribute to nest failure as well as nest abandonment (10%).

Predation may result from other factors. For example, human or other disturbance causes adult birds to move or flush their nests, which exposes eggs and makes nests more vulnerable to predation. Also, lack of habitat management allows extensive regrowth of vegetation which can create cover for predators and result in higher predation rates in adjacent suitable habitats. Integrated management of these factors is necessary to ensure recovery and survival of plovers.

**Table 4.** Causes of snowy plover nest failure at Bandon SPMA (2003-2010).

Year	Total Nests	Failed Nests	Adult Plover Predation	Egg Predations				Other Failure					
				<i>Corvid</i>	<i>Unk Predator</i>	<i>Mammal</i>	<i>Rodent</i>	<i>Weather</i>	<i>Abandon</i>	<i>1 egg nest</i>	<i>Over-wash</i>	<i>Infertile</i>	<i>Unk. Cause</i>
2010	26	15		2	3		1		1				8
2009	31	26		2	12		2			3			7
2008	28	25		10	4			2	5	2	1		1
2007	30	20		4	1	2			4	5			4
2006	23	16	4	4	4	1				1			2
2005	31	17		12		1		1	2				1
2004	17	4		1	1	1						1	
2003	5	3		1	1								1
<b>Total</b>	<b>191</b>	<b>126</b>	<b>4</b>	<b>36</b>	<b>26</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>12</b>	<b>11</b>	<b>1</b>	<b>1</b>	<b>24</b>

Source: Lauten et. al., 2003-2010 and Castelein et. al., 1999-2002.

## Section 3. Conservation Measures

OPRD's management of the Bandon SPMA will be guided by the principles that OPRD will:

- Contribute to the conservation and protection of the Pacific coast population of western snowy plover in Oregon;
- Manage for conservation and recovery of western snowy plover and their habitat in a manner that balances effort with human use on the Ocean Shore; and,
- Work in cooperation with partners to increase public awareness and support snowy plover and their habitat needs.
- Meet the requirements of the HCP and associated ITP.

Actions to help achieve these goals are outlined in this plan including the following conservation measures: habitat restoration and maintenance as needed, predator management, and monitoring.

### 3.1 Habitat Restoration and Management

Goal: Provide and maintain a minimum of 50 acres of quality habitat available for nesting and wintering western snowy plovers at Bandon SPMA. To meet the habitat restoration parameters established by the HCP, OPRD is required to restore and maintain 50 acres of snowy plover habitat within Bandon SPMA. Currently, OPRD has met the HCP requirements in HRA's north and south of the mouth of New River. OPRD will continue to maintain 50 acres of snowy plover habitat above the mean high tide line (See Section 3.1.2).

#### 3.1.1. Habitat Restoration

Habitat restoration at Bandon SPMA involves restoring coastal dune habitat through the removal of invasive plant species as well as lowering the foredune to allow storm wave over-wash to occur, where applicable.

Restoration has included bulldozing of European beachgrass, leveling of back dunes, and removal of the foredune to allow for winter storm inundation. This work is conducted in areas that will not impact existing structures or cultural resources.

Presently the Bandon SPMA contains approximately 50 acres of restored snowy plover habitat located 1.2 miles south of the China Creek parking lot. The first OPRD maintained HRA, restored in 2002, was located south of the present mouth of New River and is now maintained naturally by the north movement of the river. New River will likely continue to move north and assist in restoring habitat. There are 30 acres of restored land north of the present New River mouth and 20 acres south of the mouth. In addition to the 50 acres of habitat restoration work for the HRA, OPRD experimented with 5 cut-outs of 0.5-1 acres each located intermittently between the HRA and China Creek.

These cut-outs are small areas suitable for nesting created by removing a portion of the foredune and leveling the area of sparse vegetation behind the foredune in an effort to encourage nesting off the beach while still allowing access to the beach for foraging. Snowy plover nesting in the cut-outs may experience less disturbance from humans and weather due to the presence of the foredune; however, this observation is based on anecdotal information. Providing dispersed nesting habitat may also reduce the risk of predation, (USFWS, 2007, Page et al, 1983). Recent work has shown western snowy plovers ceased incubation and left nests when observers approached within 80 m (Muir and Colwell, 2010). To increase the likelihood of snowy plovers successfully utilizing these cutouts, suitable nesting habitat should be available at a minimum distance of 100 m from where symbolic fencing can be maintained. Due to narrow beach widths, placing cutouts behind the foredune makes this arrangement feasible.

### **3.1.2. Habitat Maintenance**

Park managers in cooperation with staff biologists and OPRD natural resource specialists will determine habitat management efforts on a year-to-year basis based on on-site inspections with the objective of maintaining suitable habitat for nesting plovers. OPRD will maintain 50 acres of habitat for snowy plover nesting by performing the following activities when necessary:

- Mechanical vegetation removal. The primary method of restoration has been by bulldozer. All work is performed between September 15 and March 15 (after the nesting season). To date, most work has been done in the winter months (December-January). OPRD will determine when restoration will be

required by an on-site inspection of the HRA to determine European beachgrass encroachment. The HRA will be maintained for suitable nesting habitat and vegetation removal will be determined by OPRD management and natural resource staff on a case-by-case basis. Limited re-growth will be acceptable as plovers use some vegetation for cover, but extensive re-growth will be managed. Mechanical maintenance work may occur every one to three years depending on habitat condition. Agricultural equipment and tillage may be used in the future as a means of reducing cover of European beachgrass.

- Based on results of best available management practices, herbicides may be used as a tool on a small scale experimental basis to reduce thick re-sprouts of beachgrass and determine if a more broad-based spray is appropriate in the future. If successful, a more broad-based spray may be incorporated into habitat management.
- Driftwood removal may be needed if driftwood accumulates in areas that block brood movements. Driftwood removal would occur between September 15 and March 15 (after the nesting season).
- It may be necessary to use an excavator to remove logs. The south end of the HRA has many logs and the bulldozers have been severely hampered in that area in the past. Condition of the habitat restoration will determine if log removal is necessary.

On-site inspections by OPRD staff biologists and natural resource specialists will help determine the condition of habitat and whether vegetation removal, herbicide application and log removal is necessary on a year-to-year basis with the objective of maintaining suitable nesting habitat. Recent research indicates vegetative cover should not exceed 40% and be patchy (Muir et. al., 2010). A combination of topographic features (beachgrass hummocks, foredune height), vegetation height, vegetative cover, and other cover (driftwood, shells, etc) can affect suitable habitat and maintenance schedules. For example, as beachgrass hummocks build in size, more rapid accumulation and stabilization of sand could occur, and removal of hummocks before this point would be more efficient. OPRD will develop a matrix of these features to help provide an assessment applicable to Bandon and other SPMA's. Some literature can provide baseline metrics (Muir et al., 2010; Hacker et al., 2011); OPRD will coordinate with USFWS on the development of the matrix.

For the past two winter seasons, the area around the mouth of Twomile Creek and New River has been restored via northern movement of the mouth and severe winter storms. Hopefully this process will continue to aid with habitat restoration efforts. Other than mechanical removal (described above), no other methods have been used on the Bandon HRA to date. Partnerships may include USFWS, BLM-New River, and the Snowy Plover Working Group. A future partnership may occur with the Oregon National Guard to perform bulldozing and excavation work to remove logs. The USFS has used the National Guard in their restoration projects and had successful results with lower cost.

## 3.2 Predator Management

Goal: Improve productivity of western snowy plover by reducing predator populations while maintaining adult population numbers.

To enhance snowy plover nesting success, OPRD, in cooperation with partner agencies (e.g., BLM, USFS, USFWS) contracts with APHIS-WS to conduct predator management. In addition to federal partnering agencies, ODFW is also a key member of the predator management subcommittee of the Snowy Plover Working Group. Information on predator management is available in annual reports prepared by APHIS-Wildlife Services (Burrell, 2011). OPRD will follow the procedures as outlined in the Western Snowy Plover Integrated Predator Damage Management Program Action Plan (Predator Management Action Plan) (USDA Forest Service et. al., 2011). The Predator Management Action Plan is updated annually and provides direction for implementation of the program in the coming year.

Corvids (i.e., ravens and crows) pose the largest threat to snowy plovers at Bandon. A variety of non-lethal and lethal methods are employed to control corvids and other predators if they are determined to be targeting plovers. Potential predators of snowy plovers that may be targeted for control include red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), spotted skunk, Virginia opossum, feral cat (*Felix domesticus*), domestic dog (*Canis domesticus*), mink (*Martes vision*), weasel (*Mustela* spp.), rodents, common raven, American crow, gulls, and raptors.

Predator management at Bandon SPMA began with the use of exclosures in 1991. . These exclosures allow passage of adult snowy plovers, but exclude larger predators such as coyote, corvids, and foxes. However, exclosure use can increase predation of adult plovers; therefore, use of exclosures must be carefully assessed for application. In 2003, the size of the exclosures were reduced. Between 2003 and 2010, the nest success of exclosed nests was much higher than non-exclosed nests, ranging from 42% to 100%;the use of exclosures appears to improve nest success at Bandon SPMA. While these data have not been statistically analyzed due to small sample size, statewide exclosed nest success was significantly higher than non-exclosed nest success (Lauten et al., 2010), and exclosure use significantly improved nest success in California (Neuman et al., 2004). . When nest success of non-exclosed nests is within expected ranges (41-58%; Colwell et. al., 2005, Page et. al., 1983, and Powell et. al., 2002), using exclosures may not necessarily increase overall productivity, as other factors such as fledgling survival may play a role (Lauten et. al., 2010). Given that nest success of non-exclosed nests at Bandon Beach averages at 10% while exclosed nest success averages 69% (1993-2010, excluding 1994, 1996, 1998, and 2000 due to uneven data), continued use of exclosures seems warranted. Exclosure use will be evaluated annually with the Western Snowy Plover Working Team.

Additional predator control measures were implemented by APHIS-WS at Bandon SNA starting in 2002, including lethal removal of corvids and other predators that target plovers. Nest success of snowy plovers in California significantly improved after mammalian predator management techniques were initiated, including exclosures and removal (Neuman et al., 2004). Animals determined to be a threat to nesting plovers will be deterred or removed using the most effective, selective, and humane methods available. OPRD will use the Predator Management Action Plan to manage for predators at Bandon SNA and will contract with APHIS-WS for predator management work. A variety of tools and definitions in the Predator Management Action Plan are summarized as follows:

**Non-lethal tools** could include any or all of the following, depending upon the circumstances: increased or improved trash management; removal of carrion; relocation of live trapped animals; aversive methods that harass or deter predators such as pyrotechnics, electronic calls, vehicle harassment, repellents, effigies, electrified or non-electrified exclusionary nest site fencing and exclosures; and habitat modification. A public education program to inform the public about the effects of cats and dogs, as well as the potential of attracting predators by leaving litter near plover use areas may also be implemented.

Plover nest enclosures can be effective for most predators except weasels, rodents, owls and other raptors. However, in some cases the use of enclosures may have contributed to increased mortality of adult plovers. Guidelines have been developed to both appropriately deploy enclosures and minimize adult mortality (ORBIC, 2012). Cautious use of enclosures is encouraged. Trash removal is effective on all predators by reducing food resources. Patrolling is effective mostly for ravens, crows, gulls, raptors, fox, coyote, dogs, and cats. Effigies may be effective for ravens and crows as well as some raptors.

**Lethal tools** could include any or all of the following depending upon field circumstances: shooting; euthanasia in conjunction with cage traps; padded-jaw leg-hold traps; nets; snares; gas cartridges; DRC-1339 (avicide); nest removal and egg destruction; snap traps; or zinc phosphide bait (rodenticide).

Targeted animals that are live-trapped are humanely euthanized according to standards approved by the American Veterinary Association. APHIS-WS personnel will determine what method or combination of methods is most appropriate and effective for each unique situation using the APHIS-WS Decision Model outlined in the Predator Management Action Plan. Specific actions taken will be based on whether an animal is considered a priority or non-priority species, or if focused attention is observed:

**Priority or target species** are animals that have the greatest tendency to prey upon plover eggs or nests. The following animals will be prioritized for removal: red fox, American crow, common raven, feral cat, skunks, and rodents.

**Non-priority or non-target species** are animals that pose a lesser threat as suggested by the data from previous years' control work. These include: raccoons, weasels, mink, Virginia opossums, gulls, dogs, raptors, bobcats, river otters, coyotes, and gray fox among others. These species will only be removed if they exhibit focused attention on plovers or plover nests. However, all Virginia opossums trapped will be euthanized per state law.

**Focused attention** means a predator is digging under or circling a nest enclosure, pursuing adults or chicks, or depredating nests. A non-priority animal may be targeted for removal if it exhibits these behaviors.

Prior to the removal of non-priority species, the OPRD ocean shore natural resource specialist will be contacted by APHIS-WS. Non-priority species caught incidentally in the pursuit of priority species will be released unharmed unless they are injured and unlikely to survive in the wild. In such cases, the animal will be humanely dispatched. Efforts will be made to take feral cats and domestic dogs to the nearest animal shelter.

APHIS-WS specialists will use animal sign, sightings, and specialized methods to locate, study, deter, capture and dispatch, or release target predators. Predators will be removed if the wildlife specialist in the field determines using the Decision Model and the criteria contained in Action Plan, that the predator is a threat to snowy plovers.

### **3.3 Monitoring**

The three types of monitoring and associated goals for which OPRD is responsible are:

1. Wintering and Breeding Window Surveys

Goal: Survey for wintering and breeding populations to provide data to USFWS that will help them obtain rangewide comparisons regarding population trends, observe presence, and calibrate seasonal recovery efforts.

2. Snowy Plover Breeding Population Monitoring

Goal: Determine the productivity of the breeding population of snowy plovers in the occupied SPMAs, including Bandon.

3. Snowy Plover Detect/Non-Detect Monitoring

Goal: Confirm occupancy and determine whether snowy plovers are dispersing to unoccupied SPMAs.

Findings will be reported to USFWS annually and OPRD will work with snowy plover partners to evaluate the effectiveness of the HCP and this site management plan.

#### **3.3.1. Wintering and Breeding Window Survey**

OPRD will continue to provide resources to assist with conducting wintering and breeding window surveys at Bandon SPMA. These surveys will be conducted as indicated in the Monitoring Guidelines for the Western Snowy Plover, Pacific Coast Populations (Appendix J in the Final Recovery Plan (USFWS, 2007)) and the

results will be compiled annually and submitted to USFWS. The objective of collecting these data is to help partners determine occupancy and detect trends across the range.

### **3.3.2 Breeding Population Monitoring**

OPRD will continue funding to monitor breeding populations at Bandon SPMA via ORBIC (or other monitors agreeable to OPRD and USFWS) and in cooperation with the Snowy Plover Working Group. This information will help provide the data necessary for partners (e.g., USFWS) to determine population levels and productivity, and support the productivity goal of one fledgling per male as outlined in the Recovery Plan. The results of breeding population monitoring will be communicated (e.g., via email) to USFWS a minimum of once a month. Monitoring reports will focus on ongoing concerns, such as recreational use violations or predation at a particular SPMA. This information will also be documented in an annual report provided to USFWS for review and will be used to determine the effectiveness of the snowy plover conservation management activities and to make adaptive management decisions.

### **3.3.3. Detect/Non-Detect Monitoring**

OPRD staff will continue to participate in detect/non-detect monitoring activities along the Ocean Shore at unoccupied SPMA sites to determine whether nesting populations of snowy plovers are present. At Bandon SPMA, an occupied site, the breeding population monitoring fulfills the need to track adults and productivity and detect/non-detect monitoring is not required.

# Section 4: Recreation Management

Goal: Reduce the potential for disturbance of snowy plover by recreational users during the breeding season by managing recreation uses and beach access within or near SPMA's while continuing to provide public beach access on the Oregon coast.

OPRD's management of the Bandon SPMA will be guided by the actions outlined in this plan, including recreation management measures to protect nesting areas from the recreating public through access restrictions, outreach and education and continued enforcement. This site management plan will define the geographic area of restricted recreation within the SPMA that will go into effect following USFWS approval.

## 4.1 Recreation Restrictions

Goal: Reduce disturbance to snowy plover by recreational users while providing public beach access.

OPRD will implement recreational use restrictions in SPMA's and RMA's for specific activities that pose potential threats to snowy plover and their habitat. The following seasonal recreational restrictions will be in effect in the SPMA's between March 15<sup>th</sup> – September 15<sup>th</sup>:

- Vehicles (motorized and non-motorized) prohibited on beach (except for administrative and permitted uses), or as otherwise restricted by existing Oregon Administrative Rule (OAR)
- Dogs prohibited on wet and dry sand
- Flying kites prohibited on wet and dry sand
- All other recreational activities directed to the wet sand (fences, ropes, and/or signs will define the dry sand breeding areas to be avoided)

### 4.1.1. Access

There are three major areas leading to the beach that may impact the plover nesting areas: China Creek, Bradley Lake Camp access, and the former Fourmile County Park, now under private ownership. Of these,

China Creek is the only official beach access route maintained by OPRD. Bradley Lake Camp and Fourmile are under private ownership, but unofficial access to snowy plover areas occurs at these sites. Bradley Lake is the primary neighbor that OPRD works with on plover issues. Bandon SNA is relatively isolated from residential areas and does not have extensive recreational traffic from adjacent property owners. China Creek is part of Bandon SPMA and is owned and managed by OPRD. China Creek is managed as a day-use beach access with visitors using the parking lot to take walks on the beach with pets, go beachcombing, for kiteboard staging, hiking, and camping. Anecdotally, there may be some limited use of the China Creek parking lot for drop-off/pick-up of Oregon Coast Trail hikers and campers. Temporary and permanent regulatory and interpretive signage has been installed at China Creek with plans to expand signage where needed.

Signs have directed visitors away from the plover sites and directed them north away from nesting areas. The volunteer hosts and park staff have also been instructed to direct people with dogs to go north as there are fewer restrictions. Most people comply. OPRD has put up symbolic fencing and signage to direct people away from nesting areas adjacent to China Creek beach access. Placing directional signs at the roped area pointing people to go around the nest sites is intended to reduce the number of incidents. Weather, beach conditions, and increased traffic and/or violations may dictate the need for additional signs or changing the location of signage.

Bradley Lake Camp access is a trail located ¼ miles south of China Creek. This trail was constructed across state park property by the camp without a permit or written authorization from OPRD. The trail was used primarily by camp patrons and there were issues in the past because the old trail ended on the beach near a potential plover nesting area. OPRD staff has resolved these issues by closing the trail and re-directing camp patrons to the China Creek beach access by building a new trail. Built in 2009, this alternative trail reduces the potential for human disturbance of nesting birds by re-routing visitors away from known nesting areas. Most large camp activities such as large picnics and beach related activities from the camp have been directed to Devil's Kitchen and camp management have been informed they are required to have a permit for large gatherings on the beach. In 2011, camp management and OPRD came to an agreement to permanently close the trail year-round. Additionally, vegetation has been planted to close off the old trail and there haven't been documented issues since. Continued coordination with the camp will be performed by the Bullards Beach park manager, ocean shore natural resource specialist, and the beach ranger.

Fourmile Creek is a former Coos County Park that is on the east bank of New River. Fourmile County Park was purchased by Michael Kaiser of Bandon Dunes Golf Resort and is no longer in county ownership. At the present time, access to the beach at Bandon SNA is limited by lack of upland development, heavy gorse, the depth of New River, and the isolated nature of the area. OPRD has had issues with people crossing the river and accessing the beach by cutting across snowy plover nesting sites. Occasionally, ATV's are an issue crossing from the county land and using the beaches illegally. Since Twomile Creek and New River have blended to make one mouth (and one long river) the issues have been reduced for the past two years. There is limited access across the river when the mouth closes up and the river is backed up. On-site meetings with BLM enforcement, Oregon State Police, OPRD, and Bandon Dunes have occurred to reduce the illegal ATV traffic that occurs on upland areas east of New River/Two-mile Creek. Volunteers, enforcement and directional signs will aid in directing people away from plover areas.

#### **4.1.2. Symbolic Fencing**

OPRD will install symbolic fencing and maintain it through the nesting season. The fencing will be installed by OPRD staff and volunteers between China Creek and the mouth of New River and will include stakes, ropes, and signage. The area south of the mouth of New River will be staked out with signage but will not have symbolic fencing. Winter storm activity at Bandon SNA will dictate where initial fencing will occur. Fencing of the HRA and the areas where storm surges will not damage fencing will occur by March 15. As the snowy plover nesting season progresses and winter storm activity subsides, OPRD will expand the fencing as needed. OPRD will fence from the north boundary of the SPMA located at the China Creek parking lot to the south boundary of the HRA located at the mouth of New River.

Later season fencing will need to be done in consultation with plover biological monitors to determine nesting sites so that nesting adults are not disturbed by fencing installation. Fencing may be realigned to encompass plovers that have nests on the beach face.

## **4.2 Signage**

Goal: Use signs to inform the public where and why restrictions occur for protection of the western snowy plover and their habitat.

### 4.2.1. Interpretive Signs

OPRD provides signage at access points to inform the public of the presence of nesting snowy plovers and the importance of snowy plover protection measures. Two snowy plover interpretive panels (Figure 7) have been installed in the parking lot of the China Creek beach access point informing the public of the status of the snowy plover and to help instill the “share the beach” message developed by state and federal partner agencies working on plover management.



Figure 8. Snowy plover interpretive sign

In cooperation with BLM and USFWS, OPRD has also assisted in the design and installation of several interpretive signs from the south jetty of the Coquille River to the mouth of New River. These signs are designed to inform Oregon Coast Trail hikers of the snowy plover recovery efforts and to guide them to camping and other recreational activities that will not impact plover nesting sites. The sign is in map format to help beach users avoid nesting sites and includes the message that no-camping is allowed until visitors reach a designated camping site on BLM property to the south of Bandon SNA. This sign is located on the beach within the HRA (at the I-beam) as well as within all OPRD owned day-use areas from the Coquille River to Bandon SNA.

OPRD will assist with any future interpretive sign design that the plover working group recommends and will dedicate OPRD staff to assist with the design and installation of signage at Bandon SNA.

Seasonal regulatory signs at the China Creek beach access informing the public on what part of the beach the restrictions occur in has been proposed but not implemented. Signs at the parking lot pointing to areas where dogs may be allowed off-leash has also been proposed. These signs will be installed on an annual basis before the start of nesting season on March 15<sup>th</sup>. The location of the seasonal signs will depend on variations in weather, tides, and other factors but will generally be near the front of the China Creek parking lot. Other temporary regulatory signs will be installed as necessary.

#### **4.2.2. Boundary Signs**

Signage indicating the presence of nesting snowy plovers and the boundaries of dry sand restrictions will be installed at the boundaries of restricted areas within Bandon SPMA. Symbolic fencing and regulatory signs will be installed by March 15 and removed after September 15 to avoid further impacts to nesting plovers during installation. As with symbolic fencing, winter storm activity at Bandon SPMA will dictate where the initial fencing/signing will be posted. Signs will be posted along the HRA and the areas where storm surges will not damage signs by March 15. As the snowy plover nesting season progresses and winter storm activity subsides, OPRD relocate and post new signs as needed. OPRD will post signs from the north boundary of the SPMA located at the China Creek parking lot to the south boundary of the HRA located at the mouth of New River. Early in the plover season, New River is hazardous to cross and no signing will be completed on the south side of the New River mouth until it is deemed safe. At that point, signs will be installed to inform beach visitors of the snowy plover restrictions.

Later season sign posting will need to be done in consultation with plover biological monitors to determine nesting sites so that nesting adults are not disturbed by installation.

Regulatory signage installed with the symbolic fencing will include wording to inform beach visitors that access to dry sand areas is prohibited and legal action will occur if violations are observed.

OPRD will design regulatory signs to be placed on the beach and the parking lot at China Creek to inform the public on the restrictions required to recover the snowy plover.



**Figure 9.** OPRD beach rangers install plover signage at Bandon SPMA

### 4.3 Outreach and Education

Goal: Inform park staff, volunteers and the general public about the ecology of western snowy plover, the significance of Oregon's beaches for successful species recovery, and the management actions taken to conserve the species, including responsible beach use in plover areas.

OPRD will continue to recruit and train volunteers to serve as docents for public outreach and education at the China Creek access to the Bandon SPMA. Volunteers recruited by Bullards Beach State Park provide valuable on-site education to the public at the China Creek beach access. Volunteers talk to beach visitors and provide brochures informing them of the plover and the restrictions that apply when walking the beach. Brochures are also distributed to the Bradley Lake Camp and visitor centers in the area. OPRD representatives visit the Bradley Lake Camp on a periodic basis and discuss plover issues with the camp directors and the impacts to the nesting sites from the camp beach access point.

Bullards Beach State Park has also conducted summer interpretive programs at the campground to educate the public on the plight of the snowy plover. An interpretive park ranger at Bullards Beach is responsible for

all interpretive activities at the park and will continue to provide evening and Junior Ranger programs directed toward the snowy plover recovery effort.

The beach ranger and the ocean shore natural resource specialist will also provide on-site outreach and education to the public at China Creek.

## **4.4 Enforcement**

Goal: Ensure that the public is aware of and adheres to OPRD rules and regulations governing Oregon's beaches, including the public use restrictions that will lead to recovery of the western snowy plover.

OPRD will continue to provide one full-time beach ranger to patrol from Coos Bay to the California border and will provide enforcement patrols at Bandon SPMA during the critical snowy plover nesting period from March 15 to September 15. Bullards Beach State Park staff will assist in enforcement and coordinating with local law enforcement and Oregon State Police to facilitate enforcement activities. OPRD enforcement staff may attend workshops and other training opportunities that are directly related to plover issues (e.g., law enforcement workshops coordinated by USFWS).

### **4.4.1. Responsibilities for Enforcement**

Patrols will be made by OPRD's beach ranger, Bullards Beach State Park staff, OPRD's ocean shore natural resource specialist, and Oregon State Police. Local law enforcement (Bandon Police Department, Coos County Sheriff) will be contacted as needed to serve as back-up for OPRD enforcement contacts that may require assistance.

### **4.4.2. Enforcement Timing**

Patrols will be concentrated during high traffic times including holiday periods during the nesting season at Bandon SPMA: Spring Break, Memorial Day, Independence Day, and Labor Day. Early in the season (April-June) an extra patrol emphasis should be made as a way to re-educate beach visitors and to ensure that the local population is informed that restrictions are now in effect. As the season progresses (July- September) more people are out during both the day and evening hours. Most serious violations have occurred in the evening during this late season period. Safety of OPRD/OSP personnel may dictate when/if

patrols will be instituted in the evenings. A uniformed presence early in the evening may discourage potential party-goers. In addition, early evening patrols on Friday and Saturday will assist in the education of hikers using the Coast Trail. Providing patrols at the China Creek parking lot and the beaches adjacent to the parking area will give OPRD enforcement an opportunity to contact visitors accessing the beach at China Creek as well as hikers walking down the beach from access points farther north. Patrols will need to be varied to include early morning as well as evening depending on the safety needs of staff. Weekends certainly need attention, but a varied schedule throughout the week is advised. Independence Day patrols have been emphasized and teaming up with USFWS enforcement personnel has occurred since 2009. Illegal fireworks have been reduced due to increased patrols and citations issued. However, due to safety concerns and the remoteness of the plover sites night-time patrols will only be scheduled if a certified police officer or other federal officer is available to accompany the OPRD beach ranger.

#### **4.4.3. Special Requirements**

OPRD beach rangers will be commissioned officers that will have the authority to write citations for OPRD Oregon Administrative Rules (OAR). Contracts with Oregon State Police (OSP) and other local law enforcement may be a tool to increase uniformed presence on the beach and to serve as back-up for OPRD enforcement officers. Past contracts have been with OSP to provide overtime opportunities to troopers to patrol the Ocean Shore and Oregon State Park campgrounds. OPRD will continue to pursue coordination with other enforcement agencies for beach patrols at plover sites, but will depend on availability of staff from those enforcement agencies.

## Section 5. Adaptive Management

Goal: Allow for changing conditions or circumstances and new information in determining management actions at OPRD's SPMA's.

Adaptive Management is a process that allows resource managers to adjust their actions to reflect new information or changing conditions in order to reach a goal (ICF International, 2010). OPRD will use adaptive management to minimize take of snowy plover resulting from management of Oregon's beaches and to ensure the long-term survival of the snowy plover along the Oregon coast, while minimizing recreational impacts (ICF International, 2010). Future research efforts to inform adaptive management measures will be undertaken through joint efforts with the other entities involved in snowy plover recovery efforts including USFS, BLM, USFWS, and ODFW (ICF International, 2010).

To allow for changing conditions, circumstances, and new information, management actions outlined in this site management plan for the Bandon SPMA will be reviewed every five years from the completion date of this plan (June, 2011). Information from annual reporting meetings between OPRD and USFWS will be used to review the performance of management efforts (e.g., habitat restoration, predator management, recreational restrictions) per the requirements of the HCP (ICF International, 2010).

OPRD will continue to work with the WSP Working Group to achieve more rigorous statistical analysis of nest success, productivity, adult over-winter survival, and the effects of predator management in annual biological monitoring reports to better inform adaptive management decisions. Environmental covariates such as weather and climactic patterns (e.g., el nino, la nina), tides, etc., should be included in statistical analyses. OPRD will continue to work with biological monitors and the Western Snowy Plover Working Group to develop more rigorous analyses.

If biological monitoring indicates consistent snowy plover population declines along the Oregon Coast when compared to population numbers provided in previous biological monitoring reports, OPRD and USFWS will work together to determine if inadequate management actions on the part of OPRD are determined to be responsible, in whole or in part, for such declines (ICF International, 2010). In addition, if statistical analysis of snowy plover population data indicates current management methods are detrimental to snowy plover, OPRD

will consult with USFWS to adjust techniques. If new techniques are available for more effectively implementing management actions, then revisions to the management prescriptions outlined in this plan will be considered. Adjustments can be made by consensus agreement as outlined in the HCP. For example, through monitoring of nest success, OPRD may evaluate the use of exclosures and their effectiveness in preventing predation and nest disturbance. Nest exclosure success at Bandon SPMA would then be examined to determine if changes in the management application (e.g., elimination of the exclosure, timing changes for application of the exclosure, design changes) should be considered. An implementation schedule (subject to adaptive management), outlines the management practices, objectives, actions, staff responsibilities, and approximate timeline for this plan (Table 5).

**Table 5.** Western Snowy plover management plan implementation schedule: Bandon SPMA

Management Practice	Goal	Management Objective	Action	Timeline	Responsibility
Habitat Restoration and Maintenance (see section 3.1)	Provide and maintain a minimum of 50 acres of quality habitat for nesting and wintering western snowy plovers	Provide plovers at least 4 areas to nest off the beach front, behind protective foredunes	Breach foredune and level interdunal area in a minimum of 4 cut-outs of up to 2 acres each	Ongoing, as necessary.	OPRD staff, contractors.
		Maintain previously restored 50 acres of habitat in functional condition	1. Spray herbicide based on best management practices and results of experimental spraying	Application will be predicated on industry herbicide application standards, OPRD internal written policy, results of experimental testing and with USFWS input.	OPRD staff
			2. Remove heavy infestations of European beachgrass through bulldozing or other mechanical means as necessary  3. Remove logs	As needed as determined by OPRD in consultation with USFWS. Maintenance frequency depends on site indicators such as percent beachgrass cover referencing current literature values. Work will be conducted between Sept. 15-March 14 to avoid impacts to nesting plovers.	OPRD staff

Management Practice	Goal	Management Objective	Action	Timeline	Responsibility
<b>Predator Management (section 3.2)</b>	Improve productivity of western snowy plover by reducing predator populations while maintaining adult population numbers.	Conduct lethal and non-lethal predator management to reduce predation on the breeding population	Continue contract for predator management with APHIS-WS in coordination with the Snowy Plover Working Group	Ongoing. Predator management timing will be determined through the Snowy Plover Working Group (as outlined in the annually updated Action Plan).	OPRD staff, APHIS-WS.
<b>Monitoring (section 3.3)</b>	Monitor status of plovers at Bandon SPMA to evaluate effectiveness of meeting HCP goals.	1. Wintering and breeding window surveys: Provide data to support rangewide comparisons regarding population trends, observe presence, and calibrate seasonal recovery efforts.	Continue to provide staff time to assist partners	Annually	OPRD staff
		2. Breeding population monitoring: Help provide data to determine productivity of the breeding population in the SPMA.	Continue to provide annual contract funding for breeding surveys.	Annually, during the breeding season.	OPRD staff, contractors (ORBIC)

Management Practice	Goal	Management Objective	Action	Timeline	Responsibility
Monitoring cont.		3. Detect/non-detect monitoring: Confirm occupancy and determine if plovers are dispersing to unoccupied SPMA's in order to adaptively manage OPRD sites.	OPRD will continue to provide staff time to assist its partners	At <i>unoccupied sites</i> (not Bandon): At the beginning of the breeding season (March) through July 15 as described in the USFWS monitoring protocol.	OPRD staff
Recreation Restrictions (section 4.1)	Reduce disturbance to snowy plover by recreational users while providing public beach access.	1. Seasonal recreational restrictions will be in effect between March 15 and September 15 to ensure that nesting snowy plover are not disturbed by recreational traffic.	1. Vehicles (motorized and non-motorized) prohibited on wet/dry sand 2. Dogs and flying kites prohibited on wet/dry sand 3. All other recreational activities directed to the wet sand (fences, ropes, and/or signs will define dry sand breeding areas to be avoided)	Vehicles are currently restricted at Bandon SNA. Year-round vehicle prohibitions will be implemented as recommended by the 2004 Ocean Shore Management Plan through the Ocean Shore rule-making process (est. completion date of March 2013). All other recreational restrictions will become effective March 15, 2013. Annual restrictions may be lifted early if no nesting occurs by July 15 <sup>th</sup> .	OPRD staff

Management Practice	Goal	Management Objective	Action	Timeline	Responsibility
Recreation Restrictions cont.		2.Symbolic fencing/ regulatory signage to notify and educate the public on restricted nesting areas	Symbolic rope fencing with signage will be installed from China Creek to The mouth of New River.	Annually from March 15 to September 15	OPRD staff
Signage (section 4.2)	Use signs to inform the public where and why restrictions occur for protection of the snowy plover and their habitat.	Regulatory (i.e., boundary) and interpretive signage to notify and educate the public on restricted nesting areas.	Regulatory signage will be installed south of the mouth of New River as natural processes permit	Annually from March 15 to September 15	OPRD staff
			OPRD will assist with any future interpretive sign design that the Snowy Plover Working Group recommends and will dedicate OPRD staff to assist with the design and installation of signage at Bandon SNA	As funding permits	OPRD staff in coordination with Snowy Plover Working Group

Management Practice	Goal	Management Objective	Action	Timeline	Responsibility
<b>Outreach and education (section 4.3)</b>	Inform park staff, volunteers and the general public about the ecology of western snowy plover, the significance of Oregon's beaches for successful species recovery, and the management actions taken to conserve the species.	Provide on-site interpretation and education. Engage in appropriate outreach efforts with neighbors and others as practicable.	Recruit and train volunteer docents for public outreach and education efforts at the China Creek access. Distribute brochures to neighbors (e.g., Bradley Lake Camp) and visitor's centers. Provide interpretive programs at Bullards Beach State Park.	Seasonally	OPRD staff and volunteers
<b>Enforcement (section 4.4)</b>	Ensure that the public is aware of and adheres to OPRD rules and regulations, including the public use restrictions that will lead to recovery of the western snowy plover	Provide patrols during critical snowy plover nesting periods.	Patrol the Bandon SPMA during busy periods, with a focus on the critical snowy plover nesting period from March 15-September 15.	Annually, focused on snowy plover nesting season (March 15-September 15) and high traffic time periods (e.g., holidays).	OPRD staff, OSP, local law enforcement

## References

Burrell, M.. 2011. Integrated Predator Damage Management Report for the Western Snowy Plover (*Charadrius alexandrinus nivosus*) 2011 Breeding Season at Baker/Sutton, Siltcoos, Overlook, Tahkenitch, Tenmile, Coos Bay North Spit, Bandon State Natural Area, and New River area of Critical Environmental Concern. USDA APHIS-Wildlife Services.

Castelein, K.A. Lauten, D.J., Popper, K.J. Fukuda, J.A., and M.A. Stern. 2000a. Snowy Plover Distribution and Reproductive Success Along the Oregon Coast – 1999. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University.

Castelein, K.A. Lauten, D.J., Popper, K.J. Bailey, D.C., and M.A. Stern. 2000b. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast – 2000. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Castelein, K.A. Lauten, D.J., Renan, L.N., Pixley, S.R. and M.A. Stern. 2001. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast – 2001. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Castelein, K.A. Lauten, D.J., Pixley, S.R., Renan, L.N., Stern, M.A. and C. Grinnell. 2002. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast – 2002. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Colwell, M.A., Millett, C.B., Meyer, J.J., Hall, J.N., Hurley, S.J., McAllister, S.E., Transou, A.N., and R.R. LeValley. 2005. Snowy Plover reproductive success in beach and river habitats. *Journal of Field Ornithology*. 76(4):373–382.

Franklin, J. F., Dyrness, C.T. 1973.. Natural Vegetation of Oregon and Washington. General Technical Report. PNW-GTR-008. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 427 pp.

Green, D.L. 1965. Developmental history of European beachgrass [*Ammophila arenaria* (L.) Link] plantings on the Oregon coastal sand dunes. M.S. thesis, Oregon State University. 64 pp.  
Hacker, S.D, P. Zarnetske, E. Seabloom, P. Ruggiero, J. Mull, S.Gerrity, and C. Jones. 2011. Subtle differences in two non-native congeneric beach grasses significantly affect their colonization, spread, and impact. *Oikos* 121:138-148.

ICF International. 2010a. Habitat Conservation Plan for the Western Snowy Plover. August. (ICF 06537.06.) Portland, OR. Prepared for Oregon Parks and Recreation Department. 370 pp.

ICF International. 2010b. Western Snowy Plover Habitat Conservation Plan. Final Environmental Impact Statement. August (ICF 06537.06). Portland, OR. Prepared for the U.S. Fish and Wildlife Service.

Lauten, D.J., Castelein, K.A., Smithers, B.V., Jandér, K.C., Elliott-Smith, E., and E.P. Gaines. 2003. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2003. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Lauten, D.J., Castelein, K.A., Seckinger, E., Kolkemo, E., and E.P. Gaines. 2004. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2004. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Lauten, D.J., Castelein, K.A., Seckinger, E., and E.P. Gaines. 2005. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2005. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR

Lauten, D.J., Castelein, K.A., Weston, S., Eucken, K., and E.P. Gaines. 2006. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2006. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR

Lauten, D.J., Castelein, K.A., Pruner, R., Friel, M., and E.P. Gaines. 2007. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2007. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR

Lauten, D.J., Castelein, K.A., Bailey, D.C., Lewis, T., and E.P. Gaines. 2008. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2008. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR

Lauten, D.J., Castelein, K.A., Farrar, D., Herlyn, and E.P. Gaines. 2009. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2009. Oregon Natural Heritage Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Lauten, D.J., Castelein, K.A., Farrar, A.A., Kotaich, and E.P. Gaines. 2010. The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast-2010. Oregon Biodiversity Information Center, Institute for Natural Resources. Oregon State University. Portland, OR.

Mullin, S.T., M.A. Colwell, S.E. McAllister, S.J. Dinsmore. 2010. Apparent survival and population growth of snowy plovers in coastal northern California. *Journal of Wildlife Management* 74(8):1792-1798.

Muir, J.J. and M.A. Colwell. 2010. Snowy plovers select open habitats for courtship scrapes and nests. *The Condor* 112(3):507-510.

Neuman, K.K., G.W. Page, L.E. Stenzel, J.C. Warriner, and J.S. Warriner. 2004. Effect of mammalian predator management on snowy plover breeding success. *Waterbirds* 27(3):257-376.

OPRD. 1986. Bullards Beach District Parks Master Plan. Oregon Parks and Recreation Department. Salem, OR.

OPRD. 2003. Oregon Statewide Comprehensive Outdoor Recreation Plan: 2003-2007. Oregon Parks and Recreation Department. Salem, OR.

OPRD. 2005. Ocean Shore Management Plan. Oregon Parks and Recreation Department. Salem, OR.

ORBIC. 2012. Recovery Unit 1 (Oregon & Washington) enclosure use guidelines developed by Oregon Biodiversity Information Center for the Western Snowy Plover Working Team.

ORNHC. 2008. Historical vegetation of the Pacific Coast, Oregon, 1855-1910. ArcMap shapfile, Version 2008\_03. Oregon Natural Heritage Information Center, Oregon State University.

Page, G. W., Stenzel, L.E., Shuford, W.D., and C.R. Bruce. 1991. Distribution and abundance of the snowy plover on its western North American breeding grounds. *Journal of Field Ornithology* 62 (2): 245-255.

Page, G.W., Stenzel, L.E., Winkler, D.W., and C.W. Swarth. 1983. Spacing Out at Mono Lake: Breeding Success, Nest Density, and Predation in the Snowy Plover. *The Auk* 100: 13-24.

Page, G.W., Stern, M.A. and W.C. Paton. 1995. Differences in wintering areas of snowy plovers from inland breeding sites in western North America. *The Condor* 97: 258-262.

Pearson, S.F., Sundstrom, C. Ritchie, W. and K. Gunther. 2010. Washington State Snowy Plover Population Monitoring, Research, and Management: 2010 Nesting Season Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Science Division. Olympia. Accessed 8/18/2011 at:

<http://www.fws.gov/arcata/es/birds/WSP/documents/siteReports/Washington/2010%20Washington%20Snowy%20Plover%20Research%20Update.pdf>

Powell, A.N., Fritz, C.L., Peterson, B.L., and J.M. Terp. 2002. Status of breeding and wintering Snowy Plovers in San Diego County, California, 1994–1999. *Journal of Field Ornithology* 73(2):156–165.

Shelby, B. and Tokarczyk, J. 2002. Oregon Shore Recreational Use Study. Prepared for the Oregon Parks and Recreation Department. 130 pp.

U.S. Fish and Wildlife Service. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*). In 2 volumes. Sacramento, California. xiv + 751 pages.

U.S. Forest Service, Bureau of Land Management, US Fish and Wildlife Service, and the State of Oregon (Parks and Recreation and Department of Fish and Wildlife). 2011. Western Snowy Plover Integrated Predator Damage Management Program 2012 Final Action Plan. Unpublished Interagency Report available from the U.S. Fish and Wildlife Service, Newport, OR. 17 pp.

Warriner, J.S., Warriner, J.C., Page, G.W., and L.E. Stenzel. 1986. Mating System and Reproductive Success of a Small Population of Polygamous Snowy Plovers. *Wilson Bull.*, 98 (1): 15-37.

Wilson, R.A. 1980. Snowy Plover Nesting Ecology on the Oregon Coast. MSc. Thesis. Oregon State University, Corvallis, OR. 41 pp.

Zarnetske, P.L., Seabloom, E.W., and S.D. Hacker. 2010. Non-target effects of invasive species management: beachgrass, birds, and bulldozers in coastal dunes. *Ecosphere*. 1(5): 1-20.