INTRODUCTION
California State Parks (CSP) manages nearly 25 percent of the state’s coastline. Many of these coastal lands provide important habitat for the western snowy plover (*Charadrius nivosus nivosus*), a shorebird listed as “threatened” by the federal government and a “species of special concern” by the State of California. As these coastal lands are also popular recreation areas for millions of people, strategic management of CSP lands is essential to meeting state and federal goals to stop the decline of this species and restore sustainable populations (CDPR 2002). Consequently, in March of 2002, CSP released the *Western Snowy Plover Systemwide Management Guidelines* to facilitate stewardship efforts to protect the western snowy plover (WSP or plover) and manage coastal habitat. The guidelines present an integrated approach to assessing WSP use of State Park System (SPS) lands, planning for the species’ conservation, implementing management actions, and monitoring progress toward recovery (CDPR 2002). A major component of the Department’s approach to WSP stewardship relies on thorough documentation of management efforts and adaptive responses at the unit or district level (CDPR 2002).

Regular evaluation of habitat management, visitor management, law enforcement, public education, and interpretative efforts is needed to continuously improve stewardship results. As such, this report assesses the effectiveness of efforts taken by CSP, North Coast Redwoods District (NCRD) to protect and restore WSP populations in light of management activities and monitoring results from recent years. This report will contribute to a systemwide annual report produced by CSP, Natural Resources Division to assess WSP management throughout CSP lands. In addition, as many activities associated with research, monitoring, or management of WSP require an endangered species permit under Section 10(a)(1)(A) of the Endangered Species Act, this report will meet the requirements of the NCRD’s 10(a)(1)(A) permit (TE004234-1).
BACKGROUND
The coastal population of the western snowy plover was listed as threatened under the Endangered Species Act in 1993 (USFWS 1993) as a distinct population segment. The listing included populations nesting along the coast in Washington, Oregon, and California. A significant population decline and a reduction in the number of active breeding areas prompted the federal listing. Expanding predator populations, human disturbance, and urban development/introduced European beachgrass (*Ammophila arenaria*) have been attributed to the decline (USFWS 2007). The United States Fish and Wildlife Service (USFWS) designated critical habitat for the WSP in 1999. This designation was amended in 2004 following a lawsuit over the failure to analyze the economic impacts of the critical habitat. In 2007, the USFWS released the final recovery plan (USFWS 2007). The goal of the plan was to ensure the long-term viability of the U.S. Pacific coast western snowy plover population with specific objectives to; (1) Increase population numbers distributed across the western snowy plover’s Pacific coast range; (2) Conduct intensive ongoing management for the species and its habitat and develop mechanisms to ensure management in perpetuity; and (3) Monitor western snowy plover populations and threats to determine success of recovery actions and refine management actions (USFWS 2007). According to the recovery plan, the population will be considered for delisting when a number of recovery criteria related to productivity and habitat protection are met within the six designated recovery units throughout the range (USFWS 2007). In 2006 the USFWS denied a proposal to de-list the plover, but did propose a special 4(d) rule that would exempt counties from certain prohibitions on take as long as populations remain above recovery goals as identified in the recovery plan (USFWS 2006).

The NCRD is located within WSP Recovery Unit 2, which includes Del Norte, Humboldt, and Mendocino counties. Recovery criteria for Unit 2 include: (1) maintain 150 adults for 10 years; (2) maintain a 5-year average productivity of at least one fledged chick per male; and (3) have in place participation plans among cooperators to insure protection and management of breeding, wintering, and migration areas to maintain the subpopulation sizes and average productivity listed above. In recent years, most plovers in Recovery Unit 2 bred and wintered in Humboldt County along ocean beaches (Colwell et al. 2012). Humboldt County is unique in that it also hosted nesting plovers along the Eel River gravel bars between 1996-2010.

Since 1998, Recovery Unit 2 (RU2) Working Group has been active in monitoring suitable WSP habitat with a coordinated effort between federal, state, and local agencies as well as
parties who have an interest in WSP conservation. Much of the WSP recovery effort is expected to be organized and facilitated by the working group, as members include conservation experts (e.g. Humboldt State University and Mad River Biologists) as well as resource managers (e.g. CSP, California Department of Fish and Wildlife, Bureau of Land Management, and USFWS) responsible for on-the-ground actions. In 2001, biologists from Humboldt State University (HSU) and Mad River Biologists (MRB) began collaborating in what has become a multi-year effort to answer questions critical to effective management and recovery of the WSP in Recovery Unit 2. Consequently, the HSU/MRB WSP annual report has served as the Recovery Unit 2 annual report since 2001. Much of this report is based on those results.

The NCRD WSP program objectives for 2012/2013 were to:

- Continue monitoring efforts throughout the NCRD and participation in the Recovery Unit 2 demographic study.
- Continue to work and coordinate with the Recovery Unit 2 working group and subcommittees, and the Humboldt Coastal Dunes Cooperative.
- Continue habitat restoration within WSP suitable habitat.
- Continue to use symbolic fencing to protect nests and wintering areas when appropriate.
- Explore avenues to attract plovers to sites where factors leading to low reproductive success can be managed most effectively.
- Continue to use beach patrol logs for the rangers to document beach and dune patrols, violations, citations, and contacts.
- Continue to increase law enforcement presence at occupied State Park beaches during the WSP breeding season, especially during holiday weekends.
- Increase public outreach via Recovery Unit 2 Outreach Subcommittee and improve signage.

STUDY AREA
California State Parks, Redwood National Park (RNP), and HSU biologists surveyed 6 State Park beaches within the NCRD that have been identified by the RU2 working group as suitable WSP habitat (Fig. 1). These beaches are (1) Tolowa Beach, Tolowa Dunes State Park (TDSP); (2) Gold Bluffs Beach, Prairie Creek Redwoods State Park (PCRSP); (3) Stone Lagoon Beach (SL), Humboldt Lagoons State Park (HLSP); (4) Dry Lagoon Beach (DL), HLSP; (5) Big Lagoon Beach (BL), HLSP; and (6) Little River State Beach (LRSB). Though RU2 working group has identified Pelican Beach and Usal Beach as suitable habitat, these sites were not surveyed due to difficulties with access.
METHODS
We conducted management activities under USFWS permit TE-004234-1 and USFWS banding permit #22971. During the 2012/2013 season (Sep 15, 2012 – Sep 14, 2013), suitable habitat within the NCRD was surveyed monthly ±4 days of the 15th with the exception of Pelican and Usal Beach. Additional surveys were conducted at the end of each month during the breeding season (March-August) and occasionally during the non-breeding season (Sep-Feb). Intensive monitoring (to search for nests and young) occurred approximately every 4 days at sites where breeding plovers were observed.

Abundance and Distribution
Annual abundance and distribution of WSP were estimated based on mid-month (±4 days) surveys, by covering identified stretches of beach (by walking or by ATV) and stopping at 50-100 meter intervals to scan with binoculars and/or spotting scopes. Western snowy plover numbers, sex, age, and color band combinations were recorded whenever possible.

Reproductive Monitoring
We searched for nests and/or breeding activity (at least twice monthly) beginning 15 March and continuing until 31 August. Intensive monitoring (every 4-5 days) occurred at sites where plovers were recorded during the breeding season. Nests searching included: observing suggestive behavior of adult plovers and watching them return to the nest to incubate, following tracks, and/or spotting incubating adults on the nest.

Predator Activity and Management
We collected data on potential plover predators to assess the threat of predation between sites and different temporal scales. It is anticipated that this data will help evaluate relationships between relative abundance of potential predators and WSP reproductive success. To assess the threat of avian predators, area-constrained (500 m radius) point counts at 20-minute intervals (walking) or 10-minute intervals (ATV) were conducted and the number of corvids and raptors recorded. We also noted the total number of potential predators (American crow, common raven, or other potential avian predator) observed during the entire survey. Point count data was summarized by averaging values for multiple observations conducted during each visit to a site, and then averaging all observations for each study site.
**Human Activity and Management**

Data on human use were collected during regular WSP abundance and distribution surveys. Area-constrained point counts at 20-minute intervals (walking) or 10-minute intervals (ATV) were conducted and the number of humans, dogs (in compliance/not in compliance), and vehicles (in compliance/not in compliance) within 500 m were recorded. Total numbers of humans, dogs, and vehicles observed during the entire survey were tallied and identified as in compliance or out of compliance depending on local regulations.

**Habitat Condition and Plover Use**

During abundance and distribution surveys, general habitat conditions were recorded. Nesting and brooding activity occurring in restoration areas was noted to determine if habitat characteristics influence nesting/fledging success. Social attraction projects were deployed at 4 sites (LRSB, BL, SL, and GBB) between 15 Jan and 6 Jun 2013 (NCRD 2012). The social attraction setup consisted of 6 plasterine decoys (3 males, 3 females) painted to match the alternate plumage of male and female WSP (Mad River Decoys, Waitsfield, VT) combined with sound broadcasting systems powered by a rechargeable deep-cycle gel battery. Sound systems broadcasted a continuous, 20-min loop of Snowy Plover vocalizations interspersed with quiet periods (~20 sec). Staff replaced batteries and decoys when needed. Decoy systems were surrounded by a plover protection area (PPA). PPA’s were delineated by erecting Carsonite posts and/or i-post (sometimes with a single strand of .25”-.5” crab rope extending post to post) with signage informing visitors that the area was temporarily closed to minimize disturbances to snowy plovers.

**Data Summary and Analysis**

Data were collected separately for the six State Park beaches using personal digital assistants (PDA), global positioning system (GPS), ESRI Mobile GIS software (ArcPad), and WSP monitoring forms (Appendix A). Survey results were distributed to the RU2 working group via email and included in the RU2 final report (Colwell et al. 2012). Abundance and distribution data, predator activity data, and human activity data are presented as means (±1 SD) and figures are presented as means (±1 SE).
RESULTS and DISCUSSION

Abundance and Distribution Surveys
For the 2012-2013 plover season, six sites were surveyed at least monthly totaling 275 survey hours and ~530 person hours. Surveys indicated that the non-breeding population (50±11) continues to be larger than the breeding population (22±17) (Fig. 2). For the NCRD, the wintering population increased from the previous year and is exceeded only by the wintering population recorded in 2005/06. During the breeding season, the average number of plovers observed increased 57% compared to 2012 representing the largest breeding population on record for the NCRD. Showing similar trends, the breeding population for the entire Recovery Unit 2 increased 17% from 36 to 42 breeding adults (22 males and 20 females) (Colwell et al. 2013).

Figure 2. Western Snowy Plover Wintering and Breeding Abundance 2005-2013.

Figure 3. Western Snowy Plover Distribution for report year 2012-2013.
We detected WSP at four of six beaches (Tolowa Beach, Gold Bluffs Beach, Big Lagoon Beach, and Little River State Beach) (Fig. 3). During the non-breeding season, birds were observed at four sites. During the breeding season birds were detected at three sites (Gold Bluffs Beach, Big Lagoon Beach, and Little River State Beach); though breeding was confirmed at only two sites (Gold Bluffs Beach and Little River State Beach) and LRSB was the only site to host birds throughout the breeding season.

**Reproductive Success**

In the NCRD, a minimum of 14 breeding plovers initiated 8 nests, produced 23 eggs, hatched 7 chicks and fledged 6 of those chicks (Table 1). Of the entire RU2 breeding population, NCRD hosted 33% (14 of 42) of the breeding adults and 35% (6 of 17) of the fledged chicks. Over the past 13 years, 48% of nests (n=49) hatched at least one chick on NCRD beaches compared to 34% (n=691) for the entire recovery unit.

### Table 1. NCRD WSP 2013 Breeding Season Summary with comparison to previous years

<table>
<thead>
<tr>
<th>Unit</th>
<th>Females</th>
<th>Males</th>
<th># of Nests</th>
<th># Exclosed</th>
<th>% Hatched</th>
<th># Chicks Hatched</th>
<th># Chicks Fledged</th>
<th>Fledged per male</th>
</tr>
</thead>
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<tr>
<td>Tolowa Lake, TDSP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Gold Bluffs Beach, PCRSP</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stone Lagoon, HLSP</td>
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<td>0</td>
</tr>
<tr>
<td>Dry Lagoon, HLSP</td>
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<td>0</td>
<td>0%</td>
<td>0</td>
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</tr>
<tr>
<td>Big Lagoon, HLSP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Little River State Beach</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>43%</td>
<td>7</td>
<td>6</td>
<td>1.0±1.1</td>
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<td><strong>All Sites 2013</strong></td>
<td><strong>7</strong></td>
<td><strong>7</strong></td>
<td><strong>8</strong></td>
<td><strong>0</strong></td>
<td><strong>43%</strong></td>
<td><strong>7</strong></td>
<td><strong>6(86%)</strong></td>
<td><strong>.86±1.07</strong></td>
</tr>
<tr>
<td>2012</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>50%</td>
<td>3</td>
<td>1(33%)</td>
<td>1±0</td>
</tr>
<tr>
<td>2011</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>43%</td>
<td>8</td>
<td>4(50%)</td>
<td>.67±1.21</td>
</tr>
<tr>
<td>2010</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>25%</td>
<td>4</td>
<td>3(75%)</td>
<td>1±1</td>
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<td>2009</td>
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<td>1</td>
<td>1</td>
<td>0</td>
<td>100%</td>
<td>3</td>
<td>3(100%)</td>
<td>3±0</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0(0%)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
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<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>2</td>
<td>2</td>
<td>1</td>
<td>100%</td>
<td>4</td>
<td>3(75%)</td>
<td>1.5±.71</td>
</tr>
<tr>
<td>2003</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>33%</td>
<td>3</td>
<td>0(0%)</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>25%</td>
<td>6</td>
<td>0(0%)</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>57%</td>
<td>10</td>
<td>5(50%)</td>
<td>1.67±.58</td>
</tr>
</tbody>
</table>

a Based on histories of marked birds known to nest in the NCRD.

b The exclusion of one nest was removed late in incubation phase, due to potential adult predation. This nest subsequently failed.
For the first time in 8 years, birds bred at Gold Bluffs Beach near Fern Canyon, where a 5 egg nest was initiated by 2 females and 1 male. This nest failed before hatch, likely to predation. No nesting occurred at Stone Lagoon, a relatively recent breeding site where plovers nested between 2009-2011. It appears likely that birds attempted to nest at Big Lagoon (based on continued observations during the breeding season and fresh scrapes), but were unsuccessful. Plovers at LRSB initiated 7 nests, 18 eggs and 7 chicks, primarily within the Habitat Restoration Area (HRA). Of the 7 chicks hatched, 6 successfully fledged from nests within the HRA. Overall, per capita reproductive success for the NCRD was down (0.86±1.07) compared to the previous year’s (1±1), however this is attributed in part to the fact that only one male bred within the NCRD last year. This number (0.86±1.07) remains larger than that for non NCRD breeding areas (0.58±1.07) or the recovery unit (.77±1.11) as a whole.

_Predator Activity and Management_

Predation (including nests with unknown fate, but assumed predated) continues to be the leading cause of nest failure (69%) in RU2 (Colwell et al. 2013) and anecdotal observations suggest that corvids, principally common ravens, are the primary predator of WSP eggs and chicks. Video evidence collected on Clam Beach supports this notion (Colwell et al. 2009). Corvid activity for the 2012/13 plover season varied only slightly among NCRD sites (Fig. 4) with the exception of TDSP which had twice as much activity as any other site.

![Figure 4. 2012/13 Corvid abundance based on average # of corvids detected during 500-m radius counts.](image-url)
Colwell et al. (2010) compared estimated daily predation rates (DPR) to evaluate the relative impact of predation on nest survival among sites and between years (2001-2010). They found that DPR of nests were particularly high at Clam Beach/LRSB (0.065-0.390) especially compared to sites such as, Big Lagoon (0.00) and Stone Lagoon (0.00). Interestingly, 2013 marked the highest number of fledged chicks on record at LRSB, coinciding with the lowest mean number of corvids observed.

Activities associated with predator management (i.e. installation of anti-predator perching devices and installation/maintenance of predator proof trash receptacles) were similar across sites with the exception of Tolowa Dunes, where public use developments are lacking entirely. The RNSP Corvid Management Strategy (RNSP 2008) attempts to address corvid management at a local and landscape level. The goal of the strategy is to decrease the density of corvids surrounding visitor use developments in Jedediah Smith Redwoods State Park, Del Norte Coast Redwoods State Park, Prairie Creek Redwoods State Park, and Redwood National Park (collectively referred to as Redwood National and State Parks or RNSP). RNSP is comprised of 132,000 acres in, or adjacent to, suitable plover habitat of the NCRD.

**Human Activity and Management**

Similar to previous years, LRSB and Dry Lagoon at HLSP had the highest levels of human and dog activity (Fig. 5). There was, however, a notable decrease in the mean number of dogs observed at LRSB compared to the previous years.

![Figure 5. 2012-2013 Human and Dog abundance based on mean number detected during 500-m counts.](image-url)
Management efforts associated with minimizing human impact to snowy plovers included dog restrictions, vehicle restrictions, and the use of breeding and non-breeding PPAs. See Appendix C for site-specific beach and dune rules and regulations. CSP rangers patrolled beaches by vehicle and foot for a total of 806 patrols (Fig. 6). During patrols, approximately 281 warnings (164 for dog violations, 5 vehicle violations and 112 for camping related issues) were issued by CSP law enforcement staff this year. Five citations were issued (1 dog violation, 1 camping violation, and 2 for improper food storage at PCRSP and 1 vehicle violation at SL) on beaches within the NCRD during 2012/13.

In an effort to minimize visitor impacts to WSP, the NCRD participates in the Recovery Unit 2 Outreach Subcommittee. One of the major products of the Outreach Subcommittee has been the development and implementation of the Share the Beach Docent program which began in 2003. The Share the Beach Program continued for the 2013/14 plover season, however due to limited funding only 4 volunteer shifts (13 volunteer hours) were implemented primarily at Clam Beach County Park (CBCP) and LRSB where the majority of the plover nesting took place in 2013. The RU2 outreach committee also organized an exhibit at the Humboldt County Fair where the public could learn about trash management, synanthropic omnivores, snowy plover ecology and conservation. In addition, subcommittee members were instrumental in reprinting and distributing a dog brochure that displays public areas where dogs are allowed and the

Figure 6. 2012/13 - Beach Patrols and Violations reported by CSP Rangers.

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Figure 6. 2012/13 - Beach Patrols and Violations reported by CSP Rangers.
associated rules. Finally, during the local annual bird watching festival “Godwit Days”, the outreach subcommittee presented a WSP educational display.

**Habitat Condition and Management**

Of the 8 nests initiated in the NCRD, 75% (6) were at sites undergoing habitat restoration (Table 2). At GBB, 2 females and 1 male initiated a double clutch of 5 eggs following nearby habitat restoration and the implementation of a social attraction project the winter prior. This was the first documented nesting at GBB in 8 years. Plovers initiated six of seven nests in restored habitat at LRSB. Of the 6 nests in the HRA 3 hatched, 2 abandoned, and 1 failed to unknown reasons. For the 3 nests that hatched there was a 100% fledge rate, resulting in 6 of the 17 total fledged birds from RU2 in 2013. 2013 marked the highest number of fledglings to date for LRSB, following several years of habitat restoration and implementation of a social attraction project. Prior to 2013, the last chick to fledge from LRSB did so in 2005 from the pilot HRA. It is of note that 2005 also marked the last complete year in which predator exclosures were used. See Appendix C for site-specific habitat condition.

<table>
<thead>
<tr>
<th>Year</th>
<th>LRSB</th>
<th>BL</th>
<th>SL</th>
<th>DL</th>
<th>GBB</th>
<th>TDSP</th>
<th>Total NCRD</th>
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</thead>
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<td>2001</td>
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<td>(0) 0</td>
<td>(0) 0</td>
<td>(0) 0</td>
<td>1.67±58</td>
</tr>
<tr>
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<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(0) 0</td>
<td>(0) 0</td>
<td>0</td>
</tr>
<tr>
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<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(0) 0</td>
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<td>0</td>
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<tr>
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<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(0) 0*</td>
<td>(1) 1±0*</td>
<td>(0) 0</td>
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</tr>
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<td>0.6±89</td>
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<td>(0) 0</td>
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<td>(0) 0</td>
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<td>(0) 0</td>
<td>0</td>
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<td>(1) 3±0</td>
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<td>(0) 0*</td>
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<tr>
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<td>(0) 0*</td>
<td>(2) 1±0*</td>
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<td>(0) 0</td>
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<tr>
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<td>(0) 0*</td>
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<td>(0) 0</td>
<td>(1) 0*</td>
<td>(0) 0*</td>
<td>0.86±1.07</td>
</tr>
</tbody>
</table>

*Invasive Exotic Removal Year
+Decoy Deployment Year

Social attraction projects were deployed at 4 sites this year (LRSB, BL, SL, and GBB) between 15 Jan and 6 Jun 2013 (NCRD 2012). Non-breeding plovers were detected at 3 sites (LRSB, BL, and GBB) and all 3 sites had sign of breeding activity (i.e. nests and scrapes), including the first documented breeding at GBB in 8 years.
In an effort to provide quality habitat for the western snowy plover and to protect the beach and dune ecosystem, the NCRD initiated the following restoration activities:

**TOLOWA DUNES STATE PARK**
The Lake Tolowa restoration project initiated in 2009 proposes restoration of 103 acres of coastal dune habitat in the southern portion of TDSP, approximately 24 acres has been treated to date. The primary goal of this project is to restore areas damaged by European beachgrass infestation. The project proposes to restore natural dune processes by removing European beachgrass, re-establishing pre-invasion dune topography and sand movement, and promoting re-vegetation by native dune vegetation.

**PRAIRIE CREEK REDWOODS STATE PARK**
Between 2005 and 2009, approximately 26 acres of European beachgrass was removed from the Ossagon and Carruther’s Cove area via heavy equipment. In 2012, the North Gold Bluffs Beach Restoration Plan was completed and permitted. The plan covers 550 acres of nearshore dunes from Home Creek to Carruther’s Cove. Approximately 8 acres of hand removal was initially treated between Fern Canyon and Ossagon in 2012/13. Retreatment by hand will be conducted several times a year.

**HUMBOLDT LAGOONS STATE PARK**
The restoration efforts at HLSP began in the spring of 2002 and initial treatment of the entire dune system was completed in March of 2005. The control of exotic invasive vegetation in the nearshore dunes at HLSP beaches is currently at maintenance level.

**LITTLE RIVER STATE BEACH**
Using mitigation funds from the Stuyvesant oil spill; the North Coast Redwoods District initially treated 34 acres of European beachgrass at LRSB. This effort, in combination with the original pilot project from 2005, resulted in 42 acres of removed beachgrass from LRSB. As with the pilot project, the initial treatment was conducted with heavy equipment, primarily bulldozers. Retreatment, utilizing a combination of volunteers, California Conservation Corps crews, Cal Fire crews, and Park staff is currently being conducted twice (spring and fall) a year.
CONCLUSION
To facilitate management of plovers within the NCRD we draw upon results presented as it relates to predation, human disturbance, and habitat degradation. These three inter-related factors have been reported to compromise reproductive success (USFWS 2007) and hence, limit plover populations along the Pacific coast. In order to continually improve our stewardship, results presented are interpreted in light of current management efforts.

In 2013, the NCRD Natural Resource Program continued monitoring WSP in the District with the help of HSU (LRSB) and RNP (PCRSP). There was a significant increase in breeding plovers within the NCRD in 2013. Fourteen breeding plovers initiated 8 nests, produced 7 chicks and fledged at least 6 juveniles compared to the previous year’s 2 breeders, 2 nests, 3 chicks and 1 fledged. Of the entire RU2 breeding population, NCRD hosted 36% (15 of 42) of the breeding adults and 35% (6 of 17) of the chicks fledged. For the greater RU2, Colwell et al. (2013) reports a slight increase in the breeding population from 2012 to 2013, however with an overall 0.77 ±1.11 per capita reproductive rate this recovery unit continues to be a sink population owing to chronic low reproductive success and the occasional high over-winter mortality.

Predator Activity and Management
Colwell et al. (2009) report that predation of eggs and chicks is the most significant problem limiting productivity of plovers in RU2. For the NCRD, of the 8 nests that were initiated in 2013, 3 hatched, 2 abandoned, 2 failed to unknown cause, and 1 failed to predation. Nests with an unknown cause likely failed due to predation. Changes in corvid abundance, across years and sites, likely plays a significant role in the degree of productivity. Having multiple suitable breeding sites available across years may function as an important factor for plovers facing changes in predator pressure, human pressure and other habitat variables. Based on preliminary results from a social attraction project there is suggestion that the use of decoys and vocalizations may be helpful to encourage wintering birds to remain and breed at wintering sites, i.e. sites with lower DPR. To make sites with lower DPR more attractive, CSP erected temporary PPAs and deployed plover decoys at LRSB, BL, SL, and GBB a technique we plan to continue for 2014. As in years past, we continued using anti-predator perching devices and predator proof trash cans to manage predator concentrations in plover breeding areas. At a landscape level, CSP (in partnership with NPS) implemented the Corvid
Management Strategy (RNSP 2008) to decrease the density of corvids surrounding visitor use developments. The Corvid Management Strategy includes effectiveness monitoring and an adaptive management approach to facilitate the selection of appropriate corvid management tools for CSP lands. Finally, CSP staff continues to participate in the RU2 working group and the RU2 Predator Sub-Committee to identify means of enhanced predator management.

*Human Activity and Management*

In 2013, no nests were known to fail directly from human activity. In years past, humans have driven over nests, vandalized exclosures and removed eggs, stepped on eggs, disturbed incubating adults causing nest abandonment, and caused the death of newly hatched chicks owing to hypothermia (Colwell et al. 2008). To address these risks, NCRD staff have erected PPA (breeding and non-breeding) to protect WSP and their eggs, increased enforcement of existing regulations, and invested in plover-centric education and outreach programs.

To encourage protection of the beach and dune ecosystem and educate the public about sharing the beach with all species, the NCRD has been active in the WSP Recovery Unit 2 Outreach subcommittee and the “Share the Beach” docent program at LRSB and adjoining CBCP. At a landscape level, CSP staff have initiated a district wide outreach campaign to inform visitors about the potential effect they have on corvid populations, the impact this may have on sensitive species, and ways that visitors can minimize the effect they have on corvid populations.

*Habitat Condition and Management*

Of the three limiting factors identified by the USFWS, habitat quality (measured physiognomically and floristically) is perhaps the most difficult to assess. Within the NCRD, plovers have selected open and restored habitats during the breeding and non-breeding season and settled disproportionately in newly restored habitats. The direct correlation between habitat condition and plover productivity remains vague; however, the positive implications of European beachgrass removal and restoration of native dune vegetation for WSP recovery are vast. For example, 1) the native dune vegetation known as “dune mat” offers a heterogeneous substrate, in which WSP eggs and chicks may be more cryptic and therefore less susceptible to predation; 2) the removal of beachgrass and its rhizomes facilitates the restoration of dune topography from
artificially high, densely vegetated dunes to the sparsely vegetated low hummocks and open ground preferred by nesting plovers; and 3) European beachgrass is associated with a lower invertebrate abundance and diversity (Slobodchikoff and Doyen 1977, Webb et al. 2000). Plovers primarily forage on surface invertebrates of the beach and dunes, a lower abundance of invertebrates may have serious implications to plover survival.

Habitat restoration, specifically the removal of exotic invasive vegetation such as European beachgrass, continues to be a major component of CSP’s Natural Resource Program. We anticipate that the relationship between exotic invasive vegetation and plover productivity will become apparent in time as we continue monitoring in restored and degraded habitats and are able to observe the implications that patch size, crypsis, topography, foraging opportunities, proximity to foot traffic, proximity to conspecifics, and corvid abundance have on plover productivity.

In 2013/14 the North Coast Redwoods Management Team has approved plans to:

- Continue monitoring efforts throughout the NCRD and participation in the Recovery Unit 2 demographic study.
- Continue to work and coordinate with the Recovery Unit 2 working group and subcommittees, and the Humboldt Coastal Dunes Cooperative.
- Continue habitat restoration within WSP suitable habitat.
- Continue to use symbolic fencing when appropriate.
- Explore avenues to attract plovers to sites where factors leading to low reproductive success can be managed most effectively.
- Continue to use beach patrol logs for the rangers to document beach and dune patrols, violations, citations, and contacts.
- Continue to increase law enforcement presence at occupied State Park beaches during the WSP breeding season, especially during holiday weekends.
- Increase public outreach via Recovery Unit 2 Outreach Subcommittee and improved signage.
LITERATURE CITED


Appendix A - WSP Survey Forms

SNPL Monitoring

SNPL Survey

SNPL Survey

SNPL Survey

SNPL Survey

SNPL Survey

SNPL Monitoring

SNPL Monitoring

SNPL Monitoring

SNPL Monitoring

SNPL Monitoring

Point Count

Bird_ID

19
<table>
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<tr>
<th>Location</th>
<th>Nest Number</th>
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<th>Male</th>
<th>Number Hatched</th>
<th>Fate</th>
<th>Date</th>
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<td>GY:BB</td>
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<td>Abandoned</td>
<td>04/03/13</td>
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<tr>
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<td>B(P):OG</td>
<td>X:W</td>
<td>0</td>
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<td>4/03/13</td>
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<td>13CN16</td>
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<td>GV:GB</td>
<td>3</td>
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<td>6/14/13</td>
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<tr>
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<td>GY:BR</td>
<td>Y/L/Y:B</td>
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<td>6/20/13</td>
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<td>WW:BB</td>
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<td>GY:GW</td>
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<td>4/23/13</td>
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</tbody>
</table>

* UTM - North American Datum 1983
Appendix C - WSP Survey Site
Research & Monitoring

Existing
Population Surveys (1x Month)
- ATV survey (70 min.) 10 min. PC
- Foot survey (210 min.) 20 min. PC
Demographic Survey (1x Week if breeding determined)

Needed

Habitat Management

Existing
*Symbolic Fencing (if breeding determined)

Needed
E. beachgrass removal, few remaining areas with open sand and or native vegetation.

Predator Management

Existing

Needed
*PP trash receptacles
*Address illegal dumping of carcasses and adjacent agricultural land use correlated with high # Corvids

Law Enforcement

Existing
Beach Patrolled (1x Week)
Vehicle NIC if
- South of Kellogg without special permit on CSP lands
- Non-street legal
- Off waveslope
- Speed > 15 mph
- Vehicle play observed

Dog NIC if
- Beyond 500 meter of Kellogg Rd.
- Off leash
- Off waveslope

Needed
*Regulatory signage

Education & Outreach

Existing
North Coast Redwood Interpretive Association and Tolowa Dunes Stewards offer field trips and talks.

Needed
*Interpretative displays

Last Recorded - TDSP
Winter – 2012/13 (1 snpl)
Summer – 2012 (3 snpl)
Nesting – 1988 (3 nests)
**Research & Monitoring**

**Existing**

- Population Surveys (1x Month)
  - ATV survey (70 min.) 10 min. PC
  - Foot survey (210 min.) 20 min. PC

- Demographic Survey (1x Week if breeding determined)

**Needed**

- ATV survey (70 min.)
- Foot survey (210 min.)

**Habitat Management**

**Existing**

- Symbolic Fencing (if breeding determined)
- 400 acre nearshore dune restoration planned for area just south of the Tolowa breach on CSP lands.

**Needed**

- *Symbolic Fencing (if breeding determined)*
- *400 acre nearshore dune restoration planned for area just south of the Tolowa breach on CSP lands.*

**Predator Management**

**Existing**

**Law Enforcement**

**Existing (CSP lands only)**

- Beach Patrolled (1x Week)
- **Vehicle NIC if**
  - South of Kellogg without special permit
  - Non-street legal
  - Off waveslope
  - Speed > 15 mph
  - Vehicle play observed

- **Dog NIC if**
  - Beyond 500 meter of Kellogg Rd.
  - Off leash
  - Off waveslope

**Needed**

- PP trash receptacles
- *Symbolic Fencing (if breeding determined)*
- *400 acre nearshore dune restoration planned for area just south of the Tolowa breach on CSP lands.*

**Education & Outreach**

**Existing**

- North Coast Redwood Interpretive Association and Tolowa Dunes Stewards offer field trips and talks.

**Needed**

- Interpretative displays
- Regulatory signage

---

**Last Recorded** - TDSP

- Winter – 2012/13 (1 snpl)
- Summer – 2012 (3 snpl)
- Nesting – 1988 (3 nests)
GBB N. (Carruthers Cove to Fern Canyon)

**Research & Monitoring**
- **Population Surveys**: min. 2 surveys/year
  - Breeding (2x Month)
  - Winter (1x Month)
  - Breeding survey - by foot only
  - ATV (40 min.) 10 min. PC
  - Foot (230 min.) 20 min. PC
- **Demographic Survey**: (1x Week if breeding determined)
- **Needed**

**Habitat Management**
- **Existing**
  - *Symbolic Fencing (if breeding determined)*
  - *E. beachgrass removal and maintenance (approximately 20 acres) ongoing from Caruthers’s Cove to Ossagon.*
- **Needed**

**Predator Management**
- **Existing**
  - *Corvid Management Plan*
- **Needed**

**Law Enforcement**
- **Existing**
  - Beach Patrolled (x Week)
  - *Vehicle use limited to permit*
  - *Vehicle NIC if*
    - Non-street legal
    - off waveslope
    - speed > 15 mph
    - vehicle play observed
  - *Dog NIC if*
    - Off leash
    - Beyond area defined as waveslope to high tide line
- **Needed**

**Education & Outreach**
- **Existing**
  - North Coast Redwood Interpretive Association
- **Needed**
  - *Interpretative displays*
GBB S. (Fern Canyon to Major Creek)

Research & Monitoring
- Population Surveys: min. 2 surveys
  - Breeding (2x Month)
  - Winter (1x Month)
  - Breeding survey: by foot only
  - ATV (30 min.) 10 min. PC
  - Foot (120 min.) 20 min. PC

Demographic Survey: (3x Week if breeding determined)

Existing

Next

Habitat Management
- Existing
  - Symbolic Fencing (if breeding determined)
  - E. beachgrass removal by hand near Espa lagoon and GBB Campground.

Demographic Survey: (1x Week if breeding determined)

Needed

Predator Management
- Existing
  - Corvid Management Plan

Needed

Law Enforcement
- Existing
  - Beach Patrolled (x Week)

Vehicle use limited to permit

Vehicle NIC if
- Non-street legal
- Off wave slope
- Speed > 15 mph
- Vehicle play observed

Dog NIC if
- Off leash
- Off wave slope

Needed

Education & Outreach
- Existing
  - North Coast Redwood Interpretive Association

Needed

*Interpretative displays
SL (Freshwater Rocks to Sharp Pt.)

- **Research & Monitoring**
  - Existing
  - Population Surveys
    - Breeding (2x Month)
    - Winter (1x Month)
    - Survey - by foot only
      - Foot (55 min.) 20 min. PC
  - Demographic Survey
    - (1x Week if breeding determined)
  - Needed

- **Habitat Management**
  - Existing
    - *Symbolic Fencing (if breeding determined)
    - *Nearshore dune exotics at maintenance level
  - Needed

- **Predator Management**
  - Existing
    - *Predator proof receptacles
  - Needed

- **Law Enforcement**
  - Existing
    - Beach Patrolled (1x/Week)
    - Vehicle use limited to permit
      - Non-street legal
      - Off wavetop
      - Speed > 15 mph
      - Vehicle play observed
    - Dog NIC if
      - Present outside of parking area or off leash anywhere
  - Needed

- **Education & Outreach**
  - Needed
    - *Interpretative displays
  - Needed

---

**Last Recorded**
- SL Winter – 2007 (5 snpl)
- Summer – 2011 (2 snpl)
- Nesting – 2011 (1 nest)
**Research & Monitoring**

- **Existing Population Survey**: min. 2 surveyors
  - Breeding (2x Month)
  - Winter (1x Month)
- Breeding survey: - foot only
  - ATV (60 min.) 10 min. PC
  - Foot (120 min.) 20 min. PC
- Demographic Survey: (1x Week if breeding determined)

**Needed**

**Habitat Management**

- Existing
  - Symbolic Fencing (if breeding determined)
  - Nearshore dune exotics at maintenance level

**Needed**

**Predator Management**

- Existing
  - Predator proof receptacles
  - Symbolic Fencing (if breeding determined)

**Needed**

**Law Enforcement**

- Existing
  - Beach Patrolled (1x Week)
  - No vehicle use
  - No dogs permitted on BLSIP. Dogs are permitted on a leash at BLCIP, within approximately 100 meters of BLCIP parking area

**Needed**

**Education & Outreach**

- Existing
  - Interpretative displays

- Needed

---

**BL (Big Lagoon Spit)**

- **2013 Nest Scrapes**
- **2013 Decoys**
- **2012 Decoys**
- **2011 Decoys**
- **2012 Beach Surveys**
- **R22 Site Ownership**
- BLM
- CDFG
- CDPR
- HUCO
- NPS
- USFWS

**RU2 Site Ownership**

- BLM
- CDFG
- CDPR
- HUCO
- NPS
- USFWS

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**RU2 Site Ownership**

- **BL**
- **BLM**
- **CDFG**
- **CDPR**
- **HUCO**
- **NPS**
- **USFWS**

---

**Last Recorded - BL**

- Winter – 2012/13 (7 snpl)
- Summer – 2013 (5 snpl)
- Nesting – 2012 (2 nests)
CN (Little River to Strawberry Creek)

**Research & Monitoring**

LRSB ONLY
- From N. parking lot to LR
  - Existing
  - Population Survey
    - Breeding (2x Month)
      - Winter (1x Month)
      - Foot (60 min.) 20 min. PC
    - Demographic Survey (1x/Week if breeding determined)
  - Needed

LRSB ONLY
- Existing
  - Symbolic Fencing (if breeding determined)
  - Nearshore dune (28 ha.) restoration proposed for 2009.
  - Needed

**Habitat Management**

LRSB ONLY
- Existing
  - Nixolite on perches
  - Needed

**Predator Management**

LRSB ONLY
- Existing
  - Nixalite on perches
- Needed

**Law Enforcement**

LRSB ONLY
- Existing
  - Beach Patrolled (3x/Week)
    - Vehicle NIC if
      - Non-street legal
      - off waveslope
      - speed > 15 mph
      - vehicle play observed
    - Dog NIC if
      - off leash
      - off waveslope
- Needed

**Education & Outreach**

LRSB ONLY
- Existing
  - FOD/Docents
  - Needed

**Habitat Management**

LRSB ONLY
- Existing
  - Nearshore dune (28 ha.) restoration proposed for 2009.
- Needed

**Predator Management**

LRSB ONLY
- Existing
  - Nixolite on perches
- Needed

**Law Enforcement**

LRSB ONLY
- Existing
  - Beach Patrolled (3x/Week)
    - Vehicle NIC if
      - Non-street legal
      - off waveslope
      - speed > 15 mph
      - vehicle play observed
    - Dog NIC if
      - off leash
      - off waveslope
- Needed

**Education & Outreach**

LRSB ONLY
- Existing
  - FOD/Docents
  - Needed
Appendix D

Redwood National Park Western Snowy Plover Monitoring
and Redwood National and State Parks Vehicle Beach Access Permit System
Annual Reports 2012-2013
November, 2013

INTRODUCTION

The western snowy plover monitoring program at Redwood National Park has always been conducted in cooperation with the California State Parks as part of the Redwood National and State Parks (RNSP) partnership. All of the information relevant to the history, background and reason for the monitoring program within Redwood National Park is the same as that given for the California State Parks described in the previous report. The information in this appendix will only cover the National Park Service owned western snowy plover survey reaches within RNSP except for commercial beach fishing vehicle access permittee activity summary reporting, which covers all of RNSP, including Gold Bluffs Beach in Prairie Creek Redwoods State Park. Regular western snowy plover wintering and breeding season surveys were started in Redwood National Park in 1996.

This appendix and the Prairie Creek Redwoods State Park portions of the previous California State Parks report satisfy the reporting requirements stipulated in the terms and conditions of the US Fish and Wildlife Service Vehicle Beach Access in Redwood National and State Parks biological opinion (USFWS ref. # 8-14-2001-F-0953 and 81331-2010-F-0021). Mandatory reporting on the beach access permittees fishing logs and ranger patrol levels for all of Redwood National and State Parks, including California State Parks owned lands, is contained within this appendix.

METHODS

All of the methods used within the California State Parks of RNSP were used for the monitoring surveys in Redwood National Park except for human and dog presence monitoring. Human and dog presence were recorded as the total number of individuals
present on each survey reach in Redwood National Park. This contrasts with the method used for Prairie Creek Redwoods State Park where human and dog presence was measured using a 500m radius instantaneous scan sample every 20 minutes of survey time. Four survey reaches were monitored from October 2012 to September 2013 in Redwood National Park. Freshwater Spit was monitored once monthly from October 2012 to February 2013 and twice monthly from March to September 2013. Mussel Beach, the southernmost portion of Gold Bluffs Beach (Major Creek south), and Crescent Beach were monitored once monthly from March to September 2013.

RESULTS

*Western Snowy Plover Abundance and Distribution Surveys*

No snowy plovers were recorded on any Redwood National Park beaches during the 2012-2013 survey year. Fifty-seven hours (100 person hours) were spent searching for snowy plovers between October 2012 and September 2013 on Redwood National Park beaches.

*Predator Activity and Management*

Common ravens were relatively evenly distributed across three of the four surveyed Redwood National Park beaches (Freshwater Spit, Major Creek South – part of Gold Bluffs Beach, Crescent Beach and Mussel Beach) while American crows were only recorded on Freshwater Spit and Crescent Beach (Figure 1).
Figure 1. Corvid abundance based on average number of corvids detected during 500-m radius instantaneous point counts. Error bars represent SE.

The Redwood National and State Parks Corvid Management Strategy (RNSP 2008) addresses corvid management at a landscape level. The goal of the strategy is to decrease the density of corvids surrounding visitor use developments in Jedediah Smith Redwoods State Park, Del Norte Coast Redwoods State Park, Prairie Creek Redwoods State Park and Redwood National Park. Please see the 2013 RNSP Corvid Monitoring and Management report (RNSP 2013) for details on corvid management activities.

Human Activity and Management

Crescent Beach received the highest average human use, Freshwater Spit had half as many people and few to no people were recorded on Mussel and Major Creek South Beaches (Figure 2). Approximately half of the surveys that recorded dogs on Crescent Beach had at least one dog recorded off leash while 10% of the surveys on Freshwater Spit with recorded dog presence recorded at least one dog off leash. No dogs were recorded at all on Major South (Gold Bluffs Beach) or Mussel Beach.
Figure 2. Human and dog use based on total number recorded per survey. Error bars represent SE.

Table 1 below (next page) summarizes the vehicle track observations made during snowy plover surveys. Vehicle use appears to have remained relatively consistent over the four survey beaches over the past three years.
Table 1. Summary by beach of number of surveys and numbers of vehicle track set observations, 2011-2013.

<table>
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<th>Beach</th>
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<td>6</td>
<td>6</td>
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*A “track set” is defined as two parallel tracks made by one vehicle. A vehicle driving out and back in the same tracks would result in one set, out and back in different locations would result in two sets.

Commercial beach fishing occurred throughout RNSP, not just Redwood National Park. Commercial beach fishing for Prairie Creek Redwoods State Park was not included in the previous report, but is presented here. Ten commercial beach fishing vehicle access permits were issued in 2013 for Redwood National Park, and all of those permittees also held access permits for Gold Bluffs Beach in Prairie Creek Redwoods State Park. The data for both the National Park Service and California Department of Parks and Recreation permit systems is reported together here. According to fishing logs submitted, commercial fishermen averaged 60 fishing days for the year (n = 10, range = 0 – 135, SD = 54.77). Approximately 94% of the days were spent fishing on Gold Bluffs Beach in Prairie Creek Redwoods State Park and 5% and 1% on
Freshwater Spit/Mussel Beach and Crescent Beach in Redwood National Park, respectively. The amount of time spent on the beaches per day per commercial fisherman differed considerably, with Gold Bluffs Beach averaging 3.20 hours/day (range = 1 – 14, SD = 2.88), Freshwater Spit/Mussel Beach averaging <1 hour/day (range = 0 – 2, SD = 0.12) and Crescent Beach averaging 1.57 hours/day (range = 1 – 3, SD 1.22). Fishing was primarily done at night with approximately 15% of the trips conducted during daylight hours. In addition to the National Park Service/California Department of Parks and Recreation commercial beach fishing vehicle access permits, six mobility impaired vehicle access permits, two “general management plan” only permits, and no traditional gathering permits were issued in 2013. These latter, non-commercial beach fishing access permits do not require access logs to be submitted.

No human management actions (i.e. exclusion zones) were used on any Redwood National Park beaches to protect snowy plovers specifically because no plovers were found on any Redwood National Park beach – an exclusion zone was established on Gold Bluffs Beach by the California Department of Parks and Recreation, refer to the main body of the previous report for details. Crescent Beach and Freshwater Spit were patrolled or observed on a daily basis by National Park Service law enforcement rangers throughout the survey year. No patrols were made on either Mussel Beach or Major South due to their isolation and very low visitor use. Evidence of unpermitted, illegal beach driving occurred on Freshwater Spit but no citations were issued. No citations were issued at Mussel Beach or Crescent Beach for illegal beach driving. No specific snowy plover educational programs were conducted.

Habitat Condition and Management

Only Freshwater Spit has had beach habitat restoration work completed within Redwood National Park. Exotic European beach grass removal was completed in 2000. The entire spit is now at a maintenance level.

CONCLUSION

No western snowy plovers were recorded on a National Park Service managed beach within Redwood National and State Parks this survey year. No snowy plovers have been recorded during any official snowy plover survey on any Redwood National Park beach over the previous 17 years. Only one snowy plover has ever been recorded on a Redwood National Park beach – an adult male was sighted for one day in April 2011 on Freshwater Spit by park staff conducting other non-plover surveys. However, as shown in the previous report, Gold Bluffs Beach within Prairie Creek Redwoods State Park
(part of RNSP) has consistently had wintering snowy plovers for ten years as well as a few years of nesting or nesting attempts, including in 2013. Additionally, successful nesting has occurred at Stone Lagoon Spit (Humboldt Lagoons State Park), located immediately south of Freshwater Spit, in the last five years. Unfortunately, the main breeding plover population in Recovery Unit Two, and presumed the potential source of breeding adults for the region, continues to suffer high nest failure rates on Clam Beach County Park and Little River State Beach (Colwell et al. 2013). At this point in time, it is unknown whether snowy plovers will consistently overwinter or nest within Redwood National Park in the future.

Compliance by permittees with the permit stipulations of the Redwood National and State Park vehicle beach access permit program continues to occur. Fishing logs were all consistently submitted. No gross or repeated violations were recorded. Of the few instances where above the wave slope driving was recorded, permittees were most likely forced above the wave slope due to heavy surf conditions or were the result of sporadic beach wood poaching. The most common human issue continues to be off-leash dog walking on Freshwater Spit and Crescent Beach with some evidence of illegal beach driving occurring on Freshwater Spit.

LITERATURE CITED

