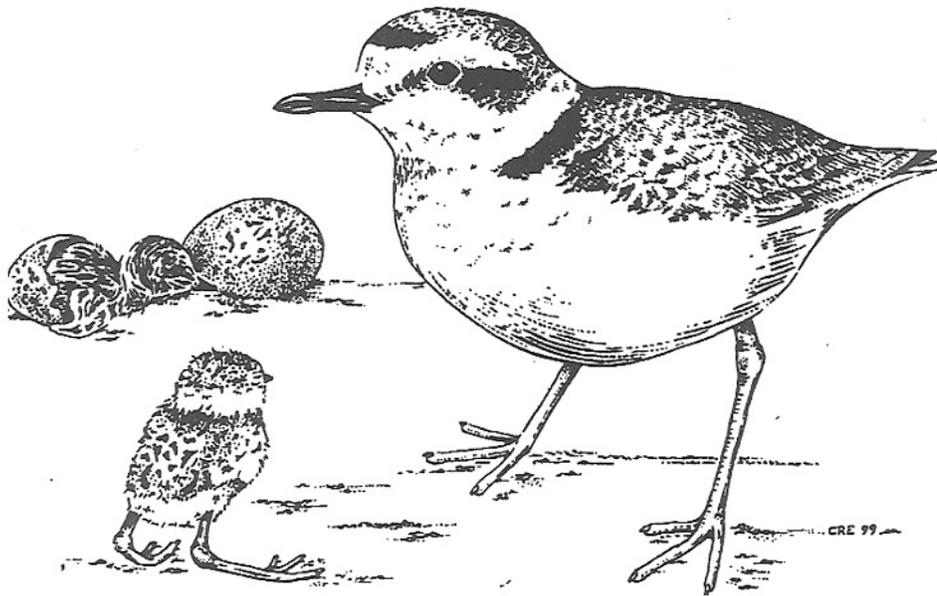


California State Parks
North Coast Redwoods District



Western Snowy Plover
Annual Report
2015-2016

March 2017

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, CDPR 2014). Consequently, in March of 2002, CSP released the Western Snowy Plover Systemwide Management Guidelines (CDPR 2002), which were revised in June 2014 (CDPR 2014) 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, CDPR 2014). 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, CDPR 2014).

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 (TE004234-5).

BACKGROUND

The coastal population of the WSP 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, urban development, and 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 is to ensure the long-term viability of the U.S. Pacific coast WSP population with specific objectives to; (1) Increase population numbers distributed across the WSP'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 WSP 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 ensure 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. 2015). Humboldt County is unique in that it also hosted nesting plovers along the Eel River gravel bars from 1996-2010. However, since 2011, no plovers have nested on gravel bars in RU2 (Feucht et al. 2016).

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 consulting 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 a local consulting firm 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 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 2015/16 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 from human disturbance when appropriate.
- Continue to use beach patrol logs for law enforcement 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 the Recovery Outreach Subcommittee and improved signage.

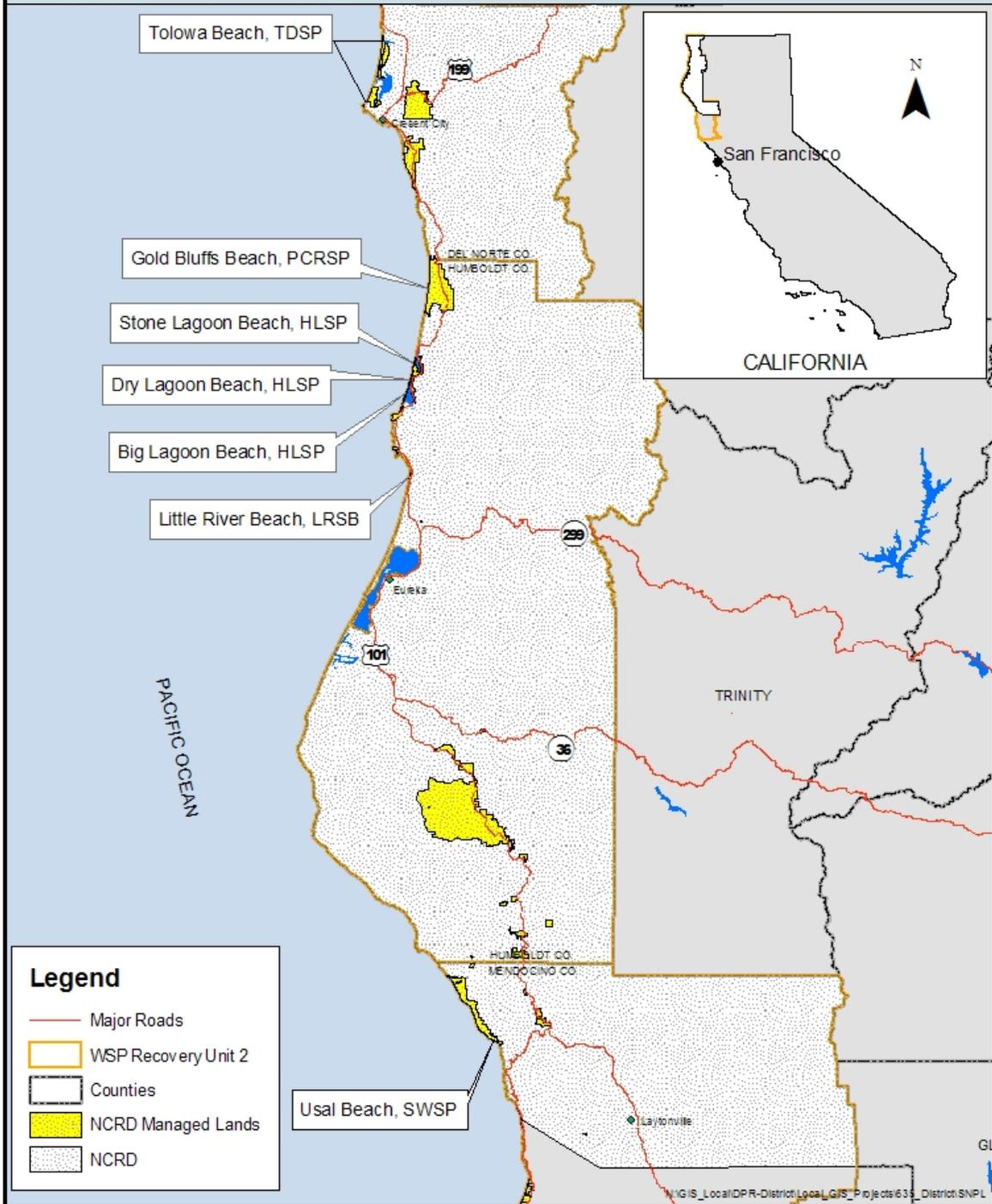
STUDY AREA

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 Dunes 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 the RU2 working group has identified Pelican State and Usal beaches (Sinkyone Wilderness State Park) as suitable habitat, these sites are usually not surveyed, due to difficulties with access. Usal Beach was surveyed once in January, 2016.



California State Parks

North Coast Redwood District



North Coast Redwoods District
Western Snowy Plover Annual Report

FIGURE 1
General Location Map

METHODS

Management activities were conducted under USFWS (10)(a)(1)(A) recovery permits TE-004234-5 and TE-73361A-1.1, and USFWS banding permit #22971. During the 2015/2016 season (Sep 15, 2015 – Sep 14, 2016), suitable habitat within the NCRD was surveyed monthly ± 4 days of the 15th. 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 of stretches of beach in the study area. Surveyors walked, or drove ATVs, 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

Nests and/or breeding activity were searched for 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. Nest searching included observing suggestive behavior of adult plovers and watching them return to nests to incubate, following tracks, and/or spotting incubating adults on nests.

Predator Activity and Management

Data was collected 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) have been conducted since 2008, in which the numbers of corvids and raptors were recorded. Also noted were the total numbers of potential predators [American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), and other potential avian predators] observed during the entire survey. Point count data were summarized by averaging values of multiple observations conducted during each visit to a site, and then averaging all observations for each study site. Mammalian predator tracks were noted opportunistically during surveys.

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 of the observer 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 activities that occurred in restoration areas were noted to help assess the relationship between restored habitat and nesting/fledging success.

Data Summary and Analysis

Data were collected separately for the 6 State Park beaches, using handheld personal computers, global positioning system (GPS), ESRI Mobile GIS software (ArcPad), and WSP monitoring forms (Appendix A). Survey results were distributed weekly to the RU2 Working Group via email and included in the RU2 final report (Feucht et al. 2016). Abundance and distribution, predator activity, and human activity data are presented as means (± 1 SD) and figures are presented as means (± 1 SE). Per Capita Reproductive Success is calculated as the mean number of successfully fledged chicks of all breeding males (± 1 SD).

RESULTS and DISCUSSION

Abundance and Distribution Surveys

During the 2015-16 plover season, 6 sites were surveyed at least monthly, totaling 267 survey hours and approximately 471 person hours. Surveys indicated that the non-breeding population (109 ± 17.8) continues to be several times larger than the breeding population (33 ± 29.5) (Fig. 2). The wintering population has increased from each previous year since 2009 and was the highest recorded in the NCRD in 2015. This steady increase can be attributed to the return of adults and yearlings, and to immigration (Feucht et al. 2016). The breeding population increased by 120% over 2015 in the NCRD. By comparison, the breeding population of the RU2 as a whole increased by 18%, from 61 to 72 breeding adults (with slightly more females than males) (Feucht et al. 2016).

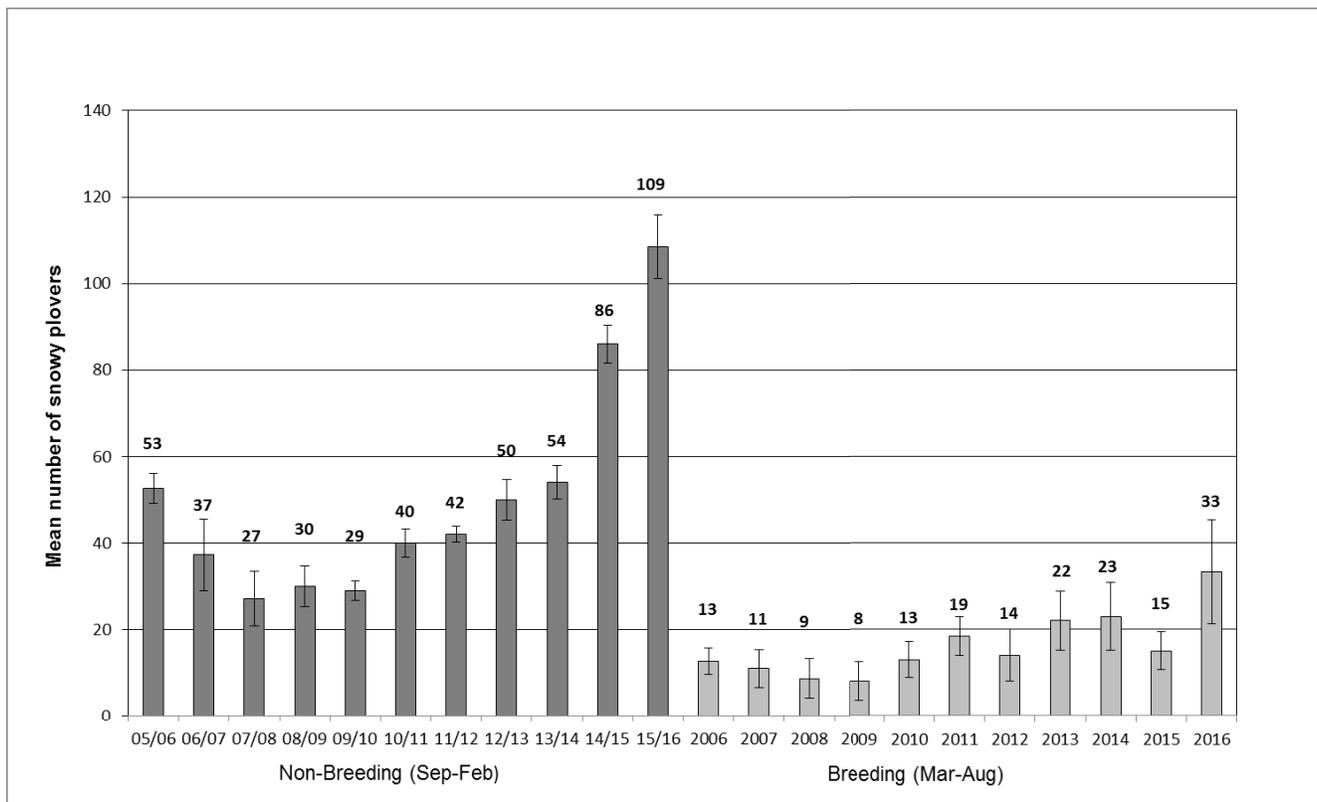


Figure 2. Western Snowy Plover Wintering and Breeding Abundance (mean \pm SE) in NCRD, 2005-2016.

Plovers were detected at 5 of 6 beaches in the NCRD (Tolowa Dunes, Gold Bluffs Beach, Stone Lagoon Beach, Big Lagoon Beach, and Little River State Beach) (Fig. 3). Breeding was confirmed at 3 sites; Stone Lagoon Beach, Big Lagoon Beach, and Little River State Beach. Little River State Beach and Big Lagoon hosted birds consistently throughout the year. For the second consecutive year, breeding season surveys documented birds at

Tolowa Dunes. It was later discovered that these birds were nesting at nearby Lake Earl Wildlife Area, managed by California Department of Fish and Wildlife (CDFW).

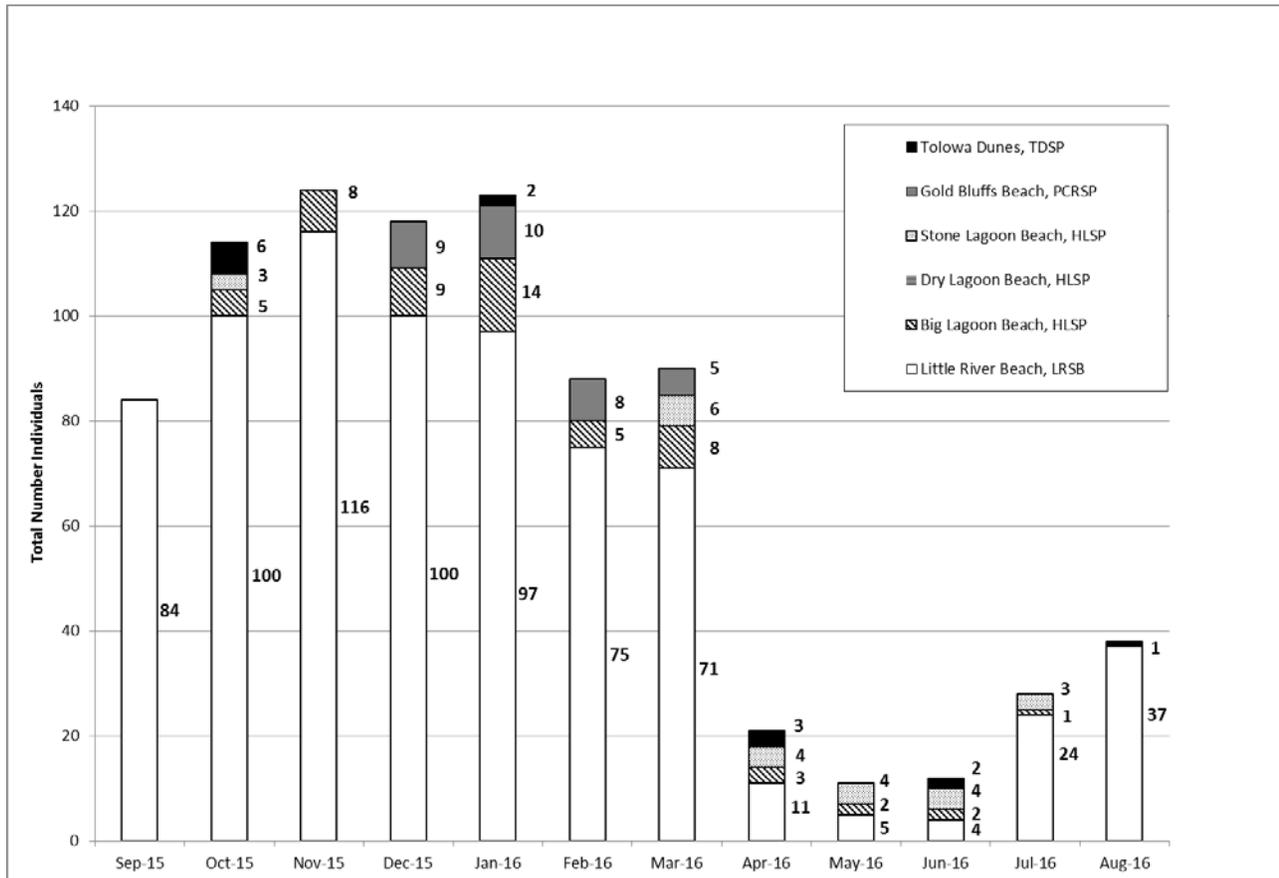


Figure 3. Western Snowy Plover Distribution during NCRD mid-month window surveys, 2015/16.

Reproductive Success

In the NCRD, a minimum of 17 plovers (8 males, 9 females) initiated 13 nests, produced 22 eggs, hatched 11 chicks and fledged 5 of those chicks (Table 1 and Appendix B). Of the entire RU2 breeding population, NCRD hosted 24% (17 of 72) of the breeding adults and 12% (5 of 40) of the fledged chicks. In 2016, Stone and Big lagoons were the only NCRD beaches to fledge birds. The breeding season started with one of the earliest nests ever recorded in RU2, found with 3 eggs on March 7 (with an estimated initiation date of at least March 3, if not earlier) at Stone Lagoon. The female of this nest incubated for at least 49 days, and likely by herself starting early on after nest initiation, as the male appeared to have abandoned incubation duties. One egg did not hatch, one only partially hatched, and the third egg hatched a weak chick which survived 2 days. Also at Stone Lagoon, the oldest known RU2 plover, a male (RU2 fledging from 2001), continued to breed. This male has successfully fledged chicks from Stone Lagoon for 4 of 6 years, since he moved from Clam Beach in

2009, where he was mostly unsuccessful for over a decade. However, in 2016, all 3 of the nests he initiated failed (1 by skunk predation, and 2 due to unconfirmed causes– but likely attributable to skunk predation). Nest initiation and success have been irregular at Little River State Beach over the past 15 years. In 2016, 4 nests were initiated and one hatched, but no chicks survived to fledgling; these numbers represent roughly an average year. For the first time in 27 years, plovers attempted nesting in the vicinity of Tolowa Dunes (Feucht et al. 2016). Birds initiated 3 nests in April and June, near the breach area of Lake Tolowa, on land under the jurisdiction of CDFW. None of the nests survived to hatching. These nests were in close proximity (0.5-1.0km) to Tolowa Dunes State Park, and were monitored by NCRD during our twice monthly surveys, but were not included in our analysis. Overall, per capita reproductive success for the NCRD was down (0.62 ± 1.2) compared to the previous year (0.80 ± 1.3). The per capita reproductive success in RU2 overall was 1.21 ± 1.29 , the highest since 2001 (Feucht et al. 2016).

Predator Activity and Management

Predation (including nests with unknown fate where predation was assumed) continues to be the leading cause of nest failure in RU2 (Feucht et al. 2016). Of the 8 nest failures in NCRD during 2016, 36% (compared to 20% in RU2 overall) was definitively attributed to depredation (by ravens, skunks and possibly other species). Another 45% (compared to 28% in RU2) of failures was due to unknown causes, but some of these were likely due to depredation (Appendix B). At Stone Lagoon, striped skunks (*Mephitis mephitis*) appeared to cause at least 3 of 6 of nest failures, a novel occurrence on this beach. After consultation with the RU2 working group, we chose to install video cameras to monitor skunk activity to assess the issue. Four cameras were installed from June 6-8, and taken down on June 17. Cameras were only active for 10-11 days, as one camera was vandalized on June 16, and all cameras were subsequently removed by NCRD. Within this short time frame, cameras recorded many false positives, and no skunk or other predator activity. Anecdotal observations across years suggest that corvids, principally common ravens, are the primary predators of WSP eggs and chicks. Video evidence collected on Clam Beach County Park supports this notion (Colwell et al. 2009). Corvid activity for the 2015/16 plover season varied among NCRD sites (Fig. 4) with Tolowa Dunes Beach continuing to have high corvid activity, as well as Little River State Beach, which again showed a slight increase in corvid numbers (mean; 2.2 ± 3.2) compared to

Table 1. NCRD WSP 2016 Breeding Season Summary with comparison to previous years								
<i>Unit</i>	<i>Females^a</i>	<i>Males^a</i>	<i># of Nests</i>	<i># Exclosed</i>	<i>% Hatched</i>	<i># Chicks Hatched</i>	<i>#(%) Chicks Fledged</i>	<i>Fledged per male</i>
Tolowa Beach, TDSP ^c	0	0	0	0	0%	0	0	0
Gold Bluffs Beach, PCRSP	0	0	0	0	0%	0	0	0
Stone Lagoon, HLSP	5	4	8	0	38%	5	2(40%)	0.5±1.00
Dry Lagoon, HLSP	0	0	0	0	0%	0	0	0
Big Lagoon, HLSP	1	1	1	0	100%	3	3(100%)	3±0
Little River State Beach	3	3	4	0	25%	3	0	0
All Sites 2016	9	8	13	0	31%	11	5(45%)	0.62±1.2
2015	5	5	11	0	27%	8	4(50%)	0.8±1.3
2014	13	10	35	0	3%	3	2(66%)	0.2±0.63
2013	7	7	8	0	43%	7	6(86%)	0.86±1.07
2012	1	1	2	0	50%	3	1(33%)	1±0
2011	6	6	7	0	43%	8	4(50%)	0.67±1.21
2010	2	3	8	0	25%	4	3(75%)	1±1
2009	1	1	1	0	100%	3	3(100%)	3±0
2008	0	0	0	0	0%	0	0(0%)	0
2007	0	0	0	0	0%	0	0(0%)	0
2006	2	2	2	2 ^b	50%	3	0(0%)	0
2005	6	5	6	3	83%	14	3(21%)	0.6±.89
2004	2	2	2	1	100%	4	3(75%)	1.5±.71
2003	3	2	3	1	33%	3	0(0%)	0
2002	3	3	8	2	25%	6	0(0%)	0
2001	3	3	7	4	57%	10	5(50%)	1.67±.58

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

b The exclosure of one nest was removed late in incubation phase, due to potential adult predation. This nest subsequently failed.

2014/15 (mean; 1.9±3.1) (Fig. 5). While this year's numbers showed a general increase in corvids over last year's, the 2015-16 numbers and site variability are still consistent with those of previous years. Corvid numbers at Little River State Beach in 2015/16 were the highest in the last 5 years, and the third highest since 2008 (Fig. 5). A GIS "Hotspot Analysis" by an HSU graduate student of raven activity from 2009-2015 on Little River State Beach and adjoining Clam Beach County Park showed a statistically significant higher count of raven tracks in the Habitat Restoration Area (HRA) of Little River State Beach and in the

naturally occurring blowouts near the Little River mouth, compared to the rest of the beach extent (Feucht et al. 2016). These findings are likely confounded by the bare-ground feature, dominant in native nearshore dunes of these areas. The HRA and blowouts are the only nearshore dunes in the study area that are devoid of contiguous invasive beachgrass, where ravens would be both more likely to walk and to leave tracks on the open sand substrate. Furthermore, ravens are likely attracted to foraging opportunities and novelty in open habitats, with a more dynamic landscape.

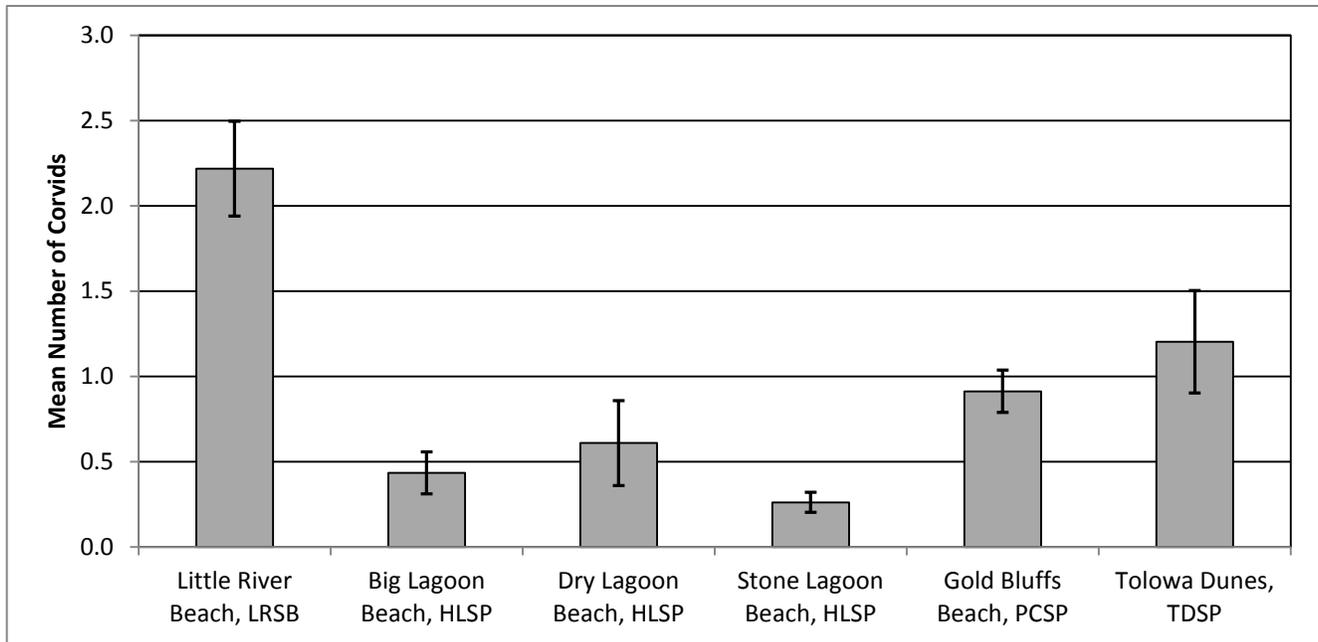


Figure 4. Corvid abundance, based on mean number detected during 500-m radius point-counts, on plover-breeding beaches in NCRD during 2015-16 season.

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 from 2001 to 2010. They found that DPR of nests was particularly high at Clam Beach County Park/Little River State Beach (0.065-0.390), especially compared to sites such as Big Lagoon Beach (0.00) and Stone Lagoon Beach (0.00). While this generally held true for ensuing years, there was a marked increase in DPR at Stone Lagoon in 2016, attributed to skunk predation.

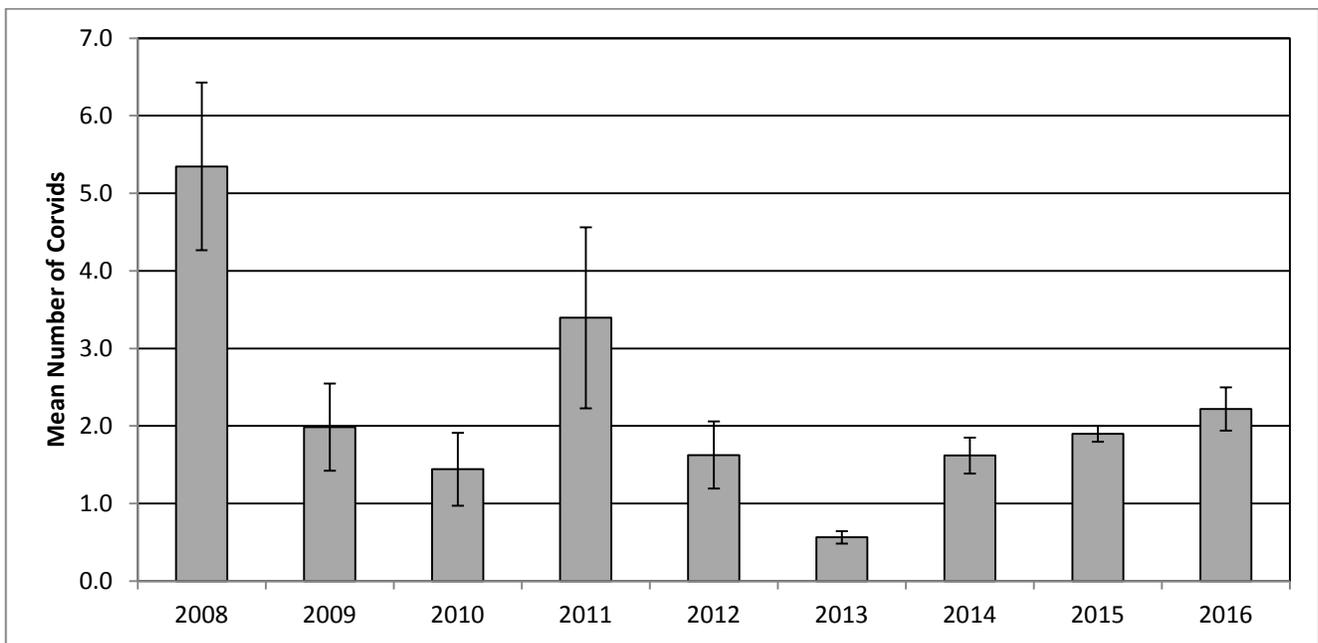


Figure 5. Annual corvid abundance, based on mean number detected during 500-m point-counts at Little River State Beach.

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 Beach, where public use developments are lacking entirely. The Redwood National and State Parks Corvid Management Strategy (RNSP 2008a) attempts to address corvid management at both local and landscape levels. 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 (i.e., Gold Bluffs Beach and Stone Lagoon) of the NCRD.

Human Activity and Management

Similar to previous years, Little River State Beach and Dry Lagoon Beach within Humboldt Lagoons State Park had the highest levels of human activity encountered during surveys (Fig. 6). Human activity at both these sites was lower than the previous year. There was however, a marked increase in the mean number of dogs observed at Little River State Beach (mean; 0.85 ± 1.3) compared to the previous year (mean; 0.27 ± 0.84) (Fig. 7).

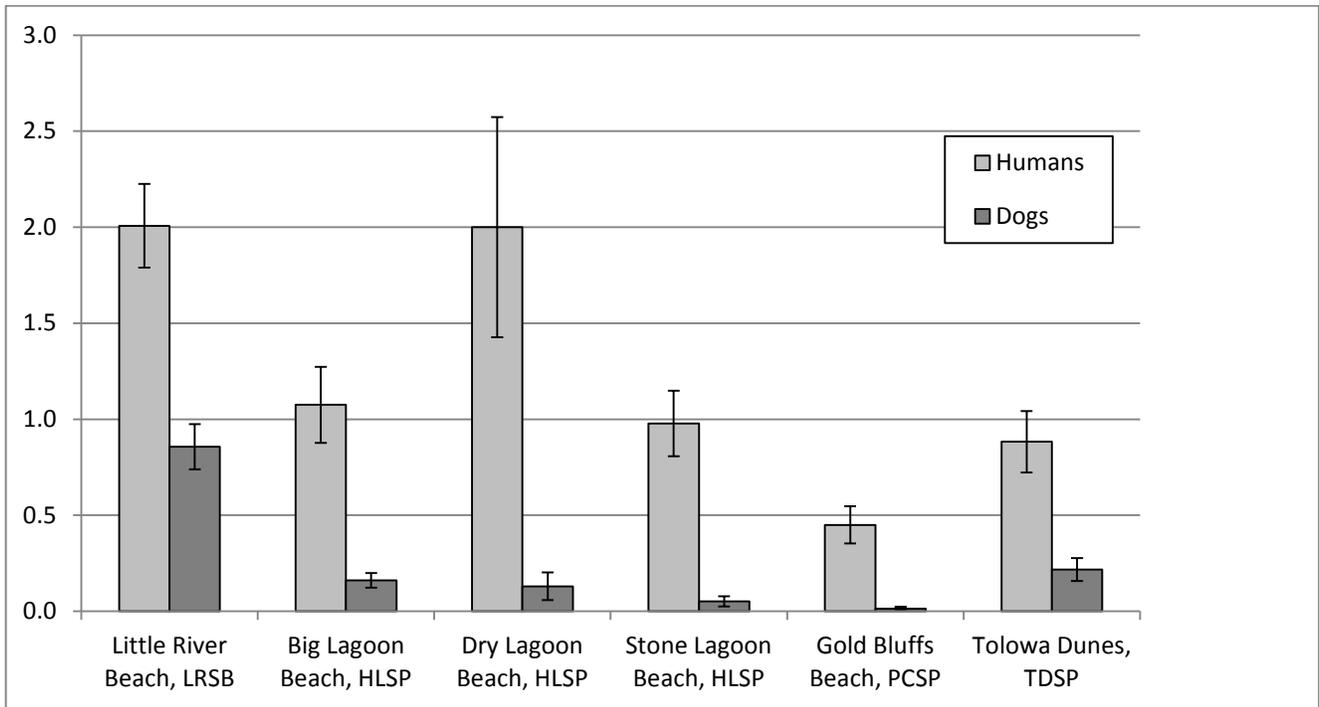


Figure 6. Human and dog abundance, based on mean numbers detected during 500-m point-counts during 2015-16 season.

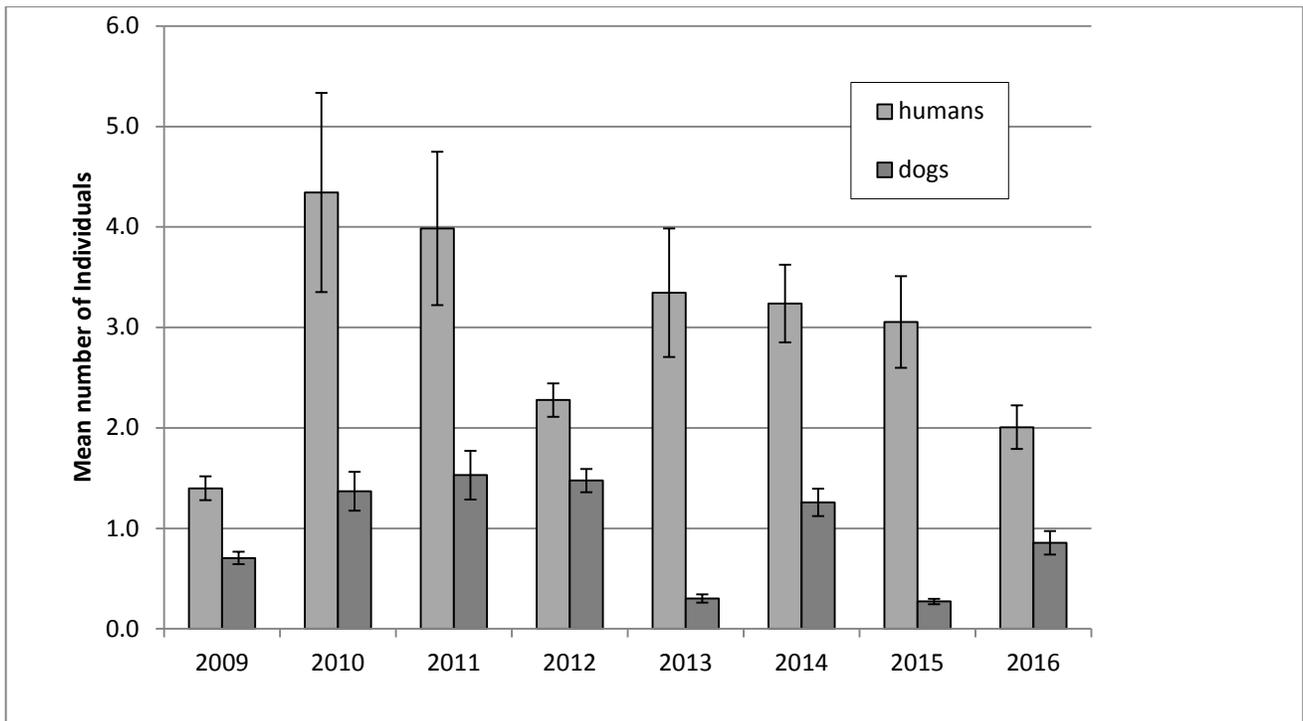


Figure 7. Human and dog abundance at LRSB, based on mean numbers detected during 500-m radius point-counts, 2009-2016.

Management efforts associated with minimizing human impact to snowy plovers included dog restrictions, vehicle restrictions, and the use of breeding and non-breeding Plover Protection Areas (PPAs). See Appendix C for site-specific beach and dune rules and regulations. All regulations and restrictions are posted on kiosks and signage at parking lots. However vandalism has been a problem, such as at Big Lagoon and Little River State beaches, where vandals have been removing PPAs and signs. CSP rangers patrolled beaches by vehicle and foot for a total of 1077 patrols within the NCRD during 2015/16. Of 120 violations observed during patrols, CSP Law Enforcement officers issued 95 warnings (41 for dog violations, 1 for PPA violation, 1 for vehicle violation, and 52 for camping-related issues) and 25 citations [12 for dog violations (7-SL, 2-DL, 3-LRSB), 9 for camping violations (GBB), 2 for illegal camping (LRSB), and 2 for illegal vehicle (BL, LRSB)] (Fig. 8). The higher number of violations at GBB is likely an artifact of it being easier to patrol and having a more frequent ranger presence due to the campground rather than a reflection of a higher level of illegal behavior.

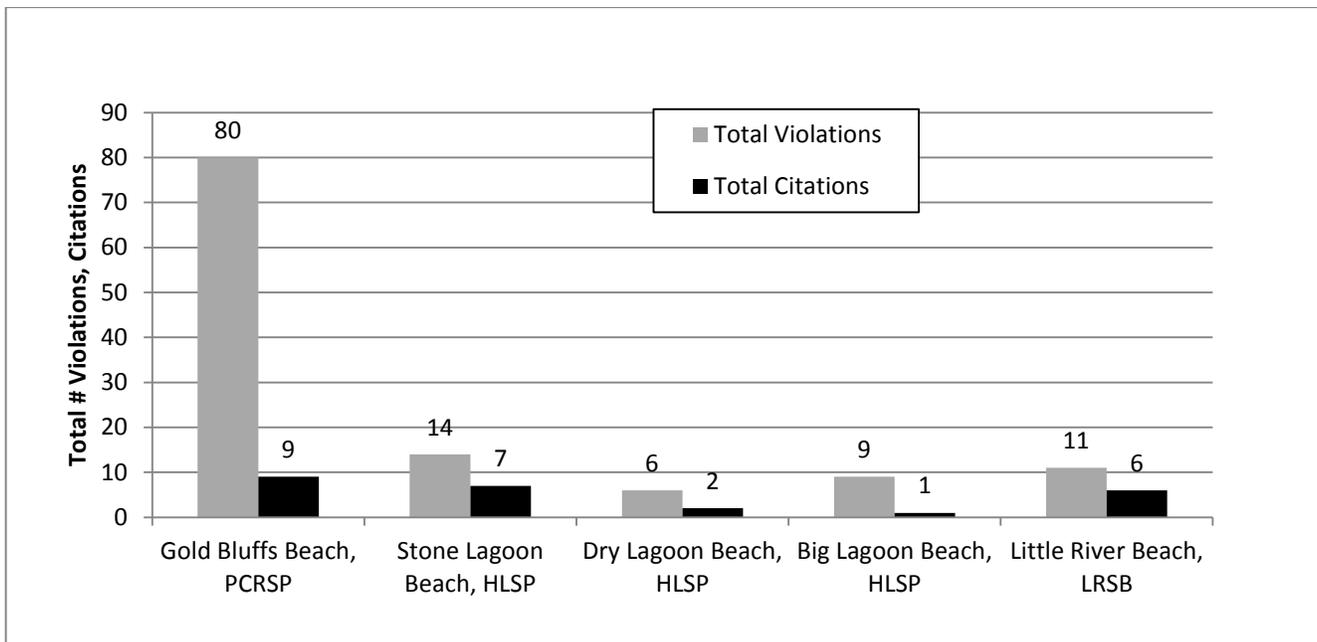


Figure 8. Violations observed and citations issued by CSP Law Enforcement during beach patrols, 2015-16 season.

In an effort to minimize visitor impacts to WSP, the NCRD continued to participate in the Recovery Unit 2 Outreach Subcommittee, which met 5 times in 2016. 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. Staff from NCRD helped with Docent training. The Share the Beach Program continued in the 2015/16 plover breeding

season with two docents at Little River State Beach and/or Clam Beach County Park every weekend during June through August. The docents walked the beaches as “roaming kiosks”, picked up trash, and conducted tabling at the north paved parking lot at the property boundary between Little River State Beach and Clam Beach County Park. In addition, they also collected data on people, dogs, and activities occurring on the beach. The Outreach Subcommittee presented WSP educational displays during the local annual Kinetic Sculpture Race, “Godwit Days” bird watching festival, and the Sand Sculpture Festival. They published 5 “Plover Tidings” articles on Tumblr (<http://usfwspacificsouthwest.tumblr.com>). Lastly, Friends of the Dunes discussed snowy plover life history in their Bay to Dunes program, in which approximately 950 students participated.

For the third year since 2012, the Jump Dance, a traditional Yurok world-renewal ceremony for the protection of the environment, education, health, and welfare of the Yurok people and humankind, was held at Stone Lagoon in Partnership with Park staff. In consultation with USFWS, it was determined that activities associated with the Jump Dance may affect, but were not likely to adversely affect, the western snowy plover. For the first time recorded, a plover brood (a male with 2 chicks) was present at Stone Lagoon during the Jump Dance. Plover protection measures were implemented (e.g. PPA’s and driving restrictions), and the male and 2 chicks were observed immediately following the 3 days of ceremony. The chicks fledged 3 days later (RNSP 2017, unpublished report).

Habitat Condition and Management

In addition to providing quality habitat for the western snowy plover, the goals of coastal dune restoration in the NCRD are to restore natural dune processes by removal of invasive non-native plants such as European beachgrass, restoring natural topography and sand movement, and promoting the reestablishment of native dune vegetation. To that end, the NCRD has initiated the following coastal dune restoration activities.

TOLOWA DUNES STATE PARK

The South Lake Tolowa Dunes restoration project initiated in 2009 proposes restoration of 103 acres of coastal dune habitat in the southern portion of TDSP. Approximately 27 acres have been treated by hand to date. Retreatment, utilizing a combination of California Conservation Corps crews, Cal Fire crews, and Park staff is currently being conducted twice a year.

PRAIRIE CREEK REDWOODS STATE PARK

Between 2005 and 2009, European beachgrass was removed from approximately 26 acres of the Ossagon and Carruther's Cove area via heavy equipment. In Fall 2013, the North Gold Bluffs Beach Restoration Plan was initiated and 101 acres (from Home Creek to Ossagon) of nearshore dunes was treated via heavy equipment and hand removal. Another 100 acres of North Gold Bluffs Beach was treated with heavy equipment in Nov/Oct of 2015 for a total of approximately 227 acres being restored. Retreatment, utilizing a combination of California Conservation Corps crews, Cal Fire crews, and Park staff is currently being conducted three times a year.

HUMBOLDT LAGOONS STATE PARK

The restoration efforts at HLSP began in spring 2002 and initial treatment of the entire dune system was completed in March 2005. The control of invasive non-native vegetation in the nearshore dunes at HLSP beaches is currently at a maintenance level.

LITTLE RIVER STATE BEACH

Using mitigation funds from the Stuyvesant oil spill, the NCRD initially treated 34 acres of European beachgrass at LRSB. This effort, in combination with the original pilot project from 2005, resulted in the removal of beachgrass on 42 acres of 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 at a maintenance level.

Of the 13 nests initiated in the NCRD, all were within sites that have undergone habitat restoration (Table 2) of varying scale. At Big and Stone Lagoon beaches, where restoration efforts are at a maintenance level, 1 and 8 nests, respectively, were established. The Big Lagoon nest hatched and fledged 3 chicks. At Stone Lagoon, 3 nests hatched and 2 chicks fledged. At Little River State Beach, all 4 nests failed. See Appendix C for site-specific habitat condition.

Social Attraction

Social attraction projects (NCRD 2012) were implemented at several sites (Gold Bluffs Beach, Stone Lagoon Beach, Big Lagoon Beach, and Little River State Beach) from 2011/12 through 2013/14. Though preliminary results from the social attraction project, suggest that the use of decoys and vocalizations may help encourage wintering birds to remain and breed at sites, this project has been put on hold due to budget constraints.

Table 2. NCRD Site Productivity - (# nests) and per capita reproductive success 2001-2016.							
	<i>LRSB</i>	<i>BL</i>	<i>SL</i>	<i>DL</i>	<i>GBB</i>	<i>TDSP</i>	<i>Total NCRD</i>
2001	(7) 1.67±.58	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0	(7) 1.67±0.58
2002	(8) 0	(0) 0*	(0) 0*	(0) 0*	(0) 0	(0) 0	(8) 0
2003	(3) 0	(0) 0*	(0) 0*	(0) 0*	(0) 0	(0) 0	(3) 0
2004	(1) 2±0*	(0) 0*	(0) 0*	(0) 0*	(1) 1±0*	(0) 0	(2) 1.5±0.71
2005	(3) 1±1	(2) 0	(0) 0	(0) 0	(1) 0*	(0) 0	(6) 0.6±0.89
2006	(2) 0	(0) 0	(0) 0	(0) 0	(0) 0*	(0) 0	(2) 0
2007	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0*	(0) 0	(0) 0
2008	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0*	(0) 0	(0) 0
2009	(0) 0*	(0) 0	(1) 3±0	(0) 0	(0) 0	(0) 0*	(1) 3.0±0
2010	(5) 0*	(0) 0	(3) 1.5±.71	(0) 0	(0) 0	(0) 0*	(8) 1.0±1
2011	(3) 0*	(3) 2±1.41 ⁺	(0) 0	(0) 0	(0) 0	(0) 0*	(6) 0.67±1.21
2012	(0) 0*	(2) 1±0 ⁺	(0) 0	(0) 0	(0) 0 ⁺	(0) 0*	(2) 1.0±0
2013	(7) 1±1 ⁺⁺	(0) 0 ⁺	(0) 0 ⁺	(0) 0	(1) 0 ⁺⁺	(0) 0*	(8) 0.86±1.07
2014	(30) 0 ⁺⁺	(1) 0 ⁺	(3).20±.63	(0) 0	(1) 0 ⁺⁺	(0) 0	(35) 0.2±0.63
2015	(4) 0*	(2) 0	(4) 2.0±1.41	(0) 0	(1) 0*	(0) 0	(11) 0.80±1.3
2016	(4) 0*	(1) 3±0*	(8) 0.5±1.0	(0) 0	(0) 0*	(0) 0	(13) 0.62±1.2

*Invasive Exotic Removal Year
+Social Attraction Year

CONCLUSION

To facilitate management of plovers within the NCRD we analyze data and present results in relation 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 2016, the NCRD Natural Resource Program continued monitoring WSP in the District with the help of HSU (Little River State Beach) and RNP (Prairie Creek Redwoods State Park). Both the wintering and breeding populations within NCRD reached a ten-year peak in 2016 of 109 and 33 individuals, respectively. Seventeen breeding plovers initiated 13 nests, produced 11 chicks and fledged 5 juveniles in 2016; this is the highest number of chicks since 2005 and the second highest number of fledglings since 2001. However, per capita reproductive success (0.62±1.2) was relatively low, compared to the last 7 years. Of the entire RU2 breeding population, NCRD hosted 24% (17 of 72) of the breeding adults and 12% (5 of 40)

of the fledged chicks. For the greater RU2, Feucht et al. (2016) reported a steady population increase for the past 7 years, and a remarkable 2106 breeding season, with the highest number of fledglings since 2001, and a per capita reproductive rate of 1.21 ± 1.29 , which exceeded the recovery objective of 1.0 for the first time since 2004.

Predator Activity and Management

Feucht et al. (2016) reported that predation of eggs and chicks continues to be the most significant problem limiting productivity of plovers in RU2. In the NCRD, of the 13 nests that were initiated in 2016, 8 nests failed; 2 of these were abandoned (LRSB, SL). The other 6 nests were most likely lost to predation; skunk tracks and broken eggs or eggshell fragments occurred at 3 (SL), and though there was no direct predator sign at the 3 other failed nests, all eggs had disappeared (2 LRSB, 1 SL). Effective predator management remains an essential tool for plover recovery in RU2.

Changes in corvid abundance across years and sites likely play 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. As in years past, CSP 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) within RNSP 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 continue to participate in the RU2 working group and the RU2 Predator Subcommittee to identify means of enhanced predator management.

Human Activity and Management

In 2016, no nests were known to fail directly from human activity. In years past, humans have driven over nests, vandalized enclosures and removed eggs, stepped on eggs, and disturbed incubating adults, causing nest abandonment and the death of newly hatched chicks owing to hypothermia (Colwell et al. 2008). To address these risks, NCRD staff have erected non-breeding and breeding PPAs to protect WSP and their eggs (though these PPAs are often ignored and vandalized), increased enforcement of existing regulations, and invested in

plover-centric education and outreach programs. Surveyors continue to document humans (and dogs) displacing and flushing plovers.

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 Little River State Beach and adjoining Clam Beach County Park. At a landscape level, CSP staff has initiated a district-wide outreach campaign to inform visitors about the potential effect they have on corvid populations, the impact corvids 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. An evaluation in 2014 of snowy plover response to beach dune habitat restoration in Humboldt County found that plovers nested primarily (84%) in restored (both via natural processes and human-implemented) habitats (Leja 2015). Restored habitats were characterized by wide beach, gentle slope, low-height foredunes with scattered driftwood and low-growing dune mat, expansive, flat sand extending into the backdunes, and less European beachgrass cover than unrestored beaches; all of these features were prevalent in areas utilized by nesting plovers; Wintering plovers also used restored areas.

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). As 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 invasive non-native vegetation such as European beachgrass, continues to be a major component of CSP's Natural Resource Program. CSP anticipates that the relationship between invasive non-native vegetation and plover productivity will become apparent in time with continued monitoring in restored and degraded habitats and observation of the effects of patch size, crypsis, topography, foraging opportunities, proximity to foot traffic, proximity to conspecifics, and corvid abundance on plover productivity.

It may prove beneficial to supplement debris cover in the HRA with additional driftwood, shells, and stones. Leja (2015) showed that there was double the amount of driftwood debris in naturally restored habitats (which plovers most frequently chose for nesting) than in human-restored areas.

Social Attraction

North Coast Redwoods District's preliminary results from the social attraction project, conducted from 2011/12 through 2013/14, suggested that the use of decoys and vocalizations may help encourage wintering birds to remain and breed at these sites (NCRD, 2012). Additionally, the presence of conspecifics was found to be the most influential social variable on nest location selection during the breeding season (Leja 2015). Thus, there appears to be credence in continuing the social attraction project in both the winter and breeding seasons in restored habitat. Due to budget constraints, the project has not been deployed since 2014.

In 2017/18 the North Coast Redwoods Management Team has approved plans to:

- Continue monitoring efforts throughout the NCRD and participate 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 and reintroduce predator exclosures when appropriate.
- Continue to explore avenues to attract plovers to sites where factors leading to low reproductive success can be managed most effectively.
- Continue the use of CSP law enforcement beach patrol logs 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 and increase signage, including a quicker turnaround on replacement of vandalized signs.

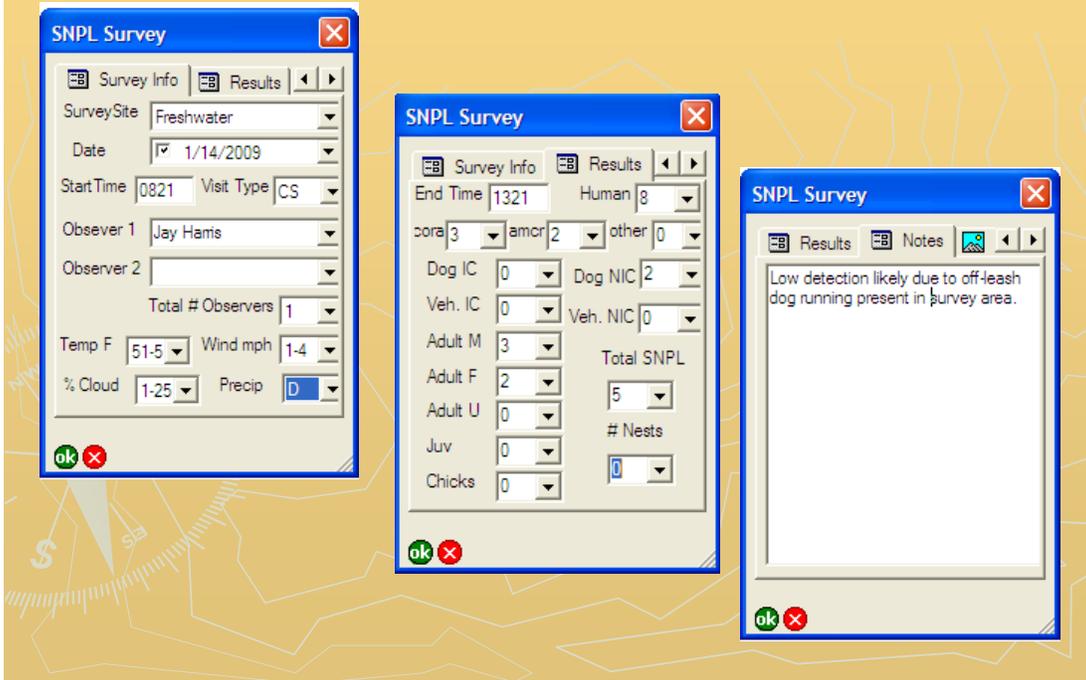
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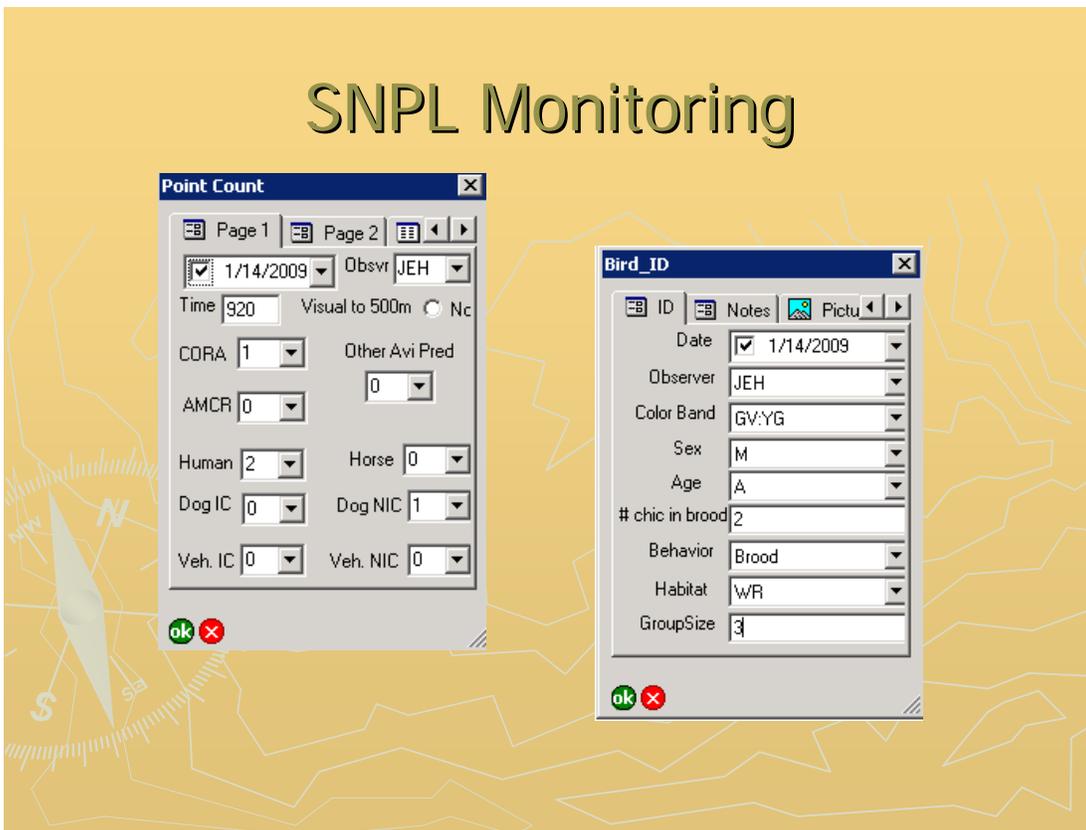
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APPENDIX A. WESTERN SNOWY PLOVER SURVEY FORMS

SNPL Monitoring



SNPL Monitoring



Appendix B. NCRD Western Snowy Plover Breeding Summary 2016

Location	Nest Number	Female	Male	Number Hatched	Fate	Date
Big Lagoon Beach, HLSP	16BL01	X:S	OV:BY	3	Fledged 3	5/22/16
Little River State Beach	16CN12	WW:AG	R/O:V	0	Covered in sand	5/30/16
Little River State Beach	16CN13	GY:YB	GV:RB	3	Failed Predation	5/30/16
Little River State Beach	16CN22	OV:OB	GY:GR	0	Failed Unk.	6/27/16
Little River State Beach	16CN23	WW:AG	UNK	0	Failed Unk.	7/04/16
Stone Lagoon Beach, HLSP	16SL01	GY:RR	UNK	1	Failed Unk.	3/07/16
Stone Lagoon Beach, HLSP	16SL02	WW:WG	OR:YR	1	Failed Unk.	3/30/16
Stone Lagoon Beach, HLSP	16SL03	GY:YY	VW:RY	0	Abandoned	4/01/16
Stone Lagoon Beach, HLSP	16SL04	RY:OG	GY:AG	0	Failed Predation	5/04/16

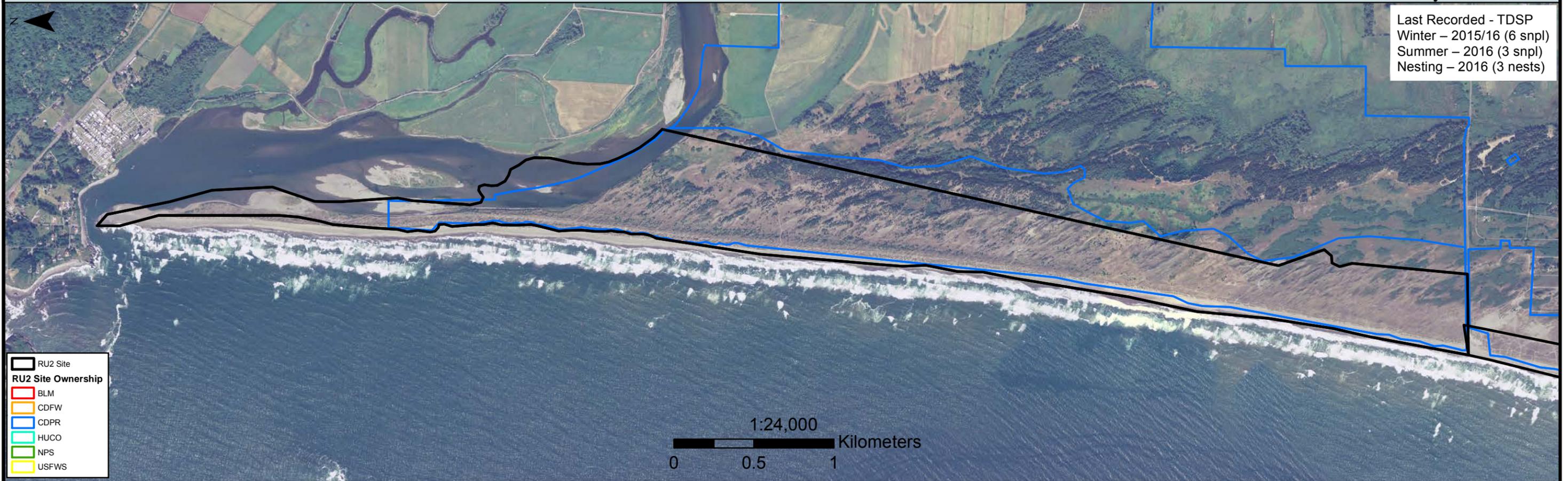
Stone Lagoon Beach, HLSP	16SL05	GY:RR	OV:GG	0	Failed Predation	5/09/16
Stone Lagoon Beach, HLSP	16SL06	VW:WB	OR:YR	0	Failed Predation	5/27/16
Stone Lagoon Beach, HLSP	16SL07	GY:RR	OV:GG	3	Fledged 2	5/30/16
Stone Lagoon Beach, HLSP	16SL08	VW:WB	OR:YR	0	Failed Unk.	6/14/16

Appendix C - WSP Survey Sites

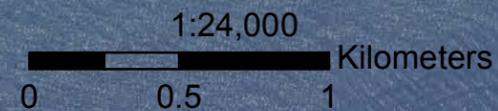
TDSP N. (Smith River to Kellogg Rd.)



Last Recorded - TDSP
Winter – 2015/16 (6 snpl)
Summer – 2016 (3 snpl)
Nesting – 2016 (3 nests)



RU2 Site
RU2 Site Ownership
 BLM
 CDFW
 CDPR
 HUCO
 NPS
 USFWS

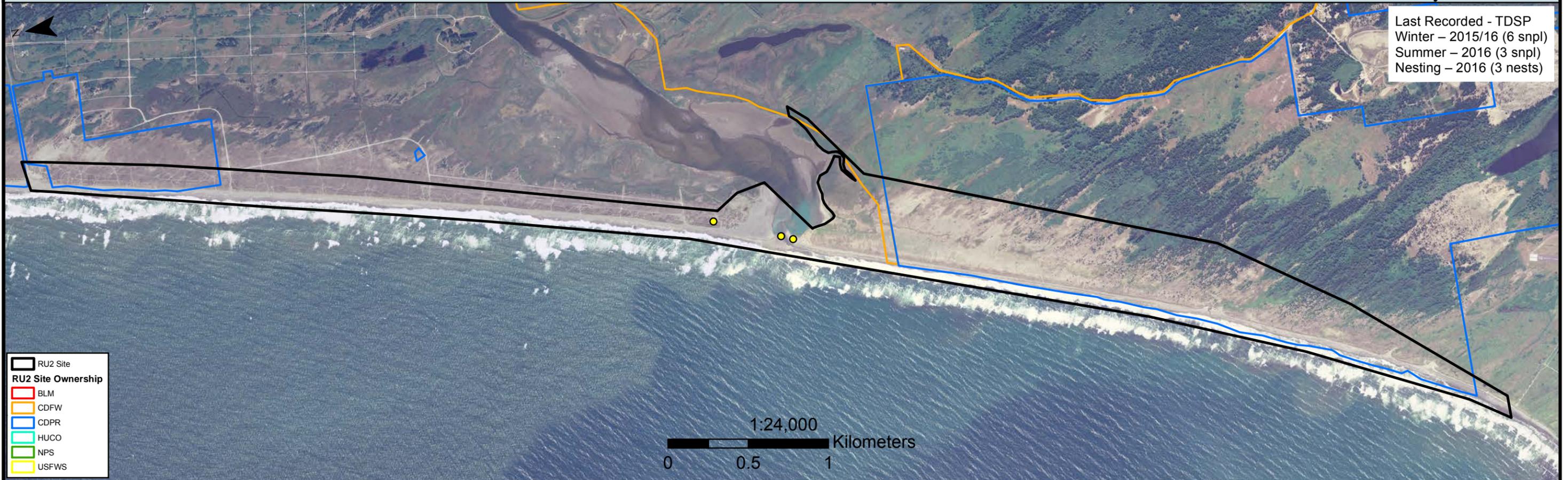


<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>	
<p><i>Existing</i> Population Surveys (1x Month) -ATV survey (70 min.) 10 min. PC -Foot survey (210 min.) 20 min. PC</p> <p>Demographic Survey (1x Week if breeding determined)</p>	<p><i>Existing</i> *Symbolic Fencing (if breeding determined)</p>	<p><i>Existing</i></p>	<p><i>Existing</i> 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</p>	<p><i>Existing</i> North Coast Redwood Interpretive Association and Tolowa Dunes Stewards offer field trips and talks.</p>	
<p><i>Needed</i></p>	<p><i>Needed</i> * E. beachgrass removal, few remaining areas with open sand and or native vegetation.</p>	<p><i>Needed</i> *PP trash receptacles *Address illegal dumping of carcasses and adjacent agricultural land use correlated with high # Corvids</p>	<p><i>Needed</i> *Regulatory signage</p>	<p><i>Needed</i> *Interpretative displays</p>	

TDSP S. (Kellogg Rd. to Pt. St. George)



Last Recorded - TDSP
Winter - 2015/16 (6 snpl)
Summer - 2016 (3 snpl)
Nesting - 2016 (3 nests)



RU2 Site
RU2 Site Ownership
 BLM
 CDFW
 C DPR
 HUCO
 NPS
 USFWS

1:24,000
 0 0.5 1 Kilometers

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)
 *400 acre nearshore dune restoration planned for area just south of the Tolowa breach on CSP lands.

Needed

Predator Management

Existing

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

Law Enforcement

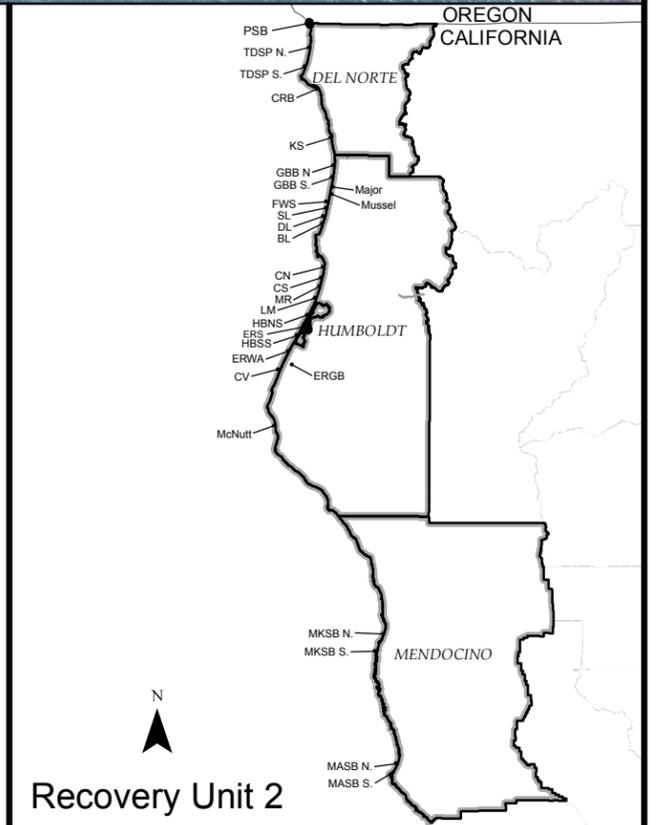
Existing (CSP lands only)
 Beach Patrolled (1x Week)
Vehicle NIC if
 -South of Kellogg without special permit
 -Non-street legal
 -off waveslope
 -speed > 15 mph
 -vehicle play observed
Dog NIC if
 -Beyond 500 meter of Kellogg Rd.
 -Off leash
 -Off waveslope

Needed
 *Regulatory signage

Education & Outreach

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

Needed
 *Interpretative displays

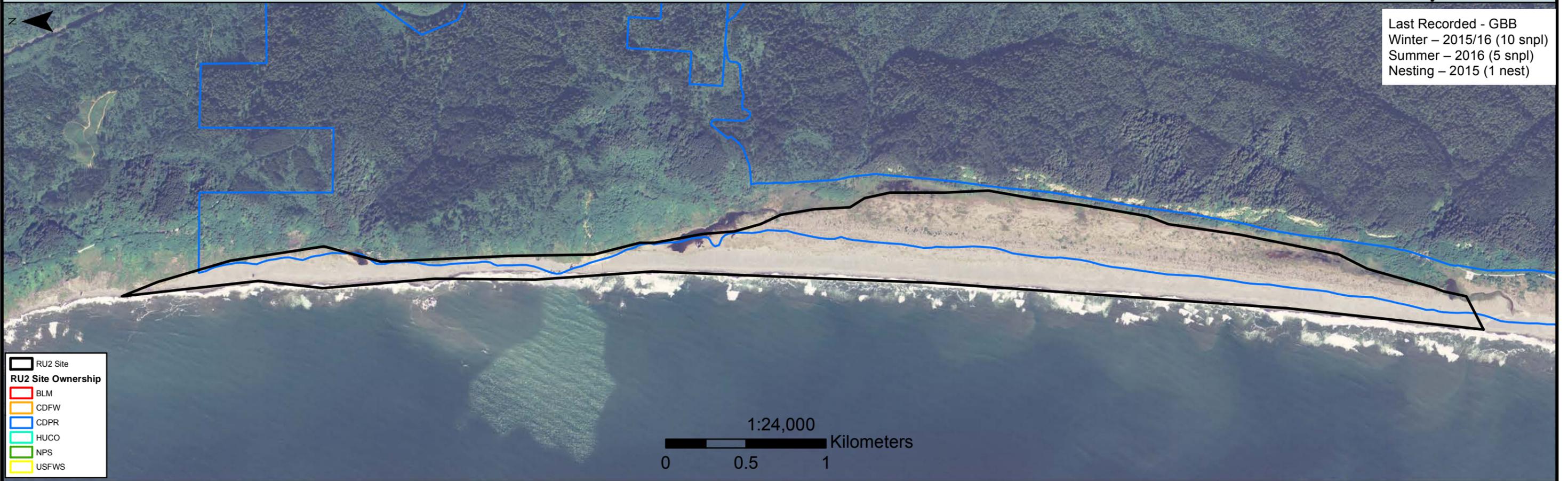


Recovery Unit 2

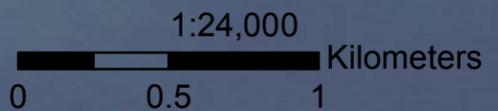
GBB N. (Carruthers Cove to Fern Canyon)



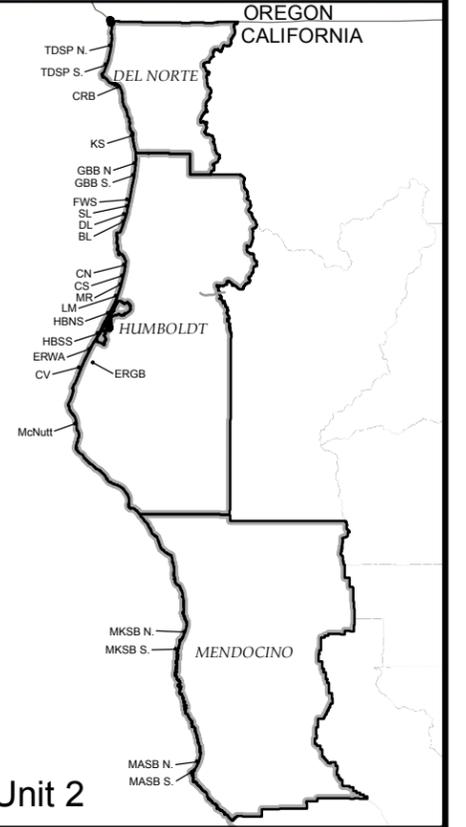
Last Recorded - GBB
Winter – 2015/16 (10 snpl)
Summer – 2016 (5 snpl)
Nesting – 2015 (1 nest)



RU2 Site
RU2 Site Ownership
 BLM
 CDFW
 C DPR
 HUCO
 NPS
 USFWS



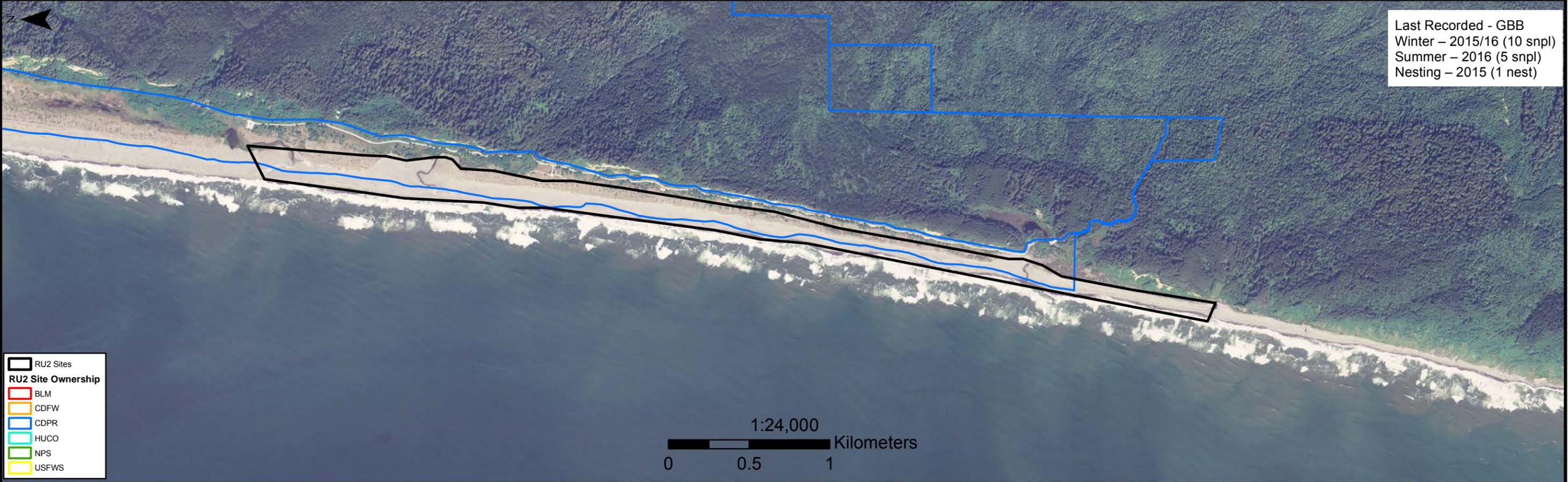
<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>
<p><i>Existing</i> Population Surveys-min. 2 surveyors Breeding (2x Month) Winter (1x Month) Breeding survey - by foot only -ATV (40 min.) 10 min. PC -Foot (230 min.) 20 min. PC</p> <p>Demographic Survey (1x Week if breeding determined)</p> <p><i>Needed</i></p>	<p><i>Existing</i> *Symbolic Fencing (if breeding determined) *E. beachgrass removal and maintenance (approximately 20 acres) ongoing from Carruthers's Cove to Ossagon. *E. beachgrass removal and maintenance (approximately 200 acres) starting in 2013 and currently ongoing from Ossagon to Fern Canyon.</p> <p><i>Needed</i></p>	<p><i>Existing</i> *Corvid Management Plan</p> <p><i>Needed</i></p>	<p><i>Existing</i> Beach Patrolled (7x 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</p> <p><i>Needed</i></p>	<p><i>Existing</i> North Coast Redwood Interpretive Association</p> <p><i>Needed</i> *Interpretative displays</p>



Recovery Unit 2

GBB S. (Fern Canyon to Major Creek)

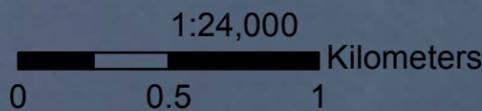
Last Recorded - GBB
Winter - 2015/16 (10 snpl)
Summer - 2016 (5 snpl)
Nesting - 2015 (1 nest)



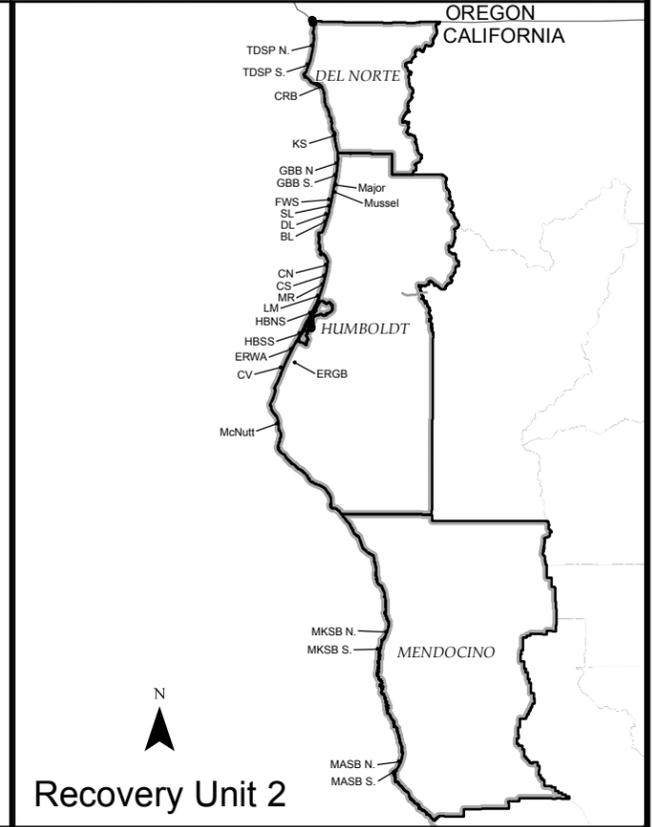
RU2 Sites

RU2 Site Ownership

- BLM
- CDFW
- CDPR
- HUCO
- NPS
- USFWS



<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>
<p><i>Existing</i></p> <p>Population Surveys-min. 2 surveyors Breeding (2x Month) Winter (1x Month) Breeding survey - by foot only -ATV (30 min.) 10 min. PC -Foot (120 min.) 20 min. PC</p> <p>Demographic Survey (1x Week if breeding determined)</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>*Symbolic Fencing (if breeding determined) *E. beachgrass removal by hand near Espa lagoon and GBB Campground.</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>*Corvid Management Plan</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>Beach Patrolled (7x 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 -Off waveslope</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>North Coast Redwood Interpretive Association</p> <p><i>Needed</i></p> <p>*Interpretative displays</p>

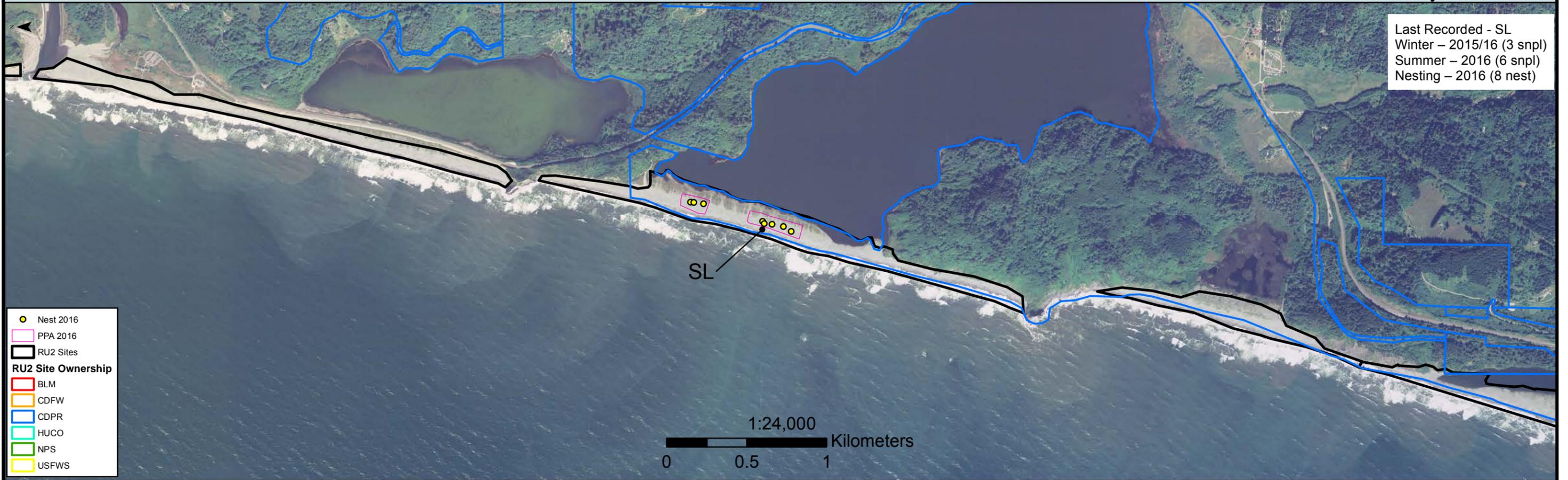


N
Recovery Unit 2

SL (Freshwater Rocks to Sharp Pt.)



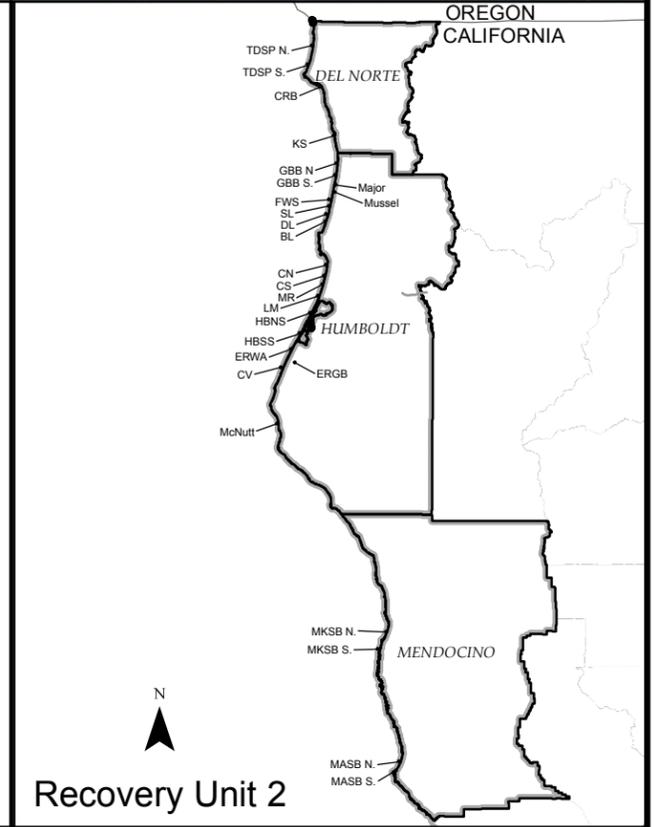
Last Recorded - SL
Winter – 2015/16 (3 snpl)
Summer – 2016 (6 snpl)
Nesting – 2016 (8 nest)



- Nest 2016
- PPA 2016
- RU2 Sites
- RU2 Site Ownership**
- BLM
- CDFW
- CDPR
- HUCO
- NPS
- USFWS

1:24,000
0 0.5 1 Kilometers

<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>
<p><i>Existing</i></p> <p>Population Surveys Breeding (2x Month) Winter (1x Month) Survey - by foot only -Foot (55 min.) 20 min. PC</p> <p>Demographic Survey (1x Week if breeding determined)</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>*Symbolic Fencing (if breeding determined) *nearshore dune exotics at maintenance level.</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>*Predator proof receptacles</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p>Beach Patrolled (1x/Week) Vehicle use limited to permit Vehicle NIC if -Non-street legal -off waveslope -speed > 15 mph -vehicle play observed Dog NIC if - Present outside of parking area or off leash anywhere</p> <p><i>Needed</i></p>	<p><i>Existing</i></p> <p><i>Needed</i> *Interpretative displays</p>

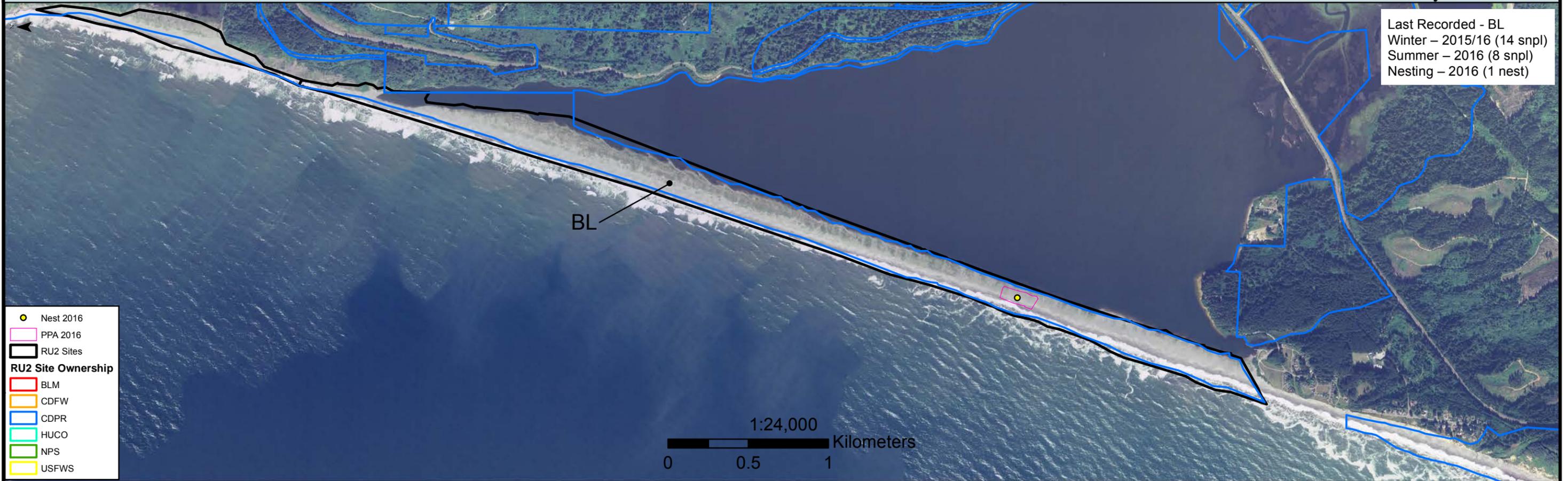


N
Recovery Unit 2

BL (Big Lagoon Spit)



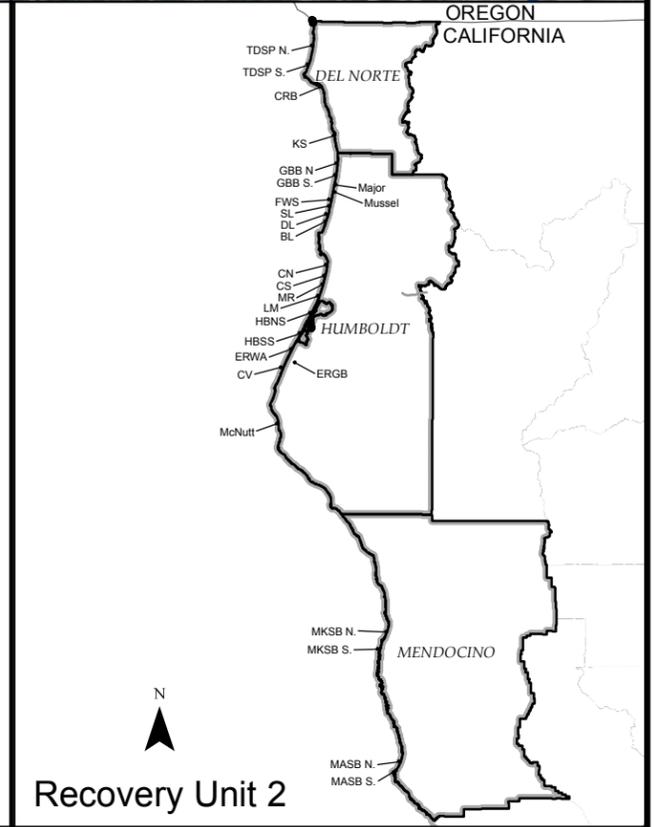
Last Recorded - BL
Winter – 2015/16 (14 snpl)
Summer – 2016 (8 snpl)
Nesting – 2016 (1 nest)



● Nest 2016
 PPA 2016
 RU2 Sites
RU2 Site Ownership
 BLM
 CDFW
 CDPR
 HUCO
 NPS
 USFWS

1:24,000
0 0.5 1 Kilometers

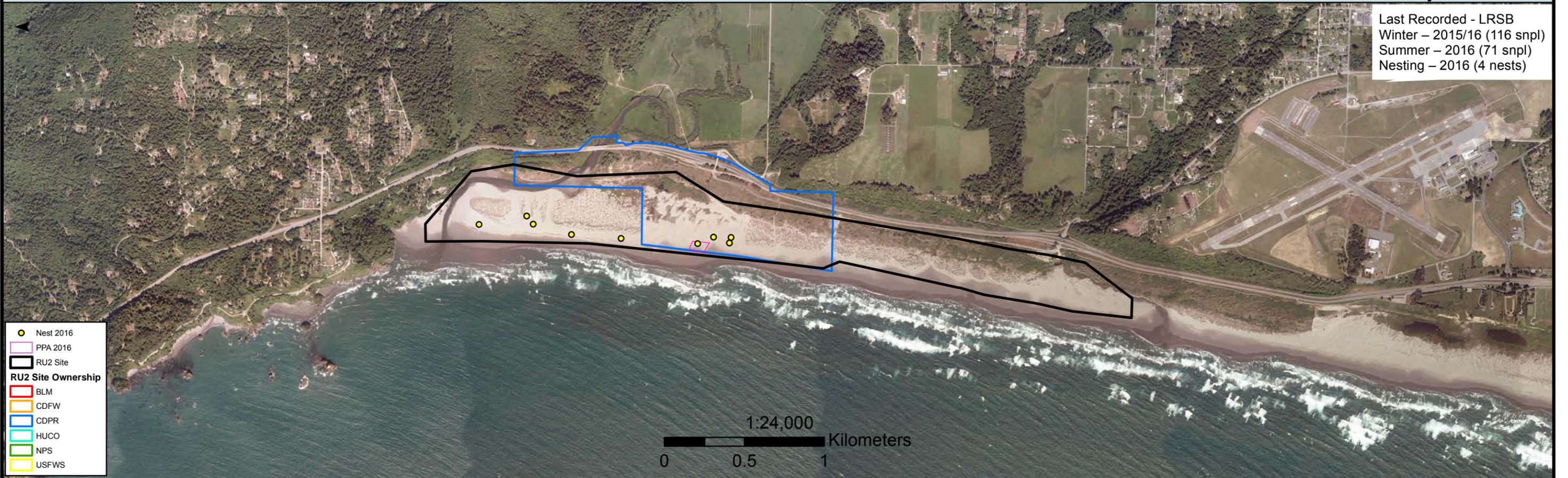
<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>
<p><i>Existing</i></p> <p>Population Survey min. 2 surveyors Breeding (2x Month) Winter (1x Month) Breeding survey - by foot only -ATV (60 min.) 10 min PC -Foot (120 min.) 20 min. PC</p> <p>Demographic Survey (1x Week if breeding determined)</p>	<p><i>Existing</i></p> <p>*Symbolic Fencing (if breeding determined) *Nearshore dune exotics at maintenance level.</p>	<p><i>Existing</i></p> <p>*Predator proof receptacles</p>	<p><i>Existing</i></p> <p>Beach Patrolled (1x Week) No vehicle use No dogs permitted on BLSP. Dogs are permitted on a leash at BLCP, within approximately 100 meters of BLCP parking area</p>	<p><i>Existing</i></p>
<p><i>Needed</i></p>	<p><i>Needed</i></p>	<p><i>Needed</i></p>	<p><i>Needed</i></p>	<p><i>Needed</i></p> <p>*Interpretative displays</p>



CN (Little River to Strawberry Creek)



Last Recorded - LRSB
Winter – 2015/16 (116 snpl)
Summer – 2016 (71 snpl)
Nesting – 2016 (4 nests)



- Nest 2016
- PPA 2016
- RU2 Site
- RU2 Site Ownership**
- BLM
- CDFW
- C DPR
- HUCO
- NPS
- USFWS

1:24,000
0 0.5 1 Kilometers

<u>Research & Monitoring</u>	<u>Habitat Management</u>	<u>Predator Management</u>	<u>Law Enforcement</u>	<u>Education & Outreach</u>
<p><u>LRSB ONLY</u> <u>From N. parking lot to LR</u></p> <p><i>Existing</i> Population Survey Breeding (2x Month) Winter (1x Month) -Foot (60 min.) 20 min. PC</p> <p>Demographic Survey (1x/Week if breeding determined)</p> <p><i>Needed</i></p>	<p><u>LRSB ONLY</u></p> <p><i>Existing</i> *Symbolic Fencing (if breeding determined) *Nearshore dune restoration completed (44 ac.) with ongoing yearly maintenance.</p> <p><i>Needed</i></p>	<p><u>LRSB ONLY</u></p> <p><i>Existing</i> *Nixalite on perches</p> <p><i>Needed</i> *Predator proof receptacles</p>	<p><u>LRSB ONLY</u></p> <p><i>Existing</i> 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</p> <p>*Regulatory signage installed</p> <p><i>Needed</i></p>	<p><u>LRSB ONLY</u></p> <p><i>Existing</i> *FOD/Docents * Interpretive signage and materials installed at parking areas and beach accesses.</p> <p><i>Needed</i></p>



N
Recovery Unit 2

Appendix D

Redwood National Park Western Snowy Plover Monitoring and Redwood National and State Parks Vehicle Beach Access Permit System Annual Reports 2015-2016

February, 2017

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 addendum 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 addendum 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. # AFWO-08B0008-15F0029 amendment to 8-14-2001-0953 and 81331-20109-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 addendum.

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 2015 to September 2016 in Redwood National Park. Freshwater Spit was monitored once monthly from October 2015 to February 2016 and twice monthly from March to September 2016. Mussel Beach, the southernmost portion of Gold Bluffs Beach (Major Creek south), and Crescent Beach were monitored once monthly from March to September 2016.

RESULTS

Western Snowy Plover Abundance and Distribution Surveys

No snowy plovers were recorded on any Redwood National Park beaches during the 2015-2016 survey year. Fifty-nine hours (102 person hours) were spent searching for snowy plovers between October 2015 and September 2016 on Redwood National Park beaches.

Predator Activity and Management

Common ravens were most common on Mussel Beach and Major Creek South (part of Gold Bluffs Beach) while American crows were either uncommon or not detected on all four Redwood National Park beaches (Figure 1).

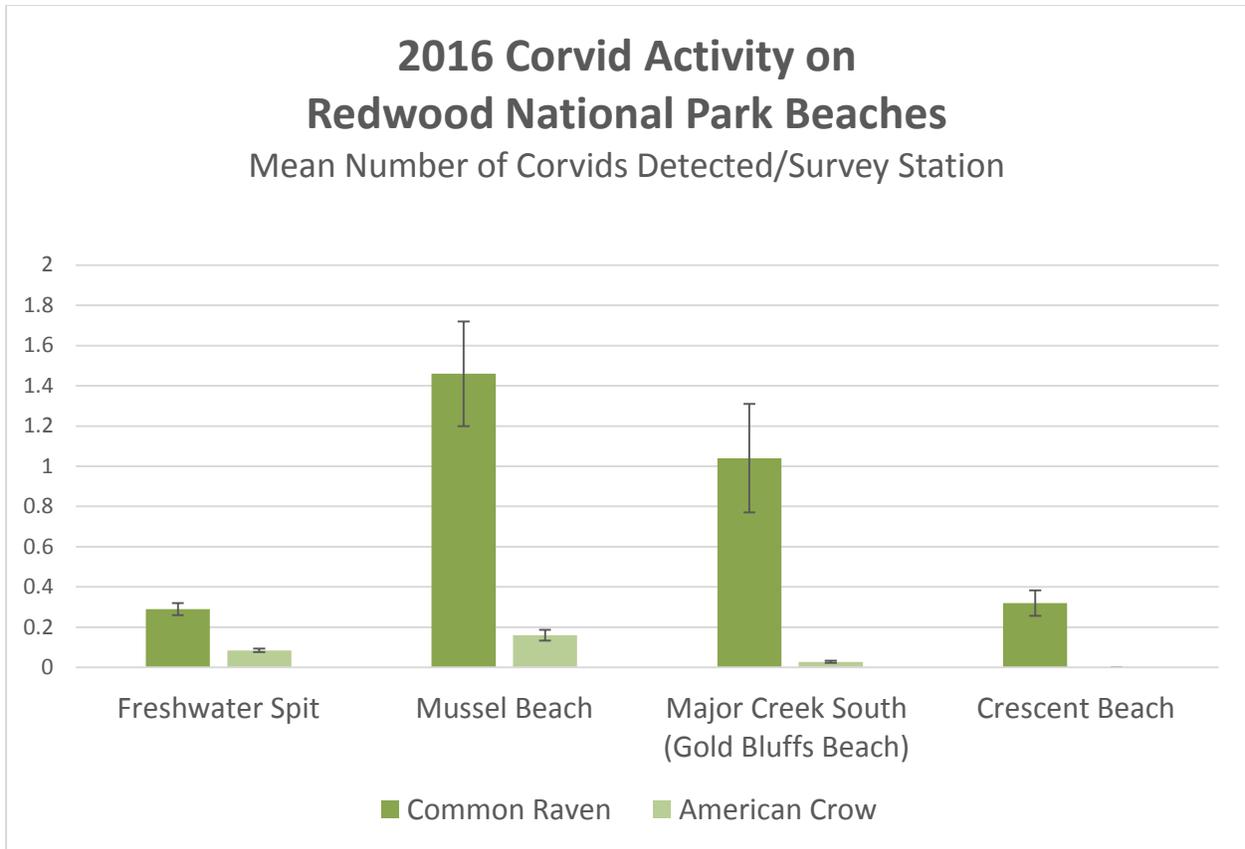


Figure 1. Corvid abundance based on average number of corvids detected during 500-m radius instantaneous point counts. Error bars represent SE. Freshwater Spit: n = 81, Mussel Beach: n = 31, Major Creek South: n = 34, Crescent Beach: n = 24

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 2016 RNSP Corvid Monitoring and Management report (RNSP 2017) for details on corvid management activities.

Human Activity and Management

Freshwater Spit and Crescent Beach received the highest average human use, while few people were recorded on Mussel and Major Creek South Beaches (Figure 2). Almost half of the surveys that recorded dogs on Freshwater Spit and all the survey on Crescent Beach had at least one dog recorded off leash. Dogs were recorded on only one survey on Mussel Beach and none were on Major South (Gold Bluffs Beach).

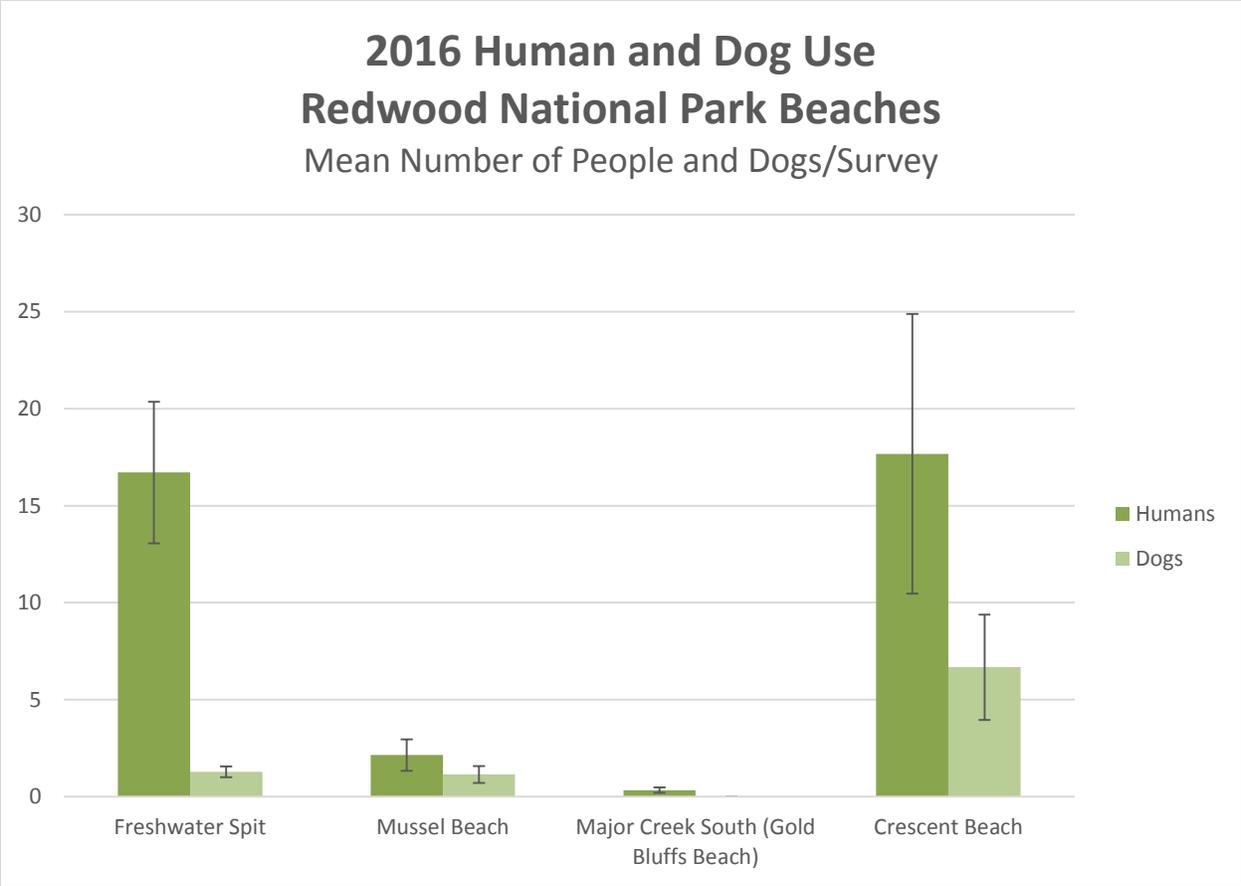


Figure 2. Human and dog use based on total number recorded per survey. Error bars represent SE. Freshwater Spit: n = 21, Mussel Beach: n = 8, Major Creek South: n = 6, Crescent Beach: n = 6.

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, 2014 - 2016.

Beach	No. Surveys			Track Sets* Observed												No. of surveys with tracks above wave slope		
				0			1-2			3-5			>5					
Year 20..	14	15	16	14	15	16	14	15	16	14	15	16	14	15	16	14	15	16
Crescent	7	6	6	2	4	1	4	1	3	1	0	2	0	1	0	0	0	0
Fresh-water	20	20	21	6	6	7	8	7	11	4	2	2	2	4	1	1	3	6
Mussel	7	7	6	3	3	2	2	2	3	1	2	1	0	0	0	0	1	1
Major South	6	6	6	2	2	2	4	3	3	1	1	1	0	0	0	0	1	1

* 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.

No human management actions (i.e. exclusion zones) were used on any Redwood National Park beaches to protect snowy plovers because no plovers were found on any Redwood National Park beach. 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.

Commercial Beach Fishing Access Permit Use Summary

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.

Twelve commercial beach fishing vehicle access permits were issued in 2016 for Redwood National Park, and seven of those permittees also held access permits for Gold Bluffs Beach in Prairie Creek Redwoods State Park. Two permittees only held permits for Gold Bluffs Beach.

According to fishing logs submitted, commercial fishermen averaged 48 fishing days for the year ($n = 15$, range = 0 - 143, SD = 51). Approximately 80% of the days were spent fishing on Gold Bluffs Beach in Prairie Creek Redwoods State Park and 17% and 2% 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, with Gold Bluffs Beach averaging 3.2 hours/day (range = 1 - 13, SD = 1.8), Freshwater Spit/Mussel Beach averaging 1.5 hour/day (range = 0.2 - 7, SD = 1.6) and Crescent Beach averaging 2.5 hours/day (range = 1 - 5, SD = 1.3). Fishing was more common at night with approximately 62% of the trips conducted during night time hours.

In addition to the National Park Service/California Department of Parks and Recreation commercial beach fishing vehicle access permits, two mobility impaired vehicle access permits and no traditional gathering permits were issued in 2016. These latter, non-commercial beach fishing access permits do not require access logs to be submitted.

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 20 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 13 years as well as a few years of nesting or nesting attempts. 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. 2016).

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.

During the last Western Snowy Plover Recovery Unit Two working group meeting held in the fall of 2016, it was discussed whether continuing snowy plover surveys on Crescent Beach, Mussel Beach, and Freshwater Spit were useful given two decades of negative results. The working group recommended that continued surveying was unnecessary for Crescent Beach and Mussel Beach and that surveying frequency on Freshwater Spit should be reduced. An amendment to the Vehicle Beach Access biological opinion is currently being prepared to implement the survey change recommendations. The US Fish and Wildlife has given preliminary concurrence to the recommendations.

LITERATURE CITED

- Colwell, M.A., E.J. Feucht, T.R. King, M.J. Lau, D.J. Orluck, S.E. McAllister. 2015. Final Report: 2015 Snowy Plover Breeding in Coastal Northern California, Recovery Unit 2. Unpub. report to the USFWS. Department of Wildlife, Humboldt State University. 17 pp.
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