Western Snowy Plover Habitat Restoration at Vandenberg Air Force Base, California: Torch Oil Spill Mitigation

Summary Report for Period 14 August 2009 to 31 January 2011

9 March 2011

Prepared for:

30th Space Wing Asset Management Flight
Natural Resources Management
30 CES/CEANC
1028 Iceland Avenue
Vandenberg Air Force Base, CA 93437-6010

Prepared by:

ManTech SRS Technologies, Inc.
Environmental, Range, and Sustainability Services
102 East Ocean Avenue
Lompoc, CA 93436

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1.0 Introduction

On 27 September 1997, a rupture occurred along a pipeline connecting offshore torch/platform Irene to the onshore processing facility. The spill released 163 barrels of crude oil into the ocean, spreading throughout 17 miles of northern Santa Barbara County coastline. The most heavily oiled beach was Surf Beach on Vandenberg Air Force Base (VAFB or Base). In October 2007, a *Torch/Platform Irene Oil Spill Final Restoration Plan/Environmental Assessment* was developed, which calls for mitigation through the restoration of sandy beach and dune habitat on Surf Beach, funded through the Natural Resources Damage Assessment and Restoration Fund. Restoration is to be accomplished through the eradication of invasive plant species and enhancement of coastal strand habitat for the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*), a small shorebird that breeds on the beaches of VAFB.

In September 2007, the 30th Space Wing Asset Management Flight, Natural Resources Management (30 CES/CEANC) at VAFB, tasked ManTech SRS Technologies, Inc. (MSRS) with implementing the *Final Plan for the Removal of Selected Invasive Plants from Western Snowy Plover Habitat at Vandenberg Air Force Base* (SRS Technologies 2005). This plan calls for the eradication of invasive coastal dune vegetation, European beachgrass (*Ammophila arenaria*), iceplant (*Carpobrotus* spp.), and Sydney golden wattle (*Acacia longifolia*) from a 29.8 acre area along a 0.62 mile section of coastline from the Santa Ynez river mouth extending south to the beach access trail at Surf Station, referred to herein as Area D (Figure 1).

In August 2009, VAFB tasked MSRS with conducting the first phase of the restoration plan, which included: herbicide treatment of European beachgrass and iceplant, mechanical mulching of Sydney golden wattle, collection of baseline vegetation data and development of photo monitoring stations within the restoration site known as Area D. Work began in September 2009 with the mechanical mulching of Sydney golden wattle, which created a firebreak perimeter in preparation for a prescribed burn of the restoration site.

On 22 October 2009, VAFB Hot Shots in coordination with 30 CES/CEANC botanist, Ms. Luanne Lum, implemented a prescribed burn within the restoration area. The prescribed burn was the first step in a European beachgrass management schedule developed by Tim Hyland (California Department of Parks and Recreation) and Pete Holloran (Environmental Studies Department, University of California, Santa Cruz) for beaches in Santa Cruz County (T. Hyland, pers. comm.). In their work, fire was used to create optimal conditions for herbicide application by removing thatch, and promoting fresh regrowth of European beachgrass. Reemerging grass shoots were then treated with a 7 percent concentration of the herbicide Roundup® Pro (Monsanto Industrial, Turf and Ornamental Group), a glyphosate based herbicide containing a surfactant that facilitates adhesion of the herbicide to foliage. Though this method is reported to result in a 60-80 percent kill rate, successive retreatment was necessary to achieve target control goals.

This report summarizes western snowy plover habitat restoration activities for Year 1 of this project, from 14 August 2009 to 31 January 2011.

Figure 1. Photo monitoring stations and vegetation transects within the restoration area.

2.0 Vegetation Survey

Prior to the October 2009 prescribed burn, MSRS performed vegetation surveys within the restoration area to record baseline plant diversity, ground cover and dune structure data before the initiation of restoration activities. A series of 100-meter point intercept transects were installed at five randomly selected locations (three transects placed perpendicular to large dune ridges created by growth of European beachgrass, one transect placed randomly within a dense infestation of Sydney golden wattle, and one transect placed randomly within hummocks infested with mixed iceplant and European beachgrass in the northwestern portion of the site). Transect end points were marked by 3-foot tall garden posts to allow for accurate resampling (Figure 1). Plant species, vegetation height, and ground cover were recorded at 1-meter intervals along each of the five transects using the Fire Effects Monitoring and Inventory System (FIREMON) point intercept protocol developed by the U.S. Forest Service, Missoula Fire Sciences Laboratory in cooperation with the U.S. Geological Survey, National Park Service and Systems for environmental management (National Biological Information Infrastructure [NBII] 2009; Figure 2). Resampling of all vegetation transects will be conducted during subsequent restoration efforts in Area D to assess the effectiveness of weed eradication efforts and quantitatively document changes in western snowy plover habitat over time.

Figure 2. MSRS employee measuring the height of vegetation along a point intercept transect.

3.0 Photo Monitoring

To maintain a qualitative record of habitat conditions in Area D throughout the restoration process, MSRS installed a series of 24 photo monitoring stations. Monitoring stations were marked with 3-foot garden posts labeled with numbered metal dog tags (Figure 1). At each station photos were taken at various compass headings. The image identification number and azimuth direction of each photograph was documented, and the geographic coordinate of each station recorded using a Trimble XT global positioning system (GPS) unit. In total, 137 monitoring photographs were taken in the weeks prior to the October 2009 prescribed burn. A second set of images were taken at all monitoring stations immediately following the fire. A third set of photographs were taken in February 2011 during the initial round of beachgrass treatment (Year 2 effort). Figures 4 through 6 provide sample images taken at the photo monitoring stations over the period of this contract. A full set of monitoring images (411 in total) are included on the compact disk that accompanies this report (in Adobe Acrobat file format).

4.0 Sydney Golden Wattle Removal

In September 2009, MSRS subcontracted *Burns Equipment Services, Inc*. to cut down and mulch approximately 6 acres of Sydney golden wattle within Area D (Figure 1) using a rubber tracked brush shredder called a masticator (Figure 3). This work was performed prior to the October 2009 prescribed burn to eradicate Sydney golden wattle from the site. It also served to create a significant break in vegetation where the VAFB property line abuts the Union Pacific Railroad right-of-way to prevent the fire from leaving the extent of the established restoration area. Approximately 95 percent of all Sydney golden wattle was eradicated using the masticator (Figure 4). The remaining trees growing on steep terrain out of reach of the masticator were either consumed by the October 2009 prescribed burn or treated with herbicide. While initial tree removal was achieved using mechanical means, continued monitoring and maintenance is required in this area because Sydney golden wattle and a second weedy tree species, lollypop tree (*Myoporum laetum*), continue to sprout within the site. MSRS performed multiple spot treatments of sapling growth using chemical herbicide between Spring 2010 and Winter 2011 (Table 1). MSRS will continue to monitor the site for evidence of invasive tree regrowth and treat any saplings or root burl growth during future rounds of herbicide application.

Figure 3. Rubber tracked masticator cutting and mulching Sydney golden wattle.

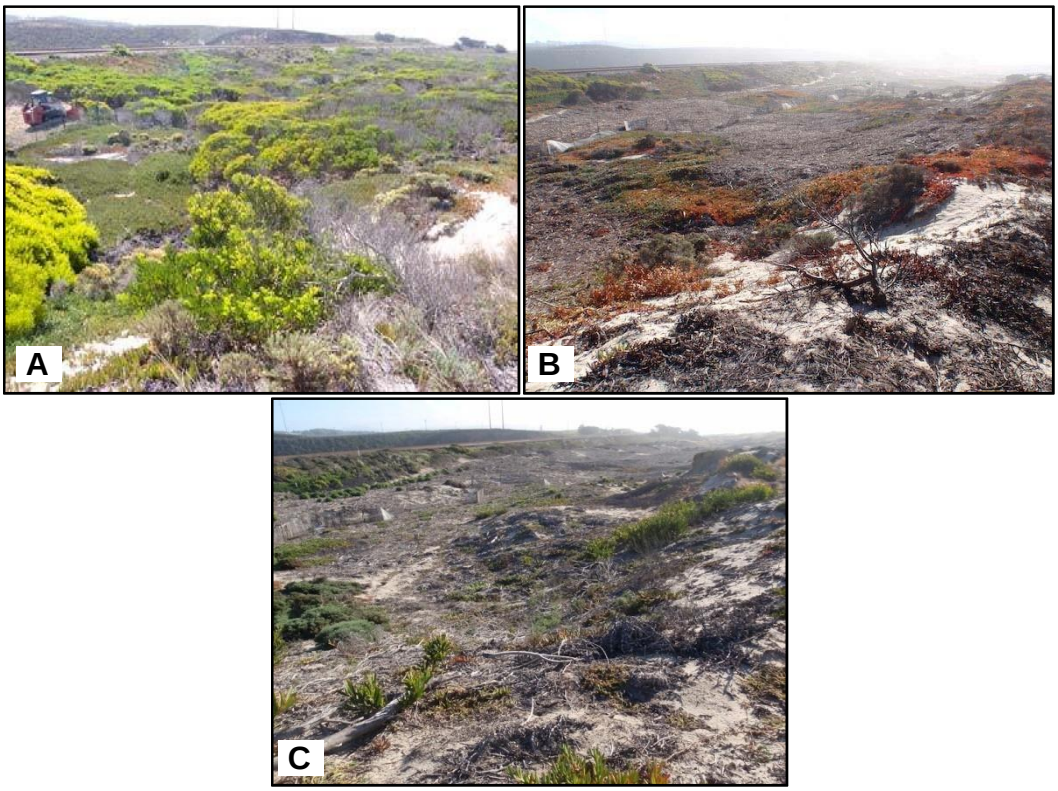

Figure 4. Monitoring photographs taken at station D3 (bearing 75 degrees) showing the condition of Sydney golden wattle prior to restoration efforts (A), following the mechanical mulching and prescribed burn (B), and after two rounds of spot herbicide treatment (C).

5.0 Prescribed Burn and Herbicide Treatment

On 22 October 2009, the VAFB Hot Shots in coordination with 30 CES/CEANC botanist, Ms. Luanne Lum, implemented a prescribed burn in Area D that engulfed approximately 18 acres of habitat infested by coastal dune invasive weeds, mostly European beachgrass. This area accounts for 60 percent of the total restoration area. Those areas that were not burned were either too sparsely vegetated, dominated by iceplant (a plant with a high water content that does not burn readily), or recently mulched Sydney golden wattle that was too wet to burn. As a whole, the prescribed burn was highly effective at removing the extensive accumulation of European beachgrass thatch within the restoration site (see the two cover photos taken before and after the burn).

During Fall Quarter 2009, MSRS focused efforts on the treatment of those weeds that were not impacted by the prescribed burn using an all-terrain-vehicle (ATV) mounted spray rig. In total, MSRS treated 12.3 acres of iceplant and 0.27 acres of unburned European beachgrass (Figure 7) within Area D using the herbicide Rodeo®, containing a non ionic surfactant (AGRI-DEX® [Helena® Development Lab]) that facilitates adhesion of the herbicide to foliage (Table 1).

During Winter Quarter 2010, MSRS did not perform herbicide treatment within the restoration site. Post-fire regrowth of beachgrass did not reach optimum density for herbicide treatment until midsummer 2010. In January 2010, the Santa Ynez River breached to the ocean blocking access to the site from the Wall Beach staging area. The alternate access route through Ocean County Park was also unavailable due to a recent modification to the handrail below the railroad trestle at the Santa Ynez River. The new handrail created a narrower passage that our Polaris Ranger ATV spray rig could not navigate.

Herbicide treatment using ATV equipment did not resume until the close of the western snowy plover breeding season in September 2010. However, a segment of the back dune where the Sydney golden wattle stands were mulched remained accessible by foot during the plover breeding season. MSRS performed limited spot treatments in this area during Spring Quarter 2010 to control for Sydney golden wattle, lollypop tree, iceplant, milk thistle (*Silybum marianum*), black mustard (*Brassica nigra*), poison hemlock (*Conium maculatum*), and prickly sow-thistle (*Sonchus asper*) (Table 1).

During Fall Quarter 2010, MSRS began the first full scale session of herbicide treatment of invasive weeds growing within areas consumed in the October 2010 prescribed burn. In total, MSRS treated 16.26 acres of coastal dune scrub habitat infested with European beachgrass, iceplant, and invasive tree saplings. Tables 1 and 2 provide a tabular summary of invasive weed treatment activities including the pounds of herbicide applied to each species.

Unfortunately, poor weather conditions in October prevented MSRS from treating the entire restoration area until January 2011, when 10 days of herbicide application were implemented in the northwestern portion of the restoration site (Figure 7). Herbicide application resumed after the contract was extended. Between 6 and 25 January 2011 (a time frame accounting for one-third of the Winter Quarter 2011 reporting period), MSRS treated 5.31 acres of invasive species with 170 pounds of concentrated Rodeo herbicide. Tables 1 and 2 provide a tabular summary of invasive weed treatment activities during this portion of Winter Quarter 2011.

Site access issues continued to pose an obstacle for efficient herbicide application in the restoration area during this portion of Winter Quarter 2011. In January, the Santa Ynez River continued to flow to the ocean cutting off access to the site from Wall Beach, and the Ocean Park access point remained impassable for an ATV spray rig. MSRS was left with no option other than backpack spray treatment, a method that is effective at controlling beachgrass but applies only one-tenth the herbicide of an ATV sprig rig in an equivalent timeframe. MSRS employed backpack application for 5 days until Ms. Lum was able to negotiate conditional access across the Union Pacific Railroad track at Surf Station. Though this access arrangement was not as time effective as accessing the site from Wall Beach, the new Surf Station alternative greatly increased productivity during the remaining 5 days of the contract. Given the uncertain and sometimes limited access to this restoration area, maintaining an agreement with the Union Pacific Railroad to allow for continued access across their Surf Station railroad platform is a necessity for the successful implementation of this project.

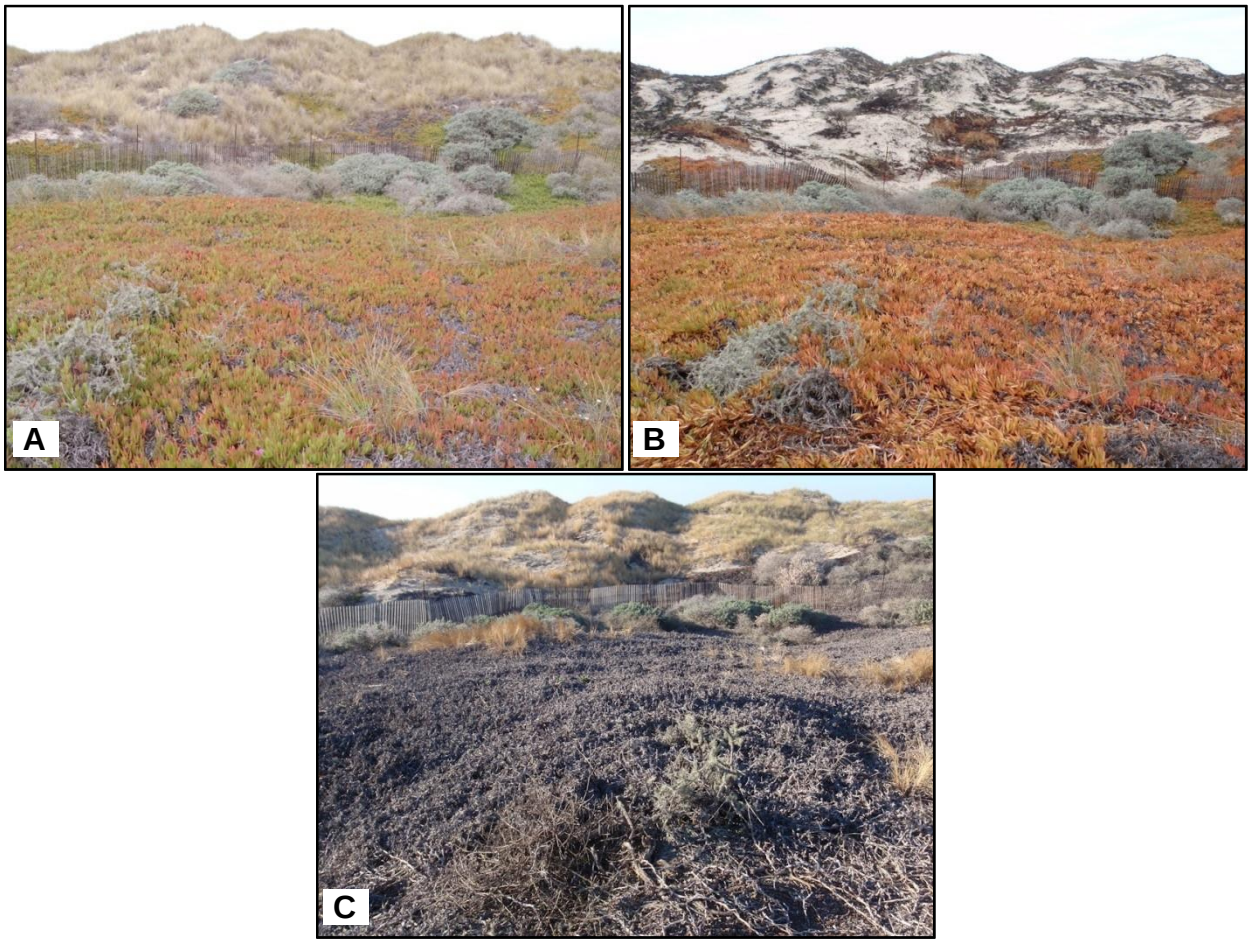

Figure 5. Monitoring photographs taken at station D10 (bearing 302 degrees) showing the condition of European beachgrass and iceplant prior to restoration efforts (A), the condition of European beachgrass following the prescribed burn (B), and after the initial round of herbicide application (C). Note that the iceplant is completely dead and the regrown beachgrass is heavily browned due to recent herbicide application.

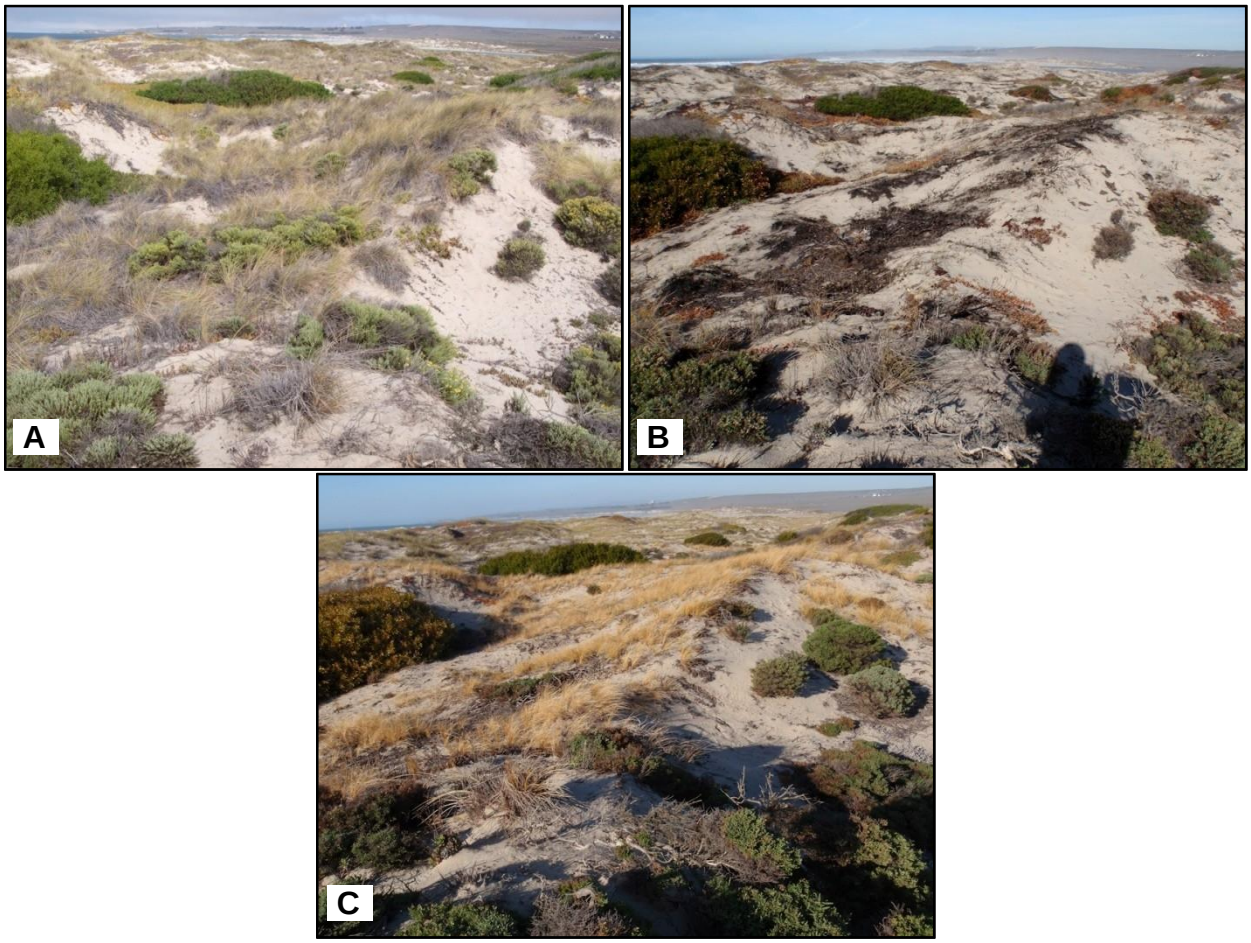

Figure 6. Monitoring photographs taken at station D4 (bearing 350 degrees) showing the condition of European beachgrass prior to restoration efforts (A), following the prescribed burn (B), and after the initial round of herbicide application (C). Note that the regrown beachgrass is heavily browned due to recent herbicide application.

Table 1. Invasive weed treatment summary by quarter and species.

Time Period	Species	Method of Control	Chemical Type	Chemical (lbs)	Invasives Treated (Acres)	Infested Habitat Treated (Acres)	Total Invasives Treated Within T&E Habitat (Acres)	Total Invasives Treated Within Wetland Habitat
2009								
Summer Quarter (14 Aug – 30 Sep)	*No treatment occurred*							
Fall Quarter (1 Oct – 31 Dec)	European beachgrass	Foliar Herbicide	Rodeo	1.25	0.27	0.27	0.27	0
		Prescribed Burn	*none*	n/a	17.7	17.07	17.70	
	Iceplant	Foliar Herbicide	Rodeo	64.62	12.36	12.36	12.36	
	Sydney golden wattle	Mechanical (Masticator)	*none*	n/a	6.00	6.00	6.00	
2010								
Winter Quarter (1 Jan – 31 Mar)	*No treatment occurred*							
Spring Quarter (1 Apr – 30 Jun)	Sydney golden wattle, milk thistle, black mustard, poison hemlock, prickly sow-thistle, and lollypop tree	Foliar Herbicide	Rodeo	3.02	0.20	5.70	0.20	0
		Manual Removal	*none*	n/a	0.10		0.10	
Summer Quarter (1 Jul – 30 Sep)	*No treatment occurred*							
Fall Quarter (1 Oct – 31 Dec)	European beachgrass	Foliar Herbicide	Rodeo	757.83	16.26	16.26	16.26	0
	Iceplant			100.40				
	Sydney golden wattle, lollypop tree			3.65				
2011								
Winter Quarter (1 Jan – 31 Mar) *-Partial Summary-* (1 Jan – 31 Jan)	European beachgrass	Foliar Herbicide	Rodeo	120.49	5.31	5.31	5.31	0
	Iceplant			42.61				
	Sydney golden wattle			6.90				
TOTAL	***Acreages include multiple retreatment of the same areas (**True acreage accounting for overlapping retreatment)**			**1,100.77**	**58.20* (21.71**)**	**63.60* (21.71**)**	**58.20* (21.71**)**	**0**

Table 2. Summary of invasive weed treatment acreages by habitat.

Time Period	NNG/ RUD	CCS	BMC	CDS	EX	RIP	VP	ANTH	Misc Wetland	Other Habitat	Total Invasives Treated
2009											
Summer Quarter (14 Aug – 30 Sept)											
Fall Quarter (1 Oct – 31 Dec)				36.33							**36.33**
2010											
Winter Quarter (1 Jan – 31 Mar)											
Spring Quarter (1 Apr – 30 Jun)				0.30							**0.30**
Summer Quarter (1 Jul – 30 Sept)											
Fall Quarter (1 Oct – 31 Dec)				16.26							**16.26**
2011											
Winter Quarter (1 Jan – 31 Mar) *-Partial Summary-* (1 Jan – 31 Jan)				5.31							**5.31**
Total	**0**	**0**	**0**	**58.20* (21.71**)**	**0**	**0**	**0**	**0**	**0**	**0**	**58.20* (21.71**)**

NOTES:

NNG/RUD – Non-native Grassland/ Ruderal
CCS – Central Coast Scrub
BMC – Burton Mesa Chaparral
CDS – Coastal Dune Scrub
EX – Exotic dominated habitat
RIP – Riparian
VP – Vernal Pool
ANTH – Anthropogenic (bare ground/disturbed habitat)
Misc. Wetland – Swales, Springs, Emergent Wetlands or Dry Drainages
Other Habitat – Oak Woodland, Bishop Pine or other Uncommon Habitats

*Acreages include multiple retreatment of the same areas
**True acreage accounting for overlapping retreatment

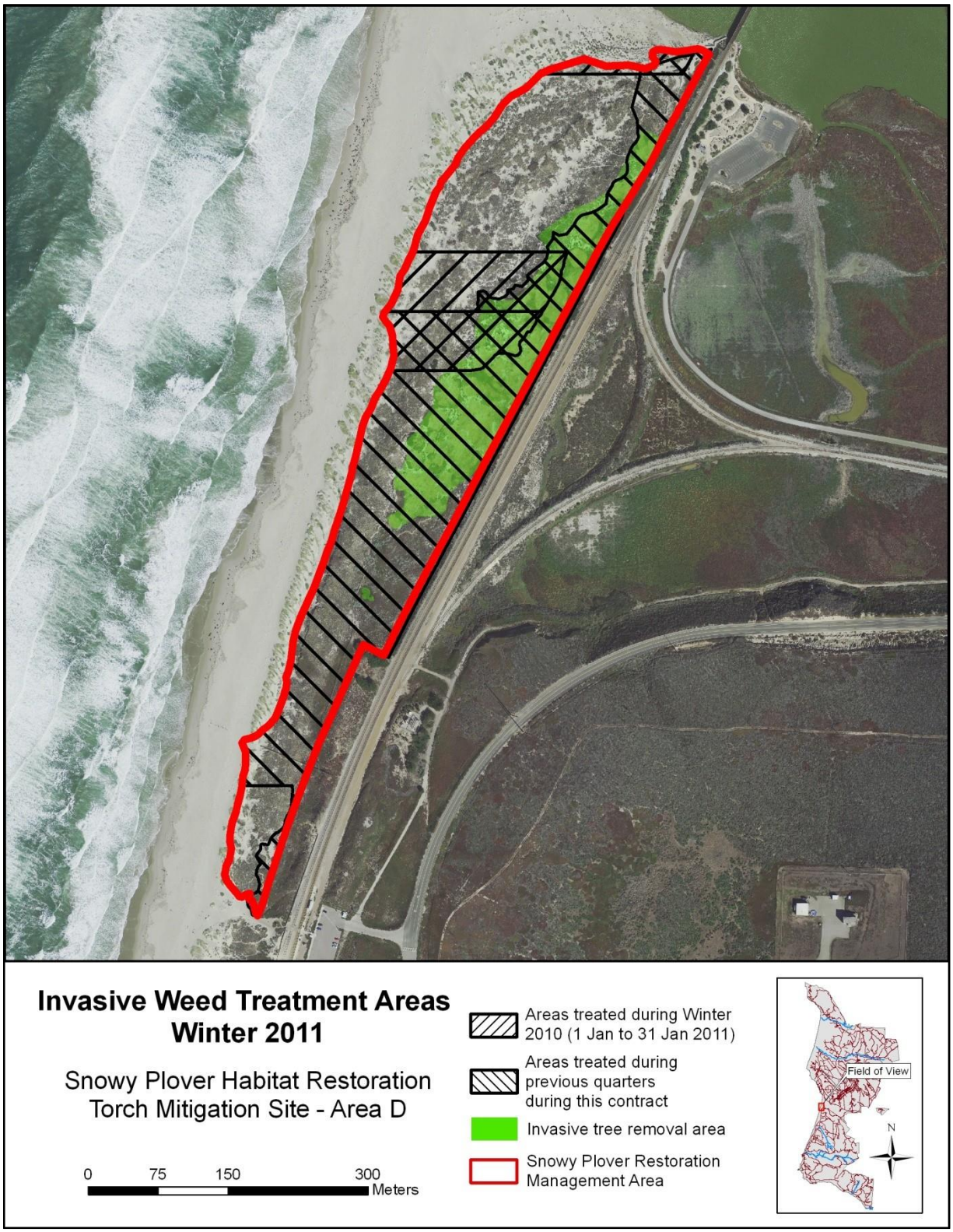

Figure 7. Invasive weed control activities within the western snowy plover restoration area as of Winter Quarter 2011.

6.0 Expense Reporting

Table 3. Expenses incurred during Q1-2011 (February - March 2011).

Period	Labor	ODCs	Grand Total
Through Dec 2009[1,2]	$ 9,841.37	$ 11,040.00	$ 20,881.37
Jan-Mar 2010[2]	$ 4,142.88	$ 2,026.60	$ 6,169.48
Apr-Jun 2010[2]	$ 1,873.59	$ -	$ 1,873.59
Jul-Sep 2010[2]	$ 1,481.39	$ 3,486.09	$ 4,967.47
Oct-Dec 2010[2]	$ 13,841.47	$ 3,733.19	$ 17,574.65
Jan 2011	$ 7,809.05	$ 1,979.43	$ 9,788.48
Total	**$ 38,989.75**	**$ 22,265.30**	**$ 61,255.04**

Notes:

[1] Indirect rates for 2009 were adjusted in July 2010.

[2] Indirect rates for 2010 were adjusted in Jan 2011.

7.0 References

NBII. 2009. Point Intercept (PO) Sampling Method. Information downloaded from the World Wide Web on January 4, 2010, http://frames.nbii.gov/documents/projects/firemon/POv3_Methods.pdf.

SRS Technologies. 2005. Final Plan for the Removal of Selected Invasive Plants from Western Snowy Plover Habitat at Vandenberg Air Force Base. 80pp.