Olympia Conservation Area

Habitat Management and Monitoring Plan

2021 Annual Report

(TE58263C-0)

Prepared by:

Jodi McGraw, Ph.D.
Jodi McGraw Consulting
PO Box 221 • Freedom, CA 95019 • (831) 768-6988
jodi@jodimcgrawconsulting.com
www.jodimcgrawconsulting.com

Prepared for:

San Lorenzo Valley Water District
13060 Highway 9
Boulder Creek, CA 95006

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Executive Summary

This report documents the work that was conducted in 2021 to implement the *Olympia Conservation Area Habitat Management and Monitoring Plan* (HMMP: McGraw 2020). The HMMP identifies the restoration, management and monitoring tasks, as well as adaptive management framework, for management of the Olympia Conservatio Area—a 6.3-acre conservation area located within the San Lorenzo Valley Water District's (District's) 180-acre Olympia Watershed Property. The Olympia Conservation Area (OCA) is a 6.3-acre area that supports endangered species and sensitive habitat found in the Santa Cruz Sandhills—a unique ecosystem found only on outcrops of Zayante soils, which supports unique assemblages of plants and animals that include seven endemic plants and animals found nowhere else in the world (Table 1; McGraw 2004b). The OCA was set aside by the District to mitigate impacts of its capital improvements and operations and maintenance projects on rare species and sensitive habitat in the Sandhills. Work to implement the HMMP is covered under federal incidental take permit TE58263C-0.

2021 Activities

In 2021, Jodi McGraw Consulting (JMc) worked with District staff to implement initial habitat management and monitoring activities in the OCA.

Habitat Management, Restoration, and Enhancement

In the second year of implementing the HMMP, which was approved by the United States Fish and Wildlife Service in summer 2020, JMc implemented the following to manage, restore, and enhance habitat:

1. **Exotic plant management**, to control populations of exotic plant species that outcompete native plants, including the four endemic species, and degrade habitat for native animals, including the endangered insects;
2. **Enhancement of the Ben Lomond wallflower** (*Erysimum teretifolium*) population, by caging flowering individuals to prevent deer herbivory, which greatly reduces seed production and thus population growth;
3. **Access management**, to prevent impacts associated with unauthorized access to the area; and
4. **Restoration** of the 0.17-acre area (Figure 2) degraded by a prior stand of silver wattle (*Acacia dealbata*).

Exotic Plant Management

On Wednesday March 31, 2021, JMc re-treated the following invasive plant species originally treated in 2020 within the OCA (Figure 2; Section 2.1):

1. French broom (*Genista monspessulana*);
2. Portuguese broom (*Cytisus striatus*);
3. Velvet grass (*Holcus lanatus*);

4. Prickly lettuce (*Lactuca serriola*); and
5. Italian thistle (*Carduus pycnocephalus*).

The exotic plant removal efforts required only one person-day, while the 2020 work required four person days. This reflects the effectiveness of annual exotic plant control, which will be conducted again in spring 2022.

Ben Lomond Wallflower Enhancement

To increase the population of Ben Lomond wallflower, JMc caged 143 adult (flowering) plants to prevent herbivory by deer, which greatly reduce wallflower seed production (McGraw 2004b) and could contribute to declines in the already small population that could lead to its extirpation as a result of demographic or environmental stochasticity (McGraw 2020; Section 2.2). The plants were caged using 2" mesh that will avoid inhibiting access by pollinators, in order to promote seed production and increase the population. The cages will be moved in winter and early spring 2022 to cage the new cohort of adults and further promote the population.

Access Management

In February 2021, JMc detected through quarterly monitoring that a motorcycle trespassing within the Olympia Watershed Property drove through the OCA (Section 2.3). The District immediately repaired the fence on the northern border where the ingress to the conservation area occurred. No future trespass was detected in the OCA during subsequent monitoring and management activities at the site in 2021. Ongoing monitoring will be used to prevent unauthorized access that can degrade habitat in the OCA.

Restoration

In fall 2021, JMc initiated work to restore the 0.17-acre silver wattle (*Acacia dealbata*, or 'acacia') area in the OCA (Figure 2; Section 2.4). The area featured acacia stumps, branches, and thick leaf litter (duff) on and in the soil following felling and partial removal of the trees between October 2011 and January 2012. This biomass was degrading habitat for the endangered plants and insects by physically inhibiting their use and promoting dense cover of exotic grasses and forbs.

In 2021, JMc initiated restoration by (Figure 3):

1. Removing the acacia stumps, branches, and surface leaf litter;
2. Removing of the partially decomposed acacia biomass/organic matter within the soil, to prevent ongoing establishment of exotic plants;
3. Seeding the area with a mix of 20 site-collected native herbaceous plants and subshrubs (characteristic of the sand parkland community (Table 2); and,
4. Planting 15 coast live oak (*Quercus agrifolia*) around the perimeter of the restoration area, to restore the structure to the native plant community and provide an additional food source.

The restoration area will be maintained and monitored for four years beginning in 2022 to achieve the goals and objectives.

Monitoring and Adaptive Management

In 2021, JMc conducted Conservation Area Condition Monitoring and photomonitoring to evaluate and document the conditions of the OCA to increase its effectiveness as outlined in Section 5.3 of the HMMP (McGraw 2020). Table 3 identifies the results of the quarterly Conservation Area Condition Monitoring conducted in 2021 to assess the general habitat conditions and determine the need for management to address stressors including exotic plants and issues related to access, as well as other factors such as erosion and disease. Figure 4 illustrates the locations of the 9 permanent photo monitoring stations established in 2021 to document baseline conditions of the OCA and evaluate changes in habitat conditions over time, including progress of the acacia area restoration.

In 2021, the adaptive management process outlined in the HMMP was used to address two changed conditions: 1) the inclusion into the site by a motorcycle, which was addressed through fencing the site: and the observation that the acacia restoration area soil featured thick organic matter, which was removed with heavy equipment to prevent it from promoting dense growth exotic plants that would degrade habitat for the endangered plants and insects.

2022 Activities

In 2022, JMc will conduct habitat restoration, enhancement, management and monitoring to follow up on the work in 2021 and as outlined in the implementation schedule in the HMMP (McGraw 2020).

In 2022, management will include three elements:

1. **Control exotic plants** including ornamental pine and vinca, as well as re-treating the exotic plants managed in 2021 (Section 2.1), to prevent their reoccurrence.
2. **Enhance the Ben Lomond wallflower population**, by caging flowering individuals to prevent deer herbivory, which greatly reduces seed production and thus population growth; and
3. **Maintain the 0.17-acre acacia Restoration Area** through irrigation and related plant maintenance (e.g., spot weeding) and through exotic plant control.

Additional native plant seed collection and seeding will be conducted if native plant establishment in the restoration area is deemed insufficient to re-establish the native sand parkland community over time. Ben Lomond wallflower seed will be collected and dispersed into the restoration area in 2022 provided that a permit can be obtained from the California Department of Fish and Wildlife (Section 4.1.2)

In 2022, monitoring will consist of the following two elements:

1. **Conservation Area Condition Monitoring**, to examine conditions of the site on a quarterly basis to identify issues and determine the need for remedial actions (Section 4.2.1); and
2. **Restoration Area Monitoring**, to assess the need for remedial actions (i.e., follow-up treatments) and to begin to evaluate the effectiveness of the restoration project at achieving the quantitative objectives (Section 4.2.2).

1 Introduction

This report documents the work that was conducted in 2021 to implement the *Olympia Conservation Area Habitat Management and Monitoring Plan* (HMMP: McGraw 2020). The HMMP identifies the restoration, management, and monitoring tasks, as well as adaptive management framework, for management of the Olympia Conservatio Area—a 6.3-acre conservation area located within the San Lorenzo Valley Water District's (District's) 180-acre Olympia Watershed Property. The conservation area was set aside by the District to mitigate impacts of its capital improvements and operations and maintenance projects on rare species and sensitive habitat in the Sandhills. The HMMP was approved by the United States Fish and Wildlife Service in summer 2020, when the District initiated work to implement the plan.

This document provides brief background information about the OCA, and then describes the work conducted by the District to implement the plan in 2021 and the plan for implementation in 2022. Additional information about the OCA and its management is provided in the HMMP (Section 1.2; McGraw 2020).

1.1 Conservation Area Overview

The Olympia Conservation Area is a 6.3-acre area that supports endangered species and sensitive habitat found in the Santa Cruz Sandhills—a unique ecosystem found only on outcrops of Zayante soils, which supports unique assemblages of plants and animals that include seven endemic plants and animals found nowhere else in the world (Table 1; McGraw 2004b). The District) established the Olympia Conservation Area in 2017 by granting to the Land Trust of Santa Cruz County (Land Trust) a conservation easement. The OCA was protected to compensate for impacts to sandhills species and habitat as part of the District's Probation Tank Replacement Project, which was permitted under federal incidental take permit TE58263C-0.

Table 1: Olympia Conservation Area Summary

Species and Communities	Status in Olympia Conservation Area
Species	
Santa Cruz kangaroo rat	Suitable Habitat
Zayante band-winged grasshopper	Species Present
Mount Hermon June beetle	Species Present
Ben Lomond spineflower	Species Present
Ben Lomond wallflower	Species Present
Ben Lomond buckwheat	Species Present
Silverleaf Manzanita	Species Present
Communities	
Sand Parkland	3.3 acres
Sand Chaparral	0.94 acres
Sandhills Woodlands and Forests	2.8 acres
Riparian	0.2 acres
Ornamental	0.01 acres
Total Area	**7.3 acres**

[1] The Olympia Conservation Area is a 6.3-acre area that is part of the SLVWD's 180-acre Olympia Wellfield. This plan assessed the contiguous 1.0-acre Mayer Conservation Easement area, which was previously protected but is not actively managed.

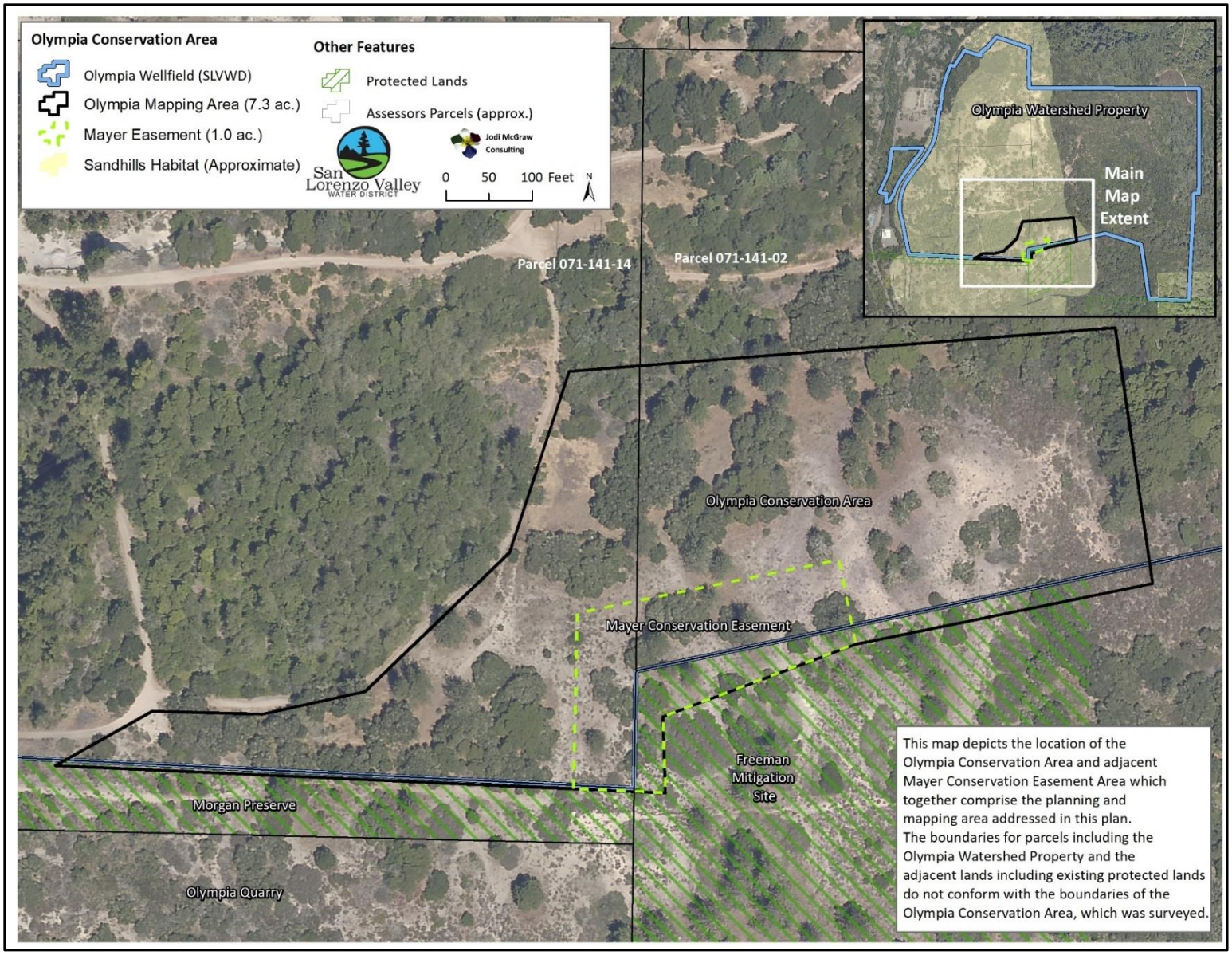

Figure 1: Olympia Conservation Area showing Mayer Conservation Easement Area and Olympia Mapping Area

Rather than setting aside just the habitat required to mitigate that project (0.995 acres; McGraw 2017), the District protected and committed to managing a larger area of Sandhills habitat to both provide for more meaningful conservation and provide a mechanism to mitigate its future capital improvement projects and operations and maintenances activities in the sandhills (McGraw 2017). With each project for which the District uses the OCA as compensatory mitigation, the District contributes funds to a non-wasting endowment used to fund implementation of the HMMP, as describe in Section 6 therein (McGraw 2020). Since its establishment, the OCA has been used to mitigate the impacts of three projects that have collectively used 2.082 acres of the habitat set aside. The remaining area is anticipated to be utilized to mitigate the impacts of future District infrastructure projects as well as operations and maintenance activities on the sandhills species, including those projects covered in a habitat conservation plan (HCP) that the District is preparing to cover activities in the sandhills over a 25-year period. The HCP is anticipated to identify additional conservation areas, as well as expand habitat restoration, management, and monitoring, as part of an update to the HMMP developed as part of the HCP planning process.

1.2 The HMMP

The HMMP describes the process by which it will be updated as part of the HCP planning process, including to fold in additional lands. In the meanwhile, it describes how the existing OCA will be restored, managed, and monitored, with greater detail provided for the initial 5-year phase of management. Specifically, the HMMP describes: the sandhills communities and species; the goals and objectives for management; the habitat management restoration, and enhancement strategies and techniques; the monitoring, reporting and adaptive management elements; a schedule, budget, and responsibilities for the initial phase of management; and guidelines for species protection during implementation of plan activities (McGraw 2020).

The HMMP addresses a 7.3-acre area that includes the OCA as well as the Mayer Conservation Easement Area—a 1.0-acre easement area established when the District granted a conservation easement in 2002 to the Center for Natural Lands Management (Figure 1). The OCA surrounds the Mayer easement on three sides; accordingly, the HMMP addressed the Mayer Conservation Easement area to enable seamless and thus more effective management. Implementation of the HMMP is covered under federal incidental take permit TE58263C-0.

1.3 The Report

This report was prepared to document the HMMP activities during 2021, the second year of implementation. Per the HMMP, the report documents the following:

1. **Section 2-Habitat Management, Restoration, and Enhancement**: The habitat management, restoration, and enhancement activities conducted, and the species protection measures implemented;
2. **Section 3- Monitoring and Adaptive Management**: Results of monitoring conducted, and any new information and changed conditions as well as modifications to management and monitoring approaches identified through the adaptive management framework; and
3. **Section 4-2022 Activities:** The planned management and monitoring for the following year based on the schedule in the HMMP (McGraw 2020).

2 Habitat Management, Restoration, and Enhancement

This section outlines the habitat restoration, enhancement, and management implemented in 2021, which entailed:

1. **Exotic plant management**, to control populations of exotic plant species that outcompete native plants, including the four endemic species, and degrade habitat for native animals, including the endangered insects;
2. **Enhancement of the Ben Lomond wallflower** (*Erysimum teretifolium*) population, by caging flowering individuals to prevent deer herbivory, which greatly reduces seed production and thus population growth;
3. **Access management**, to prevent impacts associated with unauthorized access to the area; and
4. **Restoration** of the 0.17-acre area (Figure 2) degraded by a prior stand of silver wattle (*Acacia dealbata*).

2.1 Exotic Plant Management

In 2021, JMc implemented high-priority invasive plant management in the OCA as outlined in Year 2 of the HMMP (McGraw 2020). Specifically, on Wednesday March 31, 2021, Nicole Chrislock (JMc) treated the following invasive plant species occuring within the OCA:

1. French broom (*Genista monspessulana*);
2. Portuguese broom (*Cytisus striatus*);
3. Velvet grass (*Holcus lanatus*);
4. Prickly lettuce (*Lactuca serriola*); and
5. Italian thistle (*Carduus pycnocephalus*).

On July 29, 2021, JMc removed additional velvet grass while it was in flower; this species was difficult to distinguish from exotic annual grass species during the early spring treatment.

The treatment areas included 40 mapped patches totaling 4,780 square feet (Figures 2 and 3).
Prior to the treatment, JMc examined the site to look for any additional occurrences of the target species. Bull thistle (*Cirsium vulgare*) and spring vetch (*Vicia sativa*), while mapped in 2018, were not observed in 2021 and were not treated.

French broom and Portuguese broom were primarily removed through hand pulling (Figure 3a); a few larger individuals were pulled using weed wrenches. Prickly lettuce, Italian thistle, and velvet grass were grubbed out using a Pulaski. The grass was bagged, as were the flower heads of the thistles. All exotic plant biomass was hauled to the SLVWD yard on site at the Olympia Wellfield (Olympia Watershed Property) and was stacked on pavement.

The exotic plant removal efforts in 2021 required only one person, while the 2020 efforts required a crew of four people to treat all of the mapped occurrences in the course of one day. This reflects the effectiveness of annual control, which will be conducted again in spring 2022.

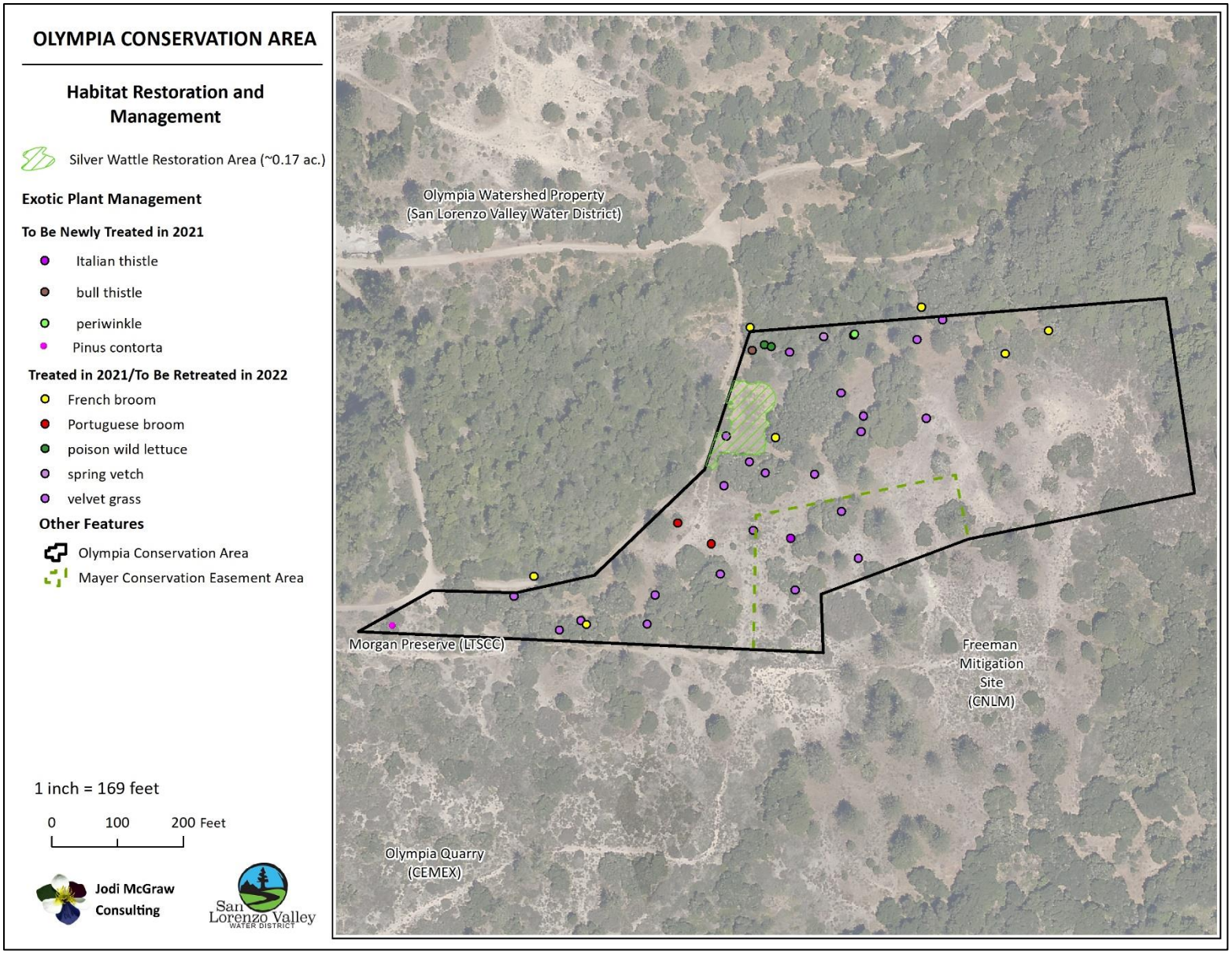

Figure 2: Habitat Management and Restoration Treatment Areas

2.2 Ben Lomond Wallflower Enhancement

On February 25 and April 1, 2021, JMc caged adult Ben Lomond wallflower within the OCA to prevent herbivory by black tailed deer (*Odocoileus hemionus columbianus*). Though deer are native, their populations may be unnaturally large due to reduced predation and/or increased availability of food in landscaped areas in the region. Their herbivory greatly reduces wallflower seed production (McGraw 2004b) and could contribute to declines in the already small population that could lead to its extirpation as a result of demographic or environmental stochasticity (McGraw 2020).

To protect the adult wallflowers from herbivory, JMc searched areas known to be occupied by Ben Lomond wallflower, as well as unoccupied but suitable habitat (McGraw 2020), to identify individuals that were likely to flower in spring based on their size and/or evidence of bolting (i.e., initiation of a flowering stalk). These individuals were caged using four-foot-tall wire cages made within 2" diameter avian wire, in order to avoid limiting access by pollinators such as the chalcedon checkerspot butterfly (*Euphydryas chalcedona*). A total of 143 cages were installed: 78 on February 25 and an additional 65 on April 1. Each cage contains at least one adult, though several cages were erected to protect multiple adults.

2.3 Access Management

In 2021, District staff conducted tasks to manage access at the Olympia Watershed Property, of which the OCA is a part.

1. **Site Patrols:** in 2021, the District worked with the Land Trust of Santa Cruz County to have the entire Olympia Watershed Property patrolled to assess public uses including detect any access into the Olympia Conservation Area.
2. **Fence and Sign Maintenance**: The District maintained the current fences and signs that are designed to promote compliance with the closure of OCA to unsupervised public access.

In February 2021, JMc observed a single set of motorcycle tracks within the Sand Parkland within the OCA. The individual drove in from the District's operational road and across the adjacent tributary to Zayante Creek into the OCA from the northern border, where there was a breech in the fence. The tracks disturbed habitat and trampled native pants.

The District immediately repaired the fence on northern boundary of the OCA. All other fences and signs installed to protect the conservation area have remained intact and there were no subsequent trespassing events detected during monitoring.

2.4 Restoration

2.4.1 Background

In 2021, JMc initiated restoration of the 0.17-acre former acacia (silver wattle; *Acacia dealbata*) area in the northwestern corner of the Olympia Conservation Area (Figure 2). The stand of acacia was removed by the District between October 2011 and January 2012 as part of a larger effort to control the invasive tree throughout the Olympia Watershed Property (SLVWD 2012). However, the acacia biomass was left

to biodegrade in place. Despite the passage of approximately one decade, in fall 2021 the area featured recalcitrant woody debris including cut stumps and branches, and areas of dense litter from the only partially decomposed leaves and fruits on the soil surface. Additionally, the soil featured relatively thick layer of organic matter from the partially decomposed biomass from the acacias.

The remaining woody debris, litter, and organic matter degraded the sand parkland habitat through a variety of mechanisms including (McGraw 2004a,b, 2020):

1. The nitrogen-fixing acacias increased the soil nitrogen, which promoted competitive exotic grasses including rip gut brome (*Bromus diandrus*), rattail fescue (*Festuca myuros*), and smooth cat's ears (*Hypochaeris glabra*), which dominated the plant cover and exserted strong competitive effects of the native herbaceous plants;
2. The branches and leaf litter on the soil surface, as well as the larger pieces of partially decomposed organic matter in the soil, inhibit establishment of smaller-seeded native plants and can promote larger seeded exotic plants, such as ripgut brome; and
3. The dense exotic plants (>50% cover) degraded habitat for the Zayante band-winged grasshopper, which preferentially occurs in areas of sparse (<20%) plant cover, and may have also impacted Mount Hermon June beetle, by reducing cover of native plants that can provide a food source for the fossorial larvae.

Because of this, the acacia removal area was identified as a priority for restoration in the HMMP (McGraw 2020). Restoration of the area to feature open canopy sand parkland habitat suitable for the endangered plants and insects could increase their populations within the OCA. It also has the potential to connect occupied habitat in the OCA to that further north in the Olympia Watershed Property, thus creating an important corridor for dispersal of the endangered species between the habitat areas and promote the populations of Zayante band-winged grasshopper population and other endangered species within the property (McGraw 2020). Section 4.2.2 identifies the specific goals and objectives for the restoration.

2.4.2 Restoration Treatments

In fall 2021, JMc implemented the following initial treatments to restore the 0.17-acre acacia area:

1. Removed the acacia biomass on the soil surface;
2. Removed of the acacia biomass/organic matter within the soil;
3. Seeded the area with a mix of site-collected native plants; and,
4. Planted 15 coast live oak (*Quercus agrifolia*) around the perimeter of the restoration area.

The following sections describe these treatments.

2.4.2.1 Acacia Biomass Removal on the Soil Surface

On November 23, 2021, JMc oversaw a crew from La Selva Tree Care, which removed the acacia stumps and branches from within the 0.17-acre restoration area. The six-person crew manually removed the material (Figure 3a and 3b), chipped it, and hauled the chipped material from the site.

2.4.2.2 Acacia Biomass Removal in the Soil

During the process of raking the soil surface to prepare the site for seeding, JMc observed that the soil featured thick (4-12") partially decomposed biomass/organic matter from the acacias. Because this material was anticipated to inhibit establishment of the native plants from seed and also promote exotic plants, JMc initiated manual efforts to remove the acacia biomass in the soil to expose the mineral soil (sand). After manually removing 11 cubic yards of organic material by loading it into trash bins and hauling it from the site (Figure 3c), JMc determined it was necessary to use heavy equipment to complete the task. On December 20, 2021, JMc oversaw work by MTM Truck and Tractor, who used an excavator to remove an additional 60-72 cubic yards of acacia organic material from the treatment area (Figure 3d). The excavator conducted an initial pass which removed 4-12" of material, then used a second pass to remove remaining biomass and expose mineral soil.

Upon completion of the biomass removal, the excavator was used to recontour and smooth the treatment area, by removing depressions created where the trees (e.g., stumps) were removed to restore the natural topography of the site. This included feathering to eliminate the 'lip' created between the treatment area and the surrounding untreated area using the excavator, after which JMc used rakes and other hand tools to smooth out the area and prepare the restoration area for seeding.

The JMc biologist monitored all work performed by the contractors to minimize impacts to the listed species including by avoiding damage outside of the designated treatment area, and to detect and salvage Mount Hermon June Beetle (*Polyphylla barbata*) larvae. A total of four *Polyphylla* larvae were discovered within the soil during excavation. All larvae were all found alive and uninjured and were relocated to areas adjacent but outside of the treatment area where they were monitored to ensure that they did not remerge, which they did not.

2.4.3 Seeding

On 12/21/21, JMc dispersed a total of 851.2 grams of site-collected seed of native plants (Table 2) within the treatment area (Figure 3e). Prior to seeding, the treatment area was raked to gently scarify the soil surface and create approximately 0.5" furrows designed to promote soil-to-seed contact and enhance seed germination. The seed mix was comprised of 20 herbs and subshrubs characteristic of the sand parkland community, which included two of the endangered species: Ben Lomond buckwheat and Ben Lomond spineflower. [Inclusion of Ben Lomond wallflower requires a permit to handle the seed of the state-listed endangered species.]

JMc harvested from the site between May and September, cleaned to reduce excess chaff, and then weighted and mixed. Prior to seeding by hand, JMc mixed the seed with rice hulls, which acted as a carrier and visual aid to help with even dispersion of the seed. To promote even seeding, JMc seeded the treatment area by hand using two perpendicular passes. Once seeding was complete, the seed was raked into the soil using rock rakes to promote soil to seed contact. Additionally, a 1" layer of rice straw was dispersed onto the soil post-seeding, to prevent wind dispersal of the seed and also reduce the potential for erosion in the treatment area, which featured open sand soil and a moderate (~10%) slope.

Table 2: Seed collected from the OCA and seeded into the Acacia Restoration Area

Species	Common Name	Weight (g)
Achillea millefolium	Yarrow	2.8
Acmispon glaber	Deer weed	194.03
Castilleja exserta	Owl's clover	50.37
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	129.27
Clarkia purpurea ssp. quadrivulnera	Four spot	0.6
Corethrogyne filaginifolia	California aster	139.27
Crocanthemum scoparium	peak rush-rose	1.54
Eriogonum nudum var. decurrens	Ben Lomond buckwheat	78.04
Eriophyllum confertiflorum	Golden yarrow	27.5
Gilia tenuiflora	Slender flowered gilia	1.26
Heterotheca sessiliflora ssp. echiodes	Bristly golden aster	168.22
Koeleria macrantha	June grass	2.56
Lasthenia gracilis	Common goldfields	29.55
Layia platyglossa	Tidy-tips	9.27
Lupinus albifrons var. albifrons	silver bush lupine	1.88
Minuartia californica	California sandwort	1.15
Minuartia douglasii	Douglas's stitchwort	0.66
Monardella sinuata ssp. *nigrescens*	Northern curly leaved monardella	2.39
Pseudognaphalium zayantense	Everlasting (undescribed endemic)	9.08
Silene verecunda ssp. platyota	San Francisco campion	1.74
	Total	**851.2**

2.4.4 Oak Planting

On December 21, 2021, JMc planted 15 coast live oaks (Figure 3f) to provide food for Mount Hermon June beetle. Though the species is a generalist (polyphagous; Hill and O'Malley 2009), *Polyphylla* larvae observed in areas that support Mount Hermon June beetle (and thus thought to be the endangered species) have been found in association with coast live oaks in Zayante soil (e.g., McGraw and Chrislock 2019, McGraw 2020). In order to maintain open canopy habitat required habitat, the trees were planted around the north/northeastern, western, and southwestern perimeter of the 0.17-acre restoration area along the ecotone with the riparian woodland (Figure 3f).

The trees were grown by a local nursery from acorns collected in the sandhills in the San Lorenzo Watershed. The planting holes were hand dug with shovels and the oaks were installed with fertilizer, to increase plant growth, and hydrogels, to aid in soil moisture retention. Basins were erected around the oaks and 2-foot diameter cages were erected to protect the oaks from deer herbivory.

a) b)

c) d)

e) f)

Figure 3: Restoration images, showing: a) and b) contractor removing acacia biomass from the 0.17-acrea Restoration Area, c) JMc manually removing acacia debris from the Restoration Area, (d) contractor mechanically removal of remaining acacia biomass from the Restoration Area, e) JMc seeding of the Restoration Area, and (f) JMc planting of the oak trees on the perimeter of the restoration Area. Photographs by Jodi McGraw Consulting.

2.5 Species Protection Measures

During the course of management in 2021, JMc and District staff implemented the applicable species protection measures identified in Appendix C of the HMMP. These measures are collectively designed to reduce short-term, direct negative impacts to the listed species including the Mount Hermon June beetle, Zayante winged-grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower during the course of management. The following outlines the relevant measures implemented in 2021:

1. **Conduct Pre-Restoration Project Training**: Prior to acacia biomass removal within the OCA, JMc provided an environmental awareness trainings to staff from the two contractors (La Selva Tree Care and MTM Truck and Tractor). The trainings provided workers information about the rare species and the steps to be taken to reduce impacts on them during the course of removing the acacia biomass, including monitoring the soil for Mount Hermon June beetle live stages, and avoiding impacts to native plant species including by hauling biomass via designated access routes and on tarps (as feasible).

2. **Monitor All Restoration Treatments:** A JMc biologist was on site during implementation of all treatments and conducted the following tasks.
    a. Examined habitat within the treatment areas, access routes, and other affected areas, in order to detect and protect the listed species. Specifically, the biologist examined soil disturbed by the restoration treatments, to salvage Mount Hermon June beetle; JMc salvaged and relocated four *Polyphylla* larvae during the acacia biomass removal (Section 2.4.2.2).
    b. Advised restoration personnel on appropriate access routes to and within treatment areas, in order to minimize impacts to listed species and their habitats, including native plants species, wherever feasible.
    c. Facilitated restoration crew implementation of other species protection measures.
3. **Minimize Ground-Disturbing activities**: To limit impacts to the fossorial Mount Hermon June beetle and Zayante band-winged grasshopper, restoration personnel minimized activities that displace or compact soil, such as digging, grading, and removing vegetation. The following are specific measures used to minimize ground disturbance.
    a. Restoration personnel staged project materials, equipment, vehicles, and biomass (e.g. exotic plant piles) on designated staging areas located in degraded habitat.
    b. Restoration personnel confined ground-disturbing activities to the designated restoration areas, and to access routes identified by the JMc biologist.
    c. Restoration personnel carried, rather than dragged, materials between the staging area(s) and the treatment areas.
    d. Restoration personnel removed all plant biomass (e.g. branches and trunks) from the OCA.

3 Monitoring and Adaptive Management

In 2021, JMc conducted Conservation Area Condition Monitoring and photomonitoring to evaluate and document the conditions of the OCA to increase its effectiveness as outlined in Section 5.3 of the HMMP (McGraw 2020).

3.1 Conservation Area Condition Monitoring

In 2021, the Olympia Conservation Area was monitored at quarterly intervals (late February, June, September, and December) by JMc to identify exotic plants as well as evaluate access, erosion, disease, and other issues. The quarterly monitoring was used to assess general habitat conditions and determine the need for management as part of the Conservation Area Condition monitoring outlined in the HMMP and detailed in Table 3, which identifies the results of monitoring in 2021.

Table 3: Results of 2021 Conservation Area Condition Monitoring

Condition	Methods	Observations
Access Management		
Fences	Visually inspect fence and document	The fences inhibiting access to the OCA from the public access trail was intact.
Signs	Visually inspect interpretive and 'sensitive habitat' signs	The interpretive sign and sensitive habitat signs were intact.
Access	Look for signs of access including footprints, dog and horse tracks and feces, debris, play equipment, etc.	In early 2021, a motorcycle trespassed onto the property and caused impacts to habitat within the OCA. The District fenced the OCA boundary and no future signs of trespass were observed.
Exotic Plants		
Early Detection-Rapid Response	Visually inspect conservation area with an emphasis on invasion 'hot spots' (e.g. perimeter, trails, riparian area, etc.) to detect new invasive plant occurrences	No new invasive plant species were detected
Examine Prior Invasive Plant Treatment Areas	Visually inspect prior invasive plant treatment areas to assess the need for follow-up treatments	Monitoring of the 2020 and 2021 treatment areas was conducted spring and summer 2021. In July 20201, follow-up treatment was conducted to remove velvet grass.
Other Factors		
Other Factors	Monitors should examine the site for other conditions that could influence management, including plant die-off or dieback due to disease or drought	There is some limited die back of silverleaf manzanita due to the apparent fungal pathogen; however, it is not a management issue. No other issues were identified.

3.2 Photomonitoring

In 2021, 9 permanent photomonitoring stations were established throughout the OCA to (McGraw 2020):

1. **Document the baseline conditions** of the Olympia Conservation Area; and
2. **Evaluate changes in habitat conditions** including plant community structure and general species composition over time.

The stations (Figure 4) were located to capture important baseline conditions as well as representative habitats and features including:

1. **Plant Associations**: Representative conditions of the 14 plant associations (McGraw 2020);
2. **Endemic Plant Occurrences:** Patches of the four rare plants;
3. **Endemic Insect Habitat**: Suitable habitat for the Zayante band-winged grasshopper and Mount Hermon June beetle; and,
4. **Management Issues**: Invasive plants, dense exotic plants, ingress/egress areas, and erosion features (i.e., trails on steep slopes).

To facilitate relocation, photostation locations were permanently monumented on the ground using a bamboo stake and pin flag and recorded using a resource-grade GPS. At each point, the general subject and view direction (azimuth) were recorded for each photograph. The digital photographs were labeled according to the station, azimuth, and date.

3.3 Adaptive Management

Adaptive management was conducted as part of the restoration work (Section 2.4). Specifically, when JMc determined that there was partially decomposed organic matter within the acacia removal area that would inhibit the successful establishment of native plants, JMc worked with the District to have the material removed.

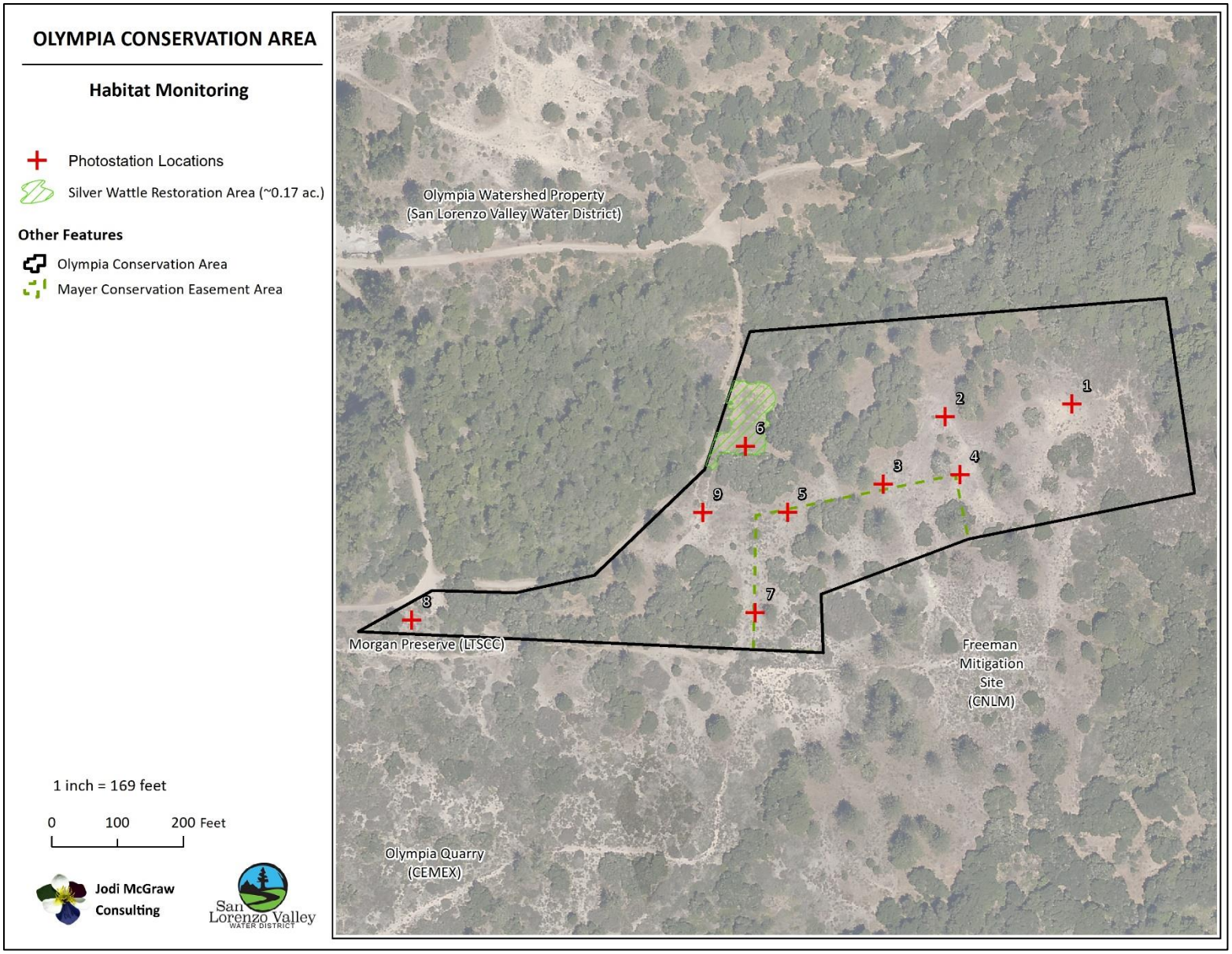

Figure 4: Photomonitoring Stations within the OCA

4 2022 Management and Monitoring

This section outlines the habitat restoration, management, and monitoring planned for 2022. It was developed based on the schedule for the first five years of management as outlined in the HMMP and the results of management and monitoring in 2021.

4.1 Habitat Restoration, Enhancement, and Management

In 2022, the District will implement three habitat restoration, enhancement, and management projects:

4. Control exotic plants including ornamental pine and vinca, as well as re-treating the exotic plants managed in 2021 (Section 2.1), to prevent their reoccurrence.
5. Enhance the Ben Lomond wallflower population, by caging flowering individuals to prevent deer herbivory, which greatly reduces seed production and thus population growth; and
6. Maintain the 0.17-acre acacia Restoration Area.

4.1.1 Exotic Plant Management

In 2022, exotic plant management will be conducted to treat the following exotic plants (Figure 2):

1. Treat the periwinkle and ornamental pine which have not yet been treated; and
2. Conduct follow-up treatments for the invasive brooms, thistles, and velvet grass treated in 2021.

The OCA featured a single pine that is not native to the Sandhills (Pinus cf. contorta) on the western edge of the site. The pine was either planted by the District as part of broader efforts to plant non-native pines in the Olympia Watershed Property in the 1970s and 1980s; alternatively, it may have dispersed from other plantings in the region. This community type might also be occupied by Mount Hermon June beetle but is unlikely to provide habitat for the other endemic sandhills species. The ornamental pine will be cut at the base to prevent further spread.

Periwinkle *(Vinca major)* occurs in limited areas within the norther portion of the OCA, primarily within riparian areas. The periwinkle will be pulled at the roots and bagged to prevent resprouting.

All exotic plants will be managed through manual or mechanical means; no herbicides will be used. The treatments will be conducted in a manner to minimize negative impacts on the endangered species and sensitive habitat, as Section 4.1.2 of the HMMP (McGraw 2020).

4.1.1 Ben Lomond Wallflower Enhancement

In 2022, the District will conduct the second year of caging for adult Ben Lomond wallflower to prevent herbivory by deer, which greatly reduces seed production and could contribute to declines in the already small population that could lead to its extirpation as a result of demographic or environmental stochasticity (McGraw 2020).

During February of 2022, a biologist will revisit known areas occupied by Ben Lomond wallflower to identify individuals that are likely to flower that spring based on their size and/or evidence of bolting

(i.e., initiation of a flowering stalk). These individuals will then be caged using 4' tall wire cages made of 2" avian wire or 2" x 4" welded wire, which is necessary to avoid limiting access by pollinators such as the chalcedon checkerspot butterfly (*Euphydryas chalcedona*). Cages installed in 2021 will be repurposed and new cages will be created, as needed, to protect all adult plants.

4.1.2 Restoration

In 2022, the restoration area will be maintained through the following:

1. Irrigation to maintain the coast live oaks; and

2. Exotic plant control to prevent establishment of invasive plants and dense occurrences of exotic plants.

Exotic plant control will be determined based on the results of monitoring (Section 4.2) and will include manual and mechanical treatments. For example, weed whacking will be used to control any dense occurrences of exotic grasses and forbs, where doing so will not significantly impact the native plants; hand pulling and hoeing will be used to remove isolated plants (e.g., brooms, thistles, invasive vines).

As needed, restoration in 2021 will also include re-seeding the restoration area with a mix of site-collected native plant seeds. Though the original restoration plan envisioned a single year of seeding, establishment of native plants from seed may be lower than needed to restore the site due to two factors: 1) the relatively late seeding, which occurred after completion of the acacia biomass removal in December two months after the germinating rains, and 2) low rainfall, as 2021-2022 is forecasted to be a "La Nina Year" which can mean low rainfall.

The cover of native plants will be assessed in May 2022 and used to evaluate whether establishment is sufficient or whether additional seeding will be needed to promote cover of native plants and if so, which species or life forms (e.g., native subshrubs).

Ben Lomond wallflower will also be seeded into the treatment area in 2022 by: 1) collecting seed from the population in the OCA, and 2) cleaning and dispersing the seed in the fall. This treatment will require JMc or the District to obtain a 2081a permit for the state-listed plant from CDFW (McGraw 2020).

4.2 Monitoring

In 2022, monitoring will consist of the following elements:

1. **Conservation Area Condition Monitoring**, to examine conditions of the site on a quarterly basis to identify issues and determine the need for remedial actions; and,
2. **Restoration Area Monitoring**, to evaluate the effectiveness of the restoration project within the 0.17-acre silver wattle acacia area (Section 4.1.1).

4.2.1 Conservation Area Condition Monitoring

In 2022, JMc will continue to conduct Conservation Area Condition Monitoring at quarterly intervals in order to identify exotic plants as well as evaluate access, erosion, disease, and other issues. The

quarterly monitoring was used to assess general habitat conditions and determine the need for management as part of the Conservation Area Condition monitoring outlined in the HMMP and Table 3.

4.2.2 Restoration Area Monitoring

The acacia Restoration area will be monitored to ensure that is achieving the goals and objectives and to identify the need for any follow-up treatments or other remedial actions as outlined in the HMMP (McGraw 2020). Monitoring in 2022 will include both qualitative assessments of conditions of the site, and collection of quantitative data to evaluate specific metrics that reflect the desired conditions (i.e., success criteria) and track changes over time and/or compare conditions to reference sites. Qualitative monitoring will be conducted quarterly in conjunction within the Conservation Area Condition monitoring, to visually assess site conditions and evaluate plant establishment including invasive plant species, to determine the need for follow-up treatments.

Quantitative monitoring will be conducted in spring to assess the status toward achieving the restoration goal and the quantitative objectives (inset box). A total of 10 plots (2m x 2m) will be randomly located and monumented throughout the treatment area. To compare habitat within the treatment area to intact habitat, an additional 10 reference plots (2m x 2m) will be randomly located and monumented in intact sand parkland habitat near the treatment area. The plots will be visually assessed to estimate plant cover.

Silver Wattle (Acacia) Restoration Area Goals and Objectives (McGraw 2020)

Goal: Restore habitat for the native herbaceous plants and Zayante band-winged grasshopper, and enhance habitat for the Mount Hermon June beetle in the 0.17-acre area where silver wattle was removed.

Objectives:

O1: Establish an assemblage of native plant species similar in structure and species composition to the adjacent sand parkland habitat surrounding the treatment area; specifically, the restoration areas will have native plant richness and native plant cover that is at least 90% of that found in the adjacent sand parkland habitat surrounding the Project site after five years.

O2: Establish Ben Lomond spineflower in the restoration area, with average absolute cover of at least 5% after five years.

O3: Establish Ben Lomond wallflower in the restoration area, with average absolute cover of at least 1% after five years.

O4: Establish Ben Lomond buckwheat in the restoration area, with average absolute cover of at least 3% after five years.

O5: Provide food for the Mount Hermon June beetle by establishing a diverse assemblage of native plants, including native plant cover and richness that is at least 90% of that in adjacent sand parkland habitat surrounding the Project site after five years.

O6: Provide suitable habitat for the Zayante band-winged grasshopper, by establishing native plant species that are either host plants for the Zayante band-winged grasshopper (ZBWG) or that provide important habitat for ZBWG, such as silver bush lupine (*Lupinus albifrons* var. *albifrons*) and bristly golden aster (*Heterotheca sessiliflora* ssp. *echioides*), which should achieve at least 3% cover in the restoration areas, while average absolute exotic plant cover will be less than 20% after five years.

O7: Prevent widespread establishment of any invasive plants, including brooms, thistles, velvet grass, which will collectively average no more than 5% absolute cover after 5 years.

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