Arana Gulch
Coastal Prairie Management Area
City of Santa Cruz

INVASIVE WEED WORK PLAN

July 20, 2015

Biotic Resources Group

Biotic Assessments • Resource Management • Permitting

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

CHAPTER 1.0

INTRODUCTION

This Invasive Weed Work Plan (IWWP) identifies methods for the removal and control of invasive weeds from the Coastal Prairie Management Area within the Arana Gulch greenbelt. The City of Santa Cruz will implement this program pursuant to the Arana Gulch Habitat Management Plan (HMP). Objective 3B of the HMP requires the reduction in the cover of non-native species in the coastal prairie from the baseline level to one more representative of a reference functioning coastal prairie by 2020 (please see the HMP, page 73) (Stanton, 2013). In 2015 the Arana Gulch Adaptive Management Working Group (AMWG) delineated the grassland areas that would be subject to prairie/grassland management activities.

The IWWP identifies the location and treatment methods to be used by the City's maintenance personnel, contractors, and/or volunteers to remove and/or control the growth of invasive, non-native plant species (invasive weeds) with the delineated grassland management area. The IWWP identifies weed control strategies for areas within designated cattle grazing fields in addition to areas where grazing does not occur. The City will implement the IWWP over several years; each year's tasks and results will be reported upon in the City's annual HMP report.

1.1 STUDY METHODOLOGY

1.1.1 Existing Vegetation Types and Delineated Grassland Area

The existing vegetation types with Arana Gulch were mapped during the preparation of HMP (Alison Stanton, 2013). Additional field surveys were conducted by the AMWG in April 2015 wherein the grasslands subject to management were determined. Two plant community types occur within the IWWP project area: annual, non-native grassland and coastal prairie. The IWWP area also supports isolated oak trees/tree groves. Figure 1 shows the delineated grassland, as per direction from the AMWG; this delineated area is subject to this work program.

1.1.2 Existing Invasive Weeds, Infestation Areas, and Threat Rankings

The occurrence of invasive weeds within the central grassland of Arana Gulch was identified and mapped during field surveys conducted in April and October 2014. The infestations were identified by GPS and mapped as polygons or spot locations onto aerial photos. The 2014 survey documented 12 significant invasive weed species from the central grassland (Arana Gulch HMP, Year 1 Annual Report, City of Santa Cruz, 2015). Using the grassland delineation approved in April 2015 by the AMWG, a field survey was conducted in May 2015 to re-check the invasive weed species located within the IWWP area. As a result, one weed species was deleted (maidenhair vine). Maidenhair vine is located outside the delineated grassland. Three species were added: wild radish, pyracantha, and poison hemlock.

A species growth pattern, extent within the project area, effect on native vegetation, and ability to spread into uninfected areas were used to determine and prioritize the need for removal and control. Information on the invasive weed species and their ranking and threat is described in Chapter 2.0. Appendix A identifies, using photographs, the invasive weeds that are currently of management concern in the IWWP area.

1.1.3 Prioritize Vegetation Management and Weed Removal/Control Treatment Areas

Using information gathered in Tasks 1.1.1 and 1.1.2, above, areas within the IWWP area were identified for vegetation management action. Various management methods were evaluated as to their potential use in the IWWP project area, such as seasonal mowing, hand removal,

solarization, periodic thinning or pruning, and animal browsing (i.e., cattle). Threat rankings used by the USDA, Cal-IPC, and input from the AMWG were used to identify areas/species with a high priority for removal.

1.1.4 Development of Maintenance and Management Treatments

Vegetation management and/or maintenance treatments were identified for the IWWP area. Short-term weed treatments, as well as both long-term strategies to reduce weeds and long-term strategies to encourage native plant growth that can reduce long-term maintenance, were evaluated. Preferred maintenance operations were also identified, such as the time and intensity of mowing/weed whipping, hand removal, selective herbicide application and animal grazing/browsing. Chapter 3.0 of the IWWP outlines these recommended invasive weed control techniques. A general yearlong schedule outlining the optimum time for implementing treatment is also provided in this chapter.

Figure 1.Delineated Grassland for IWWP Area

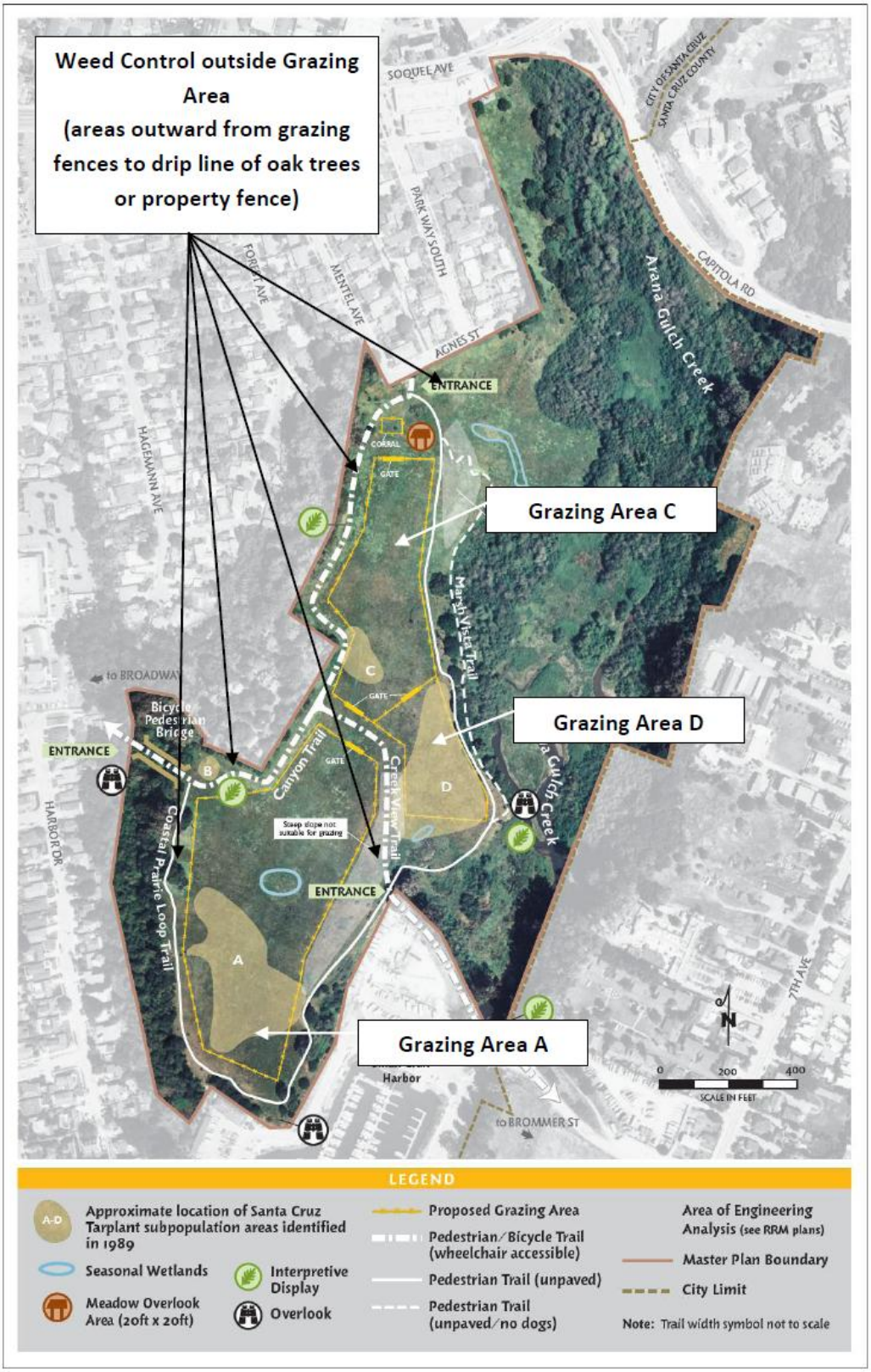

Figure 2.Grazing Areas and Adjacent Weed Control Areas

CHAPTER 2.0

INTRODUCTION TO WEEDS

Weeds, in general, are defined as plants growing in an area where they are not indigenous. In addition many plants are considered to be weeds when associated with agricultural/livestock operations. Some botanists and land managers also refer to these plants as ***non-native***. Many weeds are of European origin having entered the United States with early European explorers. In California, many weed species were also introduced during the Spanish and Mexican occupation periods, particularly at coastal sites and around settlements (Brossard, Randall and Hoshovsky 2000). Non-native plants came into California on grazing animals, in livestock feed, ship ballast, and through the transport of ornamental and crop plants. Non-native plants continue to enter California from the international transport of economic goods, the global plant trade, and tourism.

Currently, it is estimated that over 1,800 non-native plant species have become established in California, with a minority of these species (approximately 200) having escaped cultivation and invaded into natural areas (Cal-IPC 2006). In instances where a plant is found to be "troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate" the plant has been identified by the California Department of Food and Agriculture (CDFA) as a ***noxious weed*** (CDFA 2007). The CDFA rates each species based on its statewide importance, the likelihood of successful control/eradication, and the species distribution in the state.

In a similar manner, the California Invasive Plant Council (Cal-IPC) has identified plant species that displace native species and negatively affect natural systems as ***invasive species.*** Cal-IPC has developed it own ranking system that identifies a species invasive qualities as well as its negative effect on native ecosystems. These negative effects can include competition for light, soil moisture, growing space, and colonization of mineral soils.

2.1 STATE NOXIOUS WEEDS AND THREATS

The state's ***Noxious Weed List*** identifies plant species that are currently considered a pest according to laws/regulations in the California Food and Agriculture Code. Plants are rated as A, B, C, or Q, to give guidance on the most appropriate action to take against the weed species, as depicted on Table 1. Presently, there are 251 plant species considered noxious weeds in California.

Table 1.Ratings of State's Noxious Weeds

Pest Rating	Appropriate Action
A	Eradication, containment, rejection or other holding action at the state-county level; quarantine possible.
B	Eradication, containment, control or other holding action at discretion of County Agricultural Commissioner.
C	State endorsed holding action and eradication if plant found in a nursery; action to retard spread of plant outside nursery at discretion of County Agricultural Commissioner.
Q	Quarantine of species from nurseries
D	No action

Source: USDA 2015

2.2 Cal-IPC INVASIVE PLANTS AND THREATS

Cal-IPC has identified plant species that they consider to be invasive in natural areas, have an aggressive growth pattern that adversely competes with native species, and have potential to change plant community structure and reduce habitat values. In 2006 the California Invasive Plant Inventory was developed as a scientific and education report to provide information to those working on habitat restoration, land managers, and the public. The Cal-IPC inventory has no regulatory authority.

Table 2 identifies the inventory categories developed by Cal-IPC. These categories (high, moderate, or limited) reflect the level of a species negative ecological impact in California. This information can be useful to land managers in evaluating management actions. Presently, there are over 200 invasive plants listed in the Inventory. Many of these species are also listed as noxious weeds by the CDFA.

Table 2.Cal-IPC Ratings of Invasive Weeds

Ranking	Meaning of Ranking
High	Plant species pose severe ecological impacts on physical processes, plant and animal communities and vegetation structure, plants have moderate to high rates of dispersal and establishment.
Moderate	Plant species have substantial ecological impacts; plants have moderate to high rates of dispersal yet establishment is generally dependent on ecological disturbance.
Limited	Plant species are invasive, but ecological impacts are minor on statewide level; reproductive biology result in low to moderate rates of spread, but species may be locally persistent and problematic.

Source: Cal-IPC 2015

The Bay Area Early Detection Network (BAEDN) also tracks plant species that are the focus of early detection and eradication efforts throughout the nine-county San Francisco Bay Area. This organization periodically updates it list (www.baedn.org) that identifies species that are thought to only occur in limited locations, yet are of management concern.

2.3 PROBLEMS FOR MAINTENANCE AND LAND STEWARDSHIP

Both ***noxious weeds*** and ***invasive species*** can hinder natural habitats, degrade the aesthetic value of public spaces, and increase fire hazards on public lands. Typically, invasive weeds are successful in out competing native plants for growing space, soil moisture, and nutrients. These weeds may also contribute to a fire hazard, thus threatening adjacent lands.

2.4 INVASIVE WEEDS WITHIN THE VMP PROJECT AREA

The IWWP addresses plant species considered to be of significant management concern within the coastal prairie management area. Most of the plant species found within the project area are listed by the CDFA and Cal-IPC, as ***noxious weeds*** and ***invasive species.*** This plan provides field identification for the plant species considered to be of management concern. Table 3 lists these species. Table 3 also identifies the invasive threat ranking assigned to each species. This ranking is based on the CDFA ranking, Cal-IPC ranking, and field observations.

In general, ***noxious weeds*** and ***invasive plants*** are adapted to establish on previously disturbed conditions, such as loose soils exposed by grading or on sites that have experienced a substantial habitat change from previous agriculture, grazing or other activity.

The plants can be annual/biennial species, such as Italian thistle, that grow quickly and produce large amounts of seed. The seeds from annual plants are often easily dispersed by wind or by animals. Perennial herbaceous plants, such as cotoneaster, reproduce by seed but can also spread by spreading roots. The growth habitat of the IWWP invasive weed species is listed on Table 3.

Field identification features of each species are presented in Appendix A. This appendix provides the user with information on how to recognize the plant, where would one typically find it growing, and what problems it causes for habitat maintenance. Photographs are included, depicting the species in flower as well as in summer when the plants are commonly observed.

Figures 3 and 4 show the distribution of invasive weeds within the IWWP area that are currently of management concern. These weed occurrences, as well as others that may establish in the IWWP area in the future, are subject to removal and control as part of this IWWP. Note: The extent of wild radish is not depicted on the maps; this species is widespread within the three grazing areas.

Table 3. Invasive Weeds of Management Concern, Coastal Prairie Management Area, May 2015

Common Name	*Scientific Name*	Cal-IPC Ranking	Growth Habit
Italian thistle	*Carduus pycnocephalus*	Moderate [1]	Annual
Bull thistle	*Cirsium vulgare*	Moderate [1]	Biennial
Poison hemlock	*Conium maculatum*	Moderate	Annual/Biennial
Cotoneaster	*Cotoneaster franchetii*	Moderate	Perennial
Bermuda grass	*Cynodon dactylon*	Moderate	Perennial
French broom	*Genista monspessulana*	High	Perennial
English ivy	*Hedera helix*	High	Perennial
Velvet grass	*Holcus lanatus*	Moderate	Perennial
Prunus	*Prunus sp.*	Limited	Perennial
Pyracantha	*Pyracantha sp.*	Limited	Perennial
Wild Radish	*Raphanus sativus*	Limited	Annual/Biennial
Himalaya blackberry	*Rubus armeniacus*	High	Perennial
Milk thistle	*Silybum marianum*	Limited	Annual/Biennial

1 - species has a pest rating of "C" by CDFA

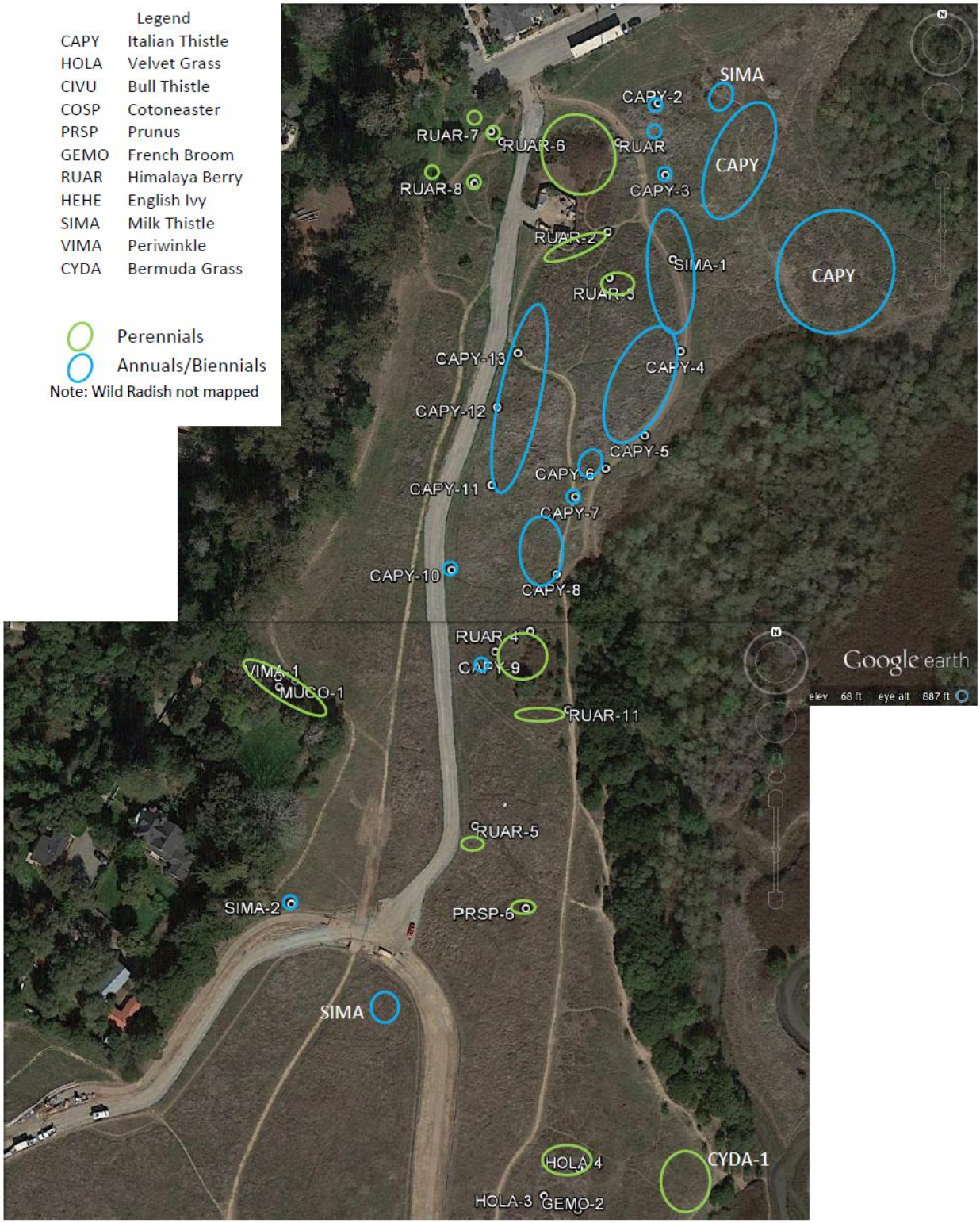

Figure 3.Occurences of Invasive Weeds, Northern Area, April 2015

Legend

CAPY	Italian Thistle	HOLA	Velvet Grass
CIVU	Bull Thistle	COSP	Cotoneaster
PRSP	Prunus	GEMO	French Broom
RUAR	Himalayan Blackberry	HEHE	English Ivy
SIMA	Milk Thistle	COMA	Poison Hemlock
PYSP	Pyracantha		
Note: Wild Radish not Mapped		PHSP	Canary Grass

Perennials

Annuals/Biennials

Figure 4. Occurrences of Invasive Weeds, Southern Area, April 2015

Note: This area of cotoneaster, Himalaya blackberry, ivy and French Broom treated in June 2015.

CHAPTER 3.0

INVASIVE WEED MANAGEMENT

The management of invasive weeds within the IWWP area refers to the removal/control of invasive, non-native plant species that have been considered an immediate and/or significant threat to the adjacent coastal prairie, including habitat areas for the Santa Cruz tarplant (*Holocarpha macradenia)*. The desired manner for the control of these species is for City maintenance personnel (or City contractors or volunteers) to remove the occurrences such that weeds are reduced from the project area. Removal of these plants will also reduce weed seeds that can re-infest the project area and surrounding areas. This chapter describes the various weed management techniques that can be used and identifies the most effective techniques for each species.

3.1 INVASIVE WEED CONTROL TECHNIQUES

Invasive weeds within the IWWP area can be controlled through hand removal/cutting, mechanical weed whipping/mowing, solarization, grazing/browsing, and herbicide application. Passive revegetation is also a viable control technique for some species and locations and for long-term weed abatement.

The most effective control techniques must take into account a species growth pattern, its reproductive characteristics, and its occurrence or level of infestation with the project area. Control and eradication techniques must also take into account a species growing cycle, particularly the flowering period and seed production/release periods. Table 4 identifies the growth patterns and the potential control techniques for each invasive weed species currently found within the IWWP area. The invasive ranking of each species within the project area is also identified. This ranking is based on the species CDFA ranking, Cal-IPC ranking, and observations of its occurrence/infestation within the project area.

3.1.1 Field Training

Although supervision as to timing, technique and general location for invasive plant management can be provided for personnel performing invasive plant fieldwork, the personnel performing the work will need to be capable of operating independently. Untrained personnel will cause negative impacts on plant management results. Therefore, a certain level of field training is required for success. Such training should also be provided so that the methods and skills are readily transferable to future workers.

Training should include, but not be limited to, the follow skills and abilities:

- The ability to identify the key invasive plant species likely to be encountered within the IWWP area. This could be achieved by disseminating a booklet of major invasive plants (see Appendix A) and field training sessions.
- The ability to identify the key native plants species likely to be encountered within the IWWP area. This could be achieved by disseminating information on native plants in the project area and field training sessions (see Appendix B).
- Although field personnel often have a high degree of skill with various types of equipment, details of proper techniques and timing should be provided to achieve maximum efficiency and success.
- Instructions if field personnel encounter plants, animals or situations outside of their scope of training, including the proper course of action when these situations occur. General guidance should be provided to workers to limit harm to sensitive or protected

habitats (such as Santa Cruz tarplant areas) including guidelines to employ that would limit the disruption of work.

- Use adaptive management strategies. Field personnel may have useful and efficient ideas and methods for doing a given task. Field supervisors should be encouraged to consider new ideas and potential improvements based on monitoring the effectiveness and effects of actions implemented on both the targeted species and the habitat, short and long-term.

3.1.2 Grubbing

Within the IWWP area, grubbing, *both with tools and by hand,* is often a suitable and efficient treatment for infestations of thistles, French broom, English ivy and most other invasive weeds found in isolated small to moderate patches. Grubbing is often used during the Bradley Method. The Bradley Method is a technique where invasive plants are completely removed around the perimeter of desirable, existing native plants to create noncompetitive growth patches for the native plants.

Additionally, hand grubbing may be used to create controllable perimeters around large patches of weeds or to provide buffers around patches of desirable native species. Depending on the species targeted and the timing of the treatment, biomass created by grubbing may need to be bagged and removed for proper disposal. Plants that should be carefully bagged and removed for disposal include species that re-sprout from spreading rhizomes or stems, such as Harding/canary grass and Bermuda grass. Table 4 provides specific details for grubbing individual plant species.

General Rules for *Grubbing* (there are exceptions to these general rules)

- If the plant has gone to flower, the floral heads should be bagged and removed for proper disposal.
- If the plant has runners (rhizomes or stolons) all parts of the plant should be bagged and removed for disposal.
- If plants are to be root cut, they should be cut below the root crown (greater than 2" below the surface) and prior to flowering.
- Small to moderate woody stem plants may be girdled, if it is safe to do so and it is not efficient to dig them up or remove them by hand.
- If you are not sure if a plant is an invasive species, do not remove it until it has been identified.

There are a number of hand tools that are widely used for ***grubbing*** specific types of invasive plants. Commonly used tools include:

- Rakes - Rakes may be used to remove lose biomass, establish clear perimeters or remove dense non-woody spreading plants or vines.
- McLeod/fire rake - These tools are used to clear areas to bare earth for controllable perimeters or when utilizing the Bradley Method.
- Pulaski/hand pick - These tools can be used like an axe, hoe, small shovel, or pick to cut large or woody plants, clear earth, dig holes, or girdle trees.
- Round-pointed shovel - Depending on type, shovels are efficient for cutting roots, exposing rhizomes and establishing perimeters.
- Soil knife- A soil knife is useful for exposing and cutting the roots of individual plants or small patches of plants. This tool can be easily carried in a pouch.
- Scythe/hand scythe - The scythe is not commonly used, as it requires proper training in both use and sharpening. However, the scythe is increasingly being used to cut grasses, as it is proving to be faster, quieter, and more effective than weed whipping when the proper technique is developed. It can be useful when disturbance to wildlife is a concern. The

hand scythe is useful for small areas of grass, in sensitive areas. Use of the hand scythe does not require any training.

- Axes, saws, loppers and pruners - These tools are used to remove woody-stemmed plants or large/tough stemmed herbaceous plants, such as late season thistles.
- Serrated knife- Knives can be carried at all times and used to cut, saw, or girdle small woody-stemmed plants or tough stemmed herbaceous plants.
- Strapping or chains- These can be used with vehicles, come-alongs, or winches to pull plants such as jubata pampas or cotoneaster out of the ground.
- Hoes- Discussed below.

3.1.3 Hoeing

Hoeing invasive weeds is an effective technique to remove small groups of plants and/or individual occurrences, particularly in areas with loose soil.

Typically, hoeing should occur prior to flowering, with the plant cut 2-4" below the ground surface (or below the root crown in hard soils). If flowers are on the plant, the cut/removed material should be bagged and removed from the site. If no flower heads have formed, the cut material can be left on site. Hoeing can be used at all times of the year, although plant removal before the flowering season (typically spring) is usually the most effective as a means of reducing weed seeds in the project area.

Within the IWWP area, hoeing is a suitable treatment for all species where they occur as small, densely concentrated infestations. Plants that can re-sprout from spreading rhizomes or stems, such as Bermuda grass should be removed in a controlled, careful manner such that hoeing does not encourage the species growth. Table 4 identifies species suitable for hoeing. Table 5 displays the typical flowering period for the invasive weeds currently found within the IWWP area; this table should be consulted such that hoeing is conducted prior to flowering.

3.1.4 Mowing and Weed-Whipping

As depicted on Table 4, many invasive weed species can be controlled with a properly timed mowing and/or weed whipping program.

To be an effective invasive weed control technique, a mowing or weed -whipping program needs to be timed to mow in the spring (prior to flowering and seed set – see Table 5), then possibly again in summer and/or early fall, depending upon the rainfall year and the species targeted. This type of mowing or weed-whipping program will adequately control most invasive weed species.

Within the IWWP area, mowing and weed-whipping is a suitable treatment for thistles (Italian thistle, bull thistle, and milk thistle) as well as many of the other targeted species. Specifications for each of these species are listed in Table 4.

Flail Mowers. By definition, a flail mower uses banks of flails (or "knives") instead of blades. A flail is a short piece of metal that operates by beating the grass (flailing it) and breaking it off. The stems are cut into small pieces, which can shorten the drying time and speed decomposition. Flail mowers have a tendency to minimize the bunching and the lumping of cut material. The cut from a flail mower is very distinctive; the flails are often Y-shaped, or sometimes a half-Y, giving the mowed grass a combed or ridged appearance.

Rotary Mowers. Rotary mowers cut larger pieces of grass and weeds. This type of mower is useful if the material is to be raked and baled.

Walk Behind Mowers. Walk behind mowers of commercial quality, such as the large DR mowers, provide an effective tool between large scale tractor mowing and weed whipping. These mowers can cut a path of 24-30" and are capable of cutting almost any weed that is less than 1.5-2", including wood stemmed plants. These mowers are self propelled with multiple forward speeds and reverse. They have fat rubber tires and can work banks up to 15-20 degrees. They should be effective for wild radish, Harding grass and similar tough weeds. They are useful in areas where tractor mowers cannot or should not go due to habitat constraints. They allow more careful control of potential negative effects on wildlife or desirable plant species, particularly with regard to flail mowers. However, like many rotary mowers, they cut at a set height of 4". This maybe too high for effective control of some species, such as Italian or slender flowered thistle.

String Trimmers/Weed Whips (includes Tri blades and metal blades). If possible, the use of both types of string trimmers/weed whips is recommended. There are significant benefits and roles for each type, if they are utilized for the correct purposes. A walk behind string trimmer can have distinct advantages and disadvantages with regard to a hand held unit. Often this leads to greatly reduce time required to treat a given area.

Advantages include:

- Use of much thicker string and greater power allows the user to cut much heavier and thicker vegetation consistently.
- Units cut a wider path, so they cover a larger area on each pass.
- These machines require less physical exertion for some applications.
- These types of units are more efficient when cutting straight lines or levels areas

Disadvantages include;

- These units have adjustable heights for the string, but do not cut lower than 1.5 inches, which can be significant for effectiveness on some species, such as Italian thistle.
- When cutting on uneven ground with many narrow depressions, achieving even cutting height can become difficult. Additionally, the narrow wheels can get caught in narrow ruts or depressions.

General notes for string trimmers or weed whipping:

- The City typically uses metal-bladed weed whips. During dry summer months or after vegetation has dried appreciably, the use of metal blades is discouraged as they may strike rocks or metal, thereby producing sparks that can start fires. Additionally, metal blades can create a wind effect that limits their effectiveness, on some plant species. If metal blades must be used during the late spring, summer or fall prior to the rainy season, City crews must provide and practice fire prevention controls during weed-whipping, such as a hand-held water sprayer or truck-mounted water tank. As plastic tri-blades will not start fires and can provide a high level of control in areas with desirable native plants or grasses, their use should be considered, as a viable alternative to metal blades for many applications where string will not work.
- Whenever it is possible, the timing for weed-whipping should be based on the biology and life cycles of the targeted species. Incorrect timing leads to reduced control effectiveness, requires additional treatments, allows greater seed spread and creates a general increase in resource expenditures.
- Both hand held and walk behind string trimmers/weed whips are useful. For a specific application one will hold an advantage in effectiveness, for example a hand held is most effective for Italian thistle, highly uneven ground, smaller mixed patches of plants. A walk behind is most effective along pathways, large level areas, thick, woody or fibrous plants (such as wild radish).

General notes for hand held *weed-whipping:*

- Invasive weeds should be cut as close to the ground as possible without causing significant increases in erosion potential or damaging desirable plant species.
- Table 5 provides a general guideline on the correct timing for the initial weed-whipping. The timing presented in this table will often need to be adjusted for conditions found during physical site inspections or seasonal monitoring
- Weed-whipping should be timed to deplete the root reserves of invasive plants, to the maximum extent possible. Correct timing can also greatly reduce the number of re-treatments and the effort required during re-treatments.
- All flower heads that have gone to or are likely to go to seed should be bagged and removed from the site. If noted for specific species (Table 4), all biomass should also be bagged and removed from the site.

Weed Whipping Thistles (Italian thistle, slender-flowered thistle, bull thistle, milk thistle) - The general concept for weed whipping these four species of thistles are similar, although bull thistle is a biennial and milk thistle can be biennial. However, there are distinct differences in practical treatment effectiveness between some species. The idea is to whip the thistles when their root reserves are depleted to the maximum extent. This limits re-growth of individual plants and reduces the number of repeat treatments required and the effort needed for the treatment.

The timing of the initial weed-whipping is critical. The optimum period for treatment varies for each species, although there may be an overlap for milk thistle with the other 3 species. This should not present a significant problem in many cases, although it may cause a reduction in the effectiveness in treatment of for one species, if they both have high density within a joint patch. Local conditions require site inspections to determine the exact timing. The initial weed-whipping should occur soon after the thistle has bolted (the main stem has risen from the basal leaf grouping) and during the period when the flower buds are forming or have formed, but have not yet opened.

With the correct timing this method can be highly effective on Italian or slender flowered thistle and may only require a quick hand pull session as a secondary treatment. As bull thistle and milk thistle are often biennial, have significantly larger roots, energy storage, and flower later in the season than Italian and slender thistle, the initial weed whipping for both bull and milk thistle likely will occur at a different time. Additionally, weed whipping bull thistle is not as effective a technique, as it is for Italian or slender thistle. Bull and milk thistle may require the use of Tri-blades instead of string and require additional weed whipping. However, the initial bull thistle treatment may correspond with a secondary treatment for the Italian and slender thistle species. Finally, as all thistles in an area do not bolt at the exact same time, several sessions over a period of a couple weeks may be required. If funding or labor availability is limited, the initial weed whipping should occur when the majority of thistles have bolted, creating buds and possibly when a few have gone to flower. If the timing is correct, only one shorter re-treatment may be necessary, particularly for Italian and slender flowered thistle. A periodic inspection of the thistle sites should be scheduled to determine the number and timing of re-treatments. Any thistle flowers that have opened or about to open should be bagged and removed from the site

3.1.5 Solarization

Within the IWWP area, solarization is a suitable treatment for the small patches of Harding/canary grass and Bermuda grass (Table 4). For these two species, a minimum thickness 10mm black plastic needs to be in place for one or more years (Harding grass) or six months (Bermuda grass) to effectively kill the plant/plant roots and the successional weed seeds. Additionally, treatment by solarization may be suitable for isolated large patches of other invasive

weeds (such as the roots of cotoneaster or pyracantha), depending on location, slope and proximity to desirable native plants. Potential concerns/problems with the solarization method are the long time the site needs to be covered to fully kill the weed species, the plastic waste created and if human or animal activities are likely to consistently damage or remove the plastic. Solarization may not be a good treatment for depressions or sloped areas where soil may deposit onto the plastic, where insufficient temperature and hours of sunlight prevent proper results, or where aggressive woody species are common.

3.1.6 Spot Application of Herbicide and Organic Sprays

The use of herbicides and organic sprays may also be suitable for some of the invasive species. All herbicide use should be used in a manner that will not negatively impact the adjacent native vegetation. Although herbicide use can prove economically attractive, the IWWP recommends the use of herbicides only where other management techniques would prove impractical or are not economically viable.

Within the IWWP area, spot application of herbicide may be a suitable treatment for biennial thistles, cotoneaster, French broom, English ivy, pyracantha, *Prunus,* and Himalaya blackberry. Herbicide use is typically effective when combined with mechanical cutting/removal techniques and/or applied to coincide with plant growth/uptake. This allows for the use of the least amount of herbicide and often eliminates the need to surfactants. Methods of application should be limited to those with the lowest probability of damage to surrounding habitat, such as cut and paint and selective, targeted foliar spray. In some cases, multiple applications will be required. Strict adherence to manufacturing and agency guidelines should be observed, as the minimum standard. Often stricter guidelines than labels or agencies require can achieve the same result. A licensed herbicide applicator with restoration experience should be consulted regarding herbicide use within the IWWP area.

In recent years, several organic, contact-type herbicide products have appeared on the market. These organic sprays include the soap-based product, Scythe™, (produced by Mycogen), clove oil products, Matran II (produced by EcoSmart), and acetic acid/citric acid products, AllDown (produced by Summerset) (UC Davis, 2007). These products damage any green vegetation contacted, though they are safe as directed sprays against woody stems and trunks. Because these herbicides only kill contacted tissue, good coverage is essential. Adding an organically acceptable surfactant is also recommended. Because these materials lack residual activity, repeat applications will be needed to control new flushes of weeds. Recent work has also examined essential oils as potential herbicides. It was found that clove oil or cinnamon oil at concentrations of 1 to 5% controlled most small weeds. The use of organic sprays could be evaluated for use within the IWWP area as part of a pilot project if so desired by the City.

3.17 Grazing/Browsing

Within the IWWP area, cattle-grazing is available in three fenced areas. As of July 2015, grazing occurred in Areas A, C, and D in 2015 from the end of February through June (see Figure 2). Grazing is a suitable treatment for velvet grass, and Harding/ canary grass; however, it is less effective on thistles and wild radish, due to the unpalatable nature of these plants and potential toxic effects of wild radish when consumed in quantity.

Grazing by cows may prove helpful in reducing the amount of velvet grass and Harding/canary grass. Cattle will graze these grasses when they are young and short but as they get taller/older cattle will begin to avoid them; therefore, timing is important if grazing is used to control these species (Devii Rao, pers. comm.., 2015). Cattle can remove biomass, thereby lowering green waste removal costs; however, they do not kill many invasive plant species and re-infestations

occur unless secondary control methods are utilized in conjunction with the cattle grazing. Currently grazing within Areas A, C and D is being used as a management tool for Santa Cruz tarplant recovery and not as a primary means of invasive weed control. Once Santa Cruz tarplant recovery is achieved the City could re-evaluate the timing, intensity and duration of grazing for invasive weed control purposes.

3.1.8 Mulching

Within the IWWP area, mulching may be a suitable weed control treatment in some areas. In suitable areas, wood chip mulch, placed three-four inches deep can be used to suppress some species re-growth. Mulch use would be most suitable for areas where initial control methods were implemented (i.e., hoeing, weed-whipped, herbicide application) and where the wood mulch would not migrate into intact prairie or areas suitable for the growth of Santa Cruz tarplant or other prairie-dependent plant species. However, mulch may also limit the spread of desirable plant species or lead to growth of specific weeds that flourish in the loose organic matter.

3.1.9 Passive Revegetation

Within the IWWP area, passive revegetation is a suitable treatment for expanding stands of desirable native plants (e.g., purple needlegrass, California oatgrass, and creeping wild rye) that are vigorous and have the potential to spread into areas infested by invasive weeds. The IWWP area supports areas of thistles and wild radish that are growing adjacent to native vegetation (i.e., areas supporting purple needlegrass and California oatgrass). In these areas, selective removal/control of the invasive weeds (while retaining the surrounding or adjoining native vegetation) will allow the native plants to spread and, over time, out-compete the invasive weeds.

Where invasive weeds abut stands of native plants, selective removal of the weeds should be done using hand labor such that there is minimal impact to the native plants to be retained.

3.2 IMPLEMENTATION SCHEDULE AND ADAPTIVE MANAGEMENT

Weed control should be timed to coincide with specific weather and plant growth conditions. As much as is possible, let the biology guide the timing of the treatment. Most invasive weed infestations can be effectively controlled when treatments are implemented prior to plant flowering, which reduces seed formation. Some biennial and perennial species are best treated after flowering, when plant nutrients are being expended and treatment actions can stress the plant, reduce its vigor, and inhibit its ability to reproduce. Other species may be best treated when they are focusing on drawing nutrients into the roots or stems for storage (i.e., English ivy, Himalaya blackberry).

Table 6 presents a generalized schedule of invasive weed control and maintenance. This schedule should only be used as a guide, as plant growth, including timing of flowering and seed set, are greatly influenced by rainfall and temperature patterns. Also, various techniques may require changing patterns to maximize effects. Management actions should be updated and refined in response to weather patterns, plant responses, and as new information on weed control/treatment is gathered.

All management actions should be monitored as to their effectiveness. Adaptive management techniques should be used to update, revise, amend, and improve the IWWP.

The actions identified on Table 6 are most suitable for the ungrazed areas where management actions (such as seasonal mowing or weed-whipping) will not affect the amount of forage

available for the cattle. Spot weed control methods, such as hand removal or hoeing thistle occurrences, may be the most suitable control methods within the grazing areas.

3.3 PRECAUTIONS TO PROTECT SENSITIVE BIOTIC RESOURCES

Implementation of some weed management activities has the potential to harm native plant and animal species, if such resources are present in the work area. For example, ground nesting birds can be harmed if they have nests within areas subject to mowing during the bird nesting season. Native plants, including the endangered Santa Cruz tarplant, can be harmed if weed control activities inadvertently weed-whip these plants. Measures are described in this section on actions to be implemented to avoid impacts to non-target plants and animals.

3.3.1 Pre-Construction Bird Nest Survey

When invasive weed removal work is to occur within the bird-breeding season (i.e., March 1 through August 15) measures are needed to ensure work does not affect nesting birds, as all migratory bird nests are protected under the Federal Migratory Bird Treaty Act.

Prior to weed-whipping or mowing the work area should be walked and inspected to determine presence/absence of nesting migratory birds. This survey should be conducted by a qualified biologist or trained City personnel. Meandering walking transects should be conducted through the work area up to 7 days prior to work. If birds are found nesting within or immediately adjacent to the proposed work area, reschedule work until young have fledged, as determined by a qualified biologist, or the biologist shall establish an appropriate sized buffer zone around the nest(s) where no work shall take place until all young have fledged.

3.3.2 Pre-Construction Native Plant Survey

When invasive weed removal work is to occur within any of the historic Santa Cruz tarplant areas (Areas A, B, C, or D, as depicted on Figure 2) measures are needed to ensure work does not affect any above or below ground tarplants (plants or seedbank), pursuant to the City's permit with California Department of Fish and Wildlife (Scientific, Education, or Management Permit No 2081(a)-13-013-RP). Prior to work, all workers shall receive on-site training on the Santa Cruz tarplant, identification information, and information on work actions to avoid take of the species. A worker training brochure shall be provided to workers (see Year 1 HMP Annual Report for copy of worker training brochure).

Invasive weed control work shall avoid/minimize adverse impacts to native plants on site.

The native plant species to be avoided are those currently on site or previously documented:

- Santa Cruz tarplant (*Holocarpha macradenia)*
- California oatgrass (*Danthonia californica*)
- purple needlegrass (*Stipa pulchra)*
- coast tarweed (*Deinandra corymbosa)*
- pretty face (*Triteleia ixioides)*
- dwarf brodiaea (*Brodiaea terrestris)*
- Choris's popcorn flower (*Plagiobothrys chorisianus)*
- Indian thistle (*Cirsium brevistylum)*
- yellow mariposa lily (*Calochortus luteus)*
- California aster (*Corethrogyne filaginifolia*)

Appendix B contains photos of each of these plant species; this information should be provided to workers.

3.4 IMPLEMENTATION SCHEDULE

Table 5 displays the typical flowering period of the targeted invasive weeds currently found with the IWWP area. This table, together with Table 6, can be used as a guideline for determining the optimum timing for invasive weed control. Table 6 presents a calendar year schedule with optimum periods of weed control for each species.

3.4.1 Invasive Weed Control Implemented in 2014 and Spring 2015

Invasive weed control with the Coastal Prairie Management Area was initiated in 2014 wherein the City cut several *Prunus.* In addition, The City initiated control of Himalaya blackberry thickets in 2014 by brush-cutting several dense stands that were growing in Grazing Area C. The entire management area was flail mowed in spring 2014.

Management actions in 2015 (to date) have included mowing of Tarplant Area B (April 2015) and mowing the northern portion of the management area (May 2015). Due to periodic episodes of wet weather through May 21, mowing of other areas did not occur until late May. Cattle-grazing occurred in all grazing areas from late February through June. Also in June a large patch of cotoneaster, with Himalaya blackberry, English ivy, and French broom, was removed from the management area (see Figure 4). Cattle grazing also provided some weed control within this grazing area as they grazed on wild radish patches.

Invasive weed control actions are identified for the remainder of 2015. Despite many invasive weeds having already flowered and many with seed set (i.e., wild radish, Italian thistle, and milk thistle); the following actions are recommended for the remainder of 2015:

<u>Recommended Invasive Weed Actions (July 2015 – December 2015)</u>

Italian and Slender-flowered Thistle

- Spot occurrences: pull plants up or cut flowering stalks, bag plants or seed heads and remove from site; will reduce seed release for 2015.
- Large infestation: Weed whip or mow for aesthetic/trail clearance purposes or to improve grazing areas and to lower the profile of potential seed spread; will not affect seed release for 2015. Potential for seed spread does exist from equipment; protocols for equipment movement with the habitat and on access paths should be established.

Milk Thistle

- Spot occurrences: cut flowering stalks. Cut and bag flower/seed heads and remove them from site; will reduce seed release for 2015, if flower/seed heads are cut and bagged.
- Large infestation: Mow for aesthetic/trail clearance purposes, fire control and to improve grazing areas; will not affect seed release for 2015. Potential for seed spread does exist from equipment. Protocols for equipment movements within the habitat should be established and followed.

Bull Thistle

- Spot occurrences: Shovel cut/dig up roots prior to flowering, or cut flowering stalks, bag the flower/seed heads and remove them from the site; will reduce seed release for 2015.
- No large infestation have been noted within the area, as of 2015.

Poison Hemlock

- Spot occurrence: Hand pull/shovel cut the roots. Bag all plant parts and remove them from site

Wild Radish

- Mow all infestations except small patches or isolated plants in desirable habitat patches. Isolated plants may be dug up and removed from site.

Cotoneaster and Pyracantha

- Cut and paint these with herbicide. No surfactant is required. Woody mass with no berries or seeds may be chipped on site. All woody mass with flowers, berries or seeds should be removed from the site

Himalayan Blackberry

- Individual or small patches may be dug up, including the roots. Larger patches should be sprayed with herbicide in the late summer or early fall.

Prunus

- Cut and paint these with herbicide. No surfactant is required. Hand pull or weed-wrench small seedlings.

3.4.2 Invasive Weed Control for 2016

Table 6 presents a calendar year schedule with optimum periods of weed control for each species. Actions in 2016 are scheduled to be implemented according to this schedule.

Table 4. Levels of Invasive Weed Infestations and Potential Control Techniques, Coastal Prairie Management Area

Common Name	Scientific Name	Invasive Weed Ranking	Infestation Threshold	Growth Pattern	Potential Control Techniques
Italian thistle	*Carduus pycnocephalus*	Moderate	Greater than 25 plants or patch greater than 25 sq. ft. Site documented to support over 15 patches (2015) or varying size and density	Annual (sometimes biennial) Spread by seeds on wind, vehicles and animals; most seeds germinate in fall and spring; basal rosettes can over winter and crowd out native plants.	a. Hand pull plants prior to flowering. b. Weed whip after the plant bolts, but before most of the flowers opens. Requires a brief revisit to treat missed plants Shovel cut basal rosettes, cutting taproot below crown (2-4") in early spring prior to bolting. c. After plant bolts, yet before flowers open, shovel cut or hoe plants, cutting taproot below ground 4-6", remove seed head, bag and dispose; or prior to flowers opening, cut off seed head, bag and dispose. d. Hand pull plant and bag flower heads if they have flowered. e. Multiple mowing from late spring to early summer, after bolting, yet before seeds form. f. Spot spray with herbicide in late fall on rosettes or in spring before flowering stalks form. Spot spray with herbicide when plants are >10" tall.
	Management Goal: Reduce number of patches to <5 in 5 years				
Bull thistle	*Cirsium vulgare*	Moderate	Greater than 25 plants or patch greater than 25 sq. ft. Site documented to support one patch (2014)	Annual or biennial Spread by seeds on wind, vehicles and animals; seeds germinate in fall after first rains or in spring; first year basal rosettes persist through summer and can over winter and crowd out native plants.	a. Shovel cut the plant, dig up the root as completely as practical shortly before flowering; bag and remove any open flowers. b. Mow after bolting, prior to flowering. c. Spot spray with herbicide in late fall on rosettes or in spring before flowering stalks form.
	Management Goal: Reduce number of patches to 0 in 5 years				

Table 4. Levels of Invasive Weed Infestations and Potential Control Techniques, Coastal Prairie Management Area

Common Name	Scientific Name	Invasive Weed Ranking	Infestation Threshold	Growth Pattern	Potential Control Techniques
Poison Hemlock	*Conium maculatum*	High	Greater than 5 plants or patch greater than 25 sq. ft. Site documented to support one patch (2015)	Annual or biennial Spread by seeds on vehicles and animals; basal rosettes over winter and crowd out native plants, yet individual plants die after setting seed.	a. Hand pull small to moderate patches before the ground dries completely. b. Shovel cut or hoe plant, cutting taproot below crown (2-4") shortly before flowering. If the plant has flowered, remove seed head, bag and dispose. If possible, bag and remove the entire plant under any circumstances. c. Spot spray with herbicide in late spring before flowering stalks form. No surfactant may be needed.
	***Management Goal**:* Reduce number of patches to 0 in 5 years				
Cotoneaster	*Cotoneaster spp.*	Moderate	Greater than 25 plants or patch greater than 25 sq. ft. Site documented to support eight patches (2014)	Perennial Spread by seeds on wind, vehicles and animals; plants can re-sprout from cut stumps and roots.	a. Manually remove small plants; cut stems of larger plants, leaving roots in place; apply cut-stem application of systemic herbicide to reduce stump and root re-sprouting. No surfactant is needed. b. Re-check area for sprouting seeds, hand pull seedlings in spring when soil is moist.
	Management Goal: Reduce number of patches to 0 in 5 years				
Bermuda grass	*Cynodon dactylon*	Moderate	Patch greater than 50 sq. ft. Site documented to support two patches in 2014	Perennial Spread by vegetative growth from creeping rhizomes and stolons and by seed.	a. Manual removal of rhizomes and stolons removing all root pieces and seed heads, bag and dispose. b. Avoid mechanical cutting of rhizomes and stolons and transport of cut pieces to new locations. c. Summer solarization for minimum of 6 weeks with 10mm black plastic or 30 mil landfill liner (if available). d. Spot spray with systemic herbicide, after flowering in summer to mid-fall.
	Management Goal: Reduce size of existing patch to <25 sq. ft. in 5 years				

Table 4. Levels of Invasive Weed Infestations and Potential Control Techniques, Coastal Prairie Management Area

Common Name	Scientific Name	Invasive Weed Ranking	Infestation Threshold	Growth Pattern	Potential Control Techniques
French broom	*Genista monspessulana*	High	Greater than 5 plants or patch greater than 15 sq. ft. Site documented to support two patches in 2014	Perennial Spread by seeds; seeds viable 5-30 years; plants can re-sprout from cut stumps. Can flower twice a year at some locations.	a. Hand pull and pull with weed wrenches, removing entire mature plant; repeat yearly for 5years. If practical, apply multiple treatments each year to speed up depletion of the seed bank.
	Management Goal: Reduce number of patches to 0 in 5 years				
English ivy	*Hedera helix*	High	Greater than 15 plants or patch greater than 25 sq. ft. Site documented to support two patches in 2014	Perennial Spread by seeds and sprouts from stem pieces; vigorous vine growth.	a. Hand-pull small to moderate/large patches. b. Cut ivy and apply herbicide directly to the cut stem, within 5 minutes. c. Apply a foliar spray application of herbicide in the later summer/early fall.
	Management Goal: Reduce number of patches to 0 in 5 years				
Velvet grass	*Holcus lanatus*	Moderate	Patch greater than 100 sq. ft. Site documented to support four patches in 2014	Perennial Spreads by seed; seeds disperse short distances yet germinate readily.	a. Manual removal of plants removing all root pieces and seed heads, bag and dispose. b. Intensively mow or weed-whip to reduce vigor, repeat several years. c. Graze low and repeatedly during the growing season to control. d. Spray with herbicide (no surfactant) prior to flowering.
	Management Goal: Reduce size of existing patches to <100 sq. ft. in 5 years				

Table 4. Levels of Invasive Weed Infestations and Potential Control Techniques, Coastal Prairie Management Area

Common Name	Scientific Name	Invasive Weed Ranking	Infestation Threshold	Growth Pattern	Potential Control Techniques
Harding grass	*Phalaris aquatica*	High	Patch greater than 100 sq. ft. Site documented to support one patch (2015)	Perennial Spreads by seed and spreading underground stems (rhizomes).	a. Avoid mechanical cutting of rhizomes and transport of cut pieces to new locations. b. Remove small patches, removing all root pieces and seed heads, bag and dispose. c. Mow close late in season to reduce vigor, repeat several years. Apply herbicide. d. Solarization for ≥1 year with 10mm black plastic. e. Spot remove young Harding/canary grass seedlings.
	Management Goal: Reduce number of patches to 0 in 5 years				
Prunus	*Prunus sp.*	Limited	Greater than 5 plants or patch greater than 25 sq. ft. Site documented to support six patches (2014)	Perennial Spread by seeds on wind, vehicles and animals; plants can re-sprout from cut stumps and roots.	a. Manually remove small plants; cut stems of larger plants, leaving roots in place; apply cut-stem application of systemic herbicide to reduce stump and root re-sprouting. No surfactant is needed.
	Management Goal: Reduce number of patches to 0 in 5 years				
Pyracantha	*Pyracantha sp.*	Limited	Greater than 1 plant or patch greater than 25 sq. ft. Site documented to support one patch (2015)	Perennial Spread by seeds on wind, vehicles and animals; plants can re-sprout from cut stumps and roots.	a. Manually remove small plants; cut stems of larger plants, leaving roots in place; apply cut-stem application of systemic herbicide to reduce stump and root re-sprouting. No surfactant is needed. c. Re-check area for sprouting seeds, hand pull seedlings in spring when soil is moist.
	Management Goal: Reduce number of patches to 0 in 5 years				

Table 4. Levels of Invasive Weed Infestations and Potential Control Techniques, Coastal Prairie Management Area

Common Name	Scientific Name	Invasive Weed Ranking	Infestation Threshold	Growth Pattern	Potential Control Techniques
Wild Radish	*Raphanus sativa*	Limited	Greater than 200 plants or patch greater than 200 sq. ft. Species widespread in grazing areas in 2015.	Annual, sometimes biennial Slender taproot that can reach 3 feet deep. Spread by seeds by, animals and human activities; dried seed pods can persist into winter; seed germination usually occurs in fall after significant rains.	a. Manually remove plants before seed production; mowing may be the most effective control for large areas, but should be done prior to seed formation. b. Goats may browse and eat radish plants, in limited quantities as this plant can be toxic.
	Management Goal: Reduce number of patches to <20 in 5 years				
Himalaya blackberry	*Rubus armeniacus*	High	Greater than 50 plants or patch greater than 100 sq. ft. Site documented to support 11 patches in 2014	Perennial Spread by seeds, spreading vines	a. Hand cut, remove rootstock. b. Establish a controllable perimeter around the edge of each large patch. c. Apply foliar spray of herbicide in late summer/ early fall. d. Cut and paint individual plants with herbicide (no surfactant).
	Management Goal: *R*educe patch size to <100 square feet in 5 years.				
Milk thistle	*Silybum marianum*	Limited	Greater than 5 plants or patch greater than 100 sq. ft.	Annual or biennial Spread by seeds on wind, vehicles and animals; basal rosettes over winter and crowd out native plants.	a. Hand pull plant and bag if they have flower heads. b. Shovel cut plants, cutting taproot below crown 4-6”), after bolting and prior to flowers opening, or remove seed head, bag and dispose. c. Multiple mowing or weed whip with Tri-blades from late spring to late summer, after bolting, yet before seeds form.
	Management Goal: Reduce number of patches to <5 in 5 years				

Table 5. Typical Flowering Period of Invasive Weeds, Coastal Prairie Management Area,

Common Name	*Scientific Name*	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Italian thistle Slender-flowered thistle	*Carduus pycnocephalus* *Carduus tenuiflorus*												
Bull thistle	*Cirsium vulgare*												
Poison hemlock	*Conium maculatum*												
Cotoneaster	*Cotoneaster spp.*												
Bermuda grass	*Cynodon dactylon*												
French broom	*Genista monspessulana*												
English ivy	*Hedera helix*												
Velvet grass	*Holcus lanatus*												
Harding grass/ canary grass	*Phalaris aquatica, P. arundinacea*												
Prunus	*Prunus sp.*												
Pyracantha	*Pyracantha sp.*												
Wild radish	*Raphanus sativus*												
Himalaya blackberry	*Rubus armeniacus*												
Milk thistle	*Silybum marianum*												

Table 6. Invasive Weed Treatment – Yearly Implementation Schedule, Coastal Prairie Management Area, Years 1-5 (2015-2020)

Task	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Yearly Tasks (Years 1-5)												
Conduct field inspection to monitor plant growth and progress of flowering stalks on invasive weed species. Monitor project area for changes in distribution of existing invasive weeds. Update distribution maps as needed.												
Conduct field inspections to document any new invasive weed species within project area. Update maps as needed.												
Prior to the spring flowering season conduct first-season mowing and/or weed whipping (see below). In summer, re-mow/weed-whip as needed (see below).												
Compile results on management actions and removal efforts; develop treatment plan for next year; insert results into HMP annual report.												
Treatment Areas (Years 1-5)												
Remove annual/biennial weed species prior to flowering; shovel-cut, hand pull, hoe, weed whip or mow (depending upon species):												
Italian thistle/ slender flowered thistle												
Bull thistle												
Poison hemlock												
Wild radish												
Milk thistle												
Remove perennial weed species before flowering or seed set; mow, cut, hand-pull or hoe the following weeds.												
Cotoneaster												
Bermuda grass												
French broom												
English ivy												
Velvet grass												
Harding grass												
Prunus												
Pyracantha												
Himalaya blackberry												
Establish solarization plot within Bermuda grass patches.												

4.0 MONITORING AND REPORTING

Annual reports prepared for the HMP will present data on the invasive weed control and the attainment of target success criteria, as presented in Table 4, progress toward final success criteria, and any remedial actions required.

4.1 Annual Reports

The following activities and results of the IWWP will be included in the HMP Annual Report:

1. Purpose and goals of the invasive weed work
2. Dates of weed abatement activities
3. Results of field data and analysis of success criteria
4. Monitoring photographs
5. Maps identifying treated and monitored areas, as appropriate.
6. Identification of any remedial actions necessary to meet performance standards.
7. List of actions for the next year's maintenance.

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APPENDIX A

Invasive Weeds within the IWWP Area

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ITALIAN THISTLE

C. pycnocephalus

SLENDER-FLOWERED THISTLE

C. tenuiflorus

DISTINCTIVE FEATURES These thistles have winged stems, are very spiny, and have many-branched stems. They grow as annual or biennial herbs from a basal rosette of spiny leaves. The leaves are deeply lobed; the undersides are slightly to very woolly. Plants typically grow 1- 4 feet tall (Italian thistles can reach 6.5 feet). Rosette is evident in fall and spring, distinguished by thorny patch with leaves that have a white midrib (center rib).

BLOOMS Pink to purple in cylindrical heads, with either single or multiple flowers, **May - August.**

PREFERRED HABITAT Bare ground, road/trail edges and previously disturbed areas. Often spreads rapidly and forms dense stands by chemically inhibiting the growth of other plants (allelopathy).

BULL THISTLE

Cirsium vulgare

DISTINCTIVE FEATURES This thistle grows as a biennial herb. The species has erect, highly branched, stems, arising from a basal rosette. The leaves are alternate and deeply lobed, with a rough, sandpaper-like texture and attach to the stem in awing-like pattern. The leaf tips have spines. The flower heads are 1-2" wide and 1-1.5" tall. Plants typically grow to 2-6 feet tall.

BLOOMS Purple-pink, **July - October**.

PREFERRED HABITAT Bull thistle is common in coastal grasslands and edges of mesic areas elsewhere in the state. Forms infestations in disturbed pastures, cleared areas and along roads and ditches. It spreads by seed, forming a rosette in year 1, with flowering and seed set in the 2nd year.

POISON HEMLOCK

Conium maculatum

DISTINCTIVE FEATURES This member of the carrot family typically grows as a biennial herb from a deep taproot. The species has finely divided leaves arising from an erect, yet hollow, ribbed stem. The stem has characteristic purple spots. The small flowers form a terminal flat-topped cluster on stalks that reach above the leaves. Plants range between 2-10 feet tall.

BLOOMS White, **April - July**.

PREFERRED HABITAT Poison hemlock occurs throughout California below 5,000 feet elevation. It is commonly found in meadows, along roadsides and riparian area, where there is moist soil during most of the growing season. Poison hemlock spreads by seed and can spread quickly in open areas. The plant is toxic to livestock, wildlife and humans. The plant forms flowering stalks in spring it is 2nd year, with seed set by early summer. Seeds can be dispersed for several months and are viable for up to 5 years.

COTONEASTER

(Cotoneaster spp.)

DISTINCTIVE FEATURES. This perennial shrub is common to previously disturbed areas, often becoming established by birds carrying seed from residential area. The numerous red seeds are characteristic of the shrubs. Shrubs can reach over 6 feet tall and can form thickets in favorable growing conditions. It spread from seeds.

BLOOMS New plants establish from seed in spring with flowering in late spring (April – July).

PREFERRED HABITAT In California, the largest patches are found in previously disturbed areas that are moist in the spring.

BERMUDA GRASS

(Cynodon dactylon.)

DISTINCTIVE FEATURES. This perennial grass is common to turf and residential settings. It also invades natural lands and established in moist areas. It spreads by creeping rhizomes and stolons, as well as from seed.

BLOOMS Flowering stalks are usually present in the summer months (June - September).

PREFERRED HABITAT In California, the largest patches are found in previously disturbed areas that are moist in the spring.

FRENCH BROOM

Genista monspessulana

DISTINCTIVE FEATURES A perennial shrub (6-10 ft.). Stem 5-angled in Scotch broom and round in French broom; leaves with 3 leaflets. Bright yellow pea flowers, forming dark brown or black pods.

BLOOMS Yellow, **March - June.**

PREFERRED HABITAT Previously disturbed areas, recently seeded areas, eroded slopes, riverbanks and road cuts. French broom is limited to the Coast Range.

ENGLISH IVY

Hedera helix

ALGERIAN IVY

H. canariensis

DISTINCTIVE FEATURES These aggressive perennial vines are evergreen, becoming woody as it ages. English ivy leaves are 3-5 lobed, leathery and are alternately arranged along the stem. Algerian ivy leaves are generally 3-lobed. Young shoots and leaves often have hairs. The vine produces inconspicuous white flowers, followed by dark blue to black fruit. Some forms have variegated leaves.

BLOOMS White, **December - February.**

PREFERRED HABITAT Forms spreading patches in coastal forests of California. Prefers shady, disturbed sites with year-round moisture, such as riparian woodlands, moist oak woodlands, and redwood forests. English ivy is native to England, Ireland and northern Europe; it is very frost-hardy. Algerian ivy is native to Tunisia and Algeria and can be frost-damaged.

English ivy

Algerian ivy

VELVET GRASS

(Holcus lanatus)

DISTINCTIVE FEATURES. This perennial grass is common in moist areas. It is characterized by its soft, velvety leaves. The leaf blades are covered with long grayish hairs. It spreads by seed.

BLOOMS Flowering stalks are usually present in the late spring and summer (May - August).

PREFERRED HABITAT In California, the largest patches are found in previously disturbed areas that are moist in the spring.

HARDING GRASS
Phalaris aquatica
REED CANARY GRASS
P. arundinaceae

DISTINCTIVE FEATURES These two perennial grasses are distinguished by their gray-blue leaves and dense, spike-like flowering heads. The plant grows from deep, spreading rhizomes, forming a dense, waist-high thicket.

BLOOMS Grass heads, **March - September.**

PREFERRED HABITAT Forms spreading patches in wet soil conditions. Spreads by seed and underground stems. Native to the Mediterranean region, it is widespread in California since it is used for forage and withstands heavy grazing.

PRUNUS
(Prunus spp.)

DISTINCTIVE FEATURES. This perennial tree is common to previously disturbed areas, often becoming established by birds carrying seed from residential areas. Commonly observed *Prunus* specimens can be flowering cherries, plums, or crabapples. The small cherry or plum-like fruit are characteristic of the trees. The foliage can range from green or red-purple. The trees spread from seeds and can re-sprout from cut stumps or roots..

BLOOMS These trees typically flower in early spring.

PREFERRED HABITAT These tree species can colonize many habitats in California, yet often prefer previously disturbed areas that are moist in the spring.

PYRACANTHA
(Pyracantha spp.)

DISTINCTIVE FEATURES. This perennial shrub is common to previously disturbed areas, often becoming established by birds carrying seed from residential area. The numerous red seeds are characteristic of the shrubs. Shrubs can reach over 6 feet tall and can form thickets in favorable growing conditions. It spread from seeds.

BLOOMS New plants establish from seed in spring with flowering in late spring (April – July).

PREFERRED HABITAT In California, the largest patches are found in previously disturbed areas that are moist in the spring.

WILD RADISH
Raphanus sativa

DISTINCTIVE FEATURES Wild radish grows as an annual herb. The lower leaves are deeply lobed; the upper leaves are toothed, often on short stalks. Plants typically grow 2-5 feet tall.

BLOOMS White to pink, in terminal clusters; flowers are 4-petaled, **February - June.**

PREFERRED HABITAT Bare ground, road/trail edges and previously disturbed areas. Spreads rapidly from seed. Native to Europe.

HIMALAYA BERRY

Rubus discolor

DISTINCTIVE FEATURES Himalaya berry is a fast-growing perennial vine, often forming dense thickets or mounds. The leaves are 5-parted, which hooked prickles on the leaf stems. Flowers form at the end of the branches, black berries form when ripe.

BLOOMS White, 5-petaled, **April - June.**

PREFERRED HABITAT Bare ground, road/trail edges and previously disturbed areas, especially riparian areas. Spreads rapidly from seed and rooting cane tips. Native to Western Europe.

MILK THISTLE

(Silybum marianum)

DISTINCTIVE FEATURES. This biennial plant is common to previously disturbed area. The prickly leaves are tinged with white. It grows 1-3 feet tall, forming dense stands in favorable growing conditions. It spread from seeds.

BLOOMS New plants establish from seed in spring with flowering in late spring (April – May).

PREFERRED HABITAT In California, the largest patches are found in previously disturbed areas that are moist in the spring.

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APPENDIX B

Native Plants within the IWWP Area

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CALIFORNIA OATGRASS
(Danthonia californica)

PURPLE NEEDLEGRASS
(Stipa pulchra)

SANTA CRUZ TARPLANT
(Holocarpha macradenia)

COAST TARWEED
(Deinandra corymbosa)

PRETTY FACE
(Triteleia ixioides)

DWARF BRODIAEA
(Brodiaea terrestris)

CHORIS'S POPCORN FLOWER

(Plagiobothrys chorisianus)

INDIAN THISTLE

(Cirsium brevistylum)

YELLOW MARIPOSA LILY
(Calochortus luteus)

CALIFORNIA ASTER
(Corethrogyne filaginifolia)