

# Invasive Plant Species Annual Work Plan, Implementation of Invasive Species Plan Recommendations

## Field season 2015

*Prepared for:*

San Diego Association of Governments

*Prepared by:*

County of San Diego AWM

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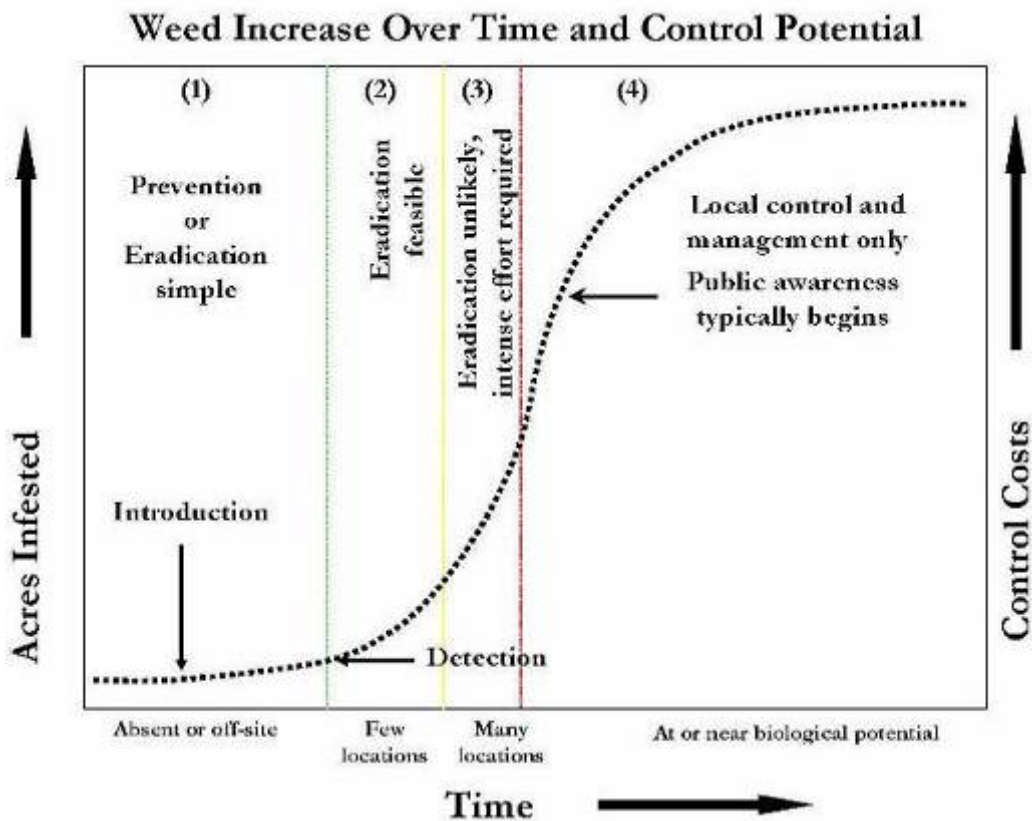
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## Introduction

A strategic plan for invasive plant control was completed by Conservation Biology Institute in September 2012. This plan created a management structure and outlined priorities for detection, eradication and management of invasive non-native plant species across the conserved lands of western San Diego County. The Invasive Plant Strategic Plan (IPSP) works in conjunction with the region's Management Strategic Plan for Conserved Lands in western San Diego County (MSP; available at [www.sdmmp.com](http://www.sdmmp.com)). The County of San Diego's Department of Agriculture, Weights and Measures (AWM), under an agreement with the San Diego Association of Governments (SANDAG) is tasked with the initial implementation of the IPSP. This annual work plan for the 2015 field season was developed to fulfill Task X of the agreement and will be used to guide the different levels of effort to be implemented: treatment, tracking, monitoring, and assessment.

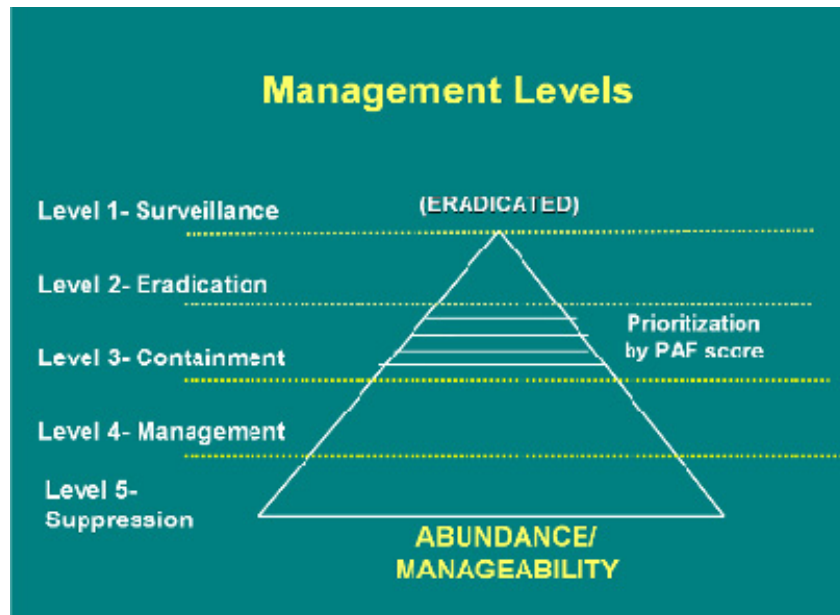
## Background on Early Detection and Rapid Response Management Approach

As outlined in the IPSP, the best time to control a non-native species, in terms of both cost and effectiveness, is when the species has just been introduced into a system. Rejmanek and Pitcairn (2002), of the University of California Davis, analyzed weed eradication efforts by the California Department of Food and Agriculture (CDFA) over a 30-year period. They showed that weed eradication success decreased exponentially and the effort (time, money, etc.) increased exponentially as the size of the weed infestation increased.



Process of invasion and the optimal time to initiate management (Siemens and Tu 2007).

This management approach is termed 'Early Detection and Rapid Response' (EDRR). This work plan focuses on the control of EDRR species, with eradication of the species being the goal. The IPSP outlined a framework of 'management levels' to categorize invasive plant species worked on in the region. There are five management levels in all, with the top two levels falling within the EDRR management approach.



The five management levels in treated invasive non-native plant species.

Table 1. Summary of management levels and goals.

Level	Distribution	Scale of Management	Feasibility	Goal
1- Surveillance	Not present	Region-wide	<u>High</u> : low effort required to achieve goal	Regional surveillance, early detection, rapid response
2- Eradication	Limited; few individuals or populations	Region-wide	<u>High</u> : moderate effort required to achieve goal	Eradication with regionally coordinated control program
3- Containment	Variable	Watershed or management unit	<u>Medium</u> : Funding typically available for re-treatments or control of small populations	Eradication with coordinated programs by management unit or watershed
4- Directed Management	Wide; abundant	Sub-management unit or reserve	<u>Medium</u> : area may be managed effectively, with slow re-invasion	Control within reserve or sub-management unit to benefit NCCP resources
5- Directed Suppression	Wide; abundant	Reserve or site	<u>Low</u> : control is typically of short term benefit (rapid re-invasion) without active restoration	Suppression, typically to allow recovery of disturbed site, improve re-vegetation success, or benefit NCCP resources

In support of the IPSP 55 species were assessed and scored using a regional plant assessment process (SDPAF score) based on the Cal-IPC state wide assessment standard. This process evaluates abiotic and biotic impacts, invasiveness, and distribution. The IPSP made management recommendations for 29 species in the region. There are two species in Management Level 1 (surveillance priority) and 12 species in Management Level 2 (eradication targets).

## Work Plan Details

This work plan outlines active control work (“treatment”) by AWM on ten of the twelve Level 2 species in the IPSP (Table 2). The two species not proposed for AWM work are barbed goat grass, which has one population that the Department of Defense (DoD) is working on, and purple star thistle, which has a low SDPAF score and was identified in the IPSP as a low priority. There are two Level 2 species additions to the Work Plan that were not evaluated in the IPSP - two *Limonium* species (European and Algerian sea lavender). As outlined in the Work Plan, these species meet the Level 2 management criteria, and are significant threats to MSP resources.

The second component of this Work Plan is tracking, monitoring and assessing work carried out by others on Level 1 and 2 species, as well as monitoring historic sites to ensure that eradicated populations are truly eradicated (Table 3). This work is a critical part of creating a coordinated eradication program. Both Level 1 species are being monitored (past controlled sites), all control work on Level 2 species not under this Work Plan is tracked, and six new species are tracked that are EDRR targets. Five of the six new Level 2 species are known by a single population each and all are under active management (by DoD, City of San Diego, or private consultants). These species will be further described in the next update of the IPSP. The sixth species, ruby saltbush, is confirmed at one location and reported at two others - further evaluation of this species will occur.

This Work Plan provides detailed sections for each of the twelve non-native plant populations outlined for treatment with the following information included: current condition, rationale for management, management information, plan recommendations, a table with specific locations, infestation size, actions to be implemented, co-occurring sensitive species (i.e. MSP and FWS species), property ownership, and maps (all populations overview and per population detail).

It is important to remember that the main priority and most efficient approach in eradicating newly introduced invasive plant species is to treat them **before** they begin to directly impact sensitive resources and **before** they become widely distributed. Therefore, the prioritization for treating the non-native species has largely been based on the overall ecological impacts associated with the invading plant (see SDPAF scores and documentation), the plant's invasiveness, as well as the size, and location of the non-native species, and not whether or not a sensitive species is present at the point of infestation. There are a few instances where sensitive plant species are adjacent or near locations to be treated, and very few where they are co-occurring or intermixed (for example *Limonium duriusculum* and salt marsh bird's beak at San Diego River estuary). These situations where they do overlap add management constraints to implementation and in some situations could make it difficult, if not impossible, to eradicate target invasives due to possible negative impacts to sensitive resources.

**Table 2: Seasonal treatment schedule by AWM crews, Level 2 management species (EDRR targets).** Not all populations are being treated, see detailed treatment, tracking, and monitoring breakouts for each species. \*Two *Limonium* species are additions to the Level 2 management list (not reviewed in IPSP).

Scientific Name	Common Name	Growth form	Populations/sites to be worked on: (x) are being assessed, but are likely	Jan 1 - Mar 15	Mar 16 - Aug 15	Aug 16 - Dec 31
<i>Ageratina adenophora</i>	Eupatory	Perennial forb	3	Treat 1 time		Treat 1 time
<i>Carrichtera annua</i>	Ward's weed	Annual forb	2		Treat 2-3 times	
<i>Centaurea solstitialis</i>	Yellow star thistle	Annual forb	14		Treat 2 times	
<i>Centaurea stoebe</i>	Spotted knapweed	Annual forb	1		Treat 2 times	
<i>Elymus caput-medusae</i>	Medusahead	Annual grass	(3)		Treat 2 times	
<i>Genista monspessulana</i>	French broom	Perennial shrub	2	Treat 1 time		Treat 1 time
<i>Hypericum canariense</i>	Canary Island St. John's wort	Perennial shrub	6	Biomass reduction/removal Treat 1 time		Biomass reduction/removal Treat 1 time
<i>Iris pseudacorus</i>	Yellow flag iris	Perennial monocot	(4 - 6)			Treat 1 time
<i>Limonium duriusculum</i> *	European sea lavender	Perennial forb	3	Treat 1 time		Treat 1 time
<i>Limonium ramosissimum</i> *	Algerian sea lavender	Perennial forb	(3-4)	Treat 1 time		Treat 1 time
<i>Lythrum salicaria</i>	Purple loosestrife	Perennial forb	2		Treat 2 times	
<i>Retama monosperma</i>	Bridal broom	Perennial shrub	2	Biomass reduction/removal Treat 1 time		Biomass reduction/removal Treat 1 time

**Table 3: Tracking, monitoring and assessing schedule: Level 1 & 2 management species (EDRR targets).** 'Tracking' is the coordinator contacting non-AWM entity to ensure treatment work is occurring. 'Monitoring' is visiting sites to ensure that either: work is occurring, or that populations considered eradicated have no propagation. 'Assessing' indicates further mapping and surveying is needed prior to initiating EDRR work. \*These species are additions to the Level 2 management list (not reviewed in Strategic Plan); they are usually known from a single occurrence that is under active treatment.

Scientific Name	Common Name	Growth form	Populations/sites to be monitored, tracked, assessed	Track: confirm other's work is occurring	Monitor: visit sites to ensure work is occurring	Assess: map and survey to determine EDRR action
<i>Aegilops triuncialis</i>	Barbed goat grass	Annual grass	1	1 (Fallbrook NWS)		
<i>Carrichtera annua</i>	Ward's weed	Annual forb	1	1 (Camp Pendleton)		
<i>Centaurea solstitialis</i>	Yellow star thistle	Annual forb	9	1 (Camp Pendleton)	6	2
<i>Centaurea stoebe</i>	Spotted knapweed	Annual forb	3		3	
<i>Cytisus scoparius</i>	Scotch broom	Perennial shrub	1		1	
<i>Enchylaena tomentosa</i> *	Ruby saltbush	Perennial sub-shrub	1 confirmed, 2 reported			2
<i>Elymus caput-medusae</i>	Medusahead	Annual grass	4		3	1
<i>Euphorbia terracina</i>	Carnation spurge	Annual forb	1		1 (AECOM)	
<i>Euphorbia virgata</i> *	Leafy spurge	Annual forb	1		1 (City SD)	
<i>Genista monspessulana</i>	French broom	Perennial shrub	3	1 (Rincon Con.)		2
<i>Heliotropium supinum</i> *	Dwarf heliotrope	Annual forb	1		1 (AECOM)	
<i>Hypericum canariense</i>	Canary Island St. John's wort	Perennial shrub	6	4 (DoD)	2	
<i>Iris pseudacorus</i>	Yellow flag iris	Perennial monocot	4-6			4-6

Scientific Name	Common Name	Growth form	Populations/sites to be monitored, tracked, assessed	Track: confirm other's work is occurring	Monitor: visit sites to ensure work is occurring	Assess: map and survey to determine EDRR action
<i>Pentameris airoides</i> *	Annual pentaschistis	Annual grass	1	1 (Camp Pendleton)		
<i>Retama monosperma</i>	Bridal broom	Perennial shrub	4	1 (Fallbrook NWS)	3 (no treatments: check not spreading)	
<i>Senecio quadridentatus</i> *	Cotton burnweed	Annual forb	1	1 (Camp Pendleton)		
<i>Sesbania punicea</i> *	rattlebox	Perennial shrub	1		1 (City SD)	



## **Ageratina adenophora (eupatory)**

SD PAF score: 5.4

**Current condition:** There are three known populations of this plant, all of which are under one acre in size (see site summary map). Eupatory typically occurs in riparian areas, but can also be found in upland scrub. In San Diego it grows in dense spreading stands, in both open and closed canopy riparian areas (as seen on Sweetwater and San Diego Rivers). The species can also occur in drier riparian systems (Florida Canyon site). There is limited information on its impacts in our region, but it has severe impacts in other parts of the world where it has invaded and spread aggressively. This plant may be in a *lag phase* (a lower reproductive period prior to a rapid expansion) in our region. This species is listed as a noxious weed by USDA and is Q rated (Quarantine) by CDFA.

**Rationale:** Eupatory could severely impact riparian habitat, where dense growth would interfere with riparian succession processes, particularly in wetter systems. Currently invaded sites support least Bell's vireo (LBV), and California gnatcatcher (CAGN) are adjacent. If eupatory were to spread to more riparian systems a wider range of species could be impacted including *Ambrosia pumila* (Amb pum), Southwestern willow flycatcher (SWWFC), and arroyo toad (AT) (see site maps).

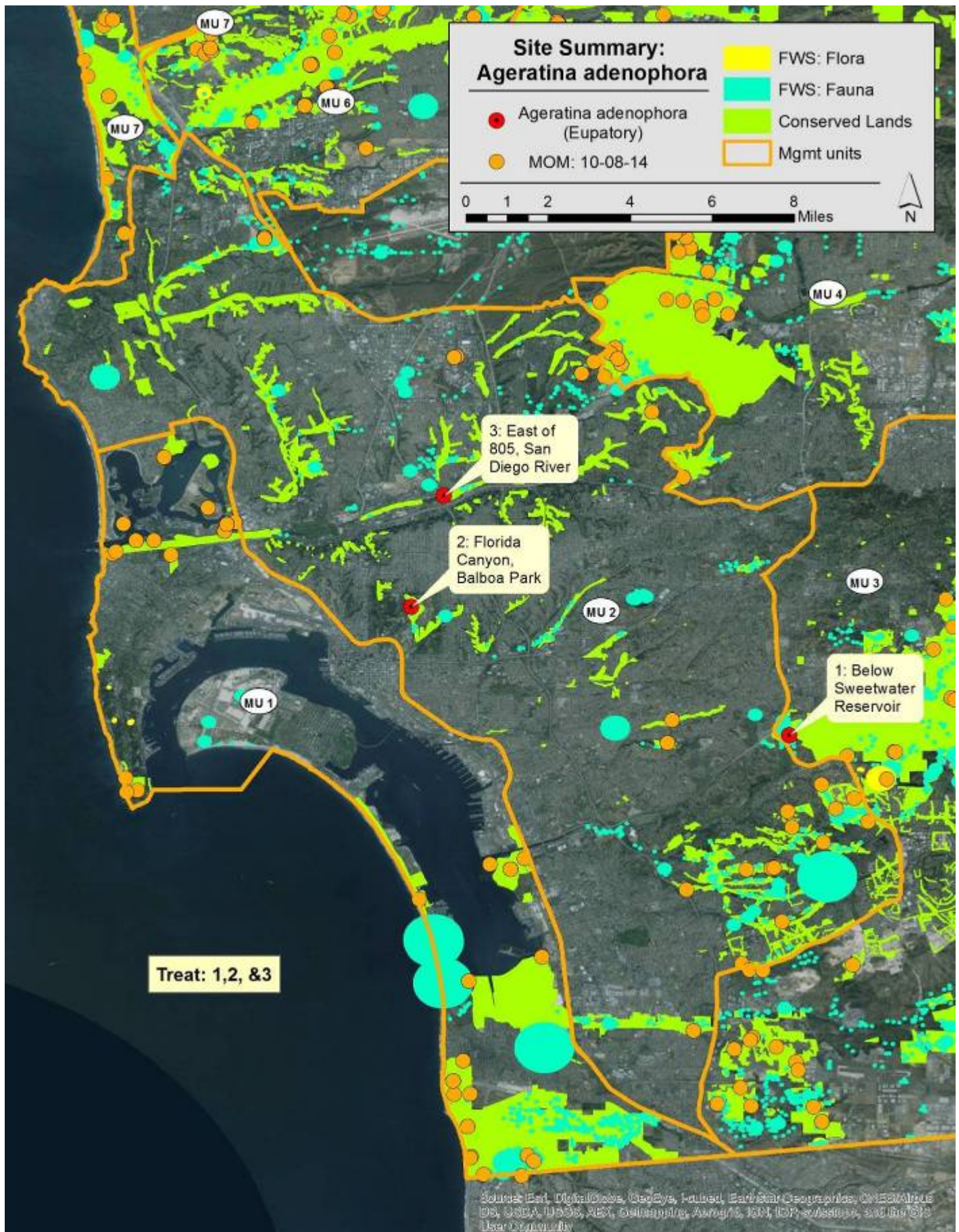
**Management information:** This perennial subshrub is moderately difficult to control, requiring a multi-year commitment because it produces copious quantities of seed. Seed is wind-dispersed and can float on water surfaces. The plant can grow from broken stem and root fragments with the crown attached (this lateral spread and fragmentation may be the main mechanism of spread in the SD region to date), and can re-sprout after fire. Limited information on control is available, but herbicide application (glyphosate) is used in Australia, and appears to be effective at the Sweetwater Authority property, where select patches have been treated.

### **Plan Recommendations: Regional Priority = High; Regional Action = Fund management**

- Initiate work on all three known populations: #1, 2, and 3
- Site #1: Sweetwater Authority has granted access for mapping. They have tentatively offered to remove biomass post treatment- but need to approve AWM treatment request prior to any work on site. The treatment site would also benefit an adjacent restoration/mitigation site which eupatory is actively spreading into (and where it is treated).
- Site #2: Will require coordination with Caltrans for a portion of the site.
- Should be possible to eradicate this species fairly quickly - three locations and only a few properties.

### **Populations of Ageratina adenophora (croftonweed, eupatory)**

#	Location	Size	Action	Sensitive species	Property ownership
1	Below Sweetwater Reservoir	0.5 ac, ~4,000 plants	Treat	LBV, CAGN	Sweetwater Authority
2	Florida Canyon, Balboa Park	0.1 acre, 300-500 plants	Treat	LBV, CAGN	City of San Diego
3	San Diego River, East of 805	0.4 ac, ~3,500 plants	Treat	LBV	Caltrans and one private















## **Carrichtera annua (Ward's weed)**

SD PAF score: 4.2

**Current condition:** There are only two occurrences of this plant in CA (and entire US), Carlsbad (sites 1&2) and Camp Pendleton (see site summary map). This species has few documented impacts, in part due to its very limited distribution, but it is a problematic weed in Australia. It occurs in coastal sage scrub and grasslands. Both populations have been under treatment for multiple years. Although significant effort by CNLM has occurred (with EMP and land management endowment), the plant has not been eradicated. This may be due to adjacent watering at a City Park and HOA restrictions. Increasing the number of control cycles by adding AWM crews to the CNLM effort should allow eradication to be achieved. Without AWM support, the species could remain in a cycle of constant recurring management.

**Rationale:** The Carlsbad sites have multiple priority listed plants: Del Mar manzanita, San Diego thornmint (AIL), thread-leaved brodiaea (BRFI), Orcutt's hazardia (HOR) as well as nearby CAGN and LBV (see site maps).

**Management information:** This annual herb is a prolific seed producer, with seed viability declining sharply after 2 years. Seeds are primarily gravity- or rain-dispersed, with most seeds falling close to the parent plant. Seeds can be spread farther distances by animals, runoff, or human-related activities. Mature plants are fairly easy to control with proper timing of application; however, seedlings are difficult to detect in dense coastal sage scrub and grasslands. The length of the control effort is 3-5 years. Sites should be surveyed multiple times during winter, and spring (and now summer with artificial watering of adjacent turf on the west site) to ensure treatment of all individuals. Initial work is typically herbicide treatment, followed by hand pulling of scattered and delayed seedlings. Areas are near listed endemic plants, but not currently co-occurring with them. Herbicide with pre-emergent properties should be considered, particularly in areas receiving artificial watering.

**Recommendations: Regional Priority = High; Regional Action = Monitor**

- Assist in treatment of Populations #1 and 2. This will be coordinated with CNLM staff. It will increase seasonal treatments from 5 to 8 (or as needed to ensure no regeneration).
- Should be possible to eradicate this species with increased treatment effort.

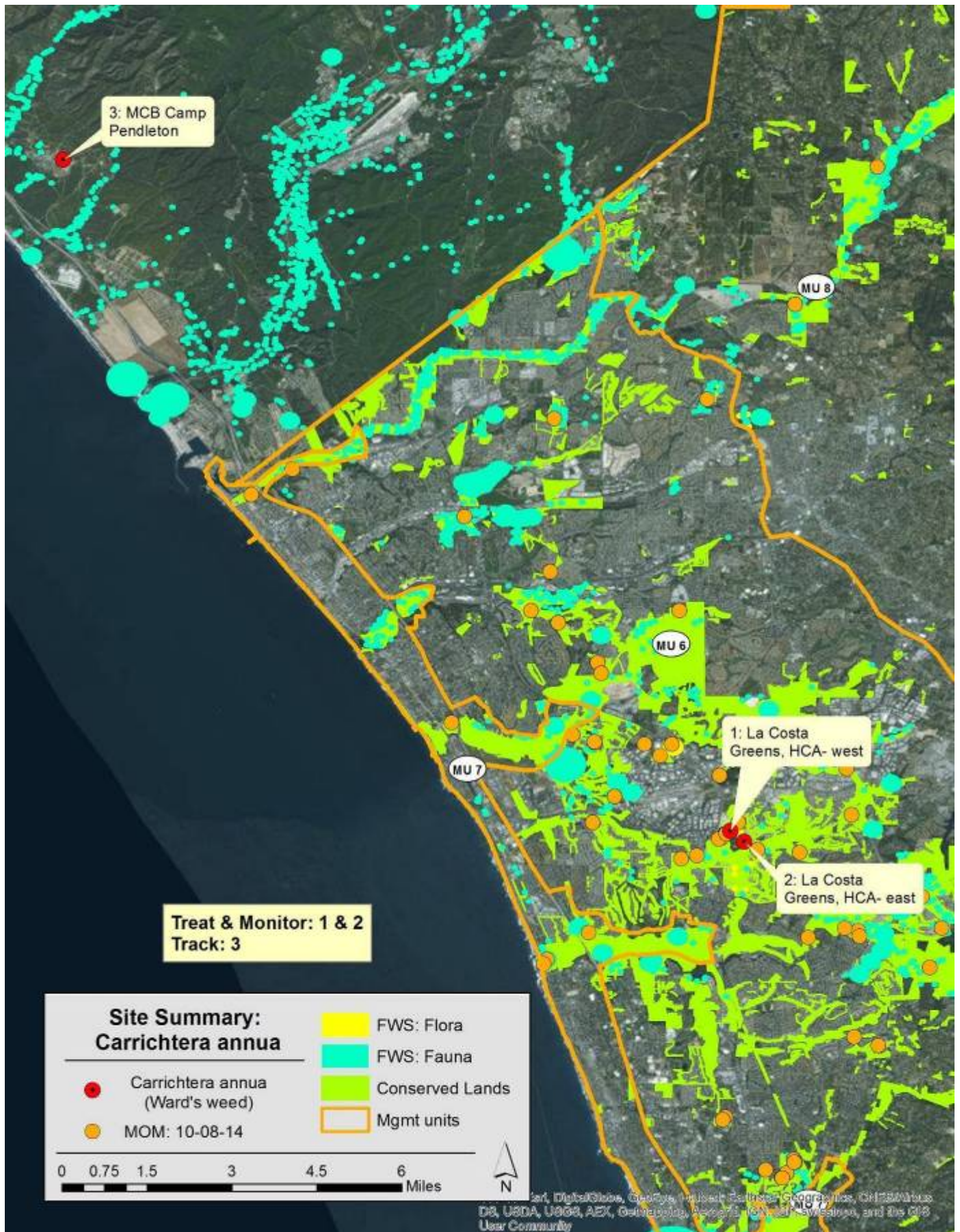
### **Populations of *Carrichtera annua* (Ward's weed)**

#	Location	Size	Action	Sensitive species	Property ownership
1	La Costa Greens Ecological Reserve, west of Alacante Rd., Carlsbad	0.75 ac	Assist in treatment	CAGN, BRFI, HOR, AIL, Del Mar manzanita	City of Carlsbad, CNLM
2	La Costa Greens Ecological Reserve, west of Alacante Rd., Carlsbad	0.75 ac	Assist in treatment	CAGN	La Costa Greens HOA, CNLM
3	Las Flores Rd., Camp Pendleton	Status?	Track	-	Camp Pendleton

<sup>1</sup> CNLM = Center for Natural Lands Management

<sup>2</sup> HOA = Homeowners Association











## **Centaurea solstitialis (yellow star thistle)**

SD PAF score: 5.9

**Current condition:** There are many current (15) and several historic (6) sites of this plant in San Diego County (see site summary map). AWM, as well as land managers, have been working actively on this plant since at least 2000. It is very widely distributed in much of California (millions of acres invaded), occurring in a wide range of ecotypes including woodlands, scrub, grasslands, and riparian areas. Our region is at the edge of its distribution, so it is possible to keep the plant suppressed, if not eliminated, from the region. A coordinated treatment effort has made significant gains in controlling this species in the region. Yellow star thistle is a C-rated CDFA noxious weed, with significant ecological impacts to flora and, to a lesser extent, fauna.

**Rationale:** There are few current direct impacts associated with the plant in our region, but there are many invaded sites on conserved lands and within the MSP area (see site maps). AWM has secured CDFA funding that will allow treatment of about half the sites. It is proposed that this be directed at areas outside the MSP, with SANDAG EMP contract funds directed at the sites within the MSP.

**Management information:** This annual herb has seeds that survive in soil 3 years or more. Seeds are primarily gravity-dispersed, although wind, animals, and humans may also be effective dispersal agents. Control is generally easy and can be of short duration (~3 years), if all individuals are treated. Initial seasonal treatments are typically carried out, with follow-up rounds of hand pulling and spot treatment.

**Recommendations: Regional Priority = High; Regional Action = Fund management**

- Treat eight sites within MSP area (SANDAG EMP contract funds): sites 5, 6, 11, 12, 15, 18, 19, and 20. All outside sites (six) will be treated with CDFA funding (for two years): sites 4, 8, 9, 13, 14, and 16.
- Sites considered eradicated (1, 2, 3, 7, 10, 21) will be monitored. Active control on Camp Pendleton will be tracked.
- ROEs for most project areas are already held by AWM.
- Achieving eradication at additional sites is likely, unclear if County wide is realistic. Re-introductions common due to extensive distribution of plant across state.

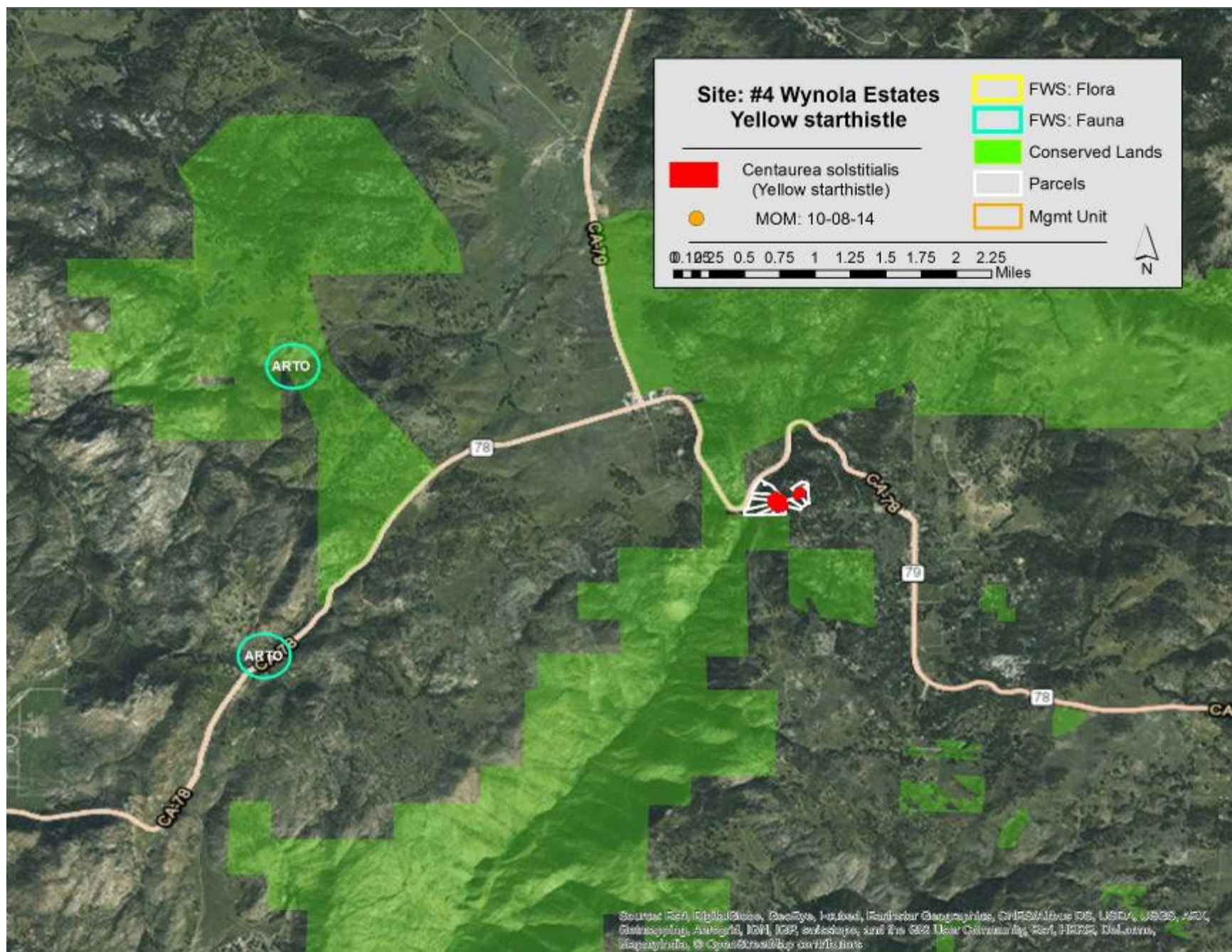
**Populations of *Centaurea solstitialis* (yellow star thistle)**

#	Location	Size	Action	Sensitive Species	Property ownership	Inside or Outside MSP	Funding
1	I-15 and Aero Dr., Serra Mesa	Eradicated	Monitor	-		Inside	
2	Mission Trails Park	Eradicated	Monitor	-		Inside	
3	SR-56, Carmel Valley	Eradicated	Monitor	-		Inside	
4	Wynola Estates, Wynola	2 acres	Treat	-	10 Private	Outside	CDFA
5	SR-52 and Sycamore Landfill	5 acres	Treat	-	City SD, 5 private	Inside	EMP
6	Woodside Dr., Lakeside	1 acre	Treat	-	City SD	Inside	EMP
7	Lake Wolford Rd., Escondido	Eradicated	Monitor	-		Inside	
8	Mendenhall Valley, Palomar Mtn	25 acres	Treat	-	2 Private	Outside	CDFA
9	Eichenlaub Ranch, Barrett Lake	10 acres	Treat	-	City SD	Outside	CDFA
10	Downtown Fallbrook	Eradicated	Monitor	-		Inside	
11	Rock Mtn. Rd., Sandia Creek area, Fallbrook	1 acre	Treat	-	Fallbrook Public Utility District, 1 private	Inside	EMP
12	Rainbow Creek, Rainbow	1 acre	Treat	-	4 Private	Inside	EMP
13	Japatul, Ariza	2 acres	Treat	-	2 Private	Outside	CDFA
14	Will Valley, Palomar Valley	2 acres	Treat	-	1 Private	Outside	CDFA
15	Emerald Crest, Valley Center	50 acres	Treat	-	3 Private	Inside	EMP
16	Mesa Grande	5 acres	Treat	-	3 Private	Outside	CDFA
17	Camp Pendleton, multiple sites	5 acres	Treat	-		Inside	-
18	Red Gate Rd., La Jolla Indian Reservation	1 acre, <100 plants	Treat	-	La Jolla Indian Reservation	Inside	EMP
19	Otay	?	Assess	Otay Manzanita		Inside	EMP
20	Hidden Meadows	?	Assess	-		Inside	EMP
21	Dye Rd, Ramona	Eradicated	Monitor	-		Inside	

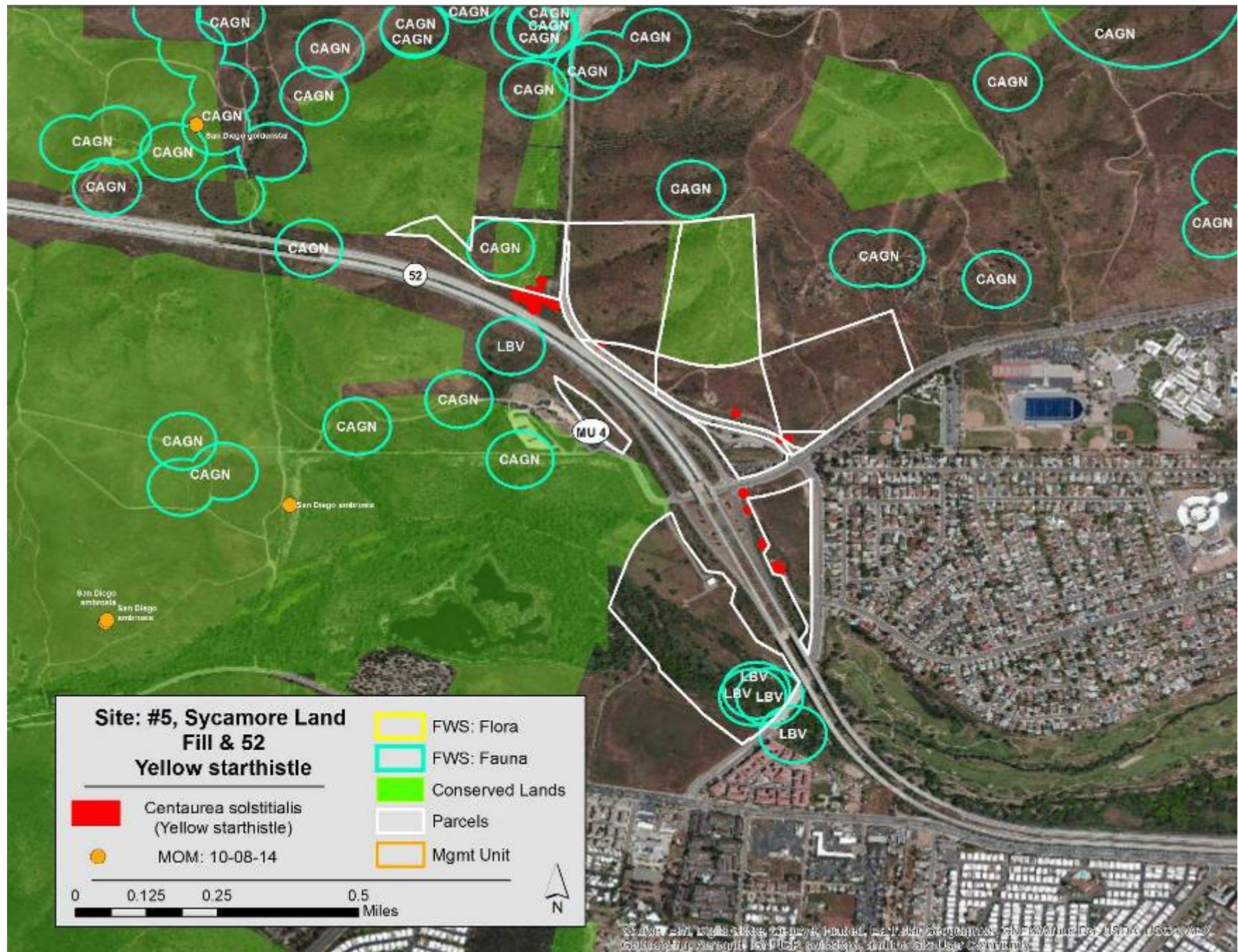
ARRA = American Recovery and Reinvestment Act 2009







































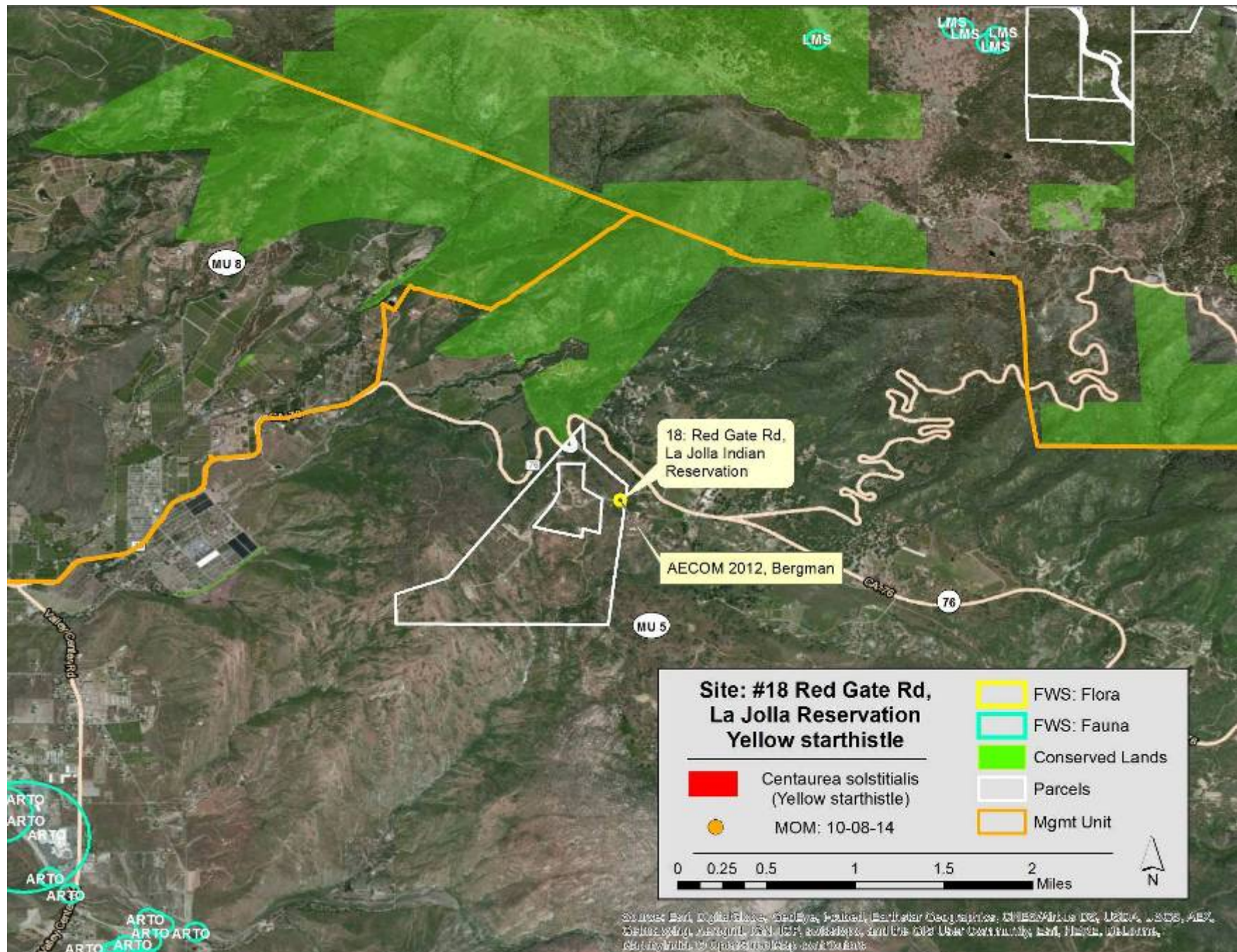
























**Centaurea stoebe ssp. micranthus (spotted knapweed)** SD PAF score: 6.0

**Current condition:** Only one known population in Palomar Mountain remains in the County, which has been treated for the past 4 years. Multiple populations were historically found in mountain areas of Cuyamaca, Julian, and Wynola, outside the MSP area, but have been controlled and are believed eradicated. Spotted knapweed is a CDFA A-rated noxious weed that can impact flora and, to a lesser extent, fauna.

**Rationale:** Could compete with Cleveland's horkelia, the host plant for Laguna Mountain skipper, which occurs west and north of the Bergman Ranch. Area is one mile from boundary of MU 5.

**Management information:** This annual herb is easy to control with proper timing of treatment, and the length of the control effort is 3-5 years. Multiple treatments (four to five) each year are best to ensure that all germinating plants are controlled before they set seed. Most seeds and seed heads are gravity-dispersed, falling near the parent plant, however, longer-distance dispersal may be carried out by wind, water, and animals.

**Recommendations: Regional Priority = Medium; Regional Action = Fund management**

- Treat remaining site (hand pulling only).
- CDFA funding match (all 2015 and 2016).
- EMP funds monitoring of three historic sites.

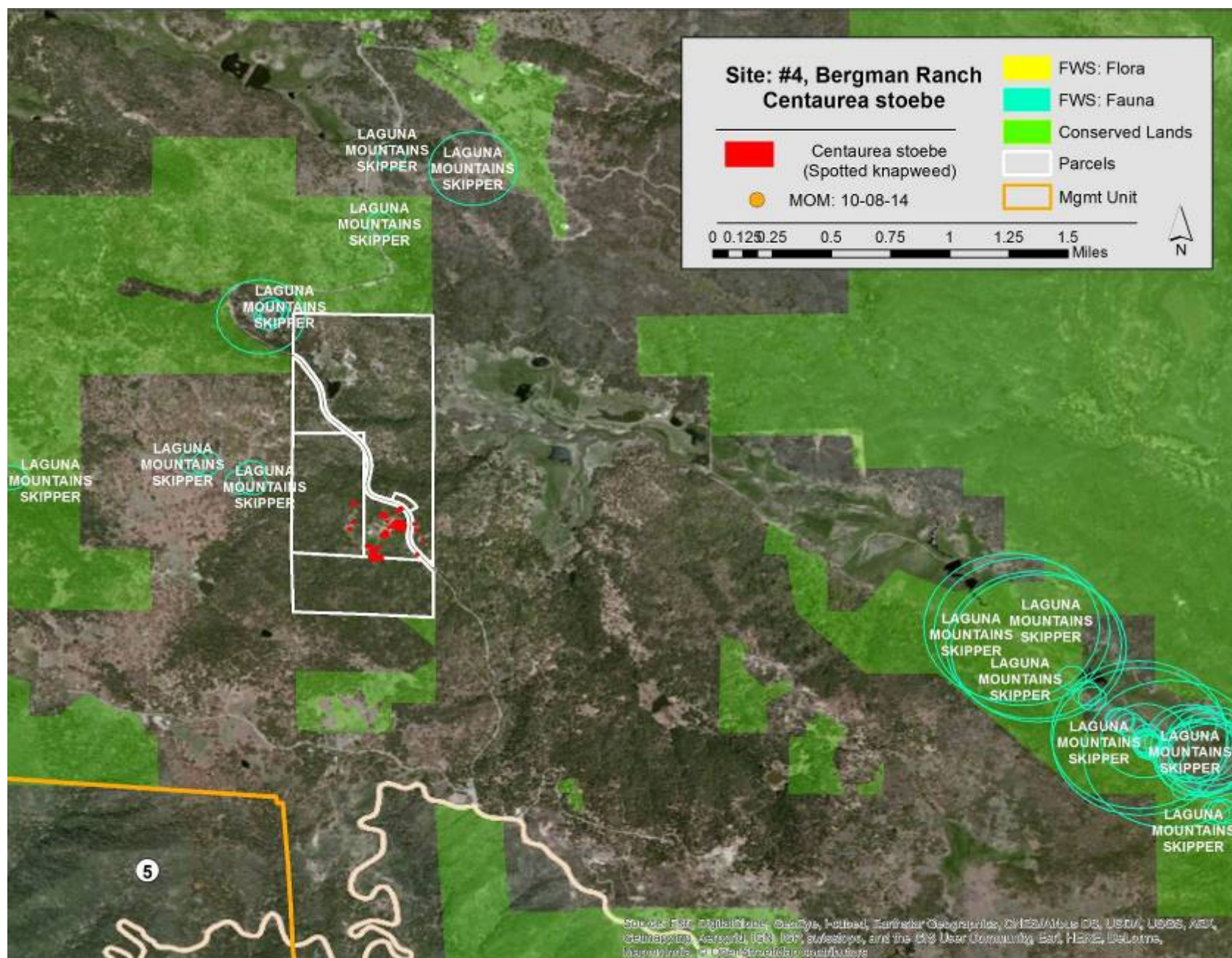
**Populations of *Centaurea stoebe ssp. micranthus* (spotted knapweed)**

#	Location	Size	Action	Sensitive species	Property ownership
1	Wynola on Hwy. 79.	Eradicated	Monitor	-	-
2	Multiple sites in Julian: post office, Porter Lane	Eradicated	Monitor	-	-
3	Toyon Mtn Rd., near Harrison Park	Eradicated	Monitor	-	-
4	Bergman Ranch, Palomar Mountain	14 acres	Treat	Laguna Mtn Skipper	1 Private









## **Elymus caput-medusae (medusahead)**

SD PAF score: 6.1

**Current condition:** This species has a distribution currently limited to the mountainous portions of the County outside of the MSP area. Most populations appear to be of limited size, but additional survey work is needed to fully determine the plant's range. It has the ability to convert grasslands and woodland understory into mono-specific stands of medusahead, creating a thick thatch layer that decomposes slowly and has a high silica content. All known populations are east of the MSP area, but they are expanding and pose a threat. CDFA lists this species as a C-rated noxious weed.

**Rationale:** This species is particularly detrimental as it type converts invaded areas into dense monotypic stands with persistent duff, excluding all other flora and impacting fauna. If this species spreads to other MSP areas it would have significant impacts. Currently it could be competing with Cleveland's horkelia, the host plant for Laguna Mtn skipper, which occurs west and north of site #5. This area is 1 mile from the boundary of MU 5. Sites #3 and #4 are also close to MU 5 (3 mi).

**Management information:** Established populations of this annual grass are difficult to control due to the dense thatch (litter) layer that develops. Seeds are short-lived (1-2 years) and can germinate and grow in the thatch layer. This thatch layer, which excludes other vegetation, often needs to be broken up (mowing, mowing/grazing, plowing/disking and prescribed burning prior to seed set). Chemical application is easier on newer, small populations with a less developed thatch layer. Control is moderately difficult; scattered plants can be difficult to detect when mixed in with other grasses. Long-awned seeds cling to animals, machinery, vehicles, and other dispersal agents and can be transported long distances.

### **Recommendations:**

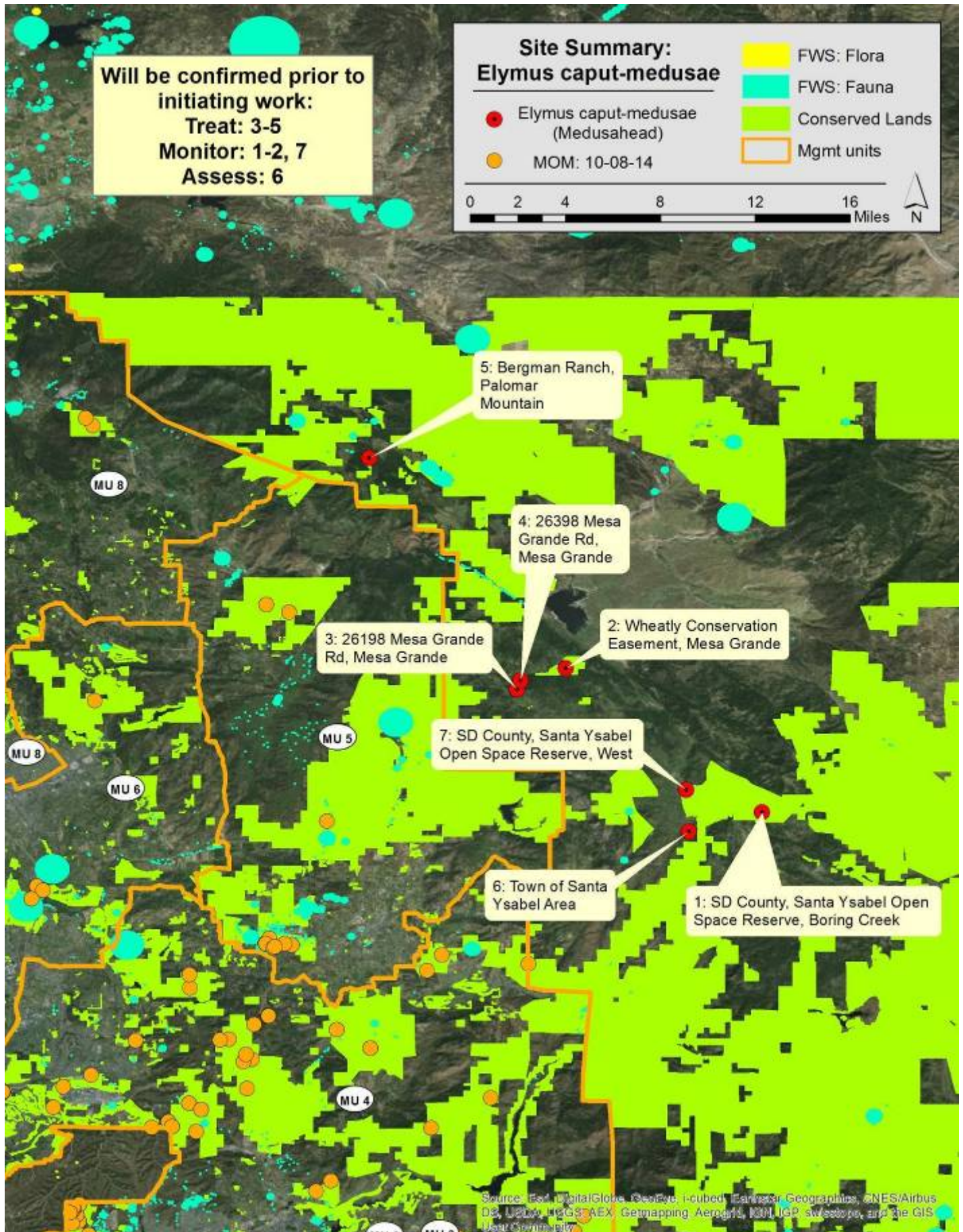
**Regional Priority = Very High; Regional Action = Coordinate; fund management**

- There is active regional interest in controlling/eradicating this species from San Diego County. The EMP program should support this effort.
- Initiate treatment of sites #3, 4, & 5.
- Site #1 & 7 are being treated by AWM with funding support from FWS Partners For Fish and Wildlife program.
- Site #2 is being treated by TNC.
- Site #6, Santa Ysabel, should be assessed to determine extent. Sites #1, 2, and 7 should be monitored to ensure work is occurring.

**Populations of *Elymus caput-medusae* (medusahead)**

#	Location	Size	Action	Sensitive species	Property ownership
1	Santa Ysabel Reserve, Open Space Reserve, East	3 acres	Not treated	-	County of SD
2	Wheatley Conservation Easement, Mesa Grande	5 acres	Since 2011	-	1 Private
3	26198 Mesa Grande Rd, Mesa Grande	~1 acre	Not treated	-	2 Private
4	26398 Mesa Grande Rd, Mesa Grande	~1 acre	Not treated	-	2 Private
5	Bergman Ranch, Palomar Mountain	~10 acres	Not treated	Laguna Mtn Skipper	1 Private
6	Multiple properties around Santa Ysabel	~300 acres?	Not treated	-	Multiple private
7	Santa Ysabel Open Space Reserve, West	~1 acre			County of SD







## ***Enchylaena tomentosa glabra* (Ruby salt bush)**

SD PAF score: NA

*This is new addition to Level 2 Management targets (not reviewed in IPSP 2012)*

**Current condition:** This species is new to the California flora (and likely the US) and was only recently detected and identified (March 2014). There is one large confirmed site in National City that covers many properties and two reported sites (Balboa Park and Lakeside). It is a half-shrub native to Australia (occurs over most of the continent), with the ability to climb and smother vegetation to a height of over several meters. The species is salt tolerant, but does not require saline soils. It is currently found growing in maritime scrub, growing over cholla and jojoba, as well as grassland and landscaped areas. It is a prolific seeder, very drought tolerant, and forms dense monotypic stands of vegetation (all observed at National City site). CDFA lists this species as a Q-rated noxious weed.

**Rationale:** This species is not known to be currently impacting sensitive resources, but it has the potential to cause substantial impacts were it to spread to other portions of the region. Ruby salt bush forms a dense smothering cover that crowds and kills surrounding vegetation (potentially impacting both listed shrubs and herbs). It has the ability to do this in dry conditions and in undisturbed habitat (based on stands in National City). The plant's ability to smother cacti would impact cactus wrens.

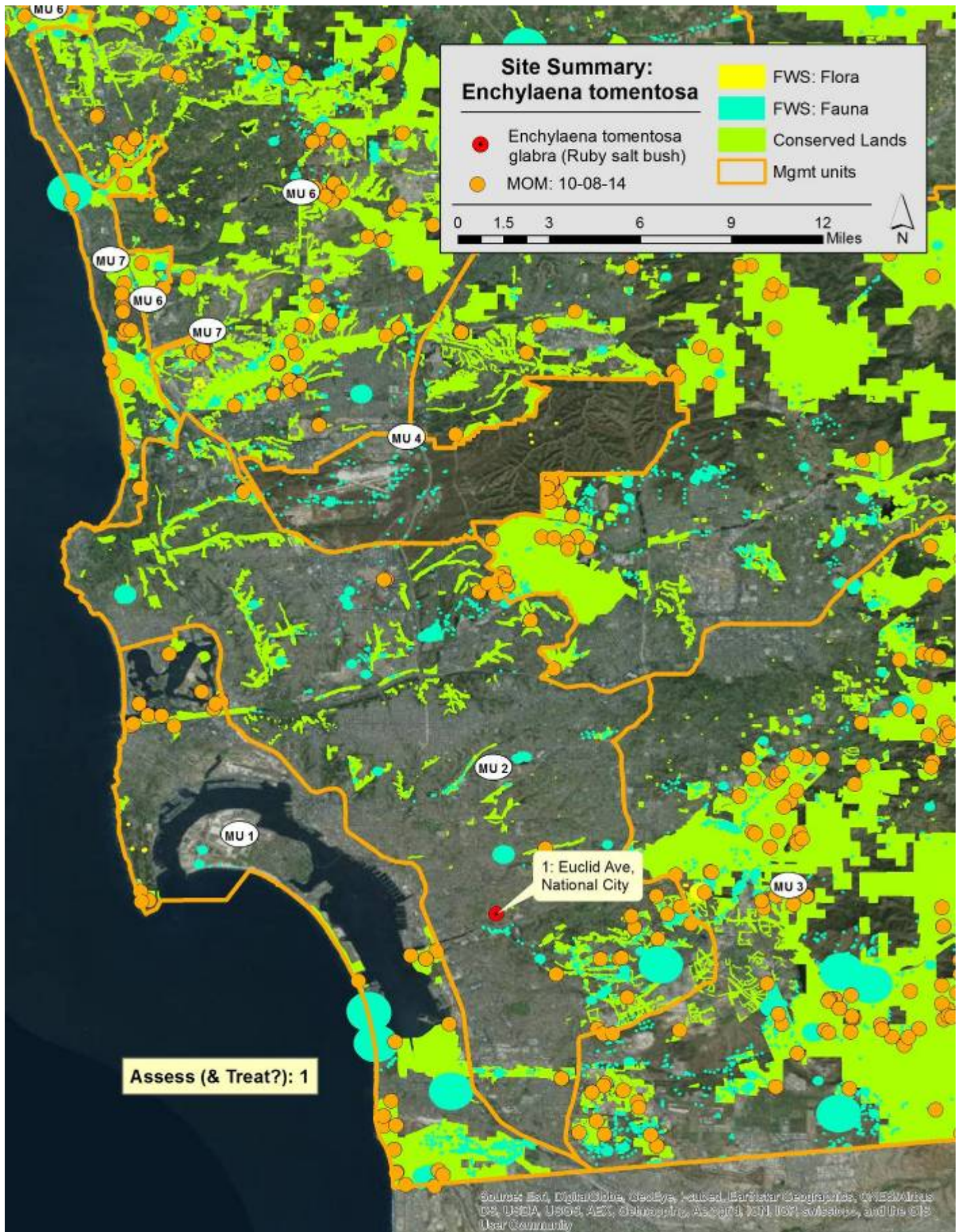
**Management information:** Prolific seed producer (red fruits), which are spread by birds in Australia. Seed probably of moderate longevity (2-4 years). Probably not difficult to control, but biomass may need to be removed in many areas. Plants also intertwined in native woody vegetation and cactus, making work difficult.

**Recommendations:** **Regional Priority = Very High; Regional Action = Coordinate; fund management**

- There is one confirmed location in two canyons in National City. It occurs on 50 private properties and has spread into areas along I-805 (Caltrans).
- Two newly reported sites need to be surveyed (Balboa Park and Lakeside).
- Initiate process of obtaining ROEs. If it appears that a majority of properties are granting access then treatments could be initiated.

### **Populations of *Enchylaena tomentosa glabra* (Ruby salt bush)**

#	Location	Size	Action	Sensitive species	Property ownership
1	Euclid Ave, National City	5 acres	Hold pending size of new reports	-	50 Private, Caltrans
2	Balboa Park area	?	Survey		
3	Lakeside area	?	Survey		







## **Genista monspessulana (French broom)**

SD PAF score: 6.9

**Current condition:** Five populations (sites) in three areas are known in the County (see site summary map). This species has the ability to impact abiotic ecosystem processes (fire), as well as flora and fauna. It invades a broad range of vegetation types in both upland and riparian habitats. In our region it appears to be invading riparian areas as well as adjacent uplands (grassland/scrub). There are multiple points of introduction in California (horticultural) with genetic types from different source regions in the Mediterranean. These types cross with each other, and may outcross with other hybrid species. This creates the potential for a wide range of plant characteristics that may increase wild population invasiveness and impacts. French broom is listed as a C-rated noxious weed by CDFA.

**Rationale:** This species is an aggressive invader in other parts of California. It should be eradicated before it becomes established, particularly in riparian areas where it would disperse downstream making eradication unrealistic. It is acting very invasive at sites #1 (riparian) and #2 (upland/riparian). Site #3 is small and should be eliminated. Sites #4 and 5 are small, but far outside the MSP area. If the County tackles site #5, and if site #4 property owners agree to removal, site #4 could be funded under EMP.

**Management information:** This perennial shrub requires a multi-year commitment to ensure eradication. Monitoring and re-treatments may be required for 10-15 years due to long seed viability. Seed pods burst to eject seed up to 4 meters from the parent plant and longer-distance dispersal may occur via water, soil movement, and animals. Individual plants are moderately difficult to control with herbicide, and re-sprouting may occur. Plants have low leaf area for translocation of herbicide, and young plants have thin stems, making cutting stem and basal bark applications of herbicide challenging. Small plants may be pulled depending on soil conditions.

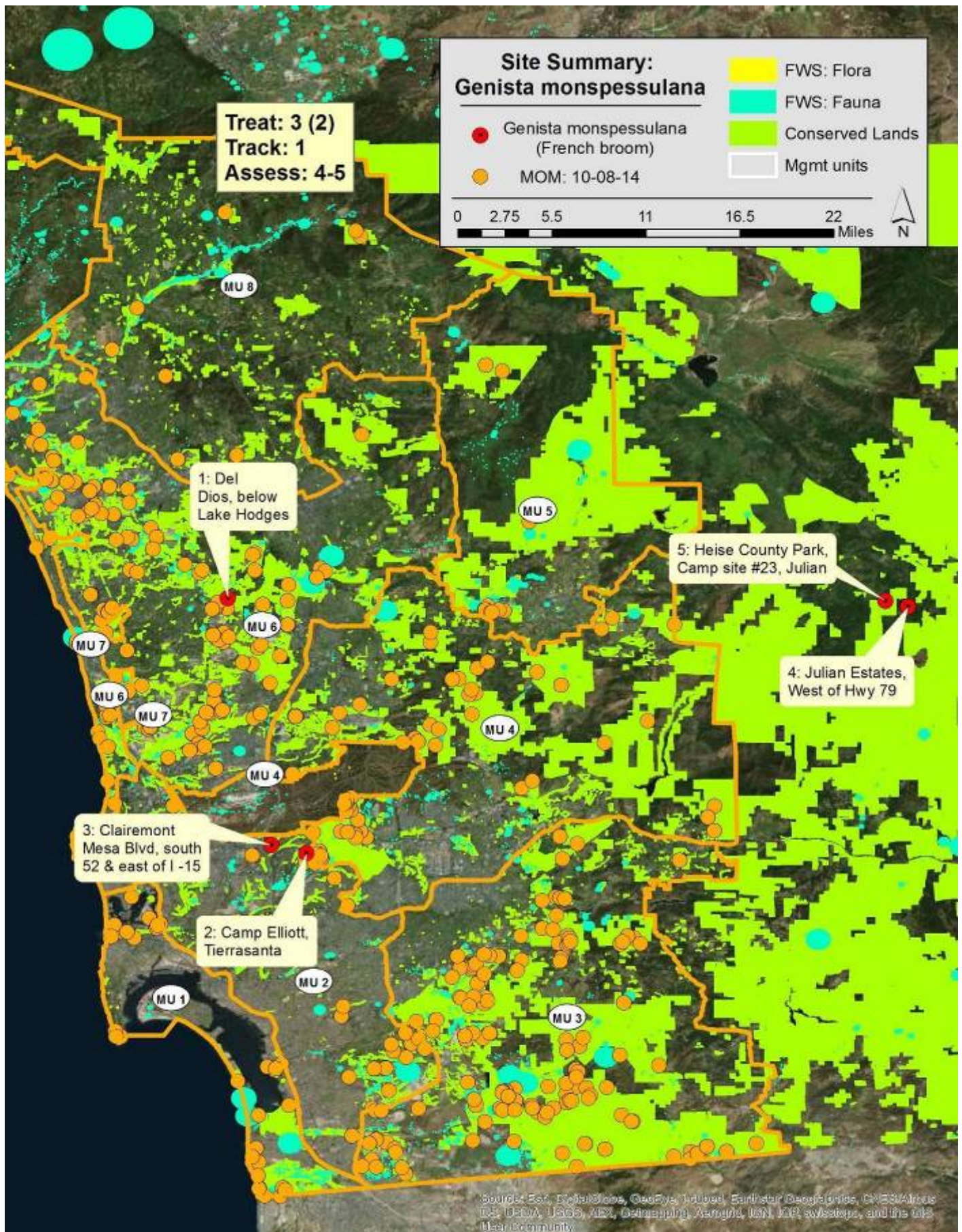
**Recommendations: Regional Priority = Very High; Regional Action = Fund management**

- Treat site #3.
- Assist in treating site #2 (if needed, treated by City contractor).
- Monitor site #1 (Rincon Env. under contract with Crosby Estates, conserved land), assess if effort is thorough enough. Consider additional AWM treatments of area, if appropriate.
- Co-ordinate with County Parks to see if Site #5 can be controlled by them (Heise Park, in campground).
- Assess site #4: size of effort, property owner receptivity.

### **Populations of *Genista monspessulana* (French broom)**

#	Location	Size	Action	Sensitive species	Property ownership
1	Del Dios, Crosby Estates, San Dieguito River	~ 1 mile of river	Monitor	-	Conserved land, Crosby Estats
2	Near Camp Elliott, Tierrasanta	Scattered over ~150 acres, ~3,000 plants	Assess and treat if needed	-	City of San Diego
3	Clairemont Mesa Blvd, Tierrasanta	<1 acre, 25 plants along road	Treat	-	City of San Diego
4	Julian Estates, west of Hwy 79, Julian	~10 acres	Assess	-	Private
5	Heise County Park, , Julian	<10 acres, 3,000-5,000 plants	Assess	-	San Diego County Parks



















## **Hypericum canariense (Canary Island St. John's wort)**

SD PAF score: 5.9

**Current condition:** This species has invaded twelve sites within the County, but is limited in distribution (see site summary map). It typically invades coastal scrub and grassland habitats, forming dense stands over time. Although abiotic impacts have not yet been documented, this species alters vegetation structure and displaces native species. The species is a growing problem in many coastal portions of the State, and is considered highly invasive. There has been a concerted effort by the DoD and some regional land managers to control this species.

**Rationale:** This species has had limited impacts to date on MSP areas, but it has the potential to spread and become a serious invader. Impacts to resources may have been occurring on DoD lands, but they have nearly eliminated the species (Miramar and Point Loma). EMP funding support should allow eradication of the species, which will compliment work by the City of San Diego and the DoD. Many of the sites are on or adjacent to conserved lands (see site maps).

**Management information:** This perennial woody shrub produces a large quantity of seed that could be viable up to 5 years. It is primarily gravity-dispersed, but long distance dispersal occurs via vehicles and human activities, and along drainages. Plants are moderately difficult to control, with re-sprouting observed. Control of the seed bank and re-sprouting adults will require an effort >5 years in duration.

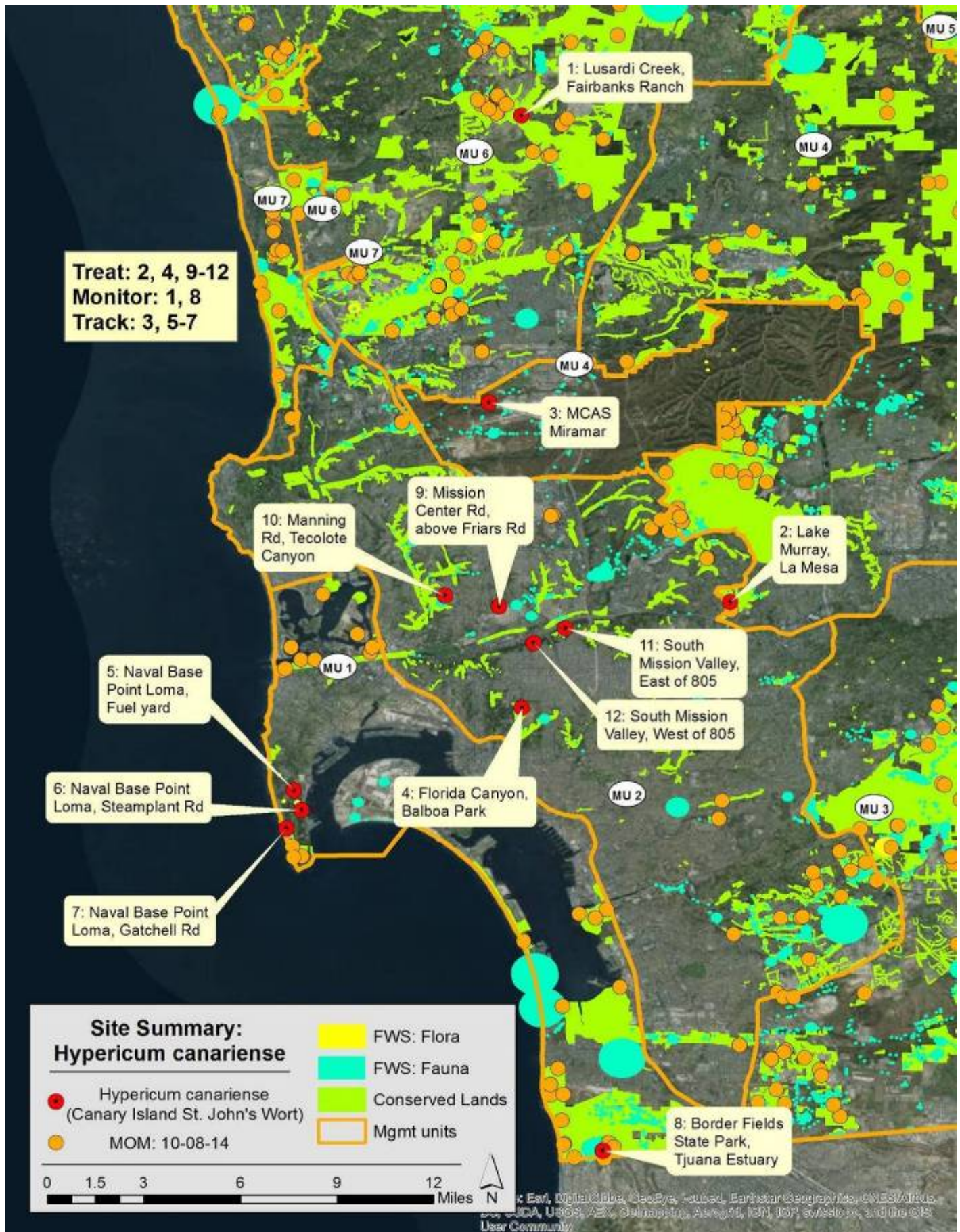
**Recommendations: Regional Priority = High; Regional Action = Fund management**

- Treat sites #2, 4, 9-12.
- Sites #2, 9, 11 and 12 will all require biomass removal/reduction. All these sites are also entirely or partially on private property (typically steep canyon open space, some of it conserved).
- Site #4 in Balboa Park has already had extensive work (biomass removal). AWM crews can assist in treatments of all areas within Florida Canyon to ensure the species is not just managed, but eradicated.
- Site #10 in Tecolote Canyon, has already had biomass reduction (coordinated by AWM) and Park staff will carry out re-treatments. AWM crews can assist in treatments of all areas within Tecolote Canyon to ensure the species is not just managed, but eradicated.
- Track DoD sites #3, 5-7 and monitor State Park site #8 to ensure work is occurring and that it is complete.

**Populations of *Hypericum canariense* (Canary Island St. John's wort)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	Lusardi Creek, Fairbanks Ranch	200 acre area, mostly seedlings	Monitor	-	Conserved lands
2	Lake Murray, La Mesa:	1.8 acres, 3,000-5,000 plants	Treat	Variegate dudleya (DUVAR)	City of SD, 2 Private
3	MCAS Miramar	Eradicated	Track	-	DoD
4	Florida Canyon, Balboa Park	3.8 acres, 3,000-5,000 plants	Treat	CAGN	City of SD
5	Naval Base Point Loma Fuel Yard	1 acre	Track	-	DoD
6	Naval Base Point Loma, Steam Plant Rd	1 acre	Track	-	DoD
7	Naval Base Point Loma, Loma Gatchell Rd.	1 acre	Track	-	DoD
8	Borderfield State Parks	<1 acre, 50 plants	Track	-	State Parks
9	Mission Center Rd. above Friars Rd., North Mission Valley	0.6 acres, 1,000-3,000 plants	Treat	-	1 Private
10	Manning St, Tecolote Canyon	2.0 acres, 5,000-10,000 plants	Treat	CAGN	City of SD
11	South Mission Valley, East of 805	0.6 acres, 1,000-3,000 plants	Treat	-	4 Private
12	South Mission Valley, West of 805	0.1 acres, 500 plants	Treat	-	1 Private





















## **Iris pseudacorus (yellow flag iris)**

SD PAF score: 5.6

**Current condition:** This species is scattered across the region, with at least nine occurrences, but surveying is detecting more (see summary map). Surveying is being carried out and detailed site maps will be provided when completed. It is restricted to freshwater wetlands, although it can potentially occur in alkaline/brackish marsh. It invades wet riparian areas, marshes, pond edges and other saturated wetland areas. The species forms dense monotypic stands, excluding other wetland vegetation. Most sites in the region are very small, but an older stand, near Guajome County Park (Oceanside), is extensive and dense, indicating that the species has the ability to cause impacts in our region. Yellow flag iris is listed as a C-rated noxious weed by CDFA.

**Rationale:** This species is not currently impacting any known sensitive species, but its ability to form dense stands could impact freshwater wetlands, which are a scarce resource. Eliminating the species from multiple watersheds, if not the region, would be cost effective at this point. If the plant spreads, difficulty of access and treatments would quickly make control unfeasible.

**Management information:** This perennial herb typically occurs in dense vegetation in wet areas and edges of open water, which can make detection, treatment, and access difficult. It is most easily detectable when flowering due to the fairly large, bright yellow flowers. It disperses by seed and rhizome fragments. Seeds remain viable in soil for >3 years, and rhizomes can persist for 10 years. Seeds can remain viable after floating in seawater for 31 days, so can spread via fresh or saltwater. Once plants are found and accessed, treatments are typically effective and of short duration (~3 years).

**Recommendations: Regional Priority = High; Regional Action = Fund management**

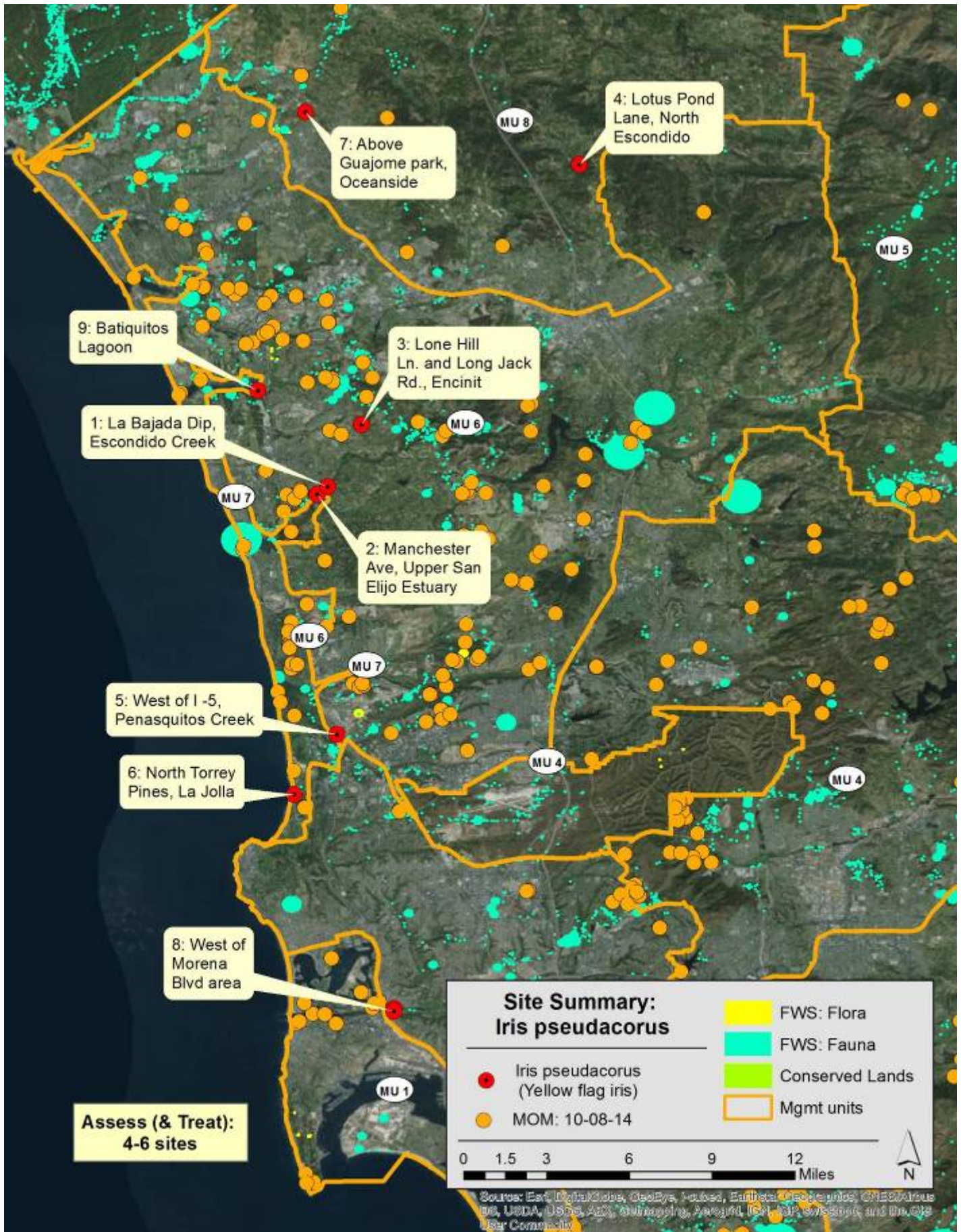
- Finish surveying (supported through Coastal Conservancy Wetlands Recovery Project (WRP) grant to Cal-IPC).
- If surveying indicates that the species is limited and treatable, initiate treatments on sites.
- WRP Grant will also fund initial treatments on selected sites (2015).
- Significant opportunity for coordination and leveraging exist for work on this species: CDFW and SELC both work on this species, State Parks can be coordinated with for population at Torrey Pines, and SDRF/SDRC (who helped locate San Diego River population) may be able to help control and monitor their populations.

## **Populations of *Iris pseudacorus* (yellow flag iris)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	La Bajada, Escondido Creek, Encinitas	1.5 miles, <1 acre	Treat	Maps will be provided when surveying completed	Assessing
2	4289,4269,4261,&4257 Manchester Av, Escondido Crk	50 plants	Treat	Same as above	Assessing
3	Corner of Lone Hill Lane and Long Jack Rd., Encinitas	25 plants	Treat	Same as above	Assessing
4	Lotus Pond Lane, north Escondido	30 plants	Treat	Same as above	Assessing
5	West of I-5, Los Peñasquitos Canyon	8 plants, plus new areas	Treat	Same as above	Assessing
6	North Torrey Pines, UCSD Reserve, La Jolla	8 plants	Treat	Same as above	Assessing



#	Location	Size	Action	Sensitive Species	Property ownership
7	Above Guajome County Park, Oceanside	0.5 ac, 5,000 plants	Treat	Same as above	Assessing
8	San Diego River	0.1 ac, 1,000 plants	Treat	Same as above	Assessing
9	Batiquitos Lagoon	50 plants	Treat	Same as above	Assessing





## **Limonium duriusculum (European sea lavender)**

SD PAF score = NA

*This is a new addition to Level 2 Management targets (not reviewed in the IPSP 2012)*

**Current condition:** There are four non-native species of *Limonium* that are invading wildlands. This species, European sea lavender, is the least common, occurring at only 4 known locations, although surveying is still underway using WRP grant funding (see site summary map). Surveying is being carried out and detailed site maps will be provided when completed. This species, and Algerian sea lavender (examined next), are invading estuary habitat. This includes low marsh areas in the tidal zone right up to where cordgrass grows. Salt marshes are typically considered 'resistant' to invasion, but this species grows with pickleweed, *Frankenia salina*, *Batis maritima*, *Distichlis spicata* and *Monanthochloe littoralis*. European sea lavender forms dense mounds of basal leaves up to 30 cm wide and tall. The mounds can grow edge to edge excluding all other vegetation at older sites. The San Diego River is the oldest, most invaded site encountered. The species is also expanding in other portions of the State, including the Bay area, where surveying and control are occurring. Both Algerian and European sea lavender coexist in the Bay area, but have not been found together in San Diego to date. They are very similar in habitat preference, and similar in stature, except European forms smaller mounds and has shorter more rounded leaves.

**Rationale:** The San Diego River infestation (site #1) is extensive and is directly impacting salt marsh birds beak (*Chloropyron maritimum*), and is adjacent to populations of Nuttall's lotus (*Acmispon prostrate*; NULO), and coast cotton-heads (*Nemacaulus denudata*; COCH). Several listed birds are estuary obligates including: light footed clapper rail, Belding's savannah sparrow, snowy plover, and California least tern. These avian species are less common at San Diego River, but core populations are found at the other three sites: San Elijo, San Dieguito, and Chula Vista (upon completion of *Limonium* surveying detailed maps will be provided). Sites #2-4 should be treated and site #1 should be worked on in partnership with SDRF and FWS.

**Management information:** European sea lavender is being controlled in the Bay area.

**Recommendations: Regional Priority = Very High; Regional Action = Fund management**

- Treat sites #2-4. All sites are small: hand pull all plants and repeat the following year.
- Treat portions of site #1. Develop a treatment plan with FWS and SDRF, who have been testing control methods (solar, hand, and scraping). Areas outside bird's beak populations should be considered for chemical application (CDFW has been testing treatments on *L. ramosissimum*). At minimum control (hand pull) outliers to spatially reduce extent of population. Maps will be provided when survey/mapping is completed for the species.

## **Limonium duriusculum (European sea lavender)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	San Diego River	4 acres, dense	Treat	NULO, COCH Maps will be provided when survey completed	USFWS
2	San Elijo Lagoon, West Basin	<100 plants	Treat	Same as above	CDFW
3	Crest Reserve, Del Mar	<50 plants	Treat	Same as above	City SD
4	Chula Vista	50 plants?	Treat	Same as above	USFWS





## **Limonium ramosissimum (Algerian sea lavender)**

SD PAF score = NA

*This is a new addition to Level 2 Management targets (not reviewed in the IPSP 2012)*

**Current condition:** There are four non-native species of *Limonium* that are invading wildlands. This species, Algerian sea lavender, is the second least common, occurring at only 6 known locations, although surveying is still underway using WRP grant funding (see site summary map). Surveying is being carried out and detailed site maps will be provided when completed. This species, and European sea lavender (examined previously), are invading estuary habitat. This includes low marsh areas in the tidal zone right up to where cordgrass grows. Salt marshes are typically considered 'resistant' to invasion, but this species grows with pickle weed, *Frankenia salina*, *Batis maritima*, *Distichlis spicata* and *Monanthochloe littoralis*. Algerian sea lavender forms dense mounds of basal leaves up to 30 cm wide and tall. The mounds can grow edge to edge excluding all other vegetation at older sites. Agua Hedionda is the oldest most invaded site encountered. The species is also expanding in other portions of the State including the Bay area, where surveying and control are occurring. Both Algerian and European sea lavender coexist in the Bay area, which has not been observed here in San Diego yet. They are very similar in habitat preference, and similar in stature, except Algerian forms larger mounds and has more linear pointed leaves.

**Rationale:** The Agua Hedionda site (site #1, 15 acres) is extensive and quite old. Several listed birds are estuary obligates including: light footed clapper rail, Belding's savannah sparrow, snowy plover, and California least tern. These avian species are less common at San Diego River, but core populations are found at the other three sites: San Elijo, San Dieguito, and Tijuana Estuary (upon completion of *Limonium* surveying detailed maps will be provided). Sites #2-4 should be treated and site #1 should be worked on in partnership with SDRF and FWS. Batiquitos Lagoon (site #2) has infestations on artificial tern breeding areas on the northeast shore. Plants could have invaded these areas naturally, been introduced from Agua Hedionda, or been brought with contaminated sandy substrate.

**Management information:** Algerian sea lavender is being controlled by CDFW in Agua Hedionda and Batiquitos Lagoons. We will coordinate to see what treatment methods have proven most effective.

### **Recommendations: Regional Priority = Very High; Regional Action = Fund management**

- Treat sites #2-7. All sites are small, so hand pull all plants and repeat the following year. Sites #3-5 still need surveying, which will be completed with WRP funding. No estuary systems should be allowed to become as invaded as Agua Hedionda Lagoon.
- Treat portions of site #1. CDFW is working on their lands. They have not secured permission for work on the southern half of the lagoon. This SDG&E property should be treated if CDFW is able to initiate work on all of their lands (by contracting with outside treatment crews). This site may be too large to tackle, but it should be attempted.
- Track and possibly assist (monitor) Camp Pendleton populations (#9). They may need assistance differentiating between European and Algerian lavender. They should initiate a control program.
- Maps will be provided when survey/mapping is completed for the species.

**Limonium ramosissimum (Algerian sea lavender)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	Agua Hedionda Lagoon	15 acres, dense	Treat part	Maps will be provided when survey completed	CDFW & SDG&E
2	Batiquitos Lagoon	0.2 acres, 1,000 plants	Treat	Same as above	CDFW
3	San Elijo Lagoon (need to re-survey)	?, likely few	Treat	Same as above	City SD
4	Torrey Pines (need to re-survey)	?, likely few	Treat	Same as above	USFWS
5	Tijuana Eestuary (need to re-survey)	?	Treat	Same as above	USFWS
6	Upper Otay need to re-survey)	?, likely few		Same as above	
7	Forester Creek, Upper San Diego River	25 plants	Treat	Same as above	?
8	Camp Pendleton	Multiple sites	Track	Same as above	DoD











## **Lythrum salicaria (purple loosestrife)**

SD PAF score = 8.1

**Current condition:** There are two populations of this plant in the San Diego Region, both on Escondido Creek (see site summary map). Purple loosestrife has impacted both abiotic ecosystem processes and flora and fauna in other parts of the U.S., and may exert similar impacts in the region. It occurs in fresh and brackish water wetlands and has the potential to impact NCCP covered species. This species is listed as a B-rated Noxious Weed by CDFA.

**Rationale:** This species is highly invasive and difficult to control (see below). Riparian areas are a valuable resource in the MSP area that would be significantly degraded if this plant were more widespread. SELC has worked on site #2 (a large infestation in the creek) for a number of years (see site map). AWM has worked on part of Site #1 (two small infestations) in the past.

**Management information:** This perennial herb requires a multi-year commitment to ensure eradication. It can produce up to 2 million seeds per plant, and seeds are viable for 3 or more years. Seeds are primarily wind-dispersed. Seeds and plant fragments can also disperse by water and animals and new plants can generate from these fragments. Once seed has dispersed into riparian areas, the entire corridor must be searched for plants. Plants grow in dense, emergent vegetation and can be difficult to see; thus, this species is most readily detected when flowering. Individual plants are not difficult to control with herbicide or hand removal in spring.

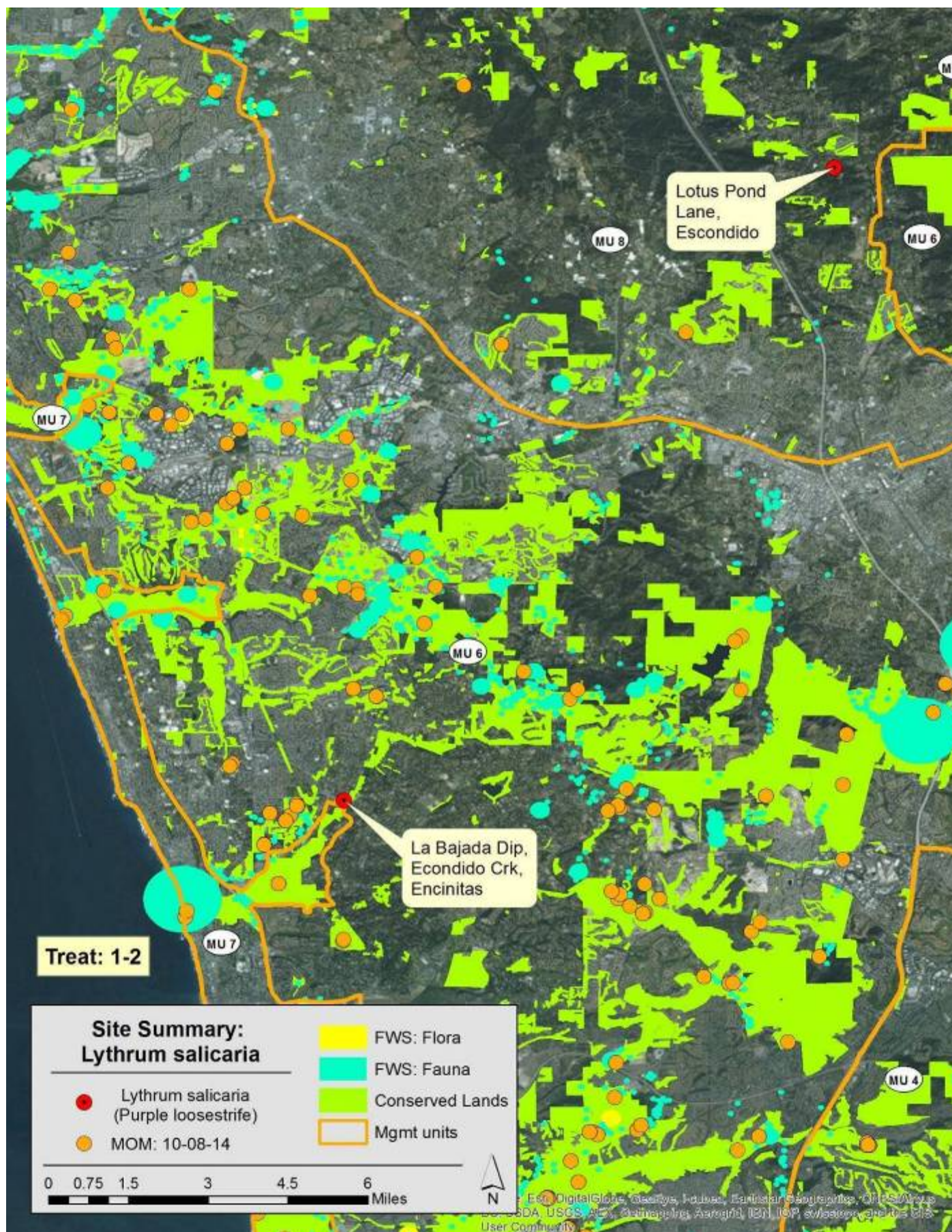
**Recommendations: Regional Priority = Very High; Regional Action = Fund management**

- Treat site #1. AWM will attempt to work on all three parts of this site. There are four private properties. Three granted permission in the past. Hand pulling was used at one property at the request of the property owner.
- Treat site #2. SELC has worked for several years on this site and AWM worked on selected properties. There are 36 property owners, SELC has ROEs with most/all. AWM will coordinate with SELC to carryout multiple rounds of control on this site each year.

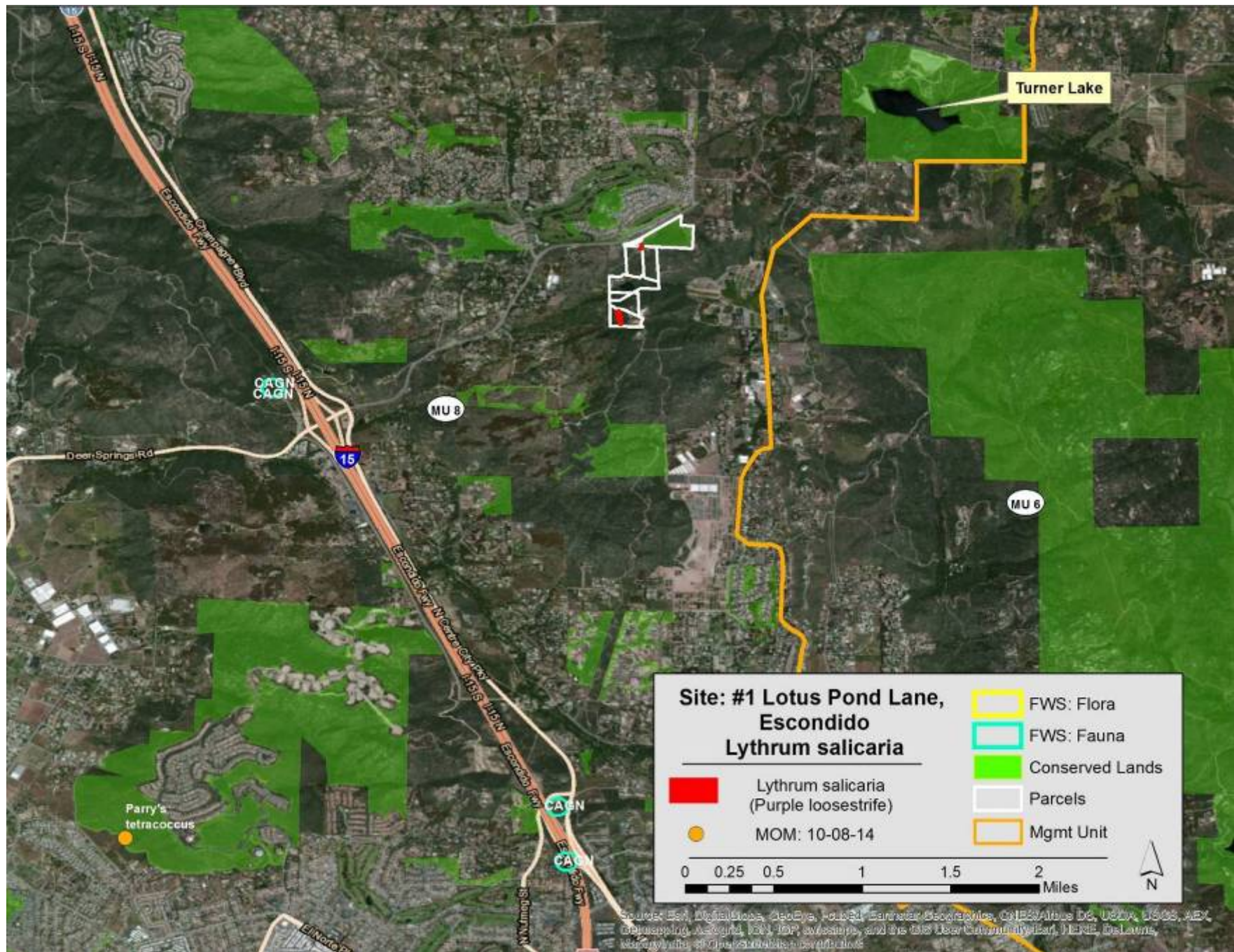
### **Populations of *Lythrum salicaria* (purple loosestrife)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	Lotus Pond Lane, Reidy Creek, Escondido	<1 ac, 3 ponds	Treat	-	4 Private
2	La Bajada, Escondido Creek, Encinitas	1.5 miles, <2 acres	Treat	-	36 Private

SELC = San Elijo Lagoon Conservancy













## **Retama monosperma (bridal broom)**

SD PAF score: 6.4

**Current condition:** This species occurs in North County at several locations (see site summary map). Three of the populations are true wild populations (#2, 3 and 5). All others were old production groves (flower industry) that should be monitored for signs of invasiveness. This species can be aggressively invasive, as seen on the Fallbrook Naval Weapons Station where a large 1,000 acre invasion occurred that was considered a threat to the federally endangered Stephen's kangaroo rat (SKR) and federally threatened California gnatcatcher (Jacobsen 2000). This population, site #5, has been drastically reduced in size. Bridal broom impacts flora and fauna in grassland and scrub habitats. Site #1 (old grove) should be closely monitored as it is directly adjacent to the Groves mitigation site in Bonsall, where it has the potential to spread and impact a large population of *Ambrosia pumila*, as both species grow in sparsely vegetated areas with compacted soils. Bridal broom is listed as a B-rated noxious weed by CDFA.

**Rationale:** The species directly impacts a number of listed species in coastal sage scrub (SKR and CAGN), and would likely impact *Ambrosia pumila*, as noted above. Sites #2 and 3 are in close proximity to the Weapons Station and are actively reproducing - these should be controlled to assist the Weapons Station in eliminating this plant. Sites #1, 4, & 6 do not currently seem to be spreading but they should be monitored to ensure they do not become invasive (this may be occurring when plants become self-compatible, according to Dean Keltch, CDFA).

**Management information:** This large perennial shrub requires a multi-year commitment to ensure eradication. Monitoring and re-treatments may require up to 15 years due to long seed viability. Individual plants are moderately difficult to control with herbicide, and re-sprouting may occur. Seeds are gravity-dispersed, but long-distance dispersal occurs via animals, which can carry seed a significant distance from the parent plant.

**Recommendations: Regional Priority = Very High; Regional Action = Fund management**

- Treat sites #2 and 3.
- Track site #5 (Fallbrook Weapons Station).
- Monitor sites #1, 4, and 6 to ensure non-invasiveness. Site # 1 could be considered for proactive control given its close proximity to valuable conserved lands.

### **Populations of *Retama monosperma* (bridal broom)**

#	Location	Size	Action	Sensitive Species	Property ownership
1	Adjacent to the Groves mitigation site, Bonsall.	~4 acres	Monitor	<i>Ambrosia pumila</i>	1 Private
2	Olive Hill Rd., east of Fallbrook NWS	1.0 acre, 500 scattered plants, seed bank well developed.	Treat	CAGN, SKR (data not shown on map)	3 Private
3	Creek View Lane (off Stage Coach Rd), Fallbrook.	1 plant	Treat	-	1 Private
4	Circle R Drive, Castle Creek	1 acre	Monitor	-	1 Private
5	Fallbrook NWS	500 acres, scattered	Track	CAGN, SKR (data not shown on map)	DoD

DOD = Department of Defense

