

Mission Canyon Biodiversity Project

Preliminary Invasive Species Survey Report

September 2021



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Introduction

The Mission Canyon Biodiversity Project is focused on the removal of invasive species and re-establishment of native species, particularly those native species that have been extirpated from the Mission Creek watershed. The project commences at the headwaters of Mission Creek and will progress downstream as funding allows. The Project may include restoration efforts to increase slope stability, improve water quality, and provide improved habitat and reduce invasive species spreading along trails and roadways within the Mission Creek watershed.

This report summarizes the findings regarding invasive species in the Mission Canyon Watershed following initial surveys in 2021.

Methods

Data collection

Surveys were primarily conducted by Santa Barbara Botanic Garden (the Garden) staff members Kylie Etter, Matt Williams, Caitlin Hazelquist, Kristen Lehman, Josie Lesage, and Isabel Rivera between March 27 and August 26, 2021. Tunnel trail was surveyed by Koby Bench, Kathy Castaneda, Josie Lesage, Scot Pipkin, and Jason Nelson. We surveyed accessible trails, roads, and creek beds in the Mission Canyon watershed. We did not survey in a small number of inaccessible reaches of the creek. Data were collected in iNaturalist using smartphones (<https://www.inaturalist.org/projects/mission-canyon-biodiversity>).

Surveys focused on invasive species that have been identified by the California Department of Food and Agriculture (CDFA) or California Invasive Plant Council (Cal-IPC) as high-impact or high-risk species. This included all CDFA A- and B-rated weeds, as well as Cal-IPC high or moderate impact species that have been recorded regionally in the past (Appendix A). Staff also collected observations for some non-native species that were not on this list but were of interest for other reasons.

Additional data about weeds known to occur on the Garden grounds were provided by Horticulture staff during a workshop held on August 12, 2021. These data were added as polygons to a map of the Garden based on staff knowledge and experience.

Data Analysis

To prioritize populations of invasive species for removal, we used WHIPPET (Weed Heuristics: Invasive Population Prioritization for Eradication Tool), a prioritization modelling tool developed by CDFA and Gina Darin¹. WHIPPET combines information about population locations, species invasiveness and impact, habitat quality, and landscape vectors for invasion (roads, trails, and streams) to rank occurrences and help land managers prioritize their control efforts. Species rankings are based on three categories: the species impacts on the environment, the invasiveness of the species, and the feasibility of species removal. Species with higher impacts, lower invasiveness, and those that are easier to remove are given higher scores.

Though we collected data on many weeds, we included only a subset of species in the WHIPPET model, based on the likelihood that they could be eradicated from the entire watershed, how

widespread they are throughout the greater Santa Barbara region, and how severe their effects of native habitat are. We did not include polygon data from the August 12th weed workshop in this run of the WHIPPET model.

We customized the WHIPPET model for the Mission Canyon watershed by generating locally appropriate habitat value and weed dispersal vector layers. Our habitat value layer was created by adding increased habitat values to areas directly along creekbeds and within 50 feet of known rare plant locations. Our vectors for dispersal were major roads, SCE catways, trails, and the creeks in the Mission Canyon watershed. We prepared the data for the WHIPPET model in ArcGIS Pro 2.8.3 and ran the model toolboxes in ArcMap 10.8.1.

Results

Survey of invasive species

Staff recorded a total of 229 occurrences of 39 non-native species in iNaturalist (Table 1). Due to SCE roadside weeding efforts and 2020's low rainfall, we were unable to capture data for several known populations. We added these data using historical records already on iNaturalist. Invasive species were generally more common lower in the watershed (Figure 1).

Table 1. Non-native species recorded in the survey of the Mission Canyon watershed. Species included in the WHIPPET model are marked with an asterisk (*).

Scientific Name	Common Name	Number of Occurrences
<i>Centaurea melitensis</i> *	Maltese star-thistle	63
<i>Ageratina adenophora</i> *	Sticky snakeroot, croftonweed	44
<i>Foeniculum vulgare</i> *	Fennel	24
<i>Oloptum millaceum</i>	Smilo grass	15
<i>Ficus carica</i> *	Common fig	10
<i>Delairea odorata</i> *	Cape ivy	8
<i>Cortaderia selloana</i> *	Pampasgrass	7
<i>Marrubium vulgare</i>	White horehound	6
<i>Urospermum picroides</i>	False hawkbit	6
<i>Genista monspessulana</i> *	French broom	5
<i>Acacia mearnsii</i> *	Black wattle	4
<i>Cenchrus setaceus</i> *	Fountain grass	4
<i>Hedera helix</i> *	English ivy	4
<i>Olea europaea</i> *	Olive	4
<i>Bromus diandrus</i>	Ripgut brome	3
<i>Centaurea solstitialis</i> *	Yellow star-thistle	3
<i>Echium candicans</i> *	Pride of Madeira	3
<i>Euphorbia terracina</i> *	Geraldton carnation weed	3
<i>Hirschfeldia incana</i>	Shortpod mustard	3

Scientific Name	Common Name	Number of Occurrences
<i>Ricinus communis</i> *	Castor bean	3
<i>Bromus rubens</i>	Red brome	2
<i>Oxalis pes-caprae</i>	Sourgrass	2
<i>Plantago lanceolata</i>	Ribwort plaintain	2
<i>Vinca major</i> *	Periwinkle	2
<i>Cenchrus clandestinus</i> *	Kikuyugrass	1
<i>Cirsium vulgare</i>	Bull thistle	1
<i>Eucalyptus globulus</i>	Blue gum eucalyptus	1
<i>Myoporum laetum</i> *	Ngaio	1
<i>Nicotiana glauca</i>	Tree tobacco	1
<i>Opuntia ficus-indica</i>	Indian fig opuntia	1
<i>Pelargonium peltatum</i>	Ivy geranium	1
<i>Phalaris aquatica</i>	Harding grass	1
<i>Phoenix dactylifera</i>	Date palm	1
<i>Pteris cretica</i>	Cretan brake	1
<i>Pyracantha/Cotoneaster</i> *	Firethorn/Cotoneaster	1
<i>Schinus mole</i> *	Peruvian pepper tree	1
<i>Silybum marianum</i>	Milk thistle	1
<i>Sisymbrium officinale</i>	Hedge mustard	1
<i>Veronica anagallis-arvensis</i>	Blue water-speedwell	1

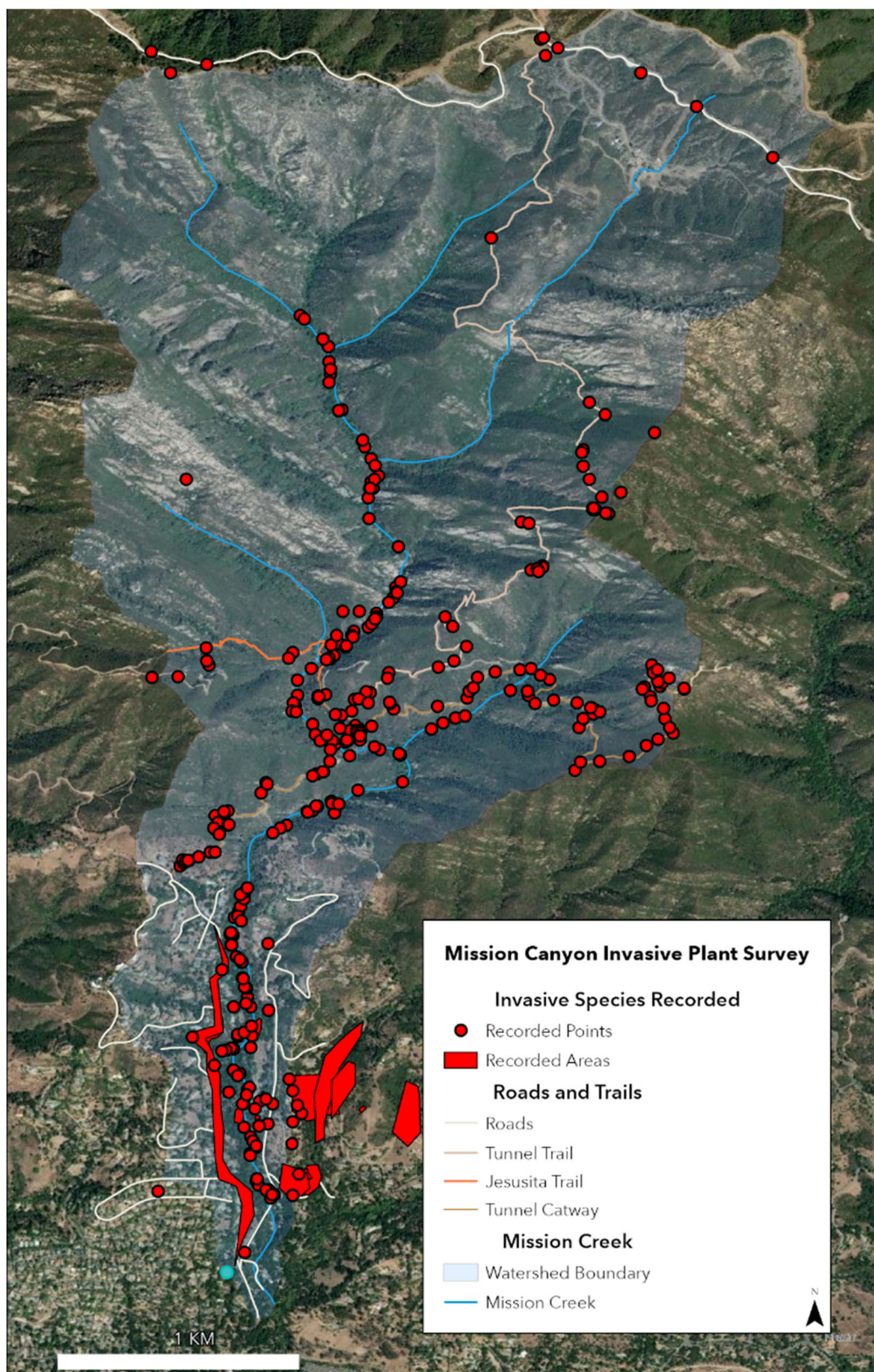


Figure 1. Map of the Mission Canyon watershed showing the locations of all non-native species recorded.

Survey of rare species

Staff recorded 44 occurrences of 7 rare or uncommon species (Table 2). These locations are shown as yellow stars in maps and helped to determine where invasive species removal could be more impactful.

Table 2. Rare and uncommon species recorded in the survey of the Mission Canyon watershed.

Scientific Name	Common Name	CNPS Rank	Occurrences mapped
<i>Quercus dumosa</i>	Nuttall's scrub oak	1B.1	5
<i>Lonicera subspicata</i> var. <i>subspicata</i>	Santa Barbara honeysuckle	1B.2	13
<i>Thelypteris puberula</i> var. <i>sonorensis</i>	Sonoran maiden fern	2B.2	14
<i>Lilium humboldtii</i> subsp. <i>ocellatum</i>	Ocellated Humboldt's lily	4.2	3
<i>Juglans californica</i>	Southern California walnut	4.2	1
<i>Galium cliftonsmithii</i>	Santa Barbara bedstraw	4.3	4
<i>Epipactis gigantea</i>	Giant stream orchid	-	4

WHIPPET Model Results

We analyzed 20 of the 39 non-native species mapped in the WHIPPET model. Occurrence scores ranged from 3.00 to 6.56, with an overall mean score of 4.68. The highest scoring occurrence of any weed was a small patch of *Hedera* above Garden property, while the lowest scoring occurrences were the *Euphorbia terracina* at the Tunnel Trail-SCE Catway junction (Figure 2, Table 3). When occurrence scores were averaged by species, *Cortaderia selloana* was the highest scoring species, and *Euphorbia terracina* was the lowest scoring (Table 4). In the remainder of this report, we describe occurrences of the high-scoring species and occurrences that were identified by WHIPPET, and provide details about the possible costs, concerns, and other considerations associated with their removal.

We do not explore in detail several species which are widespread in Mission Canyon and throughout the region, though these many still cause ecological harm. These include *Ageratina adenophora*, *Centaurea melitensis*, *C. solstitialis*, *Foeniculum vulgare*, and *Ricinus communis*. These species are common locally, and though there is no doubt that they compete with native vegetation for resources, our time and energy may be better spent on the removal of less common species and those that are less likely to reinvade following control efforts.

Table 3. The 17 highest scoring occurrences of invasive plants in the Mission Canyon watershed according to the WHIPPET model.

Population ID	Scientific Name	Common Name	WHIPPET Score
236	<i>Hedera helix</i>	English Ivy	6.56
166	<i>Ficus carica</i>	Common fig	6.51
197	<i>Ficus carica</i>	Common fig	6.51

238	<i>Cenchrus setaceus</i>	Fountain grass	6.11
240	<i>Olea europaea</i>	European olive	6.10
221	<i>Cortaderia selloana</i>	Pampasgrass	5.87
225	<i>Cortaderia selloana</i>	Pampasgrass	5.87
161	<i>Ficus carica</i>	Common fig	5.85
177	<i>Acacia mearnsii</i>	Black wattle	5.85
147	<i>Cortaderia selloana</i>	Pampasgrass	5.81
148	<i>Cortaderia selloana</i>	Pampasgrass	5.81
149	<i>Cortaderia selloana</i>	Pampasgrass	5.81
162	<i>Echium candicans</i>	Pride of Madeira	5.75
239	<i>Echium candicans</i>	Pride of Madeira	5.75
228	<i>Delairea odorata</i>	Cape ivy	5.67
110	<i>Delairea odorata</i>	Cape ivy	5.62
230	<i>Delairea odorata</i>	Cape ivy	5.62

Table 4. The average scores of invasive species included in the Mission Canyon WHIPPET model.

Rank	Scientific name	Common name	Average WHIPPET Score
1	<i>Cortaderia selloana</i>	Pampasgrass	5.68
2	<i>Delairea odorata</i>	Cape ivy	5.28
3	<i>Ficus carica</i>	Common fig	5.19
4	<i>Genista monspessulana</i>	French broom	5.13
5	<i>Hedera helix</i>	English ivy	5.12
6	<i>Pittosporum undulatum</i>	Sweet pittosporum	5.11
	<i>Foeniculum vulgare</i>	Fennel	5.04
	<i>Centaurea melitensis</i>	Maltese star-thistle	4.97
7	<i>Echium candicans</i>	Pride-of-Madeira	4.81
8	<i>Pyracantha/Cotoneaster</i>	Firethorn/Cotoneaster	4.76
9	<i>Cenchrus clandestinus</i>	Kikuyugrass	4.67
10	<i>Cenchrus setaceus</i>	Fountaingrass	4.55
11	<i>Acacia mearnsii</i>	Black wattle	4.53
12	<i>Olea europaea</i>	European olive	4.49
13	<i>Vinca major</i>	Periwinkle	4.38
14	<i>Schinus molle</i>	Peruvian pepper tree	4.14
	<i>Ageratina adenophora</i>	Sticky snakeroot	4.12
	<i>Ricinus communis</i>	Castor bean	4.07
	<i>Centaurea solstitialis</i>	Yellow star-thistle	3.70
15	<i>Euphorbia terracina</i>	Geraldton carnation weed	3.36

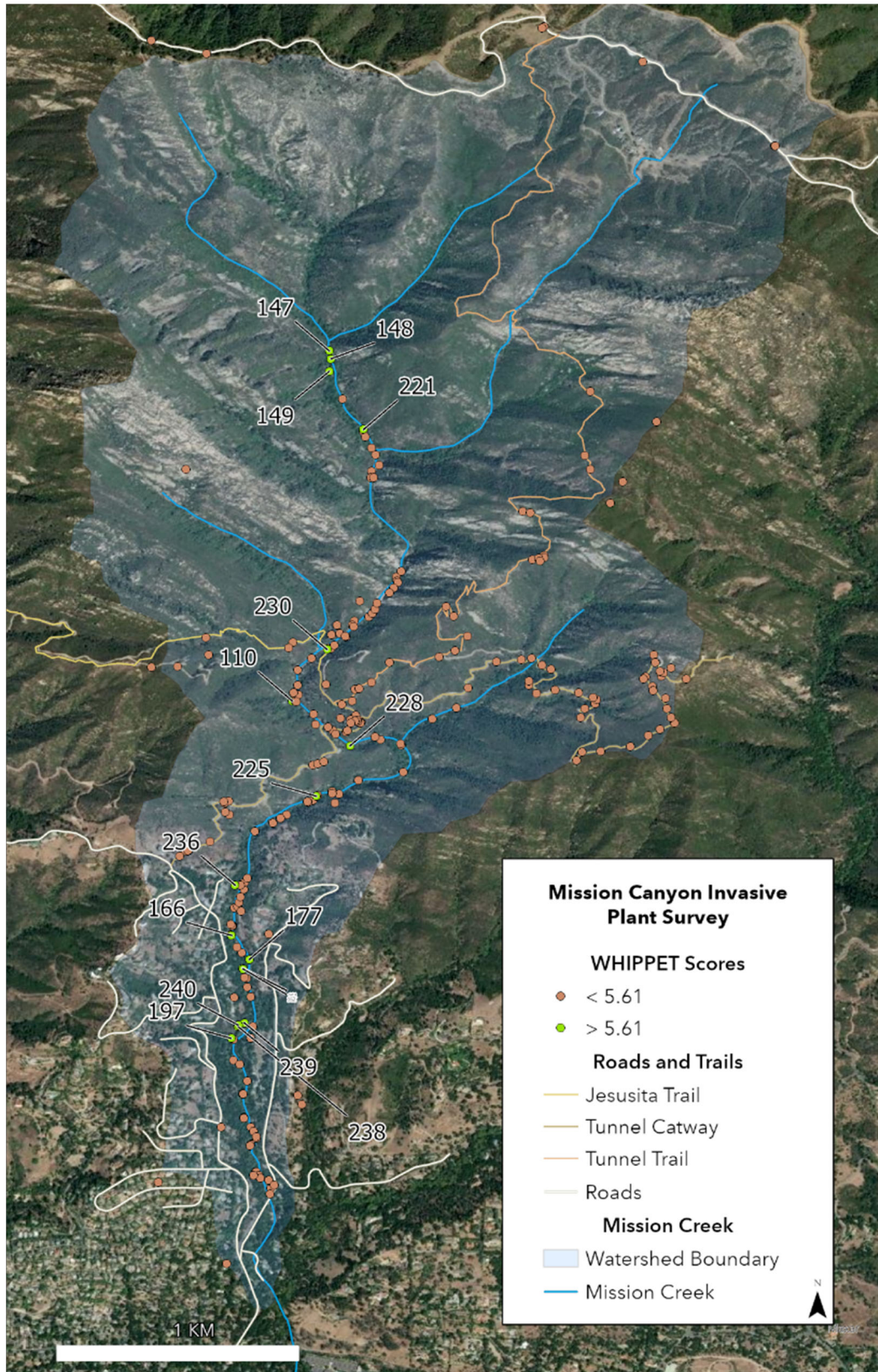


Figure 2. Locations of the 17 highest-ranked invasive species occurrences in the Mission Creek watershed, labelled by their population ID to cross-reference with Table 3.

Invasive species removal options

Ranked from highest to lowest by average WHIPPET score

#1: Pampasgrass (*Cortaderia selloana*)

Cal-IPC Rating: High

CDFA Rating: None

Native to South America, *Cortaderia* was introduced to California as an ornamental species prized for its large, fluffy inflorescences². However, it can spread rapidly by division or, in areas where both male and female plants are present, through seeds².

Locations in Mission Canyon:

There are several patches of pampasgrass in Mission Canyon creek (Figure 3). Many of the occurrences high in the watershed overlap with the areas known to contain *Thelypteris puberula* var. *sonorensis* (CNPS Rare Plant Rank 2.2B).

Removal methods:

Removal of *Cortaderia* can be difficult. A combination of chemical and manual removal is most likely to be successful². Small plants can be hand-pulled or removed with tools, while larger clumps can be removed by cutting the aboveground vegetation and applying a systemic post-emergence herbicide (such as glyphosate) to the stump³. Herbicide treatments will require additional permitting with the County and Forest Service.

Costs and other considerations:

Costs associated with the removal of this species will include tools and labor. Tools will need to be carried high into the watershed, and plant materials will need to be bagged and carried out. With a medium to large sized team, this could be accomplished over several day trips, with annual follow-up treatments throughout the remainder of the project.

Removal of *Cortaderia* in the Mission Canyon watershed would benefit the rare species which closely co-occur with it. Additionally, because there is so little of this species in the watershed, a dedicated multi-year removal effort may allow us to fully eradicate the species from this reach of the creek.



Cortaderia selloana high in the Mission Canyon watershed. [iNaturalist observation](#).

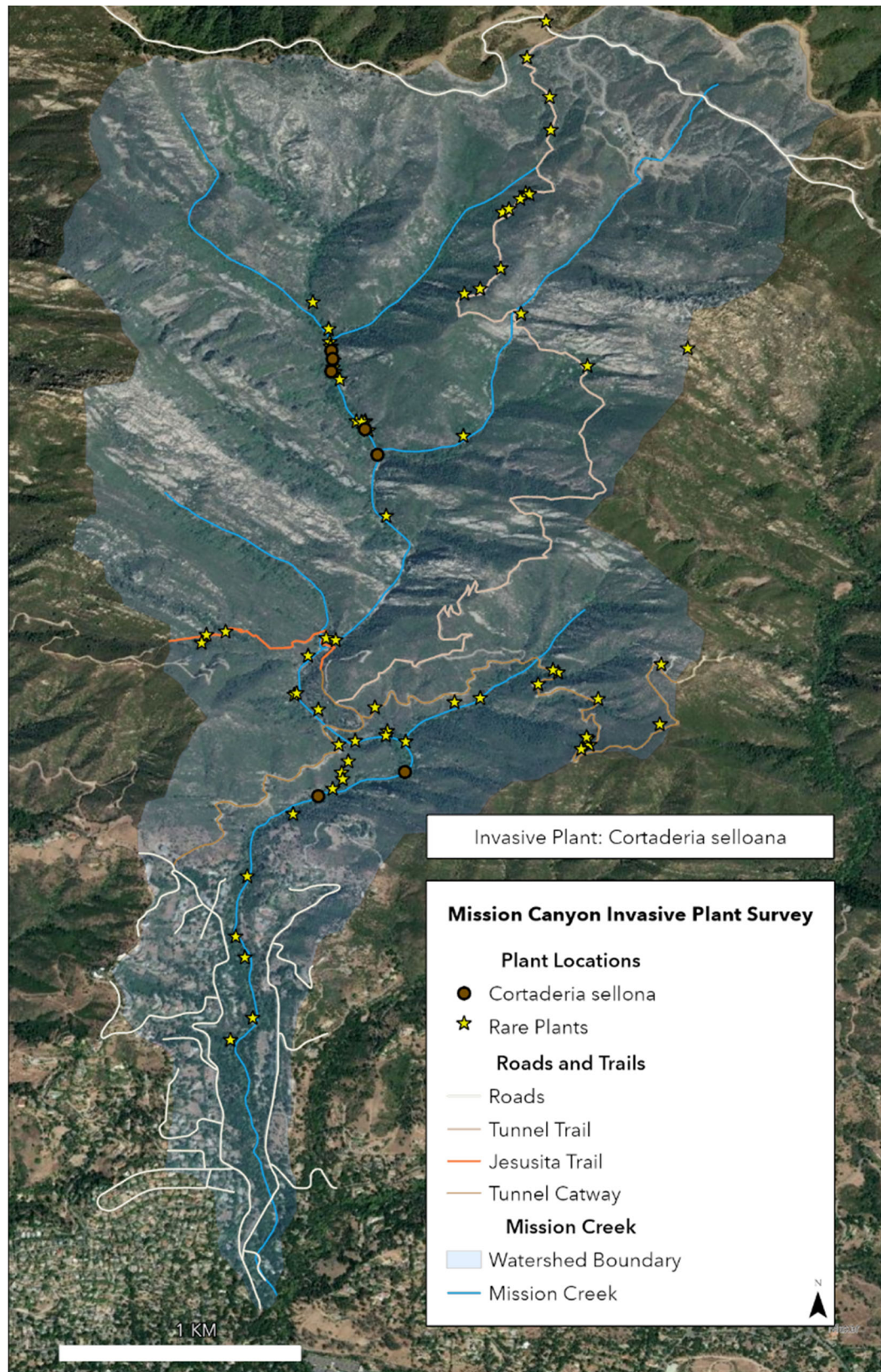


Figure 3. Locations of *Cortaderia selloana* in the Mission Creek Watershed.

#2: Cape ivy (*Delairea odorata*)

Cal-IPC Rating: High

CDFA Rating: B (on the CA Noxious Weed List)

Cape ivy is a rapidly spreading perennial vine native to South Africa that grows easily over existing vegetation, often killing it⁴. Additionally, due to the alkaloids present in this species, it can cause serious harm to fish if the leaves soak in waterways⁵. It often reproduces through fragmentation, though it can produce viable seeds in some areas.

Jason Nelson has already made considerable progress removing this species in Mission Canyon through prior restoration work.

Locations in Mission Canyon:

Small populations of Cape ivy persist in Mission Creek at several locations below the Jesusita trail crossing (Figure 4).

Removal methods:

Full mechanical removal of the plants is possible, but all root and stolon material should be bagged and taken off for this to be successful. Large swaths can be cut at the ground level and rolled up for easy removal. Pulled material should be taken isolated and allowed to fully dry out or decompose to prevent re-invasion or unintentional establishment of the plant offsite. Follow-up treatments are typically necessary for several years to ensure full removal. Chemical removal with broadleaf-specific herbicides (Clopyralid, Triclopyr) or non-selective herbicides (Glyphosate) have shown some success for controlling Cape ivy⁵.

Costs and other considerations:

Removing *Delairea* will require labor, tools, and bags to move the material offsite, as well any costs associated with herbicide application if we choose to treat it with herbicides. Several of the locations where this plant has been found in the Mission Creek watershed are difficult or dangerous to access due to steep slopes and loose materials. These patches would be best treated by professional staff with confident footing, though other areas may be treatable with the help of a volunteer labor force.



Delairea odorata in Mission Creek above the SCE catway. [iNaturalist observation](#).

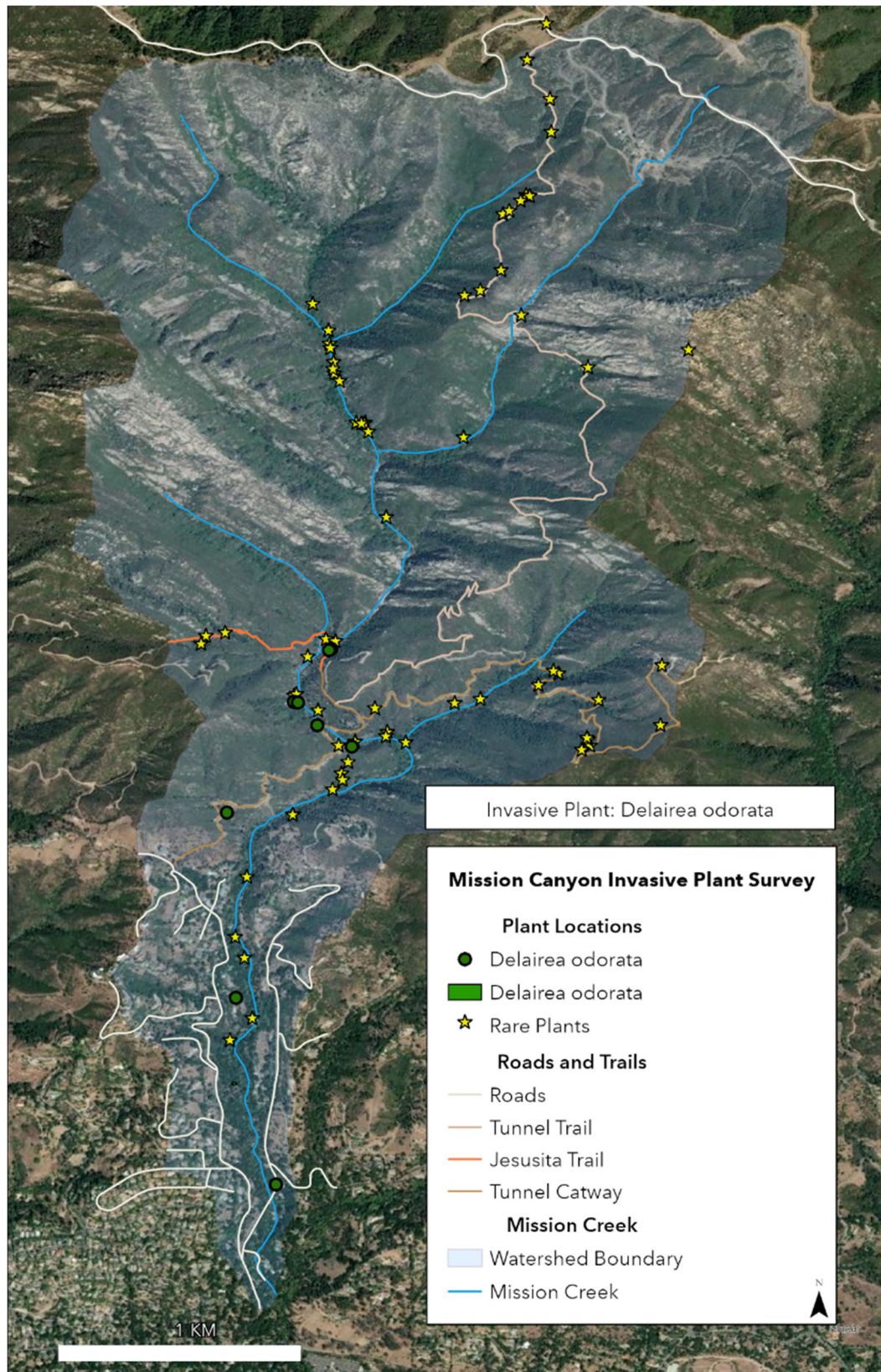


Figure 4. Locations of *Delairea odorata* in the Mission Creek Watershed.

#3: Figs (*Ficus carica*)

Fig Cal-IPC Rating: Moderate

Fig CDFA Rating: None

The edible common fig, *Ficus carica* is a common backyard escapee in coastal California. Though these trees are relatively slow growing compared to some weeds, they are readily dispersed by fauna⁶.

Furthermore, figs can form dense, clonal stands in riparian corridors, choking out native vegetation.

Locations in Mission Canyon:

Figs are relatively widespread in Mission Canyon, and can be found in multiple locations along the creek bed starting at the Jesusita trail junction and moving downstream (Figure 5).

Removal methods:

Figs can be difficult to remove because they resprout when cut^{6,7}. Small individuals with a single trunk can be removed with a weed wrench or Extractigator. Control of larger individuals and thickets is usually best achieved by a combination of cutting and herbicide application, which can be achieved through cut-stump painting with a broadleaf selective herbicide like Triclopyr.

Costs and other considerations:

Removing figs from the watershed will require labor, tools, and likely, herbicides. Because cut vegetative material can resprout from both the stump and branch ends, materials should be removed from the watershed and disposed of. In some cases when trees are near a road or vehicle access point, a wood chipper can be used to break down materials.

There are many figs in backyards throughout Santa Barbara, and they are likely to continue to reappear in the canyon due to natural dispersal by birds and other animals. However, tackling the figs in Mission Creek now, rather than waiting for them to spread further or form denser stands (as is the case in other parts of California⁶) could be a critical decision.



Ficus carica with fruit in Mission Creek. [iNaturalist observation](#).

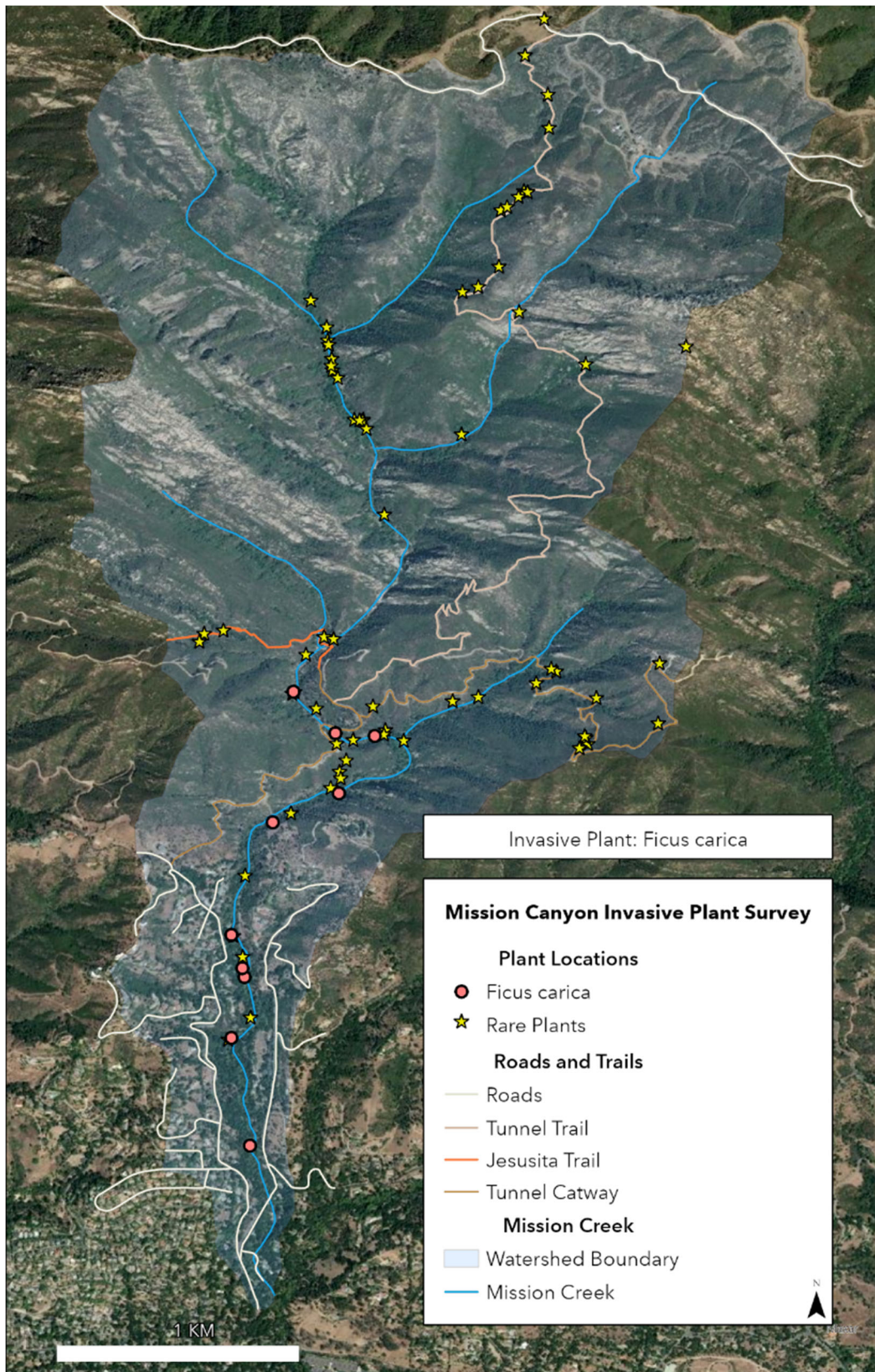


Figure 5. Locations of *Ficus carica* in the Mission Canyon watershed.

#4: French Broom (*Genista monspessulana*)

Cal-IPC Rating: High

CDFA Rating: C (on CA Noxious Weed List)

French broom was introduced to California as a horticultural ornamental from Europe. This species escapes readily into disturbed natural areas, where it can form dense monocultures, outcompete native vegetation, and produce large, long-lived soil seed banks⁸.

Locations in Mission Canyon:

In Mission Canyon, French Broom is present only in several locations – near the Catway and Tunnel Trail junction, the major bridged creek crossing, and in the creek bed on the Garden property (Figure 6).

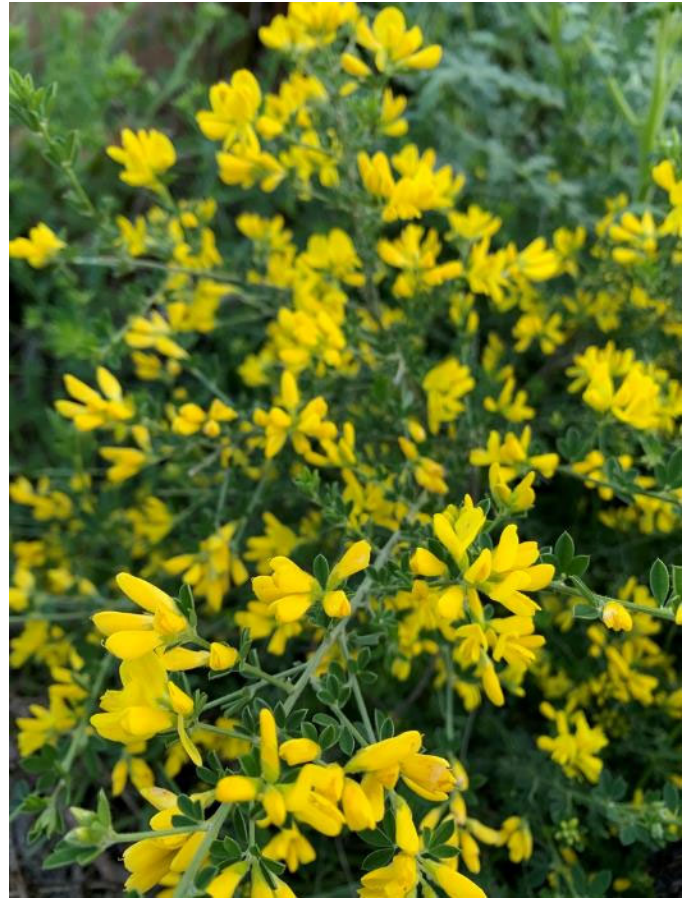
Removal methods:

Small individuals of French broom can be readily removed using targeted mechanical removal with the help of a Weed Wrench, Extractigator, Uprooter tool, or narrow shovel⁹. Given the small size of the infestations, chemical removal is unlikely to be necessary.

Costs and other considerations:

Tackling the small patches of French broom in the watershed would likely require several years of hand removal, followed by occasional touch-up treatments. Costs will include labor and tools (such as an Extractigator or weed wrench) during the initial treatment, as well as labor to remove and pulled vegetative material. Because these populations are accessible, and *Genista* is relatively easy to remove by hand, some of these costs of removal could be defrayed with volunteer labor. In other regions, broom pulling is often conducted with regular volunteer events.

Some of the French broom populations are directly along the SCE access road. If SCE is able and willing to help with removal efforts in these locations, the Garden can provide follow-up treatments. We may be able to eliminate this species from the watershed entirely over time.



Genista monspessulana at the Edison Catways and Tunnel Trail junction. [iNaturalist observation](#).

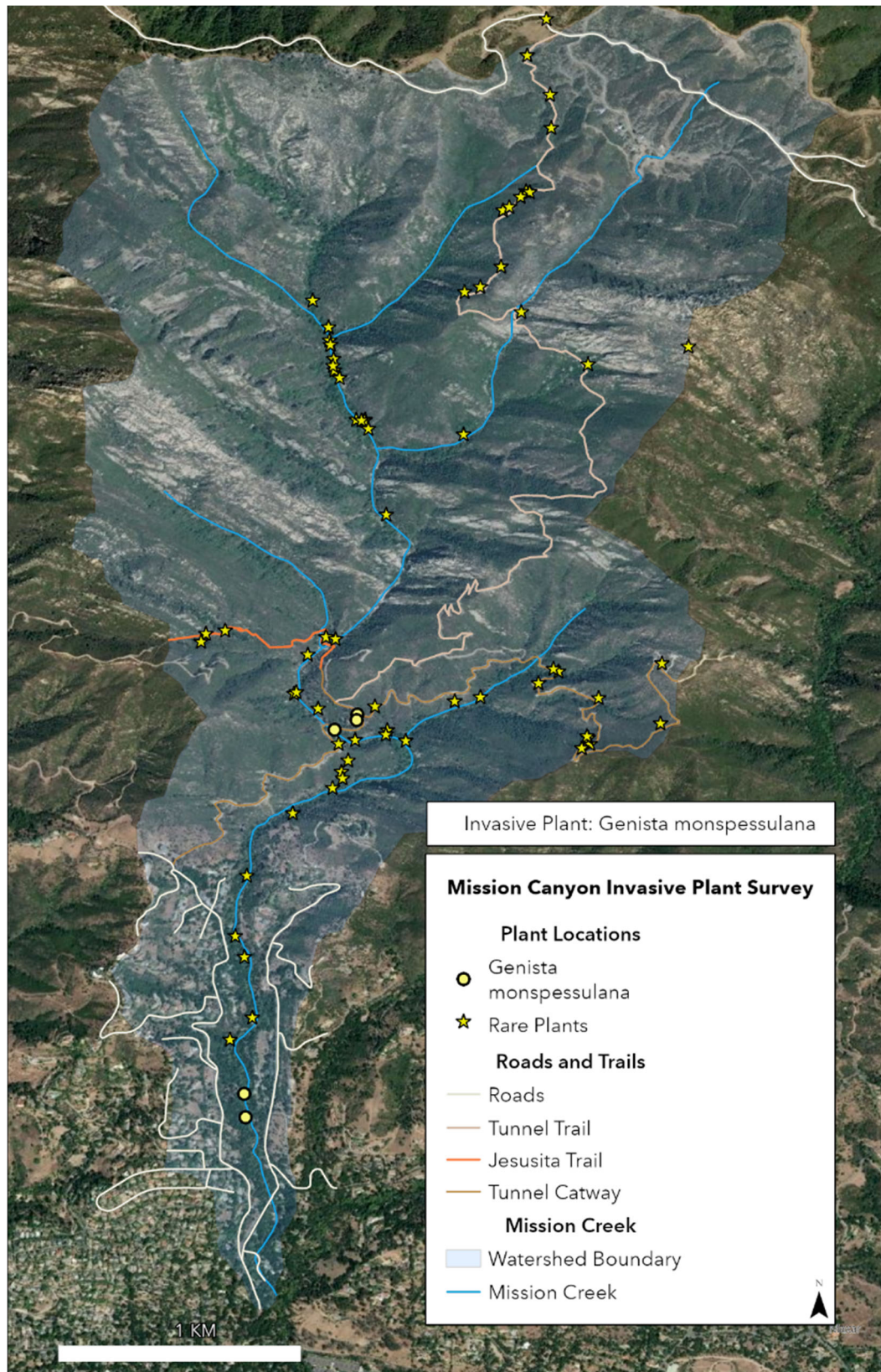


Figure 6. Locations of *Genista monspessulana* in the Mission Canyon watershed.

#5: Ivy (*Hedera helix*)

Cal-IPC Rating: High

CDFA Rating: None

Vining ivy, *Hedera*, can grow vigorously through other vegetation, suppressing it and reducing habitat quality and biodiversity. It is especially prevalent in riparian corridors and forest margins⁶. Furthermore, trees with heavy ivy cover are more susceptible to wind and storm damage due to their heavier crowns¹⁰.

Locations in Mission Canyon:

Our work identified two occurrences of *Hedera* in the survey region: a small patch just above Garden grounds, and a large infestation located at the junction of Mission Canyon Road and the creek below the Garden grounds (Figure 7). The upper watershed occurrence was ranked the highest priority for removal by the WHIPPET model of all invasive species occurrences mapped, and the lower occurrence was ranked 85th of 243.



Removal methods:

Mechanical removal of *Hedera* is difficult, as it resprouts readily from stem fragments and stolons. Pulled material should be taken offsite and allowed to fully dry out or decompose to prevent re-invasion or unintentional establishment of the plant offsite. Chemical control with both broadleaf-specific (Triclopyr) or nonspecific (Glyphosate) pesticides is also possible. Both can be applied as cut-stump treatments to reduce sucking and resprouting following manual removal.

Hedera helix in Mission Creek above grounds.
[iNaturalist observation](#).

Costs and other considerations:

Removal of the *Hedera* would require hand tools, bags to remove cut material, and potentially herbicide. Material will need to be hauled offsite to prevent resprouting. Removal with herbicides will require permitting.

The highest occurrence in the watershed would be relatively easy to remove if given landowner permission. The population near the Mission Road creek crossing would require significantly greater labor and time inputs, but has the benefit of being on Garden property. Furthermore, the lower area is relatively easy to access and could provide good volunteer restoration opportunities if poison oak is not a grave concern.

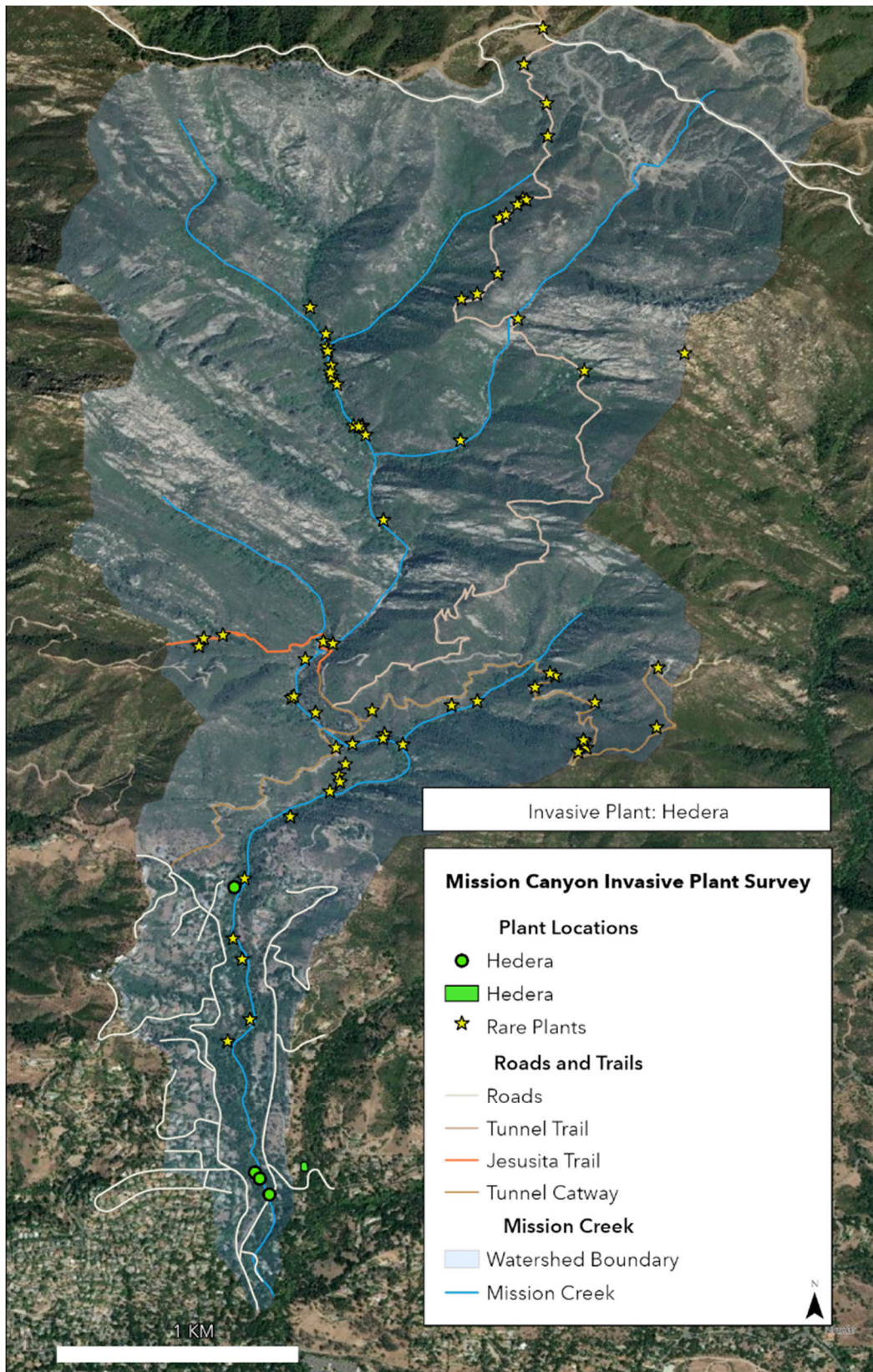


Figure 7. Locations of *Hedera helix* in the Mission Canyon watershed.

#7: Pride-of-Madeira (*Echium candicans*)

Cal-IPC Rating: Limited

CDFA Rating: None

Pride-of-Madeira is a showy shrub that was introduced to California as an ornamental landscaping plant, but can escape cultivation. It can form monocultures, outcompeting native vegetation. Relatively little has been published about the species from a wildlands management standpoint.

Locations in Mission Canyon:

E. candicans can be found high in the watershed, along the central fork of Mission Creek, as well as lower in the watershed, where it has come down from nearby neighbor's yards and has appeared on Garden property (Figure 8).

Removal methods:

Because little has been published on the removal of *E. candicans*, it is not apparent what the best way to remove the species would be. Mechanical removal with hand tools and a weed wrench or Extractigator tool may be sufficient, though the hairs of the plant can be irritating and appropriate PPE should be worn.

Costs and other considerations:

To remove the individuals high in the watershed, we would require labor, tools, and bags to collect and haul out removed materials. Lower in the watershed, we may wish to offer replacement plants to neighbors with *E. candicans* in their yards. For the individuals that are found lower in the watershed on private property, we will need permission prior to conducting removals.



Echium candicans in Mission Creek above the SCE catway. [iNaturalist observation](#).

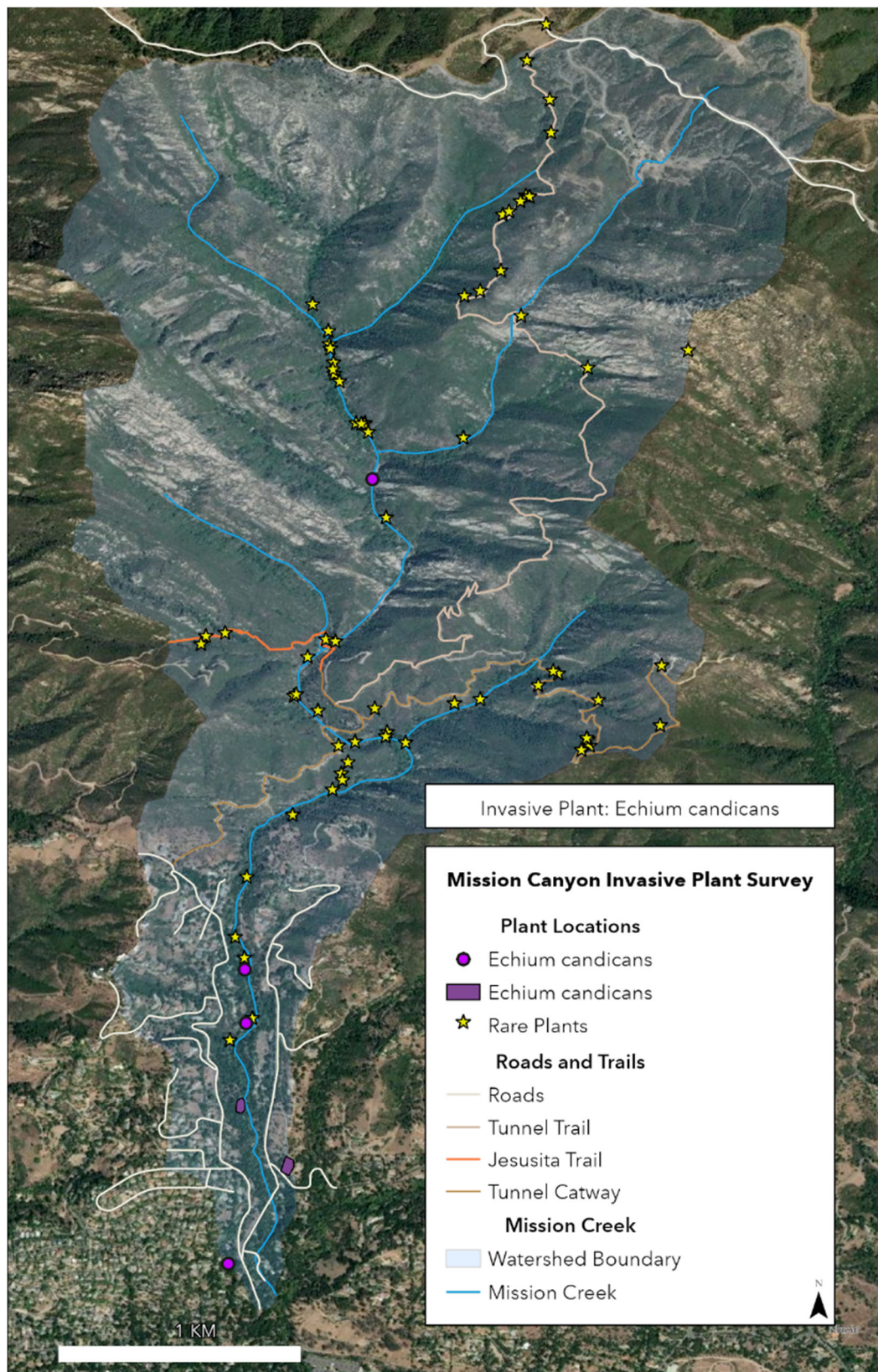


Figure 8. Locations of *Echinium candicans* in the Mission Canyon watershed.

#9: Kikuyu grass (*Cenchrus clandestinus*)

Cal-IPC Rating: Limited

CDFA Rating: C (on CA Noxious Weed List)

Kikuyu grass is an aggressive tropical grass species that spreads successfully through vegetative means¹¹. It is a major pest species on Santa Cruz Island at Scorpion landing.

Locations in Mission Canyon:

We observed only one location with Kikuyu grass in the Mission Canyon watershed, in the creek between the water treatment bridge and the Jesusita trail crossing (Figure 9).

Removal methods:

For a very small patch of kikuyu grass like that observed in Mission Canyon, removal can be done through manual pulling and bagging, or foliar application of glyphosate¹¹. Care should be given that all material is removed and bagged appropriately, as the plant can readily root from stem fragments.

Costs and other considerations:

Removing the kikuyu grass in Mission Creek will require labor, hand tools, and bags to carry the material out of the watershed. Despite being rated relatively low by the WHIPPET model, this is the only occurrence of the species we found in the watershed and removing it would prevent further spread and future invasion.



Cenchrus clandestinus in Mission Creek. [iNaturalist observation](#).

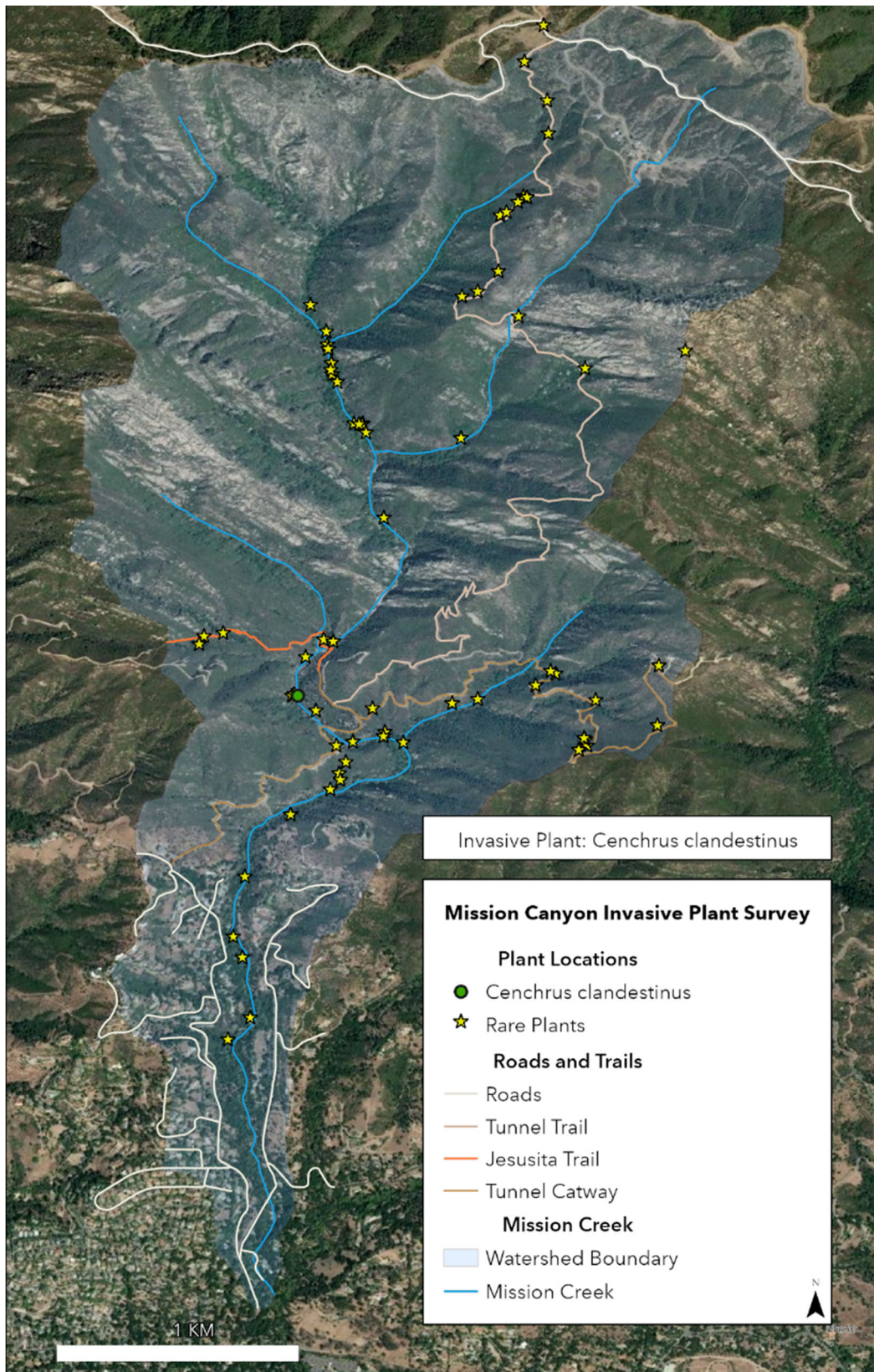


Figure 9. Locations of *Cenchrus clandestinus* in the Mission Canyon watershed.

#10: Fountain grass (*Cenchrus setaceus*)

Cal-IPC Rating: Moderate

CDFA Rating: C

Fountain grass is a popular ornamental species which has rapidly invaded wildlands in California. It is now common along Highways 192 (Foothill Road) and 154 (San Marcos Pass Road) in Santa Barbara. Unfortunately, several small populations of this species are also beginning to appear in Mission Canyon.

This species is well adapted to fire. It transports fire readily, and is easily ignited¹². Furthermore, it can recover at similar or greater densities post-fire, creating a perpetuating fire cycle¹³.

Locations in Mission Canyon:

There are several populations of *Cenchrus setaceus* in Mission Canyon. The most concentrated areas are along the SCE access road and near the trailhead water tanks (Figure 10).

Removal methods:

For small populations, hand removal can be an effective method¹³. Herbicide applications have mixed success and often require multiple applications; common herbicides like Glyphosate tend to be less effective on *Cenchrus setaceus*.

Costs and other considerations:

Removal of fountain grass in Mission Canyon would require labor, tools, and potentially herbicide. Fountain grass is widespread in the region. While removing it from Mission Canyon is a worthwhile endeavor due to its relationship with fire, it is likely to return to the canyon over time due to seed pressure from surrounding locations.

Most occurrences are relatively easy to access and are located directly along the SCE access road. It is possible that the removal of this species could fall under SCE's purview, at least while they are continuing their roadside mitigation work. The water tank population was not mapped as a part of this project, and would likely require collaboration with the water district to remove.



Cenchrus setaceus in Mission Canyon. [iNaturalist observation](#).

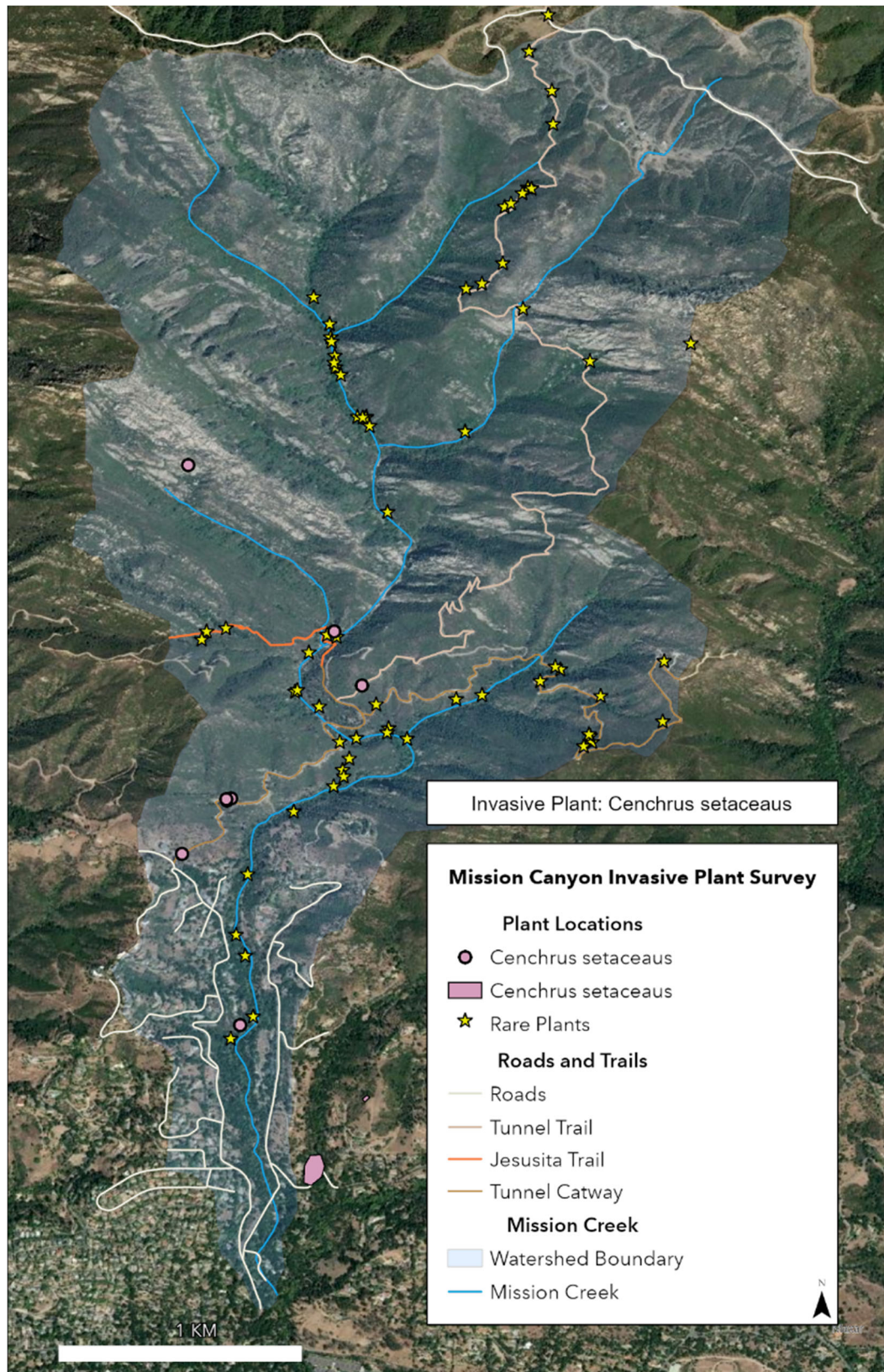


Figure 10. Locations of *Cenchrus setaceus* in the Mission Canyon watershed.

#11: Black wattle (*Acacia mearnsii*)

Cal-IPC Rating: None

CDFA Rating: None

Acacia mearnsii is a nitrogen-fixing tree native to Australia. Though the species has been listed as a noxious weed in Hawaii, it has not received a ranking by either Cal-IPC or the CDFA. The similar congener *Acacia dealbata* has ranked as “Moderate” by Cal-IPC.

The wood of *Acacia mearnsii* can be used for wood turning and fine furniture products, though it is not as sought-after as that of some other *Acacias* (such as black acacia, *A. melanoxylon*). Though the trees in our watershed are relatively small, there may be potential for the Garden to collaborate with local artists to produce items using the wood.

Locations in Mission Canyon:

We identified four occurrences of *Acacia mearnsii*, all relatively low in the watershed and directly in the creekbed (Figure 11). These sites have trees that range in size from small sprouts to individuals with 8 inch DBH measurements.



Acacia mearnsii near the Garden property along Mission Creek. [iNaturalist observation](#).

Removal methods:

There is little information available about the removal of *A. mearnsii*, but we can draw on knowledge about other *Acacia* species. Mechanical pulling or cutting is generally considered a poor control method when used alone, as the species resprouts readily from root and stump materials¹⁴. However, cut-stump application of a systemic herbicide such as Triclopyr following biomass removal can be an effective means of removal¹⁴. Follow up treatments in year 3-5 would removal resprouts and reapply herbicides as necessary.

Costs associated with removal:

Removing these trees, especially with the goal of biomass harvest for productive use, will likely require professional arborists. Pesticide application may require permitting with the county, depending on the pesticide type and method of application.

Other Considerations:

Some individuals are located on private property, and full removal from the watershed will require collaboration with these landowners.

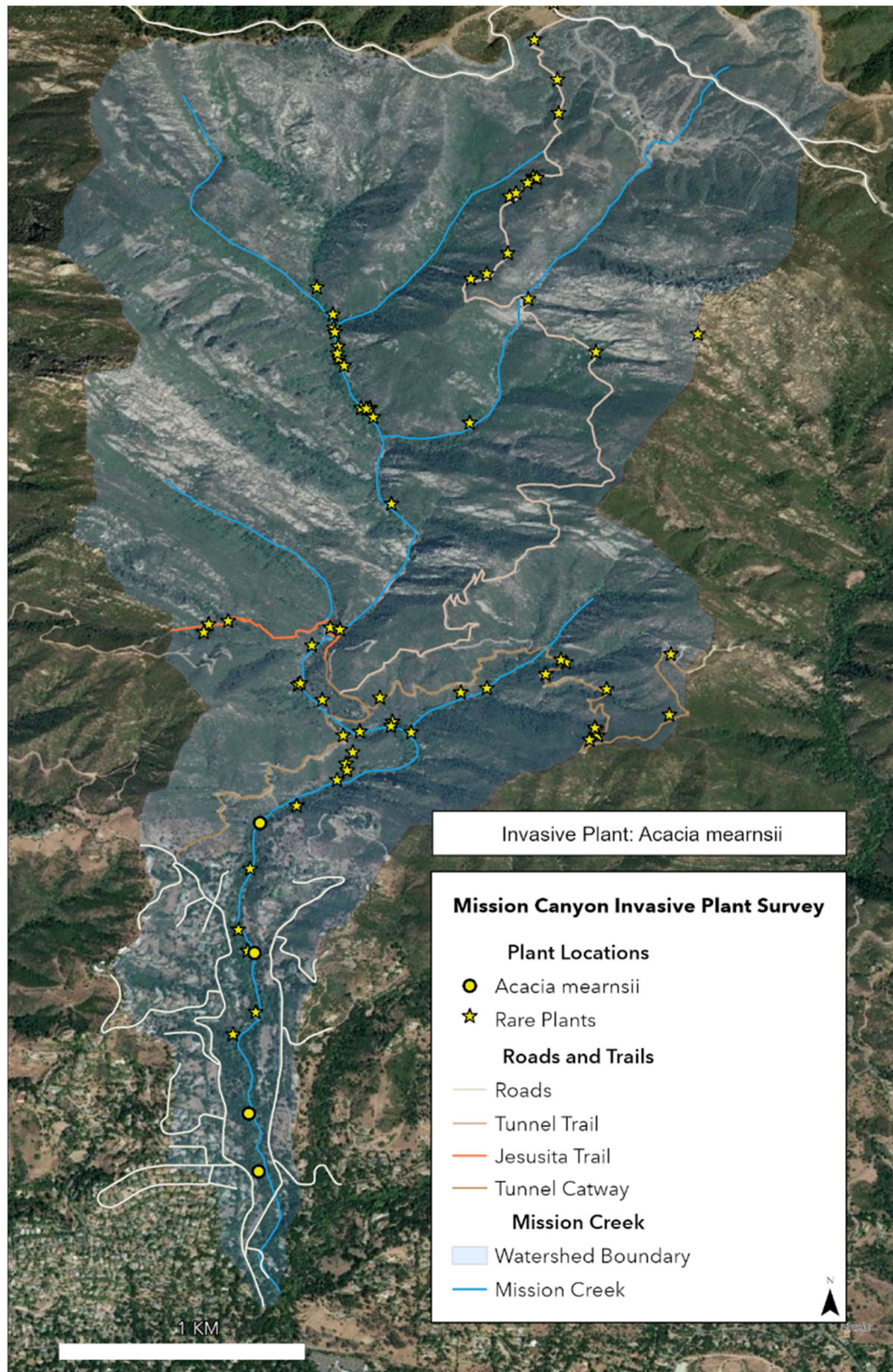


Figure 11. Locations of *Acacia mearnsii* in the Mission Creek Watershed.

Additional species

The six species described below were only seen a small number of times or were ranked low by the WHIPPET model and therefore are shown together on a single map (Figure 12). Many of these species are landscaping plants that can escape into wildlands, and collaboration with neighbors to identify and replace these species in yards could ultimately benefit Mission Canyon's native biodiversity.

#6: Sweet pittosporum (*Pittosporum undulatum*)

Cal-IPC rank: Watch

CDFA rating: None

Pittosporum undulatum is another horticultural escapee that has been recognized as invasive in other regions but for which there is remarkably little information available in California. Cutting down the tree/shrub and immediately applying herbicide appears to be a successful control strategy in other cases¹⁵. This technique would likely also be effective in Mission Creek, assuming we are able to apply herbicides and can safely remove the larger individuals, which are tree-sized.

#8: Firethorn/Cotoneaster (*Pyracantha/Cotoneaster*)

Cal-IPC rank: Limited

CDFA rating: B

With attractive red berries, *Pyracantha* and *cotoneaster* are popular landscaping plants that can sometimes escape into wildlands¹⁶. Small plants can be hand pulled or removed with the aid of weed wrench tools. Some herbicides may also be effective, though there is little data available on their use for wildlands weed management on this species¹⁶. This is another species that we may want to target for local neighbors to work with us to remove or replace with a native alternative, such as Toyon.

#12: European olive (*Olea europaea*)

Cal-IPC rank: Limited

CDFA rating: None

Olives are another common backyard or landscaping escapee that can invade native ecosystems. Like figs, they resprout readily and are best removed with a combination of mechanical and chemical means, such as cut-stump treatments. This species occurs in a handful of dispersed locations in the watershed.

#13: Periwinkle (*Vinca major*)

Cal-IPC rank: Moderate

CDFA rating: None

Vinca, known as periwinkle, is a landscaping escapee that can infest waterways. A perennial vine, it resprouts readily when pulled or cut and grows rapidly⁶. Plants can easily be removed by hand, but follow-up treatments are likely to be necessary¹⁷. Some herbicides are effective, but resprouting is common even after herbiciding¹⁷. Some populations of *Vinca* in wildlands areas along Mission Creek could also be valuable volunteer removal efforts, as they are relatively accessible.

#14: Peruvian pepper tree (*Schinus mole*)

Cal-IPC rank: Limited

CDFA rating: None

Pepper tree is yet another invasive plant that was historically used in landscaping. Sprouts and larger saplings can be removed by hand or with a weed wrench tool, while larger trees are more difficult to remove because the species resprouts from even small root fragments¹⁸. Cut-stump herbicide treatment can be effective¹⁸. While there are only a handful of occurrences of this species in the 'wildlands' area of Mission Canyon, there are numerous horticultural plantings of it. Targeting this species will require close collaboration with our neighbors.

#15: *Euphorbia terracina*

Cal-IPC rank: Limited

CDFA rating: B (on CA Noxious Weed List)

On average, *Euphorbia terracina* received the lowest WHIPPET scores of all the species included in the model, in part because it occurs in low-quality habitat and is relatively difficult to remove. This species produces a toxic sap that can result in dermatitis and eye irritation. For small patches, hand removal can be an effective strategy, though they must be repeated multiple times over a season and for several years to be successful¹⁹. Control of *E. terracina* with pesticides can also be effective. Despite the toxicity of the sap, removal with PPE-protected volunteer groups could be done, as the populations are accessible. However, the primary population is located near the SCE access road, and SCE has already committed to conducting some weed removal of this population.

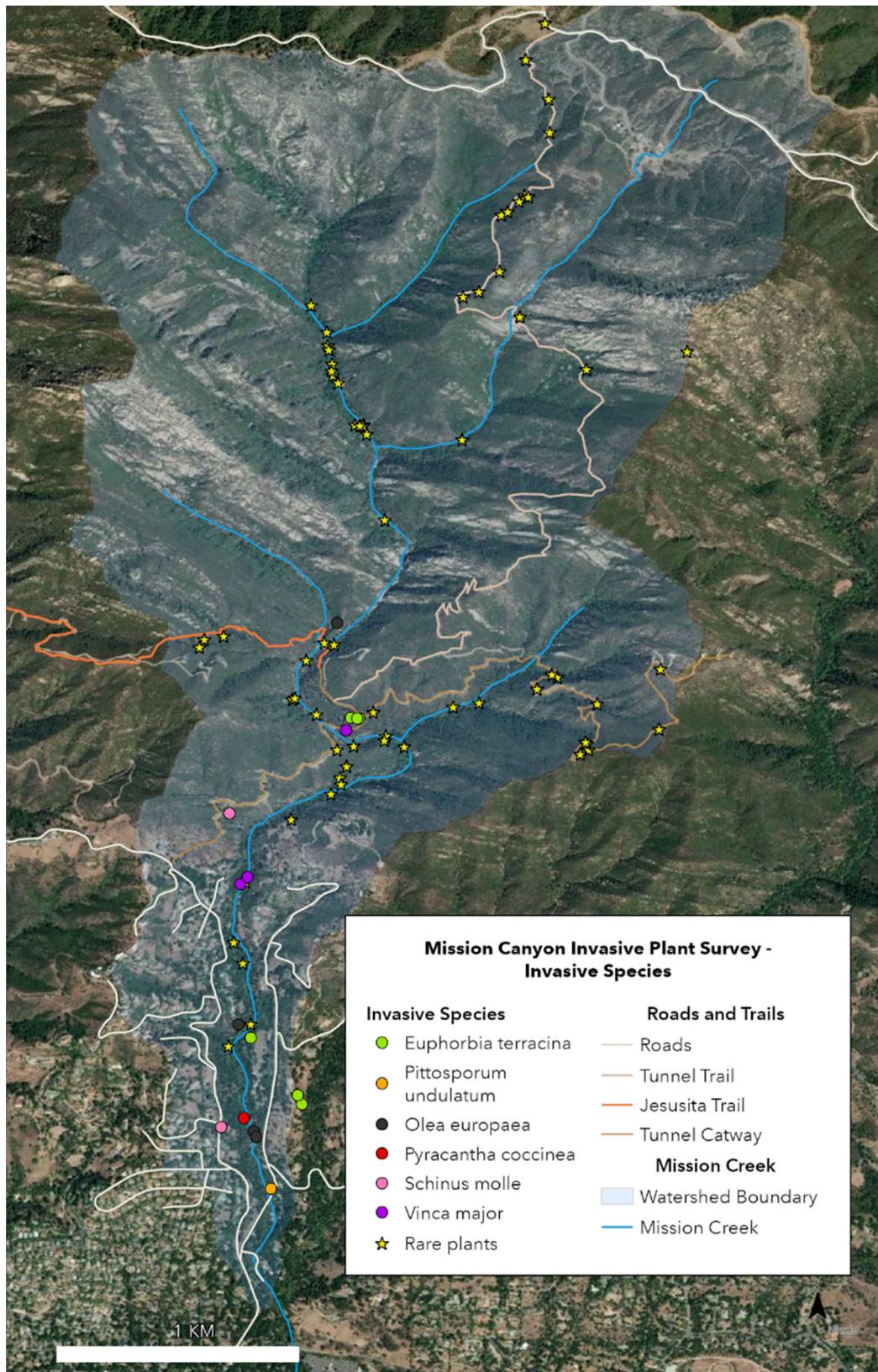


Figure 12. Locations of several invasive species in the Mission Canyon watershed.

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Appendix A.

List of invasive species targeted in surveys. In the CDFA ratings list, a “W” indicates that the species is included in the CCR Section 4500 list of California State Noxious Weeds.

Family	Scientific name	Cal-IPC Rating	CDFA Rating
Aizoaceae	<i>Carpobrotus edulis</i>	High	
Apiaceae	<i>Foeniculum vulgare</i>	Moderate	
Apocynaceae	<i>Araujia sericifera</i>		W-B
Apocynaceae	<i>Vinca major</i>	Moderate	
Araliaceae	<i>Hedera canariensis</i>	High	
Araliaceae	<i>Hedera helix</i>	High	
Asphodelaceae	<i>Asphodelus fistulosus</i>	Moderate	B
Asteraceae	<i>Ageratina adenophora</i>	Moderate	
Asteraceae	<i>Carthamus lanatus</i>		
Asteraceae	<i>Centaurea melitensis</i>	Moderate	
Asteraceae	<i>Centaurea solstitialis</i>	High	
Asteraceae	<i>Centaurea stoebe subsp. micranthos</i>		W-A
Asteraceae	<i>Chondrilla juncea</i>	Moderate	W-A
Asteraceae	<i>Cynara cardunculus</i>	Moderate	
Asteraceae	<i>Delairea odorata</i>	High	W-B
Asteraceae	<i>Onopordum acanthium</i>	High	W-A
Asteraceae	<i>Sonchus arvensis</i>		W-A
Asteraceae	<i>Tagetes minuta</i>		W-A
Boraginaceae	<i>Echium plantagineum</i>		A
Brassicaceae	<i>Brassica tournefortii</i>	High	
Brassicaceae	<i>Lepidium latifolium</i>	High	W-B
Cistaceae	<i>Cistus incanus</i>		
Cucumeraceae	<i>Cucumis melo</i>		W-A
Euphorbiaceae	<i>Euphorbia terracina</i>	Limited	W-B
Euphorbiaceae	<i>Ricinus communis</i>	Limited	
Fabaceae	<i>Acacia baileyana</i>	Watch	
Fabaceae	<i>Acacia paradoxa</i>	Watch	W-B
Fabaceae	<i>Cytisus scoparius</i>	High	
Fabaceae	<i>Genista monspessulana</i>	High	
Fabaceae	<i>Spartium junceum</i>	High	
Onagraceae	<i>Ludwigia hexapetala</i>	High	
Onagraceae	<i>Ludwigia peploides</i>	High	
Poaceae	<i>Arundo donax</i>	High	W-B
Poaceae	<i>Bromus tectorum</i>	High	
Poaceae	<i>Cortaderia jubata</i>	High	W-B
Poaceae	<i>Cortaderia selloana</i>	High	
Poaceae	<i>Ehrharta calycina</i>	High	
Poaceae	<i>Elymus caput-medusae</i>	High	

Family	Scientific name	Cal-IPC Rating	CDFA Rating
Poaceae	<i>Cenchrus setaceus</i>	Moderate	
Ponteriaceae	<i>Eichhornia crassipes</i>	High	
Rosaceae	<i>Acaena novae-zelandiae</i>	Watch	W-A
Rosaceae	<i>Rubus armeniacus</i>	High	
Simaroubaceae	<i>Ailanthus altissima</i>	Moderate	
Solanaceae	<i>Nicotiana glauca</i>	Moderate	
Tamaricaceae	<i>Tamarix gallica</i>	High	W-B
Tamaricaceae	<i>Tamarix parviflora</i>	High	W-B
Tamaricaceae	<i>Tamarix ramosissima</i>	High	W-B
Zygophyllaceae	<i>Tribulus terrestris</i>	Limited	