Ceanothus masonii McMinn

Mason's ceanothus

Rarity Status
Federal Listing: None
State Listing: Rare
CNPS List: 1B / R-E-D Code: 3-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted
Comment: This species may undergo a taxonomic revision lumping it with *Ceanothus gloriosus*. See Appendix X for a full description of this possible taxonomic revision.

Population Location(s) within:
Management boundary: [redacted]

Life History
Flowering Time: March-May

Range: *Ceanothus masonii* is endemic to California. According to CNPS Inventory of Rare and Endangered Vascular Plants, 6th edition, this species has only about five documented populations.

Characteristics: *C. masonii* is a chaparral species. It is an evergreen shrub that is generally shorter than 2 meters in height. The leaves are thick and evergreen with dentate margins and are opposite along the stem. *C. masonii* can be distinguished from *Ceanothus gloriosus* var. *exaltatus* by the mature leaf size; the leaves of *C. gloriosus* var. *exaltatus* are 1.5 to 4 cm long while the leaves of *C. masonii* are 0.6-1.8 cm long. Both species have deep blue to purple flowers.

A related species, *C. cuneatus*, occurs with *C. masonii*. *C. cuneatus* bears white or pale flowers. Since *Ceanothus* spp. frequently hybridize, surveying during the flowering season is recommended by Dr. Parker to confirm the presence of *C. masonii* individuals by their purple flowers.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This species is documented in chaparral along fire roads and trails atop [redacted]

Threats
An illegal trail on [redacted] cuts through population 3. Some plants have probably been killed as a result. Fire suppression has an adverse effect on *C. masonii*. Other tree and shrub species may be encroaching on the population.

Monitoring Conducted 2004
No monitoring was conducted in 2004.

Monitoring Results 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	CEMA	1	83	91	Surveyed; not censused	No survey	No survey	No survey	No survey
[redacted]		1a	0*	1	Surveyed; not censused	No survey	No survey	No survey	No survey
[redacted]		2	--	--	--	--	Surveyed; not censused	Surveyed; not censused	No survey
[redacted]		3	--	--	--	--	Surveyed; not censused	Surveyed; not censused	No survey

* All individuals identified as *Ceanothus gloriousus* var. *exaltatus.*

Surveys conducted between 1999 and 2001 have resulted in the mapping of this species in various sites located along the length of [redacted] fire road and along trails that lead off of [redacted]. The density of the brush in this region makes it extremely difficult to survey within the interior of the brush, therefore, it is not possible to document the complete extent of this species.

Two new populations documented in 2002 were revisited in the spring of 2003 to collect voucher specimens in order to make a final determination whether indeed the plants are *C. masonii*. These vouchers specimens were sent to a *Ceanothus* expert who found that the specimens did not seem to fit any one taxon. As of this writing a conclusive determination of the species of these plants is still pending. A complete description of the species identification status is included in Appendix X.

Management recommendations

No changes in management approaches should be undertaken until the status of the species and populations becomes clearer. Management of the new potential populations depends on the response of Dr. Wilken; if he determines that the plants belong to a special-status taxon, they should be monitored in the same way as other *Ceanothus* populations. If he determines they do not merit special status, they can be removed from the inventory. Until the status of these plants is determined, the populations should be checked every three years to verify their continued presence but there is no need for full monitoring.

Monitoring Recommendations

Populations currently confirmed as *C. masonii* should continue to be monitored every three years.

Recommended Monitoring Interval

Every three years

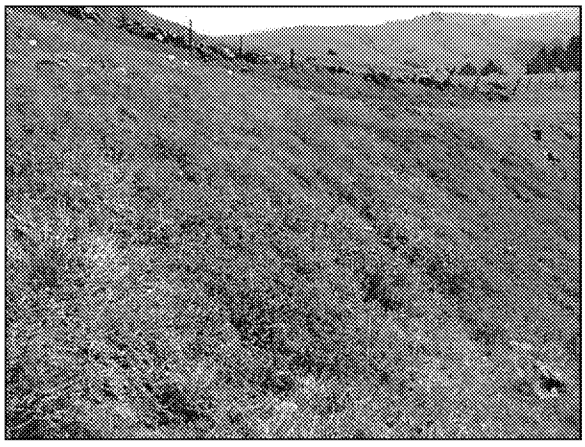
Ceanothus masonii

0.4 0 0.4 0.8 Miles

Bolinas Quadrangle

2002 Inventory/Monitoring Report

Ceanothus sp. *nova*



Rarity Status
Federal Listing: None
State Listing: None
CNPS: None

Nomenclature
The Jepson Manual: not accepted
CNPS: not accepted
Comments: This species has not been formally described.

Population Location(s) within:
Legislative boundary: [redacted]

Life History
Flowering Time: March-April

Range: One documented occurrence in Marin County, California.

Characteristics: This plant has yet to be formally described. Tom Parker at San Francisco State University was contacted in 2002 and he confirmed that he intends to describe it as a new taxon; however no time frame has been given as yet. There are no other *Ceanothus* species atop [redacted] to confuse with this species. It is growing on serpentinite substrate amidst grassland species.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is found in one site atop [redacted]. Much of the population extends onto private land east of GGNRA land.

Threats
No changes in site status were observed during a site visit in 2003. In 2003, the site appeared to be in excellent condition with very few introduced species of concern. Defoliation from a tussock moth species has been documented in previous years' reports and is visible in photos taken of the site. Cows graze both the GGNRA and private land.

Monitoring conducted 2004
No monitoring was conducted in 2004

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Nicasio	CENO	1	Surveyed; not censused	Surveyed; not censused	61% live 39% dead	Surveyed; not censused	No survey	Surveyed; not censused	No survey

During the 1998 and 1999 surveys, mapping of the boundaries of this species was largely completed. One stand not previously mapped was added in 2003. The area covered by this species is very large making the censusing of individuals unfeasible. In 2000, a sampling protocol was developed to measure percent cover and the ratio of live to dead within the population (see Appendix VIII for methods). This method has not been repeated. Photopoints were established in 2003 as a minimum method of documenting changes in canopy cover overtime. Despite some large patches of defoliated plants, the stands appeared in good condition with numerous native grasses and forbs present including two other special status plant species: *Castilleja affinis* ssp. *neglecta* and *Streptanthus glandulosus* ssp. *pulchellus*.

Management Recommendations

A considerable portion of this population occurs on private land. A meeting should be arranged with the ranchers, Point Reyes staff and GGNRA staff to make the ranchers aware of the rare plant species which occur on their land.

Maintain contact with Tom Parker at SFSU to determine the status of the species description.

Monitoring Recommendations

Retake photopoints established in 2003 to document changes in canopy cover.

Some method of monitoring dieback due to Tussock moth infestation should be conducted every three to five years. The sampling method used in 2000 should be evaluated for efficiency of time versus information gained. Another method may be developed that is less time consuming but would provide the same information. In the 2000 year-end report it was noted that the method used was very labor intensive. A series of line transects may be an easier method to obtain data on percent cover by species and live to dead ratio. [redacted] is host to six rare plant species. Ideally, a monitoring method would be adopted that can capture information on all six species but only require examining a sub-sample of the entire population.

Long term monitoring would also be valuable for gathering information on the effects of cattle grazing. This area has been grazed for many years and yet the rare plant species still persist.

Recommended Monitoring Interval

Every two years

Ceanothus species nova

2003

San Geronimo and Inverness Quadrangles

0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 Mile

N

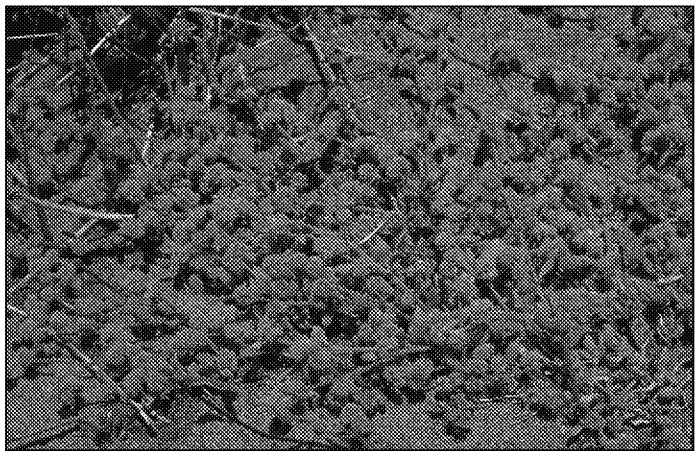
Goga-pol.shp

leg-bndy

Ceno_03.shp

Chorizanthe cuspidata S. Watson ***var. cuspidata***

San Francisco Bay spineflower



Rarity Status
Federal Listing: None
State: C2 - Threat and/or distribution data are insufficient to support federal listing.
CNPS List: 1B / R-E-D Code: 2-2-3

Nomenclature
The Jepson Manual: not accepted
CNPS: accepted
Comments: Varieties of this species are not recognized in The Jepson Manual.

Population Location(s) within:
Management boundary: Fort Funston, the Presidio

Life History
Flowering Time: April-July

Range: *Chorizanthe cuspidata* var. *cuspidata* is endemic to California. There are documented occurrences in Alameda, Marin, Santa Clara, San Francisco, San Mateo and Sonoma counties.

Characteristics:
C. cuspidata var. *cuspidata* is a small, annual prostrate herb. The tiny flowers have six hairy perianth lobes. There are six bracts subtending the inflorescence, each with a hooked awn at the tip. *C. cuspidata* var. *villosa* has woolier heads and is documented as occurring from Point Reyes to Bodega Bay. Although there are other similar looking *Chorizanthe* species in the bay area, no other members of the genus were seen on the dunes at Fort Funston.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is locally abundant in the sheltered depressions on the [redacted] throughout Fort Funston. It appears to be well adapted to disturbance as it is often observed growing directly in use trails that cut through dense stands of iceplant (*Carpobrotus* sp.). Within the Presidio, this species is found in sand dunes ranging from foredunes ([redacted]) to dune scrub sites such as [redacted].

Threats
Populations of *Chorizanthe cuspidata* var. *cuspidata* at Fort Funston appear to be stable despite heavy visitor use and a rich array of introduced species. Although it is moderately successful in high use areas, it does appear to be thriving in sites that are closed to public use for a few years (Population 7) and have had iceplant and other invasive plant species removed.

Within the Presidio, non-native grasses and shading from non-native trees are the main threats at [redacted] and [redacted]. Non-native grasses are threats in nearly all restoration sites except at [redacted] and [redacted]. *Carpobrotus edulis* is covering open sand habitat in many restoration sites and thus limiting the spread of *Chorizanthe cuspidata var. cuspidata*. *Conicosia pugioniformis* may become a problem for the [redacted] population if it continues to spread down the hillside. Additionally, trampling

from people and dogs may be threatening populations in sites such as [redacted] and [redacted]. Additional invasive species include *Carpobrotus edulis*, *Vulpia bromoides*, *Briza maxima, Bromus diandrus, Avena barbata, Raphanus sativus* and *Rumex acetosella* are the main invasive threats to many populations.

Monitoring conducted 2004

Three of the eleven Fort Funston populations were censused in 2004: populations 5, 6, 11. These were the same populations censused in 2003. This was the third consecutive year of monitoring of each of these populations.

Within the Presidio, 2004 monitoring consisted of determining if the species was present or absent from the site. If the population was found to be present then an estimate of the number of individuals was made. Additionally, if the boundary of the population had changed dramatically since the 2001 survey, a new polygon was created.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Ft Funston	CHCUCU	1	1,117	146	1432	3,660	surveyed; no census	No survey	No survey
		2	588	167	398	910	surveyed; no census	No survey	No survey
		3	--	surveyed; not census	2149	820	surveyed; no census	No survey	No survey
		4	2029	968	2481	750	surveyed; no census	No survey	No survey
		5	403	75	268	470	503	225	209
		6	--	--	218	510	605	600	505
		7	--	approx. 1,500	surveyed; not census	>20,000	surveyed; no census	No survey	No survey
		8	209	75	327	112	surveyed; no census	No survey	No survey
		9	--	--	442	1,450	surveyed; no census	No survey	No survey
		10	--	--	655	no survey	surveyed; no census	No survey	No survey
		11	--	--	--	--	5,088	1,000	2,288
[redacted]		1	--	--	--	--	--	--	3,000-5,000
		2	--	--	--	--	--	--	15,000-20,000
		3	--	--	--	--	--	--	300-500
		4	--	--	--	--	--	--	800-1,000
		5	--	--	--	--	--	--	800-1,000
?		6	--	--	--	--	--	--	?
		7	--	--	--	--	--	--	250-350
		8	--	--	--	--	--	--	85-120
		9	--	--	--	--	--	--	800-1,000
		10	--	--	--	--	--	--	100-150
		11	--	--	--	--	--	--	2
		12	--	--	--	--	--	--	15,000

The above numbers collected on the Fort Funston populations do not show a consistent trend towards increase or decrease. The very low numbers obtained in 1999 as compared with 1998 are likely due to sampling being conducted late in the year. This is an annual species, so annual census figures are expected to fluctuate depending on yearly rainfall. In general, the species is very abundant and widespread. It appears to persist in areas highly infested with ice plant and annual grasses and to germinate from the seed bank following removal of exotics.

Management Recommendations
Efforts should continue to remove non-native annual grasses and forbs at existing sites with populations of *Chorizanthe cuspidate var.cuspidata*.

Monitoring Recommendations
The ubiquitousness of this species makes censusing a daunting task. Sampling rather than censusing is recommended for this species. Sampling in restored versus un-restored areas would provide information on how well the species persists in treated versus untreated areas. Establishing a systematic monitoring method would be a means to study the impacts of humans, dogs and invasive species on this species and to contrast the changes in species abundance based on the impact to which this species is exposed.

Recommended Monitoring Interval
Fort Funston populations: every two years

Presidio Populations:
Monitoring regime (level): 1
Monitoring frequency: every 2 years
Monitoring cycle: 2 year - beta cycle

Chorizanthe cuspidata var. cuspidata

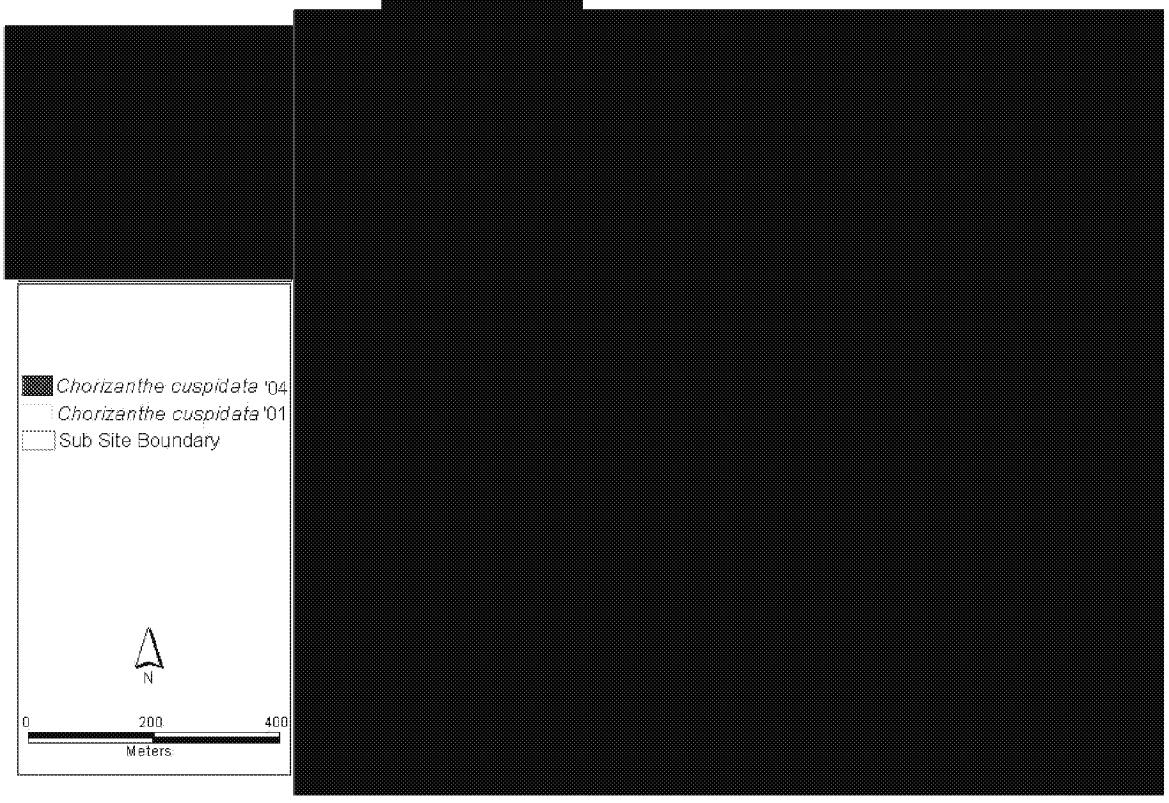
Fort Funston 2002, populations 1-11
San Francisco South Quadrangle

0.2 0 0.2 0.4 Miles

N

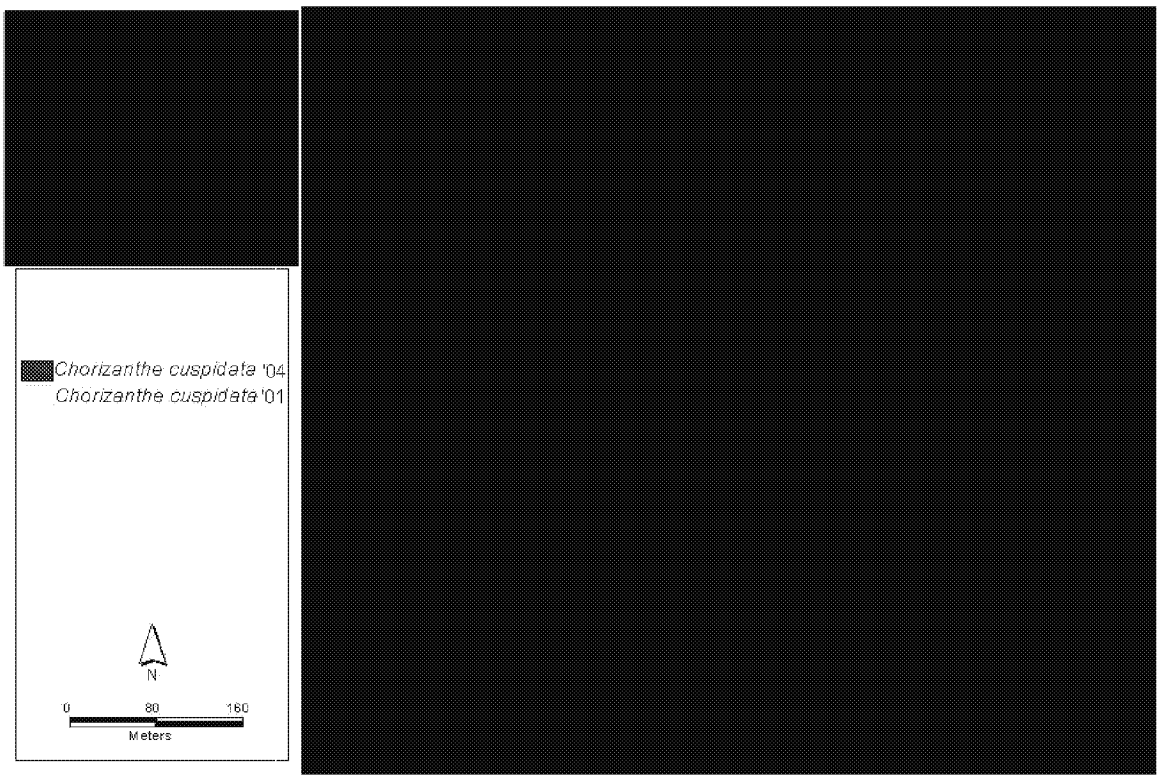
Chcucu_02.shp

Chorizanthe cuspidata var. cuspidata (San Francisco spineflower)
[redacted] the Presidio, 2004



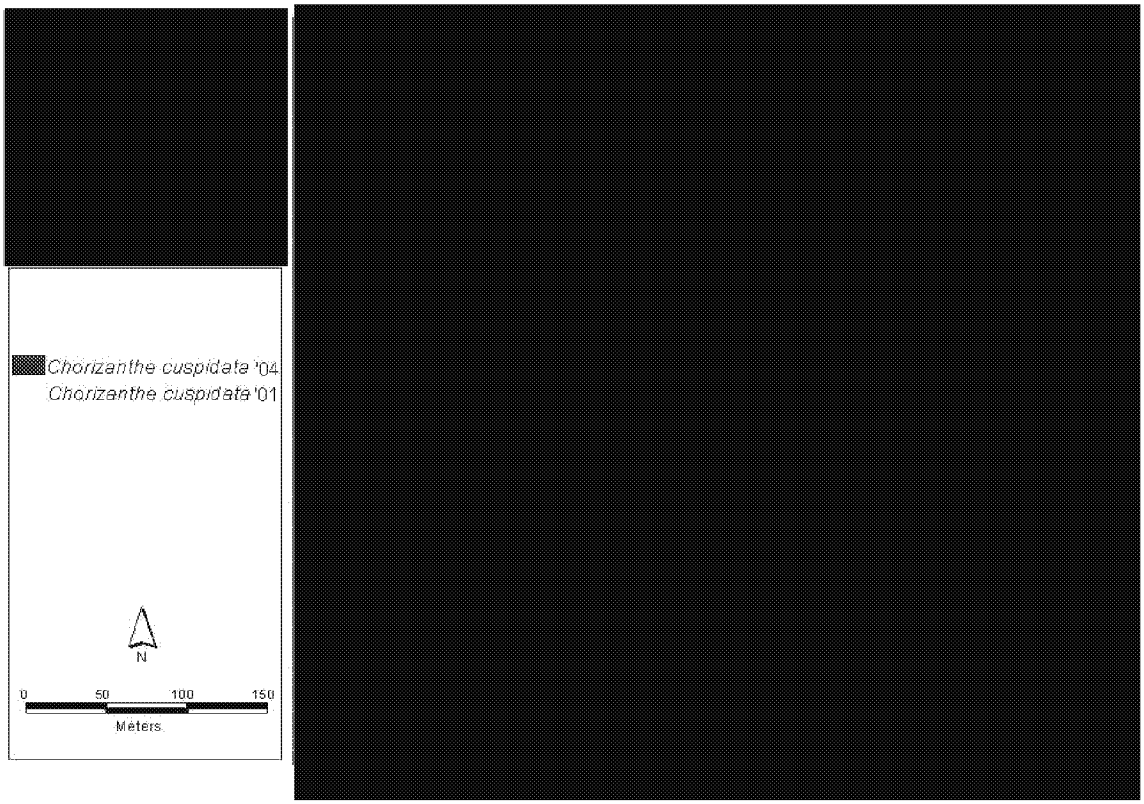
Chorizanthe cuspidata var. cuspidata (San Francisco spineflower)

[redacted]the Presidio, 2004

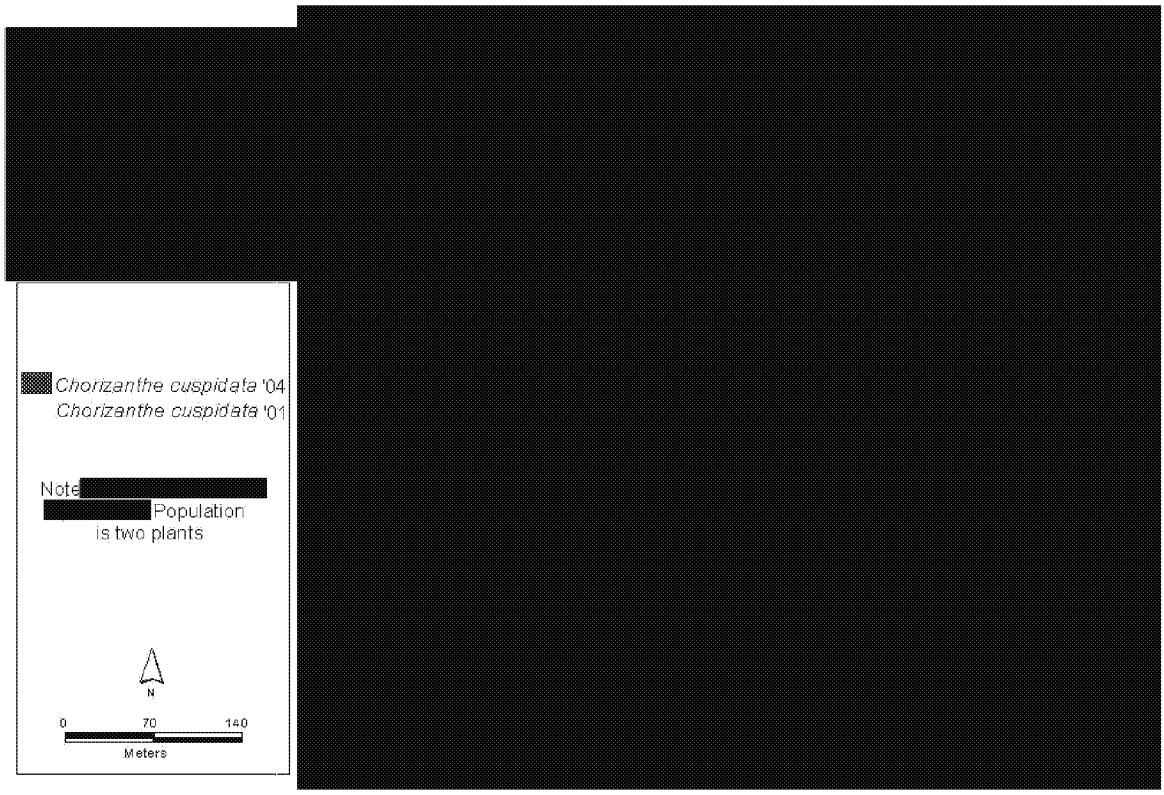


Chorizanthe cuspidata var. cuspidata (San Francisco spineflower)

[redacted] the Presidio, 2004



Chorizanthe cuspidata var. cuspidata (San Francisco spineflower)
[redacted] **the Presidio, 2004**



Cirsium andrewsii A. Gray

Franciscan thistle

Rarity Status
Federal Listing: None
State Listing: None
CNPS List 1B / RED: 2-2-3

Comments: CNPS upgraded *Cirsium andrewsii* from list 4 in the 5th inventory to list 1B in the 6th edition.

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: Marin Headlands, the Presidio

Life History
Flowering Time: March - July

Range
Cirsium andrewsii is endemic to California. Populations are documented in Marin, San Francisco, San Mateo and Sonoma counties.

Characteristics
Cirsium andrewsii is a biennial or short lived perennial thistle. Like many thistle species, *C. andrewsii* appears in the first year as a vegetative rosette. In subsequent years individuals bolt, flower and die. Flowering individuals can grow up to two meters tall with numerous flowering heads. In the Marin Headlands, the invasive *Cirsium vulgare* and native *C. brevistylum* grow in the same habitat as *C. andrewsii*. In wet seeps both of these species can become large and branched, sometimes superficially resembling *C. andrewsii*.

C. vulgare can be distinguished by the rough feel of the leaf upper surfaces, due to a covering of small stiff hairs. The upper leaf surfaces of *C. andrewsii* are cobwebby when young, becoming glabrous; they lack bristles. The stem of *C. vulgare* is spiny winged while the stem of *C. andrewsii* is wingless.

The rosettes of *C. andrewsii* are large, with leaves up to 75cm long; those of *C. brevistylum* are smaller with leaves to 25cm; the upper leaves of *C. brevistylum* are thin with weak spines less than 10mm, while the upper leaves of *C. andrewsii* are thick and more clearly clasping with spines up to 15mm. There are also differences in the flowers and stem hairs of the two species.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
Within the Marin Headlands, *Cirsium andrewsii* occurs in seeps and drainages. In the Presidio, *C. andrewsii* occurs at [redacted] and along the [redacted] surrounding the [redacted] edge of the Presidio. All populations are located within freshwater seeps located on the coastal serpentine bluffs.

Threats
Vegetation in seeps in [redacted] appeared generally in good condition with low levels of non-native species. Some seeps in [redacted] and [redacted] have higher levels of non-native species; for instance *Conium maculatum* (poison hemlock) has been seen growing in dense stands within the population and habitat of *C. andrewsii*.

Changes in the water table may have adverse affects on the health of populations. Some of the populations have fire roads and trails directly above or below them. Repairs and/or changes to the roads and trails, as well as the culverts near populations could raise or lower water tables.

The threats at the [redacted] population consist of *Cortaderia jubata* and *Delaria odorata* as well as a small population of *Escallonia sp.* which is found in the population area. The site condition is good. Along the [redacted] invasive threats include *Cortaderia jubata, Picris echioides, Carpobrotus edulis, Brassica sp.* and *Delaria odorata.* Additionally, there are social trails located adjacent to populations which accelerate natural erosion processes and thereby threaten the entire [redacted] ecosystem. In all three [redacted] populations, there is a social trail directly adjacent to population perimeter. The site condition is fair to good.

Monitoring conducted 2004
Eleven of the 18 populations located in the Marin Headlands were censused in 2004 and photopoints were retaken.

Populations of *Cirsium andrewsii* were surveyed and mapped at [redacted] and the [redacted]

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Marin Headlands	CIAN	1	*	388	298	245	photopoints	No survey	273
		2	--	95	54	22	photopoints	No survey	33
		3	--	187	112	63	photopoints	No survey	85
		4	--	166	40	33	photopoints	No survey	63
		5	--	13	19	9	photopoints	No survey	22
		6	--	37	19	22	photopoints	No survey	28
		7	--	10	8	8	photopoints	No survey	12
		8	--	6	9	3	photopoints	No survey	4
		9	--	22	21	11	photopoints	No survey	25
		10	--	0	No survey	No survey	photopoints	No survey	No survey
		11	--	--	64	42	photopoints	No survey	55
		12	--	--	--	--	1	No survey	No survey
		13	--	--	--	--	19	No survey	No survey
		14	--	--	--	--	11	No survey	No survey
		15	--	--	--	--	4	No survey	No survey
		16	--	--	--	--	46	No survey	No survey
		17	--	--	--	--	--	145	No survey
		18	--	--	--	--	--	1	No survey
[redacted]		1	7	5	3	2	3	6	6
[redacted]		2	--	--	14	8	2	24	9
		3	--	--	49	68	20	0	1
		4	--	19	27	29	58	35	60

* Population sampled not relocated in subsequent years.

In the Marin Headlands populations, both rosettes and flowering individuals were recorded during the census counts. Only the number of flowering individuals, however, are recorded above. As noted in the 2000 report, in some populations, numbers remain very consistent year to year while others fluctuate. The most serious threats to these populations appears to be the

spread of invasive species such as *Conium maculatum* and *Festuca arundinacea* that can come to dominate sites.

In the Presidio, individuals are classified as vegetative, seedling or flowering. The above numbers are the sum total of all individuals counted. Individuals in the CIAN4 population were noted as especially vigorous in 2004. The seep they occur in is actively managed to control invasive plants. Many seedlings were observed along with flowering individuals.

Management Recommendations
Maintenance workers that may be working on culverts, roads and trails near populations should be alerted to the presence of *C. andrewsii*. Extra care should be taken in ensuring water tables stay more or less the same in these sites.

Within the Presidio populations, non-native species should be selectively removed in the area surrounding the populations. Removal of *Delaria odorata* at CIAN3 should be considered in order to increase the amount of potential habitat. Active weeding of *Carpobrotus edulis*, *Delaria odorata*, *Picris echioides* and *Brassica sp.* should continue at all population locations.

Monitoring Recommendations
The impact of introduced species on *Cirsium andrewsii* is unknown at this time. Closer monitoring of *Conium maculatum*, *Dipsacus fullonum* and *Cirsium vulgare* within the populations may help in identifying changes in *Cirsium andrewsii* populations. Establishing a standardized method to gather quantitative information on other species (both native and non-native) would aid in assessing how the population size of *Cirsium andrewsii* fluctuates in relation to changes in cover and density of other species within the communities in which this species occurs.

The populations should be censused and mapped again in 2005. Results from the 2001 planting experiment should be collected and analyzed before more *Cirsium andrewsii* is outplanted.

Recommended Monitoring Interval:
Marin Headland populations: every three years

Presidio populations:
Proposed monitoring regime: Level 2.5
Proposed monitoring frequency: every year

Cirsium andrewsii

0.2 0 0.2 0.4 0.6 0.8 1 Miles

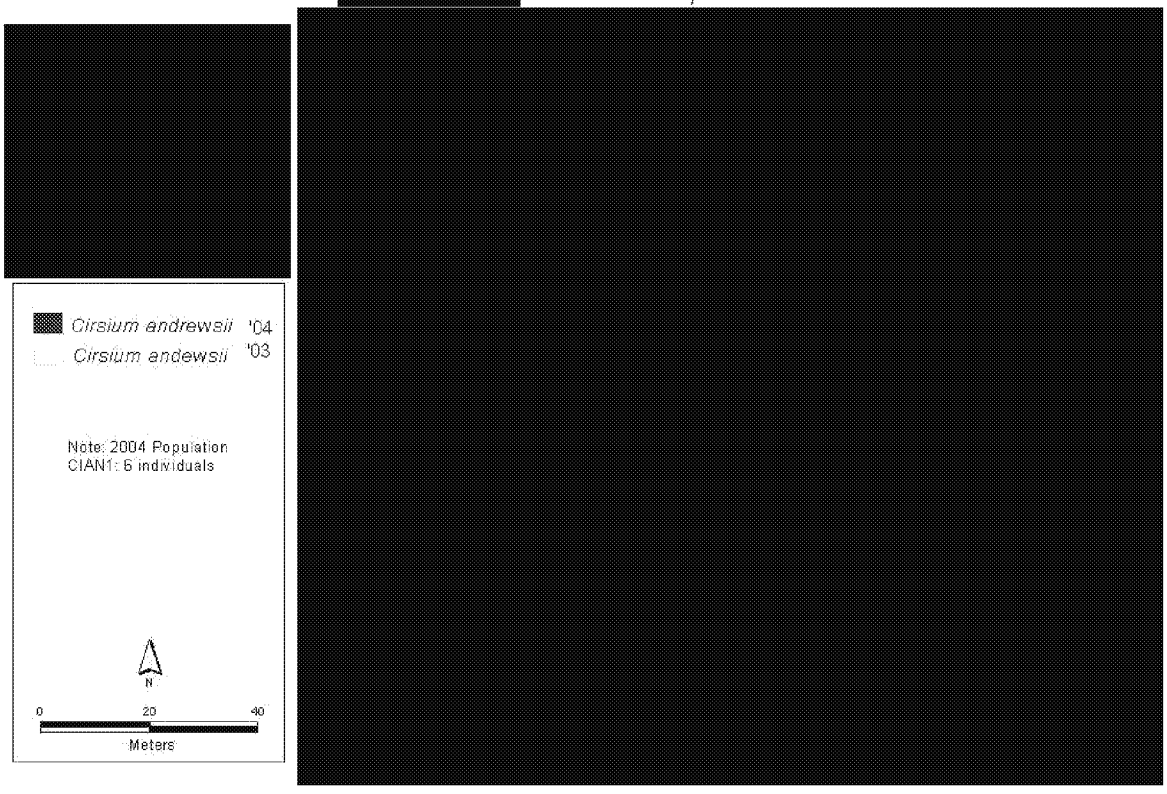
N

Marin Headlands, 2003
Point Bonita and San Francisco North Quadrangles

Cian_03.shp

Cirsium andrewsii (Franciscan thistle)

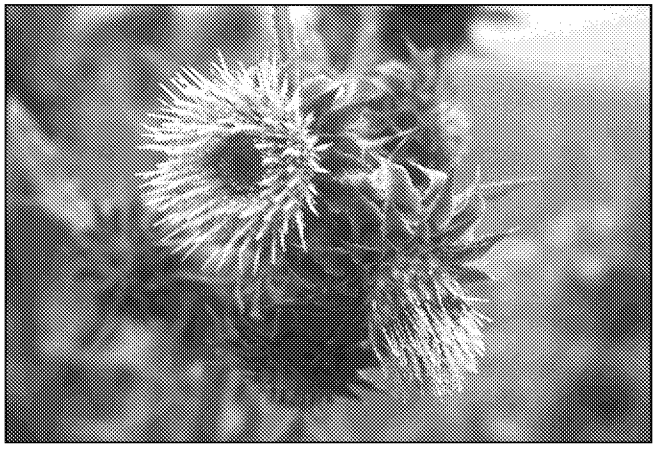
[redacted] the Presidio, 2004



Cirsium andrewsii (Franciscan thistle)

[redacted] the Presidio, 2004

Cirsium fontinale E. Greene **var. *fontinale***
Fountain thistle



Rarity Status
Federal Listing: **ENDANGERED**
State Listing: **ENDANGERED**
CNPS List: 1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Legislative boundary:
San Francisco Watershed District

Life History
Flowering Time: June-October

Range
Cirsium fontinale var. *fontinale* is endemic to California. According to the CalFlora database, populations are restricted to a few scattered sites in San Mateo County and three documented populations in San Luis Obispo County. CNPS reports populations only occurring in San Mateo County.

Flowering Time: June-October

Characteristics
Cirsium fontinale var. *fontinale* is a perennial thistle. Like many thistle species, *C. fontinale var. fontinale* appears in its first year as a small, vegetative rosette and the following year bolts and flowers. The plant's nodding flower heads and glandular leaves easily identifies flowering individuals of this distinctive and regal species. Other varieties of this species do not occur in the same locations. The first-year rosettes can be distinguished from *Cirsium vulgare* by the lack of bristles (stiff hairs) on the leaf surfaces. Both species have spiny leaf margins.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
A few scattered, small populations of *Cirsium fontinale* var. *fontinale* occur in seeps and drainages that run through the serpentinite grasslands on the east side of [redacted] in the San Francisco Watershed District. The populations occur on both sides of [redacted]. One small population is located further south near [redacted] in the [redacted]'. Six populations are documented in the San Francisco Watershed. No other populations are known to occur on GGNRA lands.

Threats
Introduced species do pose a distinct threat to the vigor of these populations. Many of the populations are adjacent to major roads and highways and are therefore going to be under constant threat from introduced species. *Cortaderia* sp. (pampas grass) poses a significant threat to several of the *Cirsium fontinale* var. *fontinale* populations. Some of the *Cortaderia* populations show signs of recent control efforts. Other introduced species of concern that could have an adverse affect on *C. fontinale* var. *fontinale* populations are *Cirsium vulgare* (bull

thistle) and *Dipsacus fullonum (*teasel*)*. Several large patches of *Centaurea solstitialis* (yellow starthistle) have been observed adjacent to the populations.

It is likely that changes in the water table would have adverse affects on the health of populations. Some of the populations have roads and trails directly above or below them. Repairs and/or changes to the roads and trails, as well as the culverts near populations could raise or lower water tables.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	Site condition	1998	1999	2000	2001	2002	2003	2004
SFWD	CIFOFO	1	Fair-Good	--	2,264	1,800	1,809	No survey	No survey	No survey
		2	Poor-Fair	--	942	473	539	No survey	No survey	No survey
		4	Good	--	65	7	No survey	No survey	No survey	No survey
		5	Poor-Fair	--	1,258	1,334	708	No survey	No survey	No survey
		7	Fair-Good	--	812	430	575	No survey	No survey	No survey
		8	Excellent	--	87	82	183	No survey	No survey	No survey

This is one of the rarest of the rare plant species occurring within GGNRA and SFWD being listed as 'endangered' at both the federal and state levels. The populations appear to be maintaining themselves despite threats from exotic species (particularly *Cortaderia*) and mowing. In 2000, surveyors reported that the population 4 was subject to mowing and that a fence that had been constructed around the population had fallen. Population 4 occurs in the same grassland area as *Pentachaeta bellidiflora* and where *Acanthomintha duttonii* was last reported.

It should be noted that both vegetative rosettes and flowering individuals were counted in the censusing of these populations and both are included in the above totals.

Management Recommendations

Efforts to extirpate *Cortaderia* sp. should continue. Maintenance workers improving or repairing culverts, roads or trails near populations should be alerted to the presence of *C. fontinale var. fontinale*. Extra care should be taken in maintaining water table levels within these populations.

Monitoring Recommendations

Photopoints may be established to monitor current locations of the populations and the extent of non-native species, particulary *Cortaderia.*

Recommended Monitoring Interval

Yearly to assess population health and to monitor invasive species.

Cirsium fontinale var. fontinale

[redacted]

near [redacted] *Park*

Woodside Quadrangle

0.2 0 0.2 0.4 Miles

Clarkia franciscana Lewis & Raven

Presidio clarkia

Rarity Status
Federal status: **ENDANGERED**
State Listing: **ENDANGERED**
CNPS List: 1B /R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: May – July

Range: San Francisco and Alameda counties. Known from fewer than five occurrences.

Characteristics: *Clarkia franciscana* is an annual herb. It occurs in coastal scrub, valley and foothill grasslands particularly on serpentinite. The inflorescence axis is straight in bud and the buds are erect. The sepals stay fused in fours after anthesis. The corolla is bowl shaped with petals wedge shaped. Petals are lavender-pink shading to white near middle with the base bright reddish purple. Petal length is 5-13mm. The ovary is four grooved. The stamens are all alike and the stigma does not exceed the anthers. In *C. rubicunda* the stigma exceeds the anthers and petal length is between 10-30mm.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
Clarkia franciscana occurs only in the Presidio at the [redacted] and [redacted] Two populations occur at the [redacted] in remnant serpentine coastal prairie. Four populations occur at [redacted] also in remnant serpentine coastal prairie.

Threats
The [redacted] Site, where CLFR 1 and CLFR 2 are found, is immediately bounded by lawn, road and coastal scrub. Growth of the shrub species poses a threat to the *Clarkia franciscana* population. The shrub species, all native, include *Ceanothus thyrsiflorus*, *Heteromeles arbutifolia* and *Rubus ursinus*. Non native grasses such as *Vulpia bromoides, Briza maxima* and *Bromus diandrus* also pose a threat at the [redacted] site.

The [redacted] populations are threatened by non native grasses. The populations are immediately bounded by conifers, a highly invaded grassland, remnant serpentine prairie, and road. The conifers cause shading and a resultant elevation in moisture. Both non-native annual and perennial grasses threaten *Clarkia franciscana* habitat including species such as *Dactylis glomerata, Holcus lanatus, Lolium multiforum, Avena sp.* and *Bromus diandrus.* Threats from native species include *Rubus ursinus*.

Monitoring Conducted 2004

All *Clarkia franciscana* populations were monitored in 2004.

Monitoring Results: 2001- 2004

Location	Species Code	Pop. No.	1998	1999	2000	2001	2002	2003	2004
[redacted]	CLFR	01	--	--	--	--	--	188	912
		02	--	--	--	--	--	3	0
[redacted]	CLFR	03	--	--	--	--	--	977	876
		04	--	--	--	--	--	15	16
		05	--	--	--	--	--	19,784	18,040
		06	--	--	--	--	--	180	105

At time of censusing, most of the individuals were flowering. CLFR 2, a population of 3 individuals added in 2003, was not present this year. A new polygon in the [redacted] was added to CLFR5 as well as 4 additional points in the [redacted] subsite.

Populations at [redacted] and the [redacted] site have been monitored since 1994. Monitoring data for all years in included in Appendix VII. This is one of the few species for which 10 consecutive years of monitoring data has been collected.

Management Recommendations

The shrub borders surrounding *Clarkia franciscana* populations at the [redacted] site should be cut back. Future stewardship activities should also focus on non-native grass removal. At [redacted] non-native grasses and accumulated thatch should be reduced. Prescribed burning, scraping, herbicide, hand removal and grazing should be explored to determine the most effective methods for management of *Clarkia franciscana* populations. Adjacent non-native trees should be removed to reduce shade and moisture levels. These moist conditions are not only counter to *Clarkia franciscana* habitat requirements but also allow other native species such as *Rubus ursinus* to proliferate.

Monitoring Recommendations

For monitoring, it is recommended that a sampling method be developed in order to reduce the amount of effort needed to complete the annual count.

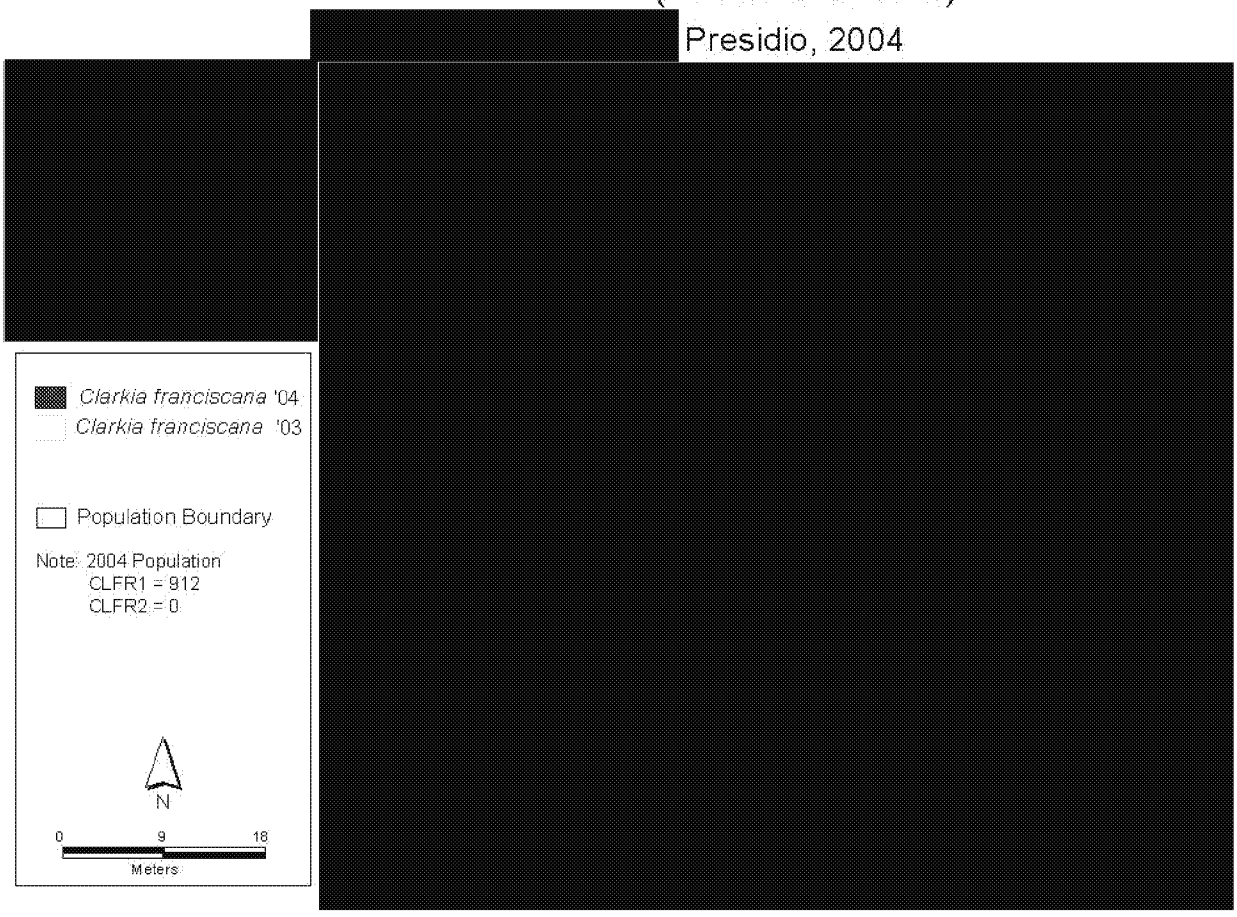
In the future, close attention should be paid to the vegetative growth of the plant to ensure those not in flower or those setting seed are identified. For novice monitors, the leaf shape and color of *Epilobium ciliatum* ssp. *watsonii* can appear similar to that of *Clarkia franciscana*. It is crucial to point out the differences before starting. On the serpentine outcrops *Clarkia franciscana* tends to be quite small in size and numerous. Also note the redder leaf color of the individuals on the outcrops.

Monitoring Schedule

Monitoring regime: level 2
Monitoring frequency: every year

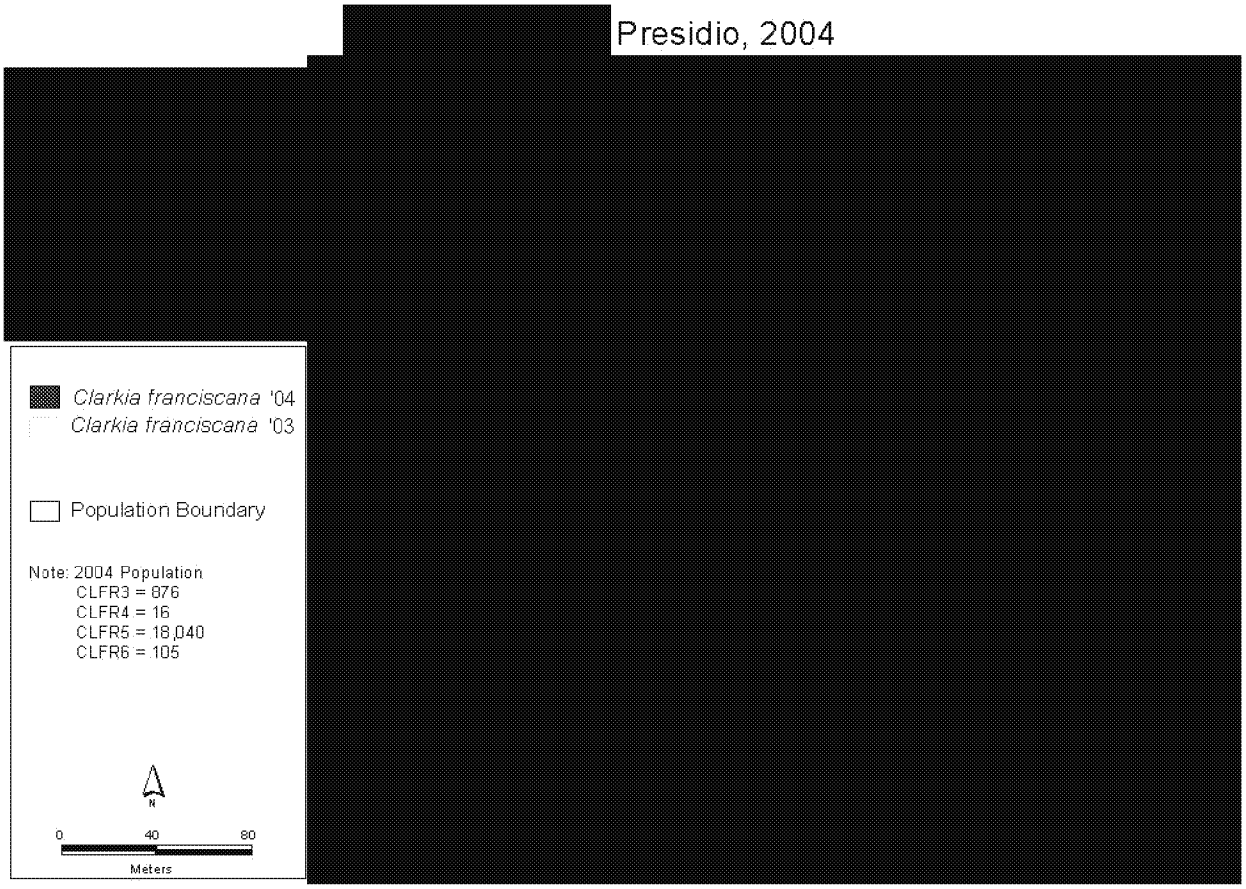
Clarkia franciscana (Presidio clarkia)

Presidio, 2004



Clarkia franciscana (Presidio clarkia)

Presidio, 2004



Cordylanthus maritimus Benth. **ssp. *palustris*** (Behr) Chuang & Heckard

Point Reyes bird's-beak

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-2

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Locations within:
Management Boundary: [redacted], the Presidio
Legislative Boundary: [redacted]

Life History
Flowering Time: June-October

Range: This plant is endemic to the pacific coast of North America.

Characteristics: This is plant is an annual herb that occurs in coastal salt marshes. The plants are grey-green in color with calyx lobes shallowly three-lobed. Stamens are 4 with 2 smaller and 2 larger. Salt crystals are usually visible on stems and leaves.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
Four populations have been documented on the [redacted] on GGNRA northern lands. Two small populations have been documented at [redacted]. There is one mega population located at the [redacted], with smaller sub-populations. All populations occur within coastal salt marsh habitat.

Threats
Carpobrotus edulis (Ice Plant) occurs within 10 feet of population 1 at [redacted]. Parts of the east shore of [redacted] are very heavily invaded by other non-native species. The populations at the [redacted] occur in intact marshland.

Site condition at [redacted] is good. Threats to this population include the variable tidal fluctuations of the [redacted], damage from gopher activities (gopher activities have been observed in one of the plots and around other plants outside of plots), and shading from other species or the lack of open space.

Monitoring conducted 2004
All populations occurring on [redacted] and the two populations occurring at [redacted] were censused in 2004.

Within the Presidio, populations of *Cordylanthus maritimus* ssp. *palustris* have all been reintroduced as part of the [redacted] restoration. Seeding of six one meter square plots placed within the existing population at the west end of the marsh was done in November 2004. Monitoring involved censusing all individuals within the seeded plots and censusing all individuals found outside the seeding plots. Additionally, in order to better understand the

population structure and to obtain reproduction information about the species, the number of individuals that had flowered and produced fruit were counted in a second census.
Only the total number of individuals counted in 2004 has been recorded below. Additional results can be found in the GGNRA restoration database.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	COMAPA	1	--	--	--	--	3	25	17
		2	-	--	--	--	--	18	22
[redacted]		1	--	--	--	approx. 250	No survey	1,507	1,109
		2	--	--	--	--	No survey	203	190
		3	--	--	--	--	No survey	3,010	2,081
		4	--	--	--	--	No survey	2,493	2,103
[redacted]		3	--	--	--	--	--	--	160
		4	--	--	--	--	--	--	555
		5	--	--	--	--	--	--	379
		6	--	--	--	--	--	--	344
		7	--	--	--	--	--	--	268
		8	--	--	--	--	--	--	389
[redacted]		west	--	--	--	--	--	122	259
		east	--	--	--	--	--	1	1
		south	--	--	--	--	--	--	8

The [redacted] populations, though small, maintained roughly the same population size between 2003 and 2004. The [redacted] populations, likewise were equally as abundant in 2004 as in 2003.

Because of the different management efforts on the Presidio populations between years, no population trend data is yet available.

Management Recommendations
Seeds should be spread from the plots to the surrounding area, to reduce the intensity of intra-competition among individual *Cordylanthus maritimus* ssp. *palustris* plants. From field observation, bigger plants seemed to produce more seeds and scattered plants seemed to grow bigger and taller than clustered plants (mostly found inside plots).

Monitoring Recommendations
None at this time.

Recommended Monitoring Interval
[redacted] and [redacted] populations:
Monitor each population yearly for three years to document fluctuations in population size between years. If the population appears to be stable, monitor every three years.

Presidio populations:
Proposed monitoring regime: Level 2
Proposed monitoring frequency: every year

Cordylanthus maritimus ssp. palustris

0.2 0 0.2 0.4 0.6 0.8 1 Mile

N

2003
Bolinas Quadrangle

Comapa_03.shp

Cordylanthus maritimus ssp. palustris

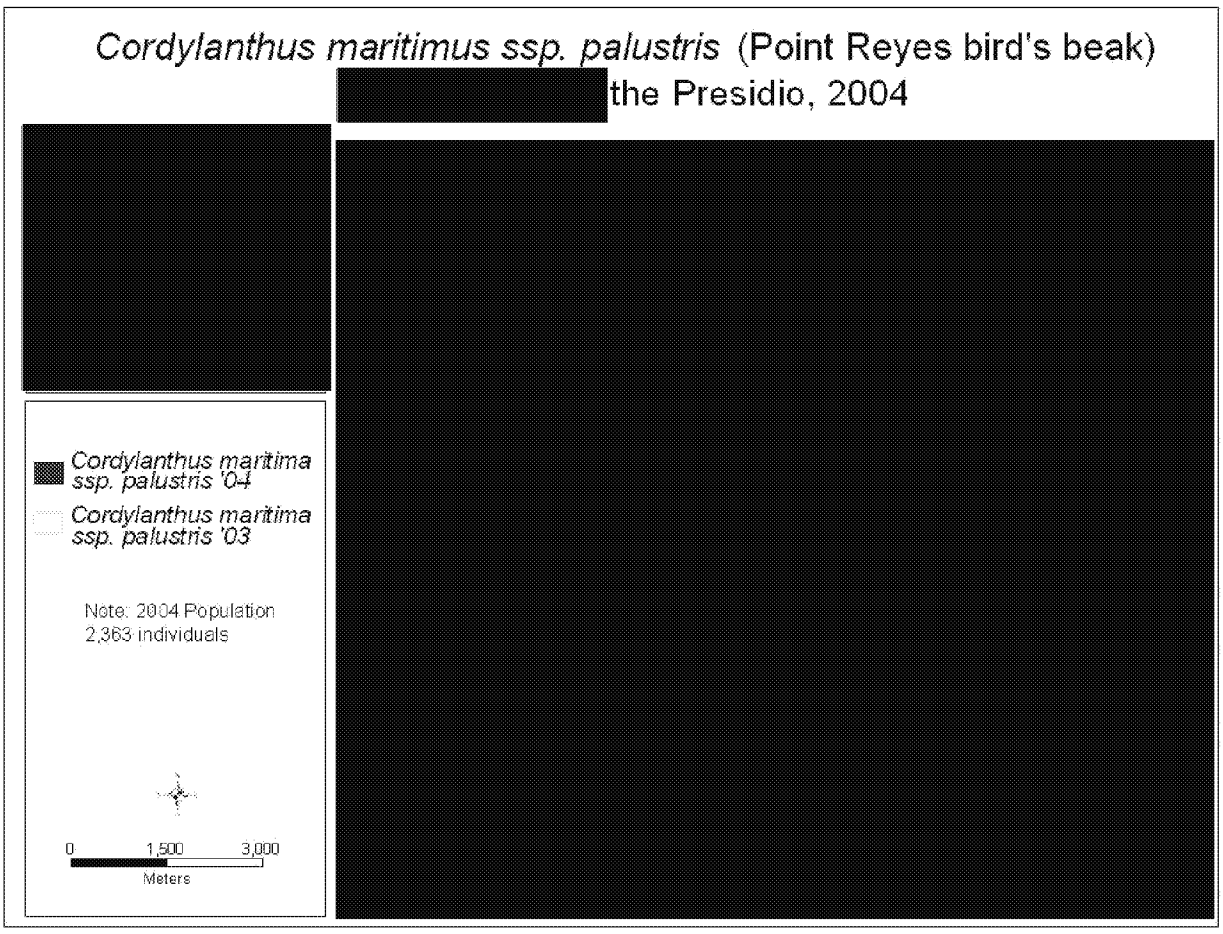
[redacted] 2003

Inverness Quadrangle

0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 Miles

Comapa_03.shp

N


Cordylanthus maritimus ssp. palustris (Point Reyes bird's beak)
[redacted] the Presidio, 2004
[redacted]
[redacted]
Cordylanthus maritima ssp. palustris '04
Cordylanthus maritima ssp. palustris '03
Note: 2004 Population 2,363 individuals
0
1,500
3,000
Meters

Dirca occidentalis A. Gray
Western leatherwood

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: [redacted], San Francisco Watershed District

Life History
Flowering Time: January-April

Range: *Dirca occidentalis* is endemic to California.

Characteristics:
This precocious deciduous shrub has a bright yellow calyx that appears before the plant leafs out very early in the spring. When flowering, *D. occidentalis* has unmistakable drooping flowers in clumps of two to three along a naked stem. Once *D. occidentalis* has leafed out, it blends in well and bears an uncanny resemblance to oso berry (*Oemleria cerasiformis*), which seems to frequently grow in association with *D. occidentalis*. Oso berry has white flowers that occur with the leaves. *Dirca occidentalis* can grow in a number of habitats. It grows beneath an oak forest canopy in GGNRA. In the SFWD it grows as an associate of the coastal scrub on mid-slopes and ridge tops as well as in stream drainages.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
Several populations are documented in the San Francisco Watershed District and one population is documented in the GGNRA northern lands along the [redacted]. It is likely more extensive than the maps would suggest as it is easily missed in surveys later in the season.

Threats
Road maintenance and firebreaks may have some adverse effects on the population. *Dirca occidentalis* was observed sprouting from a cut stump that had been bulldozed the previous year for a firebreak in the SFWD.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	DIOC	1	80	not found*	approx. 50	68	No survey	No survey	No survey
SFWD		1	--	not found*	--	15	No survey	No survey	No survey
		2	--	not found*	--	5	No survey	No survey	No survey
		3	--	not found*	--	10	No survey	No survey	No survey

* surveys conducted too late in season to identify plant

On both GGNRA lands and SFWD lands, the populations of this species appear to be thriving. Within SFWD lands, the known extent of the population has greatly increased beginning with surveys conducted in 2000. In 2001, surveyors noted that it is likely that this species is even more widespread than currently mapped.

In 2000, surveyors reported the population in [redacted] to be in excellent condition and no new disturbances or threats were noted in 2001.

Management Recommendations
None at this time

Monitoring Recommendations
More exhaustive surveys should be conducted in early February in the SFWD to determine the abundance and distribution of this species.

Recommended Monitoring Interval
Every three years

Dirca occidentalis

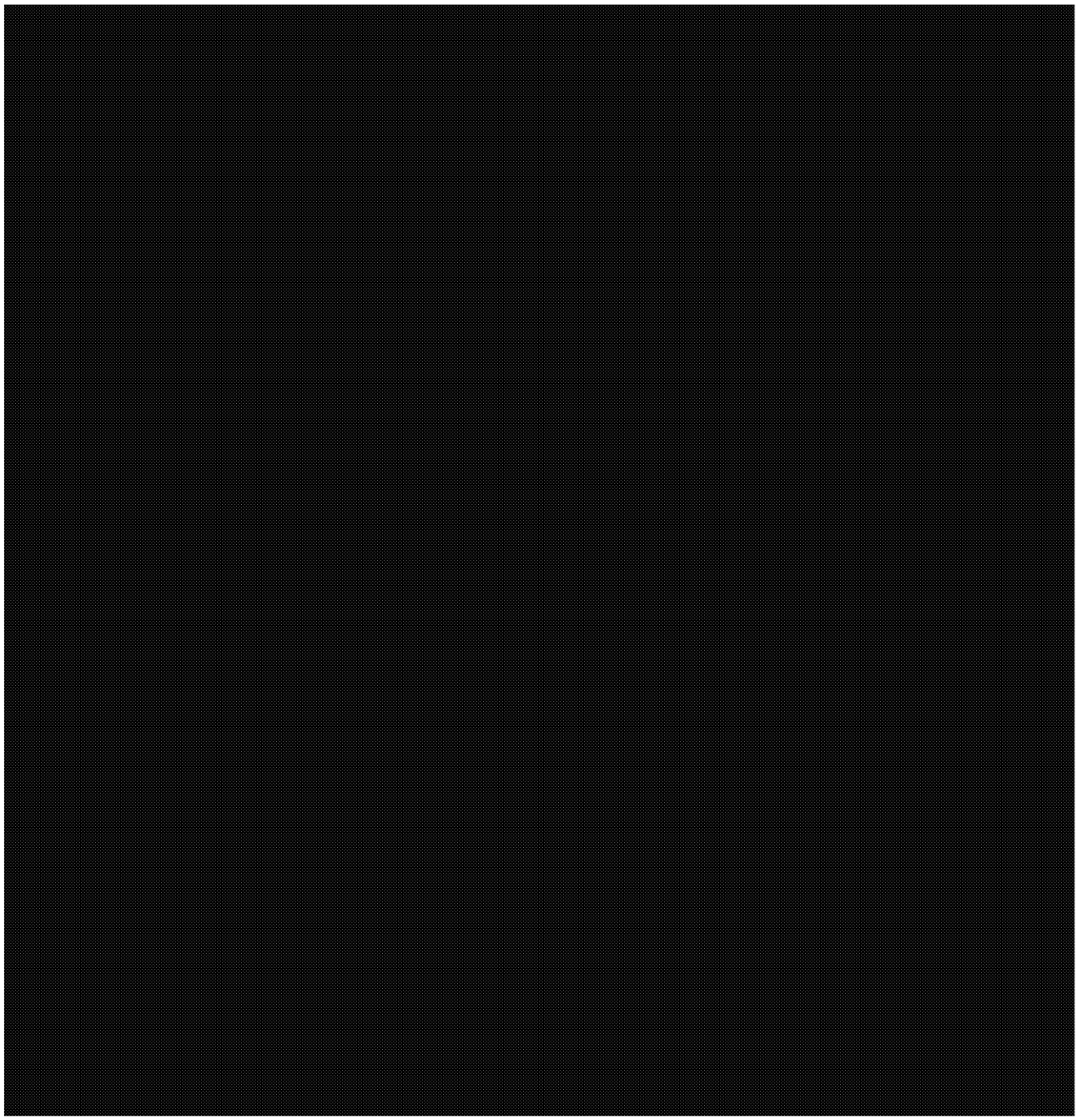
[redacted]

San Geronimo Quadrangle

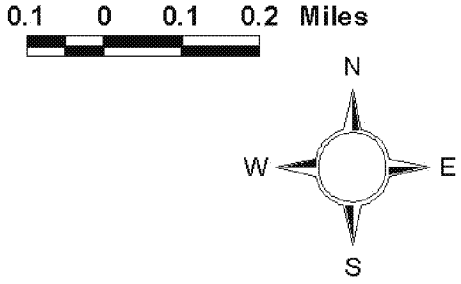
0.1 0 0.1 0.2 0.3 Miles

N W E S

Dirca occidentalis



San Francisco Watershed DIstrict
Montara Mountain Quadrangle



Elymus californicus (Bol.) Gould

California bottle-brush grass

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 4 / R-E-D Code: 1-1-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Management boundary: Muir Woods, Oakwood Valley
Legislative boundary: GGNRA Northern lands, San Francisco Watershed District

Life History
Flowering Time: May-August or later

Range: This plant is endemic to California. There are documented occurrences in Marin, Santa Cruz, Monterey, San Mateo and Sonoma counties. Within those counties there are numerous occurrences. It appears that this plant is locally common although restricted in its overall distribution.

Characteristics: This showy bunchgrass has a distinctive, somewhat drooping inflorescence and can grow up to 2 meters tall. It is unique in the genus *Elymus* in California in that its flower spikelets lack glumes. It is generally found in or at the edge of forest gaps. It is most often found in mature Douglas-fir forests but also occurs in the GGNRA in *Umbellularia californica* (Bay) forest and in plantations of *Pinus radiata* (Monterey Pine) and *Sequoiadendron giganteum* (Giant Sequoia),

The species often occurs with the common *Elymus glaucus*, and can be confused with it unless the spikelets are carefully examined.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This species is locally common on the moist western slopes of Bolinas Ridge, in the SFWD, in Muir Woods and in Oakwood valley. On GGNRA northern lands, it occurs in mixed evergreen forest in the Lagunitas Creek drainage off of [redacted].

Threats
The species seems so abundant that few immediate threats are apparent. Perennial grasses such as *Phalaris aquatica* (Harding Grass) can be found near some stands, however, and may in time take over portions of the habitat.

Monitoring conducted 2004
No monitoring was conducted in 2004.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	ELCA	1	--	--	--	--	101	No survey	No survey
		2	--	--	--	--	770	No survey	No survey
		3	--	--	--	--	112	No survey	No survey
		4	--	--	--	--	310	No survey	No survey
Muir Woods		all	approx. 1,485	No survey	710	No survey	No survey	No survey	No survey
Oakwood Valley		1	--	--	--	--	260	No survey	No survey
Lagunitas Crk		1	--	--	--	206	No survey	No survey	No survey
[redacted]		2	--	--	--	69	No survey	No survey	No survey
SFWD		1	--	Surveyed; not censused	Surveyed; not censused	Surveyed; not censused	No survey	No survey	No survey

Due to the wide spread occurrence and numerous individuals found, mapping of population boundaries rather than individual census counts are acceptable for this species. The numbers listed above are rough estimates of the size of these populations.

Management Recommendations
None at this time

Monitoring Recommendations
This is not a priority species. Populations should be briefly revisited every three years to monitor threats from invasive species.

Continue inventories for possible new populations. This information will provide further information on this species distribution within Marin and San Mateo counties.

Recommended Monitoring Interval
Every three years.

Elymus californicus

Bolinas Quadrangle

0.3 0 0.3 0.6 Miles

2002 Inventory/Monitoring Report

to insert MUWO map

Elymus californicus
Oakwood Valley

Point Bonita Quadrangle

0.09 0 0.09 0.18 Miles

2002 Inventory/Monitoring Report

Elymus californicus

Lagunitas Creek [redacted] 2001
Inverness/San Geronimo Quadrangles

0.4 0 0.4 0.8

N

Elca_01.shp

Elymus californicus

San Francisco Watershed District

[redacted] and

Woodside Quadrangle

0.3 0 0.3 0.6 0.9 1.2 Miles

N

W E

S

(Eriogonum luteolum E. Greene **var. *caninum*** (E. Greene) Rev.)

Tiburon buckwheat

****pending positive identification****

Rarity Status
Federal Listing: C3c – Too widespread and/or not threatened
State Listing: None
CNPS List: 3 / R-E-D Code:?-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: [redacted]

Life History
Flowering Time: June-Sept

Range: This plant is endemic to California and is documented in numerous counties in and around the San Francisco Bay Area. It is possible that many of these populations have been misidentified and the actual range of this subspecies is much smaller.

Characteristics:
This small annual buckwheat has showy red flowers and little or no cauline leaves. It is very difficult to distinguish between the two varieties of this species. *Eriogonum luteolum* var. *luteolum* is common in California. Both varieties grow in the same habitat of open serpentinite chaparral.

The two varieties differ in the following characters:

E. luteolum var. caninum	***E. luteolum var. luteolum***
Involucre appearing terminal	Most involucres appearing lateral
Infloresence ± repeatedly forked (or ± evenly branched); or umbel-like	Inflorescence cyme-like, ± unevenly branched
Flowering branches w/short branchlets usually of a single internode; involucres in axils and terminal	Flowering branches elongate, virgate, bearing involucres at the nodes; the lateral ones appressed

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
The only documented population is at [redacted] on Mt. Tamalpais.

Threats
The presence of introduced species and encroachment of native tree and shrub species due to fire suppression may be of concern.

Species determination
During the 2001 survey, the surveyor questioned whether or not the species observed was actually *E. luteolum* var. *caninum* or the more common variety *E. luteolum* var. *luteolum*. In 2002, a voucher collection was made and taken to California Academy of Sciences to compare with specimens in the herbarium. The specimens have been mounted and are housed in the herbarium cabinets in Building 1061, Fort Cronkhite.

The strongest character found to differentiate the two varieties was the number of lateral infloresences. The specimens collected have generally two lateral inflorescences between the axial and terminal inflorescence. The specimens of *E. luteolum* var. *luteolum* viewed from the Academy collection had numerous lateral inflorescences. This character is visible in the photo of *E. luteolum* var. *luteolum* at the end of this entry. Contrast the number of lateral inflorescences in the photo below with the specimens collected.

In order for a final determination of variety can be made, the vouchers collected should be verified by another qualified botanist. This could be a botanist among GGNRA staff or an outside expert.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	ERLUCA	1	17	31	33	587	Surveyed; no census	No survey	531
		2	--	--	--	346	Surveyed; no census	No survey	298

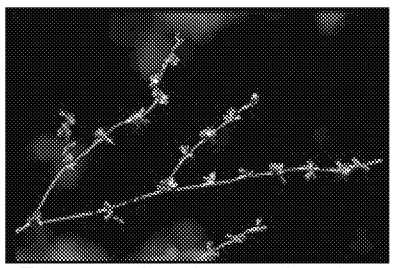
The low numbers recorded in 1998 through 2000 as compared with those in 2001 are due to a smaller area being surveyed and the surveys being conducted too early in the year. Surveys conducted in 1998 through 2000 were conducted mid-May to mid-June when most plants are still in the rosette stage. Censuses conducted in 2001 and 2004 were conducted in late June. Both populations were censused in 2004 and the species was found to be quite abundant in both the east and west populations.

Management Recommendations
None at this time.

Monitoring Recommendations
In order for a final determination to be made as to the identification of variety, the vouchers collected should be verified by another qualified botanist. This population should not be reported to CNPS or NDDB until a positive determination has been made.

This species has a Federal listing of 3c and its rarity is undetermined by CNPS. Therefore, though positive identification should be made, this species may not warrant continued intensive monitoring. Establishing line transects would allow for the gathering of absolute cover data for individual species as well as relative cover data for all species occurring within this community. A series of transects distributed across these populations would provide data on changes in cover of both native and non-native species.

Recommended Monitoring Interval
Every three years



Eriogonum luteolum var. *luteolum*

(Eriogonum luteolum var. caninum)

[redacted]

San Rafael Quadrangle

0.05 0 0.05 0.1 Miles

N
W E
S

Eriophyllum latilobum Rydb.

San Mateo wooly sunflower

Rarity
Federal Listing: **ENDANGERED**
State Listing: **ENDANGERED**
CNPS List:1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Legislative boundary**:** San Francisco Watershed District

Life History
Flowering Time: May-June

Range
Eriophyllum latilobum is endemic to California and, according to CNPS, is restricted to only one extant population. According to the CalFlora Occurrence Database, there are a few other reported occurrences in San Mateo, Napa and San Bernardino counties.

Characteristics
E. latilobum is a subshrub in the family Asteraceae. It has bright yellow ligules and light green stems and leaves. *E. latilobum* is easily confused with *Eriophyllum confertiflorum* var. *confertiflorum*. The inflorescence of *E. c.* var. *confertiflorum* is much denser than that of *E. latilobum*. The phyllaries of *E. confertiflorum* var. *confertiflorum* are strongly overlapping whereas the phyllaries of *E. latilobum* are only slightly overlapping. The ligules of *E. c.* var. *confertiflorum* are generally shorter (2-5mm) than the ligules of *E. latilobum* (5-10mm).

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
There is only one known population in the San Francisco Watershed. Scattered clumps occur along the [redacted]. The population is adjacent to the road and generally grows on or adjacent to partly shaded road cuts.

Threats
The first site visit in 2001 occurred on May 18. The survey revealed a stable population of approximate 190 individuals along the [redacted]. A subsequent visit on June 1, 2001 showed that much of the population had been mowed. Perennial mowing of the population could have a negative long-term effect on this population. Other road management practices such as herbicide application or mechanical grading could have serious negative effects of the population and possible extinction of a federally endangered species.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
SFWD	ERLA	1	--	443	surveyed; not censused	189	No survey	No survey	No survey

With only two years of actual census data it is difficult to say whether the population is declining as might be suggested by the above data. Since the plant occurs in an area which is regularly mowed, mowing may be having a deleterious effect on this population.

Management Recommendations

Considering the extreme rarity of *Eriophyllum latilobum*, it is highly recommended that a change in maintenance practices occur for this section of road. Managers could wait until plants have gone to seed before mowing, or preferably, avoid entirely the dense clumps of the species. County and city officials should be alerted to the presence of this very rare plant.

Monitoring Recommendations

None at this time.

Recommended monitoring interval

Yearly to document presence and abundance of the population.

This is priority species in 2004

Eriophyllum latilobum

[redacted]

San Mateo Quadrangle

0.2 0 0.2 0.4 0.6 Miles

N W E S

Erysimum franciscanum Rossbach

San Francisco wallflower

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 4 / R-E-D Code: 1-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Management boundary: Marin Headlands, Sweeney Ridge, Fort Funston, Pedro Point
Legislative boundary: San Francisco Watershed District

Life History
Flowering Time: March - June

Range:
This species is endemic to California. It occurs in Marin, Santa Cruz, San Francisco, San Mateo and Sonoma counties. Literature cites this species in Sierra County as well, although there is no reported voucher specimens from that county.

Characteristics:
The San Francisco wallflower is a short-lived perennial herb with cream to yellow colored flowers. Like other mustards, its bisexual flowers are 4-petaled and cross-shaped, with four long and two short stamens. It can have several stems that can be branched and grow up to 50 cm tall. Plants are often woody at the base, with more flexible stems at the top. Its basal leaves are linear, often tapered to the petiole, generally toothed and with appressed, branched hairs. Fruits are narrow siliques, often crowded and strongly ascending. Fleshy coastal plants have sometimes been separated into the variation *crassifolium*.

The San Francisco wallflower can be distinguished from the more common *Erysimum capitatum* (western wallflower) by the mature fruit and mature seed shape. The San Francisco wallflower has a flat fruit, while the mature fruit of the western wallflower is generally four sided. The seed of the San Francisco wallflower is winged at the tip as well as along one or both sides. The western wallflower has a seed that is not winged or winged only at the tip. The petal color of both species is highly variable.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
E. franciscanum is found in the Marin Headlands, Fort Funston, Sweeney Ridge, Milagra Ridge, Pedro Point, the Presidio and in the San Francisco Watershed District. The San Francisco wallflower occurs below 500m in elevation on serpentinite outcrops, granite cliffs, and on coastal dunes. It is associated with coastal strand, valley grassland and northern coast scrub plant communities. *E. franciscanum* is likely more extensive than presently mapped in the San Francisco Watershed District. Within the Presidio, populations are found on coastal bluffs on serpentinite soils and coastal dune scrub communities.

Threats
Erysimum franciscanum appears to thrive along road cuts and trails, which suggests that it might respond negatively to the expansion of dense scrub due to fire suppression. Exotic shrubs like French broom (*Genista monspessulana*) and perennial grasses such as Harding grass (*Phalaris aquatica*) could similarly threaten the wallflower.

Within the Presidio, along the [redacted], the site condition ranges from poor to excellent. The threats include *Delaria odorata, Oxalis pes-caprae* and non-native annual grasses. The proliferation of social trails pose significant threats to the [redacted] populations. The remediation of [redacted] may impact populations and care should be taken to reduce impacts upon the population. In [redacted], the threats include, *Vulpia bromoides*, *Briza maxima*, *Bromus diandrus*, *Rumex acetosella, Carpobrotus edulis*, *Conicosia pugioniformis*, *Erharta erecta, Oxalis pes-caprae, Hordeum murinum* and *Bromus hordaceous*. Within the [redacted], subsite [redacted], the site condition was poor to fair. The threats include, *Cupressus macrocarpa*, *Carpobrotus edulis, Alyssum alyssoides, Holcus lanatus*, *Rumex acetosella* and *Vulpia bromoides.* Social trails also pose a threat to this population. [redacted] threats include *Pinus radiata* and non-native annual grasses. The [redacted] site condition is fair.

Monitoring conducted 2004
No monitoring of populations occurring in GGNRA north and south districts was conducted in 2004.

Within the Presidio, *Erysimimum franciscanum* populations at the southwest coastal dune sites, the serpentine [redacted] and at [redacted] were monitored. Populations were ground truthed using the 2003 Presidio Special Status Plant Report maps. Upon locating each population a census of individuals was conducted.

Monitoring Results: 1998 – 2004 (see table on the following page for census figures)
Like *Arabis blepharophylla*, *Erysimum franciscanum* is a locally abundant species. Yearly fluctuations in abundance do occur. The 1999 counts were much lower than in 1998 in both the Marin Headlands and on Milagra Ridge. Surveyors in 1999 noted the difference in counts and that they had sampled earlier than in 1998, however, subsequent site visits did not reveal larger numbers of plants. Note that several populations have gone from as large as 56 individuals to 0 (MAHE #4). These sites should be revisited in subsequent years to see if individuals reappear. Counts from Fort Funston for 1998 and 1999 have been omitted from the above table. These numbers contain counts of out plantings and consequently were dramatically higher than the 2001 counts (see data sheets in *Erysimum* folder).

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Muir Beach		1	--	--	--	--	--	17	No survey
Marin Headlands		1	575	112	298	No survey	No survey	No survey	No survey
		2	989	325	498	447	No survey	No survey	No survey
		3	403	117	80	87	No survey	No survey	No survey
		4	56	9	13	0	No survey	No survey	No survey
		5	29	9	2	46	No survey	No survey	No survey
		6	--	--	6	7	No survey	No survey	No survey
		7	--	--	1	not found, location is uncertain	No survey	No survey	No survey
Ft Funston	ERFR	6	--	--	--	17	No survey	No survey	No survey
		7	--	--	--	5	No survey	No survey	No survey
Milagra		1	2,222*	95	156	755	No survey	No survey	No survey
		2	--	15	78	740	No survey	No survey	No survey
		3	--	10	7	9	No survey	No survey	No survey
Pedro Point		1	--	--	--	--	--	105	No survey
Sweeney		1	not found	488	176	327	No survey	No survey	No survey
[redacted]	ERFR	1	--	--	--	--	--	0	0
[redacted]		2	--	--	--	--	--	16	31
		3	--	--	--	--	--	2	12
		4	--	--	--	--	--	105	45
[redacted]		5	--	--	--	--	--	6	4
		6	--	--	--	--	--	0	0
		7	--	--	--	--	--	4	4
		8	--	--	--	--	--	0	0
[redacted]		9	--	--	--	--	--	0	0
[redacted]		10	--	--	--	--	--	0	2
		11	--	--	--	--	--	0	0
		12	--	--	--	--	--	41	21
		13	--	--	--	--	--	48	175
		14	--	--	--	--	--	12	3
[redacted]		15	--	--	--	--	--	4	6
[redacted]		16	--	--	--	--	--	2	0
		17	--	--	--	--	--	4	2
[redacted]		18	--	--	--	--	--	0	0
		19	--	--	--	--	--	61	24
		20	--	--	--	--	--	2	0
		21	--	--	--	--	--	3	0
SFWD		1	--	20	1	0	No survey	No survey	No survey
		2	--	10	0	0	No survey	No survey	No survey
		3	--	--	--	13	No survey	No survey	No survey
		4	--	--	5	36	No survey	No survey	No survey
		5	--	--	20	88	No survey	No survey	No survey
		6	--	--	260	246	No survey	No survey	No survey
		7	--	--	12	24	No survey	No survey	No survey
		8	--	--	407	241	No survey	No survey	No survey
		9	--	--	5	16	No survey	No survey	No survey
		10	--	--	--	2,473	No survey	No survey	No survey
		11	>200	1,186	2,390	1,823	No survey	No survey	No survey
		12	--	--	--	103	No survey	No survey	No survey
		13	--	--	--	46	No survey	No survey	No survey

*number is total of all three Milagra populations

Management Recommendations
For the Presidio populations, stewardship activities should continue to focus upon the removal of non-native annual grasses, forbs and trees. Efforts should also be taken to close social trails where appropriate.

No recommendations at this time for other populations occurring within GGNRA.

Monitoring Recommendations
Continue to census this species every three years. Monitor for the presence of introduced species of concern. Continue to survey for new populations. Survey those sites which were previously populated but where recent surveys have reported zero individuals.

Recommended Monitoring Interval
GGNRA north and south district populations: every three years

Presidio populations:
Proposed monitoring regime: Level 2
Proposed monitoring frequency: 1 year

Erysimum franciscanum

Muir Beach, 2003
San Rafael Quadrangle

0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 Miles

N

Erfr_03.shp

127

GGNRA189500

0.5 0 0.5 1 Miles

Erysimum franciscanum

Marin Headlands
San Francisco North and
Point Bonitas Quadrangle

Erysimum franciscanum

Fort Funston
San Francisco South Quadrangle

0.1 0 0.1 0.2 0.3 0.4

N
W E
S

129

GGNRA189502

Erysimum franciscanum

Milagra Ridge
San Francisco South Quadrangle

0.1 0 0.1 0.2 Miles

Erysimum franciscanum

Pedro Point, 2003
Montara Mountain Quadrangle

0.2 0 0.2 0.4 0.6 0.8 1 Miles

N

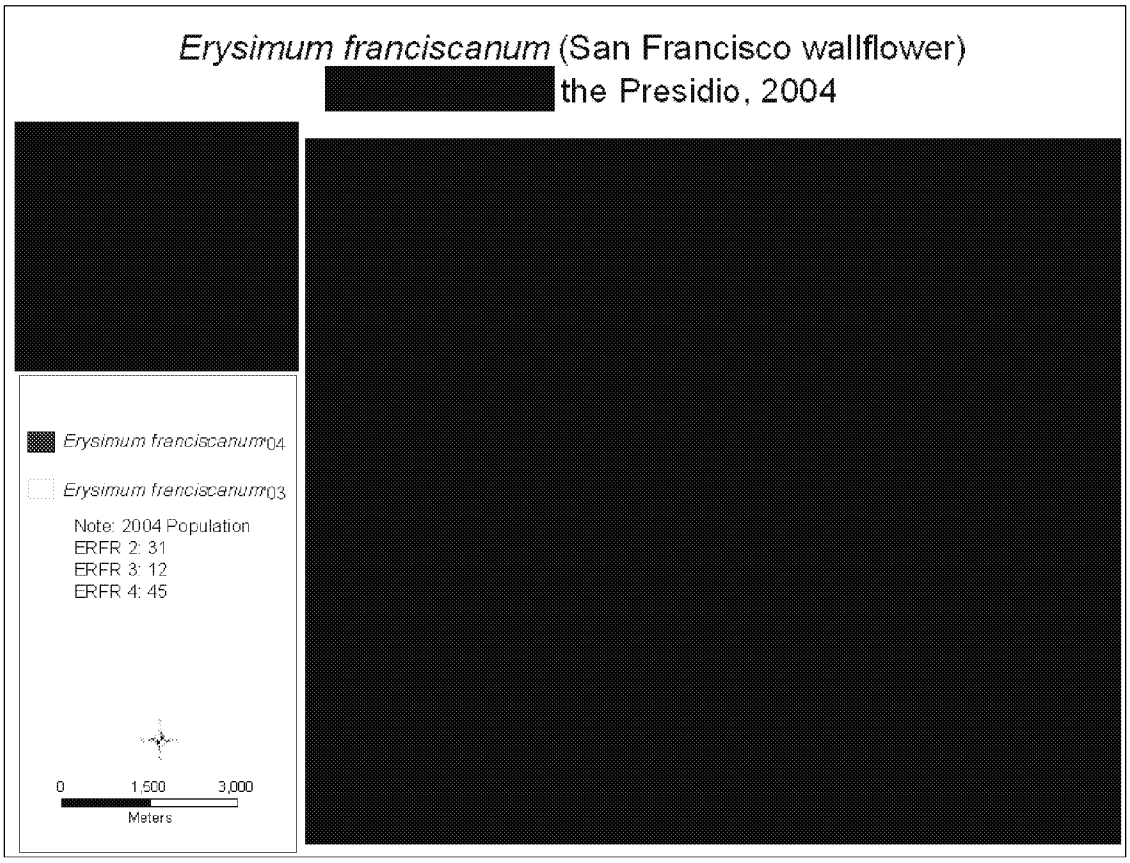
Erfr_03.shp

Erysimum franciscanum

Sweeney Ridge and SFWD North
Montara Mountain Quadrangle

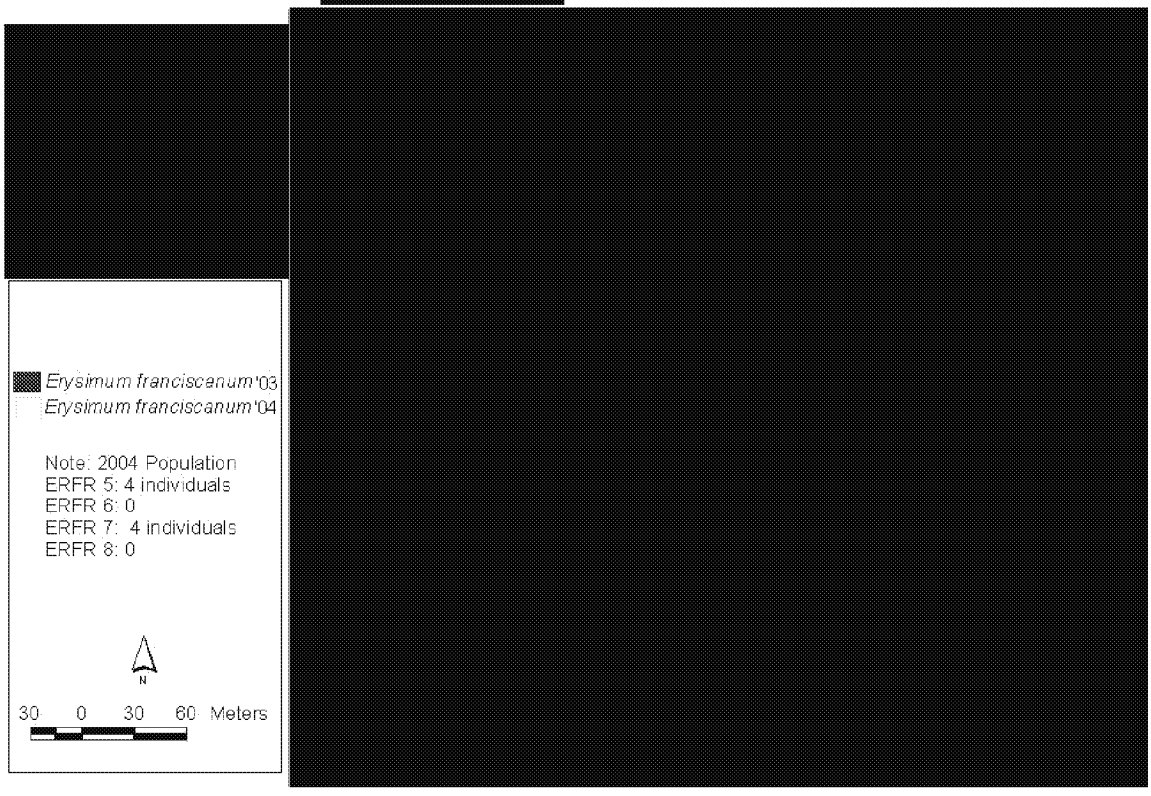
0.2 0 0.2 0.4 0.6 0.8 Miles

N
W E
S


Erysimum franciscanum (San Francisco wallflower)
[redacted] the Presidio, 2004
[redacted]
[redacted]
*Erysimum franciscanum*04
*Erysimum franciscanum*03
Note: 2004 Population
ERFR 2: 31
ERFR 3: 12
ERFR 4: 45
0
1,500
3,000
Meters

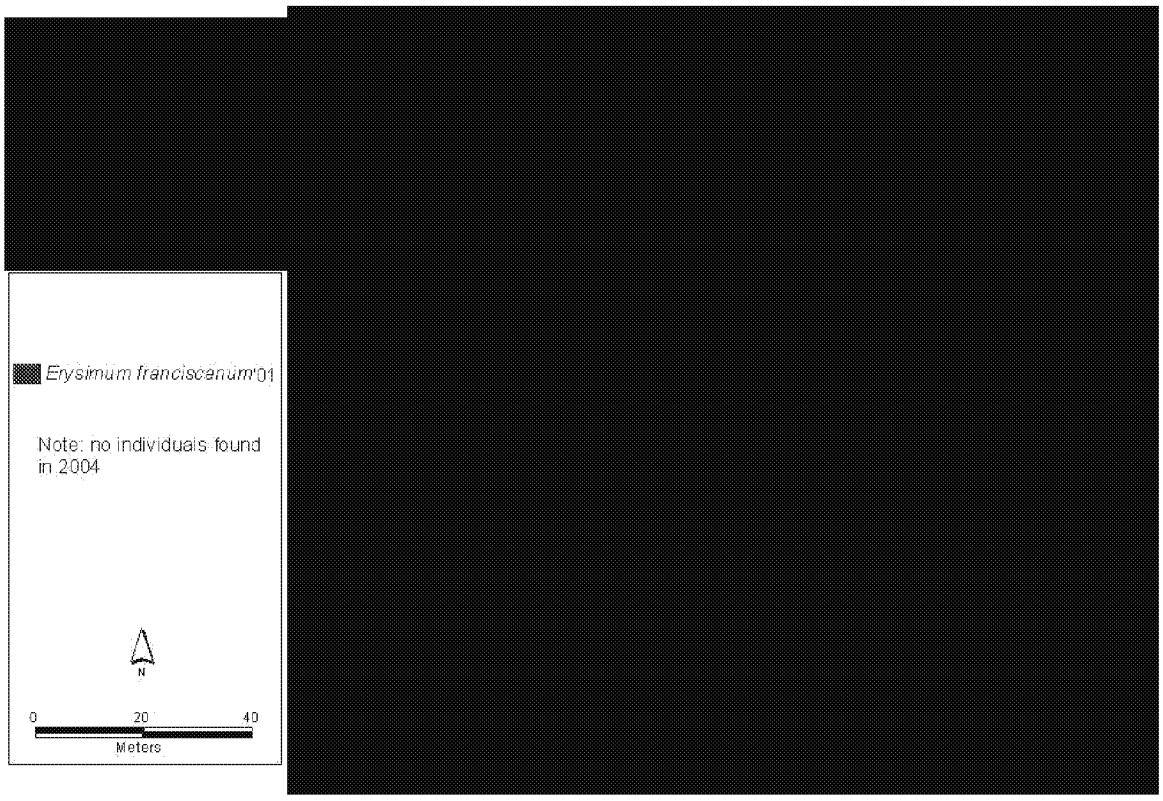
Erysimum franciscanum (San Francisco wallflower)

[redacted] the Presidio, 2004



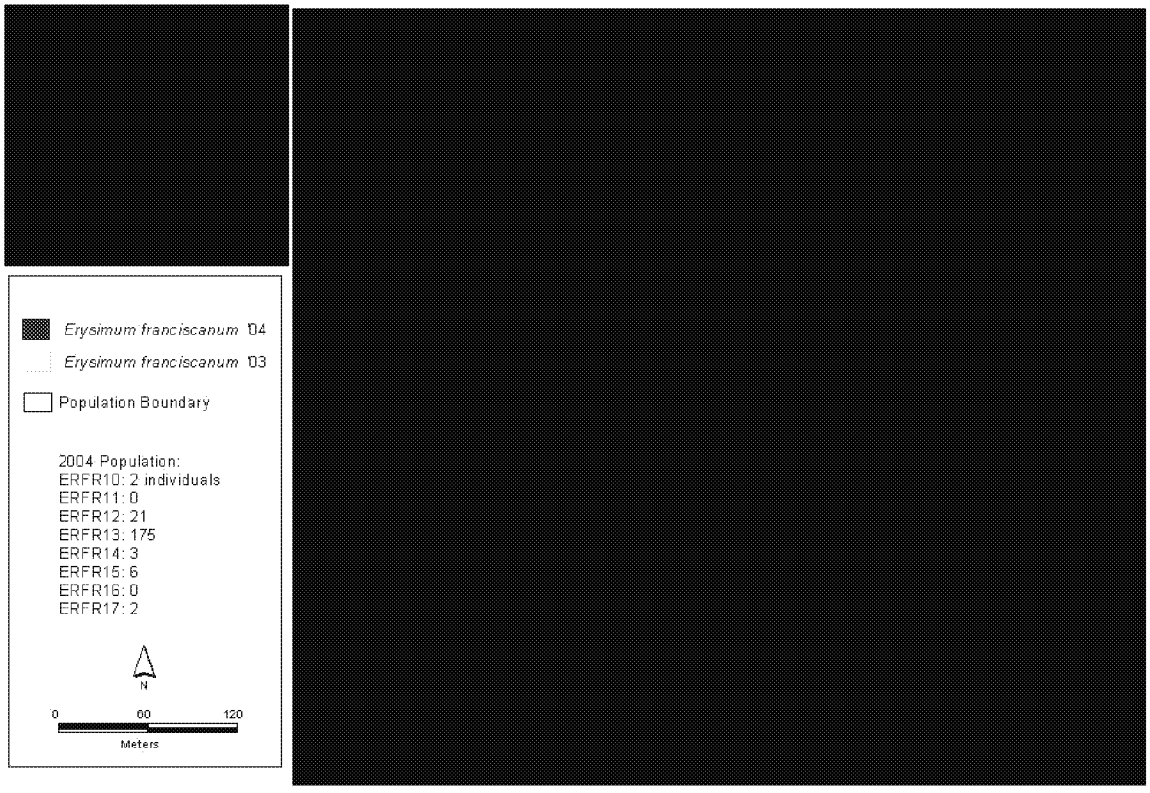
Erysimum franciscanum (San Francisco wallflower)

[redacted] the Presidio, 2004



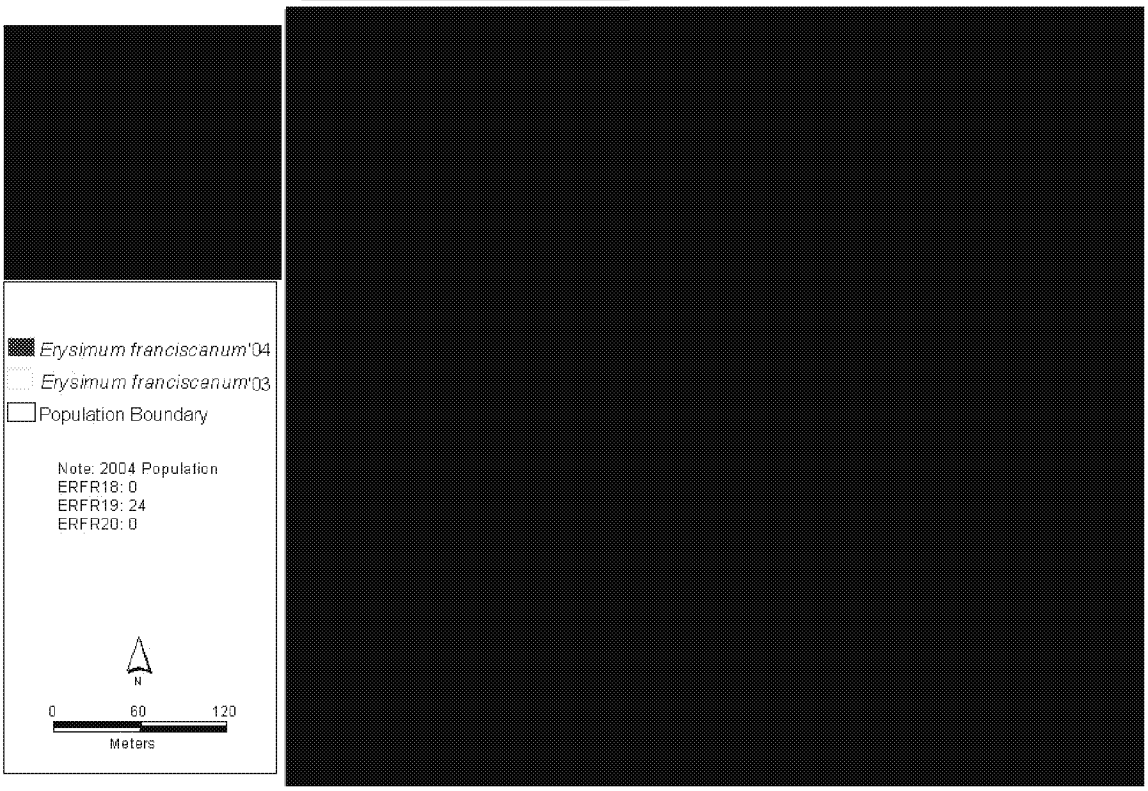
Erysimum franciscanum (San Francisco wallflower)

[redacted] the Presidio, 2004



Erysimum franciscanum (San Francisco wallflower)

[redacted] the Presidio, 2004



Erysimum franciscanum

San Francisco Watershed District
Montara Mountain Quadrangle

0.1 0 0.1 0.2 0.3 0.4 Miles

Erysimum franciscanum

San Francisco Watershed District
San Mateo Quadrangle

0.3 0 0.3 0.6 0.9 1.2 Miles

Fritillaria affinis Pursh **var. *tristulis*** (A.L. Grant) B. Ness
Marin checker lily

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Not accepted; see *F. lanceolata* var. *tristulis,*

Population Location(s) within:
Legislative boundary: GGNRA Northern District – Olema Valley

Life History
Flowering Time: February-April

Range: This plant is endemic to California. Ten populations have been documented in Marin County.

Characteristics: *Fritillaria affinis* var. *tristulis* is a perennial bulbiferous plant with nodding dark, brownish purple flowers. It is most easily distinguished from the more common var. *affinis* by the petal color. The var. *affinis* has clearly mottled petal pattern, while the var. *tristulis* has petals that are scarcely mottled. It is difficult to distinguish between these two varieties.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
A single population was discovered in 2001near the [redacted] in Olema Valley on GGNRA northern lands. This population grows at the margins of grasslands and Douglas fir forest.

Threats
This site is exposed to cattle grazing. It is not known what impact this has on this diminutive population.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	FRAFTR	1	--	--	--	3	No survey	1	No survey

A revisit of the site in 2003, found only 1 individual. The survey was conducted somewhat late for this species and only one individual was found in fruit. The site should be revisited earlier in the spring in 2005 to census this population.

Management Recommendations
None at this time.

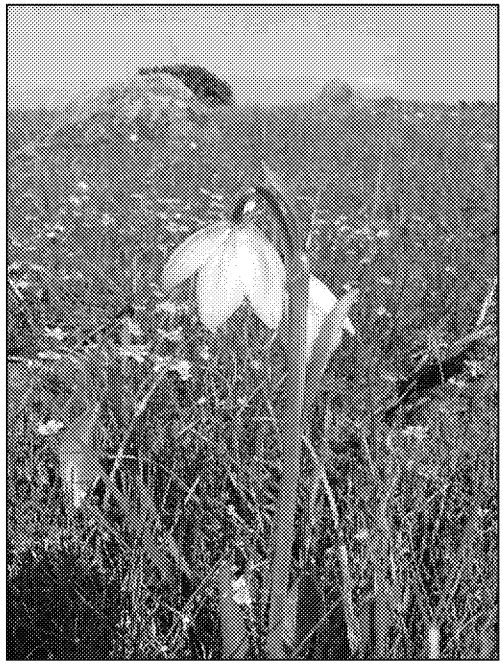
Monitoring Recommendations
A re-survey of the [redacted] site should be conducted in order to document number of individuals. Similar habitats within [redacted] should be inventoried to potentially document other populations.

Recommended Monitoring Interval
Yearly for three years in order to document species abundance between years. If the population appears stable, monitor every two years.

Fritillaria affinis var. tristulis
2001
Bolinas Quadrangle
Frafftr_pt.shp
Frafftr_02.shp
0.8
0.4
0
0.2
0.4

Fritillaria liliacea Lindl.

Fragrant fritillary, Fragrant mission bells



Rarity Status
Federal Listing: C2-Threat and/or distribution data are insufficient to support federal listing
State Listing: not listed
CNPS List: 1B / R-E-D Code: 2-2-3
Comments: CNPS RED code was changed from 1-2-3 in CNPS Inventory of Rare and Endangered Vascular Plants 5th edition to 2-2-3 in the 6th edition.

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: [redacted], San Francisco Watershed District

Life History
Flowering Time: February-April

Range: This species is endemic to California. It occurs in Alameda, Contra Costa, Monterey, Marin, San Benito, Santa Clara, San Francisco, San Mateo, Siskiyou, Solano and Sonoma counties. There is citation by botanical literature, although no voucher specimen, from San Benito county as well.

Characteristics:

The fragrant fritillary is a perennial bulb with nodding white, cup-shaped flowers. Its single stem can bear several flowers and is 10 to 35 cm tall. Flowers have six petal-like perianth segments. The petals have purplish to greenish nectaries that are at least one half the petal length. The styles are conspicuously branched. Flowers can have a sweet scent or no smell. Sessile, linear to ovate leaves are arranged alternately at the base.

Fragrant fritillary can be easily distinguished from *F. affinis* (Checker Lily), which also occurs in the GGNRA, by the flower color. The checker lily has brownish purple mottled flowers. The fragrant fritillary looks more similar to *F. agrestis* (Stinkbells), which has a distinctive unpleasant odor.

Flowers are often not present on this species, which seems to be favorite forage for animals. Once the flower has withered, its often reddish, unwinged fruit capsule can identify *F. liliacea*.

The fragrant fritillary occurs on open hills and fields near the coast at elevations below 200 meters. According to The Jepson Manual, it grows in heavy soils. Although at [redacted] it occurs in rocky outcroppings of shallow topsoil. It is associated with coastal prairie, valley grassland, and northern coastal scrub plant communities and can occur on serpentinite (CalFlora 2001).

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District

Fritillaria liliacea occurs in the serpentinite grasslands of the San Francisco Watershed district east of [redacted] and atop of [redacted]. The [redacted] population extends beyond the park boundaries onto private lands.

Threats

No literature on specific threats to this species was found. Grazing may possibly affect the regeneration of populations, although there is no evidence either way as to that effect. Competition from invasive species able to grow on serpentinite could injure populations, and loss of habitat due to other factors like development is of course a concern.

In 2001, over 95% of the individuals within the [redacted] population were reported to have had the inflorescences bitten off. Cows, horses and deer are present and abundant within the population.

Monitoring 2004

No monitoring was conducted in 2004.

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	FRLI	1	Surveyed; not censused	46,109*	surveyed; not censused	40,000*	No survey	22,097**	No survey
SFWD		1	--	41	919	Surveyed; not censused	No survey	No survey	No survey
		2	--	--	--	Surveyed not censused	No survey	No survey	No survey

*these numbers include totals for entire FRLI population on both private and GGNRA lands.
** This number includes total number of individuals on GGNRA land only

During the 1998 survey on [redacted], mapping of the boundaries of this species was completed. This population is bisected by the GGNRA legislative boundary, consequently a large portion of the population falls on private land. The area covered by this species is very large making the counting of individuals unfeasible. In 1999, a sampling method was designed to sub-sample a portion of the population to estimate the number of individuals in the entire population (see Appendix VIII for monitoring methods). The above numbers for 1998 and 2001 were gathered by sampling on both private and GGNRA lands. It was decided at the conclusion of the 2001 monitoring season, that no future censusing would be conducted on private land. In 2003, the same sampling method was used but data was collected only from census grids falling on GGNRA land.

Despite heavy grazing impacts, this species remains abundant, however, the ability of the species to maintain itself may be affected by flowers being eaten before seed development. Very few individuals were observed in the SFWD populations in 2001 which is probably due to the area being surveyed one month later than in 2000.

Management Recommendations
A considerable portion of the [redacted] population occurs on private land. A meeting should be arranged with the ranchers, Point Reyes staff and GGNRA staff to make the ranchers aware of the rare plant species which occur on their land.

Monitoring Recommendations
Continue monitoring every two years for changes in population composition. A considerable amount of time is taken to sub-sample these populations in order to obtain a rough estimate of the number of individuals. It is recommended using sampling methods that will be less time consuming. A number of small (1/10 ha) permanent plots could be established in areas of varying density and re-read at set intervals to determine changes in composition. Six rare plant species occur on [redacted]. Ideally a monitoring method would be adopted that would capture information on all six species.

Greater emphasis should be placed on grazing impacts and monitoring for invasive species on [redacted]. While there is no grazing at the sites in the San Francisco Watershed District, those populations should be monitored for invasive species.

Establishing photopoints would help to supplement any quantitative data collected. A visual overview of the sites would document gross vegetation changes over time.

Recommended Monitoring Interval
Every two years

Fritillaria liliacea

[redacted]

San Geronimo Quadrangle

0.1 0 0.1 0.2 0.3 Miles

F. liliacea within GGNRA
F. liliacea on private lands

N
W E
S

0.3 0 0.3 0.6 0.9 Miles

N
W E
S

Fritillaria liliacea

San Francisco Watershed District
Woodside and San Mateo Quadrangle

Gilia capitata Sims. ssp. *chamissonis* (Greene) V. Grant

Dune Gilia

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B/ R-E-D 2-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: April-July

Range: Dune gilia is endemic to California and occurs in Marin, San Francisco and Sonoma counties.

Characteristics: Dune gilia is an annual herb occurring on coastal dunes and in coastal scrub. The plant generally has a skunk-like odor. The stems have spreading branches, 15-70 cm which are stout and glandular. The leaves occur in a basal rosette; are fleshy, glandular and twice-pinnate. The inflorescence is 25-35 mm wide, with a densely tomentose base and the flowers are sessile. The calyx is tomentose with the ribs green and the membrane purplish. Calyx lobes are acuminate with recurved tips. The corolla is bright blue-violet in color; 9-10mm in length.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations occur within the Presidio. They are found in sand dunes ranging from foredunes ([redacted], with some wind protection) to dunes such as those within the [redacted].

Threats
Threats to these population include *Carpobrotus edulis, Vulpia bromoides, Briza maxima, Bromus diandrus, Avena barbata, Ehrharta erecta, Raphanus sativa*, and *Rumex acetosella.*

Monitoring conducted 2004
All populations were monitored in 2004. Monitoring consisted of determining if the species was present or absent from the site. If the population was found to be present then an estimation of the number of individuals was made. Additionally if the boundary of the population had changed dramatically since the 2001 survey a new polygon was created.

Monitoring Results: 1998- 2004

Location	Species Code	Pop. No.	1998	1999	2000	2001	2002	2003	2004
[redacted]	GICA	1	--	--	--	--	--	--	10,000
		2	--	--	--	--	--	--	10-15
		3	--	--	--	--	--	--	150 - 200
		4	--	--	--	--	--	--	800 - 1,000
		5	--	--	--	--	--	--	500 - 700
		6	--	--	--	--	--	--	75-85
		7	--	--	--	--	--	--	75 - 100
		8	--	--	--	--	--	--	85 - 100
		9	--	--	--	--	--	--	1,800 - 2,000
		10	--	--	--	--	--	--	10
		11	--	--	--	--	--	--	100-150
		12	--	--	--	--	--	--	6,000 - 8,000
		13	--	--	--	--	--	--	20
		14	--	--	--	--	--	--	200 - 1,000
		15	--	--	--	--	--	--	50-75
		--	--	--	--	--	--	--	1

A single *Gilia capitata* ssp. *chamissonis* plant was found at [redacted] site but was not considered as a new population in 2004. The [redacted], [redacted] and [redacted] populations are newly documented in 2004. The numbers listed above are estimates of population size.

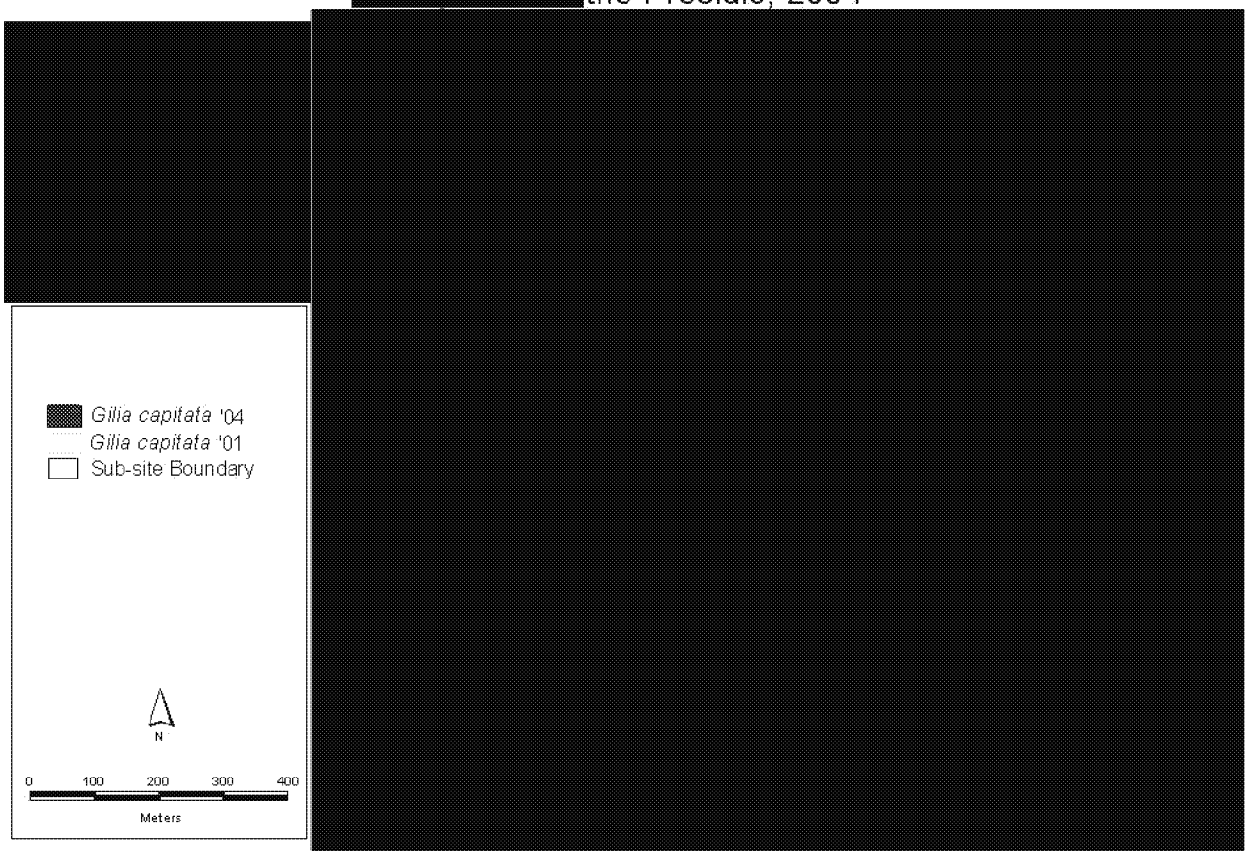
Management Recommendations
Efforts to remove invasive species such as *Carpobrotus edulis, Oxalis pes-caprae* and invasive annual grasses should be continued throughout restoration sites.

Monitoring Recommendations
None at this time

Recommended Monitoring Schedule
Presidio populations:
Monitoring regime (level): 1
Monitoring frequency: Every 2 years
Monitoring cycle: 2 year - beta cycle

Gilia capitata ssp. chamissonis(dune gilia)

[redacted]the Presidio, 2004

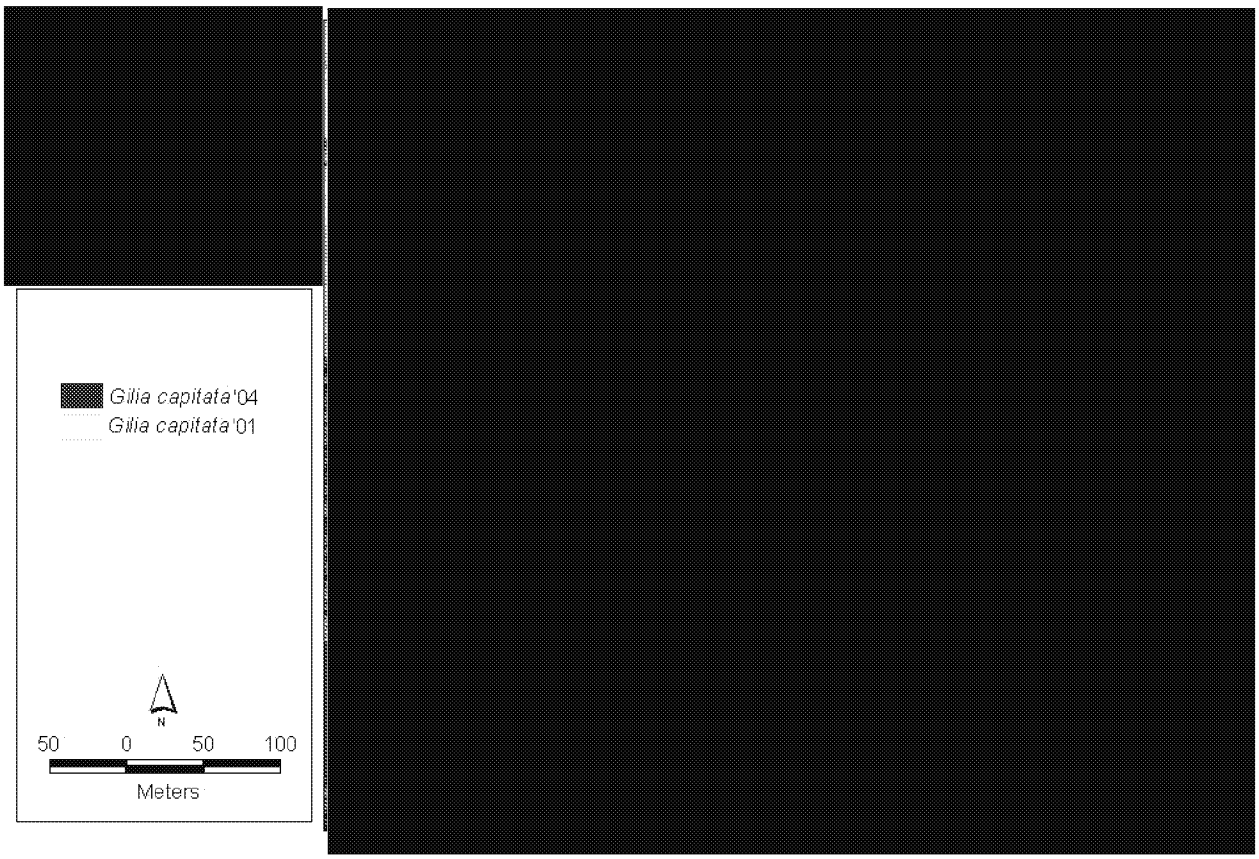


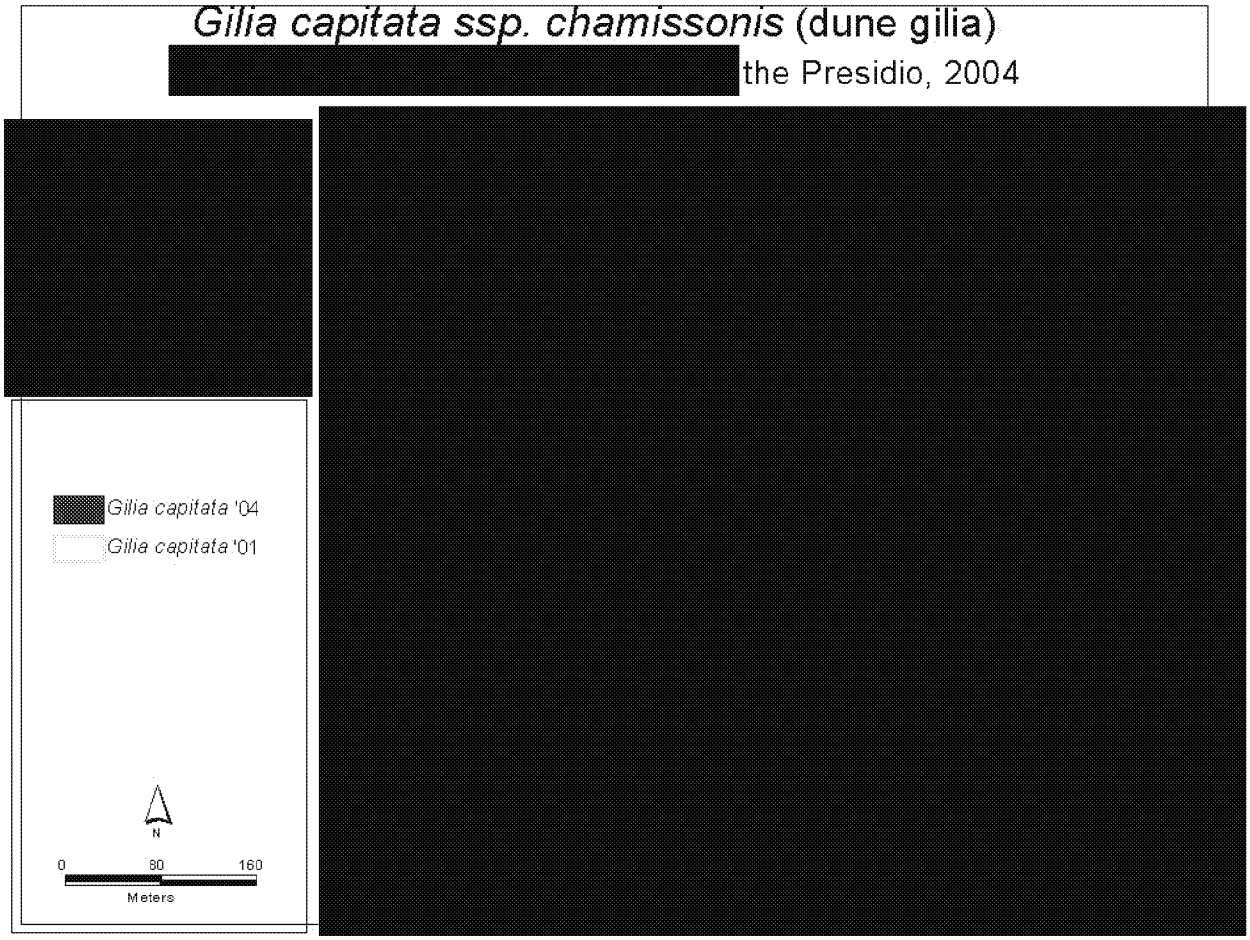
Gilia capitata ssp. chamissonis (dune gilia)

[redacted] the Presidio, 2004

Gilia capitata ssp. chamissonis (dune gilia)

[redacted] the Presidio, 2004




Gilia capitata ssp. chamissonis (dune gilia)
[redacted] the Presidio, 2004
[redacted]
[redacted]
Gilia capitata '04
Gilia capitata '01
N
0
80
160
Meters

Gilia capitata ssp. chamissonis (dune gilia)

[redacted] the Presidio, 2004

Grindelia hirsutula H. & A. **var. *maritima*** (Greene) M.A. Lane

San Francisco Gumplant

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted
Comments: The taxonomy of the genus *Grindelia* may be revised. A new treatment of the genus is being worked on for the Flora of North America. See Appendix X for additional details on the revision.

Population Location(s) within:
Management boundary: the Presidio, (potentially Marin Headlands – see abundance and distribution within GGNRA)

Life History
Flowering Time: August-September

Range: This plant is endemic to California. CNPS lists this variety as documented in Monterey, Marin, Santa Cruz, San Francisco, San Luis Obispo and San Mateo counties. In The Jepson Manual, this variety is listed as occurring only in San Francisco and San Mateo counties.

Characteristics: Identification of this species is often difficult and it is believed that var. *maritima* is a hybrid between *Grindelia hirsutula* var. *hirsutula* and *Grindelia stricta* var. *platyphylla*. *G. hirsutula* var. *maritima* is a perennial herb of coastal bluffs on sandy or serpentinite soils. Plants are generally 3-5 dm in height with stems glabrous and red-brown to purple in color. The leaves are generally gray-green. Inflorescence heads are ± subtended by bracts with the involucres generally 12-15(25) mm in diameter. The phyllaries are erect to ± spreading. Ray flowers number 10-40 with ligules 11-15 mm. The fruit is 3.5-4.2 mm, golden to gray-brown and deeply ridged. The top of the fruit is generally flanged or knobby with pappus awns 4-5. The fruit of var. *hirsutula* is reddish, smooth or narrowly 2-3 ribbed with the top generally truncate.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations confirmed as *Grindelia hirsutala* var. *maritima* occur within the Presidio. They are found in serpentine coastal bluffs and grasslands. Populations of this species may also occur in the Marin Headlands. Specimens were collected in 2002 and sent to Dr. John Strother at the University of California at Berkeley Herbarium. After a brief examination of the specimens, Dr. Strothers thought that under the current classification, the specimens should be reported as the rare species. However, due to the fact that the taxonomy of the genus may be revised, and the classification of these specimens change, the Marin Headland populations have not been definitively identified as *G.h.* var. *maritima* and have not been mapped and monitored. See Appendix X for a detailed account of areas surveyed and specimen collection sites.

Threats

[redacted] site condition is poor to good. The threats in the [redacted] sites include: *Eucalyptus globulus*, *Holcus lanatus*, *Bromus diandrus*, *Cotoneaster* sp., *Cupressus macrocarpa*, *Cortaderia jubata*, *Oxalis pes-caprae* and *Carpobrotus edulis*. Site condition is poor to good in the [redacted] sites. The threats include *Cortaderia jubata*, *Plantago lanceolata*, *Sonchus oleraceus*, *Cupressus macrocarpa*. The continued use and creation of social trails poses a great threat to these populations. This is due to the increase in natural erosion processes that arise with unrestricted trail use. Trampling is also causing negative impact upon the populations. Site conditions are good at the [redacted] site. The threats at the [redacted] sites include: non-native annual grasses, *Cupressus macrocarpa*, *Cortaderia jubata*, *Plantago lanceolata*, *Holcus lanatus* and *Pinus radiata*.

Monitoring conducted 2004

No monitoring was conducted in 2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. No.	1998	1999	2000	2001	2002	2003	2004
[redacted]	GRHIMA	1	--	*304	*89	--	--	34	No survey
		2	--	--	--	--	--	25	No survey
		3	--	--	--	--	--	30	No survey
[redacted]		4	--	*373	*401	--	--	176	No survey
		5	--	--	--	--	--	75	No survey
		7	--	--	--	--	--	150	No survey
[redacted]		6	--	*2,503	*1,910	--	--	113	No survey
		9	--	--	--	--	--	903	No survey
		10	--	--	--	--	--	12	No survey
		11	--	--	--	--	--	226	No survey
[redacted]		8	--	--	--	--	--	656	No survey

*Numbers are the sum totals of all populations at each site.

There is additional monitoring data from 1987, 1994, 1996 and 1997 for this species. Monitoring results for these years can be found in Appendix VII, Table II.

Management Recommendations

None at this time

Monitoring Recommendations

None at this time

Monitoring Schedule

Presidio Populations:
Proposed monitoring regime: Level 2
Proposed monitoring frequency: every 2 years
Proposed monitoring cycle: Alpha 2003

To insert GRHIMA map from 2003 report

Hesperolinon congestum (A. Gray) Small

Marin dwarf flax

Rarity Status
Federal Listing: Threatened
State Listing: Threatened
CNPS List: 1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Management Boundary: the Presidio
Legislative Boundary: [redacted] San Francisco Watershed District

Life History
Flowering Time: April-July

Range: This plant is endemic to California. According to CNPS, there are fewer than twenty documented populations restricted to Marin, San Francisco and San Mateo counties.

Characteristics:
Hesperolinon congestum is a small annual plant with small, pinkish, five-petaled flowers. *H. congestum* can be confused with *Minuartia douglasii*, another small annual plant. *M. douglasii* has opposite leaves while *H. congestum* has alternate leaves. *M. douglasii* also has yellow-white petals and *H. congestum* has pink-white petals. *Hesperolinon californicum* is another member of the genus that can occur in the serpentinite grasslands. *H. californicum* has glabrous sepals while *H. congestum* has slightly hairy sepals. *Hesperolinon congestum* occurs in grasslands upon serpentinite substrate.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
There are scattered clumps along the western slope of [redacted] generally on exposed serpentine soils with sparse vegetative cover. The [redacted] populations extend onto private land. Several populations occur in the serpentinite grasslands of the San Francisco Watershed District between [redacted] and the [redacted].

Threats
Introduced species are likely the greatest threat to all populations. In the San Francisco Watershed District, there are numerous introduced species of concern in and around the populations. *Centaurea solstitialis* is common in dense stands throughout the serpentinite grasslands and should be controlled. Other plants of concern in the area are: *Foeniculum vulgare*, *Carduus pycnocephalus*, and *Dipsaca fullonum*. The [redacted] has dense populations of *Scabiosa atropurpurea* growing on the serpentinite outcrops alongside *H. congestum*.

Within the Presidio, at the [redacted] site, *Grindelia hirsutula* var. *maritima* and *Chlorogalum pomeridianum* var. *divaricatum* are filling in the openings in the scrub on the site. *Ceanothus thyrsiflorus* and *Oemleria cerasiformis* are also growing over the once-open

pathways that *Hesperolinon congestum* favors. The exotic annual grass, *Briza maxima*, has successfully covered some of the ground at both sites; percent cover estimates unknown.

Monitoring conducted 2004

Within the Presidio, a complete census of all populations was conducted in 2004. No other populations within GGNRA nor the SFWD were monitored.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	HECO	1	157	87	>2,000*	178	No survey	313	No survey
		2	56	0	surveyed, not censused	0	No survey	2,363	No survey
[redacted] -- on private land		3	--	2**	740	No survey	No survey	No survey	No survey
[redacted] -- on private land		4	--	--	285	No survey	No survey	No survey	No survey
		5	--	--	>200***	130	No survey	1,267	No survey
		6	--	--	>200***	182	No survey	891	No survey
		7	--	--	--	160	No survey	343	No survey
[redacted]		1	187*	172*	87*	62*	66*	121*	1,748****
[redacted]		1	--	--	--	--	--	--	811****
SFWD		1	--	not found	569	910	No survey	No survey	No survey
		2	--	not found	143	54	No survey	No survey	No survey
		3	--	--	210	320	No survey	No survey	No survey
		4	--	--	2,486	160	No survey	No survey	No survey
		5	--	--	>5,000	surveyed, not censused	No survey	No survey	No survey
		6	--	--	17	0	No survey	No survey	No survey

* Numbers are the sum total of both populations
** too late in season for accurate census
*** ocular estimates
****numbers include counts from population formerly identified as H. californicum

The above numbers do not show a consistent trend towards increase or decrease. This is an annual species, so annual census figures are expected to fluctuate depending on yearly rainfall. As stated in the 1994 Rare Plant Management Guidelines, "Climatic conditions influence the appearance of these plants and the period in which they flower." In several of the populations (SFWD #4), it can be seen that population numbers vary greatly between years. In 2003, while monitoring the [redacted] populations the species was found to be abundant and widespread.

Variations in population numbers can also be a factor of area surveyed. Since population boundaries are not marked, the size of the area surveyed may vary somewhat year to year. When comparing the above numbers between years, it is necessary to refer to population boundaries as mapped in Arcview for each year.

Monitoring of the Presidio populations has been conducted annually since 1995 (see Appendix VII, Table II for monitoring results for 1995-1997). Seed was collected in late summer of 2002 and dispersed in November 2002. It has yet to be determined if this action resulted in the increase in population size seen in 2003. In August 2004, a population at the [redacted] which was previously identified as *Hesperolinon californicum* was re-identified as *H. congestum* (see Michael Chasse for e-mail record).

Management Recommendations
A considerable portion of the [redacted] population occurs on private land. A meeting should be arranged with the ranchers, Point Reyes staff and GGNRA staff to make the ranchers aware of the rare plant species which occur on their land.

An increase in the available habitat at the [redacted] site is vital to increasing population numbers. A system of weeding and pruning needs to be implemented in order to keep the area open. The [redacted] site is relatively open with minor weed problems. This species is federally threatened and this location has the only remaining population in San Francisco county, therefore extreme care must be taken to protect the population and increase its size.

Monitoring Recommendations
Closer monitoring of introduced species of concern should be conducted in all sites. *Centaurea solstitialis* should be eradicated from the serpentinite grasslands in the San Francisco Watershed to prevent the potential extirpation of several rare species in the area.

H. congestum occurs with several other rare plant species in three unique serpentinite grassland communities. Rather than collecting census data on a single rare species, a standardized sampling method should be utilized to gather cover and density data for both native and non-native species. By having quantitative information on both native and non-native species, information would be gained on how the cover and density of native and non-native species change in relation to each other.

On [redacted], long term monitoring would also be valuable for gathering information on the effects of cattle grazing. This area has been grazed for many years and yet the rare plant species still persist.

Establishing photopoints would help to supplement any quantitative data collected. A visual overview of the site would document gross vegetation changes over time.

Recommended Monitoring Interval:
[redacted] populations: every 2 years

Presidio populations:
Monitoring regime (level): 2
Monitoring frequency: 1
Monitoring cycle: N/A

Hesperolinon congestum

[redacted] 2003

Inverness and San Geronimo Quadrangles

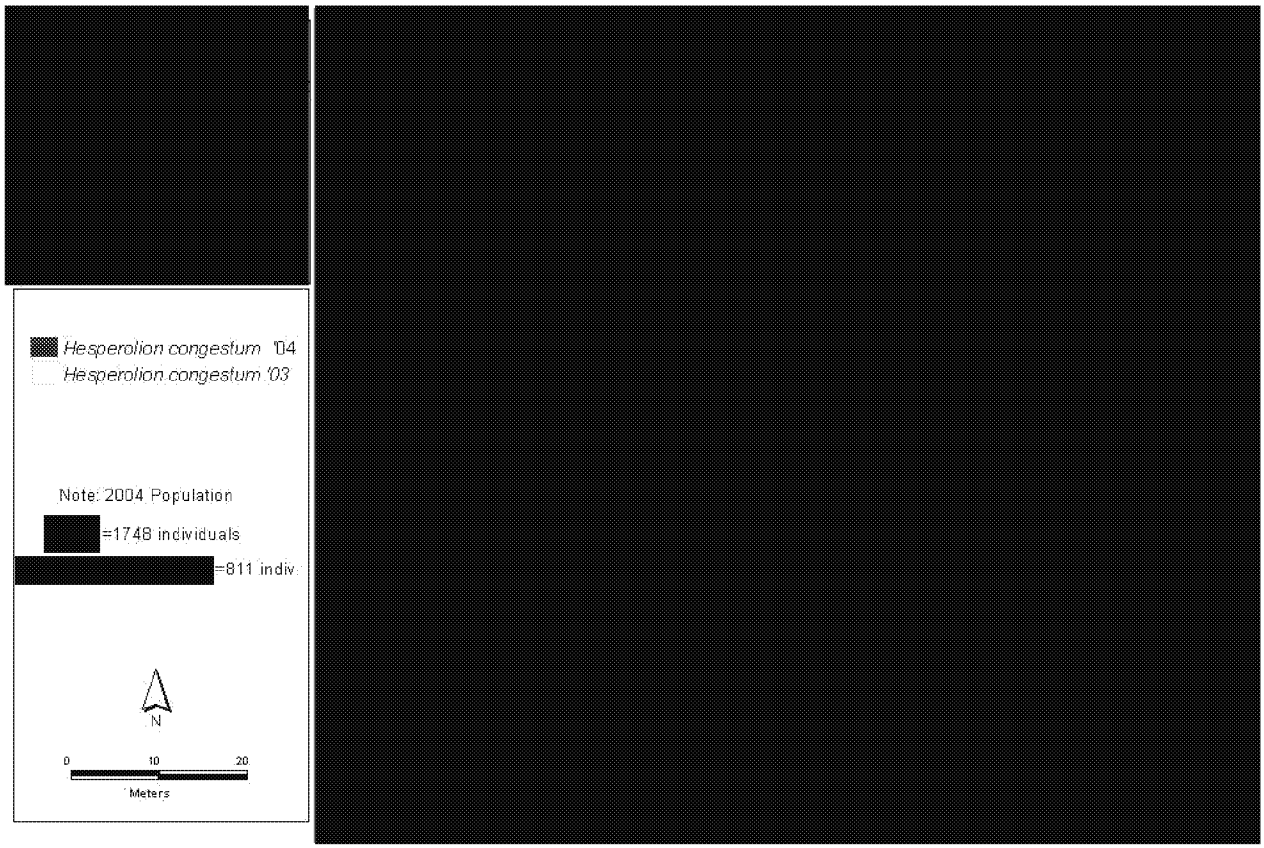
0.1 0 0.1 0.2 0.3 0.4 0.5 Miles

N

Goga-pol.shp
inholding
leg-bndy
offshore
Heco_03.shp

Hesperolinon congestum (Marin dwarf flax)

[redacted] the Presidio, 2004



0.3 0 0.3 0.6 0.9 1.2 Miles

N
W E
S

Hesperolinon congestum

San Francisco Watershed District
San Mateo Quadrangle

Horkelia cuneata Lindl. ssp. ***sericea*** (Gray) Keck

Kellogg's horkelia

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted
Comment: According to CNPS, the remaining plants occurring within the San Francisco Bay Area are closer to *H. c.* ssp. *cuneata* than those formerly occurring near San Francisco.

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: April - September

Range: This plant is documented as occurring in Monterey, Santa Barbara, Santa Cruz, San Luis Obispo and San Mateo counties. Historic occurrences have been extirpated from Alameda, Marin and San Francisco counties.

Characteristics: *Horkelia cuneata* ssp. *sericea* is a perennial herb found in old dunes and coastal sand hills. Its growth habit is matted with stems 20-70 cm. Leaves are generally 10-30 cm, green to grayish with 5-12 leaflets per side. Leaflets are generally 10-25 mm ± equal the terminal leaflet, ± elliptic, pinnately veined, evenly ± 10-15 toothed generally < 1/3 to midvein, ± glabrous to densely hairy. *H. cuneata* ssp. *sericea* is distinguished by its hairs being ± non-glandular and often appressed. The inflorescence is dense to open; clusters several to many; several flowered. The hypanthium inner rim is very hairy.

H. cuneata ssp. *cuneata* has hairs which are both glandular and non-glandular and the hairs are spreading. The inflorescence is ± open; clusters several to many; few flowered. The inner rim of the hypanthium is ± hairy.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations occur on the Presidio in coastal sand dune bluff. Each of the populations was a reintroduction.

Threats
The [redacted] site is in good condition. Threats to this population include erosion from regular social trail use and invasive species such as *Senecio elegans* and annual non-native grasses. The remediation of [redacted], which is located immediately north of this population, has created potential habitat for this population. However, the steep sandy slope is especially vulnerable to erosion.

Monitoring conducted 2004
The two existing populations, HOCU1 and HOCU2, were both thoroughly examined and all existing individuals were counted.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	HOCU	1	---	---	---	---	5	2	3
[redacted]		2	---	---	---	---	1	0	0

The small size of this population may warrant re-introduction efforts.

Management Recommendations

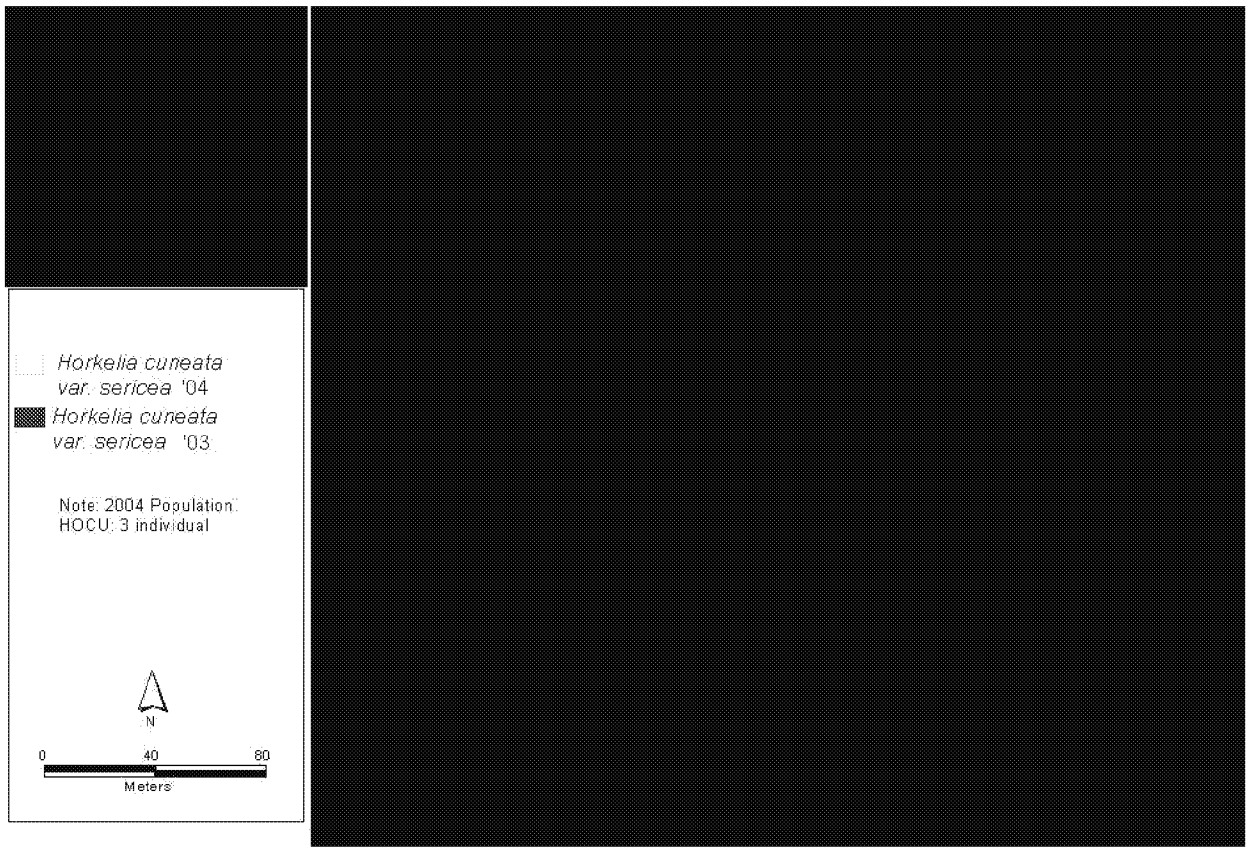
Care should be taken while completing the remediation at [redacted] to avoid impacting the HOCU1 population. Efforts should also be taken to close the existing social trail(s) in this area. Continued stewardship efforts should focus on the removal of *Senecio elegans* and annual non-native grasses.

Monitoring Schedule

Presidio populations:
Future monitoring regime: Level 2
Proposed monitoring frequency: 1 year
Proposed monitoring cycle: monitor every year

Horkelia cuneata var. sericea (Kellogg's horkelia)

[redacted] the Presidio, 2004



Lessingia arachnoidea E. Greene

Crystal Springs lessingia

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 3-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: San Francisco Watershed District

Life History
Flowering Time: July-October

Range
This plant is known to only occur in the vicinity of [redacted] in San Mateo County. Unconfirmed reports of populations from Sonoma County need further verification.

Characteristics
This late summer annual in the family Asteraceae has small dense heads of purple, bilateral disk flowers. *Lessingia arachnoidea* is easily observed amidst the yellow, withered remains of the erstwhile verdant grasslands. The phyllaries of *L. arachnoidea* are slightly tomentose and the entire plant is glandless. The basal leaves have generally withered at the time of flowering. No other species of *Lessingia* were seen growing in the area although *Epilobium foliolosum,* a purple-flowered summer annual was present and could be confused from a distance.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is locally abundant in the serpentinite grasslands on the [redacted] side of [redacted] on San Francisco Watershed lands. It is restricted to well-developed soils on serpentinite substrate.

Threats
Many introduced plants of concern occur within the *L. arachnoidea* populations of the SFWD. Large, dense stands of Yellow starthistle (*Centaurea solstitialis*) have been observed within the serpentinite grasslands and appear to be displacing *Lessingia arachnoidea*. The serpentinite grasslands around the crystal springs reservoir are surrounded and bisected by many roads. These disturbances will be a constant seed source for invasive species. This poses a difficult challenge for resource managers who desire to return the unique serpentinite grassland to pristine conditions.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
SFWD	LEAR	1	--	--	surveyed; not censused	1,500	No survey	No survey	No survey
		2	--	--	surveyed; not censused	50,000	No survey	No survey	No survey
		3	--	--	surveyed; not censused	5,000	No survey	No survey	No survey
		4	--	--	surveyed; not censused	170,000	No survey	No survey	No survey

In 2000, mapping of the known occurrences was completed. 2001 was the first year that this species was censused. The number of individuals recorded for each population were ocular estimates rather than actual tallies. The abundant numbers indicate that sampling rather than censusing may be a better method to determine changes in species abundance over time.

Management Recommendations

Yellow starthistle removal in the serpentinite grasslands of the SFWD should be a high priority in invasive plant control in the area. Other introduced species of concern should also be removed or closely monitored.

Monitoring Recommendations

This species occurs with several other rare plant species in a unique serpentinite grassland community. Rather than collecting census data on a single rare species, a standardized sampling method should be utilized to gather cover and density data for both native and non-native species. By having quantitative information on both native and non-native species, information would be gained on how the cover and density of native and non-native species change in relation to each other.

Photopoints could be established to supplement quantitative data collected to monitor changes in *Lessingia* and other rare plant populations and the effect of invasive species on the abundance of these rare species.

Recommended Monitoring Interval

Every year for three years to gain information on fluctuations in population size. If population is stable, monitor every two years.

Lessingia arachnoidea

San Francisco Watershed District
San Mateo Quadrangle

0.4 0 0.4 0.8 Miles

N
W E
S

Lessingia germanorum Cham.

San Francisco lessingia

Rarity Status
Federal Listing: **ENDANGERED**
State Listing: **ENDANGERED**
CNPS List: 1B/ R-E-D 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: June-November

Range: This plant occurs only in San Francisco and San Mateo counties. It is known from only four occurrences on the Presidio and one on San Bruno Mountain. In The Jepson Manual it is noted that it is apparently restricted to sandy soils.

Characteristics: *Lessingia germanorum* is an annual herb found in coastal scrub generally on remnant dunes. The plant is non-glandular and loosely grayish tomentose becoming glabrous with age. Stems are 0.5-3 dm, decumbent, rarely erect, reddish brown. The basal leaves are deciduous, < 5 cm, oblanceolate to long tapered obovate, pinnately lobed, the lobes toothed. Cauline leaves are 0.5-3 cm, oblong to oblanceolate, entire to pinnately lobed. The flowers are discoid, solitary or rarely tightly clustered, terminal. Involucres are 2-8 mm, bell-shaped; phyllaries lanceolate, tips with abrupt point, recurved. Corollas are funnel-shaped to tubular, deep lemon-yellow with reddish brown band in the throat. The fruit is 1-3 mm. Pappus bristles are free or fused at base in groups of 2-4; white or tannish white.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations occur within the Presidio in coastal dune habitat.

Threats
Invasive species are most likely the cause of population declines and extirpation of *Lessingia germanorum*. Non-native annual grasses often invade remaining open areas. Non-native trees growing adjacent to many sites are also causing shading and duff accumulation. Additionally, the lack of natural disturbance regimes (grazing, fire, sand movement, wind) has likely impacted the species and future restoration efforts should attempt to replicate these disturbance regimes where appropriate.

Monitoring conducted 2004
A census was conducted on the following sites: 1. [redacted] 2. [redacted] 3. [redacted] and 4. [redacted], a subsite of [redacted] (formerly [redacted] On each of these sites every individual was counted.

Sampling was conducted on seven sites including: 1. [redacted] 2. [redacted] ([redacted]), 3. [redacted] ([redacted] 4. [redacted] ([redacted]), 5. [redacted]

([redacted] 6. [redacted] ([redacted]), 7. [redacted] All population boundaries were mapped with a GPS unit in the field and plotted in Arcview.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num	Site Condition	1998	1999	2000	2001	2002	2003	2004
[redacted]	LEGE	1	?	--	--	--	--	--	315*	146*
[redacted]		2	?	--	--	--	--	--	1*	1*
[redacted]		3	Poor	4,869*	1,530	824*	342	525	181*	127*
[redacted]		4	Fair	155,738	1,654	478*	2,281	24,324	19,378	25,739
[redacted]		1	Fair-Good	78,657	4,528	4,135*	2,041	9,349	3,924*	3,034*
[redacted]		1	Good	--	--	1,113*	1,056*	5,985*	8,293*	11,330
[redacted]		2	Fair-Good	1,488,886**	339,617**	1,283,839	358,104	163,540	672,631	82,195
[redacted]		3	Fair	--	42,207	75,189	38,251	29,670	31,702	5,025
[redacted]		4	Fair	--	1,307	26,042	--	25,531	73,688	4,677
[redacted]		5	Poor	--	--	254*	103*	7*	0*	0* Presumed extirpated
[redacted]		1	Fair	--	--	--	--	--	--	16*
[redacted]		1	?	--	10,285^	146,915	126,803	79,844	242,516	28,501
[redacted]		1	Fair-Good	4,068*	1,970	1,254	6,035	20,944	11,284	3,274

*censused
**Figures for 1998 and 1999 include numbers from main and remnant populations
^error in total quadrat calculation

Two methods were used to estimate the sizes of populations of *Lessingia germanorum* on the Presidio. The method used depended on the size of the population based on the previous years' results. A census was performed for populations under 10,000 individuals and random quadrat sampling was performed for populations over 10,000 individuals.

Several populations have been monitored annually since 1994 (see Appendix VII,Table II for monitoring results 1994 – 1997). All of the populations have had some restoration efforts which include seeding of *L. germanorum* and removal of non-native species. The majority of the populations have abundant numbers of *L. germanorum* individuals year to year. Exceptions are, [redacted] where numbers have been declining each year; and [redacted] where the population appears to have been extipated.

Management Recommendations

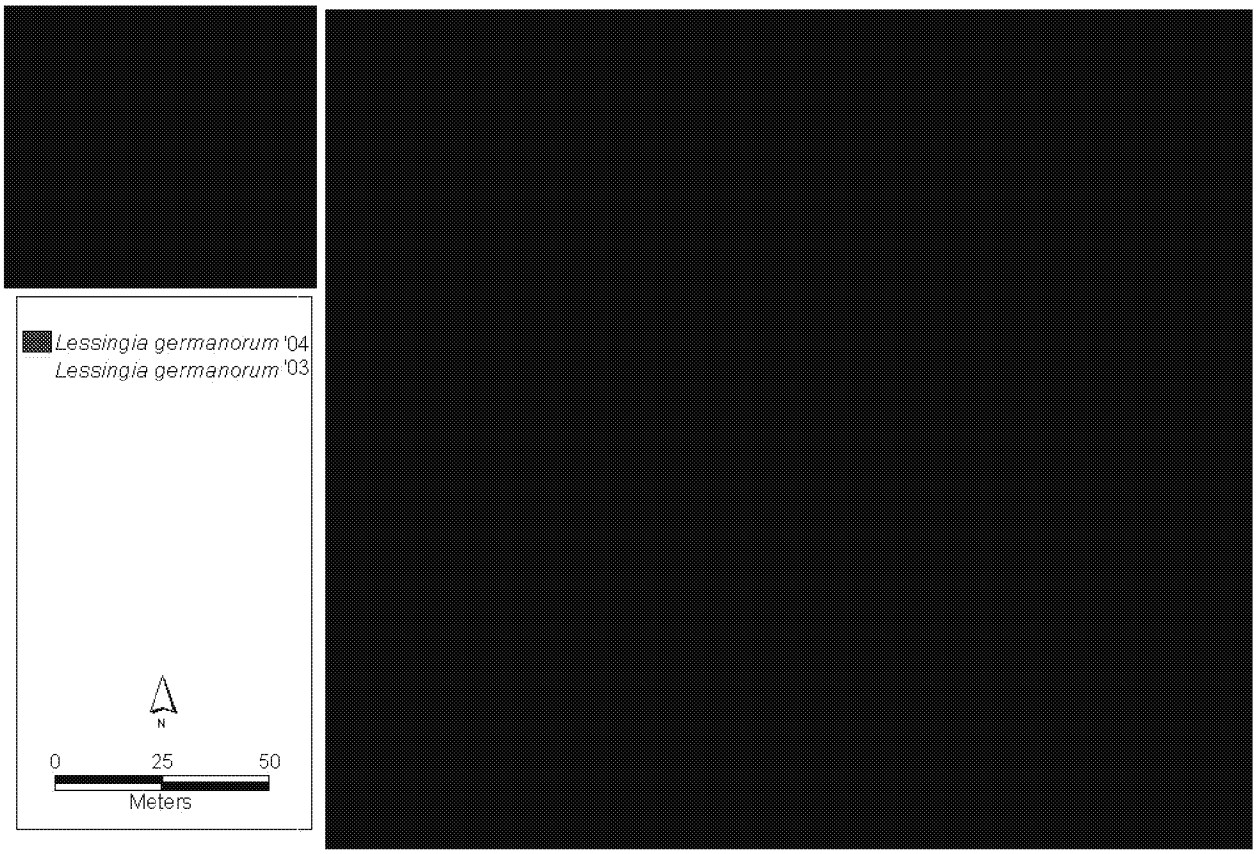
It is recommended that this species be monitored closely in the future. It is equally important to consider the effects of natural succession on all the dune annual species; many sites which were cleared in the past ten years are now beginning to exhibit a mature dune scrub plant community. An adaptive management program aimed at improving *Lessingia germanorum* habitat would also increase our understanding of the ecological requirements of the species.

Monitoring Schedule

Proposed monitoring regime: Level 1 and Level 2
Proposed monitoring frequency: Level 1 every year, Level 2 every 2 years
Proposed monitoring cycle: Monitor every year.

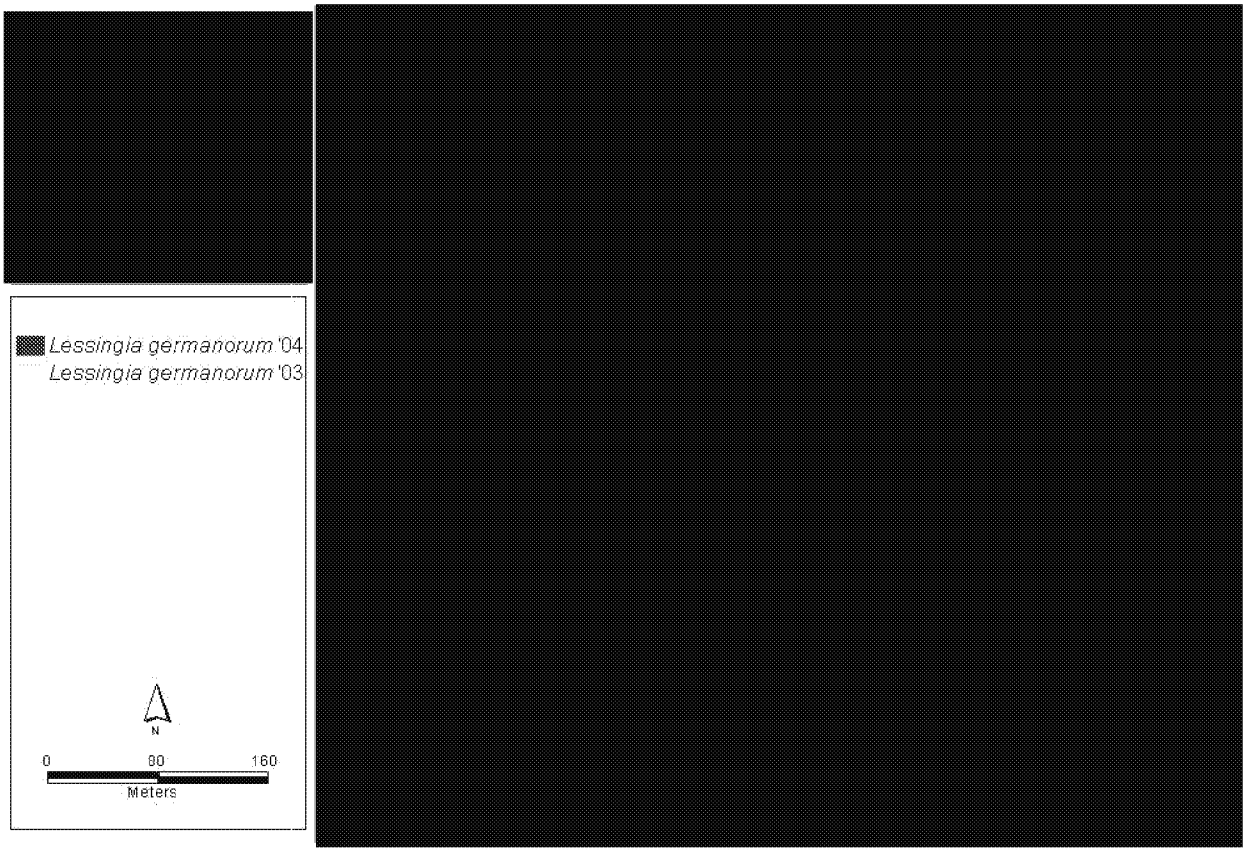
Lessingia germanorum (San Francisco lessingia)

[redacted] the Presidio, 2004



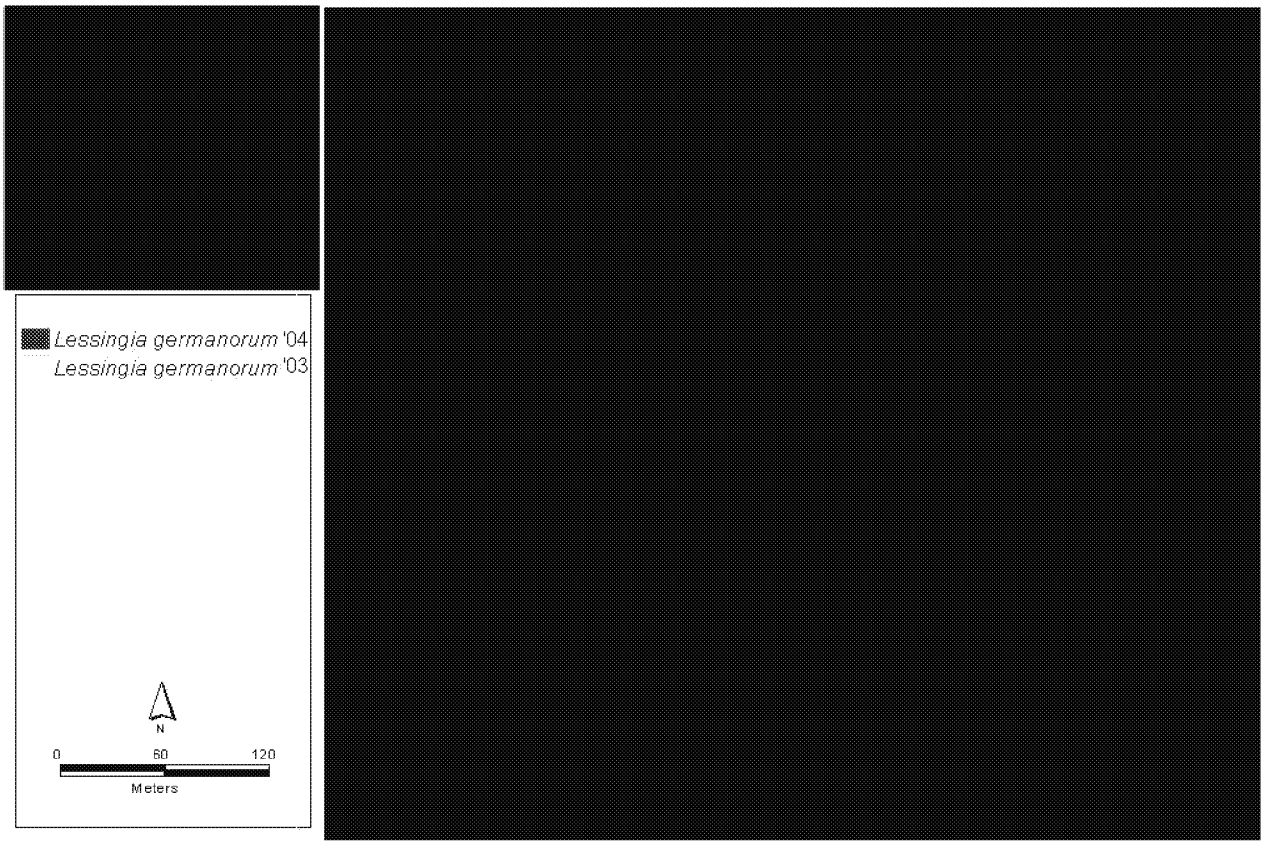
Lessingia germanorum (San Francisco lessingia)

[redacted] the Presidio, 2004



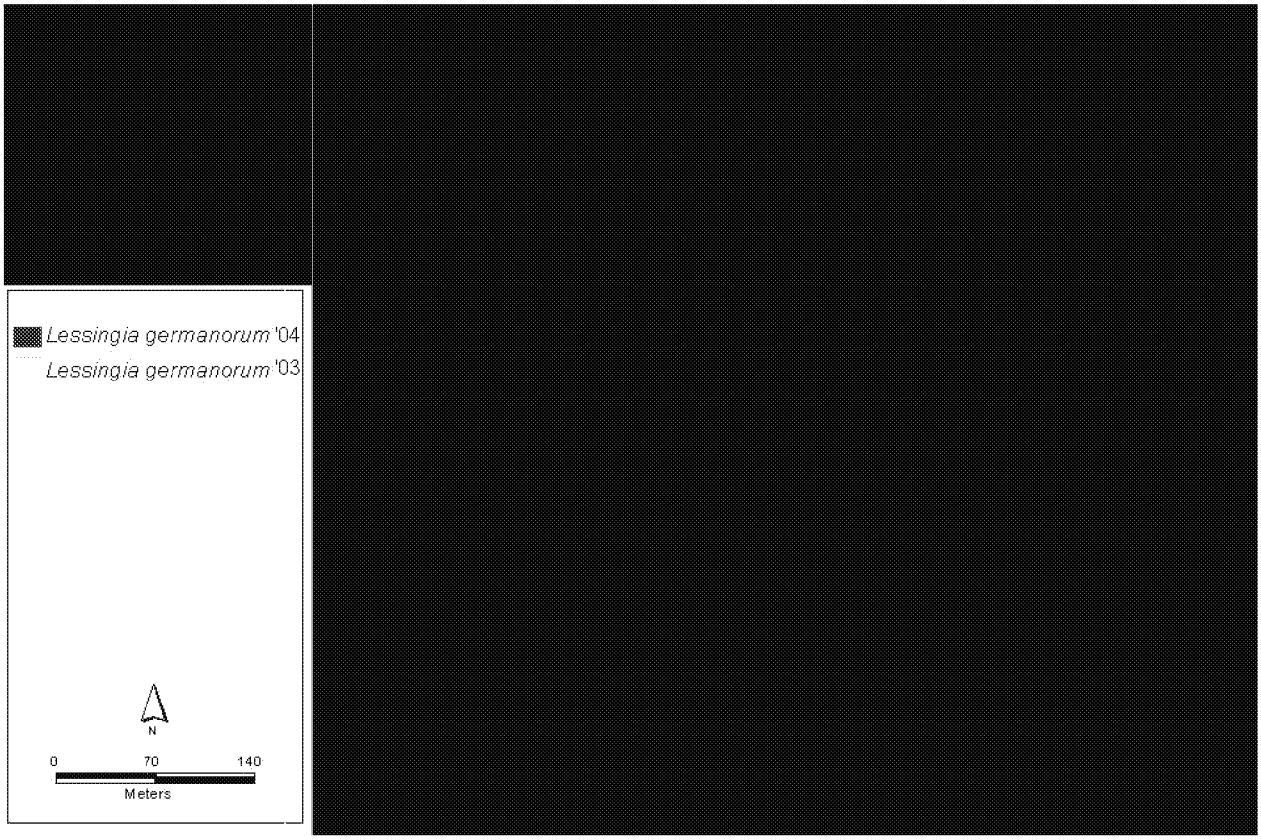
Lessingia germanorum (San Francisco lessingia)

[redacted] the Presidio, 2004

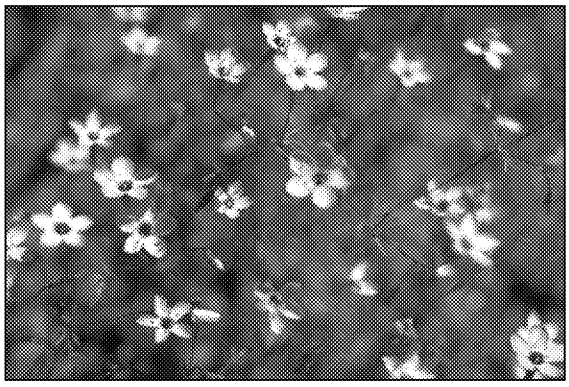


Lessingia germanorum (San Francisco lessingia)

[redacted] the Presidio, 2004



Linanthus ambiguus (Rattan) E. Greene
Serpentine Linanthus



Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 4 / R-E-D Code: 1-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: San Francisco Watershed District [redacted])

Life History
Flowering Time: March June

Range: This plant is endemic to California and documented in nine counties within the California Floristic Province.

Characteristics: This small annual Linanthus is smaller than 20 cm and has a solitary inflorescence (many California linanthus species have head-like inflorescences). The corolla lobes are yellow with a pink base. The tube and throat are violet and purple. The corolla has a hairy band inside near the throat. *Linanthus liniflorus* is a more common species in the serpentinite grasslands of the SFWD than *L. ambiguus*. *L. liniflorus* has hairy filaments and white flowers while *L. ambiguus* has no hairs on the filament.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is documented in one population in the serpentinite grasslands of the SFWD within the [redacted]'. It is possible that there are other populations in the northern grasslands as well, although it has not been observed.

Threats
Introduced species and fragmentation of the habitat.

Monitoring Results: 1998 - 2004
Linanthus ambiguus was first observed in the serpentinite grasslands of the SFWD in 2001. The population was not mapped nor was a census conducted. This population is documented in the CalFlora database, but it is new to the GGNRA rare plant project.

Management Recommendations
None at this time

Monitoring Recommendations
This plant should be mapped and censused in 2005.

Recommended Monitoring interval
Every year for three years. If population is stable, than every two years.

Linanthus rosaceus Greene

Rose Linanthus

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: Not in Jepson manual
CNPS: Listed in online 6th Inventory
Comments: Originally described as a separate species nearly 100 years ago, but subsequently absorbed into *L. androsaceus*. Resurrected in 2001 as a separate species (Battaglia & Patterson, Madrono 48:2, 62-78).

Population Location(s) within:
Legislative boundary: Mori Point, outside the NPS managed-area boundary

Life History
Flowering Time: April-June

Range: This plant is endemic to California. According to CNPS data, the only recently verified *L. rosaceus* populations are at Mori Point and in the Point Reyes area. The species previously occurred more widely. It is thought to have been extirpated throughout most of its range.

Characteristics
This is a small annual herb somewhat similar to other species of the genus. According to the Battaglia & Patterson paper, the species differs from *L. androsaceus* by its spatulate, more or less fleshy leaf lobes, and by its corolla lobes. In *L. rosaceus* the lobes are generally 6-8 mm long and rounded, in *L. androsaceus* they are generally >8mm long and often terminate in a small point. A key differentiating *L. rosaceus* from other close relatives is included in the paper. A copy of the paper is included with the stored rare plant data sheets for this species.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is known only from a single population on [redacted]-facing coastal bluffs at Mori Point. The population appears to lie just [redacted] of the NPS managed-area boundary. The population was located in 2002, but its size could not be determined because it was not possible to survey during the blooming season. In 1999, when discovered, the population was estimated to measure 30m X 20m and to comprise about 500 individuals.

Threats
Development has been proposed immediately [redacted] of Mori Point. The area near the population already experiences heavy recreational use, with social trails passing nearby. This population could be negatively affected by foot or bicycle traffic which could damage or kill the small annual plants. *Carpobrotus edulis* (Ice plant) is present on the bluffs, though none was seen near the population.

Monitoring conducted 2004
The site was surveyed in 2004 but the site visit was too late in the season to conduct an accurate census.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Mori Pt.	LIRO	1	--	--	--	--	--	>500	Surveyed, not censused

Linanthus rosaceus was added to the GGNRA Special Status plant list in 2002. 2003 was the first year that a census was conducted on this population, therefore, no trend information is yet available for this species.

Management Recommendations
None at this time.

Monitoring Recommendations
None at this time.

Recommended Monitoring Interval
Monitor consecutively for three years in order to obtain information on fluctuation in population size between years. If population appears to be stable, monitor every two years.

Linanthus rosaceus

0.2 0 0.2 0.4 0.6 0.8 Miles

N

Mori Point, 2003
Montara Mountain Quadrangle

Liro_03.shp

189

GGNRA189562

Lupinus arboreus Sims **var. *eximius*** (Burtt Davy) C.P. Smith

San Mateo tree lupine

Rarity Status
Federal Listing: C2- Threat and/or distribution data are insufficient to support federal listing

State Listing: None

CNPS List: 3 / R-E-D Code: 2-2-3

Comments: CNPS Rare plant inventory fifth ed. mentions moving this species to list 1B. It is still a List 3 plant in the sixth edition.

Nomenclature
The Jepson Manual: Not accepted
CNPS: Not accepted
Comments: This species is listed as '*Lupinus eximius* Davy' by CNPS. The Jepson Manual mention *L. arboreus* var. *eximius* in the description comments of *L. arboreus* Sims, but it is not formally recognized as a variety.

Population Location(s) within:
Legislative boundary**:** San Francisco Watershed District

Life History
Flowering Time: April-July

Range: This plant is endemic to California. According to CNPS, it is known from San Mateo County and Sonoma County. Sonoma county plants need taxonomic verification. The CalFlora occurrence database documents populations in Point Reyes National Seashore in Marin County and scattered populations in Monterey County. As this plant is difficult to identify, many of these occurrences may have been misidentified. The original description of *L. eximius* describes its location as 'restricted to the ridge of [redacted]' in the SFWD.

Characteristics:
This variety of *L. arboreus* is very difficult to distinguish from other varieties of *L. arboreus.* According to the original description, *L. arboreus* var. *eximius* is hairier than other varieties of *L. arboreus* and is described as having fragrant flowers with blue wings and a yellow banner. The more common form of *L. arboreus* in the San Francisco area has all yellow flowers or less frequently, all blue flowers.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
One small population is mapped in the San Francisco Watershed District. It may be more extensive than the map suggests.

Threats
The mapped population occurs adjacent to a limited use fire road in the SFWD. It is subject to disturbance from road maintenance and from the introduction of invasive species that are disturbance dependant. Many non-natives occur within the population.

San Francisco Watershed District is effectively managing the area to protect the population from being unintentionally graded or mowed.

Monitoring conducted 2004
No monitoring was conducted in 2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
SFWD	LUAREX	1	--	28	28	24	No survey	No survey	No survey

Comparing the census figures for 1999 – 2001, the population, though small in numbers appears to be stable.

Management Recommendations
Continue to protect the site from further disturbance. Point Reyes staff was notified following the 2001 survey season about the potential population in Point Reyes to determine if that population is valid. Consult publications to determine if any new taxonomic work has determined the validity of *L. eximius* as a valid variety of *L. arboreus*.

Monitoring Recommendations
Monitor for noxious weeds within and adjacent to the population.

Recommended Monitoring Interval
Every three years.

0.2 0 0.2 0.4 0.6 Miles

Lupinus arboreus var. eximus

San Francisco Watershed District
Montara Mountain Quadrangle

N
W E
S

Malacothamnus fasciculatus (Torrey & A. Gray) E. Greene **var. *arcuatus*** (Greene) Greene

Arcuate bush-mallow

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-3

Comments: This species was upgraded from List 4 in CNPS Rare Plant Inventory 5th edition to list 1B in the 6th edition.

Nomenclature
The Jepson Manual: Not Accepted
CNPS: Not Accepted
Comments: Listed as *Malacothamnus arcuatus* in the CNPS Inventory. Mentioned in Jepson in the *Malacothamnus fasciculatus* species description but it is not officially recognized. For a good description of *M. arcuatus*, see A California Flora and Supplement, Munz, P.A., 1959, p. 126.

Population Location(s) within:
Management boundary: Sweeney Ridge

Life History
Flowering Time: April-July

Range: *Malacothamnus fasciculatus* var. *arcuatus* is endemic to California and is documented to occur in Santa Clara, Santa Cruz and San Mateo county.

Characteristics:
Malacothamnus fasciculatus var. *arcuatus* is a shrub/sub-shrub with a woody base. It is very difficult to distinguish from other varieties of *M. fasciculatus*. According to A California Flora and Supplement (Munz 1959), it can be distinguished from *M. fasciculatus* by the hairs on the stem. On *M. f. arcuatus*, the stems are 'densely white tomentose' and on *M. fasciculatus*, the stems are 'covered with short, soft tomentum'.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant was last observed growing along Sweeney Ridge more than ten years ago. There are no other documented occurrences in GGNRA or in SFWD. It is documented in [redacted], in San Mateo County.

Threats
This plant may not be present, or present in very small numbers due to lack of fire. Seeds of plants belonging to the family Malvaceae can lie dormant for decades before germinating after fire. This variety may respond vigorously to fire.

Monitoring conducted 2004
No monitoring was conducted in 2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
Sweeney	MAFAAR	1	--	0	0	0	No survey	No survey	No survey

Surveys conducted in 1999 – 2001 found no individuals. The last reported sighting of this species was in the late 1980s by Toni Corelli of CNPS. This species may be a fire dependent species. A healthy population occurs in [redacted] in an area that has burned in recent years.

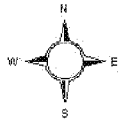
Management Recommendations
None at this time.

Monitoring Recommendations
If the site burns, it is recommend that the site be surveyed the following year. It should be easy to walk around the area and readily spotted. If observed in high numbers, a good collection should be made and sent to a taxonomic expert. Until the site burns, continued surveys do not seem necessary. Several surveys in the last ten years have resulted in no plants observed. If no plants are found for three subsequent years following a fire, then I recommend removing this from the GGNRA list of rare plants.

Recommended Monitoring Interval
None, until the site burns. Postburn, recommended monitoring interval is one, two, five and ten years postburn.

Malacothamnus fasciculatus var. arcuatus

Sweeney Ridge
San Fransisco South and
Montara Mountain Quadrangle



Pentachaeta bellidiflora E. Greene

White-rayed pentachaeta

Rarity Status
Federal Listing: **ENDANGERED**
State Listing: **ENDANGERED**
CNPS List: 1B / R-E-D Code: 3-3-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

Population Location(s) within:
Legislative boundary: San Francisco Watershed District

Life History
Flowering Time: March-May

Range
This plant is endemic to California. According to CNPS, this plant is known from only one fragmented population bisected by I-280. In Marin Flora, this plant is listed as "...occurring in grassy slopes on the edge of woods or brush. Rare but locally common." It is listed as known from Corte Madera, Larkspur and [redacted] with Corte Madera being the type location. The Marin populations have apparently all been lost to development.

Characteristics
Pentachaeta bellidiflora is a small, pulchritudinous composite with conspicuous daisy-like flower heads. When flowering, it clearly stands out from the other plant species. The population on SFWD lands is restricted to the serpentinite grasslands. *Pentachaeta exilis* ssp. *aeolica* is another white-rayed pentachaeta that can occur in the San Francisco Bay Area. *P. bellidiflora* has a greater number of ray flowers (7-16) per head than *P. e.* ssp. *aeolica* (0-3). *P. bellidiflora* also has glabrous to short hairy peduncles, whereas *P. e.* ssp. *aeolica* has shaggy hairs on the peduncle. There are no reports of *P. exilis* ssp. *aeolica* occurring in the I-280 triangle.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
The population that is mapped and documented in the watershed is located in what has been called the [redacted]. The [redacted] is a patch of grassland on the west side [redacted] and on the south side of [redacted].

A population was found listed in the NDDB database as occurring on the slopes above [redacted] Though listed as extirpated the location was searched in 2002 and 2003. No individuals were found.

Threats
Numerous roads and trails dissected the SFWD population. During the last site visit in 2001, the site was not visited late in the year so it is not known whether *Centaurea solstitialis* (yellow starthistle) is present in the area. If present, yellow starthistle could pose a significant threat to this already fragmented population.

Monitoring conducted 2004
No monitoring was conducted in 2004

Monitoring Results: 1998 – 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
SFWD	PEBE	1	--	11,446,998	112,355,758	Surveyed, not censused	No survey	No survey	No survey
[redacted]		--	--	--	--	--	0	Population extirpated	--

The SFWD population of *Pentachaeta* is very abundant and appears to be holding steady. Census data collected in 1982 by CNPS recorded population numbers in the millions. The population estimates were obtained by sub-sampling the area and extrapolating to the whole area. The sampling method used is detailed in Appendix VIII.

The survey conducted in 2003 of the [redacted] population confirmed that the population has been extirpated.

Management Recommendations
Directed searches for invasive plant species within the SFWD population should be conducted. Visit the site in August 2004 to check for the presence of yellow starthistle. If it is not present, annual targeted searches for yellow starthistle should be done. If it is discovered it should be immediately eradicated.

Monitoring Recommendations
Expand the sampling method to include density and cover estimates for non-native species. Currently, the presence of non-native species is documented but no quantitative data is gathered. Gathering cover and density data for both native and non-native species would provide information on how the abundance of these species change in relation to one another.

Recommended Monitoring Interval
Every three years

0.1 0 0.1 Miles

Pentachaeta bellidiflora

[redacted]

San Francisco Watershed District
Woodside Quadrangle

Pentachaeta bellidiflora

[redacted] Survey Area, 2002

Point Bonita/San Rafael Quadrangles

0.2 0 0.2 0.4 0.6 Miles

N

Plagiobothrys chorisianus (Cham.) I.M. Johnston **var. *chorisianus***
Choris's popcornflower

Rarity Status
Federal Listing: None
State Listing: None
CNPS: List: 1B/R-E-D Code: 2-2-3
Comments: Moved from list 3 in CNPS 5th edition to list 1B in 6th edition

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management Boundary: Sweeney Ridge

Life History
Flowering Time: April-June

Range: This plant is endemic to California and is documented in Santa Cruz, San Mateo and San Francisco Counties.

Characteristics:
Proper identification of *Plagiobothrys chorisianus* var. *chorisianus* requires a mature fruit (nutlet). *P. chorisianus* var. *chorisianus* is an annual plant with opposite leaves near base of plant. The position of the nutlet scar is lateral or slightly oblique. The shape of the scar is linear. Nutlet scars are often wider than linear on other species in the genus *Plagiobothrys*. *P. chorisianus* var. *chorisianus* is distinguished from *P. chorisianus* var. *hickmanii* by several distinct characteristics. The lower leaves of *P. c.* var. *chorisianus* are generally fused and loosely sheathing the stems. The lower leaves of *P. c.* var. *hickmanii* are free and are only slightly sheathing the stems. The pedicels are longer than the calyx in *P. c.* var. *chorisianus* whereas the pedicel is shorter than the calyx in *P. c.* var. *hickmanii.*

Species determination
The voucher specimens collected from Sweeney Ridge were taken to California Academy of Sciences to compare with herbarium specimens. The following characteristics were used to verify the variety of the collected specimen.

Plagiobothrys chorisianus* var. *chorisianus	***Plagiobothrys chorisianus* var. *hickmanii***
1. habit trailing or erect (M.)	1. habit prostrate (M.)
2. lower lvs. conspicuously connate in pairs (M.)	2. without prominent basal sheathing of lf base (M.)
3. pedicel conspicuous, generally 2-10 mm (J.)	3. pedicels mostly shorter than calyx (M.)

M = from Munz; J = from Jepson

Though other characters are used to describe the varieties, these are the characters that were used to distinguish the two varieties and determine that the specimen collected is indeed *P. chorisianus* var. *chorisianus.* Based on the trailing habit of the plant and the length of the pedicels in relation to the length of the calyx, I believe the plant to be *P.chorisianus* var. *chorisianus*. The lower leaf pairs are connate but I (J. Taylor) would not say conspicuously so.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District

A single, small population has been previously mapped and documented on Sweeney Ridge just [redacted] of the boundary with the San Francisco Watershed District in the area known as the "[redacted]". No plants were found during surveys conducted in 2002.

A new population was documented in 2002 occurring along the [redacted] north of the [redacted] (see map for location).

Threats

The site documented in 2002 occurs alongside the trail and several plants were found growing in the trail. *Leucanthemum vulgare* (Ox-eye daisy) occurs on the site. Any trail maintenance work to widen the trail could remove the population.

Monitoring conducted 2004

The population occurring along the [redacted] was revisited to census the population.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	PLCHCH	1	0	no survey	no survey	no survey	0	No survey	No survey
[redacted]		2	--	--	--	--	approx. 35	93	82

The population though small appears to be remaining stable.

Management Recommendations

Revisit site to determine threats to and vigor of the population. Carefully remove Ox-eye daisy growing with the plants in late April or early May. At this time, the *Plagiobothrys* is in bloom and thus visible and the Ox-eye daisy is not yet in flower. This will prevent inadvertently pulling the *Plagiobothrys* and removing the Ox-eye daisy before it has a chance to flower and set seed.

Monitoring Recommendations

Survey other reported sites and similiar habitats for other populations. It appears the plant may grow well in moist areas. Population 2 is growing in what appears to be an old drainage ditch. While comparing the collected specimens with those in the Cal Academy herbarium, a specimen collected by John Thomas Howell on San Bruno Mountain in 1961 described the collection location as "... in a low wet depression along road". Continued surveys along the edges of the South Meadow may reveal new occurrences.

In order for a final determination to be made as to the identification of this plant, the vouchers should be verified by another qualified botanist. This could be a botanist among GGNRA staff or an outside expert. The specimens collected have been mounted and are housed in the herbarium cabinets in Building 1061, Fort Cronkhite.

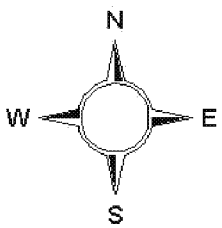
Recommended Monitoring Interval

Monitor population yearly for three years in order to gather data on yearly fluctuations in abundance. If the population is stable, monitor every two years.

Plagiobothrys chorisianus var. chorisianus

0.2 0 0.2 0.4 0.6 Miles

Sweeney Ridge
Montara Mountain Quadrangle



[redacted]

Silene verecunda Wats. **ssp. *verecunda***

San Francisco campion

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D 3-2-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management Boundary: the Presidio

Life History
Flowering Time: March - August

Range: Occurrences have been documented in Santa Cruz, San Francisco and San Mateo counties. It is known from fewer than twenty occurrences.

Characteristics: San Francisco campion is a perennial herb from 1–5 dm tall with opposite leaves. It is found on coastal bluffs, chaparral, coastal prairie and coastal scrub generally in sandy soils. The stem is erect and puberulent. The leaves are ± gradually reduced upward; lower leaves are 3-6 cm in length and 2-10 mm wide. The inflorescence is elongate. Flowers are pink to rose with petals > 10 mm long; the petal claw is ciliate at the base. The calyx and pedicel are ± sparsely short-hairy. It is noted in The Jepson Manual that this subspecies intergrades with and is difficult to separate from ssp. *platyota*. In plants of ssp. *platyota* the lower leaves are 5-9 cm in length and the calyx is ± densely puberulent.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations occur in the Presidio in coastal dune scrub.

Threats
The site condition is fair at [redacted]. Within this site the invasive species consist primarily of annual grasses. There was a marked reduction in the size of the individuals this year in relation to 2003. Within the [redacted] site, site condition is good to fair. Threats consist of non-native annual grasses and forbs, including *Bromus diandrus* and *Briza maxima, Conicosia pugioniformis* and trampling from pedestrians using adjacent social trails. There was also a marked increase in *Artemisia pycnocephala* and *Lupinus chamissonis* between 2003 and 2004. This increase in cover has resulted in a decrease of open sand habitat. At the [redacted] ([redacted]), site condition is good. Threats include non-native trees such as *Pinus radiata* and *Cupressus macrocarpa* which drop litter upon the population and shade much of the population. There is also an expanding population of *Ehrharta erecta*, an invasive grass species, which is adjacent to the population. At the [redacted], site condition is poor and the threats include high densities of annual grasses and forbs. In addition, the shading and litter from *Pinus radiata* trees may be impacting the sustainability of the *Silene verecunda ssp. verecunda* populations.

Monitoring conducted 2004
All populations were located by ground-truthing maps from the 2003 Presidio Special Status Plant Report. All individuals were counted and the polygon was re-drawn if the population had shifted significantly from previous years.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. No.	1998	1999	2000	2001	2002	2003	2004
[redacted]	SIVEVE	1	--	--	--	16	--	76	63
		2	--	--	--	2	--	0	0
		3	585	1	952	--	--	73	40
		4	--	--	--	2	--	0	0
[redacted]		5	201	--	158	176	--	36	40
		6	869	--	213	214	--	219	219
		7	16	11	5	1	--	0	0
[redacted]		8	10	--	2	1	--	0	0
[redacted]		9	18	--	--	1	--	4	5
[redacted]		10	6	--	20	5	--	5	4
		11	--	24	3	24	--	8	4

Several populations have monitoring data for the years 1985, 1991, 1996 and 1997. Monitoring results for these years can be found in Appendix VII, Table II. Some of the populations have had some restoration efforts which include planting of *Silene verecunda* ssp. *verecunda* and removal of non-native species. Refer to the GGNRA restoration database for a history of management efforts.

Management Recommendations
Removing dense stands of native dune scrub at the [redacted], [redacted] site (SIVE3) should be considered in order to create potential open dune habitat. Also, limbs of *Cupressus macrocarpa* trees along northern edge of SIVE6 and SIVE5 should be trimmed/removed to reduce shade and duff. The *Ehrharta erecta* plants should be manually removed. At SIVE5, hand removal of non-native grasses on the slope next to [redacted] should continue to maintain suitable habitat. Sensitive habitat signs or fences should be also be placed at SIVE4 and SIVE9 to protect populations from trampling. The social trail near SIVE9 has especially heavy pedestrian use. Removal of *Carpobrotus edulis* at the [redacted] site may increase potential habitat for a future *Silene verecunda ssp. verecunda* population. There was *Silene vercunda ssp. verecunda* found at this site in 2001. Due to the low survivorship of planted individuals, opening additional habitat adjacent to existing sites may improve recruitment. Seeding should be considered as a method of bolstering populations. There were 8 individuals found at the [redacted] (SIVE 9) site which were planted in 2003, these individuals will be counted as part of the population in 2005 if they are still present.

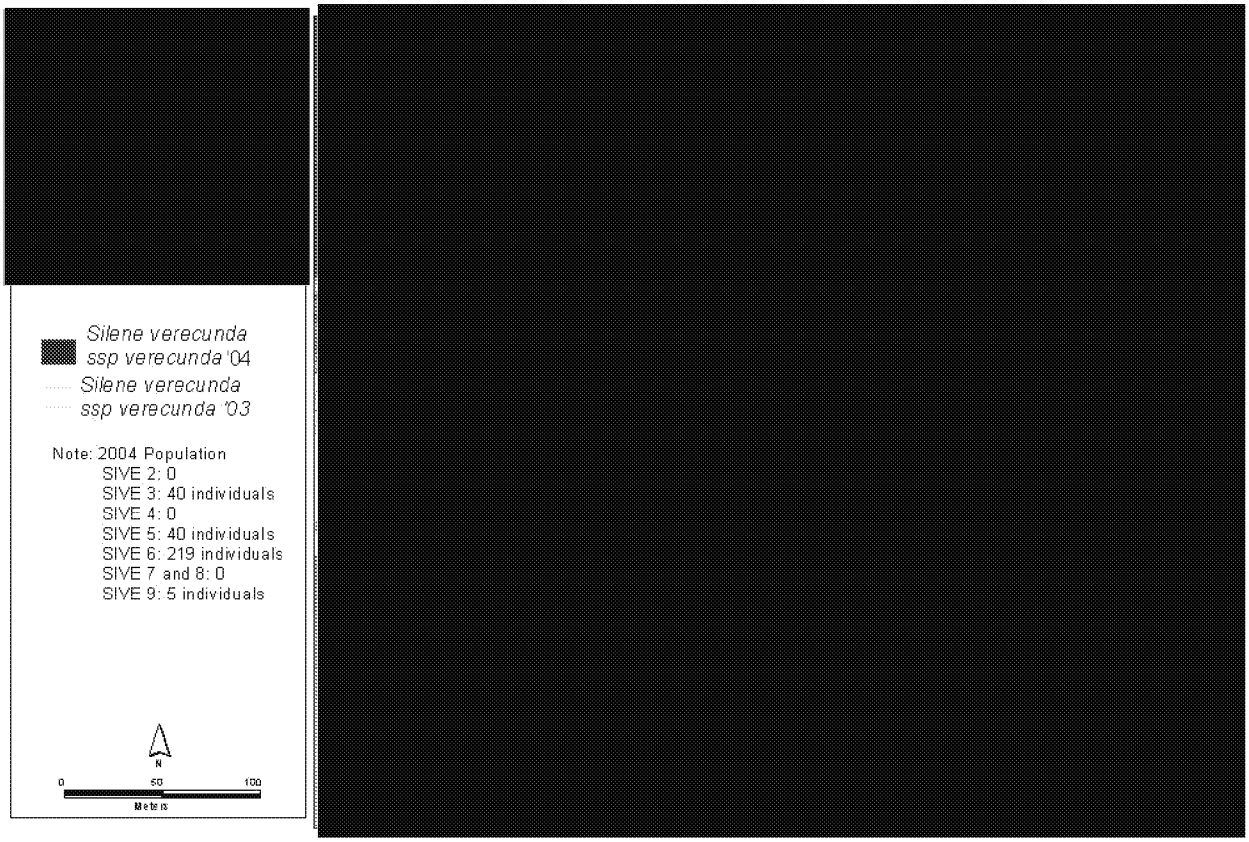
Monitoring Recommendations
None at this time.

Monitoring Schedule
Presidio populations:
Proposed monitoring regime: Level 2
Proposed monitoring frequency: 1 year

Insert SIVEVE [redacted] Map

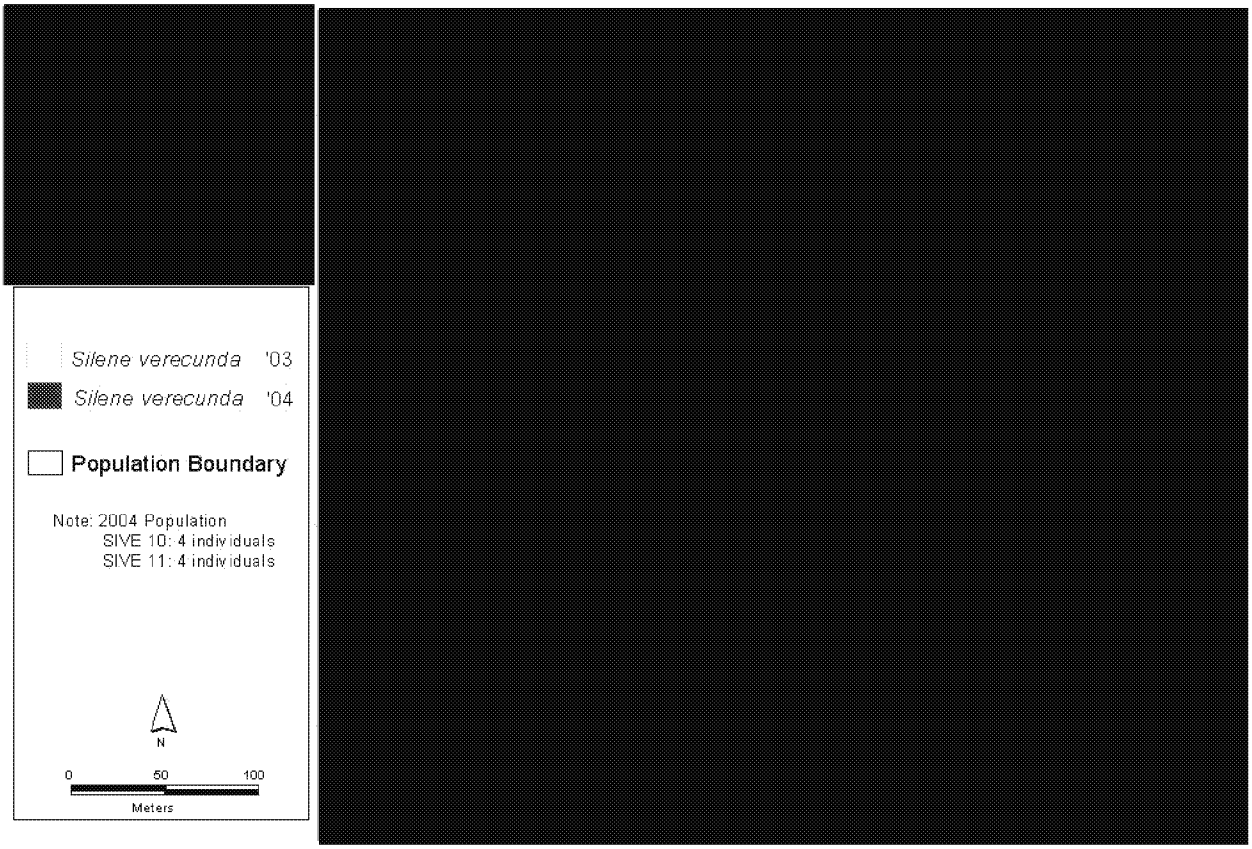
Silene verecunda ssp.verecunda (San Francisco campion)

[redacted] the Presidio, 2004



Silene verecunda ssp.verecunda (San Francisco campion)

[redacted] the Presidio, 2004



Stebbinsoseris decipiens (Chambers) Chambers

Santa Cruz microseris

Rarity Status
Federal Listing: C2-Threat and/or distribution data are insufficient to support federal listing.
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management Boundary: Stinson Beach, along Highway 1
Legislative Boundary: [redacted]

Life History
Flowering Time: April-May

Range:
Stebbinsoseris decipiens is endemic to California. Within California, it is known to occur in Marin, Monterey and Santa Cruz counties. According to the CalFlora occurrence database, only three populations are documented in Marin County. Fewer than twenty occurrences are known throughout its range.

Characteristics:
Stebbinsoseris decipiens can be very difficult to distinguish from *Uropappus lindleyi*, *Stebbinsoseris heterocarpa* and several *Microseris* species. Specimens from the California Academy of Sciences herbarium of both species of *Stebbinoseris* and of *Uropappus lindleyii* were viewed and the following characters observed.

Character	***Uropappus lindleyii***	***Stebbinoseris decipiens***	***Stebbinoseris heterocarpa***
1. pappus coloring	silvery white	tawny or tan to off-white	tawny or tan to off-white
2. achene color	black	tan	tan
3. achene width at junction of pappus	distinctly narrowed; almost beak-like	*not* tapered at pappus; width of achene uniform from base to tip	*slightly* tapered at pappus; slightly wider at base of achene than at pappus junction
4. ratio of achene length to pappus length	--	longer than pappus; visibly apparent without measurement	achenes only slightly longer than the pappus; ratio of achene length to pappus length is nearly equal
5. mid-vein on pappus scale	--	vein uniform in width from base to tip	vein widens at base
6. flower in bud	erect	nodding	nodding

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
A population has been recorded as occurring along [redacted] near the junction with the [redacted] This population was last documented in 1985 and is believed to have been extirpated by road work.

A second population consisting of one individual was reported to have been found at [redacted] in 1999. Censuses conducted in 2000 and 2001 on [redacted] appear to have misidentified *Uropappus lindleyii* as *Stebbinoseris decipiens*.

Monitoring conducted 2004
No monitoring was conducted in 2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	STDE	1	--	--	0	0	0	0	No survey
		2	--	--	0	0	0	0	No survey
Stinson Bch		1	No survey	0	No survey	0	0	0	No survey

In 1999, one individual of *Stebbinoseris decipiens* was found on [redacted] (personal communication, K. Strathmann). In the censuses conducted in 2000 and 2001 population numbers were in the 100s. Following the 2001 census it was recommended that a voucher collection be made to verify the identification of the species of *Stebbinoseris* occurring at [redacted] Surveys in 2002 and 2003 to collect a voucher found no individuals of *Stebbinoseris*. After reviewing vouchers collected, photographs taken and talking with previous monitors, it is concluded that the individuals counted as *Stebbinoseris decipiens* in 2001 and 2002 were actually *Uroppappus lindleyii*. Therefore, the census data for this species in 2001 and 2002 has been changed to zero individuals found. There is the possibility that some individuals included in the census counts were *Stebbinoseris decipiens*, however, based on subsequent surveys of the mapped populations conducted in 2002 and 2003 where no *S. decipiens* was found, it is concluded that the majority of plants counted had to have been *U. lindleyii.*

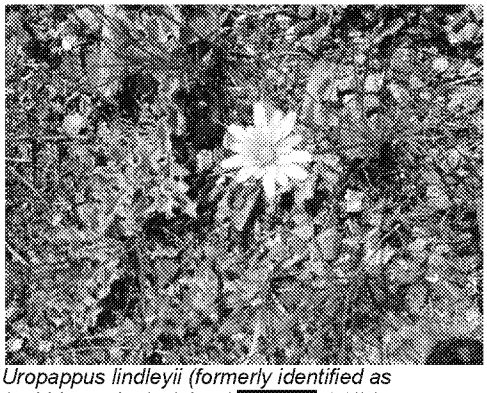
Management Recommendations
None at this time

Monitoring Recommendations
In order to verify the presence of *S decipiens* on [redacted] another search should be conducted in mid to late April 2004 and a voucher specimen collected (provided there is more than 1 individual!). I recommend looking for the plant in the area indicated on the attached map. The search should be conducted before noon since flowers of members of the chicory tribe tend to close as the day progresses.

The last several surveys of the Stinson Beach site have revealed no individuals. The last recorded occurrence was in 1985 by Terry Thomas then of GGNRA. It is possible that this population is extirpated. Future surveys to this site should include broader searches in the grasslands [redacted] and [redacted] of the road. When the plant was first collected at this site in 1955, the site was described as "plants growing out of a mat of moss." A search for locations fitting this description should be conducted. Additionally, other grassland areas occurring on serpentine rock outcrops along [redacted] could be surveyed.

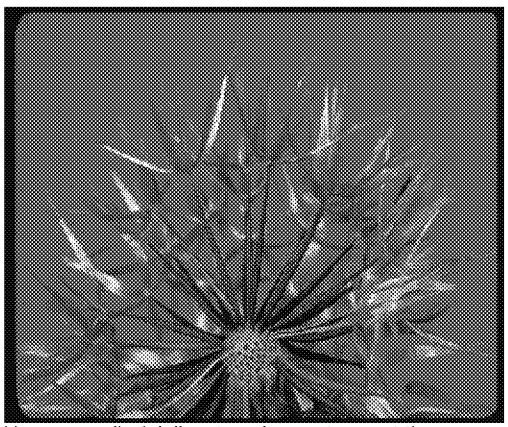
Recommended Monitoring Interval
[redacted] – None at this time pending species verification

Stinson Beach – None at this time pending locating new populations.



Uropappus lindleyii (formerly identified as Stebbinoseris decipiens) [redacted] *04/01*

Uropappus lindleyii (formerly identified as Stebbinoseris decipiens), [redacted] *04/01*



Uropappus lindelyii, note achenes taper at tip

Uroppapus lindleyii, note erect inflorescenes in bud

Stebbinoseris decipiens

[redacted]
Proposed search area 2004
Populations previously mapped as STDE

0.1 0 0.1 0.2 Miles

N

Stde_search.shp
Stde_01.shp

0.1 0 0.1 0.2 Miles

Stebbinsoseris decipiens

Stintson Beach
San Rafael Quadrangle

Streptanthus glandulosus Hook. **ssp. *pulchellus*** (Greene) Kruckeberg
Mount Tamalpais jewelflower

Rarity Status
Federal Listing: C2-Threat and/or distribution data are insufficient to support federal listing.
State Listing: None
CNPS List: 1B / R-E-D Code: 3-2-3
Comments: R-E-D code changed from 3-1-3 to 3-2-3 in the CNPS Inventory 6th edition.

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Legislative boundary: [redacted], [redacted]

Life History
Flowering Time: April-July

Range: *S. glandulosus* ssp. *pulchellus* is endemic to California and is known to occur only in Marin County.

Characteristics: This small annual plant is as pretty as its name suggests. Its bright purple, urn shaped calyx lobes can help distinguish this distinct plant. The petals are all more or less similar in color. The inflorescence is one-sided in *S. g.* ssp. *pulchellus*, whereas the inflorescence of *S. g.* ssp. *glandulosus* is not one-sided. These subspecies both have purple calyces.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
Populations are known to occur on serpentinite rock outcrops with thin soils and sparse herbaceous cover. There are several populations mapped on the west slopes of [redacted] and below [redacted] on Mt. Tamalpais on the [redacted].

Threats
Populations atop [redacted] are subject to cattle grazing atop [redacted]. It is not apparent how the presence of cows affects the vigor of these populations. On [redacted], the introduced species *Scabiosa atropurpurea* is abundant in the same habitat as *Streptanthus glandulosus* ssp. *pulchellus*. This could have a negative effect on its abundance. In the [redacted], several plants of concern, including yellow starthistle (*Centaurea solstitialis*) could also have an adverse effect on the vigor of the populations. Fire suppression may be allowing the encroachment of Douglas fir and other tree and shrub species to encroach into the open serpentinite chaparral sites.

Monitoring conducted 2004
No monitoring was conducted in2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	STGLPU	1	129	555	923	surveyed; not censused	2,491	No survey	No survey
		2	0	No survey	1,122	surveyed not censused	1,668	No Survey	No survey
[redacted]	STGLPU	1	1,089*	No survey; too late in season	1,358*	119*	No survey	256	No survey
		2	--	--	--	12	No survey	127	No survey
		3	--	--	--	53	No survey	469	No survey
		4	--	--	--	--	--	989	No survey
		5	--	--	--	--	--	120	No survey

*include counts on private land

Note that the census figures for 1998, 2000 and 2001 for Nicasio #1 include totals for populations on private and GGNRA land. Following the 2001, season it was decided to no longer census populations occuring on private land. In 2001, the census was conducted late in the year and may account for the low totals in 2001 as compared with 2003. In 2003, Nicasio #3 was surveyed in a larger area which would contribute to the higher numbers obtained in 2003 versus 2001 (see Arcview shape files for 2001 and 2003)

The populations at [redacted] were not censused in 2001 because it was too late in the season at the time the site visit was made. In 2002, two new survey areas were added to population 1 on [redacted] A larger area surveyed is a likely factor contributing to the large increase in census counts between 2000 and 2002 in this population.

Management Recommendations
Removal of yellow starthistle in the [redacted] may help the long-term status of several rare plant species that reside in the area. It may be of interest to examine historical photos taken at the [redacted] to determine if significant tree or grass encroachment is occurring in the area.

Monitoring Recommendations
Closely monitor the [redacted] populations for potential negative impacts from cattle grazing and for introduced species of concern. [redacted] is host to six rare plant species. Ideally, a monitoring method would be adopted that can capture data on all six species but only require examining a sub-sample of the entire population.

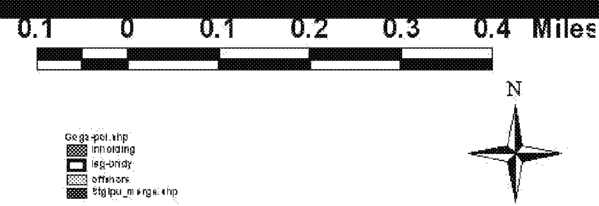
The [redacted] site has several rare species and should be monitored closely for invasive species and changes in stand structure due to fire suppression. Establishing line transects would allow for the gathering of absolute cover data for individual species as well as relative cover data for all species occurring within this community. A series of transects distributed across these populations would provide data on changes in cover of both native and non-native species.

Recommended Monitoring Interval
Every three years

[redacted]

Streptanthus glandulosus ssp. pulchellus

[redacted] 2003
Inverness and San Geronimo Quadrangles



Streptanthus glandulosus ssp. pulchellus

2002

San Rafael Quadrangle

0.1 0 0.1 0.2 0.3 Miles

N

Stglpu_02.shp

Suaeda californica Wats.
California sea-blite

Rarity Status
Federal Listing: **ENDANGERED**
State Listing: None
CNPS List: 1B / R-E-D 3-3-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s):
Management boundary: the Presidio

Life History
Flowering Time: July - October

Range: Historic occurrences in Alameda and Santa Clara counties have been extirpated. Only current extant population is in Morro Bay, San Luis Obispo county. Remains from adobe bricks indicate this species may have occurred along the Petaluma River in Sonoma County.

Characteristics: California seablite is a perennial shrub 3-8 dm in height, mound-like, glabrous or sparsely hairy, generally green. Its habitat is the margins of coastal salt marshes in the upper intertidal marsh zone. Leaves are overlapping, subsessile with petioles 1 mm in length forming prominent knobs on lower stems. Blades are 5-35 mm ± lanceolate, subcylindric to flat. Flowers are in clusters scattered throughout the plant subtended by bracts equal to the leaves in length and overlapping at branch tips. Flowers are bisexual or the lateral pistillate, 2-3 mm, 1-5 per cluster. Calyx lobes are rounded or hooded, glabrous; ovary ± conic; stigmas are 3 and are hairy-papillate.

Abundance and Distribution within the Presidio
This species occurs at [redacted] in coastal marsh habitat. Four populations of the species were reintroduced in 2001.

Threats
Lack of tidal influence upon this species may be a threat to the populations.

Monitoring conducted in 2004
No monitoring was conducted in 2004.

Monitoring Results: 2001- 2004

Location	Species Code	Population No.	2001	2002	2003	2004
[redacted]	SUCA	1	7	2	0	No survey
	SUCA	2	6	5	0	No survey
	SUCA	3	7	5	0	No survey
	SUCA	4	7	1	0	No survey

Populations of *Suaeda californica* were surveyed on a monthly basis from January 2002 to May 2003. Between the February and May surveys conducted in 2003, the number of individuals declined from six living individuals in all populations to zero living individuals.

Management Recommendations

The closure of [redacted] and the associated fluctuation in the marsh water level along with changed nutrient availability could have impacted the populations. Further research is needed to better understand the habitat requirements for this species before another reintroduction effort is made.

Monitoring Schedule

Proposed monitoring schedule: Level 2
Proposed monitoring frequency: 1 year
Proposed monitoring cycle: monitor every year.

To insert *Suaeda californica* map

Tanacetum camphoratum Less.

Dune tansy

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: None / R-E-D Code: None

Comments: This plant was considered for listing, but rejected by CNPS because it is considered too common in California. The Presidio populations are being monitored at the recommendation of the Yerba Buena chapter of CNPS which passed a resolution recognizing the rarity of the species and the need for further genetic research.

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: August - September

Range: *Tanacetum camphoratum* is the only native species of *Tanacetum* in California. It occurs in coastal dunes and ranges from northern California to southern British Columbia.

Characteristics: (from The Jepson Manual) Dune tansy is a perennial herb with a creeping rhizome. The stems are stout, aromatic and hairy, particularly on young growth. Stems are 10-25 cm, branched, decumbent. Leaves are 7-25 cm, 3-5 cm wide, thick, ovate, sessile, clasping at base, 2-3 pinnate, each 1° leaflet with 1-5 divisions, flat or edges curled under, glandular. Heads are disciform or radiate, 3-15 flowered in flat-topped clusteres. Pistillate flowers surround the disk flowers. The pistillate corollas are tubular or with a ligule less than 3 mm. Disk flowers are 3-4 mm, tubular, 5-lobed. Fruits are 2-4 mm, indistinctly 5-ribbed, glandular, with a pappus that is a short irregularly toothed crown. Phyllaries are firm, margins are scarious.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
This plant is common in the Fort Funston, [redacted] and the Presidio. It has been planted and is doing well in new populations. All populations on the Presidio occur in coastal foredune and dune scrub plant communities.

Threats
At the [redacted] foredunes, the site quality is good. Threats include non-native forbs such as *Medicago polymorpha*, *Oxalis pes-caprae* and *Melilotus indica*. Throughout the [redacted] foredunes, the site quality is good. The invasive threats are minimal. At the [redacted] and [redacted] sites, the site quality is fair. Threats include non-native annual grasses.

The remaining populations are protected from development in the National Parklands. The park populations are threatened from human and dog disturbance and from a wide variety of introduced plant species.

Monitoring conducted 2004
No monitoring was conducted in 2004.

Monitoring Results: 1998 - 2004

Location	Species Code	Pop. Num.	1998	1999	2000	2001	2002	2003	2004
[redacted]	TACA	1	--	--	--	--	--	542	No survey
[redacted]		2	--	--	--	--	--	6	No survey
[redacted]		3	--	--	--	--	--	4	No survey
[redacted]		4	--	--	--	--	--	22	No survey

These populations were first monitored in 2003.

Management Recommendations
At [redacted], any future planting should occur at the north upland, since the substrate is well drained. Non-native annual grasses should be removed from the immediate area surrounding [redacted] and [redacted] populations.

Monitoring Recommendations
None at this time.

Monitoring Schedule
Presidio populations:
Proposed monitoring regime: Level 1
Proposed monitoring frequency: 2 years
Proposed monitoring cycle: beta 2006

Insert TACA maps

Triphysaria floribunda (Benth.) Chuang & Heckard
San Francisco owl's-clover

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D 2-2-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Population Location(s) within:
Management boundary: the Presidio

Life History
Flowering Time: April - June

Range: Occurrences have been documented in Marin, San Francisco and San Mateo counties.

Characteristics: *Triphysaria floribunda* is an annual herb 10–30 cm in height. It occurs in coastal prairie, coastal scrub and valley and foothill grasslands. It is often found on serpentinite soils. The herbage is yellow brown and ± glabrous or sparsely stiff-hairy. Leaves are 10-40 mm and 5-9 lobed. The inflorescence is generally 1-5 cm and dense. Bracts are 5-12 mm, 3-7 lobed, ± glabrous. The calyx is 4-6 mm, divided ¼ - ½ its length. The corolla is 10-14 mm, creamy white, tube slender, glabrous ± 2 times the length of the calyx. Lower lip is ± equal to the beak, pouches ± 2 mm deep. The stamens are exerted.

Abundance and Distribution within and around Golden Gate National Recreation Area and the San Francisco Watershed District
All populations occurr on the Presidio in serpentine coastal prairie.

Threats
Trifolium subterraneum and *Plantago lanceolata* populations at the [redacted] site are filling in the open, hard packed prairie area of the "lawn". Disturbance to the soil by party-goers at events held at the [redacted] has increased over previous years. Tire ruts remain after last year's driving incident, although large log barricades now line the parking area to prevent this from happening again. The total area occupied by the population has diminished over the past two years, although specific measurements have not been taken.

Monitoring conducted 2004
A complete census of both the [redacted] and [redacted] populations was conducted in 2004.

Monitoring Results: 1996 - 2004

Location	Species Code	Pop. Num.	1996	1997	1998	1999	2000	2001	2002	2003	2004
[redacted]	TRFL	1	--	--	--	--	--	2,220	7,857	3,419	2,189
[redacted]		2	30	52	15	11	6	1	3	3	1

In the 2003 year-end report the [redacted] site is recorded to be in good quality. Despite the maintenance of good site quality, the population has showed a marked decline since 1998. Perhaps a closer look at the habitat is needed and insure that monitoring is being conducted at peak flowering period for this species.

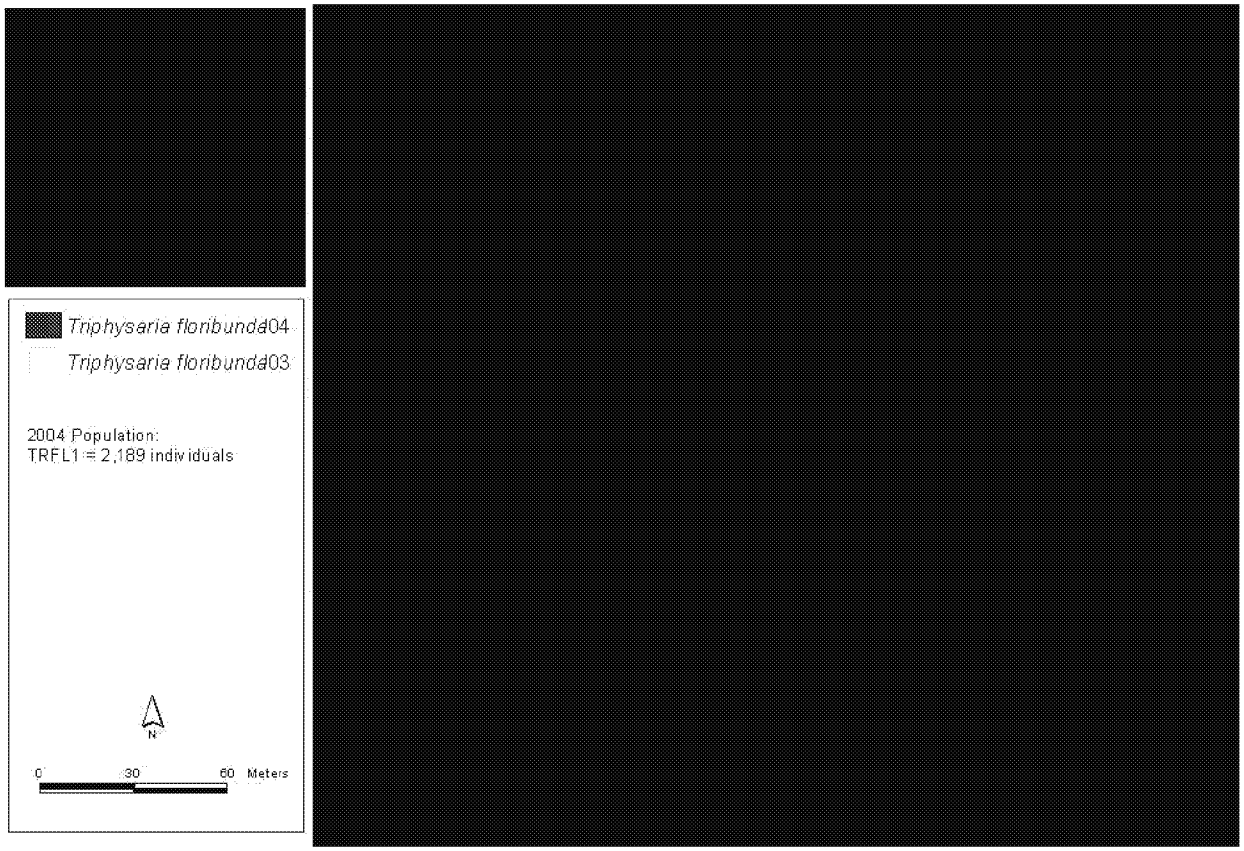
Management Recommendations
Trifolium subterraneum and *Plantago lanceolata* need to be targeted in early February before *Triphysaria floribunda* germinates. Selective scraping of the soil containing these species may prove helpful. A fence should be installed along the edge of the population boundary adjacent to the lawn to prevent party-goers from disturbing the soil and to make visitors aware of the sensitive habitat adjacent to the cabin. Mowing should continue with removal of debris.

Monitoring Recommendations
Photo-documentation should be conducted to monitor the size of the area occupied by *Triphysaria floribunda.*

Monitoring Schedule
Monitoring regime (level): 2
Monitoring frequency: 1
Monitoring cycle: N/A

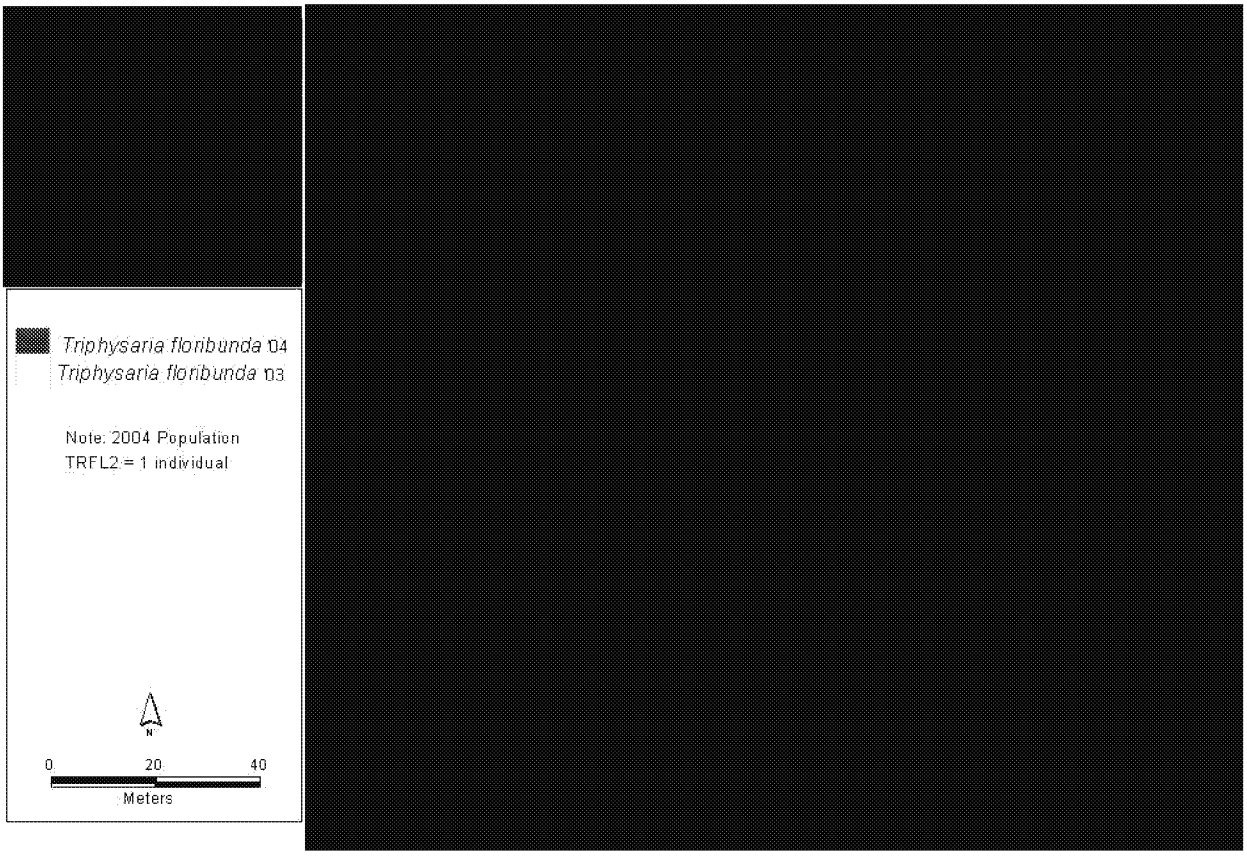
Triphysaria floribunda (San Francisco owl's clover)

[redacted] the Presidio, 2004



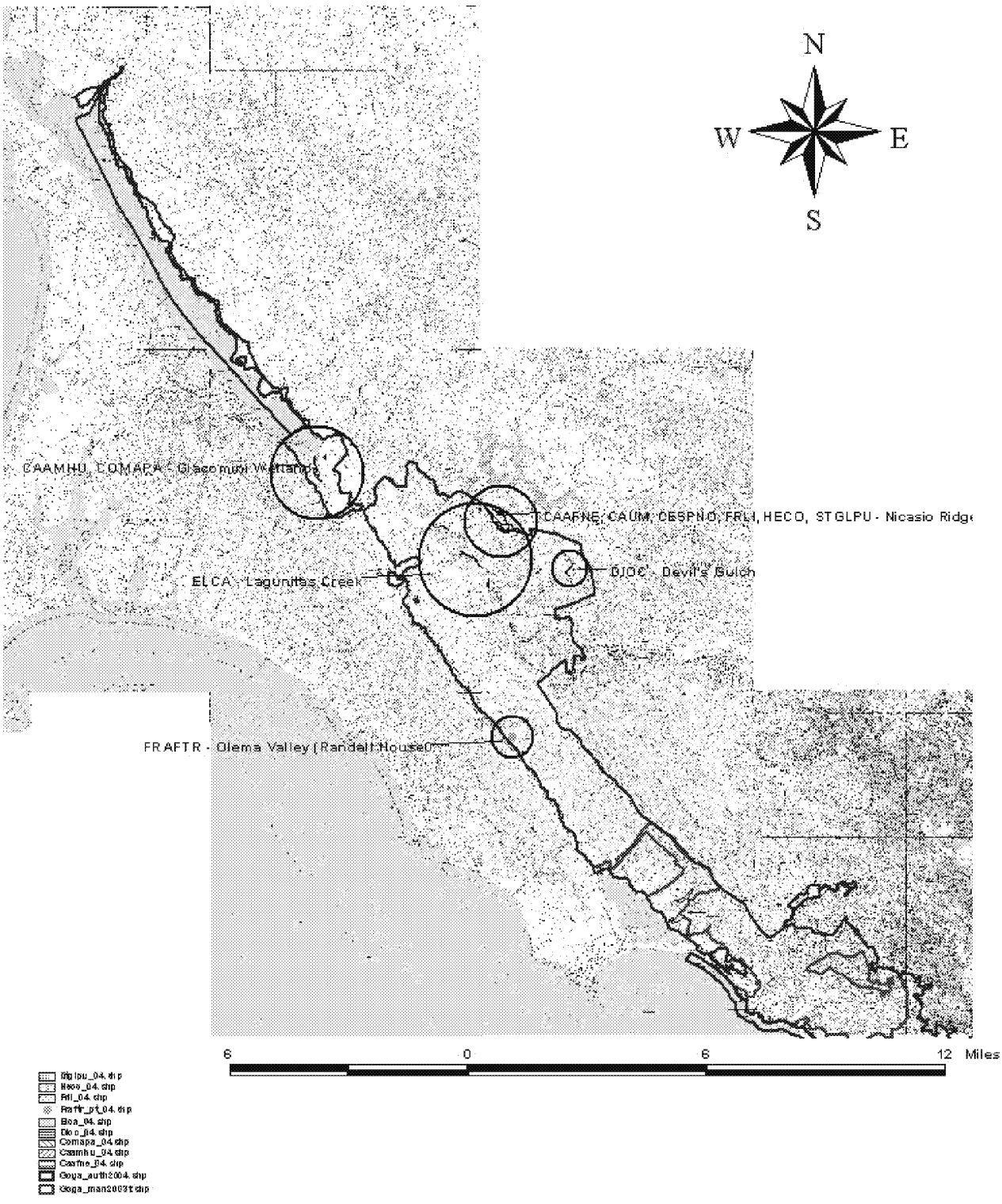
Triphysaria floribunda (San Francisco owl's clover)

[redacted] the Presidio, 2004

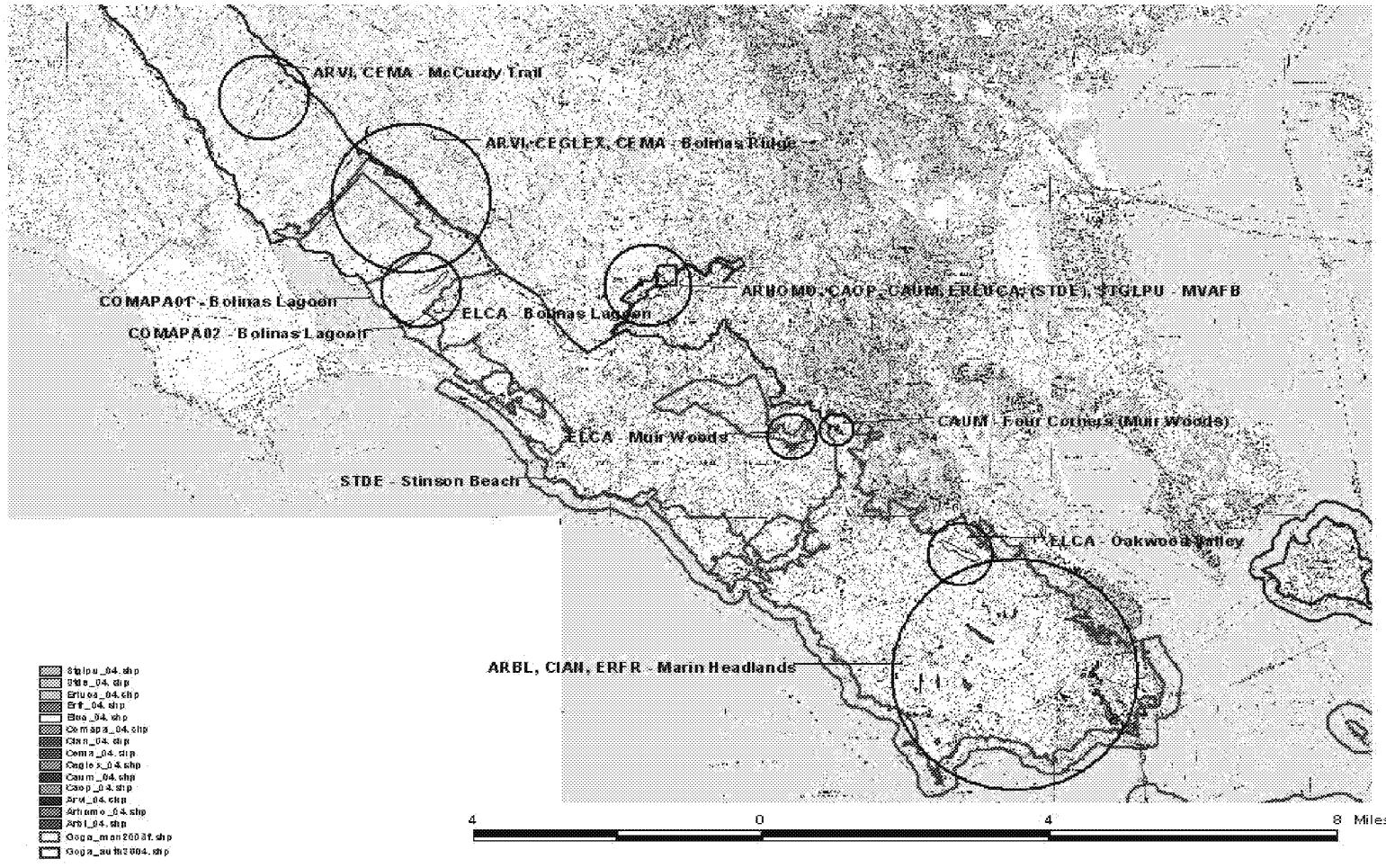


Appendix I. Rare plant population maps - by park area

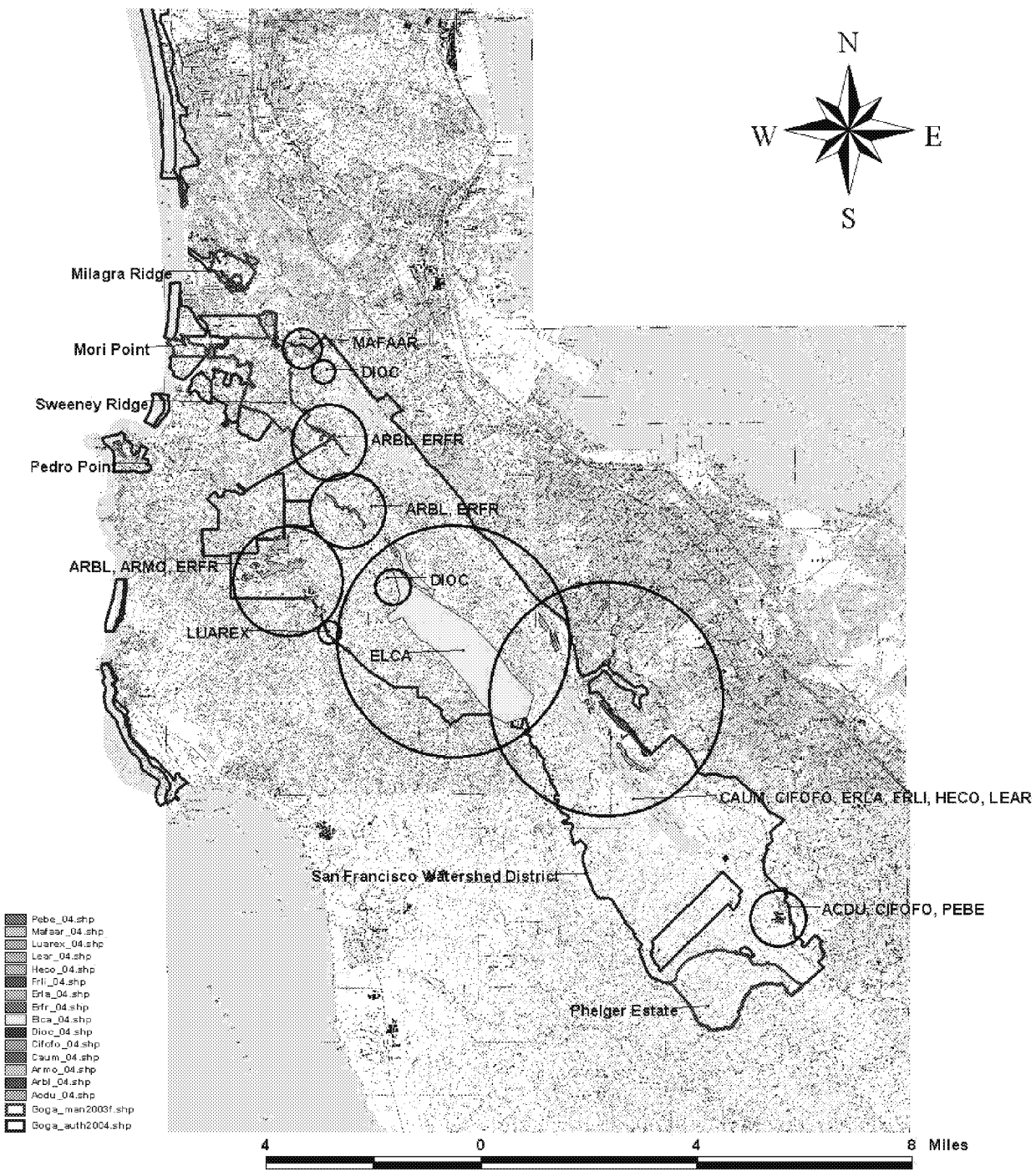
Rare plant populations within the management and legislative boundaries of GGNRA



Rare plant populations occurring on GGNRA northern lands



Rare plant populations - Marin Headlands to Bolinas Ridge



Rare Plant populations - San Francisco Watershed District

Appendix II: Rare plant species tables - by park location

GGNRA North District- Marin Headlands to Bolinas Ridge

Marin Headlands

Arabis blepharophylla Hook & Arn.	Coast rock cress
Cirsium andrewsii A. Gray	Franciscan thistle
Erysimum franciscanum Rossbach	San Francisco wallflower
Gutierrezia californica (DC.) Torrey & A. Gray ***(removed 2002)***	California matchweed

Oakwood Valley

Elymus californicus (Bolander) Gould	California bottlebrush grass

Muir Woods – [redacted]

Calochortus umbellatus Alph. Wood	Oakland star-tulip

Muir Woods

Elymus californicus (Bolander) Gould	California bottlebrush grass

Bolinas Ridge

Arctostaphylos virgata Eastw.	Marin manzanita
Ceanothus gloriosus J. Howell var. *exaltatus* J. Howell	Glory brush
Ceanothus masonii McMinn	Mason's ceanothus

Appendix II: Rare plant species tables - by park location (cont.)

GGNRA South District- The Presidio to Sweeney Ridge

The Presidio

Arabis blepharophylla Hook & Arn.	Coast rock cress
Arctostaphylos hookeri D. Don ssp. *ravenii* Wells	Raven's manzanita
Chorizanthe cuspidata S. Watson var. *cuspidata*	San Francisco Bay spineflower
Cirsium andrewsii A. Gray	Franciscan thistle
Clarkia franciscana Lewis & Raven	Presidio clarkia
Cordylanthus maritimus Benth. ssp. *palustris* (Behr) Chuang & Heckard	Point Reyes bird's-beak
Erysimum franciscanum Rossbach	San Francisco wallflower
Gilia capitata ssp. *chamissonis* (Greene) V. Grant	Dune gilia
Grindelia hirsutula H. & A. var. *maritima* (Greene) M.A. Lane	San Francisco gumplant
Horkelia cuneata Lindl ssp *sericea* (Grey) Keck	Kellog's horkelia
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax
Lessingia germanorum Cham.	San Francisco lessingia
Silene verecunda Wats ssp. *verecunda* Rossbach	San Francisco campion
Tanacetum camphoratum Less. ***(added 2003)***	Dune Tansy
Tryphysaria floribunda (Benth) Chuang and Heckard	San Francisco owl's clover

[redacted]

Tanacetum camphoratum Less. ***(removed 2002)***	Dune Tansy

Fort Funston

Chorizanthe cuspidata S. Watson var. *cuspidata*	San Francisco Bay spineflower
Erysimum franciscanum Rossbach	San Francisco wallflower
Tanacetum camphoratum Less. ***(removed 2002)***	Dune Tansy

Milagra Ridge

Arabis blepharophylla Hook & Arn.	Coast rock cress
Erysimum franciscanum Rossbach	San Francisco wallflower

Mori Point

Linanthus rosaceus Greene	Rose Linanthus

Sweeney Ridge

Arabis blepharophylla Hook & Arn.	Coast rock cress
Erysimum franciscanum Rossbach	San Francisco wallflower
Malacothamnus fasciculatus (Torrey & A. Gray) E. Greene var. *arcuatus* (E. Greene) E. Greene	Arcuate bush mallow
Plagiobothrys chorisianus (Cham.) I.M. Johnston var. *chorisianus*	Choris's popcornflower

Appendix II: Rare plant species tables - by park location (cont.)

Lands within GGNRA Legislative Boundary

[redacted] **Mount Tamalpais**
This property falls within the GGNRA legislative boundary but is managed by Mount Tamalpais State Park.

Arctostaphylos hookeri G. Don ssp. *montana* (Eastw.)P. Wells	Tamalpais manzanita
Calamagrostis ophitidis	Serpentine Reed Grass
Calochortus umbellatus Alph. Wood	Oakland star-tulip
(Eriogonum luteolum E. Greene var. *caninum* (E. Greene) Rev.)	Tiburon buckwheat
(Stebbinsoseris decipiens (Chambers) Chambers)	Santa Cruz microseris
Streptanthus glandulosus Hook. ssp. *pulchellus* (E. Greene) Kruckeb.	Mount Tamalpais jewelflower

GGNRA Northern Lands – Olema Valley to Giacomini Wetland
These lands fall within the GGNRA legislative boundary but are managed by Point Reyes National Seashore.

Olema Valley

Fritillaria affinis Pursh var. *tristulis* (A.L. Grant) B. Ness	Marin checker lily

[redacted]

Dirca occidentalis A. Gray	Western leatherwood

Lagunitas Creek

Elymus californicus (Bolander) Gould	California bottlebrush grass

[redacted] **Ridge**

Calochortus umbellatus Alph. Wood	Oakland star-tulip
Castilleja affinis Hook & Arn. ssp. *neglecta* (E.M. Zeile) Chuang & Heckard	Tiburon indian paintbrush
Ceanothus sp. nova	
Fritillaria liliacea Lindley	Fragrant fritillary
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax
Streptanthus glandulosus Hook. ssp. *pulchellus* (E. Greene) Kruckeb.	Mount Tamalpais jewelflower

[redacted]

Castilleja ambigua Hook. & Arn. ssp. *humboldtiensis* (Keck) Chuang & Heckard	Humboldt bay owl's clover
Cordylanthus maritimus Benth. ssp. *palustris* (Behr) Chuang & Heckard	Point Reyes bird's-beak

Appendix II: Rare plant species tables - by park location (cont.)

Lands within GGNRA Legislative Boundary

Pedro Point

This property falls within the GGNRA legislative boundary but is managed by _____.

Arabis blepharophylla Hook & Arn.	Coast rock cress
Erysimum franciscanum Rossbach	San Francisco wallflower

San Francisco Watershed District

These lands fall within the GGNRA legislative boundary but are managed by the San Francisco Watershed District.

Acanthomintha duttonii (Abrams) *Jokerst*	San Mateo thornmint
Arabis blepharophylla Hook & Arn.	Coast rock cress
Arctostaphylos montaraensis Roof	Montara manzanita
Calochortus umbellatus Alph. Wood	Oakland star-tulip
Cirsium fontinale E. Greene var. *fontinale*	Fountain thistle
Dirca occidentalis A. Gray	Western leatherwood
Elymus californicus (Bolander) Gould	California bottlebrush grass
Eriophyllum latilobum Rydb.	San Mateo wooly sunflower
Erysimum franciscanum Rossbach	San Francisco wallflower
Fritillaria liliacea Lindley	Fragrant fritillary
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax
Lessingia arachnoidea E. Greene	Crystal Springs lessingia
Linanthus ambiguus (Rattan) E. Greene	Serpentine linanthus
Lupinus arboreus Sims var. *eximus* (Burtt Davy) C.P. Smith	Yellow bush lupine
Pentachaeta bellidiflora E. Greene	White-rayed pentachaeta

Appendix III: Rare plant species tables - by CNPS listing level

2004 Rare and Endangered Vascular Plant Species
Golden Gate National Recreation Area and the San Francisco Watershed District

Scientific Name	Common Name	State Status	Federal Status
CNPS List 1B: Rare, Threatened or Endangered in California and Elsewhere			
Acanthomintha duttonii (Abrams) *Jokerst*	San Mateo thornmint	**ENDANGERED**	**ENDANGERED**
Arctostaphylos hookeri G. Don ssp. *montana* (Eastw.)P. Wells	Tamalpais manzanita		
Arctostaphylos hookeri D. Don ssp. *ravenii* Wells	Raven's manzanita		**ENDANGERED**
Arctostaphylos montaraensis Roof	Montara manzanita		
Arctostaphylos virgata Eastw.	Marin manzanita		
Castilleja affinis Hook & Arn. ssp. *neglecta* (E.M. Zeile) Chuang & Heckard	Tiburon indian paintbrush	Threatened	**ENDANGERED**
Castilleja ambigua Hook. & Arn. ssp. *humboldtiensis* (Keck) Chuang & Heckard	Humboldt bay owl's clover		
Ceanothus masonii McMinn	Mason's ceanothus	Rare	
Chorizanthe cuspidata S. Watson var. *cuspidata*	San Francisco Bay spineflower		
Cirsium andrewsii A. Gray	Franciscan thistle		
Cirsium fontinale E. Greene var. *fontinale*	Fountain thistle	**ENDANGERED**	**ENDANGERED**
Clarkia franciscana Lewis & Raven	Presidio clarkia		**ENDANGERED**
Cordylanthus maritimus Benth. ssp. *palustris* (Behr) Chuang & Heckard	Point Reyes bird's-beak		
Dirca occidentalis A. Gray	Western leatherwood		
Eriophyllum latilobum Rydb.	San Mateo wooly sunflower	**ENDANGERED**	**ENDANGERED**
Gilia capitata ssp. *chamissonis* (Greene) V. Grant	Dune gilia		
Grindelia hirsutala H. & A. var. *maritima* (Greene) M.A. Lane	San Francisco gumplant		
Fritillaria affinis Pursh var. *tristulis* (A.L. Grant) B. Ness	Marin checker lily		
Fritillaria liliacea Lindley	Fragrant fritillary		
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax	Threatened	Threatened
Horkelia cuneata Lindl ssp *sericea* (Grey) Keck	Kellog's horkelia		

Appendix III: Rare plant species tables - by CNPS listing level (cont.)

2004 Rare and Endangered Vascular Plant Species
Golden Gate National Recreation Area and the San Francisco Watershed District

Scientific Name	Common Name	State Status	Federal Status
CNPS List 1B: Rare, Threatened or Endangered in California and Elsewhere			
Lessingia arachnoidea E. Greene	Crystal Springs lessingia		
Lessingia germanorum Cham.	San Francisco lessingia		**ENDANGERED**
Linanthus rosaceus Greene	Rose Linanthus		
Malacothamnus fasciculatus (Torrey & A. Gray) E. Greene var. *arcuatus* (E. Greene) E. Greene	Arcuate bush mallow		
Pentachaeta bellidiflora E. Greene	White-rayed pentachaeta	**ENDANGERED**	**ENDANGERED**
Plagiobothrys chorisianus (Cham.) I.M. Johnston var. *chorisianus*	Choris's popcornflower		
(*Stebbinsoseris decipiens* (Chambers) Chambers)	Santa Cruz microseris		
Streptanthus glandulosus Hook. ssp. *pulchellus* (E. Greene) Kruckeb.	Mount Tamalpais jewelflower		
Silene verecunda Wats ssp. *verecunda* Rossbach	San Francisco campion		
Tryphysaria floribunda (Benth) Chuang and Heckard	San Francisco owl's clover		
CNPS List 3: Plants About Which We Need More Information			
Eriogonum luteolum E. Greene var. *caninum* (E. Greene) Rev.	Tiburon buckwheat		
Lupinus arboreus Sims var. *eximus* (Burtt Davy) C.P. Smith	Yellow bush lupine		
CNPS List 4: Plants of Limited Distribution—A Watch List			
Arabis blepharophylla Hook & Arn.	Coast rock cress		
Calamagrostis ophitidis (J. Howell) Nygre	Serpentine reed grass		
Calochortus umbellatus Alph. Wood	Oakland star-tulip		
Ceanothus gloriosus J. Howell var. *exaltatus* J. Howell	Glory brush		
Elymus californicus (Bolander) Gould	California bottlebrush grass		
Erysimum franciscanum Rossbach	San Francisco wallflower		
Linanthus ambiguus (Rattan) E. Greene	Serpentine linanthus		

Appendix III: Rare plant species tables - by CNPS listing level (cont.)

2004 Rare and Endangered Vascular Plant Species
Golden Gate National Recreation Area and the San Francisco Watershed District

Scientific Name	Common Name	State Status	Federal Status
Not recognized in CNPS Inventory			
Ceanothus sp. nova			
Tanacetum camphoratum Less. ***(removed 2002)***	Dune tansy		
Gutierrezia californica (DC.) Torrey & A. Gray ***(removed 2002)***	California matchweed		

Appendix III: Rare plant species tables - by CNPS listing level (cont.)

2004 Rare and Endangered Vascular Plant Species
The Presidio

Scientific Name	Common Name	State Status	Federal Status
CNPS List 1B: Rare, Threatened or Endangered in California and Elsewhere			
Arctostaphylos hookeri D. Don ssp. *ravenii* Wells	Raven's manzanita		**ENDANGERED**
Chorizanthe cuspidata S. Watson var. *cuspidata*	San Francisco Bay spineflower		
Cirsium andrewsii A. Gray	Franciscan thistle		
Clarkia franciscana Lewis & Raven	Presidio clarkia		**ENDANGERED**
Cordylanthus maritimus Benth. ssp. *palustris* (Behr) Chuang & Heckard	Point Reyes bird's-beak		
Gilia capitata ssp. *chamissonis* (Greene) V. Grant	Dune gilia		
Grindelia hirsutala H. & A. var. *maritima* (Greene) M.A. Lane	San Francisco gumplant		
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax	Threatened	Threatened
Horkelia cuneata Lindl ssp *sericea* (Grey) Keck	Kellog's horkelia		
Lessingia germanorum Cham.	San Francisco lessingia		**ENDANGERED**
Silene verecunda Wats ssp. *verecunda* Rossbach	San Francisco campion		
Tryphysaria floribunda (Benth) Chuang and Heckard	San Francisco owl's clover		
CNPS List 4: Plants of Limited Distribution—A Watch List			
Arabis blepharophylla Hook & Arn.	Coast rock cress		
Erysimum franciscanum Rossbach	San Francisco wallflower		
Plants About Which More Research is needed			
Tanacetum camphoratum Less.	Dune tansy		

Appendix III: Rare plant species tables - by CNPS listing level (cont.)

2004 Rare and Endangered Vascular Plant Species
San Francisco Watershed District

Scientific Name	Common Name	State Status	Federal Status
CNPS List 1B: Rare, Threatened or Endangered in California and Elsewhere			
Acanthomintha duttonii (Abrams) *Jokerst*	San Mateo thornmint	**ENDANGERED**	**ENDANGERED**
Arctostaphylos montaraensis Roof	Montara manzanita		
Cirsium fontinale E. Greene var. *fontinale*	Fountain thistle	**ENDANGERED**	**ENDANGERED**
Dirca occidentalis A. Gray	Western leatherwood		
Eriophyllum latilobum Rydb.	San Mateo wooly sunflower	**ENDANGERED**	**ENDANGERED**
Fritillaria liliacea Lindley	Fragrant fritillary		
Hesperolinon congestum (A. Gray) Small	Marin dwarf flax	Threatened	Threatened
Lessingia arachnoidea E. Greene	Crystal Springs Lessingia		
Pentachaeta bellidiflora E. Greene	White-rayed pentachaeta	**ENDANGERED**	**ENDANGERED**
CNPS List 3: Plants About Which We Need More Information			
Lupinus arboreus Sims var. *eximus* (Burtt Davy) C.P. Smith	Yellow bush lupine		
CNPS List 4: Plants of Limited Distribution—A Watch List			
Arabis blepharophylla Hook & Arn.	Coast rock cress		
Calochortus umbellatus Alph. Wood	Oakland star-tulip		
Elymus californicus (Bolander) Gould	California bottlebrush grass		
Erysimum franciscanum Rossbach	San Francisco wallflower		
Linanthus ambiguus (Rattan) E. Greene	Serpentine linanthus		

Appendix IV: CNPS List and R-E-D definitions

CNPS Lists

1A: Plants Presumed Extinct in California
1B: Plants Rare, Threatened or Endangered in California and Elsewhere
2: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
3: Plants About Which We Need More Information--A Review List
4: Plants of Limited Distribution--A Watch List

CNPS R-E-D Code Definitions
Rarity (R)
1—Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.
2—Distributed in a limited number of occurrences, occasionally more if each occurrence is small
3—Distributed in one to several highly restricted occurrences, or present in such small numbers that it is seldom reported

Endangerment (E)
1—Not endangered
2—Endangered in a portion of its range
3—Endangered throughout its range

Distribution (D)
1—More or less widespread outside of California
2—Rare outside California
3—Endemic to California

Appendix V. Flowering calendar

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	
			Arctostaphylos montaraensis							
			Arctostaphylos virgata							
				Dirca occidentalis						
				Arabis blepharophylla						
				Fritillaria affinis ssp. *tristulis*						
				Fritilliaria liliacea						
				Arctostaphylos hookeri ssp. *montana*						
				Arctostaphylos hookeri ssp. *ravenii*						
				Ceanothus sp. *nova*						
				Ceanothus masonii						
				Triphysaria floribunda						
					Ceanothus gloriosus var. *exaltatus*					
					Calochortus umbellatus					
					Pentachaeta bellidiflora					
						Linanthus ambiguus				
						Erysimum franciscanum				
						Acanthomintha duttonii				
						Linanthus rosaceus				
						Castilleja affinis ssp. *neglecta*				
						Calamagrostis ophitidis				
						Plagiobothrys chorisianus var. *chorisianus*				
						Silene verecunda ssp. *verecunda*				
					Stebbinoseris decipiens					
						Clarkia franciscana				
						Eriophyllum latilobum				
							Gilia capitata ssp. *chamisonis*			
							Malacothamnus fasciculatus var. *arcuatus*			
							Lupinus arboreus var. *eximius*			
							Chorizanthe cuspidata var. *cuspidata*			
								Castilleja ambigua ssp. *humboldtiensis*		
							Hesperolinon congestum			
							Streptanthus glandulosus ssp. *pulchellus*			
								Elymus californicus		
							Horkelia cuneata ssp. *sericea*			
							Cirsium andrewsii			
								Grindelia hirsutula var. *maritima*		
									Eriogonum luteolum var. *caninum*	
										Cordylanthus maritimus ssp. *palustris*
										Cirsium fontinale var. *fontinale*
								Lessingia germanorum		
										Lessingia arachnoidea
								Tanacetum camphoratum		
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	

Appendix VI. Rare Plant Monitoring to be conducted in 2005 (by species)

Appendix VII: 1998 – 2004 Monitoring Results

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
Marin Headlands	*Arabis blepharophylla*	1		626	1289	383	325	No survey	No survey	No survey	
		2		3	2	0	No survey	No survey	No survey	No survey	Unable to access due to bridge construction
		3		770	720	30	111	No survey	No survey	No survey	
		4		1364	*3792	546	545	No survey	No survey	No survey	*One portion of pop. 4 not found in 1999
		5		266	*80	47	12	No survey	No survey	No survey	*Pop. 5B not found in 1999; found 5B in 2000
		6		0	0	0	0	No survey	No survey	No survey	
		7		0	0	0	0	No survey	No survey	No survey	
		8		1445	298	900	303	No survey	No survey	No survey	Polygon shape change in 1999; Pop C not found in 2000
		9		0	No survey	0	0	No survey	No survey	No survey	
		10		265	850	176	324	No survey	No survey	No survey	
		11		15	211	87	78	No survey	No survey	No survey	threatened by Carpobrotus
		12		20	35	47	47	No survey	No survey	No survey	
		13		--	11	11	0	No survey	No survey	No survey	
		14		--	51	4	0	No survey	No survey	No survey	
		15		--	48	5	5	No survey	No survey	No survey	
		16		--	1019	296	572	No survey	No survey	No survey	Additional polygon added in 2001
		17		--	5	0	2	No survey	No survey	No survey	
		18		--	885	265	149	No survey	No survey	No survey	
		19		--	18	134	128	No survey	No survey	No survey	
		20		--	101	10	7	No survey	No survey	No survey	
		21		--	Surveyed; not censused	27	34	No survey	No survey	No survey	
		22		--	20	*0	0	No survey	No survey	No survey	*Surveyed too late in season
		23		--	11	0	4	No survey	No survey	No survey	

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		24		--	Surveyed; not censused	7	0	No survey	No survey	No survey	
		25		--	--	1	0	No survey	No survey	No survey	
		26		--	--	4	Population not found	No survey	No survey	No survey	
		27		--	--	9	34	No survey	No survey	No survey	
		28		--	--	1	9	No survey	No survey	No survey	
		29		--	--	72	101	No survey	No survey	No survey	
		30		--	--	--	5	No survey	No survey	No survey	
		31		--	--	--	15	No survey	No survey	No survey	
		32		--	--	--	--	--	25	No survey	
		33		--	--	--	--	--	85	No survey	
		34		--	--	--	--	--	12	No survey	
		35		--	--	--	--	--	67	No survey	
		36		--	--	--	--	--	12	No survey	
		37		--	--	--	--	--	7	No survey	
Milagra	*Arabis blepharophylla*	1		*1,334	876	34	294	No survey	No survey	No survey	*total of counts in patches 1&2
		2		--	*61	17	101	No survey	No survey	No survey	*total of counts in patches 3, 4, 5
		3		15	6	40	289	No survey	No survey	No survey	
		4		--	--	10	*28	No survey	No survey	No survey	*planted 38 individuals not included in count
		5		--	--	76	345	No survey	No survey	No survey	
		6		--	--	Population not found	Population not found, location is uncertain; late survey	No survey	No survey	No survey	
		7		--	--	*	65	No survey	No survey	No survey	*combined totals for pops 5 & 7 into 5 since two populations merged in 2001
		8		--	--	--	225	No survey	No survey	No survey	
		9		--	--	--	40	No survey	No survey	No survey	

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
Pedro Point	*Arabis blepharophylla*	1		--	--	--	--	--	Approx. 27	No survey	
Sweeney	*Arabis blepharophylla*	1		176	158	27	535	No survey	No survey	No survey	
[redacted]	*Arctostaphylos hookeri* ssp. *montana*	1		925	973	820	596	established photopoints	No survey	No survey	
		2		--	--	306	624	established photopoints	No survey	No survey	
		3		--	--	--	--	79		No survey	
Bolinas Ridge	*Arctostaphylos virgata*	1	16	--	Surveyed; not censused	Surveyed; not censused	No survey	No survey	No survey	Surveyed; not censused	
[redacted]	*Calamagrostis ophitidis*	1	4	--	--	--	--	Surveyed; not censused	No survey	No survey	
		2		--	--	--	--	Surveyed; not censused	No survey	No survey	
[redacted]	*Calochortus umbellatus*	1		102	1162	1851	1177	1276	No survey	No survey	
		2		197	251	998	720	369	No survey	No survey	
		3		--	--	--	117	758	No survey	No survey	
Muir Woods ([redacted])	*Calochortus umbellatus*	1		--	--	--	--	--	approx. 470	No survey	
[redacted]-on private land	*Calochortus umbellatus*	1		710	826	1151	349	No survey	No survey	No survey	Larger area sampled in 1999 and 2000 than 1998. Population entirely on private land, no further surveys to be conducted
[redacted]	*Castilleja affinis* ssp. *neglecta*	1		--	--	--	--	--	4	4	
[redacted]-on private land		1a*	8	100	41	84	68	No survey	No survey	No survey	*Census figures from portion of population on private land; no further surveys to be conducted

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
[redacted]	*Castillega ambigua* ssp. *humboldtiensis*	1		--	--	--	--	No survey	0	No survey	
		2		--	--	--	--	No survey	787	No survey	
		3		--	--	--	--	No survey	*15,000	No survey	*Census counts approximate
		4		--	--	--	--	No survey	*10	No survey	*Census counts approximate
		5		--	--	--	--	No survey	*100	No survey	*Census counts approximate
		6		--	--	--	--	No survey	144	No survey	
		7		--	--	--	--	No survey	*1,000	No survey	*Census counts approximate
		8		--	--	--	>1,000	No survey	*10,000	No survey	*Census counts approximate
[redacted]	*Ceanothus gloriosus* var. *exaltatus*	1		4	37	Surveyed; not censused	No survey	No survey	No survey	No survey	
		1a		6	4	Surveyed; not censused	No survey	No survey	No survey	No survey	
		2		--	--	--	--	1	No survey	No survey	
[redacted]	*Ceanothus masonii*	1	1	83	91	Surveyed; not censused	No survey	No survey	No survey	No survey	
		1a		*0	1	Surveyed; not censused	No survey	No survey	No survey	No survey	*all plants identified as CEGLEX
[redacted]		2		--	--	--	--	Surveyed; not censused	*Surveyed; not censused	No survey	*voucher specimen collected; sent to expert for species verification
[redacted]		3		--	--	--	--	Surveyed; not censused	*Surveyed; not censused	No survey	*voucher specimen collected; sent to expert for species verification
[redacted]	*Ceanothus* sp. *nova*	1		--	Surveyed; not censused	Cover data: 61% live 39% dead	Surveyed; not censused	No survey	Surveyed; not censused	No survey	
Ft Funston	*Chorizanthe cuspidata* var. *cuspidata*	1	4	1117	146	1432	3660	Surveyed; not censused	No survey	No survey	

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		2	4	588	167	398	910	Surveyed; not censused	No survey	No survey	
		3	4	--	Surveyed; not censused	2149	820	Surveyed; not censused	No survey	No survey	
		4	4	2029	968	2481	750	Surveyed; not censused	No survey	No survey	
		5	4	403	75	268	470	503	225	209	
		6	4	--	--	218	510	605	600	505	
		7	4	--	approx 1500	Surveyed; not censused	>20,000	Surveyed; not censused	No survey	No survey	
		8	5	209	75	327	112	Surveyed; not censused	No survey	No survey	
		9	5	--	--	442	1450	Surveyed; not censused	No survey	No survey	
		10	--	--	--	655	No survey	No survey	No survey	No survey	
		11	--	--	--	--	--	5,088	1,000	2,288	
Marin Headlands	*Cirsium andrewsii*	1		*210	388	298	245	Established photopopints	No survey	273	*population not relocated in subsequent years. Population no. 1 in different location in subsequent years.
		2		--	95	54	22	Established photopopints	No survey	33	All counts for *C. andrewsii* of flowering individuals only. Number of rosettes counted recorded on data sheets.
		3		--	187	112	63	Established photopopints	No survey	85	
		4		--	166	40	33	Established photopopints	No survey	63	
		5		--	13	19	9	Established photopopints	No survey	22	

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		6		--	37	19	22	Established photopopints	No survey	28	
		7		--	10	8	8	Established photopopints	No survey	12	
		8		--	6	9	3	Established photopopints	No survey	4	
		9		--	22	21	11	Established photopopints	No survey	25	
		10		--	*0	**no survey	**no survey	Established photopopints	No survey	No survey	*Juveniles found but no matures so no count entered; ** wrong area surveyed; 2 individuals counted in 2000 added to population 9 totals; population 10 was enhanced by outplanted seedlings in winter of 1998/1999
		11		--		64	42	Established photopopints	No survey	55	
		12		--	--	--	--	1	No survey	No survey	
		13		--	--	--	--	19	No survey	No survey	
		14		--	--	--	--	11	No survey	No survey	
		15		--	--	--	--	4	No survey	No survey	
		16		--	--	--	--	46	No survey	No survey	
		17		--	--	--	--	--	145	No survey	
		18		--	--	--	--	--	1	No survey	
[redacted]	*Cordylanthus maritimus* ssp. *palustris*	1		--	--	--	--	3	25	17	
		2		--	--	--	--	--	18	22	
[redacted]	*Cordylanthus maritimus* ssp. *palustris*	1		--	--	--	approx. 250	No survey	1,507	1,109	

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		2		--	--	--	--	--	230	190	
		3		--	--	--	--	--	3,010	2081	
		4		--	--	--	--	--	2,493	2,103	
[redacted]	*Dirca occidentalis*	1	28	80	*not found	approx. 50	68	No survey	No survey	No survey	* Surveys conducted too late in season to identify plant
[redacted]	*Elymus californicus*	1		--	--	--	--	101	No survey	No survey	
		2		--	--	--	--	770	No survey	No survey	
		3		--	--	--	--	112	No survey	No survey	
		4		--	--	--	--	310	No survey	No survey	
Oakwood Valley	*Elymus californicus*	1		--	--	--	--	260	No survey	No survey	
MUWO	*Elymus californicus*	all		approx. 1485	no survey	710	No survey	No survey	No survey	No survey	
Lagunitas Creek	*Elymus californicus*	1		--	--	--	206	No survey	No survey	No survey	
[redacted]	*Elymus californicus*	2		--	--	--	69	No survey	No survey	No survey	
[redacted]	*Eriogonum luteolum var. caninum*	1		17	31	33	587	Surveyed; not censused	No survey	531	
		2		--	--	--	346	Surveyed; not censused	No survey	298	
Ft Funston	*Erysimum franciscanum*	6			*	*	17	No survey	No survey	No survey	*Counts confused by plantings: missing 2001 d-sheets for FOFU populations
		7			*	*	5	No survey	No survey	No survey	
Marin Headlands	*Erysimum franciscanum*	1		575	112	298	No survey	No survey	No survey	No survey	Populations 1 and 3 difficult to census due to inaccessibility
		2		989	*325	498	447	No survey	No survey	No survey	*northern most patch of MAHE#2 not censused; remainder of MAHE#2 censused in April; plants may have been past peak
		3		403	117	*80	*87	No survey	No survey	No survey	*Likely undercounts due to inaccessibility

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		4		56	9	13	0	No survey	No survey	No survey	
		5		29	9	2	46	No survey	No survey	No survey	
		6		--	--	6	7	No survey	No survey	No survey	
		7		--	--	*1	Population not found, location is uncertain	No survey	No survey	No survey	*possible out planting
		8		--	--	--	--	--	17	No survey	
Milagra	*Erysimum franciscanum*	1		*2222	95	156	755	No survey	No survey	No survey	*Total of pops. 1,2, 3
		2		--	15	78	740	No survey	No survey	No survey	
		3		--	10	7	9	No survey	No survey	No survey	
Pedro Point	*Erysimum franciscanum*	1		--	--	--	--	--	105	No survey	
Sweeney	*Erysimum franciscanum*	1		not found	*488	176	327	No survey	No survey	No survey	*missing '99 d-sheet; #s from year-end report
Olema Valley	*Fritillaria affinis* var. *tristulus*	1		--	--	--	3	No survey	1	No survey	
[redacted]	*Fritillaria liliacea*	1		--	--	--	--	No survey	*22,097	No survey	*Data collected on GGNRA land only
		1a		Surveyed; not censused	*46,109	Surveyed; not censused	*40,000	No survey	No survey	No survey	*Data collected on both private and GGNRA land
Marin Headlands	*Gutierrezia californica*	0		676	1274	No survey	1250	No further surveys			Removed from Special Status Plant list in 2002
		1		*323	1157	No survey	1045				*divided total #s for pops 3 & 3a into pops 1&2; polygons assigned new numbers in 2000, 2001
		2		*323	1011	No survey	943				
		3		385	1653	No survey	1431				
[redacted]	*Hesperolinon congestum*	1		157	87	>2000	178	No survey	313	No survey	Figures from 1998-2001 include counts from pop. on private land
		2		56	0	Surveyed; not	0	No survey	*2,363	No survey	*Larger area censused than in previous years

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
						censused					
[redacted] -- on private land		3		--	*2	740	No survey	No survey	No survey	No further surveys	*not exactly same polygon as in 2000, 2001; too late in season for census
[redacted] -- on private land		4		--	--	265	No survey	No survey	No survey		
		5		--	--	>200*	130	No survey	1,267	No survey	*ocular estimate; question on d-sheet whether this pop. was pop. 2 in 1998
		6		--	--	>200*	182	No survey	891	No survey	*ocular estimate
		7		--	--	--	160	No survey	343	No survey	
Mori Point	*Linanthus rosaceus*	--		--	--	--	--	Surveyed; not censused	>500	No survey	
Sweeney	*Malacothamnus fasciculatus var. arcuatus*	1			0	0	0	No survey	No survey	No survey	
[redacted]	*Plagiobothrys chorisianus* var. *chorisianus*	1		0	No survey	No survey	No survey	0	No survey	No survey	
Sweeney Ridge		2	--	--	--	--	--	approx. 35	93	82	
[redacted]	*Stebbinsoseris decipiens*	1		--	--	~~*135~~	~~*782~~	0	0	No survey	*determined in 2003 that all or majority of individuals actually *Uropappus lindleyii*
		2		--	--	~~*55~~	~~*58~~	0	0	No survey	*determined in 2003 that all or majority of individuals actually *Uropappus lindleyii*
Stinson	*Stebbinsoseris decipiens*	1	15	*No survey	0	* No survey	0	0	0	No survey	*From description on datasheet, surveyed wrong area
[redacted]	*Streptanthus glandulosus*. ssp. *pulchellus*	1	11	129	555	923	*Surveyed; not censused	** 2,491	No sur vey	No survey	*too late in season to census **larger area sampled in 2002 than previous years
		2**	10	0	No survey	1,122	*Surveyed; not censused	1,668	No sur vey	No survey	*too late in season to census; **combined populations 2 and 3 into 2 in 2002

Table 1. Monitoring Results for rare plant populations occurring on GGNRA northern lands, north district and south district, 1998 - 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
Nicasio	*Streptanthus glandulosus.* ssp. *pulchellus*	1		1,088	*Surveyed; not censused	1,368	116	No survey	256	No survey	*too late in season to census Figures include counts from pop. on private land
		2		--	--	--	12	No survey	127	No survey	
		3		--	--	--	53	No survey	469	No survey	
		4		--	--	--	--	--	989	No survey	
		5		--	--	--	--	--	120	No survey	
[redacted]	*Tanacetum camphoratum*	4		--	--	--	No survey	No further surveys			Removed from Special Status Plant List 2002
Fort Funston	*Tanacetum camphoratum*	1		--	--	--	No survey				
		3		--	--	--	No survey				
		7		--	--	--	No survey				
		8		--	--	--	No survey				
		9		--	--	--	No survey				
		10		--	--	--	No survey				
[redacted]	*Tanacetum camphoratum*	1		986	Low	Low	No survey				
[redacted]	*Tanacetum camphoratum*	2		439	Low	Med	No survey				
		3		--	Med	Med	No survey				
		4		--	Sparse	Sparse	No survey				
		5		--	Sparse	Sparse	No survey				

In Table II you will find that there are not yearly census figures for each population. Instead you will find that the total number of individuals of all populations occurring at a single site are included. Individual population data can be found in the GGNRA restoration database.

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
[redacted]	ARBL	1	--	--	--	--	--	--	--	--	--	500	No survey	Have monitoring data from 1996 as well
[redacted]	ARBL	2	--	--	--	--	--	--	--	--	--	365	No survey	
[redacted]	ARBL	3	--	--	--	--	--	--	--	--	--	241	No survey	
Totals all [redacted] ARBL populations			--	--	738	4,071	--	13,130	--	--	--	1,106	No survey	
[redacted]	ARBL	4	--	--	--	--	--	--	--	--	--	31	38	Have monitoring data from 1996 as well
	ARBL	5	--	--	--	--	--	--	--	--	--	46	58	
	ARBL	6	--	--	--	--	--	--	--	--	--	84	1,762	
	ARBL	7	--	--	--	--	--	--	--	--	--	447	1,169	
	ARBL	8	--	--	--	--	--	--	--	--	--	10	50	
	ARBL	9	--	--	--	--	--	--	--	--	--	0	46	
	ARBL	10	--	--	--	--	--	--	--	--	--	150	207	
	ARBL	18	--	--	--	--	--	--	--	--	--	235	662	
[redacted]	ARBL	11	--	--	--	--	--	--	--	--	--	3	10	
	ARBL	12	--	--	--	--	--	--	--	--	--	40	474	
	ARBL	13	--	--	--	--	--	--	--	--	--	120	116	
	ARBL	14	--	--	--	--	--	--	--	--	--	1	73	
	ARBL	15	--	--	--	--	--	--	--	--	--	14	6	
Totals all [redacted] ARBL populations			--	--	1,000	4,075	--	6,389	--	--	--	1,182	4,671	
[redacted]	ARBL	16	--	--	--	--	--	--	--	--	--	2	1	Have monitoring data from 1981 as well
[redacted]	ARBL	17	--	--	--	--	--	--	--	--	--	9	4	

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
Totals all [redacted] populations	ARBL		--	--	200	224	--	200	--	--	--	11	5	
[redacted]	ARHORA	1	--	--	--	--	--	--	--	--	--	--	--	See previous reports; data collected on ARHORA not count data
[redacted]	ARHORA	2	--	--	--	--	--	--	--	--	--	--	--	
[redacted]	ARHORA	3	--	--	--	--	--	--	--	--	--	--	--	
[redacted]	CHCUCU	1	--	--	--	--	--	--	--	--	--	--	3,000-5,000	All 2004 figures are ocular estimates of population size
[redacted]	CHCUCU	2	--	--	--	--	--	--	--	--	--	--	15,000-20,000	
[redacted]	CHCUCU	3	--	--	--	--	--	--	--	--	--	--	300-500	
[redacted]	CHCUCU	4	--	--	--	--	--	--	--	--	--	--	800-1,000	
[redacted]	CHCUCU	5	--	--	--	--	--	--	--	--	--	--	800-1,000	
?	CHCUCU	6	--	--	--	--	--	--	--	--	--	--	?	
[redacted]	CHCUCU	7	--	--	--	--	--	--	--	--	--	--	250-350	
[redacted]	CHCUCU	8	--	--	--	--	--	--	--	--	--	--	85-120	
[redacted]	CHCUCU	9	--	--	--	--	--	--	--	--	--	--	800-1,000	
[redacted]	CHCUCU	10	--	--	--	--	--	--	--	--	--	--	100-150	
[redacted]	CHCUCU	11	--	--	--	--	--	--	--	--	--	--	2	
[redacted]	CHCUCU	12	--	--	--	--	--	--	--	--	--	--	15,000	
[redacted]	CIAN	1	--	--	17	7	7	5	3	2	3	6	6	Figures are total number of individuals counted; see data
[redacted]	CIAN	2	--	--	--	--	--	--	14	8	2	24	9	

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
[redacted]														sheets for number of individuals in each growth phase; i.e. vegetative, seedling, flowering
[redacted]	CIAN	3	--	--	--	--	--	--	49	68	20	0	1	
[redacted]	CIAN	4	--	--	--	--	--	19	27	29	58	35	60	
[redacted]	CLFR	01	--	--	--	--	--	--	--	--	--	188	912	
[redacted]	CLFR	02	--	--	--	--	--	--	--	--	--	3	0	
Total all [redacted] CLFR pops.			860	547	738	11	132	545	345	258	285	191	912	
[redacted]	CLFR	03	--	--	--	--	--	--	--	--	--	977	876	
[redacted]	CLFR	04	--	--	--	--	--	--	--	--	--	15	16	
[redacted]	CLFR	05	--	--	--	--	--	--	--	--	--	19,784	18,040	New polygon added to pop. in 2004
[redacted]	CLFR	06	--	--	--	--	--	--	--	--	--	180	105	
Total all [redacted] CLFR populations			8,714	9,098	3,869	744	9,061	9,450	11,409	12,578	9,989	20,956	19,037	
[redacted]	COMAPA	3	--	--	--	--	--	--	--	--	--	--	160	Figures are total number of individuals counted; see data sheets for number of individuals recorded as flowering and number of individuals recorded as fruiting
	COMAPA	4	--	--	--	--	--	--	--	--	--	--	555	
	COMAPA	5	--	--	--	--	--	--	--	--	--	--	379	
	COMAPA	6	--	--	--	--	--	--	--	--	--	--	344	
	COMAPA	7	--	--	--	--	--	--	--	--	--	--	268	
	COMAPA	8	--	--	--	--	--	--	--	--	--	--	389	
[redacted]	COMAPA	west								1	10	122	259	
	COMAPA	east	--	--	--	--	--	--	--	--	--	1	1	

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
	COMAPA	south	--	--	--	--	--	--	--	--	--	--	8	
[redacted]	ERFR	1	--	--	--	--	--	--	0	--	--	0	0	
[redacted]	ERFR	2	--	--	--	--	--	--	--	--	--	16	31	
	ERFR	3	--	--	--	--	--	--	--	--	--	2	12	
	ERFR	4	--	--	--	--	--	--	--	--	--	105	45	
Totals all [redacted] ERFR [redacted] populations			--	--	--	--	--	--	412	--	--	123	88	
[redacted]	ERFR	5	--	--	--	--	--	--	--	--	--	6	4	
	ERFR	6	--	--	--	--	--	--	--	--	--	0	0	
	ERFR	7	--	--	--	--	--	--	--	--	--	4	4	
	ERFR	8	--	--	--	--	--	--	--	--	--	0	0	
Totals all [redacted] ERFR populations			--	53	--	37	69	--	38	--	--	10	8	
[redacted]	ERFR	9	--	--	--	--	--	--	--	--	--	0	0	
[redacted]	ERFR	10	--	--	--	--	--	--	--	--	--	0	2	
	ERFR	11	--	--	--	--	--	--	--	--	--	0	0	
	ERFR	12	--	--	--	--	--	--	--	--	--	41	21	
	ERFR	13	--	--	--	--	--	--	--	--	--	48	175	
	ERFR	14	--	--	--	--	--	--	--	--	--	12	3	
Totals all [redacted] ERFR populations			--	292	245	261	227	*33	526	--	--	101	201	*counts of planted individuals
[redacted]	ERFR	15	--	--	--	--	--	--	--	--	--	4	6	
[redacted]	ERFR	16	--	--	--	--	--	--	--	--	--	2	0	
[redacted]	ERFR	17	--	--	--	--	--	--	--	--	--	4	2	
Totals all [redacted] ERFR populations			--	11	24	15	8	*13	382	--	--	6	2	*counts of planted individuals
[redacted]	ERFR	?	--	--	--	--	4	*36	5	--	--	0	0	*counts of planted individuals
[redacted]	ERFR	?	--	--	--	--	--	*11	11	--	--	0	0	*counts of planted individuals

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
[redacted]														
[redacted]	ERFR	18	--	--	--	--	--	--	--	--	--	0	0	
	ERFR	19	--	--	--	--	--	--	--	--	--	61	24	
	ERFR	20	--	--	--	--	--	--	--	--	--	2	0	
	ERFR	21	--	--	--	--	--	--	--	--	--	3	0	
Totals all Lobos [redacted] ERFR populations			--	--	--	--	1	*51	696	--	--	66	24	*counts of planted individuals
[redacted]	GICACH	1	--	--	--	--	--	--	--	--	--	--	10,000	All 2004 numbers are ocular estimates of population size
[redacted]	GICACH	2	--	--	--	--	--	--	--	--	--	--	10-15	
[redacted]	GICACH	3	--	--	--	--	--	--	--	--	--	--	150-200	
[redacted]	GICACH	4	--	--	--	--	--	--	--	--	--	--	800-1,000	
[redacted]	GICACH	5	--	--	--	--	--	--	--	--	--	--	500 - 700	
[redacted]	GICACH	6	--	--	--	--	--	--	--	--	--	--	*75-85	*new pop. in 2004
[redacted]	GICACH	7	--	--	--	--	--	--	--	--	--	--	75-100	
[redacted]	GICACH	8	--	--	--	--	--	--	--	--	--	--	85-100	
[redacted]	GICACH	9	--	--	--	--	--	--	--	--	--	--	1,800-2,000	
[redacted]	GICACH	10	--	--	--	--	--	--	--	--	--	--	10	
[redacted]	GICACH	11	--	--	--	--	--	--	--	--	--	--	100-150	
[redacted]	GICACH	12	--	--	--	--	--	--	--	--	--	--	6,000- 8,000	
[redacted]	GICACH	13	--	--	--	--	--	--	--	--	--	--	20	
[redacted]	GICACH	14	--	--	--	--	--	--	--	--	--	--	*200-1,000	*new pop. in 2004
[redacted]	GICACH	15	--	--	--	--	--	--	--	--	--	--	*50-75	*new pop. in 2004
[redacted]	GICACH	--	--	--	--	--	--	--	--	--	--	--	1	One individual observed in 2004 but

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
														not considered a new population
[redacted]	GRHIMA	1	--	--	--	--	--	--	--	--	--	34	No survey	
	GRHIMA	2	--	--	--	--	--	--	--	--	--	25	No survey	
	GRHIMA	3	--	--	--	--	--	--	--	--	--	30	No survey	
Totals all [redacted] GRHIMA populations			--	473	--	132	416	--	304	--	--	89	No survey	Have monitoring data from 1987 as well
[redacted]	GRHIMA	4	--	--	--	--	--	--	--	--	--	176	No survey	
	GRHIMA	5	--	--	--	--	--	--	--	--	--	75	No survey	
	GRHIMA	7	--	--	--	--	--	--	--	--	--	150	No survey	
Totals all [redacted] GRHIMA populations			--	293	--	297	479	--	373	--	--	401	No survey	Have monitoring data from 1987 as well
[redacted]	GRHIMA	6	--	--	--	--	--	--	--	--	--	113	No survey	
	GRHIMA	9	--	--	--	--	--	--	--	--	--	903	No survey	
	GRHIMA	10	--	--	--	--	--	--	--	--	--	12	No survey	
	GRHIMA	11	--	--	--	--	--	--	--	--	--	226	No survey	
Totals all [redacted] GRHIMA populations			--	1,800	--	1,071	2,087	--	2,503	--	--	1,910	No survey	Have monitoring data from 1987 as well
[redacted] Serpentine	GRHIMA	8	--	--	--	--	--	--	--	--	--	656	No survey	
[redacted]	HECO	1	--	--	--	--	--	--	--	--	--	--	*1,748	*Unsure if 2004 pop totals include totals from population previously identified as *H. californicum*
[redacted]	HECO	1	--	--	--	--	--	--	--	--	--	--	*811	
Totals all HECO populations			--	996	347	182	187	172	87	62	66	121	2,559	
[redacted]	HOCUSE	1	--	--	--	--	--	--	--	--	5	2	3	
[redacted]	HOCUSE	2	--	--	--	--	--	--	--	--	1	0	0	
[redacted]	LEGE	1	--	--	--	--	--	--	--	--	--	*315	*146	*single asterisk

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
- [redacted]														indicates LEGE populations that were censused
[redacted]	LEGE	2	--	--	--	--	--	--	--	--	--	*1	*1	
[redacted]	LEGE	3	*2,337	*5,871	*1,537	*873	*4,869	1,530 (SE 218)	*824	*342	*525	*181	*127	Population consists of four sub-populations
[redacted]	LEGE	4	*3,341	*8,642	*3,279	*19,218	155,738 (SE 19,595)	1,654 (SE 249)	*478	*2,281	*24,324	19,378 (5,027)	25,739	
[redacted]	LEGE	1	*3,531	*7,741	*3,227	*9,916	78,657 (SE 15,794)	4,528 (SE 618)	*4,135	*2,041	*9,349	*3,924	*3,034	Population consists of nine sub-populations
[redacted]	LEGE	1	*3,800	*18,801	*16,828	--	--	--	*1,113	*1,056	*5,985	*8,293	11,330	
[redacted]	LEGE	2	--	--	--	*129,562	**1,488,886 (SE161,263)	**339,617 (SE 39,615)	1,283,839 (SE 166,740)	358,104 (SE 47,428)	163,540 (SE 29,742)	672,631 (157,253	82,195	** includes counts from main & remnant pops.
[redacted]	LEGE	3	--	--	--	--	--	42,207 (SE 6,408)	75,189 (SE 10,758)	38,251 (SE 5,616)	29,670 (SE 6,602)	31,702 (6,515)	5,025	
[redacted]	LEGE	4	--	--	--	--	--	***1,307 (SE 168)	26,042 (SE 4,640)	--	25,531 (SE 5,690)	73,688 (17,563)	4,677	***includes counts from Del Mar pop.
[redacted]	LEGE	5	--	--	--	--	--	--	*254	*103	*7	*0	*0	***0 Presumed extirpated!**
[redacted]	LEGE	1	--	--	--	--	--	--	--	--	--	--	16	
[redacted]	LEGE	1	--	--	--	3	--	^10,285 (SE 1,489)	146,915 (SE 20,632)	126,803 (SE 2,224)	79,844 (SE 14,947)	242,516 (52,984)	28,501	^error in total quadrat calculation
[redacted]	LEGE	1	*7,950	*6,861	*8,425	*215	*4,068	1,970 (SE 356)	*1,254	6,035 (SE 903)	20,944 (SE 8,699)	11,284 (3,818)	3,274	
[redacted]	SIVEVE	1	--	--	--	--	--	--	--	16	--	76	63	
[redacted]	SIVEVE	2	--	--	--	--	--	--	--	2	--	0	0	
[redacted]	SIVEVE	3	--	--	--	87	585	1	952		--	73	40	Have monitoring data from 1985 as well
[redacted]	SIVEVE	4	--	--	--	--	--	--	--	2	--	0	0	

Table II. Monitoring Results for rare plant populations within the Presidio, 1994 – 2004

Location	Species	Pop. No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Comments
[redacted]	SIVEVE	5	--	--	306	720	201	--	158	176	--	36	40	Have monitoring data from 1991 as well
[redacted]	SIVEVE	6	--	--	--	1	869	11	213	214	--	219	219	Have monitoring data from 1991 as well
[redacted]	SIVEVE	7	--	--	--	--	16	--	25	1	--	0	0	Have monitoring data from 1991 as well
[redacted]	SIVEVE	8	--	--	--	--	10	--	2	1	--	0	0	
[redacted]	SIVEVE	9	--	--	--	90	18	--	--	1	--	4	5	
[redacted]	SIVEVE	10	--	--	--	4	6	--	20	5	--	5	4	
[redacted]	SIVEVE	11	--	--	--	--	--	24	3	24	--	8	4	
[redacted]	TACA	1	--	--	--	--	--	--	--	--	--	--	542	
[redacted]	TACA	2	--	--	--	--	--	--	--	--	--	--	6	
[redacted]	TACA	3	--	--	--	--	--	--	--	--	--	--	4	
[redacted]	TACA	4	--	--	--	--	--	--	--	--	--	--	22	
[redacted]	TRFL	1	--	--	--	--	--	--	--	2,220	7,857	3,419	2,189	
[redacted]	TRFL	1	--	--	30	52	15	11	6	1	3	3	1	

Table III. Monitoring Results for rare plant populations within the San Francisco Watershed District, 1998- 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
SFWD	*Acanthomintha duttonii*	1	6	No survey	0	0	0	No survey	No survey	No survey	Plant not observed since 1991
SFWD	*Arabis blepharophylla*	1	--	surveyed; not censused	234	130	779	No survey	No survey	No survey	
		2	--	--	Population not found, mapped incorrectly	204	186	No survey	No survey	No survey	
		3	--	--	--	>2,000	718	No survey	No survey	No survey	
SFWD	*Arctostaphylos montaraensis*	1	6	--	Surveyed; not censused	Surveyed; not censused	Surveyed; not censused	No survey	No survey	No survey	Last census conducted by T. Corelli in 1991; plants have same disturbance threats as in previous years
		2	6	--	Surveyed; not censused	Surveyed; not censused	Surveyed; not censused	No survey	No survey	No survey	
SFWD	*Calochortus umbellatus*	1	--	--	--	*Surveyed; not censused	0	No survey	No survey	No survey	*too late in season
SFWD	*Cirsium fontinale* var. *fontinale*	1	1	--	2,264	1,800	1809	No survey	No survey	No survey	Note that *C. fontinale* counts include both rosettes and flowering individuals
		2	2	--	942	473	539	No survey	No survey	No survey	
		4	--	--	65	7	No survey	No survey	No survey	No survey	
		5	5?	--	1,258	1,334	708	No survey	No survey	No survey	
		7	7?	--	812	430	575	No survey	No survey	No survey	
		8	8?	--	87	82	183	No survey	No survey	No survey	
SFWD	*Dirca occidentalis*	1	--		*not found	*not found	15	No survey	No survey	No survey	
		2	--	--	*not found	*not found	5	No survey	No survey	No survey	
		3	--	--	*not found	*not found	10	No survey	No survey	No survey	
SFWD	*Elymus californicus*	1	--	--	Surveyed; not censused	Surveyed; not censused	Surveyed; not censused	No survey	No survey	No survey	

Table III. Monitoring Results for rare plant populations within the San Francisco Watershed District, 1998- 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
SFWD	*Eriophyllum latilobum*	1	1	--	443	Surveyed; not censused	189	No survey	No survey	No survey	
SFWD	*Erysimum franciscanum*	1	4	--	*20	1	0	No survey	No survey	No survey	*late survey - 05/20/99
		2		--	*10	0	0	No survey	No survey	No survey	*late survey - 05/20/99
		3		--	*	*	13	No survey	No survey	No survey	*numbers entered in pop. 11; same area surveyed but assigned new map #
		4		--	--	5	36	No survey	No survey	No survey	
		5		--	--	20	88	No survey	No survey	No survey	
		6		--	--	260	246	No survey	No survey	No survey	
		7		--	--	12	24	No survey	No survey	No survey	
		8		--	--	407	241	No survey	No survey	No survey	
		9		--	--	5	16	No survey	No survey	No survey	
		10		--	--	--	2,473	No survey	No survey	No survey	
		11		>200	1,186	2,390	1,823	No survey	No survey	No survey	
		12		--	--	--	103	No survey	No survey	No survey	
		13		--	--	--	46	No survey	No survey	No survey	
SFWD	*Fritillaria liliacea*	1	19	--	*41	919	Survey; not censused	No survey	No survey	No survey	*No d-sheet for 1999, surveyed past peak bloom; polygon size much smaller in 1999 than 2000 and 2001
		2	19	--	--	--	Surveyed; not censused	No survey	No survey	No survey	
SFWD	*Hesperolinon congestum*	1		--	not found	569	910	No survey	No survey	No survey	
		2	22	--	not found	143	54	No survey	No survey	No survey	
		3		--	--	210	320	No survey	No survey	No survey	
		4		--	--	2,486	160	No survey	No survey	No survey	
		5		--	--	>5,000	Surveyed; not censused	No survey	No survey	No survey	

Table III. Monitoring Results for rare plant populations within the San Francisco Watershed District, 1998- 2004

Location	Species	Pop. Num.	NDDB Occ. No.	1998	1999	2000	2001	2002	2003	2004	COMMENTS
		6		--	--	17	0	No survey	No survey	No survey	
SFWD	*Lessingia arachnoidea*	1	2	--	--	Surveyed; not censused	*1,500	No survey	No survey	No survey	*Ocular estimates
		2	3	--	--	Surveyed; not censused	*50,000	No survey	No survey	No survey	*Ocular estimates
		3	2	--	--	Surveyed; not censused	*5,000	No survey	No survey	No survey	*Ocular estimates
		4	1	--	--	Surveyed; not censused	*170,000	No survey	No survey	No survey	*Ocular estimates
SFWD	*Linanthus ambiguous*	--	--	--	--	--	Surveyed; not censused	No survey	No survey	No survey	
SFWD	*Lupinus arboreus* var. *eximus*	1	1	--	28	28	24	No survey	No survey	No survey	
SFWD	*Pentachaeta bellidiflora*	1	1		11,446,998	112,355,758	Surveyed; not censused	No survey	No survey	No survey	Population has remained high since 1982; was scheduled to be monitored every three years; 2002 was third year

Appendix VIII. Rare Plant Monitoring Protocols

GGNRA – northern lands, north district, south district; SFWD

Pre-monitoring planning

Contacts. There are a number of organizations/individuals who have conducted past rare plant surveys in the GGNRA, each of whom are excellent resources for information. These contacts can give time saving information about population locations, as well as habitat preferences and historical conditions of each population. Resources include contractors, interns, volunteers and Park Service staff. For areas such as the San Francisco Water District, these contacts are often outside of NPS (see K/common/rareplnt/contct.doc – old network location, ***file not found in 2004***).

Field Forms. It is essential to review all old-field forms and maps before conducting a census. The hard copies are housed in the Marin Headlands, Building 1061. They are also located in the park restoration database. Originals are not to be taken into the field; copies should be made before site visits.

Field Maps. In the rare plant folders are hardcopies of ArcView maps for each population occurrence. In addition to obtaining copies of these maps, the surveyor should have a small-scale map of the region and a list of the rare plants known to occur in that region. Having a small-scale map will enable the surveyor to record new populations or extensions of a population's range.

Field schedule. All plants need to be censused during their peak blooming times; consulting the blooming calendar for all species helps for efficient planning of field days (included in Appendix V). Climatic variability from year to year can result in earlier or later blooms than previous years. It is often necessary to make several trips to a population to conduct a census.

Permits, keys, combination locks.

Northem lands.

To access Nicasio Ridge, notify the Range Conservationist (currently Mark Hamrichhausen) at Point Reyes National Seashore (415-464-5172) of the intended dates of your sites visits. He will notify the ranchers and PORE law enforcement.

To enter Mount Tamalpais State Park, a call must be made to law enforcement (415-331-3812).

North District.

Gerbode Valley and Tennessee Valley require gate combos for access. Point Bonita requires a FP2 key to enter the land adjacent to the lighthouse. Of course, you can always walk a short ways.

South District.

For Fort Funston, notify the staff (currently Asha Setty) to inform them of your presence (415) 239-2366.

Sweeney Ridge requires a SP2 key or the gate combination for access.

San Francisco Water District
For the San Francisco Water District the surveyor must contact Kathy Zalok (650-872-5934), assistant to Joe Naras, to obtain a request form for access into the Water District. The permit requires information on vehicle, permitee, supervisor, entry and exit times, etc. The request requires a minimum of one month to be approved. A liability statement must be sent to the district, releasing the water district from responsibility for any injuries incurred on this property. If approved, the permit will be sent to the main contact listed on the request form. The permit is kept on the dash of the vehicle. A Sergeant 25 and/or 63 keys must be requested at the same time as the permit. After obtaining a permit, the surveyors must let the watershed keeper, John Adza (650-652-3210), know one week before entering where NPS staff will be working. It is important to follow the specific guidelines set forth in the permit. Violations can result in a loss of access.

Site visit - Field Form Protocol
A modified field form has been used in 2003 and 2004. The new form is an amalgam of the NDDB form and the CNPS releve form. Information from the NDDB form includes population location, species biology, habitat, reporter, method of identification, contact people, and date of survey. The information from the CNPS releve form allows for the collection of cover data on the most common native and non-native species occurring with the rare species population. The electronic field form is found on the directory **Q:\Home_working\Rare_02**. Blank forms are found in the Rare Plant file drawer.

Population identification.
Some of the populations that have been censused in previous years have a Natural Diversity Database (NDDB) occurrence number that can be found on the previous year's datasheet. The occurrences are also listed on the Fish and Wildlife's NDDB database. GGNRA owns a copy of *RareFind2*, software that enables the user to assign new NDDB occurrence numbers for new populations of rare and endangered species. Along with the occurrence number, the populations have an identification number assigned by GGNRA for the park database. This number is found on old datasheets, or by accessing the ArcView tables associated with the rare plant polygons. Each population has a two-part label, with a name and number. The name represents a general area, such as SFWD. New populations are assigned the name and a number that is the next in order from the last recorded occurrence in the area. General area labels, not including the Presidio, include the following: Nicasio Ridge, Devil's Gulch, Bolinas Ridge, Bolinas Lagoon, Stinson Beach, Mill Valley Air Force Base, Marin Headlands, Muir Woods, Muir Woods - FourCorners, Oakwood Valley, Fort Funston, Milagra Ridge, Sweeney Ridge, Mori Pint, Pedro Point and the SFWD.

Location.
Includes information on where the population is found, directions to the population, landowner, and quadrangle name. A hand drawn map of the population is to be drawn on the back of the field survey form, in addition to the topographic map with the population drawn in.

Note: Be very detailed in describing population locations and directions to populations. Describe trails taken and landmarks used to mark where the trail was left to travel to the population location. Measure distances whenever possible using either odometers, meter tapes or pacing. If you have found easier access routes then previously used, provide that information to future monitors.

GPS Coordinates and Files.
UTM coordinates and rover files, if collected, are recorded on the field survey forms. For new populations, it is ideal to have the UTM coordinates of the location. Data dictionaries are unnecessary and time consuming, and are not recommended for censusing. To create a

polygon, the surveyor should create a rover file, which will have to be converted later into an ArcView shapefile using Trimble Path Finder software. After the files have been converted, the Base, Rover, Corrected and any associated auxiliary files must be deleted. The only file that needs to be retained is the ArcView shapefile. The process of correcting and converting files takes time, so when possible, only take UTM coordinates.

Species Biology. Total number of individuals (if applicable), population area, phenology, age class, and comparisons from previous visit.

Habitat. Description of habitat, overall site quality, aspect, slope, topographic position, light, moisture, elevation, substrate/soils, plant communities, other rare species, and visible threats or disturbance.

Photographs. Slide or digital photographs are taken of both the plant and its habitat. The originals are stored at Building 1061, Ft. Cronkhite for all species except those that occur on the Presidio. Digital photos are currently stored in the rare plant directory for each year starting with 2001. Slides taken in years previous to 2001 are to be scanned, and stored on the network. It will have to be arranged with the GIS specialist whether slides for each year should be stored in the respective rare plant directory or in a separate directory for photos only.

Identification. A definitive identification using an updated key such as The Jepson Manual is essential. Other good reference materials are Endangered Plants of San Mateo County by Corelli *et al.*, Plants of the San Francisco Bay Region by Kozloff, Marin Flora by Howell, and *Arctostaphylos* key by Vasey and Parker.

Equipment

Blank survey forms
Past survey forms and methods (photocopied; no originals in the field. Bldg. 1061 MAHE)
Maps
Clip Board
Camera and slide film or digital camera
Compass
Counters
Keys (obtained from supervisor)
Meter tapes
GPS unit (Bldg. 1061, Marin Headlands; must be reserved for use in the censusing)

Survey Methods

Note: The following protocols were followed through the 2004 season. These methods may be modified in 2005.

The plants to be monitored are perennial and annual, shrubs and subshrubs, forbs, and grasses. Monitoring protocols vary for each type depending on size, growth habit, and location. Note that some populations of the same species have different monitoring protocols depending on their location. For example, *Elymus californicus* individuals are counted in Muir Woods but only the population boundaries are mapped in the SFWD. This is because the size of the population in the SFWD is too large to count all individuals whereas the populations in Muir Woods are small enough to count all individuals.

Counting individual plants and mapping population edges or occurrences
For these species, the population sizes are small, so each plant is counted.

Arabis blepharophylla
In order to determine individual number of plants for Arabis, it is important to distinguish what constitutes an individual. This plant sends up many flowering stalks per basal rosette, so careful observation of individual basal rosettes must be made while censusing.
Acanthomintha duttonii
Arctostaphylos hookeri ssp. *montana*
Lupinus eximius
Eriophyllum latilobum
Castilleja affinis ssp. *neglecta*
Castilleja ambigua ssp. *humboldtiensis*
Calochortus umbellatus
Chorizanthe cuspidata var. *cuspidata*
Cirsium andrewsii
Both immature plants (those without flowering stalks) and mature plants are censused. Only the number of mature plants is included in the total number of individuals censused.
Cirsium fontinale var. *fontinale*
Both immature and mature plants are included in the total number of individuals censused.
Cordylanthus maritimus ssp. *palustris*
Dirca occidentalis
*Elymus califomicus (*Muir Woods*)*
Eriogonum luteolum var. *caninum*
Erysimum franciscanum
Fritillaria liliacea (SFWD)
(*Gutierrezia californica* – no longer censused after 2001)
Hesperolinon congestum
Malacothamnus fasciculatus var. *arcuatus*
Plagiobothyrus chorisianus var. *chorisianus*
Stebbinsoseris decipiens
Streptanthus glandulosus ssp. pulchellus

Mapping population edges or separate occurrences; no individual census counts
Arctostaphylos virgata
Arctostaphylos montaraensis
Ceanothus gloriosus var. *exaltatus*
Ceanothus masonii
Ceanothus species nova
Elymus califomicus ([redacted]
Oakwood Valley, SFWD)

Sampling a sub-set of a population and mapping edges

***Castilleja ambigua* ssp. *humboltiensis*,** [redacted]

Sampling method: 2003
Eight populations of *Castilleja ambigua* ssp. *humboltiensis* have been documented at the [redacted]. All populations were surveyed in 2003 as the first year of a planned three consecutive years of monitoring. 2003 was a healthy year for the species with numerous individuals in each population. Populations 01, 02, 04, 05, and 06 were censused meaning each individual was counted. Three of the populations (03, 07, and 08) were sampled as follows:

The length of the long axis of each population was walked from end to end. At every 10 meters, the number of individuals found within a 1 meter square were counted. Because of differences in the size of each population the number of 1 meter squares counted varied in each population. Summing the total number of individuals obtained in each 1 meter square, the total number of individuals within each population was estimated using the following equation:

$$\text{\# individuals within population} = \frac{\text{\# of individuals counted} \times \text{total population area}}{\text{area sampled}}$$

Sampling a sub-set of a population and mapping edges (cont.)

***Ceanothus* species nova,** [redacted]

Monitoring method: 2000 (repeated from 2000 year-end report)

A grid was laid over the mapped *Ceanothus* using Arcview software. Each square grid unit is approximately 20m x 20m. The coverage of *Ceanothus* as mapped in 1999 is 95,247 square meters. This is an over estimate of the actual square meters of *Ceanothus* because the area is slightly mismapped and coverage is patchy. In order to sample approximately 10% of the *Ceanothus*, 20 plots of 20m x 20m each were randomly placed within the population. Plot locations were chosen from a list of the 206 intersection points of the gridlines using a random number table. These points served as the mid-point for four subplots of 10m x 10m each which were arranged along north-east, south-west lines using a compass. When it appeared on the map that a chosen point would create subplots outside of the population area, they were discarded and new points were chosen.

Number	X-coordinate (easting)	Y-coordinate (northing)
[redacted]		

*These points describe plots without any CENO cover
**These points were used to replace two empty plots in assessment of live/dead percentages (for more accuracy)

Once points were chosen and located with a GPS unit, subplots were established using meter tapes and a compass. Flags were used to mark the corners and then ocular estimates were made of the percentages of total live and dead *Ceanothus* cover. Dead cover was defined as any completely leafless branches as well as newly denuded branches. The first plot's cover was estimated separately by two people to assess accuracy of the ocular estimates. Only one person surveyed all remaining plots.

Two plots were found to contain no *Ceanothus* (one completely outside of the population; one in an old roadbed). These zero percentages were included in the average of total *Ceanothus* cover as they would more accurately reflect the patchy nature of coverage. However, two other plots were then chosen to use in the assessment of dead/live percentages in order to make them more accurate.

Sampling a sub-set of a population and mapping edges (cont.)

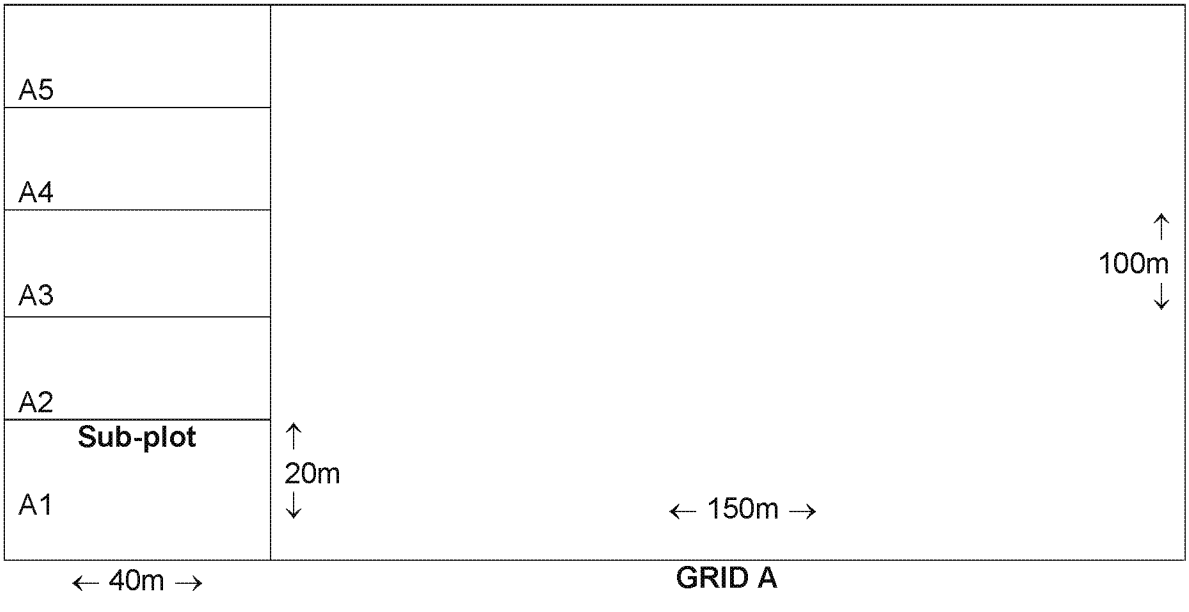
Fritillaria liliacea, [redacted]

Sampling method: 1999 and 2001
Because of the large size of the population of *Fritillaria liliacea* on [redacted], censusing all individuals is impractical for this population. The population count was derived from sub-sampling 10% of the total area covered by the fritillary. To randomly choose the area to sample, a grid was created in ArcView and overlaid on a map of the population. The grid can be found in Arcview project "base98.apr" located on the network at q:\GOGA\Data\Species\Vegetation\Rare\RARE_99\base98.apr". The view name is "fritillary". In Arcview select 'View' 'fritillary'

After determining the number of grid cells that cover 10% of the population, the grids were assigned letters and random grids chosen to sample. Nine (9) grids were randomly selected for sampling. Each grid was given a letter name (A, B, C, D, E, F, G, H, I). The grids are approximately 100m x 150m.

The UTM coordinates of one corner of each grid are recorded in order to determine its location in the field. In the field, the grids to be sampled are located with a GPS unit. In the field, five(5), 20 x 40m sub-plots were censused in each sample grid.

The sub-plots were established by starting at one edge of the grid, pacing 20m then 40m. Subsequent grids were adjacent to first. See drawing:



Sampling a sub-set of a population and mapping edges (cont.)

***Fritillaria liliacea*, Nicasio Ridge** (cont.)

Sampling methods: 2003
The same methods used in 1999 were used again in 2001 and 2003 with the exception that in 2003 a smaller area was sampled. Much of the [redacted] population of *Frillaria liliaceae* occurs on private land. At the conclusion of the 2001 monitoring season, the decision was made to discontinue monitoring that portion of the population occurring on private land. Only grids falling on GGNRA were sampled in 2003. The same grids falling on GGNRA land sampled in 1999 were resampled in 2003 rather than randomly sampling a new series of grids.

The entire population boundary occurring within GGNRA land is 83, 425 square meters. This figure was obtained by calculating the area of the population boundary falling on GGNRA land in Arcview. In keeping with the methods used in 1999 and 2001, the following was done:

- In order to sample approximately 10% of the entire population occurring on GGNRA land, 8,000 square meters of ground were traversed (approximately 10% of 83,425 square meters)
- Of the nine grids sampled in 1999 and 2001, only two (C and I) fall on GGNRA land.
- Within grids C and I, five 20m x 40m plots were sampled, starting at the SW corner of each grid.
- The SW corner of the grid was located by first plotting its location on a topographic map in Arcview and recording its coordinates. These coordinate points were located in the field with a GPS unit.
- The 20m axis of each sub-plot was aligned due north, the 40m axis due east. Each sub-plot is directly north of the preceding sub-plot.
- Within each sub-plot all individuals of *Fritillaria liliaceae* were counted.
- Summing the total number of individuals obtained in each grid, the total number of individuals within the entire population was estimated using the following equation:

$$\text{\# individuals within population} = \frac{\text{\# of individuals} \times \text{total population area}}{\text{area sampled}}$$

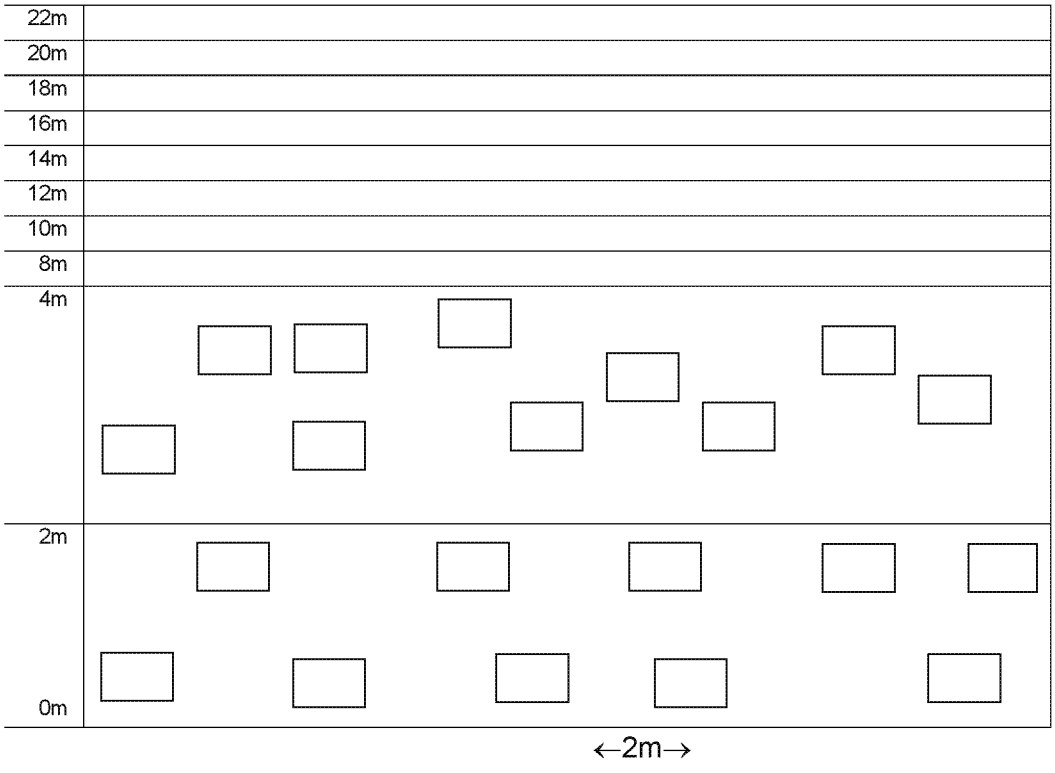
***Lessingia arachnoidea*, San Francisco Watershed District**
A sampling design has not yet been developed for this species. Due to the size of the population, ocular estimates of number of individuals were made in 2001. No other population estimates have been made.

Sampling a sub-set of a population and mapping edges (cont.)

***Pentachaeta bellidiflora*, San Francisco Watershed District**

Sampling methods: 1999

- Randomly select a starting point within the approximate center of the *Pentachaeta* population.
- Stretch a 50 meter tape through the *Pentachaeta*
- Stretch a second meter tape perpendicular to the 50 meter tape and extend it for 2 meters
- Count the number of individuals in ten, ten centimeter square ($10cm^2$) plots within the 2m x 2m area
- The $10cm^2$ areas are randomly selected by tossing a rock within the 2m x 2m area
- Count the number of individuals in ten, $10cm^2$ squares in 10 successive 2m x 2m square areas. See illustration below:



Appendix VIII. Rare Plant Monitoring Protocols (cont.)

GGNRA – the Presidio

General Instructions for Implementation of Monitoring Protocols

Step 0: Consult Presidio Rare Plant Program Binder, Monitoring Regime & Protocols, as well as Rare Plant Revegetation data and files to avoid including recent planting projects. (Project managers should separately perform rare plant revegetation survivorship monitoring at their sites per protocol.)

Step 1: Determine, through Presidio Plant Conservation or Restoration Committees, which rare plants you are responsible for monitoring.

Step 2: Print out JPEGs of species populations from previous years.

Step 3: Schedule sufficient field time to complete monitoring according to implementation schedule.

Step 4: Monitoring Day – Field Supplies

1) Rare plant JPEGs
2) Clipboard and writing utensil.
3) Rare plant (CNDDB) field forms, and/or tabulation forms and/or Raven's manzanita data sheets.
4) Scratch paper.
5) Clicker/counter.
6) Bring a buddy for safety if monitoring hard to access sites on the bluffs.
7) Safety and communication equipment.
8) GPS unit if necessary.

Step 5: Upon returning to the office, the monitor should confirm that all necessary monitoring for that species for that year has been completed.
Create file folder by species/year.

Step 6: All Rare Plant monitoring results should be entered into the restoration database.

Step 7: Rare Plant Report

1) Text – Each monitor should create the species summary for the work that they did (please see standard and ask Tim Doherty).
2) Table – Each monitor should also take responsibility for creating a new population table for that species and updating it with the new information (Consult with Tim Doherty for help with this segment).
3) GIS layers – Each monitor should create a new Arcview project for their species, using the previous year's as a baseline, and then update with the new spatial information. A layout should be created, from which new JPEGs can be exported.

Step 8: Submit CNDDB forms and all files to Presidio Rare Plant Monitoring Coordinator.

*Throughout the Monitoring process, monitors should be free and sure to consult with the Presidio Rare Plant Monitoring Coordinator to ensure that they are completing all necessary tasks.

Insert Presidio Monitoring Regime document

Presidio monitoring methods used in 2004 (by species)

Arabis blepharophylla
Monitoring Level: 2, map and census

All known [redacted] populations were censused and population locations were ground-truthed using GIS aerial photo maps.

Arctostaphylos hookeri ssp. *ravenii*
Monitoring level: 3, demographic monitoring

Below are the two monitoring protocols proposed but rejected in 2004. For monitoring methods used in previous years, refer to the document entitled "Rare and Endangered Plant Management Program" copies of which can be found in the Natural Resources Offices in Presidio buildings 1539 and 1216 and the Marin Headlands, building 1061.

Proposed monitoring protocol I:
Meter tape will be laid on each individual in a 1 meter by 1 meter grid. Then a 1 meter by 1 meter quadrat with 25 cells will be placed on each clone and the mother plant. Within each cell the per cent cover will be estimated to be 0, 25, 50 75 or 100. This protocol was discontinued because there was no suitable method to place a quadrat on to the mother plant.
Proposed monitoring protocol II:
Each individual will be digitally photographed (in panoramic mode, if possible) close-up (approximately 1m square per frame), and at a high resolution* from the top of an eight foot ladder. The ladder will be placed over a GPS-recorded point for each individual. A measuring tape will be laid horizontally across the bottom of each frame for calibration and reference. The number of photos for each plant will be determined by the size of the plant, allowing a clear view of the margin of the plant and including approximately 6 inches of bordering material in the frames which showed edge(s). The photo sets will then be "stitched" into composite images of each individual plant using panorama creation software. These "panoramic" images can then be closely examined electronically, without having to further disturb the plants. Additional, wider-frame photos were also taken of each individual to show their exact placement at the site and to give an idea of overall coverage. These will be taken from a distance of at least 10 meters*. Individual clones which have grown together into indistinguishable mats will be combined into single individuals for monitoring purposes and re-numbered. This protocol was discontinued because of the vegetation "pattern" of the mother plant. As a result the computer software could not recognize a distinct pattern within the mother plant and was unable to stitch together the numerous images.

Chorizanthe cuspidata var. *cuspidata*
Monitoring Level: 1, presence/absence & general health of populations

2004 monitoring consisted of determining if the species was present or absent from the site. If the population was found to be present then an estimation of the number of individuals was conducted at that time. Additionally if the boundary of the population had changed dramatically since the 2001 survey a new polygon was created.

Presidio monitoring methods used in 2004 (by species) cont.

Cirsium andrewsii
Monitoring Level: 2.5, map and census+demographic information by population

The census was done by walking the population area and by counting each individual. Demographic monitoring: In order to better understand the population structure and the possible cause of mortality, demographic monitoring was initiated in 2001. Each *Cirsium andrewsii* population will be monitored and each individual scored as seedling, vegetative, or flowering. If the plant is less than 6 inches in diameter it is classified as a seedling, if larger than 6 inches diameter it is classified as vegetative and finally if the plant is flowering it is classified as flowering.

Clarkia franciscana
Monitoring Level: 2, map and census

Population boundaries were initially marked with pin flags. The perimeter of the population was then walked with the GPS unit to create accurate polygons for mapping. Each population polygon was then divided into sections using transect tape measures. The size section was determined by *Clarkia franciscana* density and topographic features. Monitors counted the individual *Clarkia franciscana* in the smaller sections, "leap frogging" their way across the entire polygon. A clicker was used to count each individual.

Cordylanthus maritimus ssp. *palustris*
Monitoring Level: 2, map and census + demographic information

Sub-populations of *Cordylanthus maritimus ssp. palustris* (the seeding plots and individual plants outside of the plots) were surveyed and counted once on May 12, 2004 during the 51-day marsh closure, about three weeks before bleaching the marsh inlet. The census was done by counting each individual plant within each seeding plot and outside of the seeding plots. The extent or boundary of the population at the west side of the marsh was mapped with a Pro-XR GPS unit on May 25, 2004, and additional plants found at the south and east sides of the marsh were mapped later in June.

Demographic monitoring: In order to better understand the population structure and to obtain reproduction information of the species, we counted the number of individuals that had flowered and produced fruit as well the total number of individual plants on July 31 and Aug. 10, 2004. Future reports should include this data. If the plant seemed to have produced flower at some point, it was considered to have flowered, even if the plant was dried up at the time of the survey. If the plant had one or more seed pots on it at the time, it was considered to have fruited.

In order to enhance the genetic diversity and the size of the existing population, we sowed approximately 13.6g of seeds (12,811 seeds) into six one-meter-square seeding plots within the existing population at the west side of the [redacted] on Nov. 25, 2004 (Please refer to coma_Reintro_note03.doc for details). The seeding plots were mapped on Dec. 11, 2003. The elevations of the seeding plots were surveyed on May 13, 2004.

Presidio monitoring methods used in 2004 (by species) cont.

Erysimum fransicanum
Monitoring level: 2, map and census

Erysimimum franciscanum populations were only monitored in the [redacted] sites and along the serpentine [redacted] as well as at [redacted]. Populations were ground truthed using the 2003 Presidio Special Status Plant Report maps. Upon locating each population a census of individuals was conducted.

Gilia capitata ssp. *chamissonis*
Monitoring Level: 1, presence/absence & general health of populations

2004 monitoring consisted of determining if the species was present or absent from the site. If the population was found to be present then an estimation of the number of individuals was conducted at that time. Additionally, if the boundary of the population had changed dramatically since the 2001 survey a new polygon was created.

Grindelia hirsutula ssp. *maritima*
Monitoring level: 2, map and census

No monitoring was conducted in 2004. Last census of this species was conducted in 2003.

Hesperolinon congestum
Monitoring level: 2, map and census

A complete census of both populations was conducted in 2004.

Horkelia cuneata ssp. *sericea*
Monitoring level: 2, map and census

The two existing populations, HOCU1 and HOCU2, were both thoroughly examined for plants using the 2003 Presidio Special Status Plant Report. All existing individuals were counted.

Presidio monitoring methods used in 2004 (by species) cont.

Lessingia germanorum
Monitoring level: 2, map and census/sample

Two methods were used to estimate populations of *Lessingia germanorum* on the Presidio of San Francisco. The method used depended on the size of the population based on the previous years' results. A census was performed for populations under 10,000 individuals, and random quadrat sampling was performed for populations over 10,000 individuals. Prior to either method, the perimeter of each population was plotted using a GPS unit and mapped in a digital GIS format.

A census was conducted on the following sites, [redacted] and [redacted], a subsite of [redacted] (formerly [redacted] On each of these sites every individual was counted.

Sampling was conducted on seven sites including [redacted] ([redacted]), [redacted] ([redacted]), and [redacted].

Sampling method (repeated from 2003 year-end report):
½ square meter bipartite quadrats were randomly located on each of these sites using the Alaska Pak extension for Arcview 3.1. The number of quadrats used for each area was determined by calculating the sample variance. The sampling level was determined to be sufficient when the variance was 20% or less for each additional quadrat. An estimation for the entire population size was made by taking the mean of all sampled quadrats and multiplying it times the number of quadrats that can fit in the population area.

Silene verecunda var. *verecunda*
Monitoring level: 2, map and census

All populations were located by ground-truthing maps from the 2003 Presidio Special Status Plant Report. All individuals were counted and the polygon was re-drawn if the population had shifted significantly from previous years.

At SIVE 6, two tape measures were laid out in order to divide the population area into 4 squares. This allowed for smaller areas to be counted with greater accuracy due to a high number of *Silene vercunda spp. verecunda* plants that are located in the *Lupinus chamissonis* understory.

Suaeda californica
Monitoring level: 2, map and census

Information below repeated from 2003 year-end report –

In January of 2003 a new datasheet was created to collect quantitative data for *Suaeda caliornica*. Information recorded includes the height of the tallest stem/branch of an individual, the length of the longest stem/branch, the number of alive terminal nodes, and whether the individual was in flower.

Presidio monitoring methods used in 2004 (by species) cont.

Tanacetum camphoratum
Monitoring level: ?

No monitoring was conducted in 2004. The last census was conducted in 2003 and was the first year this species was censused within the Presidio.

Tryphysaria floribunda
Monitoring level: 2, map and census

A complete census was done throughout the area. Meter tapes were laid out to divide the area into one-meter wide sections. Each person began at opposite ends of the line and counted each individual until meeting in the middle. Flagging tape was used by each person to further divide the area and mark sections that had already been counted. Counting was recorded on hand tally counters. The eastern part of the population was surveyed, but no individuals were found.

Appendix IX. Protocol and File Structures for Arcview Shape files

PROTOCOL AND FILE STRUCTURES FOR ARCVIEW SHAPE FILES (TEMPLATE.DBF, RAREFLORA.DBF) GGNRA RARE PLANT MONITORING PROGRAM

Currently, all arcview files created in 2002, 2003 and 2004 are in the network folder: **Q:\Home_working\Rare_yr\Arcview\.** All arcview files for years previous to 2002 are in the network folder: **Q:\GOGA\data\Species\Vegetation\Rare\Rare_yr** (e.g Rare_01, Rare_00).

The tables below contain attributes associated with the Rare Plant Survey ArcView shape files for each rare plant population. Populations for each species of concern are contained in a file with the following data structure. Each year a copy of the previous years' shape file and associate files are copied, renamed and repopulated with that years' data.

Rare Species ArcView Shape files: ([*sp_code*]+[*survey year*].*shp*)

Each year, a new ArcView Shape file is created for each rare plant species known to occur in GGNRA or in the San Francisco Watershed District. The file names consist of the species code followed by the last two digits of the survey year (e.g. the shape file for *Arabis blepharophylla* in 2003 is called *arbl_03.shp*). Every shape file attribute table must have the following file structure. A –99 denotes no data available. This is used so that there is no confusion between no data and numeric data equaling zero.

	Field Name	Type	Width, Decimal	Description
1	POP_CODE	Character	25	Unique population code. Derived from the species code, location and population number fields. (e.g. ARBL_MAHE_05). This code is the only unique field for a population.
2	PARTS	Numeric	11	Number of polygons associated with this population. Greater than one polygon can be associated with each population.
3	CREATOR	Character	30	Person or persons who surveyed the population this year.
4	TOTAL_IND	Numeric	10	Total number of individuals for this population counted this year. **–99 denotes no data available whereas 0 denotes no species observed at the site.**
5	SP_CODE	Character	6	4 or 6-letter species code derived from the first two letters of the genus, species and sub specific names given in the Jepson Manual. This is used to link to *rareflora.dbf* and as well as part of the field pop_code.
6	EST_YEAR	Numeric	4	Year this population was first added to GGNRA Rare Plant Surveys
7	SURV_DATE	Character	9	Date population was surveyed this year written as mm/dd/yy; this will be -99 if no survey was attempted this year (SURV_STAT=5)
8	SURV_YEAR	Numeric	4	Survey year-assigned even if no survey was done this year.

9	POP_NUM	Numeric	2	Unique population number for a general location.
10	LOCATION	Character	10	General location name for this population
11	MAP_SOURCE	Character	10	Survey methods used to map population
12	MODIFIED	Character	100	Notes regarding changes to polygon this year
13	AREA	Numeric	18,4	Area in square meters of population
14	PERIMETER	Numeric	18,4	Perimeter, in meters, of population
15	ACRE	Numeric	18,4	Area in, acreage, of population
16	SURV_METH	Character	25	Methods used to census population this year
17	SURV_STAT	Numeric	2	Survey status for this years census: 1=Population located and counted this year. 2=Population located, but not counted this year 3=Population site located with high certainty, but no individuals were observed. 4=Population site not located with high certainty, no individuals observed. 5=Population not visited this year.
18	NDDB_OCC	Numeric	5	Natural Diversity Database Occurrence number, if any.

rareflora.doc

This table contains the attributes for rare vascular plant species listed in CNPS's Inventory of Rare and Endangered Vascular Plants of California that are known to occur in Golden Gate National Recreation or the San Francisco Watershed District. Nomenclature primarily follows The Jepson Manual: Higher Plants of California (Hickman 1993).

	Field Name	Type	Width, Decimal	Description
1	CODE	Character	6	Unique 4 or 6 letter code derived from the first two letters of genus, species and sub specific names given in the Jepson Manual (Hickman 1993).
2	FAMILY	Character	18	Family
3	GENUS	Character	16	Genus
4	SPECIES	Character	25	Specific epithet
5	SP_AUTH	Character	55	species authority
6	RANK	Character	4	Ssp., var., or s.l. designation s.l. = *sensu latu*; in the broad sense. Used when insufficient information is available to determine subspecies or variety
7	SSP	Character	20	subspecific name, if applicable
8	SSP_AUTH	Character	55	subspecific authority
9	TRINOMIAL	Character	115	full latin species name
10	COMMON	Character	50	Common name of taxon; convention dictates that these not be capitalized even when in latin
11	COM_SOURCE	Numeric	1	Source of common name: 1 = The Jepson Manual (Hickman 1993) 2= CNPS's Inventory of Rare and Endangered Vascular Plants of California

				(Skinner 1994)
12	FORM	Numeric	2	11 = Annual Herb 12 = Biennial Herb 13 = Perennial Herb 20 = Sub-shrub 30 = Shrub - unknown if deciduous or evergreen 31 = Deciduous Shrub 32 = Evergreen Shrub 41 = Deciduous Tree 42 = Evergreen Tree 50 = Other 99 = Unknown
13	RARITY	Numeric	1	CNPS Rarity Code: 1=Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time. 2=Distributed in a limited number of occurrences, occasionally more if each occurrence is small. 3=Distributed in one to several highly restricted occurrences, or present in such small numbers that it is seldom reported.
14	ENDANGER	Numeric	1	CNPS Endangerment Code” 1=Not endangered 2=Endangered in a portion of its range 3=Endangered throughout its range
15	DISTRIB	Numeric	1	CNPS Distribution Code: 1=More or less widespread outside California 2=Rare outside of California 3=Endemic to California
16	STATE	Character	2	State-Listed Plant Codes: CE=State-listed, endangered CT=State-listed, threatened CR=State-listed, rare CC=Candidate for state listing
17	FED	Character	3	Federally-listed codes: FE=Federally-listed, endangered FT=Federally-listed, threatened PE=Federally-proposed, endangered PT=Federally-proposed, threatened C1=Enough data are on file to support federal listing. C2=Threat and/or distribution data are insufficient to support federal listing. C2*= Threat and/or distribution data are insufficient to support federal listing, but the plant is presumed extinct C3a=Extinct C3b=Taxonomically invalid C3c=Too widespread and/or not threatened
18	CNPSLIST	Character	2	Code for CNPS lists:

				1A:Plants Presumed Extinct in California 1B:Plants Rare, Threatened or Endangered in California and Elsewhere 2=Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere 3=Plant About Which We Need More Information--A Review List 4=Plant of Limited Distribution--A Watch List
19	COMMENTS	Character	50	comments regarding nomenclature

Directions on how to copy and rename last year's shape files (themes) to present year's folder:
(using ArcView 3.1)
-Open any ArcView view window:
-File
-Manage Data Sources
-Copy and rename files to this years name (e.g. change ARBL_02 to ARBL_03)
-Repeat for each species file.
**You must repopulate the newly created attribute table with present years data

Directions on how to add a new population to an existing species file:
After copying and renaming files, add your newly created theme to a view
-Theme
-Start Editing
-Click on the draw polygon editor to add an polygon and .
-Stop and save edits
-remember to recalculate the area, perimeter and acre fields after adding the new polygon

To calculate a field's values
To update the area, perimeter and acre fields:
-Select the table of the shape file to which a change in polygon size or shape has been made
-Select the field to be updated by clicking on the field name at the top of the column
-Select (i.e. highlight) the records that are to be updated (you can update a single record or several at a time)
-Select "Field" "Calculate" in the drop down menu
-Type in the expression
[Shape].ReturnArea – calculates area of a polygon
[Shape].ReturnLength – calculates perimeter of a polygon
[Area]*0.0002471 – calculates acres

For additional information look in the Arcview Help menu under"Calculating a field's values"

Directions on how to modify an existing population:
After copying and renaming files, add your newly created theme to a view
-Theme
-Start Editing
-click on 'vertex edit' and modify polygon as needed
-Stop and Save edits
-remember to recalculate the area, perimeter and acre fields after adding the new polygon

How to convert shape files from previous years into present years format
Merge shapes:
Before 2001, if there were greater than one polygon for a population, there was greater than one record for that population. These multiple records also contain identical information as

each other. This is confusing and a potential risk for data interpretation. It is possible to place multiple polygons within a single table record. The only downside is that it is slightly more arduous to add another polygon to an existing population. It is just as simple to add a new population to a shape file. It is easiest to merge polygons before adding this years data to the tables. Once this is done, it will never have to be done again unless you add a new polygon to an existing population.

Directions on how to merge population polygons in a shape file

**You only need to do this procedure if there are multiple polygons for a population.

When you merge polygons, ArcView 3.1 will automatically create a new summary shape file. Fear not, you will not be overwriting the source shape file.

-Open the shape file you want to merge

-Open the attribute table

-If you have not already done so, you need to create a field that contains a unique code for each population.

-Table

-Start editing

-Edit

-Add field

Add a string (character) field called *pop_code* with 25 characters in it. Populate this field with the species code, location code and the population number. It should look something like this: HECO_MAHE_01

Stop and save edits.

-Click on the *pop_code* field header.

-Click on the summary button

-Select where and what you want to call the summary table to be saved.

-Add *merge_shape* to the right box, this will merge all polygons that contain identical entries in the *pop_code* field. This is the most important field to keep. Add the remaining fields that you want to be added to your summary field.

-Once you've selected all your fields and how you want them to be summarized, click on OK.

Now you have a summary field with all the wrong field names. For example, the *perimeter* field will be called *sum_perimeter* in the summary table. This means that you have to rename the field perimeter. In arcview 3.1 there is now simple way to do that. Instead, you have to add a new field called perimeter and copy the original data in there. See directions below on how to update these fields to the present file structures.

How to update shape file attribute table files structures

Unfortunately in ArcView 3.1 there is no quick way to rename file structures or change their type (numeric, string, boolean etc...). Instead you have to create a new field, copy the data from the old field into the new field and delete the old field. The end result is a table with an identical file structure to the one in the table above.

Appendix X. Problematic Species Information

Ceanothus masonii McMinn

Mason's ceanothus

Rarity Status
Federal Listing: None
State Listing: Rare
CNPS List: 1B / R-E-D Code: 3-2-3

Nomenclature
The Jepson Manual: accepted
CNPS: accepted

2003 update:
1. Status of the species *C. masonii*
A new treatment of the genus *Ceanothus* is being prepared as part of a forthcoming book, Ceanothus, by David Fross & Dieter Wilken, to be published by Timber Press, Portland, Ore. Dr. Wilken indicates that because of the close similarity between *C. masonii* and *C. gloriosus* var. *exaltatus, C. masonii* should be included within *C. gloriosus* (also a special status species occurring within the GGNRA) rather than considered a separate species. Note that this treatment has not yet been finalized and published and therefore this update is presented here for guidance only; it should be treated with caution. Dr. Wilken's treatment notes that populations conforming to the description of *C. masonii* are of special conservation concern due to their restricted distribution. His description indicates that these populations mostly have leaves 7-21mm long (a slightly different set of measurements from the *C. masonii* description above, which is taken from the Jepson manual).

It is not clear what impact this new treatment, when published, might have on the recognition of *C. masonii* by other botanists and organizations. *C. masonii* has been recognized as a separate species for many years. Note that even if included within *C. gloriosus*, the plants may merit special status.

Populations currently documented as C. masonii should continue to be managed as special status plants unless the CNPS ceases to recognize them.

2. Status of populations within the GGNRA
Two new areas containing plants that resembled *C. masonii* (CEMA_[redacted]_02, CEMA_[redacted]_03) were investigated during late summer 2002 and tentatively added to the inventory of rare plant populations. In spring 2003 the populations were revisited and samples taken from plants in bloom. The flower color in both populations was medium purple to pale purple, becoming lighter in color as flowers aged. Leaf morphology was very variable but appeared in at least some plants to be consistent with specimens labeled as *C. masonii* in the California Academy of Sciences herbarium. Plants from the area of Pop. 2 have previously been considered specimens of *C. masonii* by Dr. Tom Parker at SFSU and by Dr. Mike Hardig at the University of Montevallo, Al. (Dr. Hardig has researched *Ceanothus* taxonomy).

Specimens from these populations were sent to Dr. Cliff Schmidt, the author of the *Ceanothus* treatment in the Jepson Manual, who said that they did not seem to fit any one taxon. Ceanothus taxa hybridize easily and Dr. Schmidt suggested that the plants may be hybrids

between different local species. In December 2003, the specimens were sent to Dr. Wilken for further evaluation.

Management recommendations

No changes in management approach should be undertaken until the status of the species and populations becomes clearer. Populations currently confirmed as *C. masonii* should continued to be monitored every three years. Management of the new potential populations depends on the response of Dr. Wilken; if he determines that the plants belong to a special-status taxon, they should be monitored in the same way as other *Ceanothus* populations. If he determines they do not merit special status, they can be removed from the inventory. Until the status of these plants is determined, the populations should be checked every three years to verify their continued presence but there is no need for full monitoring.

Appendix X (cont.)

***Grindelia hirsutula* H. & A. *var. maritima* (Greene) M.A. Lane**
San Francisco Gumplant

Rarity Status
Federal Listing: None
State Listing: None
CNPS List: 1B / R-E-D Code: 2-2-3

Nomenclature
The Jepson Manual: Accepted
CNPS: Accepted

Reporter: M. Faden

Update and management recommendations
This is an update of the identification problem described in Appendix VII of the 2002 Rare Plant Monitoring Report report.

Grindelia hirsutula var. *maritima* is a plant of coastal bluffs. Within the GGNRA, occurrences are documented only at the Presidio. However, plants resembling this variety can be found at various locations in the Marin Headlands.

During summer 2003, specimens collected in the Marin headlands during summer 2002 were taken to Dr. John Strother, a specialist at the University Herbarium, University of California at Berkeley. Dr. Strother is working on a new treatment of the genus *Grindelia* for the Flora of North America.

Dr. Strother agreed to look at the specimens and to provide a preliminary opinion, with a definitive identification later on when the new treatment has been completed. He briefly examined the specimens and rendered a preliminary opinion that under the current classification, the specimens should be reported as the rare *G. hirsutula* var. *maritima.*

However, due to the fact that the taxonomy of the genus may be revised, it is not recommended that any further inventory or monitoring work be undertaken until the new treatment is complete and/or the taxonomic status of the plants is clarified. The taxonomy of *Grindelia* is problematic and has changed frequently; the status and definition of some species might therefore change again under any new treatment.

Dr. Strother should be contacted periodically to check on the progress; the treatment was originally scheduled for completion in fall 2003 but has been delayed. The Marin Headlands specimens were left by Mike Faden with Dr. Strother at the Herbarium. If the specimens are considered to belong to a special status species, a full inventory should be undertaken and a monitoring approach devised.

Background information and detail

The taxonomy of the genus *Grindelia* is widely seen as problematic: the descriptions, names and overall number of species have changed repeatedly. An additional identification problem is that plants tend to be very variable.

The Jepson manual description of the rare *G. hirsutula* var. *maritima*, by Meredith A. Lane, describes the variety as more or less glabrous, often leaning, with red-brown to purple stems and with heads more or less subtended by phyllary-like bracts. The phyllaries are erect to spreading and the ray flowers are short, 11-15mm in length.

Other members of the genus that occur on or near coastal bluffs include *G. stricta* var. *platyphylla* and the common *G. hirsutula* var. *hirsutula*. It was suggested by Lane that *Grindelia* frequently hybridize and that the rare var. *maritima* may have arisen as a hybrid of these two taxa.

G. hirsutula var. maritima can be distinguished from *G. stricta* var. *platyphylla* by leaf shape. The Jepson key distinguishes *G. hirsutula* var. *maritima* from *G. hirsutula* var. *hirsutula* by fruit morphology. However Marin specimens of both varieties in the California Academy of Sciences herbarium were examined in 2002, and no consistent distinguishing characteristics in the fruits could be observed in the time available.

Specimens from Marin, labeled as such by M. A. Lane, can be found in the California Academy of Sciences herbarium. Only one specimen was found at the CAS herbarium that had been collected in the Marin Headlands; it was taken from between Tennessee Cove and Pirate's Cove.

In 2002 field inventory surveys, plants that more or less conformed to var. *maritima* were found on coastal bluffs and hills in several locations in the Marin Headlands. The plants that conformed most closely to the Jepson description of overall plant morphology were found on the north-facing slopes of [redacted] above [redacted]. Other plants were found along coastal bluffs between [redacted] and [redacted]; on hills [redacted] of Muir Beach; along the [redacted] and east on north-facing slopes of [redacted]. These plants were found in survey areas GOGA001, 012, 014, 018, 019, 025 (see the 2002 Rare Plant Inventory Report); the plants may be considered locally common on bluffs. In other areas searched, such as Rodeo Valley, the Conzleman Road/Hawk Hill area, and Sweeney Ridge, only plants that better fitted *G. hirsutula* var. *hirsutula* were found. Specimens were collected from several locations and pressed.

Unsuccessful attempts were made in 2002 to contact M. A. Lane for help with identification. These specimens are now in the possession of Dr. Strother at the UC Herbarium. He can be contacted at strother@uclink4.berkeley.edu, 510-642-7890. His address is: University Herbarium, 1001 Valley Life Sciences Bldg., #2465, Berkeley, CA 94720-2465.

Appendix XI. Photo Credits

Cover page,

p. 8 *Acanthomintha duttonii*, John Game
p. 12 *Arabis blepharophylla*, Robert Potts, California Academy of Sciences
p. 26 *Arctostaphylos hookeri* ssp. *montana*, Gladys Lucille Smith, Cal. Academy of Sci.
p. 42 *Calamagrostis ophitidis*, Dean Wm. Taylor
p. 46 *Calochortus umbellatus,* Charles Webber, California Academy of Sciences
p. 52 *Castilleja affinis* ssp. *neglecta,* Dr. Robert Thomas and Margaret Orr, Cal Academy
p. 59 *Castilleja ambigua* ssp. *humboldtiensis*, Brother Alfred Brousseau, St. Mary's College
p. 63 *Ceanothus gloriosus* J. Howell var. *exaltatus* Charles Webber, California Academy of Sci.
p. 71 *Ceanothus* sp. Nova (undescribed), Brent Johnson, Contractor, GGNPA 2001
p. 75 *Chorizanthe cuspidata* var. *cuspidata*, John Game
p. 85 *Cirsium andrewsii*, Brother Alfred Brousseau, St. Mary's College
p. 93 *Cirsium fontinale* var. fontinale, J. E.(Jed) and Bonnie McClellan, Cal. Academy
p.101 *Cordylanthus maritimus* Benth. ssp. *palustris* (Behr) Chuang & Heckard
p.107 *Dirca occidentalis* flowers, Brother Alfred Brousseau, St. Mary's College
p.108 *Dirca occidentalis* with fruits, Gladys Lucille Smith, California Academy of Sciences
p.113 *Elymus californicus*, Doreen Smith
p.121 *Eriogonum luteolum* E. Greene var. *caninum*, Bart and Susan Eisenberg
p.122 *Eriogonum luteolum* E. Greene var. *luteolum,* Brother Alfred Brousseau, St. Mary's College
p.125 *Eriophyllum latilobum*, Dean Wm. Taylor
p.129 *Erysimum franciscanum*, Brent Johnson
p.147 *Fritillaria affinis* var. *tristulis,* John Game
p.151 *Fritillaria liliacea*, Brent Johnson, Contractor, GGNPA 2001
p.181 *Lessingia arachnoidea*, Brent Johnson, Contractor, GGNPA 2001
p.182 *Lessingia arachnoidea* and *Centaurea solstitialis,* Brent Johnson
p.192 *Linanthus ambiguus*, Gladys Lucille Smith, Cal. Academy of Sciences
p.198 *Lupinus arboreus* var. *eximus*, Dean Wm. Taylor
p.202 *Malacothamnus fasciculatus* var. *arcuatus*, Sheri Lubin
p.206 *Pentachaeta bellidiflora*, John Game
p.210 *Plagiobothrys chorisianus* var. *chorisianus,* Dean Wm. Taylor
p.219 *Uropappus lindleyii*, (formerly identified as *Stebbinoseris decipiens*), Brent Johnson, GGNPA 2001
p.219 *Uropappus lindleyii*, Beatrice F. Howitt, California Academy of Sciences, 1999
p.219 *Uropappus lindleyii*, Charles Webber, California Academy of Sciences, 1998

Appendix XII. Sources

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Subject: Draft Agenda for Dog Mgt Plan Coordination mtg.
(Thursday,3/17:10:30-12PM); Location: Chris's office.
Call-in #: 1-866-732-4230, then dial Non-Responsive

A. Interim Commercial Dogwalking (10:30-11:15)

-Trust's CDW draft rule (Katie, USPP, et al)
-LE/USPP field reports; security briefing overview (Xave; Chad/Tim)

B. Proposed Rule (11:15-11:20)

-Status of Technical Corrections (Mike)

C. **Communications (11:20-12)**

-Public Mtgs Plan & Stations Overview: (Howard, Kristin)
-Comms Strategy: Follow-up Actions (Howard)
-FOIA follow-up: (Howard)

Total Maximum Daily Load for Bacteria in San Francisco Bay Beaches

Draft Staff Report for Proposed Basin Plan Amendment

California Regional Water Quality Control Board

San Francisco Bay Region

FOR PEER REVIEW – September 15, 2015

San Francisco Bay Regional Water Quality Control Board
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http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/SFbaybeachespathogens.shtml

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1 INTRODUCTION

This report presents the supporting documentation for a proposed amendment of the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) to address impairment of San Francisco Bay beaches by bacteria and other pathogens (e.g., viruses) associated with fecal contamination, hereinafter referred to as bacteria. The Basin Plan amendment would establish:

(1) Numeric targets for indicator bacteria densities (concentrations) based on current Basin Plan water quality objectives. Attainment of targets will protect the health of water contact recreational users of the beaches;

(2) Total Maximum Daily Loads (TMDL) and allocations that will achieve the targets; and

(3) Implementation plans for bacteria.

This TMDL addresses bacteria impaired beaches in San Francisco Bay east of the Golden Gate Bridge. The impaired beaches include:

- Aquatic Park Beach, San Francisco
- Jackrabbit, Sunnydale Cove, and Windsurfer Beaches in Candlestick Point State Recreation Area, San Francisco
- Crissy Field Beach, San Francisco
- Parkside Aquatic and Lakeshore Beaches on Marina Lagoon, City of San Mateo
- China Camp Beach, Marin County
- McNears Beach, Marin County

Two of these beaches, China Camp and McNears, are on the Clean Water Act (CWA) Section 303(d) list of impaired water bodies because only one bacterial indicator, total coliform, exceeds the Basin Plan's water quality objective. The other beaches exceed the water quality objectives for enterococcus as well as other bacterial indicators.

Figure 1.1 shows all the beaches located along San Francisco Bay that are monitored for bacteria under section 115880 of the California Health and Safety Code, with the CWA Section 303(d)-listed beaches highlighted. This report contains the results of analyses of bacteria impairment assessments, sources and loadings, linkage analyses, proposed acceptable bacterial load allocations, and implementation actions.

1.1 Regulatory Background

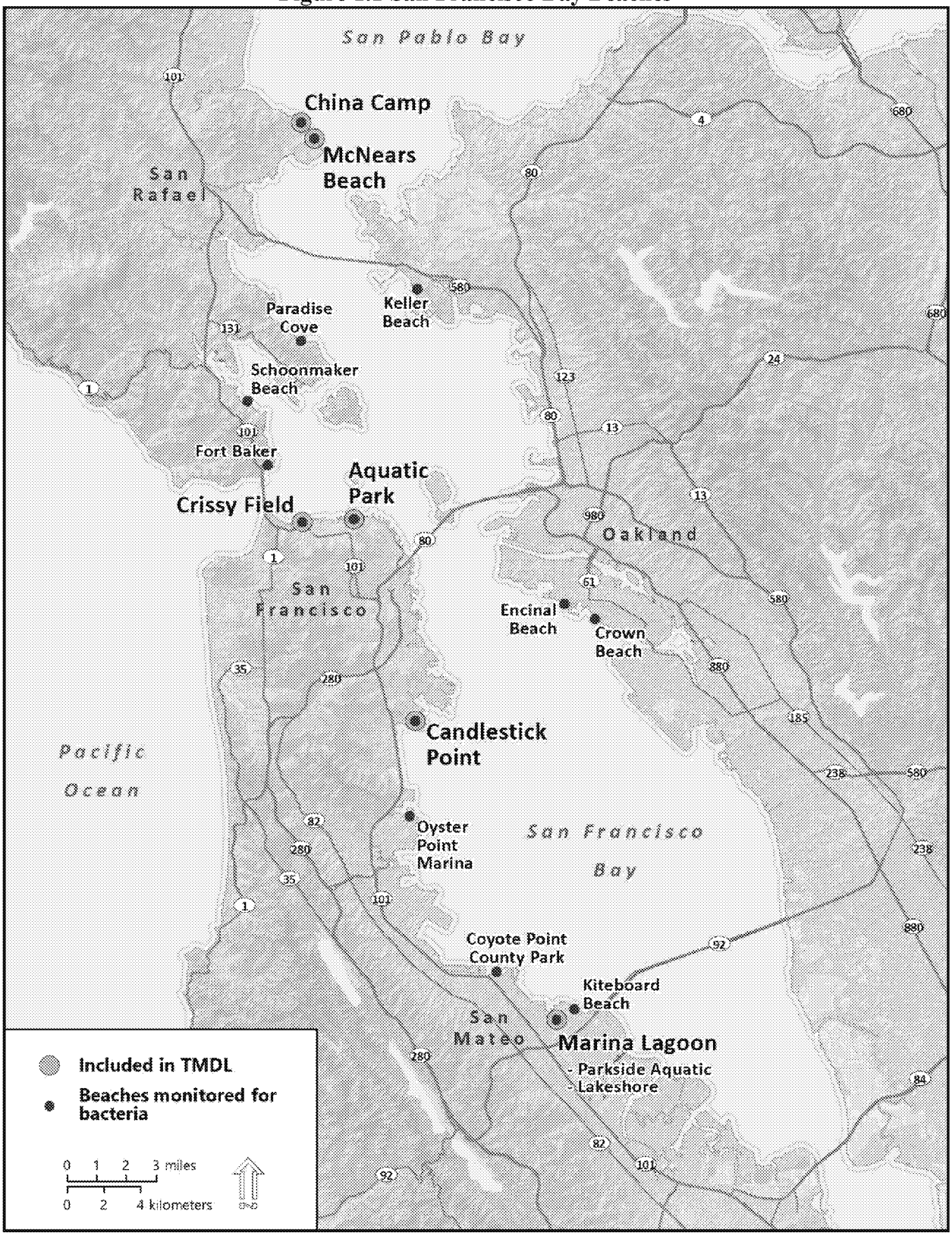
The CWA requires California to adopt and enforce water quality standards to protect all water bodies within the State. The Basin Plan delineates these standards for the Region. The standards include beneficial uses of waters in the Region, numeric and narrative water quality objectives to protect those uses, provisions to enhance and protect existing water quality (antidegradation), and other plans and policies necessary to implement water quality objectives. CWA Section 303(d) requires states to compile a list of "impaired" water bodies that do not meet water quality standards and to establish a TMDL for the pollutant that causes impairment. The proposed TMDL and implementation plan are designed to resolve existing bacterial impairment in San Francisco Bay beaches.

A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates the acceptable pollutant load to point and nonpoint sources. A TMDL is defined as the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background such that the capacity of the water body to assimilate pollutant loads (the loading capacity) is not exceeded. The TMDL must take into account seasonal variations and include a margin of safety to address uncertainty in the analysis. In addition, the Water Board must develop a water quality management plan ("implementation plan") to implement the TMDL. Finally, TMDLs must be included in the State's water quality management plan (i.e., the Basin Plan).

The U.S. Environmental Protection Agency (U.S. EPA) has oversight authority for the CWA 303(d) program and is required to review and either approve or disapprove the state's 303(d) list and each TMDL developed by the state.

In addition, the scientific basis of the Basin Plan amendment must undergo external scientific peer review. This step is required under section 57004 of the Health and Safety Code, which specifies that an external review is required for work products that serve as the basis for a rule, "…establishing a regulatory level, standard, or other requirements for the protection of public health or the environment." The scientific basis of the San Francisco Bay Beaches Bacteria TMDL, as presented in the Staff Report, will undergo evaluation by one or more peer reviewers whose comments will be considered in finalizing this staff report and the proposed Basin Plan amendment.

Figure 1.1 San Francisco Bay Beaches



1.2 Document Organization

The process for establishing a TMDL includes compiling and considering available data and information, conducting appropriate analyses relevant to defining the impairment problem, identifying sources, and allocating responsibility for actions to resolve the impairment. This report is organized into sections that reflect the key elements of the TMDL and the new implementation provisions for bacterial water quality objectives. Section 2 presents background information about the physical settings of Aquatic Park, Candlestick Point, China Camp, Crissy Field, Marina Lagoon, and McNears Beaches. Section 3 presents the problem definition that the project is based on and defines the project, why it is necessary, and its objectives. Section 4 presents the applicable water quality standards.

Section 5 presents results of past and recent bacterial water quality studies. Section 6 presents the proposed numeric targets. Section 7 provides our understanding of the potential sources of loading of bacteria to each of the San Francisco Bay Beaches.

Section 8 presents the proposed pollutant load and wasteload allocations to identified pollutant sources. Section 9 presents the linkage analysis, which describes the relationship between indicator bacteria sources, load allocations, and the proposed targets. Section 10 presents the implementation plan, which includes actions and requirements deemed necessary to resolve the water quality impairment.

Section 12 specifies monitoring activities to demonstrate attainment of numeric targets and pollutant load and wasteload allocations. Section 13 will present the Regulatory Analyses, including the CEQA analysis and CEQA checklist and a consideration of economics, and will be drafted after peer review is completed. Section 14, References, lists all the information sources cited and relied upon in preparation of this report.

The proposed Basin Plan Amendment is contained in Appendix A.

2 DESCRIPTION OF IMPAIRED BEACHES

This section provides descriptions of the general characteristics, surrounding land use, and recreational usage of each of the San Francisco Bay beaches for which recreational uses are impaired currently by excessive concentrations of fecal indicator bacteria (FIB).

2.1 Aquatic Park Beach

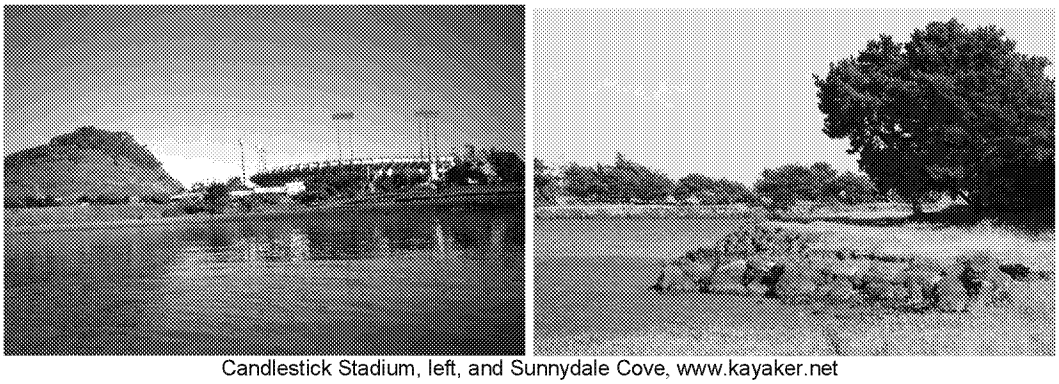
Aquatic Park Beach is located in San Francisco, within the San Francisco Maritime National Historic Park. The beach lies within a horseshoe-shaped cove bounded by Hyde Street Pier on the east and the fishing pier on the west. Other features within this National Park include historic ships, such as the Balclutha on Hyde Street Pier and the Bathhouse building, which was built by the Works Progress Administration in the 1930s.

Situated between Fisherman's Wharf and Crissy Field Park, Aquatic Park is a highly popular location for strolling, sunning and swimming. In addition, the beach is used year-round by swimming and rowing clubs. Land use in the Aquatic Park Beach watershed is intensely urban.

Aquatic Park Beach, National Park Service Photo

2.2 Candlestick Point Beaches

Candlestick Point State Recreation Area is located at the southeastern tip of San Francisco, adjacent to Candlestick Stadium. The State purchased the land in 1973 and soon after turned it into a state recreation area, making Candlestick Point Park the first urban state recreation area in California. The park contains two fishing piers and three beaches: Jackrabbit Beach, Windsurfer Circle, and Sunnydale Cove (sometimes identified as Hermit's Cove). Windsurfer Circle in particular is a popular area for windsurfing due to its strong winds. The area adjacent to Candle Point State Recreational Area has a mix of urban industrial and commercial land uses and is currently undergoing extensive redevelopment. The future use of the former Candlestick Stadium site is expected to be a mix of residential and commercial uses.



Candlestick Stadium, left, and Sunnydale Cove, www.kayaker.net

As required by its National Pollutant Discharge Elimination System (NPDES) permit for discharges of treated wastewater, the San Francisco Public Utility Commission (SFPUC) conducts recreational-use studies to quantify, to the extent possible, the number of people using areas near its outfalls for water contact recreation and non-contact recreation. Results of a study of Candlestick Point beaches conducted between October 2009 and September 2011, shown in Table 2.1, provide an idea of the recreational usage at the three beaches.

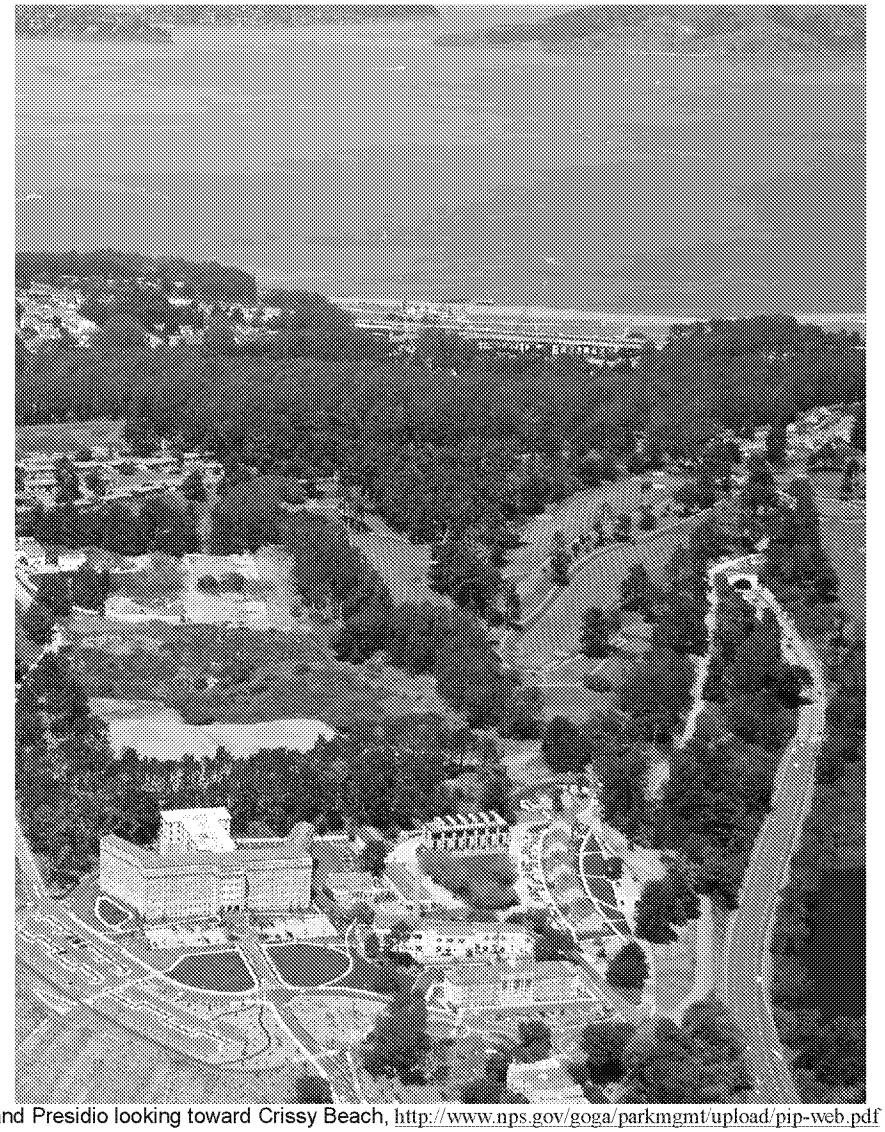
Table 2.1 Estimated Annual Recreational Users - Candlestick Point Beaches[a]

Beach	Water-Contact Users (REC-1)	Non-Contact Users (REC-2)	Total Users	Activities
Sunnydale Cove	210	261	471	Walking, jogging and fishing
Windsurfer Circle	5,698	529	6,227	Fishing at nearby pier accounted for 65% of all REC1; Site also had 87% of all windsurfers observed during study
Jackrabbit	456	770	1,226	Walking/jogging followed by sitting/sunbathing; 75% of all wading observed during study

[a] SFPUC 2012

2.3 Crissy Field Beach

Crissy Field Beach, also called Crissy Beach, is a highly popular two-mile long beach located within the Golden Gate National Recreation Area and the Presidio, a National Historic Landmark District and former U.S. Army base. After the U.S. Army transferred the base to the National Park Service in 1994, Congress created the Presidio Trust, a federal corporation, to manage building leasing, operation and maintenance for the interior area of the Presidio. This interior, or upland, area contains the San Francisco National Cemetery, restaurants, a hotel, museums, office space, retail stores, a water treatment facility, roads and highway, and residences, in addition to high-use park trails and open space. The National Park Service remains responsible for the remaining coastal areas and a few other sites.



Upland Presidio looking toward Crissy Beach, http://www.nps.gov/goga/parkmgmt/upload/pip-web.pdf

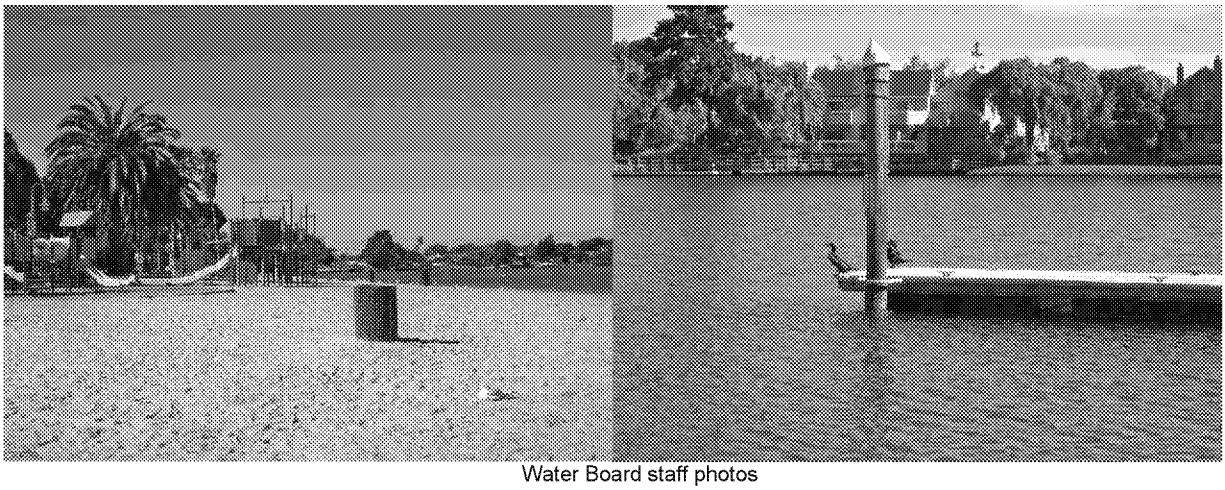
Crissy Field Beach, http://commons.wikimedia.org

The beach is highly popular year-round for strolling, playing, boardsailing and general recreation. Swimming and wading occur, but can be limited by cold water temperatures and strong tidal currents.

2.4 Marina Lagoon Beaches

Marina Lagoon is a tidal slough that has been diked and dredged. It now serves as a flood control basin and aesthetic amenity, and is managed by the City of San Mateo.[1] The lagoon covers approximately 169 acres, ranges from 300 to 400 feet wide, and averages a depth of 6 feet at mid-channel during the summer. It flows from its inlet at the Belmont city limits, where a concrete slide gate structure controls inflow from O'Neill Slough, to its outlet into Seal Slough, a distance of about four miles (City of San Mateo 2013a). It is not uncommon to see the entire distance of Marina Lagoon labeled as Seal Slough on maps.

Recreational uses of Marina Lagoon include swimming, wading, kayaking, motor boating, waterskiing, and wakeboarding. More than 300 private residences, most of which have boat docks, border the Lagoon (City of San Mateo 2012a).



Water Board staff photos

Two public beaches are located on the Lagoon (shown on Figure 5.5):

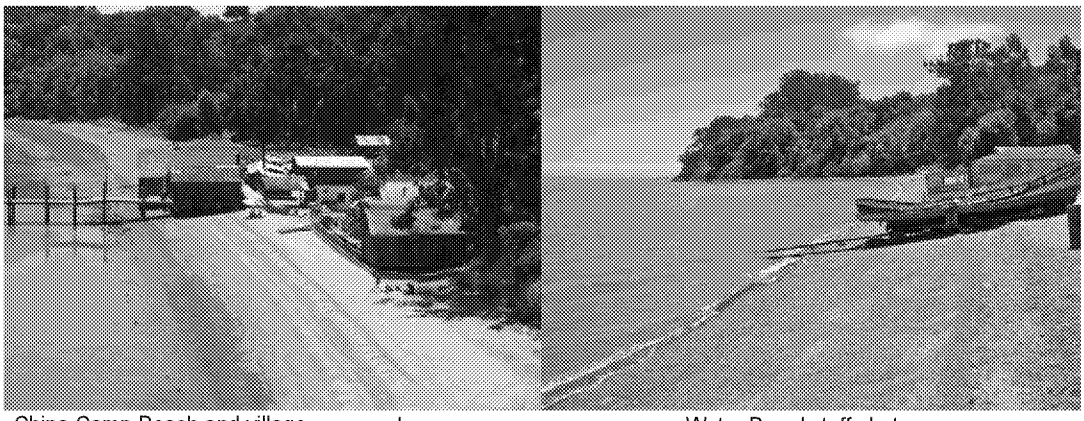
- Lakeshore Park, located at 1500 Marina Court, has beach access to the Lagoon as well as picnic areas, a playground, basketball courts, and a baseball diamond.
- Parkside Aquatic Park, with a sandy beach for swimming, is located at the end of Seal Street. This park offers kayaks, sailboats and stand up paddle surfboards for rent, as well as a boat ramp.

2.5 China Camp Beach

China Camp Beach is located within China Camp State Park, on the southwest shore of San Pablo Bay (Figure 1.1) in San Rafael. A Chinese shrimp-fishing village thrived on this site in the 1880s, populated by nearly 500 people from Canton, China. In its prime, there were three general stores, a marine supply store and a barber shop. Today, the beach offers year-round wading, swimming, kayaking, and boating, with the greatest usage during the warmer months. China

[1] The Corps of Engineers has deferred administrative oversight of this waterway to the City through a renewable 5-yr permit (City of San Mateo 2012a).

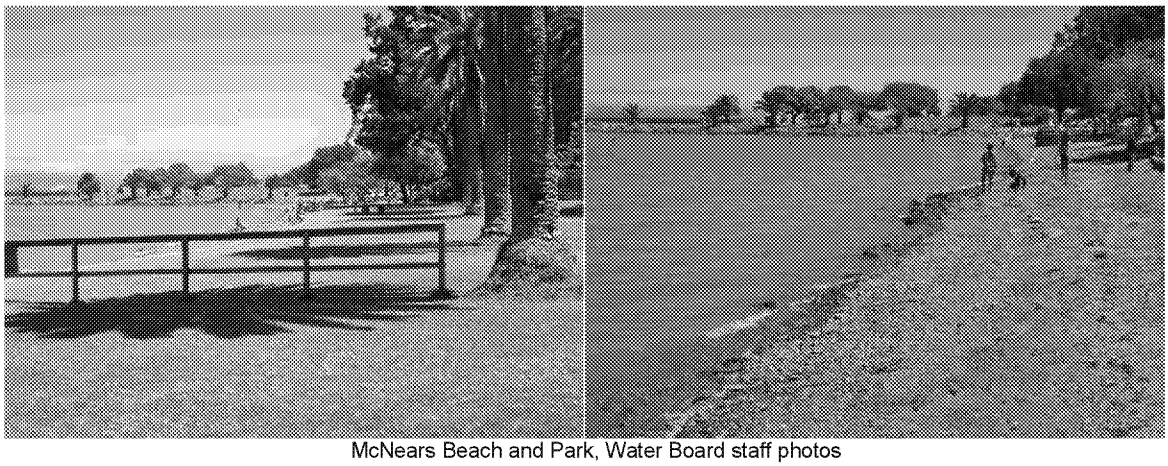
Camp Beach is home to China Camp Village, which consists of a small museum, snack shop, restrooms, and a year-round residence. Other surrounding land uses include the park road and open space.



China Camp Beach and village www.parks.ca.gov Water Board staff photo

2.6 McNears Beach

Just south of China Camp, McNears Beach is located in San Rafael along San Pablo Bay within the 55-acre McNears Beach Park, a popular park operated by Marin County Parks (Figure 1.1). The one-mile long beach is used for swimming, wading, fishing, kayaking and canoeing. In addition to the beach, McNears Beach Park offers adult and toddler swimming pools, tennis courts, grassy play areas, and a fishing pier, as well as shower/changing rooms and restrooms. Dogs are not permitted in the park.



McNears Beach and Park, Water Board staff photos

3 PROJECT DEFINITION

This section presents the problem statement upon which the proposed Basin Plan amendment project is based. It also presents the project definition and objectives by which the project is evaluated under the California Environmental Quality Act (CEQA).

3.1 Problem Statement

San Francisco Bay Beaches are impaired due to fecal indicator bacteria concentrations that exceed water quality objectives. Fecal indicator bacteria include fecal coliform, total coliform and enterococcus, which are types of bacteria that indicate the potential for fecal contamination and a potential risk of pathogen-induced illness to humans. Pathogens pose potential health risks, including gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases, to people who recreate in contaminated waters. Because specific illness-inducing pathogens are difficult to measure in water, we infer the presence of pathogens from high concentrations of fecal indicator bacteria.

This TMDL addresses bacteria impaired beaches in San Francisco Bay east of the Golden Gate Bridge. The impaired beaches include:

- Aquatic Park Beach, San Francisco
- Jackrabbit, Sunnydale Cove, and Windsurfer Beaches in Candlestick Point State Recreation Area, San Francisco
- Crissy Field Beach, San Francisco
- Parkside Aquatic and Lakeshore Beaches on Marina Lagoon, City of San Mateo
- China Camp Beach, Marin County
- McNears Beach, Marin County

3.2 Project Definition

The project is the adoption of a proposed Basin Plan Amendment to: (1) establish a TMDL and an implementation plan for indicator bacteria in San Francisco Bay Beaches; and, (2) establish a framework for achieving water quality objectives at other San Francisco Bay beaches at which bacteria standards are exceeded in the future. The Water Board is obligated under CWA §303(d) to develop a TMDL for these water bodies to address their impairment. The following components form the basis of the proposed regulatory provisions and define the project:

- Numeric targets for indicator bacteria concentrations in water column;
- Density-based total maximum daily bacteria-indicator loads to the beaches;
- Allocation of the density-based total maximum daily bacteria-indicator load among the categorical source categories at each beach;
- A plan to implement the TMDL that includes actions to reduce sources of fecal contamination to achieve load allocations at each of the Beaches; and
- A monitoring program to evaluate progress in meeting the numeric targets.

3.3 Project Objectives

The objectives of the proposed Basin Plan amendment are consistent with the mission of the Water Board and the requirements of the CWA and Water Code. The objectives are to:

- Comply with the CWA requirement to adopt a TMDL for Section 303(d)-listed water bodies;
- Protect existing recreational uses at San Francisco Bay Beaches;
- Attain the water quality objectives for enteroccocus protective of water contact recreation at San Francisco Bay Beaches, as quickly as feasible;
- Set numeric targets to attain relevant water quality standards at San Francisco Bay Beaches;
- Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; and
- Complete implementation of needed fecal contamination abatement measures in as short a time as is feasible.

4 WATER QUALITY STANDARDS

This section identifies applicable laws and regulations, including applicable water quality objectives, beneficial uses of the water bodies covered by this TMDL, and water quality standards.

4.1 Use of Pathogen Indicator Organisms in Water Quality Standards

Microorganisms that have the potential to cause disease are called pathogens, and a subset of these microorganisms is capable of causing human diseases. More than 100 types of human pathogens can occur in a water body polluted by fecal matter (Havelaar 1993), and detecting these organisms is costly and time consuming. Fecal indicator organisms are easier to identify and enumerate in water samples than the broad range of pathogens in human and animal feces, and thus FIB are commonly used to assess microbial water quality for recreational uses.

We acknowledge that FIB include bacteria from animal and environmental sources as well as human sources. Animal sources can include domestic pets, wild animals and rodents, and horses; environmental sources can include biofilms in storm sewers, naturally occurring soil bacteria and decaying kelp; and human sources include sanitary sewer overflows, combined sewer overflows and others. Human sources of bacteria are expected to pose a greater health risk than animals and environmental sources (U.S. EPA 2007). However, U.S. EPA states (U.S. EPA 2009):

> *Contamination of recreational waters with feces from warm-blooded animals poses a risk of zoonotic[2] infection of humans with some of the pathogens in those waters. Although the risk and severity of human illness due to contamination with animal feces and zoonotic pathogens is most likely lower than the risk and severity of illness from treated or untreated human sewage, currently available data are insufficient to quantify the differences.*

While FIB are not necessarily human pathogens, they are abundant in wastes from warm-blooded animals and are easily detected in the environment. The detection of FIB indicates that the environment is contaminated with fecal waste and that human pathogens may be present. Commonly used bacterial indicators of fecal contamination include total coliform, fecal coliform, *E. coli*, and enterococcus.

- Total coliform include several genera of bacteria commonly found in the intestines of warm-blooded animals. However, many types of coliform bacteria grow naturally in the environment—that is, outside the bodies of warm-blooded animals. As discussed further below, the U.S. EPA no longer recommends total coliform be used as FIB.
- Fecal coliform are a subset of total coliform and are more specific than total coliform to wastes from warm-blooded animals, but not necessarily to humans. As discussed further below, the U.S. EPA no longer recommends total coliform be used as FIB.
- *E. coli* are a subset of fecal coliform and are thought to be more closely related to the presence of human pathogens than fecal coliform (U.S. EPA 2002).

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[2] Indicates a disease that normally exists in animals but that can infect humans.

- Enterococcus represents a different bacterial group from coliform. It is regarded to be a good indicator of fecal contamination from warm-blooded animal sources, especially in salt water (*ibid.*).

Epidemiology studies conducted in the 1950s and 1960s found an association between fecal coliform bacteria and human illness, which forms the basis for why these particular FIB are used in water quality objectives. More recent scientific studies, however, have found that in marine waters enterococcus is most closely associated with human illness, and the other bacterial indicators of fecal contamination listed above are not (e.g., Cabelli 1982). This is discussed further in Section 6.1.

4.2 Water Quality Standards

Under the authority of the CWA, the Water Board has established water quality standards for bacteria. Water quality standards consist of the following elements: 1) beneficial uses of the water body in question; 2) narrative and/or numeric water quality objectives to protect those beneficial uses; and 3) the state of California's antidegradation policy, which requires continued maintenance of existing high-quality waters. These three elements are described below.

4.2.1 Beneficial Uses

The Basin Plan designates beneficial uses for each water body in the Region. The designated beneficial uses of San Francisco Bay that are impaired by FIB include the following:

- IND – industrial service supply
- COMM – commercial sport fishing
- SHELL – shellfish harvesting
- EST – estuarine habitat
- MIGR – fish migration
- RARE – preservation of rare and endangered species
- SPWN – fish spawning
- WILD – wildlife habitat
- REC-1 – water contact recreation
- REC-2 – noncontact water recreation
- NAV – navigation

The observed elevated concentrations of fecal indicator bacteria in San Francisco Bay beaches pose a potential health risk to individuals recreating in these water bodies. Specifically, the REC-1 and REC-2 beneficial uses, described in Table 4.1, could be negatively impacted.

Table 4.1 Beneficial Uses of San Francisco Bay Beaches Relevant to Bacteria TMDL

Designated Beneficial Uses	Description
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water such that ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.

Designated Beneficial Uses	Description
Non-contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

While a possibility of impairment of the shellfish harvesting beneficial use could exist, the fecal indicator bacteria data upon which this TMDL is based were collected at locations where people wade and swim at the beaches, and further data are needed to determine if SHELL beneficial uses are in fact impaired. The goal of this TMDL is to restore and protect REC-1 and REC-2 beneficial uses in San Francisco Bay beaches. SHELL beneficial uses will be addressed in a separate TMDL project and/or water quality standards action at a later date.

4.2.2 Water Quality Objectives

The Basin Plan contains bacteria water quality objectives (WQOs), shown on Table 4.2, to protect REC-1 and REC-2 uses. WQOs for REC-2 are less stringent than those for REC-1; therefore, attainment of REC-1 objectives through the implementation of the TMDL will also meet the water quality objectives for REC-2.

Table 4.2 Basin Plan's Recreational Water Quality Objectives for Bacteria

Beneficial Use	Fecal Coliform (MPN[a]/100 mL)	Total Coliform (MPN/100 mL)	Enterococci (MPN/100mL)
Water Contact Recreation (REC-1)	Geometric mean[b] < 200 90th percentile < 400	Median < 240 No sample > 10,000	Geometric mean < 35 No sample > 104
Non-contact Water Recreation (REC-2)	Mean < 2000 90^{th} percentile < 4000	No objective	No objective

a. Most Probable Number (MPN) is a statistical representation of the results of the standard coliform test.
b. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

The Basin Plan also contains U.S. EPA bacteriological criteria for REC-1, and, of these, the criteria for enterococcus in salt water are applicable and used in this TMDL:

- enterococcus geometric mean < 35 colonies/100 mL; and
- enterococcus single sample maximum < 104 colonies/100 mL.

As shown on Table 4.2, the Basin Plan WQOs currently include fecal coliform, total coliform and enterococcus. However, scientific studies have shown that, in marine waters, enterococcus is more closely associated with human illness than are the other FIB; U.S. EPA has recommended States adopt WQOs based on enterococcus; and the State of California has begun the process of adopting new WQOs based on U.S. EPA's recommendations, as further described below.

CWA section 304 requires U.S. EPA to develop criteria recommendations to aid states in developing water quality standards. In 2012 U.S. EPA recommended new recreational water quality criteria for bacteria indicators. U.S. EPA's recommended criteria reflect the latest scientific knowledge and epidemiological investigations conducted at nine beaches from 2003 to

2009 (U.S. EPA 2012). Results of these investigations reaffirmed an association of enterococcus and Escherichia coli (*E.coli)* with gastrointestinal illness and found total and fecal coliform not highly associated with illness. The U.S. EPA recommended criteria for marine waters are shown in Table 4.3.

Table 4.3 U.S.EPA 2012 Recommended Recreational Water Quality Criteria

Indicator	Recommendation 1[a] Estimated Illness Rate 36/1000		Recommendation 2[a] Estimated Illness Rate 32/1000	
	Geometric mean (cfu/100 mL)[b]	Statistical Threshold Value (cfu/100 mL)	Geometric mean (cfu/100 mL)	Statistical Threshold Value (cfu/100 mL)
Enterococci (marine & fresh water)	35	130	30	110

[a]Individual states select level of protectiveness when they adopt the Recreational Water Quality Criteria.
[b]Colony forming units per 100 milliliters of sample
Duration: The water body geomean and Statistical Threshold Value should be evaluated over a 30-day interval.
Frequency: The selected geometric mean should not be exceeded in any 30-day interval, nor should there be greater than a 10 percent excursion frequency of the selected Statistical Threshold Value in the same 30-day interval.

The U.S. EPA recommendations are not regulations themselves; states may either adopt the criteria or develop updated criteria using other scientifically defensible methods. The State Water Resources Control Board (State Water Board) has begun the process of amending the statewide Water Quality Control Plans for (1) Inland Surface Waters, Enclosed Bays and Estuaries and (2) Ocean Waters of California. The result of this process will be the adoption of new State of California bacteria water quality standards. As CWA §304(a) criteria, the new standards will be used in all CWA programs, including TMDLs.

4.2.3 Antidegradation

The Code of Federal Regulations (Title 40, §131.12) contains the federal antidegradation policy. State Water Resources Control Board Resolution 68-16 contains California's antidegradation policy. These antidegradation policies are intended to protect beneficial uses and the water quality necessary to sustain them. When water quality is sufficient to sustain beneficial uses, it cannot be lowered unless doing so is consistent with the maximum benefit to the citizens of California. Even then, water quality must sustain existing beneficial uses. The proposed TMDL will not degrade water quality, and will in fact improve water quality by reducing the incidences of FIB exceedances.

5 BEACH WATER QUALITY DATA

Beach water quality data are generated through three types of efforts: Beach monitoring programs required by the California Health and Safety Code; monitoring required by NPDES permits issued to publically owned wastewater treatment facilities; and special monitoring studies.

California law (Health and Safety Code section 115880 et. seq.) requires local health officers to conduct weekly bacterial testing, between April 1 and October 31, of waters adjacent to public beaches that have more than 50,000 visitors annually and are near storm drains that flow in the summer. Local health officers are required to test for three indicator organisms: total coliform, fecal coliform, and enterococcus. If any one of these indicator organisms exceeds standards established by the State Department of Public Health, the county health officer is required to post warning signs at the beach. In the case of extended exceedances, the officer must make a determination whether to close that beach.

Wastewater NPDES permits may require wastewater dischargers to monitor for fecal indicator bacteria at beaches that could potentially be affected by sewage discharges. For example, the wastewater permit issued to the SFPUC's Southeast Wastewater Treatment Plant requires monitoring of beaches that could potentially be impacted by combined sewer overflows, which could occur when heavy rains overload the SFPUC's system of combined sanitary and stormwater sewers (SFBRWQCB 2013).

Special monitoring studies at beaches may include bacteria source tracking studies, which focus on determining whether the bacteria are from human versus animal sources, and where the source is located in relation to the beach. For example, Stanford University researchers collected samples at San Francisco beaches and processed them for DNA to determine if human markers were present in the samples.

5.1 Data Evaluation

Bacteria data were compared to water quality objectives in Tables 4.2 to determine exceedance rates of the WQOs. For this evaluation, WQOs for each FIB were included, rather than focusing solely on the more applicable enterococcus objectives.

Initially, each total coliform, fecal coliform, and enterococcus datum was compared with the associated single-sample objective, and all values exceeding the standard were tabulated as an exceedance. The number of exceedances was then divided by the number of samples to determine the percent exceedance. Geometric means were then calculated for each indicator bacteria based on a minimum of five samples per rolling 30-day period. Total coliform, fecal coliform, and enterococcus geometric means were compared to the applicable geometric mean water quality standards. All values exceeding the geometric mean standards were counted as exceedances and were divided by the total number of geometric means calculated to determine the percent exceedance.

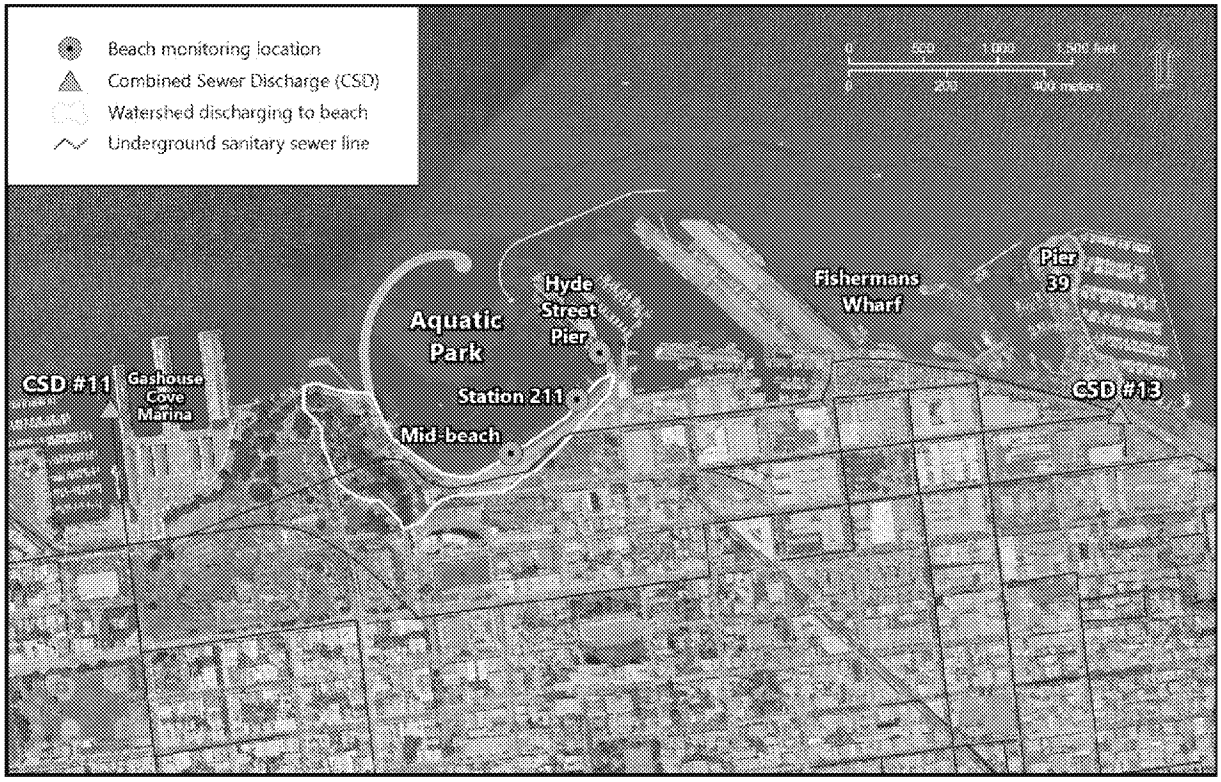
In accordance with CWA §303(d), the State's Policy for developing California's impaired water body list specifies that a water segment shall be placed on the Section 303(d) list if bacteria water quality standards in the California Code of Regulations, Basin Plans, or statewide plans are exceeded more than ten percent of the time for water quality

monitored year-round or exceeded more than four percent of the time for beaches monitored during the summer (State Water Board 2004b). FIB data from each beach exceeded water quality standards more than the requisite percent of the time, as discussed further below.

5.2 Aquatic Park Beach

Beach Monitoring Data: The SFPUC collects water samples at Aquatic Park Beach weekly and analyzes the samples for three FIB: total coliform, *E.coli*, and enterococcus. Samples are collected year-round at two locations along the beach, off Hyde Street Pier and at Station 211 (Figure 5.1).

Figure 5.1 Aquatic Park Beach, San Francisco



In the mid-1990s the Station 211 sample location was moved from the approximate center of the beach to a more easterly location, because that is where most of the swimming occurs, and because members of swim clubs expressed concern to the SFPUC about the impacts of homeless or transient visitors on water quality at the new location (Kellogg 2014). In addition to weekly sampling, after a combined sewer discharge SFPUC monitors the beach daily until monitoring confirms that FIB levels are below water contact recreation standards. Beach monitoring data are summarized in Table 5.1; entries in bold type exceed CWA §303(d) impairment listing criteria.

Table 5.1 Aquatic Park Beach Data Summary: 1/2/2008 – 11/24/2014

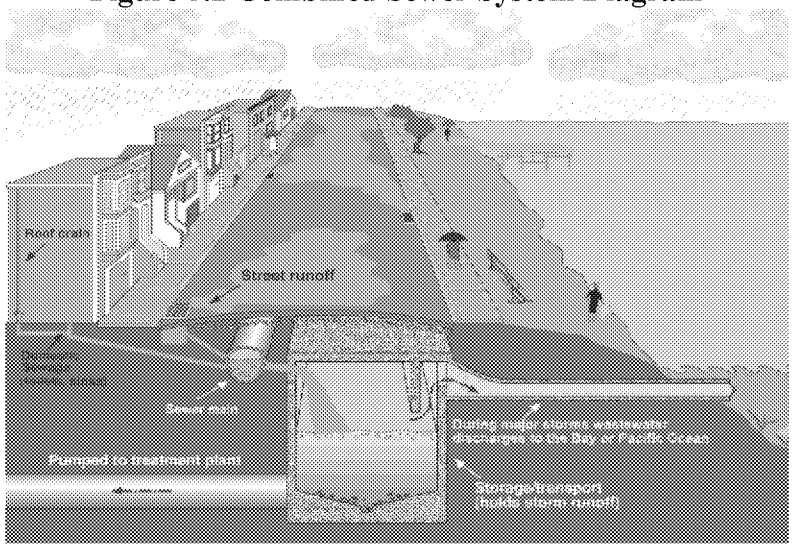
	Location	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	Hyde St. Pier	386	11 (2.8%)	15 (3.9%)
	Station 211	434	42 (9.7%)	**78 (18.1%)**
Total Coliform	Hyde St. Pier	385	0	21 (5.5%)
	Station 211	434	2 (0.5%)	**104 (24.2%)**
E.coli [b]	Hyde St. Pier	385	8 (2.1%)	0
	Station 211	434	38 (8.8%)	20 (9.7%)

[a]Geometric means calculated using all data collected in rolling 30-day periods.
[b]Compare to fecal coliform objective, because no marine *E.coli* objective exists for estuarine waters.

These data indicate that enterococcus and total coliform exceed the water quality standards more than ten percent of the time at the Station 211 sample location. Exceedances of FIB water quality objectives rarely exceed water quality standards at the Hyde Street Pier location, indicating there is a source of FIB in the vicinity of Station 211 that is not impacting the Hyde Street Pier location. With very few exceptions, the elevated FIB concentrations occurred during winter, wet weather months.

NPDES Monitoring Data: The SFPUC operates a combined wastewater and stormwater collection and treatment system (Figure 5.2) throughout most of city of San Francisco. During periods of heavy rain, the collection system's storage capacity can be exceeded due to very high volumes of stormwater runoff, resulting in combined sewer overflow discharges (CSDs) to the Bay. The combined flows receive some level of treatment prior to discharge in that some solids will settle and floatable wastes are retained by baffles, as illustrated in Figure 5.2. SFPUC monitors and records CSDs, as required by its NPDES permit. These CSD event data from outfalls within approximately one mile of Aquatic Park were evaluated for possible connection to bacteria objective exceedances at the beach (Table 5.2).

Figure 5.2 Combined Sewer System Diagram



Source: SFPUC

As shown on Table 5.2, the two CSD outfalls closest to Aquatic Park Beach discharged only four times in the seven year period, and the enterococcus objective was not exceeded following any of the discharge events. CSDs are not suspected as a significant source of FIB to Aquatic Park Beach.

Table 5.2 CSDs in Vicinity of Aquatic Park Beach: 2008 – 2014[a]

CSD Outfall #	11	13	Does next weekly sample at Station 211 exceed enterococcus single sample maximum water quality objective?
Location	Approximately 0.6 mile west of Aquatic Park, at eastern end of Gas House Cove (Fig. 5.1)	Approximately one-half mile east of Aquatic Park Beach, near Pier 39 (Fig. 5.1)	
Date	Duration of reported combined sewer discharge in hours[a]		
3/14/2012	0	5.7	no
11/30/2012	0	1.7	no
2/9/2014	0	1	no
11/20/2014	0	0.4	no

[a]Compiled from Self-Monitoring Reports available in CIWQS

Special Monitoring Study: In 2012, the Boehm Research Group at Stanford University conducted a study in which it collected two water samples near Station 211 and analyzed the samples using traditional techniques for FIB as well as quantitative polymerase chain reaction (qPCR) technique for human fecal markers. The samples contained enterococcus concentrations of 10 and 41 MPN/100 mL, well below the single sample maximum objective of 104. Total coliform and *E.coli* were not detected. The HF183Taqman human fecal material marker was present at 114 and 158 copies per milliliter of Bay water, indicating that evidence of human fecal coliform was found (Boehm 2012).

5.3 Candlestick Point Beaches

Beach Monitoring Data: The SFPUC and San Francisco Department of Public Health sample the three Candlestick beaches (Figure 5.3) weekly for three FIB: total coliform, *E.coli*, and enterococcus. Samples are collected year-round and are not analyzed specifically for fecal coliform. In addition to weekly sampling, following a combined sewer discharge the beaches are monitored daily until monitoring confirms that FIB levels are below water contact recreation standards. Beach monitoring data for Jackrabbit Beach, Sunnydale Cove, and Windsurfer Circle are summarized in the tables below; entries in bold type exceed CWA §303(d) impairment listing criteria.

Figure 5.3 Candlestick Point Beaches

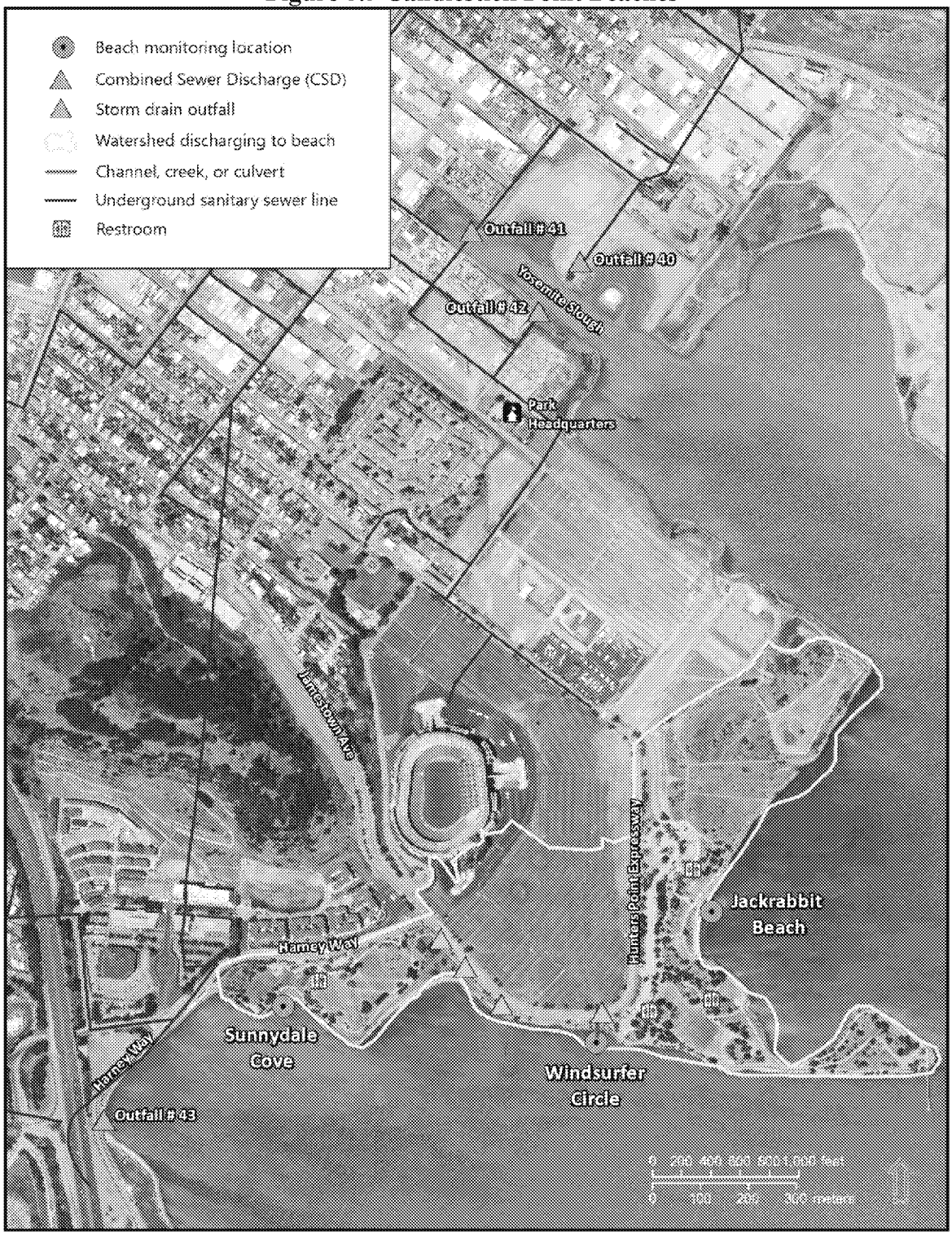


Table 5.3 Jackrabbit Beach Data Summary, 1/2/2008 – 11/24/2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	431	**60 (13.9%)**	**82 (20.4%)**
Total Coliform	431	4 (0.9%)	**56 (13.1%)**
E.coli	431	26 (6.0%)[b]	14 (3.3%)[b]

[a]Geometric means calculated using all data collected in rolling 30-day periods.
[b]Compare to fecal coliform objectives, because no marine *E.coli* objective exists for estuarine waters.

The Jackrabbit Beach data indicate that both enterococcus and total coliform exceed water quality objectives in more than 10% of the samples. These exceedances occurred predominately during the wet season (October 1 – April 15). Numerous enterococcus exceedances during the summer months of May through August, 2011, correspond to a period of unusual summer rain events.

Table 5.4 Sunnydale Cove Data Summary, 1/2/2008 – 11/24/2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	485	**120 (24.7%)**	**244 (50.7%)**
Total Coliform	485	14 (2.9%)	**229 (47.6%)**
E.coli	485	45 (9.3%)[b]	31 (6.4%)[b]

[a]Geometric means calculated using all data collected in rolling 30-day periods.
[b]Compare to fecal coliform objectives, because no marine *E.coli* objective exists for estuarine water.

The Sunnydale Cove data indicate that half the samples over a seven year period exceed the geomean standard for enterococcus, and these exceedances occur largely during the wet season, including May and June of 2011. Total coliform geomean exceedances were sporadic and largely occurred during the wet season. Total coliform geomean exceedances also occurred for the entire period of August 4, 2014 through November 24, 2014, a period in which there was no rainfall. *E.coli* results indicate infrequent single sample maximum exceedance occurring during summer months.

Table 5.5 Windsurfer Circle Data Summary, 1/2/2008 – 11/24/2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	593	**218 (36.8%)**	**371 (63.0%)**
Total Coliform	593	**81 (13.7%)**	**450 (76.4%)**
E.coli	593	**92 (15.5%)[b]**	**126 (21.4%)[b]**

[a]Geometric means calculated using all data collected in rolling 30-day periods.
[b]Compare to fecal coliform objectives, because no marine *E.coli* objective exists in estuarine waters.

At Windsurfer Circle exceedances of the enterococcus geomean objective occurred predominantly during the wet months of October through March, including the entire wet season of September 2010 through April 2011, and nearly every week of the following three wet seasons (2011-12, 2012-13, and 2013-14). Sporadic exceedances of the enterococcus objective occurred during typically dry months. Similarly to Sunnydale

Cove and Jackrabbit Beach, enterococcus exceedances occurred during May, 2011, coinciding with rain events; however, unlike at the other two beaches, these exceedances did not extend through the remainder of the summer months of 2011.

Total coliform exceedances occurred largely during the wet season, and also during June and July 2011. Except for one four-week period, the geomean objective for total coliform was exceeded for the entire period of September 2012 through November 2014 (end of data set). *E.coli* exceedances most often coincided with wet weather months.

NPDES Monitoring Data: The SFPUC operates a combined wastewater and stormwater collection and treatment system (Figure 5.2). During periods of heavy rain, the collection system's storage capacity can be exceeded due to very high volumes of stormwater runoff, resulting in CSDs to the Bay. The combined flows receive some level of treatment prior to discharge in that some solids will settle and floatable wastes are retained by baffles, as illustrated in Figure 5.2. SFPUC monitors and records CSDs, as required by its NPDES permit. These CSD event data were evaluated for possible connection to bacteria objective exceedances at Candlestick beaches. The four CSD outfalls located closest to Candlestick Park (Figure 5.3) discharged on seven days during the seven year period of 2008-2014 (Table 5.6) and the enterococcus objective was exceeded following four of the discharge events. During the same timeframe, however, the enterococcus water quality objective was exceeded from 60 times (at Jackrabbit) to 218 times (at Windsurfer Circle). CSDs are not suspected to be a significant source of FIB to Candlestick Park beaches.

Table 5.6 Combined Sewer Discharges in Vicinity of Candlestick Park Beaches: 2008 – 2014[a]

CSD Outfall #	40	41	42	43	Does next weekly sample at Jackrabbit exceed enterococcus single sample maximum water quality objective?	Does next weekly sample at Sunnydale exceed enterococcus single sample maximum water quality objective?
Location	In Yosemite Slough, approx. one mile northwest of Jackrabbit Beach (Fig. 5.2)			Approximately one-quarter mile southwest of Sunnydale Cove (Fig. 5.2)		
Date	**Duration of reported combined sewer discharge in hours[a]**					
1/4/2008	0.25	0.25	0.25	0	yes	yes
1/25/2008	3.1	3.1	3.1	8.25	yes	yes
3/5/2009	0	0	0	0.9	no	no
10/13/2009	1.1	1.1	1.1	0	no	yes
10/19/2009	1.5	1.5	1.5	0	no	no
1/19/2010	1.1	1.1	1.1	0	no	yes
12/2/2012	0.22	0.22	0.22	0.63	no	no

[a]Compiled from Self-Monitoring Reports available in CIWQS

Special Monitoring Studies: While most of the area abutting Candlestick Point is served by the SFPUC's combined sewer system, some portions of Candlestick Stadium, Jamestown Avenue and Hunters Point Expressway drain to one of two separate networks of stormwater pipes, and then to one of four stormwater outfalls (Figure 5.3). In addition, the southeastern-most outfall discharges stormwater from the Stadium parking lot to Windsurfer Circle (Figure 5.3).

In 2012, the Boehm Research Group at Stanford University conducted a study in which it collected two water samples from the storm drain outfall at Windsurfer Circle and analyzed them using both traditional techniques for FIB and a quantitative polymerase chain reaction (qPCR) technique for human fecal markers. The samples contained enterococcus concentrations of 2,000 - 3,000 MPN/100 mL, well above the single sample maximum objective of 104. *E. coli* were detected at 1,500 - 1,700 MPN/100 mL. However, the HF183Taqman human fecal material marker was not detected in either sample, meaning that evidence of human fecal coliform was not found in the samples (Boehm 2012).

5.4 Crissy Field Beach

Beach Monitoring Data: The SFPUC and San Francisco Department of Public Health sample Crissy Field Beach weekly for three FIB: total coliform, *E. coli*, and enterococcus. Samples are not analyzed specifically for fecal coliform. Samples are collected year-round at two locations along Crissy Beach. In addition to weekly sampling, following a combined sewer discharge the beaches are monitored daily until monitoring confirms that FIB levels are below water contact recreation standards.

Data for the CWA 303(d) listing were collected at the "West Trees" and "Crissy East" locations (Figure 5.4). In 2008 the National Park Service requested that SFPUC sample the far west end of Crissy Beach instead of the "West Trees" location, because the west end has higher recreational usage. Since that time, samples have been collected at the "Crissy West" and "Crissy East" locations (Figure 5.4). Water contact recreation objective exceedances are infrequent at "Crissy West," as evidenced in Table 5.7; entries in bold type exceed CWA 303(d) impairment listing criteria. Enterococci continue to exceed the water quality standard more than 10% of the time at the east sample location. Exceedances occurred primarily during the wet season.

Table 5.7 Crissy Field Beach Data Summary: 1/2/2008 – 11/24/2014

	Location	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	Crissy East	428	**58 (13.6%)**	**82 (19.3%)**
	Crissy West	370	13 (3.5%)	13 (3.6%)
Total Coliform	Crissy East	428	3 (0.7%)	18 (4.2%)
	Crissy West	370	6 (1.6%)	29 (7.9%)
E.coli[b]	Crissy East	428	15 (3.5%)	2 (0.5%)
	Crissy West	370	7 (1.9%)	1 (0.3%)

[a] Geometric means calculated using all data collected in rolling 30-day periods.
[b] Compare to fecal coliform objective, because no marine *E.coli* objective exists for estuarine waters.

Figure 5.4 Crissy Field Beach

NPDES Monitoring Data: The SFPUC operates a combined wastewater and stormwater collection and treatment system (Figure 5.2). During periods of heavy rain, the collection system's storage capacity can be exceeded due to very high volumes of stormwater runoff, resulting in CSDs to the Bay. The combined flows receive some level of treatment prior to discharge in that some solids will settle and floatable wastes are retained by baffles, as illustrated in Figure 5.2. CSDs within approximately one mile of Crissy Field Beach were evaluated for possible connection to bacteria objective exceedances at the beach (Table 5.8). CSDs occurred on 11 days during the seven year period of analysis, and the enterococcus objective was not exceeded following three of the discharge events. During the same timeframe, enterococcus single-sample maximum objective exceedances occurred 58 times. CSDs are not suspected as a significant source of FIB to Crissy Field Beach.

Table 5.8 Combined Sewer Discharges in Vicinity of Crissy Beach: 2008 – 2014[a]

CSD Outfall #	9	10	11	Does next weekly sample at Crissy Field East station exceed enterococcus single sample maximum water quality objective?
Location	Baker Street, at the east end of Crissy Field Beach, discharges 290 feet off-shore (Fig. 5.3)	Approximately 0.5 mile east of Crissy Field East station (Fig. 5.3)	Approximately 1 mile east of Crissy Field East station (Fig. 5.1)	
Date	Duration of reported combined sewer discharge in hours[a]			
12/28/2010	4	4	0	yes
12/29/2010	0.3	0.3	0	yes
2/17/2011	0.9	0.9	0	no
3/18/2011	0.5	0.5	0	no
6/28/2011	2.3	2.3	0	no
1/20/2012	0	1.3	0	yes
3/14/2012	5.7	5.7	0	no
11/30/2012	1.7	1.7	0	no
12/2/2012	0.3	0.3	0	no
2/9/2014	1	1	0	no
11/20/2014	0.2	1	0	no

[a]Compiled from Self-Monitoring Reports available in CIWQS

Special Monitoring Study: The National Park Service collected water quality data, including bacteria data, from Crissy Field Marsh (Figure 5.5) from February 2007 to March 2008. Grab samples were collected from nine locations around the Marsh at approximately 30-day intervals following a dry period of at least 72 hours. Two additional sampling events targeted "first-flush" events, defined as the first precipitation event of each winter season with rainfall equal to 0.1 inch or greater.

Stormwater runoff from the upland catchment area discharges into Crissy Field Marsh at four locations, labeled as SE, SW, Tennessee Hollow and Commercial Outfalls in Figure 5.4. Three outfalls and the tidal inlet were included in Marsh sampling conducted by the National Park Service during two rain events and during dry weather. Samples were analyzed for FIB and other parameters (Ward 2013); results are shown in Table 5.9. For comparison purposes, results above WQOs are shown in bold font.

Figure 5.5 Crissy Field Marsh Sample Locations

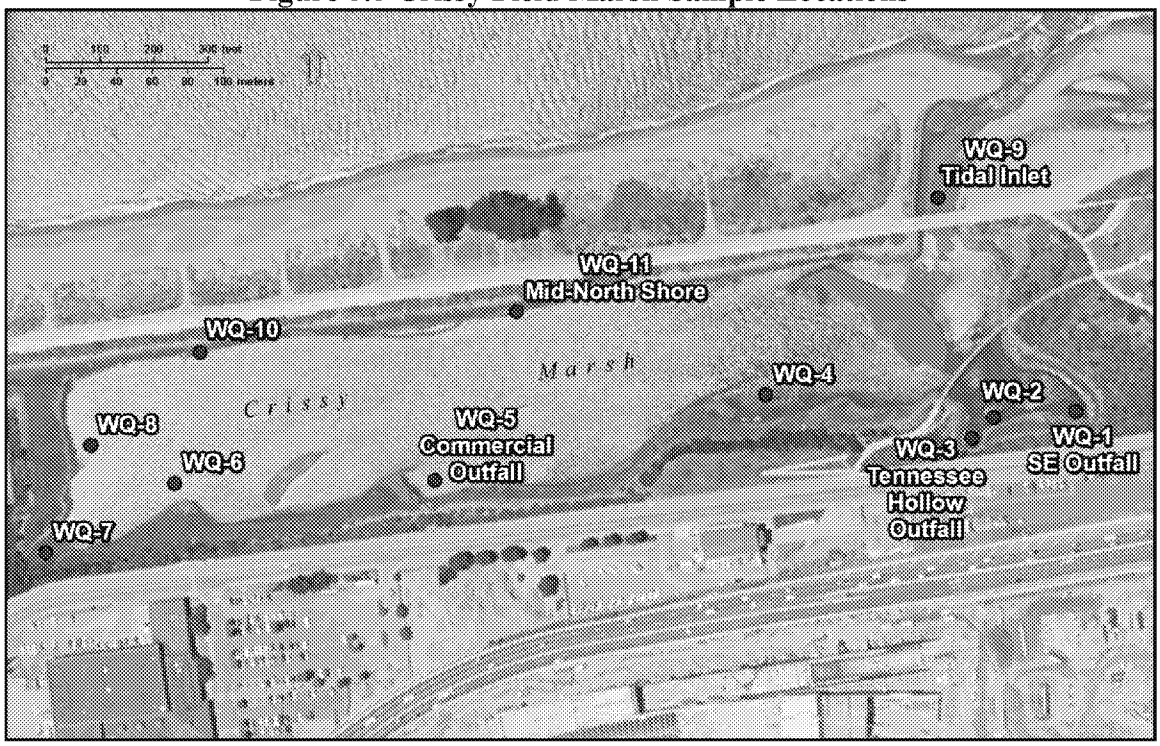


Table 5.9 Crissy Field Marsh Bacteria Data, 2007[a]

	WQ-9 Tidal Inlet	WQ-1 SE Outfall	WQ-3 Tennessee Hollow Outfall	WQ-5 Commercial Outfall	WQ-11 Mid-North Shore
Enterococcus (MPN/100 mL)					
Wet Weather:					
2/9/2007	**280**	**5800**	**5800**	**1300**	not sampled
10/11/2007	present>QL[b]	**410**	**260**	**680**	present > QL
Dry Weather summary for 11 samples:					
Mean	23.3	**98.6**	**143.4**	**99.8**	Not enough results above detection limit to do summary statistics
Median	15.0	41.0	46.0	40.0	
Maximum	70.0	**440.0**	**820.0**	**540.0**	
***E.coli* (MPN/100 mL)**					
Wet Weather summary for 11 samples:					
2/9/2007	5	170	present > QL	present > QL	not sampled
10/11/2007	52	**260**	**380**	**390**	120
Dry Weather:					
Mean	133.7	137.2	146.6	137.5	309.8
Median	72.0	74.0	120.0	80.5	285.5
Maximum	350.0	**990.0**	**550.0**	**550.0**	**620.0**
Total Coliform (MPN/100 mL)					
Wet Weather:					
2/9/2007	870	present > QL	present > QL	present > QL	not sampled
10/11/2007	330	present > QL	present > QL	present > QL	1900
Dry Weather summary for 11 samples:					
Mean	2191	9520	9937.5	5200	1430
Median	1700	**11,000**	9450	4100	1350
Maximum	**>24,000**	**>24,000**	**>24,000**	**>24,000**	2200

[a]Ward 2013

[b]Parameter detected above the method quantitation limit (QL)

Bold type indicates values exceeding the Water Quality Objective

This limited data set shows enterococci present at higher concentrations at the stormwater outfalls in the Marsh (SE, Tennessee Hollow and Commercial Outfalls) during wet weather and at lower concentrations during dry weather, indicating stormwater runoff transport of enterococci from the surrounding catchment area. Total coliform concentrations indicate the opposite relationship, being below detection levels during wet weather and at very high concentrations during dry months. FIB concentrations in general appear to be lower where the marsh interfaces with Crissy Beach (at tidal inlet location) than at the stormwater outfalls. This study provides a useful snapshot of the distribution of FIB in the marsh; however, the study is not comprehensive enough to indicate with reasonable certainty whether the marsh is a source of FIB to Crissy Beach and, if so, its relative contribution.

FIB data collected from creeks and stormwater conveyances upstream from the marsh provide further information about potential upland bacteria sources. The Presidio Water Quality Monitoring Program has collected watershed data since 2008, sampling locations where creek restoration projects have occurred and where basic water quality information is needed. A summary of the data is shown in Table 5.10 and the sample locations are shown in Figure 5.5.

Table 5.10 Presidio Watershed Monitoring Data Summary

Location	Parameter	Years Sampled	# Data Points	# Samples exceeding Single Sample Max (%)
El Polin Spring 1	Enterococcus	2008	7	4 (58%)
	E.coli	2008 - 2015	82	22 (27%)
	Total Coliform	2008 - 2015	82	18 (22%)
El Polin Spring 2	*E.coli*	2011 - 2015	40	6 (15%)
	Total Coliform	2011 - 2015	40	16 (40%)
Tennessee Hollow (TH) 1	*E.coli*	2009 - 2015	48	6 (12%)
	Total Coliform	2009 - 2015	48	16 (33%)
TH 2	Enterococcus	2008	5	3 (60%)
	E.coli	2008 - 2015	66	13 (%)
	Total Coliform	2008 - 2015	66	13 (20%)
TH 3	Enterococcus	2008 - 2009	18	13 (72%)
	E.coli	2008 - 2015	81	22 (27%)
	Total Coliform	2008 - 2015	81	50 (62%)
TH 4	Enterococcus	2008 - 2009	17	5 (29%)
	E.coli	2008 - 2015	81	15 (19%)
	Total Coliform	2008 - 2015	81	48 (59%)

The few enterococcus data collected indicate that high densities of this bacterium can be present in upland surface waters; however, the paucity of enterococcus data prevent drawing conclusions on its relative significance at the beach.

5.5 Marina Lagoon Beaches

Beach Monitoring Data: Since 1998, the San Mateo County Health System has collected samples at two sites on Marina Lagoon: Parkside Aquatic Park and Lakeshore Park (Figure 5.6). Prior to 2007, County Health collected additional samples at Lakeshore Park along the rocks south of the Recreation Center, but sampling at this location was discontinued because swimmers do not use this rocky area (Smith 2012). As funding

levels have fluctuated, the City of San Mateo has taken responsibility for some of this sampling. The two beach areas are sampled year-round on a weekly basis for three FIB: total coliform, fecal coliform, and enterococcus. Beach monitoring data are summarized in Table 5.11 and Table 5.12; entries in bold type exceed CWA 303(d) impairment listing criteria.

Table 5.11 Parkside Aquatic Park Beach Data Summary, 1/2/2008 – 12/22/2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	327	**102 (31.2%)**	**145 (54.1%)**
Total Coliform	329	**65 (19.8%)**	**266 (96.0%)**
Fecal Coliform	329	**115 (35.0%)**	**134 (48.0%)**

[a]Geometric means calculated using all data collected in rolling 30-day periods.

Table 5.12 Lakeshore Park Beach Data Summary, 1/2/2008 – 12/22/2014

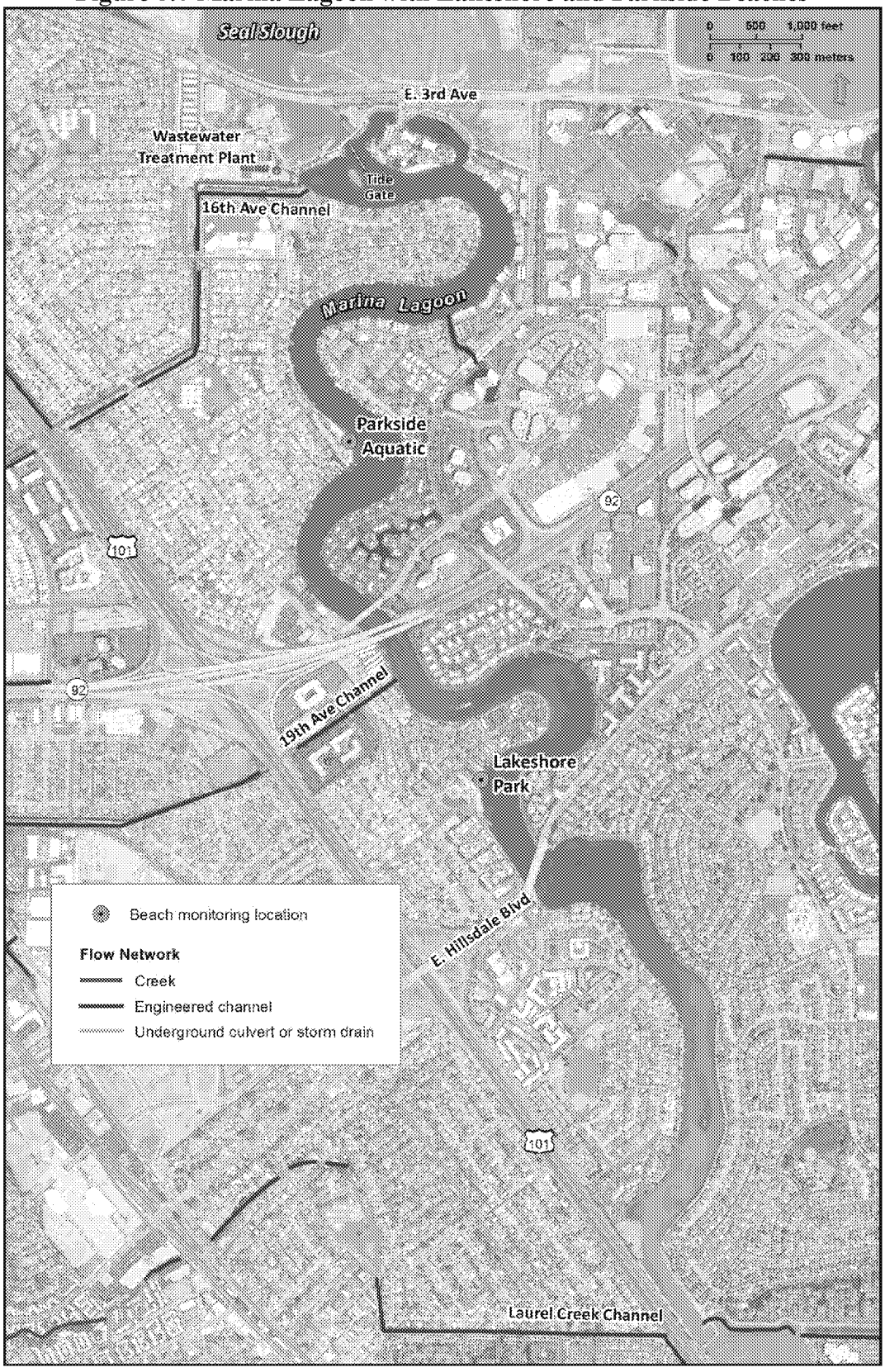
	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	325	**84 (25.8%)**	**148 (54.6%)**
Total Coliform	326	**65 (19.9%)**	**274 (98.9%)**
Fecal Coliform	326	**84 (25.8%)**	**99 (35.7%)**

[a]Geometric means calculated using all data collected in rolling 30-day periods.

The data are similar between the two beaches on Marina Lagoon. The enterococcus geomean objective is exceeded in approximately half the samples and nearly all the samples exceed the total coliform geomean objective. At Aquatic Park Beach, enterococcus exceedances occurred during both wet and dry months, including the entire relatively storm-free period from September 2013 through mid-July of 2014. At Lakeshore Park Beach, enterococcus exceedances occurred during typically wet months, and also during the typically dry months of June-September of 2012.

NPDES Monitoring Data: The City of San Mateo Wastewater Treatment Plant (Plant), located at the mouth of Marina Lagoon (Figure 5.6), discharges secondary and advanced secondary treated municipal wastewater through a deep water discharge pipe approximately 3,700 feet offshore in San Francisco Bay. This discharge does not affect the San Mateo beaches, and the Plant's NPDES permit (No. CA0037541) does not require pathogen monitoring in Marina Lagoon. The Plant is not considered a source of FIB to Marina Lagoon beaches.

Figure 5.6 Marina Lagoon with Lakeshore and Parkside Beaches



Special Monitoring Study – Goose Excrement Removal at Beaches: The City of San Mateo conducted a pilot study in 2014 to determine if goose excrement is a significant source of bacteria at Lakeshore Park and Parkside Aquatic Park Beaches. During the period July 15 to November 18, goose and gull feces were picked up daily; goose fences were installed at the waterline of both beaches; path and rip-rap cleaning and beach raking techniques were modified to reduce water contamination; aquatic weeds and algae were removed to discourage goose feeding; and educational information was disseminated to beach patrons and nearby home owner associations. After the first week of the project, City of San Mateo staff reported that Lakeshore Park bacteria densities dropped enough to open the beach for the first time in 2014, and bacteria levels continued to be somewhat lower than historic levels for the remainder of the project (Rudnicki 2014). When compared to historic bacteria data, enterococcus and fecal coliform densities exceeded water quality objectives less frequently during the pilot project timeframe (Table 5.13). However, bacteria densities generally followed the historic pattern of lower concentrations in summer months, and all the FIB geomeans remained consistently above water quality objectives.

Table 5.13 Bacteria Densities: Goose Pilot Period vs. Historic

Beach	Time-frame	Enterococcus		Fecal Coliform		Total Coliform	
		% Single Sample Max Exceed-ance	% Geomean Exceed-ance	% Single Sample Max Exceed-ance	% Geomean Exceed-ance	% Single Sample Max Exceed-ance	% Geomean Exceed-ance
Parkside Aquatic	Pilot[a]	10	26	26	42	11	100
	2008-2014	31	54	35	48	20	96
Lake-shore Park	Pilot	15	40	5	20	15	100
	2008-2014	26	55	5	25	15	100

[a] Pilot project ran July 15 - November 18, 2014

5.6 China Camp Beach

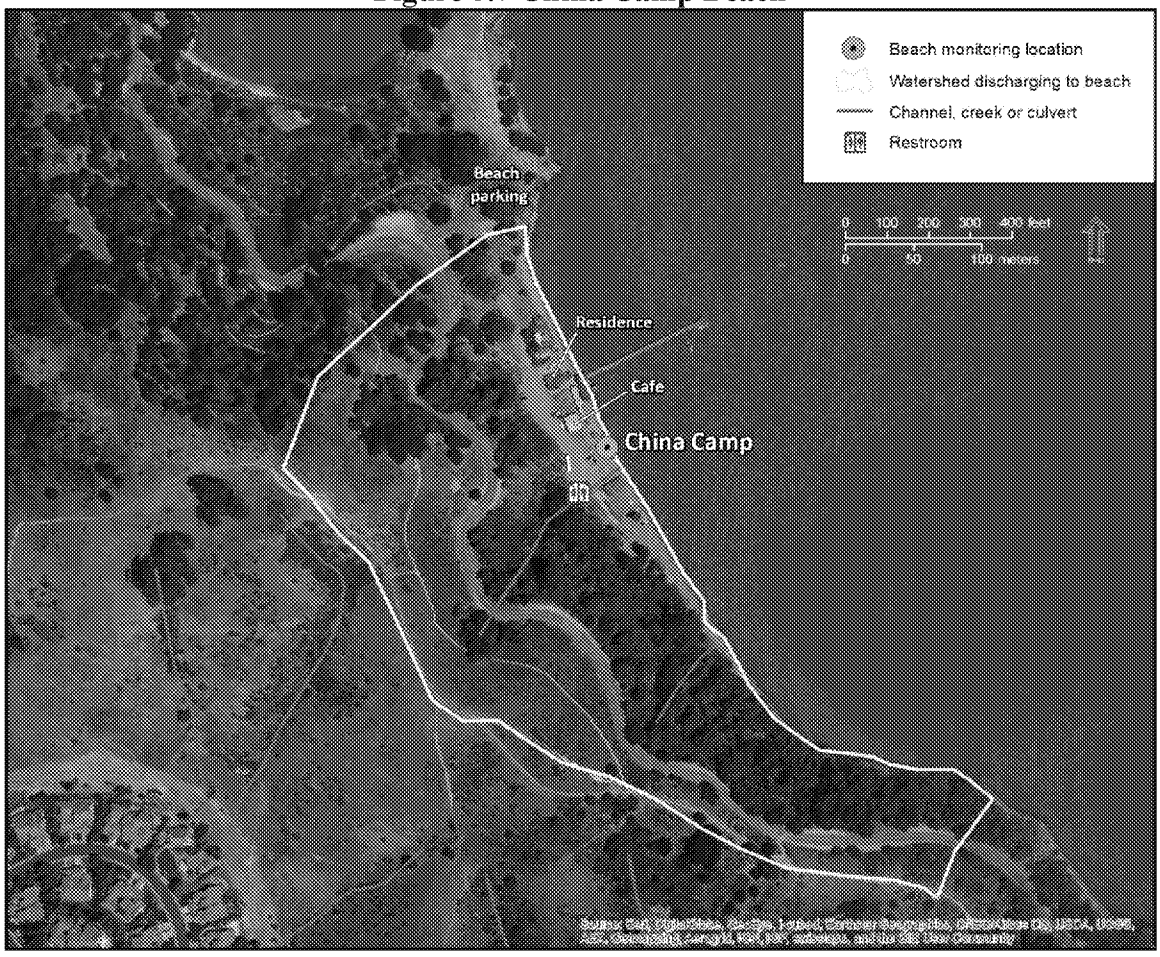
Beach Monitoring Data: The Marin County Health Department collects a single sample, location shown on Figure 5.7, from China Camp Beach weekly during the months of April through October. U.S. EPA placed China Camp Beach on the 303(d) list based on 26% of samples exceeding the geomean of total coliform objective (U.S. EPA 2011), using data collected in the 2003-2005 sampling timeframe. Analysis of beach monitoring data collected since then (Table 5.14) indicates that the geomean for total coliform remains elevated above the objective.

Table 5.14 China Camp Beach Data Summary: 4/5/2006 – 10/29/2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	271	3 (1.1%)	0
Total Coliform	267	10 (3.7%)	**75 (32.1%)**
E.coli [b]	271	2 (0.7%)	0

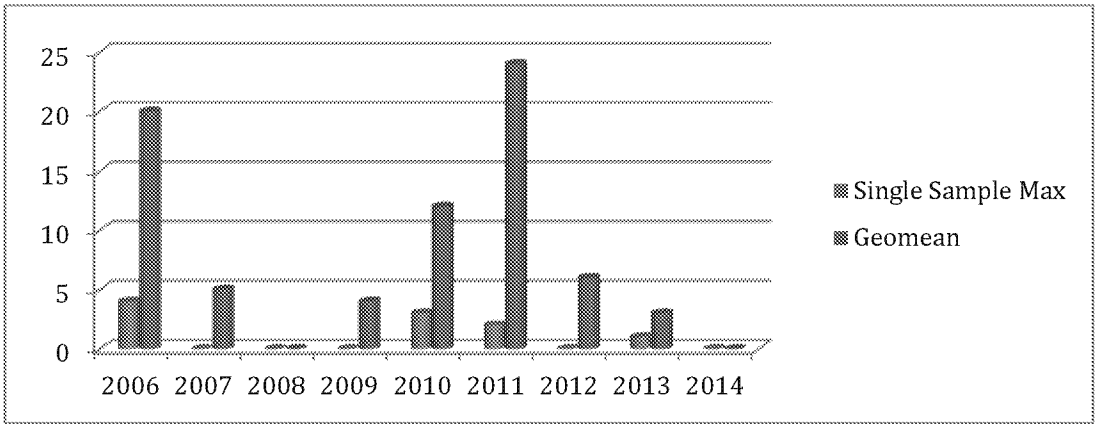
[a]Geometric means calculated using all data collected in rolling 30-day periods.
[b]Compare to fecal coliform objectives, because no marine *E.coli* objective exists for estuarine waters.

Figure 5.7 China Camp Beach



The total coliform exceedances tended to occur between May and September, typically dry months. However, there is a wide annual variation in total coliform results, as illustrated in Figure 5.8. Note that approximately 30 samples are collected annually between April 1 and October 31.

Figure 5.8 Annual Total Coliform Exceedances - China Camp Beach



5.7 McNears Beach

The U.S. EPA placed McNears Beach on the CWA §303(d) list in 2006, based on 15% of samples exceeding the geomean for total coliform (U.S. EPA 2011). The sampling timeframe was the summers of 2003 through 2005. The Marin County Health Department continued collecting one sample at McNears Beach weekly during the months of April through October until 2009, at which time sampling stopped. Weekly sampling resumed in July, 2013. Available data for the timeframe following the CWA §303(d) listing are summarized in Table 5.15; entries in bold type exceed CWA §303(d) impairment listing criteria. McNears Beach and the location of the beach sampling station are shown in Figure 5.9.

Table 5.15 McNears Beach Data Summary, 2006 – 2008, 2013-2014

	# Data points	# Samples exceeding Single Sample Max (%)	# Samples exceeding Geometric Mean[a] (%)
Enterococcus	144	7 (4.9%)	4 (3.3%)
Total Coliform	144	0	**41 (32.5%)**
Fecal Coliform	144	1 (0.7%)	0

[a]Geometric means calculated using all data collected in rolling 30-day periods.

Figure 5.9 McNears Beach