

**Biological Resources - Volume 3
Sycamore Environmental Consultants, Inc.
Technical Memoranda**

**SANTA ROSA SUBREGIONAL
LONG-TERM WASTEWATER PROJECT**

Prepared for

**City of Santa Rosa
and
U.S. Army Corps of Engineers**

July 16, 1996

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INTRODUCTION

Biological Resources Technical Memorandum, Volume 3 contains five technical memoranda prepared by Sycamore Environmental Consultants, Inc. in support of the Biological Resources Technical Memorandum, Volumes I and II. These technical memoranda specifically cover botanical studies conducted in support of the Santa Rosa Subregional Long-Term Wastewater Project EIR/EIS. The five technical memoranda are presented in the following appendices:

- **Appendix A** - Reservoir Technical Memorandum: Botanical Resources;
- **Appendix B** - Agricultural Irrigation Technical Memorandum: Botanical Resources;
- **Appendix C** - Wastewater Transmission Pipeline Technical Memorandum;
- **Appendix D** - Geysers Technical Memorandum: Botanical Resources; and
- **Appendix E** - Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum.

APPENDIX A - STORAGE RESERVOIR BOTANICAL RESOURCES

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Appendix A. Plant species list for reservoir component.

1. INTRODUCTION

The purpose of this technical memorandum is to provide information on existing botanical resources, special-status plant species, sensitive natural communities, and protected tree resources that occur or may occur within the proposed reservoir facilities. Existing botanical resources, populations of special-status plant species, and sensitive natural communities were mapped within the reservoir study area. These data provide a basis for the assessment of impacts. A complete project description and project alternatives are presented in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS (HBA, 1996b).

2. SETTING: PROJECT AREA DESCRIPTIONS

The Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area, located in Sonoma and Marin counties, is divided into five relatively distinct geographic areas. These are Santa Rosa Plain/ Russian River, West County, South County, Sebastopol, and Geysers (HBA, 1996b). All ten proposed storage reservoir sites are located in Sonoma County (Figure 1-1 in HBA, 1996a).

SOUTH COUNTY PROPOSED RESERVOIR SITES

The South County geographical area varies from level farmlands north of San Pablo Bay to rolling foothills. The area supports a large agricultural community including vineyards; irrigated cropland; and pasture for sheep, cattle, and horses. The northern portion of this area consists of pasture and vineyards on rolling terrain. Steeper hillsides support relatively undisturbed herbaceous plant communities including many areas dominated by native grasses because these areas are inaccessible to cattle. There are freshwater seeps on many of the hillsides in the area. Along drainages and in areas with deeper soil, there are riparian woodlands and coast live oak/interior live oak woodlands. In many areas eucalyptus occur along drainages and are planted along fence lines as windbreaks. The floodplain of the Petaluma River is composed of irrigated cropland and pasture. Seasonal wetlands and vernal pools occur in this area. The Bay Flats study area formerly consisted of marsh wetlands along northern San Pablo Bay. This area was drained and now supports cropland.

The South County geographic area contains the proposed Adobe Road, Lakeville Hillside, Sears Point, and Tolay storage reservoir sites.

WEST COUNTY PROPOSED RESERVOIR SITES

The West County geographical area topography varies from rolling hills to steep, incised valleys. The gently sloping, wind-swept hills of the area support treeless, annual grasslands; while within the steeper valleys pockets of coast live oak/interior live oak woodland and oak-bay-madrone woodland are found. The area has a strong maritime influence which contributes to the growth of coastal prairie grasslands (Shuford and Timossi, 1989). The numerous perennial and intermittent streams and drainages in West County support willow riparian and mixed riparian woodlands, or narrow seasonal wetlands along their banks. Many of the valleys and low lying areas support seasonal wetlands, freshwater marshes, and vernal pools. Patches of northern coastal scrub occur on the drier hillsides with shallow rocky soils. The West County is extensively cultivated. Land uses in the area include cropland and pasture for cattle and other livestock.

The West County geographic area contains the proposed Bloomfield, Carroll Road, Huntley, Two Rock, and Valley Ford storage reservoir sites.

3. METHODS

LITERATURE REVIEW AND CONSULTATIONS

Information on the biology, distribution, taxonomy, legal status, and other aspects of the special-status plant species was obtained from documents on file in the library of Sycamore Environmental Consultants, Inc. (Sycamore Environmental). Standard references used for the taxonomy of plants and plant community descriptions included Abrams (1923-1960); Barbour and Major (1977); Hickman, ed. (1993); Holland (1986); Mason (1957); Munz (1959); and Skinner and Pavlik (1994).

A computerized search of the California Natural Diversity Data Base (CNDDDB/RareFind, 1 September 1995) was conducted for the Glen Ellen, Two Rock, Valley Ford, Petaluma River, and Sears Point 7.5-minute United States Geological Survey (USGS) topographic quadrangles to determine if there were any known occurrences of state- or federal-listed species recorded from the reservoir sites. These reports are on file at the office of Harland Bartholomew & Associates, Inc. (HBA).

In addition to the CNDDDB/RareFind report, the following lists prepared by the California Department of Fish and Game (CDFG), Natural Diversity Data Base, were reviewed:

- *Special Plants List* (CDFG, January 1996); and
- *Endangered, Threatened, and Rare Plants of California* (CDFG, January 1996).

Two letters, one in 1994 and the other in 1995, were sent by HBA to the U.S. Fish and Wildlife Service (USFWS), Ecological Services, Sacramento Field Office, requesting file data on special-status plant species that could occur in the project study area. The response letters are on file at the office of HBA.

Other reference materials provided by HBA and Parsons Engineering Science (PES) included:

- Aerial photographs of the proposed reservoir sites (3 x 3 inch color slides, April 1994);
- Blue line aerial photographs of the project study area (1" = 500 ± 5%, June 1990); and
- Blue line topographic maps with proposed project facilities prepared by PES (1" = 200' and 1" = 6000').

Consultations were conducted on several occasions with Caitlin Bean CDFG Region 3; Betty Guggolz, Milo-Baker Chapter of the California Native Plant Society (CNPS); and Dr. Charles Quibell, Professor of Botany, Sonoma State University.

Existing policies regarding natural resources were also reviewed, including the Sonoma County Tree Ordinance (No. 4014, 13 June 1989).

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES EVALUATED

Special-Status Plant Species and Sensitive Natural Communities

A comprehensive list of special-status plants was compiled from the species listed in the USFWS 1995 letter and from the species that appeared on the CNDDDB/RareFind report. A pre-project meeting on 24 January 1994 was attended by the City, USFWS, CDFG, Sycamore Environmental, and HBA. Caitlin Bean of CDFG recommended that all CNPS List 4 species potentially occurring in the project study area be included in the species evaluated for this project. In addition, Ms. Bean requested that several other species of concern to CDFG also be included for evaluation in the EIR/EIS that were not currently recognized as a special-status plant species.

The list of special-status plant species was initially compiled in 1994 and was updated as new and revised listings became available from CDFG, CNPS, and the USFWS. From these data, a list was compiled of 182 special-status plant species that needed to be surveyed and evaluated in the EIR/EIS. A brief discussion of each special-status plant species is presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996).

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Descriptions of sensitive natural communities are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996). The list of sensitive natural communities was derived from the CNDDDB/RareFind report and from site visits.

CNPS

Sycamore Environmental provided Betty Guggolz with Project Overview maps (1" = 6000') that presented overviews of all the project alternatives. Ms. Guggolz mapped locations of Sonoma County sensitive plant records. Her personal list of sensitive plant records was compiled from plant lists prepared by historical and contemporary botanists, and included CNPS-listed plants, and state- and federal-listed endangered, threatened, and rare species. Sycamore Environmental reviewed the locations of sensitive plant

records mapped by Betty Guggolz. Her location data was incorporated into the summaries of known location data for special-status plant species to determine the total special-status plant species populations within the project study area (Section 4).

Protected Tree Resources

The Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh over nine inches (diameter breast height, defined as 4.5 feet above ground level) of the following species are protected: big-leaf maple (*Acer macrophyllum*), blue oak (*Q. douglasii*), California black oak (*Quercus kelloggii*), coast live oak (*Q. agrifolia*), coast redwood (*Sequoia sempervirens*), interior live oak (*Q. wislizenii*), Pacific madrone (*Arbutus menziesii*), oracle oak (*Q. morehus*), Oregon oak (*Q. garryana*), valley oak (*Q. lobata*), and California bay (*Umbellularia californica*). The ordinance also protects hybrids of these species.

FIELD SURVEYS

Botanists conducted field surveys to identify locations of special-status plant species and sensitive natural communities, to map plant communities, and to assist in the collection of data necessary for a California Wildlife Habitat Relationships (CWHR) analyses. Surveys of some or all sites were conducted by R. John Little, Ph.D., Theresa Fortner Ward, Susan Holve-Hensill, Nancy Coulson, Ellen Piazza, and Debbie Eakins. Field surveys were conducted during four time periods: fall 1994, spring 1995, summer 1995, and fall 1995 (Table 3-1). These four survey periods provided optimal coverage of early- and late-blooming special-status plant species.

Surveys consisted of walking the area of each site identified on the proposed project facilities maps. Plant communities were identified and mapped in conjunction with plant surveys.

Botanical Surveys

Prior to conducting botanical surveys, botanists compiled a field notebook that included key characteristics, descriptions, habitat notes, and illustrations for each of 182 special-status species that potentially occur in the project study area. CNDDDB/RareFind overlays were obtained from CDFG for the Glen Ellen, Two Rock, Valley Ford, Petaluma River, and Sears Point USGS quadrangles. These quadrangles cover the entire Sebastopol, South County, and West County study areas. All CNDDDB/RareFind occurrences for each quad were displayed on the overlays. The overlays were used to identify known populations of special-status plants occurring on or near the proposed reservoir sites.

Table 3-1.

Reservoir site survey periods

Reservoir Site		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Bloomfield	1994												
	1995												
Carroll Road	1994												
	1995												
Huntley	1994												
	1995												
Two Rock	1994												
	1995												
Valley Ford	1994												
	1995												
Adobe Road	1994												
	1995												
Lakeville Hillside	1994												
	1995												
Sears Point	1994												
	1995												
Tolay	1994												
	1995												

Surveys conducted during month indicated.

During the botanical surveys, botanists compiled a comprehensive plant species list, mapped vegetation, and searched for sensitive natural communities and habitats where special-status plant species were likely to be found. Botanists walked transects on each parcel with a blueline aerial photo and a parcel map. Transects were 25 to 100 feet wide and were spaced to achieve 100% coverage of each parcel.

Plants that could not be identified in the field were collected for later identification. Voucher specimens were collected for most native species observed in the field, a process recommended by the California Botanical Society (Ferren *et al.*, 1995). Voucher specimens were also collected for many non-native species. These voucher specimens were processed in accordance with standard herbarium techniques (Lawrence, 1951; Radford *et al.*, 1974) and are maintained for reference in the Herbarium located at the office of Sycamore Environmental. Duplicate specimens will be donated to Sonoma State University and the University of California at Berkeley.

During the pre-project meeting on 24 January 1994, Bill Cox of CDFG requested that separate plant species lists be prepared for each project component, to which the City agreed. Therefore, separate plant species lists for each reservoir component were compiled (Appendix A). Records of all species found in the project study area were managed and analyzed with Microsoft Access®, a relational database. Taxa noted in Appendix A as "sp." had insufficient material on collected specimens or available in the field to make a determination to species. (Note: The Tolay reservoir site was initially a single configuration. After surveys began, two configurations were devised, Tolay A and Tolay C. However, a single plant species list was prepared because the two configurations overlap.)

Plant Community Mapping

Plant communities were mapped for each of the ten reservoir configurations. The boundaries of different habitat types were mapped onto blue-line copies of aerial photographs. The field maps were digitized into AutoCAD® by Sycamore Environmental using USGS quadrangle maps as basemaps. Acreages of plant communities were calculated by PES using ArcINFO™.

Names of plant communities were based on community descriptions by Holland (1986) and Shuford and Timossi (1989). A comparison of the community descriptions used by Sycamore Environmental for the Santa Rosa EIR/EIS (HBA, 1996b) and the descriptions used by Holland (1986) and Shuford & Timossi (1989) are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996). Plant communities occurring in each of the three study areas are described in detail in the Section 4 of this document.

FLORISTIC ANALYSIS

The floras of the nine proposed reservoir sites were evaluated and compared (Tolay A and C were analyzed as one site). Formal estimates of species diversity require the determination of the number of species present and their abundance (Barbour *et al.*, 1980). The number of species present, known as species "richness," was determined for each reservoir site. In this document, the term "floristic diversity" refers to taxonomic richness, specifically the numbers of families, genera, and species present.

The floristic analyses are based on species lists prepared during field surveys. A species list for each reservoir site is presented in Appendix A. Sycamore Environmental determined the range of elevations of each site from project facility maps. PES provided project facility maps, reservoir acreages, and plant community acreages.

The floras of the nine proposed reservoir sites were combined into a comprehensive flora and compared with floras of other areas in the Central Coast Ranges of California. Floristic diversity data were derived from information on file in the Sycamore Environmental library and the Shields Library (including electronic databases) at the University of California, Davis. Dr. Charles Quibell, Professor of Botany, Sonoma State University, was consulted regarding information on floristic studies conducted in the Central Coast Ranges.

CALCULATION OF AREA OF IMPACT

Acreages of plant communities were calculated by PES using ArcINFO™.

4. RESULTS

RESERVOIR SITE DESCRIPTIONS

Bloomfield

The proposed Bloomfield reservoir site is situated in a north-south oriented valley located on the north side of Highway 1, one mile west of the town of Bloomfield in Sonoma County (Figure 2.1-1 in HBA, 1996a). The areas of all reservoir sites are presented in Table 4-1. Elevations of the site range from 80 to 400 feet. Several drainages flow down surrounding hillsides into two unnamed, intermittent channels at the northern end of the Bloomfield site. These channels join together above a stock pond at the southern end of the site and then flow off-site into Americano Creek. The Bloomfield site has been managed as rangeland for cattle for several generations.

The plant communities identified and mapped at the proposed Bloomfield reservoir site were annual grassland, eucalyptus, freshwater pond, mixed and willow riparian woodland, non-wooded riparian, northern coastal scrub, and oak-bay-madrone woodland (Map C-6 in PES, 1996). The site is primarily being used as rangeland for cattle. The Bloomfield plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the Bloomfield site is annual grassland. This site has been seeded with several types of clover. Introduced species, such as red (*Trifolium pratense*), strawberry (*Trifolium fragiferum*), and subterranean clovers (*Trifolium subterraneum*), and annual grasses dominate the grassland communities. Native and introduced wildflowers, such as blue-eyed grass (*Sisyrinchium bellum*), California poppy (*Eschscholzia californica*), common flax (*Linum usitatissimum*), rough cat's ear (*Hypochaeris radicata*), and yarrow (*Achillea millefolium*), are interspersed in the grassland community.

Cattle have complete access to the drainages and creek corridors on this site. Most of the drainage corridors have non-wooded riparian vegetation consisting of scattered patches of sedge (*Carex praegracilis*) and rushes (*Juncus balticus* and *Juncus effusus*) growing within the drainage corridor on sand bars. Other herbaceous species occurring within the drainage corridors include brass buttons (*Cotula coronopifolia*), common monkey-flower (*Mimulus guttatus*), and mints (*Mentha pulegium* and *M. suaveolens*).

Small patches of willow riparian woodland exist along the central drainages and several of the side drainages. The dominant species in these patches are arroyo willow (*Salix lasiolepis*) and shining willow (*Salix lucida* ssp. *lasiandra*). Mixed riparian woodland

occurs along a drainage in the northeast portion of the site. The vegetation in the drainage is characterized by California bay (*Umbellularia californica*), hazelnut (*Corylus cornuta* var. *californica*), wax myrtle (*Myrica californica*), and willows. The understory is dominated by patches of Himalayan blackberry (*Rubus discolor*) and western poison-oak (*Toxicodendron diversilobum*). California rose (*Rosa californica*), cotoneaster (*Cotoneaster pannosa*), creeping snowberry (*Symphoricarpos mollis*), honeysuckle (*Lonicera hispidula* var. *vacillans*), and honeysuckle cucumber (*Marah watsonii*) are other understory species present in the creeks and drainages on-site. A small patch of oak-bay-madrone woodland occurs at the northern end of the Bloomfield site.

A freshwater pond had been created at the southern end of the study area by the construction of a berm in the main channel. A few willows occur beside the pond. Vegetation in and along the edge of the pond includes common horsetail (*Equisetum arvense*), cattails (*Typha domingensis* and *T. latifolia*), long-leaved pondweed (*Potamogeton nodosus*), rushes, and sedges.

Several eucalyptus groves occur along the drainages at the northeast and west sides of the site. The most common species in these groves is blue gum (*Eucalyptus globulus*). These groves are well-established and have little understory vegetation.

Northern coastal scrub vegetation occurs on the northeast corner of the site and is dominated by native coyote brush (*Baccharis pilularis*) and introduced scotch broom (*Cytisus scoparius*). Open areas between the bushes support wildflowers such as western morning-glory (*Calystegia purpurata* ssp. *purpurata*), and native grass species such as annual hairgrass (*Deschampsia danthonioides*), California brome (*Bromus carinatus*), and purple needle-grass (*Nassella pulchra*).

Table 4-1.

Acreages of plant communities and other mapped features in the reservoir study areas.

Vegetative Communities/ Mapped features	South County					West County				
	Bloomfield	Carroll Rd	Huntley	Valley Ford	Two Rock	Adobe Rd	Lakeville Hillsdale	Sears Pt	Tolay A	Tolay C
Annual grassland	306.16	273.16	288.64	307.3	235.11	265.36	166.36	387.85	350.98	294.17
* Buckeye									.75	.75
CLO/ILO woodland						16.83		6.19		
Cropland									605.94	245.9
* Cypress					.49					
Drainage		.85		2.82	.44		.48	1.2	6.14	3.
Eucalyptus	6.	18.19	17.8	2.07	1.81		13.65	3.45	.05	2.59
Excavated ditch									10.34	4.91
Freshwater marsh					.41					
Freshwater pond	.78	2.44	.51	3.	6.75	2.39	.19		9.77	1.55
Freshwater seep		.19	2.36	1.78	23.93	.73	.58	.4	.48	.32
* Lombardy poplar							.72			
Mixed riparian	1.01		1.07		8.28	60.22		43.7	4.37	4.37
Native grassland		1.	2.05		1.25		.56		24.78	23.92
Non-wooded riparian	13.6	1.08	2.54	3.17	2.95	3.87	7.87	6.35	19.	18.91
Northern coastal scrub	4.58	2.9								
Oak-Bay-Madrone woodland	.83			.96	58.28					
* Redwood		.07								
Seasonally wet vegetation			8.33	46.51	1.02			.73	13.89	1.39
Urban									8.24	.1
Vineyard							28.21		10.71	
Willow riparian woodland	8.7	17.35	3.51	8.87	7.43		10.54	15.38	2.42	2.56
Communities per Site	8	10	9	9	13	6	10	9	15	14
Elevation of Site (feet)										
Minimum	60	60	80	40	160	180	80	20	190	190
Maximum	400	300	340	220	480	450	240	280	360	360
Size of Site (Acres)	341.46	317.03	306.81	376.48	348.13	349.4	231.24	465.25	1067.86	604.44

* Small stands of trees; not vegetative communities.

Carroll Road

The proposed Carroll Road reservoir site is located in a north-south oriented valley on the north side of Highway 1, 2.2 miles east of the town of Valley Ford in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 60 to 300 feet. Two unnamed, intermittent streams flow from drainages at the northern end of the site, then join and flow off-site into Americano Creek. The Carroll Road site is managed as rangeland and pasture for cattle.

The plant communities identified and mapped at the proposed Carroll Road reservoir site were annual grassland, eucalyptus, freshwater pond, freshwater seep, native grassland, northern coastal scrub, non-wooded riparian, seasonally wet vegetation, and willow

riparian woodland (Map C-6 in PES, 1996). The Carroll Road plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Carroll Road reservoir site is annual grassland. Introduced clovers and annual grass species, such as annual ryegrass (*Lolium multiflorum*), barley (*Hordeum murinum*), and oats (*Avena barbata* and *A. fatua*), dominate the grassland. Some native grass species such as California brome (*Bromus carinatus*) and native barley (*Hordeum brachyantherum*) occur within the annual grassland communities. An area of native grassland dominated by alkali ryegrass (*Leymus triticoides*) occurs on the northwest corner of the site.

Several willow dominated, riparian drainages occur on-site. Two drainages, one running west-east in the northern portion of the site and the other running north-south, are deep, narrow canyons approximately 20-30 feet deep and 5-15 feet wide. These canyons are characterized by the presence of old growth willows on the canyon floor. Fern species, including five-finger fern (*Adiantum aleuticum*) and western sword (*Polystichum munitum*), grow on the steep canyon walls.

eucalyptus occurs in scattered patches and groves at the Carroll Road site. These established groves have little understory vegetation. A small stand of coast redwood (*Sequoia sempervirens*) occurs beside a drainage at the southern end of Carroll Road.

A freshwater pond is located adjacent to the old homestead at the northern end of the site. A few remnant native trees and shrubs occur near the pond such as big-leaf maple (*Acer macrophyllum*), blue elderberry (*Sambucus mexicana*), and willows.

Several freshwater seeps occur on the hillsides at the southern end of the Carroll Road site. The freshwater seeps supports wetland species such as Bolander's rush (*Juncus bolanderi*), brown-headed rush (*Juncus phaeocephalus* var. *phaeocephalus*), common monkey-flower, and semaphore grass (*Pleuropogon californicus*).

Northern coastal scrub vegetation occurs on a hillside at the northeastern corner of the Carroll Road site. Shrub species, such as coyote brush, scotch broom, and sticky monkey-flower (*Mimulus aurantiacus*), occur in this community.

Huntley

The proposed Huntley reservoir site is situated in a small, north-south oriented valley, 1.3 miles south of the town of Bloomfield (Figure 2.1-1 in HBA, 1996a). Martinoni Road runs through the site. Elevations of the site range from 80 to 320 feet. An unnamed, intermittent creek flows through the center of Huntley, then off-site into Stemple Creek. Water from several seeps and drainages flows into the main creek corridor at the northern end of the site.

The plant communities identified and mapped in the proposed Huntley reservoir site were annual grassland, eucalyptus, freshwater pond, freshwater seep, mixed riparian, native grassland, non-wooded riparian, seasonally wet vegetation, and willow riparian woodland (Map C-7 in PES, 1996). The Huntley plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Huntley reservoir site is annual grassland. Grassland communities at the Huntley site are dominated by introduced annual grasses such as annual ryegrass, bromes (*Bromus diandrus* and *B. hordeaceus*), and oats. Several patches of hayfield tarplant (*Hemizonia congesta* ssp. *leucocephala*, CNPS List 3) occur within the grassland community at the southern end of the site. Other wildflowers such as California poppy, Johnny jump-up (*Viola pedunculata*), and lupines (*Lupinus albifrons* and *L. bicolor*), occur interspersed in the grassland community.

Several large patches of native grassland occur on the hillsides at the northern and southeastern parts of the site. These native grasslands are dominated by California oatgrass (*Danthonia californica* var. *californica*), foothill needle-grass (*Nassella lepida*), and purple needle-grass (*Nassella pulchra*).

Groves of eucalyptus occur along the upper end of Martinoni Road and along the drainage channel running east-west at the northern end of the site. Miner's lettuce (*Claytonia parviflora* and *C. perfoliata*) and yellow star thistle (*Centaurea solstitialis*) are the dominant understory species in the eucalyptus groves.

At the northern end of the valley, numerous freshwater seeps occur on the hillsides and drain into the stream corridor. Small pools have formed near the top of several of the seeps. The seeps are dominated by common horsetail, sedges, and rushes (such as brown-headed rush). Seasonally wet vegetation occurs adjacent to the main creek channel at the southern end of Huntley reservoir site.

Non-wooded riparian vegetation occurs along most of the main channel on the Huntley site. Some remnant mixed and willow riparian vegetation remains along the drainage channel downstream of the eucalyptus grove. The non-wooded areas of the channel are dominated by patches of rushes and sedges, including baltic rush (*Juncus balticus*), Bolander's rush, spreading rush (*Juncus patens*), and Dudley's sedge (*Carex dudleyi*). Pools form in several areas along the drainage. Vegetation in the pools includes aquatic plant species such as Lobb's aquatic buttercup (*Ranunculus lobbii*) and small pondweed (*Potamogeton pusillus*). Vegetation within the willow riparian corridor includes tree species such as arroyo, red, and shining willow, and understory species such as California blackberry (*Rubus ursinus*) and Himalayan blackberry.

Two Rock

The proposed Two Rock reservoir site is situated in an east-west oriented valley, 2.6 miles north of the town of Two Rock in Sonoma County (Figure 2.1-1 in HBA, 1996a). The proposed Two Rock reservoir site is topographically diverse, with elevations ranging from 140 to 380 feet. The diverse topography creates numerous microhabitats. Rock outcroppings occur on-site in the woodlands, grasslands, and along the creeks. Five creek tributaries flow into the main, unnamed creek channel, then off-site into Stemple Creek. The entire site is being managed as rangeland and pasture for cattle and horses.

Button Ranch is included within the boundaries of the proposed Two Rock reservoir site. Button Ranch has been recommended for incorporation into the NRS reserve system by the University of California Natural Reserve System (NRS; Elliott-Fisk *et al.*, 1992). NRS described the Button Ranch area as having "unique potential as a natural reserve" because of the extensive native evergreen forests, high species diversity, perennial stream and riparian communities, and native perennial grasslands present within the ranch area.

The plant communities identified and mapped at the proposed Two Rock reservoir site were annual grassland, eucalyptus, freshwater marsh, freshwater pond, freshwater seep, mixed and willow riparian woodland, native grassland, non-wooded riparian, seasonally wet vegetation, and oak-bay-madrone woodland (Map C-1 in PES, 1996). The Two Rock plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Two Rock reservoir site is annual grassland. The annual grassland is dominated by introduced annual grasses, such as annual ryegrass, bromes, and oats. Eighteen species of native grasses were observed during surveys at the Two Rock site. Previous studies documented up to 24 native grass species at the proposed Two Rock reservoir site (Connors, 1990). Native grass species include California oatgrass, blue bunchgrass (*Festuca idahoensis*), blue wild ryegrass (*Elymus glaucus*), and purple needle-grass. Native wildflowers, such as Baby blue eyes (*Nemophila menziesii*), cream cups (*Platystemon californicus*), footsteps of Spring (*Sanicula arctopoides*), and lupines, occur interspersed in the grassland communities.

Oak-bay-madrone woodlands dominate many of the hillsides at the Two Rock site. Tree species, such as coast live oak, California bay, and Pacific madrone, dominate the woodlands. Species composition varied with slope and microclimate. Woodlands on south and west facing slopes are dominated by coast live oak, while on the north and east facing slopes, California bay grows in almost pure stands with madrone and oak species interspersed among the bay trees. Other tree species that occur within the woodlands include California black oak, Douglas Fir (*Pseudotsuga menziesii* var. *menziesii*), and Oregon oak. Big-leaf maple, red and white alders (*Alnus rhombifolia* and *Alnus rubra*), and willows occur in drainages within the oak-bay-madrone woodland community.

Understory vegetation in the oak-bay-madrone woodlands includes shrubs such as hazelnut, ocean spray (*Holodiscus discolor*), red-flowering currant (*Ribes sanguineum*), and wood rose (*Rosa gymnocarpa*). Herbaceous understory vegetation includes ferns such as lady fern (*Athyrium filix-femina* var. *cyclosorum*) and five-finger fern; and native wildflowers such as checker lily (*Fritillaria affinis* var. *affinis*), false Solomon's seal (*Smilacina racemosa*), giant trillium (*Trillium chloropetalum*), mariposa lily (*Calochortus luteus*), and shooting star (*Calochortus luteus*). In areas dominated primarily by bay trees, there is little understory vegetation, probably due to the allelopathic effects of bay leaves. In these areas, understory vegetation consists primarily of western poison oak along with fern species, such as bracken fern (*Pteridium aquilinum* var. *pubescens*) and goldback fern (*Pentagramma triangularis* ssp. *triangularis*), and herbaceous species such as miner's lettuce and sanicle (*Sanicula crassicaulis*).

Mixed and willow riparian woodlands occur along the drainages and channels at the Two Rock site. Tree species that occur within riparian communities include arroyo, narrow-leaved (*Salix exigua*), red, and shining willows; big-leaf maple; and red and white alders. Shrub species include blue elderberry, California buckeye (*Aesculus californica*), hazelnut, and red osier dogwood (*Cornus sericea* ssp. *sericea*). Herbaceous species occurring in riparian areas at the Two Rock site include common monkey-flower, water buttercup (*Ranunculus aquatilis*), and wood strawberry (*Fragaria vesca*). Non-wooded riparian vegetation occurs in some areas of the creek at the Two Rock site. Vegetation in these areas consists primarily of patches of rushes and sedges. Other herbaceous species in non-wooded riparian areas include arroyo lupine (*Lupinus succulentus*), common horsetail, and pennyroyal (*Mentha pulegium*).

Several freshwater ponds occur along the main and tributary creek channels at the Two Rock site. The large stock pond located at the eastern end of the Two Rock site has little associated vegetation, perhaps due to its accessibility to cattle. Ponds on the Button Ranch side of the proposed Two Rock reservoir site have dense patches of bulrushes (*Scirpus americanus*) and cattails along their margins.

Numerous freshwater seeps occur at the Two Rock site. Vegetation occurring in seeps includes water-loving plants such as American brooklime (*Veronica americana*), common meadowfoam (*Limnanthes douglasii* ssp. *douglasii*), and white brodiaea (*Triteleia hyacinthina*). Some of the seeps support sedges and rushes including brown-headed rush, clustered field-sedge (*Carex praegracilis*), dense sedge (*Carex densa*), and spreading rush.

Rock outcroppings that occur on the proposed Two Rock reservoir site create microhabitats for many native species. Native plant species occurring near rock outcroppings at the Two Rock site include sticky monkey flower, dichondra (*Dichondra donnelliana*), live-forever (*Dudleya cymosa*), and Indian paintbrush (*Castilleja affinis* ssp. *affinis*).

Scattered patches of eucalyptus are established along drainages and at old homestead sites at the Two Rock site. These stands of eucalyptus have little understory vegetation.

Valley Ford

The proposed Valley Ford reservoir site is situated in a narrow, north-south oriented valley on the north side of Highway 1, 1.6 miles east of the town of Valley Ford in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 40 to 270 feet. At the northern end of the site, two main tributaries join to create the main, unnamed channel that flows through the center of the valley. This channel flows off-site into Americano Creek.

The plant communities identified and mapped in the proposed Valley Ford reservoir site were annual grassland, eucalyptus, freshwater pond, freshwater seep, non-wooded riparian, seasonally wet vegetation, oak-bay-madrone woodland, and willow riparian woodland (Map C-6 in PES, 1996). The Valley Ford plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Valley Ford reservoir site is annual grassland. These grassland communities on Valley Ford are dominated by introduced grass species, such as annual ryegrass and oats. Other herbaceous species occurring in the grassland communities include introduced, herbaceous species, such as clovers, mustard, and honeysuckle radish, along with native wildflowers, such as California poppies, cream cups, and yarrow.

A wide channel, runs north-south across Valley Ford, and is dominated by non-wooded riparian vegetation. The main channel is fed by two tributaries at the northern end of the site and several smaller drainages from hillsides surrounding the site. Non-wooded riparian vegetation occurring in these channels and drainages includes native common rush (*Juncus effusus*) interspersed with perennial grasses such as semaphore grass (*Pleuropogon californicus*). Other species occurring in the channel include flowering quillwort (*Lilaea scilloides*), water cress (*Rorippa nasturtium-aquaticum*), and water parsley (*Oenanthe sarmentosa*).

Remnant willow riparian woodland occurs along the channels and drainages at the northern end of the site. Willow species occurring here include arroyo, narrow-leaved, red, and shining willows. Himalayan blackberry, sweet brier (*Rosa eglanteria*), and western poison oak are shrubs occurring in the understory of the willow riparian habitat. Primarily non-native herbaceous species occupy the understory of the willow riparian communities. Non-wooded riparian vegetation occurs in the drainages throughout the rest of the site.

Three freshwater ponds have been constructed by impounding channels at Valley Ford. Two stock ponds are located at the northern end of the site. The stock ponds support narrow bands of common rush and introduced annual grasses along their edges. A third pond is located at the southeast corner of the site and is fenced to exclude cattle. A small patch of willows occurs beside the pond and dense stands of cattail, bulrush, sedges, and spikerush (*Eleocharis macrostachya*) occur along the edges of the pond.

Numerous freshwater seeps occur interspersed in the grassland communities and on hillsides at Valley Ford. Wildflowers, such as common meadowfoam, harvest brodiaea (*Brodiaea elegans* ssp. *elegans*), and popcorn flower (*Plagiobothrys trachycarpus*) are present along these seeps. Seasonally wet vegetation occurs at the southern end of the site. The seasonally wet vegetation is characterized by species such as brown-headed rush and spreading rush.

eucalyptus is well-established along two drainages on the west side of the site. These stands have little understory vegetation. Some remnant willow riparian woodland occurs downstream of these eucalyptus stands.

Adobe Road

The proposed Adobe Road reservoir site is located in a northeast-southwest oriented valley, 3.6 miles southeast of the town of Penngrove in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 180 to 420 feet. An unnamed, intermittent creek runs through the site in a southerly direction, then flows off-site into the Petaluma River. Several side channels flow into the creek from the surrounding hillsides. The site is being used as rangeland for cattle.

The plant communities identified and mapped in the proposed Adobe Road reservoir site were annual grassland, coast live oak/interior live oak woodland, freshwater pond, freshwater seep, mixed riparian, and non-wooded riparian (Map C-2 in PES, 1996). The Adobe Road plant species list is presented in Appendix A. Acreages of plant communities mapped on-site are shown in Table 4-1.

The dominant plant community at the proposed Adobe Road reservoir site is annual grassland. Introduced clovers and annual grass species, such as annual ryegrass and oats, dominate the grassland communities. Native grass species, such as alkali rye-grass, blue wild rye-grass, California brome, and purple needle-grass, occur in patches within the annual grassland communities. Wildflowers, such as California poppy, geranium (*Geranium dissectum*), and yarrow are interspersed within the grassland communities.

A mature, mixed riparian corridor exists along the entire length of the main creek channel. Steep banks provide protection for many herbaceous and perennial species including native grasses, since cattle cannot easily access these areas. Dominant tree

species in the riparian corridor include arroyo and red willows, big-leaf maple, California buckeye, and coast live oak. Understory shrub species include ninebark (*Physocarpus capitatus*), California rose, and California blackberry. Herbaceous species, such as ferns and western morning glory (*Calystegia purpurata* ssp. *purpurata*), grow on the steep banks of the creek.

Oak woodlands occur at the proposed Adobe Road reservoir site in scattered patches on hillsides surrounding the valley. These oak woodlands are dominated by Oregon oak. Other tree species occurring in small numbers within the oak woodlands include California bay, coast live oak, Pacific madrone, and valley oak. The understory vegetation in the oak woodlands consists primarily of introduced annual grasses. Other species occurring in the understory include shrub species such as western poison oak and herbaceous vines and wildflowers, such as creeping snowberry and miner's lettuce.

A large shallow stock pond is located at the northwest corner of the Adobe Road site. There is little vegetation around this pond. Two other small stock ponds are located at the south end of Adobe Road. A few small freshwater seeps occur near the southern end of the Adobe Road site.

Lakeville Hillside

The proposed Lakeville Hillside reservoir site is located in a steep-sided, east-west oriented valley, located 2.3 miles east the town of Lakeville in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 80 to 240 feet. Two unnamed, intermittent creeks flow into the proposed Lakeville Hillside reservoir site from the north, into a main channel and then flow off-site into the Petaluma River. Most of Lakeville Hillside is being used as rangeland for cattle and horses. A vineyard is located at the northern end of the site between the two creek channels.

The plant communities identified and mapped in the proposed Lakeville Hillside reservoir site were annual grassland, eucalyptus, freshwater pond, freshwater seep, native Grassland, non-wooded riparian, vineyard, and willow riparian woodland (Map C-3 in PES, 1996). The Lakeville Hillside plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Lakeville Hillside reservoir site is annual grassland. These grasslands are dominated by introduced grasses such as annual ryegrass, bromes, vulpia (*Vulpia bromoides* and *V. myuros*), and oats. Interspersed among the grasses are several species of wildflowers including California poppy, cream cups, Ithuriel's spear, Johnny jump-up, and silver lupine (*Lupinus albifrons* var. *albifrons*). Patches of native grassland occur on hillsides in the northwestern corner of the project site. Native grass species occurring there include California brome, California oatgrass, and purple needle-grass.

Several groves of eucalyptus are established in the proposed Lakeville Hillside reservoir site. Herbaceous species, such as miner's lettuce and introduced yellow star thistle, are dominant in the understory of the eucalyptus groves. Some remnant willow riparian vegetation occurs beside the creeks at the northern end of Lakeville Hillside. Dominant species in the willow riparian woodlands are arroyo and red willows. The understory of the willow riparian areas is vegetated with thick patches of Himalayan blackberry, western poison-oak, and wood rose.

Non-wooded riparian vegetation occurs along the creek in the southern portion of the site. Scattered patches of sedges and rushes occur on sandbars within the creek channel. Tree species occurring near the creek channel in the southern portion of the site include scattered Lombardy poplars (*Populus nigra* var. *italica*) and a few small willows.

Freshwater seeps occur along the hillsides at the southern end of Lakeville Hillside. These freshwater seeps support small patches of willows, tules, sedges, and rushes. Other species occurring in the seeps are common monkey-flower, curly dock (*Rumex crispus*), prickly-fruited buttercup (*Ranunculus muricatus*), and water chickweed (*Monilia fontana*).

Sears Point

The proposed Sears Point reservoir site is located in a narrow, northwest-southeast oriented valley, 1.5 miles north of the intersection of State Routes 121 and 37 in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 220 to 340 feet. Part of Tolay Creek flows through the center of the valley. Tolay Creek drains into San Pablo Bay southeast of Sears Point. The proposed Sears Point reservoir site is being used as rangeland for cattle.

The plant communities identified and mapped in the proposed Sears Point reservoir site were annual grassland, coast live oak/interior live oak woodland, eucalyptus, freshwater seep, mixed and willow riparian woodland, non-wooded riparian, and seasonally wet vegetation (Map C-5 in PES, 1996). The Sears Point plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Sears Point reservoir site is annual grassland. The grassland communities are dominated by introduced annual grasses such as annual ryegrass, oats, and vulpia. Some native grasses occur interspersed within the grassland communities.

A wide corridor of mixed riparian woodland occurs at the northern end of the Tolay Creek corridor in the proposed Sears Point reservoir site. Tree species occurring in the riparian corridor include arroyo, black, and red willows, big-leaf maple, California buckeye, and coast live oak. Many old growth trees occur in the riparian corridor. The understory vegetation in the mixed riparian corridor includes shrub species such as

blackberries, California coffeeberry (*Rhamnus californica*), and mule fat (*Baccharis salicifolia*); and herbaceous vines and wildflowers such as California figwort plant (*Scrophularia californica* ssp. *californica*), California man-root (*Marah fabaceus*), honeysuckle (*Lonicera hispidula* var. *vacillans*), and miner's lettuce.

Willow riparian woodland is dominant at the southern end of the Tolay Creek corridor in the proposed Sears Point reservoir site. The dominant willow species in the willow riparian woodlands are arroyo, narrow-leaved, and red willows. Numerous drainages flow down the surrounding hillsides into Tolay Creek and some of these support small patches of willows. Eucalyptus groves are established along several drainages at the proposed Sears Point reservoir site.

Several coast live oak/interior live oak woodlands occur in the proposed Sears Point reservoir site adjacent to the riparian corridors and in isolated patches on hillsides. These oak woodlands are dominated by coast live oak.

Several freshwater seeps and seasonally wet vegetation occur in Sears Point. These areas support wetland species such as brown-headed rush, common monkey-flower, prickle-fruited buttercup, and toad rush (*Juncus bufonius*).

Tolay

The proposed Tolay reservoir site is located in a northwest-southeast oriented valley, 1.6 miles east of the town of Lakeville in Sonoma County (Figure 2.1-1 in HBA, 1996a). Elevations of the site range from 220 to 320 feet. A shallow inland lake occurred here prior to being drained for agriculture. Tolay Creek flows southward through the valley floor and drains into San Pablo Bay southeast of the proposed Tolay reservoir site.

The plant communities identified and mapped at the proposed Tolay reservoir site were annual grassland, cropland, eucalyptus, freshwater pond, freshwater seep, mixed and willow riparian woodland, native grassland, non-wooded riparian, seasonally wet vegetation, and vineyard (Map C-3 and Map C-4 in PES, 1996). The Tolay plant species list is presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community at the proposed Tolay reservoir site is cropland and vineyards. Crops grown in the Tolay site include corn, squash, and pumpkins. Areas in which crops and vineyards are not being grown are managed as rangeland for cattle.

Annual grasslands occur along the edges of agricultural fields and on the hillsides surrounding the valley floor. Non-native annual grasses, such as annual ryegrass and oats, along with herbaceous perennials such as bristly ox-tongue (*Picris echinoides*) and hayfield tarweed (*Hemizonia congesta* ssp. *congesta*), dominate these grasslands. Several

patches of native grassland, dominated by alkali ryegrass, occur interspersed within the annual grasslands on hillsides at the southern end of the site and adjacent to riparian areas.

Tolay Creek runs southeast through the floor of the Tolay valley and several drainages flow into the creek from the surrounding hillsides. Non-wooded riparian vegetation, dominated by bulrush and cattails, occurs along the northern portion of Tolay Creek. At the southern end of the proposed Tolay reservoir site the main creek corridor is dominated by willow and mixed riparian woodlands. The willow riparian woodlands are dominated by arroyo, red, and shining willows. Mixed riparian vegetation includes willows and other tree species such as big-leaf maple and California bay.

Seasonally wet vegetation is found along many drainages and along parts of Tolay Creek. The seasonally wet vegetation is dominated by bulrushes and cattail in the main channel, and sedges in the side channels. A freshwater pond had been constructed within a drainage flowing into the southern end of the Tolay site. The pond is bordered along its shores by dense populations of cattail and bulrush with adjacent populations of common rush.

An isolated stand of California buckeye is located on a hillside at the southern end of the proposed Tolay reservoir site. Understory vegetation in this stand consists primarily of introduced annual grasses.

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES

Historic Records

Information on the potential presence of special-status plant species was derived from CNDDB/RareFind records (1 September 1995), through consultation with the USFWS (see letter in Appendix A), and consultation with Betty Guggolz, and through observations during site visits. There are 41 records for 28 plant species on the CNDDB/RareFind report for the Glen Ellen, Petaluma River, Sears Point, Two Rock, and Valley Ford 7.5-minute USGS quadrangles (Table 4-2). However, none of the records occur within proposed reservoir boundaries. The closest records occur 1.5 to 3.8 miles from the proposed reservoir sites:

- Two records for showy Indian clover (*Trifolium amoenum*) occurring 2.2 and 3.8 miles west of the proposed Catroll Road reservoir site; and
- Two records for showy Indian clover, located 1.5 and 3.0 miles west of Valley Ford.

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Table 4-2.

CNDDB/RareFind records of special-status plant species and sensitive natural communities in the study area quadrangles of proposed reservoirs.

Species name	USGS Quadrangle ^a					Total
	Glen Ellen	Petaluma River	Sears Point	Two Rock	Valley Ford	
<i>Agrostis blasdalei</i>					2	2
<i>Agrostis clivicola</i> var. <i>punta-reyesensis</i>					1	1
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>				2		2
<i>Astragalus tener</i> var. <i>tener</i>		1				1
<i>Biennosperma bakeri</i>	1		2			3
<i>Ceanothus sonomensis</i>	1					1
<i>Chorizanthe valida</i>		1				1
<i>Cordylanthus mollis</i> ssp. <i>mollis</i>		2	1			3
<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>					1	1
<i>Delphinium luteum</i>		1			3	4
<i>Downingia pusilla</i>	1					1
<i>Fritillaria liliacea</i>		1		1		2
<i>Hesperolinon congestum</i>		2				2
<i>Legenere limosa</i>	1					1
<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>				1		1
<i>Limnanthes vincularis</i>				4		4
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>		1				1
<i>Plagiobothrys mollis</i> var. <i>vestitus</i>		1				1
<i>Pleuropogon hooverianus</i>	1				1	2
<i>Polygonum marinense</i>		1				1
<i>Rhynchospora californica</i>				1		1
<i>Trifolium amoenum</i>				1	4	5
Total records	5	11	3	10	12	41
Sensitive Natural Communities						
Northern coastal Salt Marsh		1	2			3
Coastal Brackish Marsh		1	1		2	4
Northern vernal pool	1		1			2

^a The Bloomfield site is located on the Two Rock 7.5-minute USGS quadrangle.
The Carroll Road site is located on the Two Rock and Valley Ford 7.5-minute USGS quadrangles.
The Huntley site is located on the Two Rock 7.5-minute USGS quadrangle.
The Two Rock site is located on the Two Rock 7.5-minute USGS quadrangle.
The Valley Ford site is located on the Valley Ford 7.5-minute USGS quadrangle.
The Adobe Road site is located on the Glen Ellen 7.5-minute USGS quadrangle.
The Lakeville Hillside site is located on the Petaluma River 7.5-minute USGS quadrangle.
The Sears Point site is located on the Sears Point 7.5-minute USGS quadrangle.
The Tolay site is located on the Petaluma River 7.5-minute USGS quadrangle.

Three sensitive plant communities were reported on CNDDDB/RareFind for the Glen Ellen, Petaluma River, Sears Point, Two Rock, and Valley Ford 7.5-minute USGS quadrangles: northern vernal pool, northern coastal salt marsh, and coastal brackish marsh (CNDDDB/RareFind, 1995). A description of these sensitive plant communities is found in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996).

Betty Guggolz (personal communication, 1995) was not aware of any additional special-status plant locations in or near the boundaries of the proposed reservoir sites.

Field Records

Special-Status Plant Species

During surveys in the project study area, Sycamore Environmental botanists observed a total of 15 previously unreported populations of hayfield tarplant, two previously unreported populations of Lobb's aquatic buttercup, and one previously unreported population of bristly linanthus. The 15 new populations of hayfield tarplant represent a 68% increase over the number of populations previously reported in Sonoma and Marin counties (Table 4-3). The two new populations of Lobb's aquatic buttercup represent a 8% increase over the number of previously reported populations (Table 4-3). The new population of bristly linanthus represents an 11% increase over the number of previously reported populations in Sonoma and Marin counties (Table 4-3).

Special-status plant species observed in the reservoir component of the project study area consisted of the following:

- Two populations of hayfield tarplant (*Hemizonia congesta* var. *leucocephala*, CNPS List 3);
- One population of Lobb's aquatic buttercup (*Ranunculus lobbii*, CNPS List 4); and
- One population of bristly linanthus (*Linanthus acicularis*, CNPS List 4).

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Table 4-3.

Records of special-status species in the storage reservoir components.

	COUNTIES	UC ^a	ROPA ^b	CNDDDB ^c	CNPS ^d	EIR/EIS ^e	Total historic and current populations	% Increase over previous records ^f
Hayfield tarplant (CNPS List 3)	MARIN	8	0	0	0	5	13	
<i>Hemizonia congesta</i> var. <i>leucocephala</i>	SONOMA	12	0	0	2	10	24	
		20	0	0	2	15	37	68% (15/22)
Lobb's aquatic buttercup (CNPS List 4)	MARIN	8	1	0	0	0	9	
<i>Ranunculus lobbii</i>	SONOMA	8	8	0	0	2	18	
		16	9	0	0	2	27	8% (2/25)
Bristly linanthus (CNPS List 4)	MARIN	7	*	0	0	0	7	
<i>Linanthus acicularis</i>	SONOMA	2	*	0	0	1	3	
		9		0	0	1	10	11% (1/9)

^a Herbarium at University of California, Berkeley. * Information unavailable for DEIR.

^b Herbarium at Sonoma State University, Rohnert Park. * Information unavailable for DEIR.

^c CNDDDB/RareFind records.

^d Represents known records from the project study area (Betty Guggolz, Personal communication 1995).

^e Populations observed in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area.

^f Based on total known populations.

^g New records found during 1994-1995 surveys by Sycamore Environmental compared to historic records in Sonoma and Marin counties. Locations of historic records may or may not be extant.

The two populations of hayfield tarplant observed in the reservoir study area were found on the proposed Huntley reservoir site. The hayfield tarplant population located on the west side of Martinoni Road consisted of approximately 100-200 plants, scattered over an area occupying a 100 ft x 100 ft area (Map C-7 in PES, 1996). The hayfield tarplant population located on the east side of Martinoni Road consisted of approximately 50-100 plants, scattered over an area occupying a 100 ft x 100 ft area. The population of Lobb's aquatic buttercup observed in the reservoir study was found on the Huntley reservoir site in a 10 ft x 20 ft ponded area within the unnamed creek. The population of bristly linanthus was observed on the Two Rock reservoir site (Map C-1 in PES, 1996).

In addition to the special-status plant species observed in reservoir study areas, one population of Lobb's aquatic buttercup, and one of Victor's gooseberry (*Ribes victoris*), were observed at locations outside proposed construction boundaries.

The population of Lobb's aquatic buttercup was collected from a seasonal pool approximately 1,500 feet south of the location of the proposed main Valley Ford dam. The Victor's gooseberry was collected on a moderately steep hillside, approximately 1,500 feet southwest of the proposed Two Rock reservoir construction boundary.

Sensitive Natural Communities

Sensitive natural communities occurring in the reservoir study areas consist of the following:

- Coast live/interior live oak woodland;
- Freshwater marsh;
- Freshwater seep;
- Native grassland; and
- Riparian habitats, including mixed and willow riparian communities.

Acreages of sensitive natural communities occurring in the proposed reservoir sites are presented in Table 4-4.

Protected Tree Resources

Protected tree resources occurring at each proposed reservoir site are presented in Table 4-5. Nine of the eleven protected tree species were observed on reservoir sites. These tree species are listed as protected under Sonoma County Tree Ordinance 4014 (13 June 1989).

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Table 4-4.

Acreages of sensitive natural communities at proposed reservoir sites.

Sensitive Natural Communities	Adobe Road	Bloom-field	Carroll Road	Huntley	Lakeville Hillside	Sears Point	Tolay A	Tolay C	Two Rock	Valley Ford
Willow riparian	0	8.7	17.4	3.5	10.6	13.4	2.4	2.6	7.4	9
Mixed riparian	60.2	1	0	1.1	0	43.7	4.4	4.4	8.3	0
Total riparian habitat	60.2	9.7	17.4	4.6	10.6	59.1	6.8	7	15.7	9
Freshwater marsh	0	0	0	0	0	0	0	0	0.4	0
Freshwater seep	0.7	0	0.2	2.4	0.6	0.4	0.5	0.3	23.9	1.8
Total wetland vegetation	0.7	0	0.2	2.4	0.6	0.4	0.5	0.3	24.3	1.8
CLO/ ILO woodland	16.8	0	0	0	0	6.2	0	0	0	0
Total woodland habitat	16.8	0	0	0	0	6.2	0	0	0	1
Total native grassland	0	0	1	2.1	0.6	0	24.8	23.9	1.3	0
Total acres of sensitive natural communities affected	77.7	9.7	18.6	9.1	11.8	65.7	32.1	31.2	41.3	11.8

Table -4-5.

Protected tree resources observed at proposed reservoir sites.

Tree Species	Adobe Road	Bloom-field	Carroll Road	Huntley	Lakeville Hillside	Sears Point	Two Rock	Tolay	Valley Ford
Big-leaf maple	x		x			x	x	x	
Blue oak									
California bay	x	x	x	x		x	x	x	
California black oak			x				x		x
Coast live oak	x					x	x	x	x
Coast redwood			x				x		
Interior live oak							x		
Oregon oak	x						x	x	
Oracle oak									
Pacific madrone	x	x				x	x		
Valley oak	x					x	x		

FLORISTIC ANALYSIS OF RESERVOIR SITES

Floristic Diversity

An evaluation of "floristic diversity," which refers to the number of families, genera, or species in an area, was used to compare reservoir site floras. Taxonomic and other summary data for the West County, South County, and combined reservoir flora are presented in Table 4-6. A total of 82 families, 281 genera, and 495 species comprise the combined flora for the nine reservoir sites. (Note that the totals for the combined reservoir flora are based on the number of unique categories for the West and South County floras and are not the numeric total of the two.)

Table 4-6.

Floristic diversity of West County, South County, and combined
reservoir floras.

Category	West County	South County	Combined Reservoir Flora
Approximate area (acres):	1,690	2,718	4,408
Number of species per acre:	0.17	0.16	0.11
Families	64	78	82
Genera	185	262	281
Species ^a	291	437	495
Native Species ^a	177	287	329
% ^b	60.8%	65.7%	66.4%
Introduced Species ^a	113	146	159
% ^b	38.8%	33.4%	32.3%
Special-Status Plant Species ^c	3	0	3

^a Includes subspecies and varieties. The numbers of native and introduced species do not include collections that were identifiable only to genus. Thus, the number shown for native and introduced species is a few less than the total species.

^b Since a few collections were identifiable only to genus, the percent native and introduced calculations are based on the ratio of total native and introduced to total species.

^c See the Special-Status Plant Species and Sensitive Natural Communities section of this document.

Although South County ranked numerically higher in each taxonomic category, West County had slightly more species per acre (0.17 vs. 0.16). However, South County had more native species than West County (65.7% vs. 60.8%) and fewer introduced species (33.4% vs. 38.8%). Special-status plant species were found only in the West County reservoir sites. For the combined reservoir flora, native California species amounted to 66.4% of all species identified.

Three taxonomic categories for the nine reservoir sites are compared in Figure 4-1. Sites are ranked in order of increasing floristic diversity. The Two Rock reservoir site ranked highest in each category although it was only the 6th largest site. Lakeville Hillside ranked last in the three taxonomic categories. A total of 86.4% of all families, 79.9% of all genera, and 65.1% of all species present on the nine sites are represented at the Two Rock site. Two Rock ranked first in the number of native species present (215 species, 67.2% native) and Lakeville Hillside ranked last (68 species, 20.9% native; Figure 4-2). Except for Tolay which had 122 species (37.4% native), Two Rock had over twice as many native species as all other sites.

Factors Contributing to Floristic Diversity

Natural factors that influence species diversity include elevation, size, climate, soil type, and topography (Barbour *et al.*, 1980). Man-induced factors that affect species diversity in agricultural communities include farming and grazing practices. This section discusses elevation, size, and grazing factors in relation to floristic diversity.

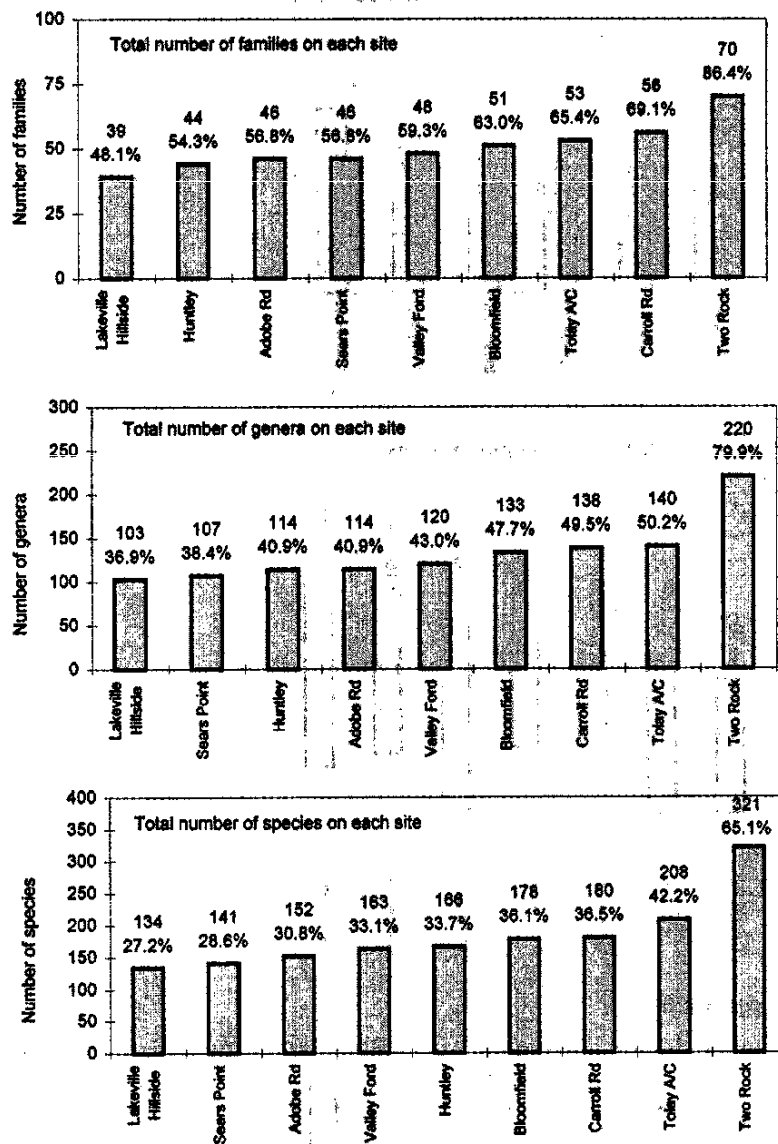
The elevations of the proposed reservoir sites range from 20 to 480 ft (Figure 4-3). A comparison of Figure 4-1 with Figure 4-3 shows that there is no correlation between taxonomic category (e.g., family, genus, species) and elevation.

Large areas tend to support more species (i.e., more floristic diversity) than smaller areas (Barbour *et al.*, 1980). Therefore, size differences alone could be expected to influence floristic diversity. Although the nine proposed reservoir sites vary substantially in size (231 to 1,055 acres, Figure 4-4), a linear correlation does not exist between their size and the number of species they support. For example, the Two Rock site which is only 9.8% larger than Carroll Road, has 175% more species. We believe the floristic diversity of Two Rock is related to its topographical diversity. Another example is provided by Sears Point and Bloomfield. Whereas Sears Point is 135% larger than Bloomfield, Bloomfield has 129% more species than Sears Point.

The number of species unique to each reservoir site is presented in Figure 4-5. As used here, "unique" is defined as a species that occurs at only one reservoir site. The greatest number of unique species (76) were found at the Two Rock site. Lakeville Hillside and Sears Point reservoir sites each had 5 unique species, the lowest among all sites.

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Figure 4-1. Number and percentage of taxa occurring on each site.



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Figure 4-2. Number of native species occurring on each site.

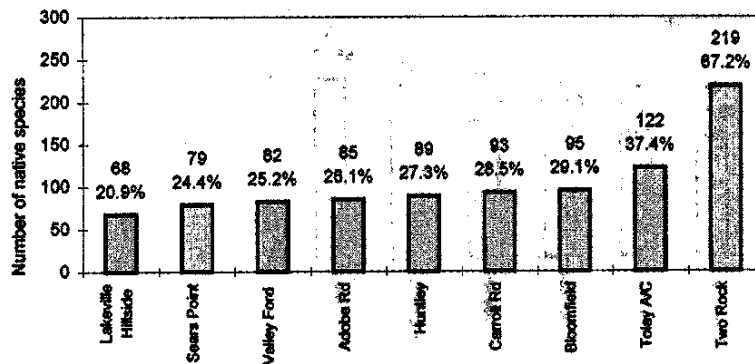


Figure 4-3. Range of elevation for the reservoir sites.

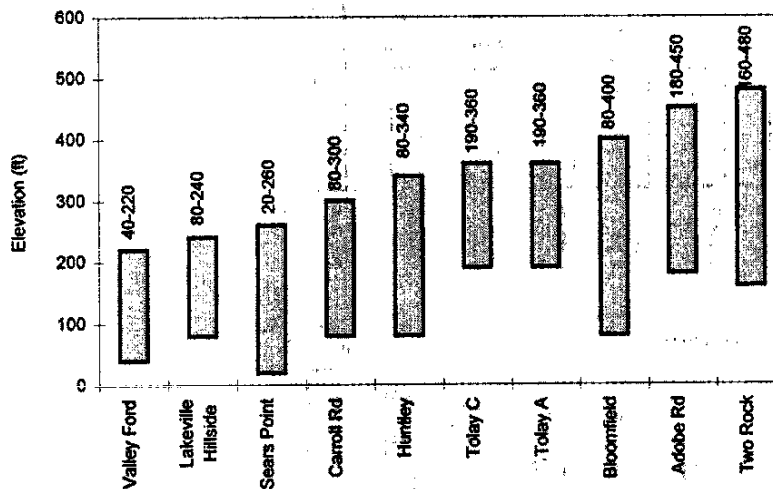


Figure 4-4. Size of reservoir sites.

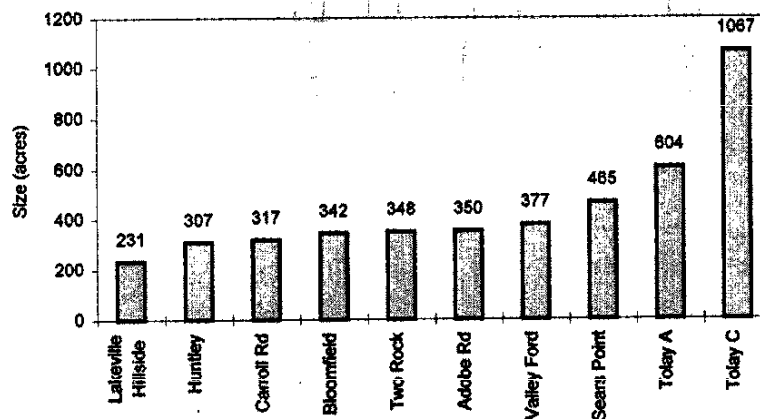
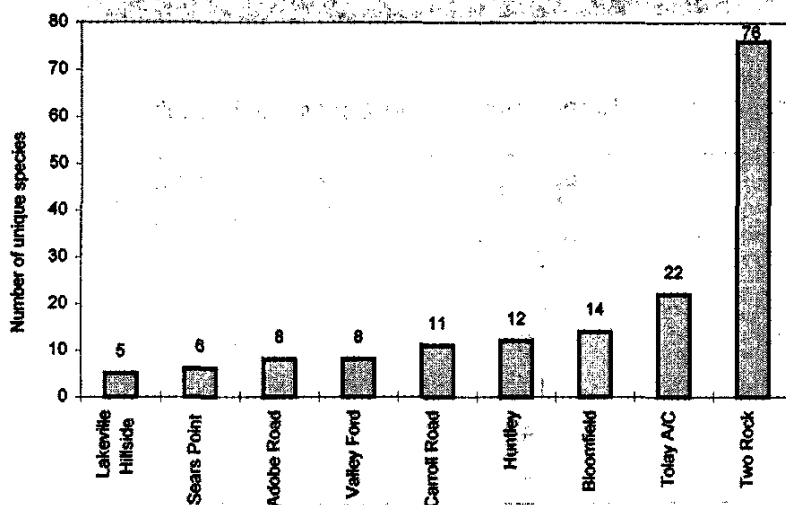


Figure 4-5. Number of species unique to each reservoir site.



In the reservoir study areas, grazing is the most common land use. Other land uses in the reservoir study sites include the growing of crops and vineyards. Grazing is known to have influenced the floristic composition of grasslands within Sonoma and Marin counties (Heady *et al.*, 1977). Four factors found to have substantially affected the distribution and composition of species in coastal prairie grassland communities of Sonoma County are a) the introduction of highly competitive, exotic species; b) an increase in grazing pressures; c) the elimination of annual fires; and d) cultivation (Heady *et al.*, 1977). These factors also affect floristic diversity of other plant communities. Based on the studies cited, as well as our observations of the study areas, Sycamore Environmental believes that grazing has affected the floristic diversity of the reservoir sites by reducing the number of native species and increasing the number of introduced species.

Growth Habit

The combined reservoir flora in accordance with their growth habit were summarized (herbs, trees, shrubs, ferns, shrub/trees, and vines, Table 4-7). The 'shrub/trees' category was applied to species described as "shrub or tree" or "shrub to tree" in *The Jepson Manual* (Hickman, ed., 1993). Herbaceous species represent the most common growth habit of species occurring at reservoir sites, comprising 85.5% of all species identified (Table 4-7).

Table 4-7.

Summary of the combined reservoir flora by growth habit.

Category	Species ^a	% of Combined Reservoir Flora
Herbs	421	85.5
Trees	29	5.9
Shrubs	27	5.5
Ferns	10	2.0
Shrub/ Trees	4	0.8
Vines	4	0.8

^a Includes subspecies and varieties.

Wetland Indicator Species

Species collected in the reservoir study sites were classified as 'wetland indicator' species if they were obligate, facultative wetland, or facultative indicator species based on the classifications assigned by Reed (1988). A total of 143 species, representing nearly one third of the combined reservoir flora, are regarded as obligate, facultative wetland, or facultative indicator species (Reed, 1988).

Grass Species

An analysis of the grass family, Poaceae, was conducted because of the interest in reestablishing native grassland communities and for preserving native grass species (California Native Grass Association, undated). Native grasses were collected in all of the reservoir sites and are a significant portion of the grass species collected in annual grasslands. Although native grass species were collected at all reservoir sites, only five sites had populations of native grass species of sufficient size to be mapped: Carroll Road, Huntley, Two Rock, Lakeville Hillside, and Tolay.

Taxonomic Summary for Poaceae

Taxonomic and other data for the combined reservoir flora for Poaceae are summarized in Table 4-8. A total of 70 grass species, representing 36 genera, were identified. Native grass species accounted for 40.0% (28/70) of all grass species identified. A total of 8.5% (28/495) of all species identified were

members of the Poaceae. No special-status grass species were found in the reservoir study areas.

The most common grass species were introduced annuals such as annual ryegrass, bromes, and oats. Seventeen genera of grasses are represented by only one species each, and eleven genera are represented by two species each. Eight genera are represented by three or more species: *Bromus* and *Melica* (5 species each); *Hordeum*, *Phalaris*, and *Poa* (4 species each); and *Agrostis*, *Elymus*, and *Festuca* (3 species each).

Table 4-8

Summary of the combined reservoir grass species (Poaceae).

Category	Poaceae (Grasses)	% of Reservoir Flora
Genera	36	12.8%
Species ^a	70	14.1%
Native Species ^a	28	8.5%
% ^b	40.0%	
Introduced Species ^a	40	24.6%
% ^b	57.1%	
Special-Status Plant Species	0	0

^a Includes subspecies and varieties.

^b Since a few collections were identifiable only to genus, the percent native (or introduced) calculation is based on the ratio of total native (or introduced) to total species.

Reservoir Summary

Two taxonomic categories for the nine reservoir sites are compared in Figure 4-6. The Two Rock reservoir site ranked highest in the number of grass genera (29) and species (43). Lakeville Hillside and Sears Point ranked last in number of grass genera (16). Lakeville Hillside had the fewest number of species (21). Bloomfield, Lakeville Hillside, and Valley Ford tied for the fewest number of native grass species (6).

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Figure 4-7 shows the number of native grass species per site as a percentage of the total grass species at each site. For example, of 30 grass species at Tolay, nine were native ($9/30 = 30.0\%$). Two Rock had the highest percentage of native grasses ($19/43 = 44.1\%$). Valley Ford had the lowest percentage of native grasses (22.2%).

Figure 4-6. Number and percentage of grass taxa occurring on each site.

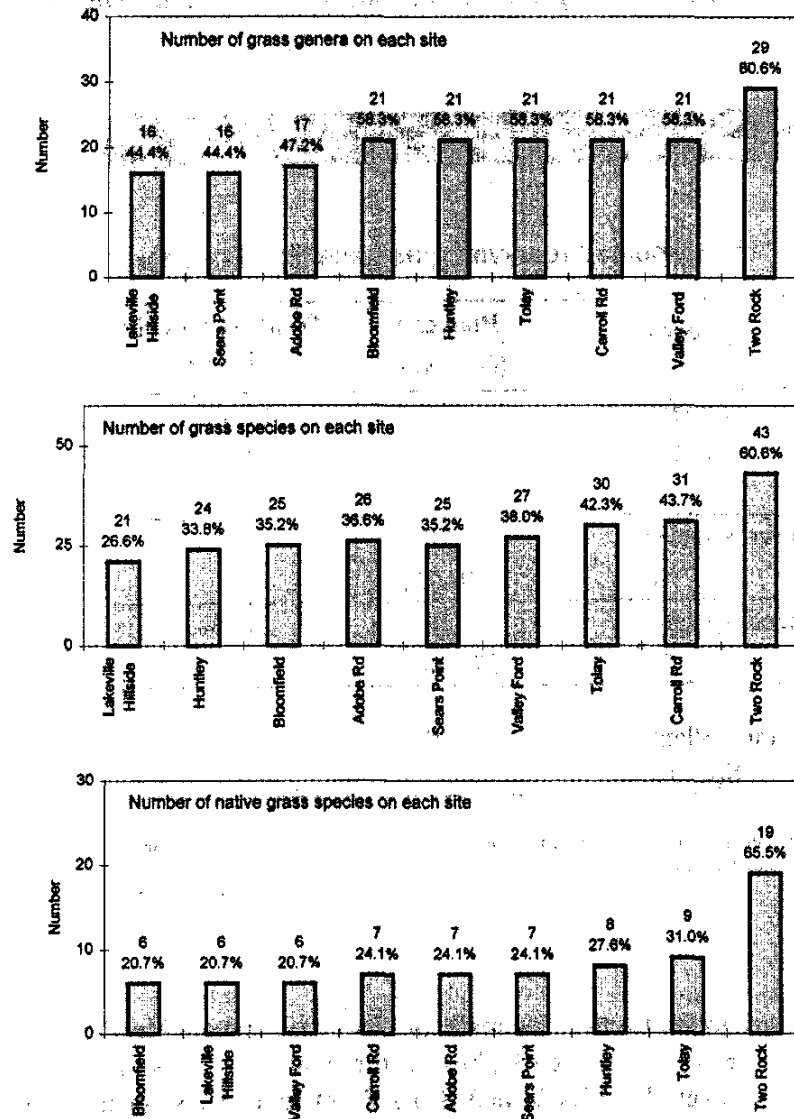
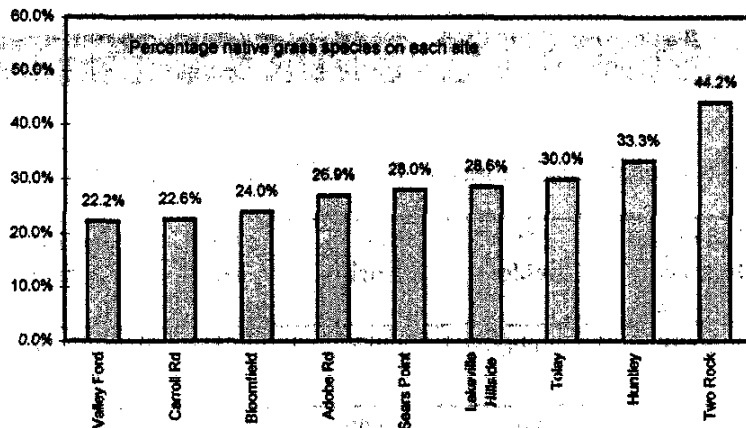


Figure 4-7. Number of native grass species per site as a percentage of the total grass species at each site.



Comparison of Combined Reservoir Flora with Floras of Other Areas

A literature search for floristic studies in the coast ranges of Sonoma County found no studies comparable in size to the Santa Rosa EIR/EIS. However, three studies conducted in northern California and one in southern California provide information with which to make comparisons with the flora of the reservoir study areas.

Other Floras

Table 4-9 provides a comparison of taxonomic categories between the combined reservoir flora and four other floras (Bowerman, 1944; Little, 1977; Willoughby, 1981; and McClintock, *et al.*, 1990). These floras, which encompass both larger and smaller areas than the combined reservoir study area, include Mt. Diablo in Contra Costa County (Bowerman, 1944), Starr Ranch in Orange County (Little, 1977), the Vaca Mountains in Napa and Solano counties (Willoughby, 1981), and the San Bruno Mountains in San Mateo and San Francisco counties (McClintock, *et al.*, 1990). All of these floras were conducted in the coastal mountains of California and include plant communities that also occur in the reservoir study area.

The number of species per acre is an indicator of floristic diversity. The San Bruno Mountains flora has the highest (0.22) and Mt. Diablo the fewest (0.03) number of species per acre. The number of species per acre for the combined reservoir flora is 0.11 (Table 4-9), which is a mid-range value compared with the

other floras. Thus, floristic diversity of the combined reservoir flora is neither extremely low nor extremely high in the number of species present.

Table 4-9.

Comparison of the combined reservoir flora with four other floras.

Category	Combined Reservoir Flora	Mt. Diablo ^a	Starr Ranch ^b	Vaca Mts. ^c	San Bruno Mts. ^d
Approximate area (acres):	4,408	20,000 ^e	4,000	6,178	3,000
Number of species per acre:	0.11	0.03	0.09	0.09	0.22
Families	82	83	67	89	97
Genera	281	(ukn)	230	317	379
Species	495	630	359	586	659
Native Species	329	539	288	429	404
%	66.4%	85.6%	80.2%	73.2%	61.3%
Introduced Species	159	91	71	157	255
%	32.3%	14.4%	19.8%	26.8%	38.7%

^a Bowerman, 1944.

^b Lintle, 1977.

^c Willoughby, 1981.

^d McClintock, et al., 1990.

^e The acreage was not given in Bowerman (1944) and therefore was estimated from a Mt. Diablo State Park brochure (1993).

Introduced Species

The percentage of introduced species in a flora provides evidence of the amount of historic disturbance of an area. The percentage of introduced species is presented in Table 4-10 for nine studies. The overall value for the State of California is also given. The percentage of introduced species reported for the combined reservoir flora (33.9%) is almost twice the state-wide average (17.4%).

The combined reservoir flora has the second highest percentage of introduced species (32.3%) compared to eight other studies conducted in California. Only the San Bruno Mountains flora (38.7%) has a higher percentage of introduced

species. Both of these areas have been subjected to extensive grazing and support Sycamore Environmental's contention that grazing tends to increase the number of introduced species while decreasing the number of native species.

Table 4-10.

Percentage of introduced species present in floras.

Regional Study	% of Introduced Species	Source
Mt. Hamilton Range	9.0	Sharsmith, 1945 ^a
Mt. Diablo	14.4	Bowerman, 1944
Geothermal Pipeline	16.5	WESCO, 1986
Starr Ranch, Orange Co.	19.8	Little, 1977
Marin County	23.5	Howell, 1970 ^a
Vaca Mountains	26.8	Willoughby, 1981
Santa Cruz Mountains	30.7	Thomas, 1961 ^a
Combined Reservoir Flora	32.3	Current study
San Bruno Mountains	38.7	McClintock, et al., 1990
State of California	17.4	Hickman, ed., 1993

^a From summary in Willoughby, 1981.

5. IMPACT ANALYSIS

INTRODUCTION

This section discusses the methods and the significance criteria used to evaluate impacts and describes botanical resource impacts expected to result from implementation of the proposed project.

METHODS: DETERMINATION OF SIGNIFICANCE OF IMPACTS

Impacts to botanical resources were evaluated for significance based on legal protection; local, state, and federal agency policies; and documented resource scarcity and sensitivity.

State and Federal Statutes

State and Federal statutes pertinent to botanical resources that need to be evaluated in an EIR include:

- Federal Endangered Species Act (16 U.S.C. 1531-1543).
- California Environmental Quality Act (P.R.C. 21000 et. seq.).
- California Endangered Species Act (California Fish and Game Code 2050 et. seq.).
- Native Plant Protection Act (California Fish and Game Code 1900-1913).

Federal Endangered Species Act

The Federal Endangered Species Act defines "take" (Section 9) and prohibits "taking" of a listed endangered or threatened species (16 USC 1532, 50 CFR 17.3). If a federally listed species could be harmed by a project, a Section 7 or 10 consultation must be initiated and an Incidental Take Permit must be obtained (16 USC 1539, 50 CFR 13).

California Fish and Game Code

The California Fish and Game Code defines "take" (Section 86) and prohibits "taking" of a species listed as threatened or endangered under the California Endangered Species Act (California Fish and Game Code Section 2080) or otherwise fully protected (as defined in California Fish and Game Code Sections 3511, 4700, and 5050).

The CDFG also regulates activities that may impact streambeds or other wetland areas. Division 2, Chapter 6, Section 1601 of the Fish and Game Code states that

"...general plans sufficient to indicate the nature of a project for construction by, or on the behalf of, any governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or will use material from the streambeds designated by the department, shall be submitted to the department."

The CDFG has stated that their jurisdiction is any wetland area that is within the 100-year floodplain. Completion of a Section 1601-03 Streambed Alteration Agreement with the CDFG is required before any work begins that will affect wetland areas within the 100-year floodplain.

Other Special-Status Species Classifications

California species of special concern and species on California Native Plant Society (CNPS) lists 1B, 2, 3, and 4 were evaluated.

Sensitive Natural Communities

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Sensitive natural communities occurring in the reservoir study area include plant communities associated with native grassland, oak woodland, riparian habitat, and wetland habitats.

Native Grassland

Grazing pressures and the introduction of non-native annual species have contributed to the reduction or elimination of native bunch grasses from many areas of Sonoma and Marin counties. Annual, non-native grasses have replaced the native perennial bunchgrass prairies that once dominated lower elevations throughout North America. One of the main factors that shifted the competitive advantage from native to non-native grasses appears to be the inability of native grasses to successfully compete under heavy grazing conditions (Barbour and Major, 1977).

Oak Woodland

Oak woodlands provide habitat for a wide diversity of wildlife. Thirty-five percent of California's mammal species utilize oak woodlands for food and shelter (Pavlik *et al.*, 1991). Oaks have figured prominently in the history of California, providing food, fuel, and tools to both native Americans and pioneers. Oak woodlands are a significant natural resource providing erosion and landslide

control, nutrient cycling, ground water recharge, air and water quality, recreation, wood production, livestock grazing, aesthetic qualities, and wildlife habitat (Hagen, 1995). Although oak woodlands cover millions of acres throughout California, there is widespread concern about native oaks. An estimated 14,000 acres are lost each year (Hagen, 1995). Threats to oaks include urbanization, conversion of oak woodlands to agriculture, and fragmentation of natural habitats in rural areas.

Riparian Habitat

Riparian habitats are very important for the survival of wildlife providing food, shelter, and serving as migration and dispersal corridors (Sands, 1980; Warner and Hendrix, 1984). California has rich mammal, reptile, and amphibian faunas; many species of which are dependent upon riparian habitats. One quarter of California's mammals are limited to or are closely dependent upon riparian habitats. Half of the reptiles and 75% of the amphibians in California are closely associated with riparian systems. Through its influence on water quality, temperature, and nutrients, riparian vegetation determines the structure and functioning of stream ecosystems and fish communities. Most of California's original riparian vegetation has been lost. Only 15% of the riparian habitat in the Central Valley remains, and 75% of what remains has been degraded (Warner and Hendrix, 1984).

Wetland Habitat

Wetlands are protected under Section 404 of the Clean Water Act. Wetlands perform many important functions such as improving water quality, recharging ground water, providing natural flood control, and providing habitat for numerous species of wildlife, plants, and fish. Wetland habitats of concern in the reservoir study areas include freshwater seeps, freshwater marshes, and seasonally wet vegetation.

Protected Tree Resources

Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh of nine inches or greater of the following species are protected: big-leaf maple, black oak, blue oak, California bay, coast live oak, interior live oak, Pacific madrone, oracle oak, Oregon oak, coast redwood, and valley oak. The ordinance also protects hybrids of these species.

SIGNIFICANCE CRITERIA

The following significance criteria were used to evaluate impacts on botanical resources:

- Any loss of the habitat, individuals, or populations of federally listed endangered, threatened, or proposed plant species, or plant species that are federal candidates for listing.
- Any loss of the habitat, individuals, or populations of state listed endangered, threatened, rare, or proposed plant species.
- Any loss of the habitat, individuals, or populations of species occurring on List 1B of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Loss of more than 15% of the known and historic populations in Sonoma and Marin counties of species occurring on List 2, 3, or 4 of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Any loss of sensitive plant communities, as defined by CDFG, or other communities of recognized regional importance.
- Any loss of riparian habitats.

IMPACTS OF PROPOSED PROJECT ALTERNATIVES

Short-term vegetation impacts result from construction activities that involve creation of dust, habitat alteration, temporary vegetation removal, etc. Long-term impacts result when vegetation is permanently removed or destroyed, when land is cleared for construction, when special-status species are threatened, or when the integrity of a plant community is destroyed. Construction of temporary or permanent roads, dumping of trash or construction materials, dumping or removal of soil, and flooding or dewatering are examples of actions that can destroy the integrity of a sensitive natural community.

Construction of the proposed reservoirs will primarily result in long-term impacts. The long-term impacts associated with construction and maintenance of the storage reservoirs result from construction of the main dam, backdam, saddle dam, spillway, inlet and outlet conduit pipelines, irrigation delivery pump station, access roads and fencing, runoff diversion structures, and water storage for each reservoir site. A complete project description is presented in the Santa Rosa Subregional Long-term Wastewater EIR/EIS (HBA, 1996b).

For all main dams, a concrete lined, chute-type spillway will be constructed. The spillway will extend from the embankment downslope to discharge through an energy dissipation structure into a channel below the dam. The energy dissipation structure will consist of a rock lined section of the natural creek channel, up to 25 feet wide, for up to

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300 feet downstream from the spillway. The spillway is intended for emergency release of water only in the event of upstream flow from a severe storm entering the reservoir when it is full.

All proposed borrow areas, which will provide the basic fill material for construction of the dam, are located within the reservoir footprints. However, all reservoirs will require some imported materials.

Plant Communities

Acres of plant communities potentially affected by construction and maintenance of the proposed reservoir storage facilities are presented in Table 5-1.

Table 5-1.

Acreage of plant communities and mapped features potentially affected by the project components.

Vegetative Communities/ Mapped features	South County					West County				
	Bloomfield	Carroll Rd	Huntley	Valley Ford	Two Rock	Adobe Rd	Lakeville Hillside	Sears Pt	Tolay A	Tolay C
Annual grassland	306.16	273.16	268.64	307.3	235.11	255.36	168.36	387.85	350.88	294.17
* Buckeye									.75	.75
CLO/LO woodland						16.83		6.19		
Cropland									605.94	245.9
* Cypress					.49					
Drainage		.85		2.82	.44		.48	1.2	6.14	3.
Eucalyptus	6.	18.19	17.8	2.07	1.81		13.65	3.45	.05	2.59
Excavated ditch									10.34	4.91
Freshwater marsh					.41					
Freshwater pond	.78	2.44	.51	3.	6.75	2.39	.19		9.77	1.55
Freshwater seep		.19	2.36	1.78	23.93	.73	.56	.4	.48	.32
* Lombardy poplar							.72			
Mixed riparian	1.01		1.07		8.26	60.22		43.7	4.37	4.37
Native grassland		1.	2.05		1.25		.56		24.78	23.92
Non-wooded riparian	13.6	1.08	2.54	3.17	2.95	3.87	7.97	6.35	19.	18.91
Northern coastal scrub	4.58	2.9								
Oak-Bay-Madrone woodland	.63			.96	58.28					
* Redwood		.07								
Seasonally wet vegetation			8.33	48.51	1.02			.73	13.89	1.39
Urban									8.24	.1
Vineyard							28.21		10.71	
Willow riparian woodland	8.7	17.35	3.51	8.87	7.43		10.54	15.38	2.42	2.56
Communities per Site	8	10	9	9	13	6	10	9	15	14
Elevation of Site (feet)										
Minimum	80	80	80	40	190	180	80	20	190	190
Maximum	400	300	340	220	480	450	240	280	380	360
Size of Site (Acres)	341.46	317.03	306.81	376.48	348.13	349.4	231.24	465.25	1067.85	604.44

* Small stands of trees; not vegetative communities.

Special-Status Plant Species

Selection of the Huntley reservoir site will result in the loss of two populations of hayfield tarplant. This loss would represent 5% (2/37) of all historic and current populations in Sonoma and Marin counties. The loss of these two populations would represent a 13% (2/15) loss of the previously unreported populations discovered by Sycamore Environmental in Sonoma and Marin counties during the surveys for this EIR/EIS. In accordance with the significance criteria, if six populations (15% of all historic and current records in Sonoma and Marin counties) of hayfield tarplant would need to be affected in order to result in a significant impact. Since only two populations of hayfield tarplant would be affected, the impact is not considered significant.

Selection of the Huntley reservoir site will result in the loss of one population of Lobb's aquatic buttercup. This loss would represent 4% (1/27) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, if four populations (15% of all historic and current records in Sonoma and Marin counties) of Lobb's aquatic buttercup would need to be affected in order to result in a significant impact. Since only one population of Lobb's aquatic buttercup would be affected, the impact is not considered significant.

Selection of the Two Rock reservoir site will result in the loss of one population of bristly linanthus. This loss would represent 10% (1/10) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, if two populations (15% of all historic and current records) of bristly linanthus would need to be affected in order to result in a significant impact. Since only one population of bristly linanthus would be affected, the impact is not considered significant.

The total loss of all populations from all project components will need to be considered in order to compare impacts among various project alternatives.

Protected Tree Resources

Table 4-5 of this document presents a list of the protected tree species that occur on each reservoir site. Protected tree species occur on all of the proposed reservoir sites except Lakeville Hillside. The surveys conducted for this project determined the presence or absence of protected tree resources, but did not attempt to quantify the numbers of such trees present at each site. The number of trees subject to the Sonoma County Tree Ordinance will be determined during site-specific, pre-construction surveys.

Sensitive Natural Communities

Table 5-2 presents acreages of sensitive natural communities potentially affected by implementation of the reservoir component. In accordance with the significance criteria, any loss of sensitive natural communities is considered significant.

- Selection of the Adobe Road site would affect 60.2 acres of riparian habitat. Selection of the Sears Point site would have the second highest impact, at 59.1 acres. Selection of the Huntley site would affect 4.6 acres, the fewest acres of riparian habitat among the alternative sites.
- Selection of the Two Rock site would affect 24.3 acres of wetland vegetation, the largest amount of wetland vegetation affected of all alternative components. Selection of the Adobe Road, Carroll Road, Lakeville Hillside, Sears Point, Tolay A or Tolay C sites would affect less than one acre of wetland vegetation. Selection of the Bloomfield site would not affect any wetland vegetation.
- Selection of the Adobe Road site would affect 16.8 acres of woodland habitat, the largest number of acres of sensitive woodland habitat affected of all alternative components. Selection of the Bloomfield, Carroll Road, Huntley, Lakeville Hillside, Tolay A, Tolay C, Two Rock or Valley Ford sites would not affect any sensitive woodland habitat.
- Selection of the Tolay A site would affect 24.8 acres of native grassland, the largest number of acres of native grassland affected of all alternative components. Selection of the Tolay C site would have the second highest impact, at 23.9 acres. Selection of the Adobe Road, Bloomfield, Sears Point, or Valley Ford sites would not affect any native grasslands.
- Total Impact on Sensitive Natural Communities: Selection of the Adobe Road site would affect a total of 77.7 acres of sensitive plant communities. This represents the greatest impact on sensitive plant communities among all alternatives. Selection of the Valley Ford, Bloomfield, or Huntley sites would affect the fewest acres of sensitive plant communities (10.8, 9.7, and 9.1 acres respectively).

Table 5-2.

Acreages of sensitive plant communities affected by reservoir components.

Sensitive Natural Communities	Adobe Road	Bloom-field	Carroll Road	Huntley	Lakeville Hillside	Sears Point	Tolay A	Tolay C	Two Rock	Valley Ford
Willow riparian	0	8.7	17.4	3.5	10.6	15.4	2.4	2.6	7.4	9
Mixed riparian	60.2	1	0	1.1	0	43.7	4.4	4.4	8.3	0
Total riparian habitat	60.2	9.7	17.4	4.6	10.6	59.1	6.8	7	15.7	9
Freshwater marsh	0	0	0	0	0	0	0	0	0.4	0
Freshwater seep	0.7	0	0.2	2.4	0.6	0.4	0.5	0.3	23.9	1.8
Total wetland vegetation	0.7	0	0.2	2.4	0.6	0.4	0.5	0.3	24.3	1.8
CLO/ ILO woodland	16.8	0	0	0	0	6.2	0	0	0	0
Total woodland habitat	16.8	0	0	0	0	6.2	0	0	0	0
Total native grassland	0	0	1	2.1	0.6	0	24.8	23.9	1.3	0
Total acres of sensitive natural communities affected	77.7	9.7	18.6	9.1	11.8	65.7	32.1	31.2	41.3	10.8

Mitigation Measures Incorporated into Project Design

If sensitive botanical resources cannot be avoided through project design or during construction, specific measures will be implemented (HBA, 1996c): all mitigation measures of the Sonoma and Marin County Tree ordinances will be met; if avoidance of a sensitive plant species is not feasible, a qualified botanist will salvage individual specimens or seeds and revegetate following construction; where avoidance of other sensitive resources, excluding species protected under FESA or CESA, is not feasible, the affected habitat will be replaced at a minimum 3:1 ratio.

Downstream Effects-Indirect Impacts

Potential downstream impacts are discussed in the Aquatic section of the Biological Impact Analysis Report. In a contingency irrigation mode, the Bloomfield reservoir would result in a significant increase in dry season flow at one location along the creek, which could have an overall beneficial impact to riparian and aquatic vegetation compared to existing conditions. Significant decreases in wet season flow would occur below the base of Huntley dam and below the base of Two Rock dam. However, decreases in wet season flow are not anticipated to affect vegetation because most species are dormant during winter. Thus, the downstream effects of project operation on vegetation are expected to be minimal, and may be beneficial due to the availability of summer water.

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7. LITERATURE CITED AND PERSONAL COMMUNICATIONS

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APPENDIX A.

Plant Species List for Reservoir Component.

Appendix A. Reservoir Plant Species List

Family	Species	Common Name	N/I*	Tolay	Two Rock	Bloom field	Carroll Road	Valley Ford	Lake Adobe ville	Sears Road	Huntley Point
ROSACEAE	Acaena pinnatifida var. californica	California acaena	N	○	●	○	○	●	○	○	○
ACERACEAE	Acer macrophyllum	Big-leaf maple	N	●	●	○	○	○	○	●	○
ASTERACEAE	Achillea millefolium	Yarrow	N	●	●	●	●	●	●	●	●
ASTERACEAE	Achyrochaena mollis	Blow-wives	N	●	●	○	○	○	○	○	○
PTERIDACEAE	Adiantum aleuticum	Five-finger fern	N	○	●	○	○	○	○	○	○
PTERIDACEAE	Adiantum jordanii	California maiden-hair	N	○	●	○	○	○	○	○	○
HIPPOCASTANACEAE	Aesculus californica	California buckeye	N	●	●	○	○	○	○	○	○
ASTERACEAE	Agoseris apargioides var. apargioides	Agoseris	N	●	●	○	○	○	○	○	○
ASTERACEAE	Agoseris apargioides var. eastwoodiae	Agoseris	N	○	○	○	○	○	○	○	○
ASTERACEAE	Agoseris grandiflora		N	○	○	○	○	○	○	○	○
ASTERACEAE	Agoseris heterophylla		N	●	○	○	○	○	○	○	○
POACEAE	Agrostis exarata	Bent grass	N	○	○	○	○	○	○	○	○
POACEAE	Agrostis stolonifera	Creeping bent	I	○	○	○	○	○	○	○	○
SIMAROUBACEAE	Allanthus altissima	Tree of heaven	I	○	●	○	○	○	○	○	○
POACEAE	Aira caryophyllaea	Silver European hairgrass	I	○	●	○	○	○	○	○	○
ALISMATACEAE	Alisma lanceolatum	Water plantain	I	●	●	○	○	○	○	○	○
ALISMATACEAE	Alisma plantago-aquatica	Water plantain	N	○	○	○	○	○	○	○	○
BETULACEAE	Alnus rhombifolia	White alder	N	○	●	○	○	○	○	○	○
BETULACEAE	Alnus rubra	Red alder	N	○	●	○	○	○	○	○	○
POACEAE	Alopecurus saccatus	Foxtail	N	○	●	○	○	○	○	○	○
AMARANTHACEAE	Amaranthus retroflexus	Amaranth	I	○	○	○	○	○	○	○	○
ROSACEAE	Amelanchier sp.	Service-berry	N	○	○	○	○	○	○	○	○
BORAGINACEAE	Amsinckia menziesii	Fiddleneck	N	●	●	○	○	○	○	○	○

APIACEAE	<i>Daucus pusillus</i>	Rattlesnake weed	N	○	●	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	<i>Delphinium decorum</i> ssp. <i>decorum</i>	Coast larkspur	N	○	●	○	○	○	○	○	○	○	○	○
POACEAE	<i>Deschampsia danthonioides</i>	Annual hairgrass	N	○	○	○	○	○	○	○	○	○	○	●
POACEAE	<i>Deschampsia elongata</i>	Slender hairgrass	N	○	○	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	Blue dicks	N	○	○	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Dichelostemma congestum</i>	Ookow	N	○	○	○	○	○	○	○	○	○	○	●
LILIACEAE	<i>Dichelostemma multiflorum</i>	Wild hyacinth	N	○	○	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Dichondra donnelliana</i>	Dichondra	N	○	○	○	○	○	○	○	○	○	○	○
DIPSACACEAE	<i>Dipsacus fulvonum</i>	Wild teasel	I	○	○	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Disporum hookeri</i>	Hooker's fairy bell	N	○	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Distichlis spicata</i>	Saltgrass	N	○	○	○	○	○	○	○	○	○	○	○
PRIMULACEAE	<i>Dodecatheon hendersonii</i>	Mosquito bills	N	○	○	○	○	○	○	○	○	○	○	○
DRYOPTERIDACEAE	<i>Dryopteris arguta</i>	Wood fern	N	○	○	○	○	○	○	○	○	○	○	○
CRASSULACEAE	<i>Dudleya cymosa</i>	Common dudleya	N	○	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Echinochloa colona</i>	Barnyard grass	I	○	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Echinochloa crus-galli</i>	Barnyard grass	I	○	○	○	○	○	○	○	○	○	○	○
CYPERACEAE	<i>Eleocharis acicularis</i> var. <i>acicularis</i>	Spike rush	N	○	○	○	○	○	○	○	○	○	○	○
CYPERACEAE	<i>Eleocharis macrostachya</i>	Spike rush	N	○	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Elymus glaucus</i> ssp. <i>virescens</i>	Blue wildrye	N	○	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Elymus multisetus</i>	Big squirreltail	N	○	○	○	○	○	○	○	○	○	○	○
ONAGRACEAE	<i>Epilobium brachycarpum</i>	Willow herb	N	○	○	○	○	○	○	○	○	○	○	○
ONAGRACEAE	<i>Epilobium ciliatum</i> ssp. <i>glandulosum</i>	Willow herb	N	○	○	○	○	○	○	○	○	○	○	○
EQUISETACEAE	<i>Equisetum arvense</i>	Common horsetail	N	○	○	○	○	○	○	○	○	○	○	○
EQUISETACEAE	<i>Equisetum hyemale</i> ssp. <i>affine</i>	Western scouring rush	N	○	○	○	○	○	○	○	○	○	○	○
EQUISETACEAE	<i>Equisetum laevigatum</i>	Smooth scouring rush	N	○	○	○	○	○	○	○	○	○	○	○

ASTERACEAE	Lactuca saligna	Willow lettuce	I	○	○	●	○	○	●	○	○	○	○
ASTERACEAE	Lactuca serriola	Prickly lettuce	I	●	○	○	○	○	○	○	○	○	●
ASTERACEAE	Lagophylla ramosissima ssp. congesta		N	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	Lamium purpureum	Dead nettle	I	○	○	○	○	○	○	○	○	○	○
ASTERACEAE	Lasthenia californica	Goldfields	N	○	○	○	○	○	○	○	○	○	○
FABACEAE	Lathyrus hirsutus	Caley pea	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	Lathyrus odoratus	Sweet pea	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	Lathyrus polyphyllus		N	○	○	○	○	○	○	○	○	○	○
FABACEAE	Lathyrus vestitus var. ochropetalus	Wild pea	N	○	○	○	○	○	○	○	○	○	○
ASTERACEAE	Layia gairdnerioides	Tidy tips	N	○	○	○	○	○	○	○	○	○	○
LEMNACEAE	Lemna minorcula	Duckweed	N	○	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Lepidium nitidum	Peppergrass	N	○	○	○	○	○	○	○	○	○	○
ASTERACEAE	Lessingia flaginifolia var. californica	California-aster	N	○	○	○	○	○	○	○	○	○	○
ASTERACEAE	Lessingia flaginifolia var. flaginifolia	California-aster	N	○	○	○	○	○	○	○	○	○	○
POACEAE	Leymus triticoides	Alkali rye-grass	N	○	○	○	○	○	○	○	○	○	○
APIACEAE	Ligusticum apiculatum		N	○	○	○	○	○	○	○	○	○	○
JUNCAGINACEAE	Lilaea scilloides	Flowering quillwort	N	○	○	○	○	○	○	○	○	○	○
LINNANTHACEAE	Linanthus douglasii ssp. douglasii	Common meadowfoam	N	○	○	○	○	○	○	○	○	○	○
LINNANTHACEAE	Linanthus douglasii ssp. nivea		N	○	○	○	○	○	○	○	○	○	○
POLEMONIACEAE	Linanthus acicularis		N	○	○	○	○	○	○	○	○	○	○
POLEMONIACEAE	Linanthus ciliatus	Whisker brush	N	○	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Linaria vulgaris	Butter-and-eggs	I	○	○	○	○	○	○	○	○	○	○
LINACEAE	Linum usitatissimum	Common flax	I	○	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	Lithophragma heterophyllum	Woodland star	N	○	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	Lithophragma parviflorum		N	○	○	○	○	○	○	○	○	○	○

ROSACEAE	<i>Malus sylvestris</i>	Apple	I	○	○	○	●	○	○	○	○	○	○
MALVACEAE	<i>Malva neglecta</i>	Common mallow	I	○	○	○	○	○	○	○	○	○	○
MALVACEAE	<i>Malva nicaeensis</i>	Bull mallow	I	○	○	○	○	○	○	○	○	○	○
MALVACEAE	<i>Malva parviflora</i>	Little mallow	I	○	○	○	○	○	○	○	○	○	○
MALVACEAE	<i>Malva leprosa</i>	Alkali-mallow	N	○	○	○	○	○	○	○	○	○	○
CUCURBITACEAE	<i>Marah fabaceus</i>	California man-root	N	○	○	○	○	○	○	○	○	○	○
CUCURBITACEAE	<i>Marah watsonii</i>	Wild cucumber	N	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Marrubium vulgare</i>	Horehound	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Medicago arabica</i>	Spotted burdock	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Medicago polymorpha</i>	California burdock	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Medicago sativa</i>	Alfalfa	I	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Melica californica</i>	California melic	N	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Melica geyeri</i>	Melic	N	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Melica imperfecta</i>	Small-flowered melica	N	○	○	○	○	○	○	○	○	○	○
POACEAE	<i>Melica torreyana</i>	Melic	N	○	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Melilotus indica</i>	Sourclover	I	○	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Melilotus officinalis</i>	Yellow sweetclover	I	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Mentha pulegium</i>	Pennyroyal	I	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Mentha suaveolens</i>	Mint	I	○	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	<i>Mimulus aurantiacus</i>	Sticky monkey-flower	N	○	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	<i>Mimulus guttatus</i>	Common monkey-flower	N	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Monardella villosa</i> ssp. villosa	Coyote-mint	N	○	○	○	○	○	○	○	○	○	○
PORTULACACEAE	<i>Montia fontana</i>	Water chickweed	N	○	○	○	○	○	○	○	○	○	○
BORAGINACEAE	<i>Myosotis discolor</i>	Forget-me-not	I	○	○	○	○	○	○	○	○	○	○
BORAGINACEAE	<i>Myosotis verna</i>	Forget-me-not	I	○	○	○	○	○	○	○	○	○	○

Family Species Common Name N/I* Tolay Rock field Bloom Carroll Valley Lake Adobe Sears Huntley
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ROSACEAE	Physocarpus capitatus	Ninebark	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASTERACEAE	Picris echinoides	Bristly ox-tongue	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
PINACEAE	Pinus sabiniana	Gray pine	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BORAGINACEAE	Plagiobothrys glyptocarpus var. glyptocarpus	Popcornflower	N	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BORAGINACEAE	Plagiobothrys stipitatus var. micranthus	Popcornflower	N	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BORAGINACEAE	Plagiobothrys trachycarpus	Popcorn flower	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
PLANTAGINACEAE	Plantago erecta	Plantain	N	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PLANTAGINACEAE	Plantago lanceolata	English plantain	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
PLANTAGINACEAE	Plantago major	Common plantain	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
PAPAVERACEAE	Platystemon californicus	Cream cups	N	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Pleuripogon californicus	Semaphore grass	N	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
POACEAE	Poa annua	Annual bluegrass	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
POACEAE	Poa howellii	Bluegrass	N	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Poa pratensis ssp. pratensis	Kentucky bluegrass	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Poa secunda	Bluegrass	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
POLYGONACEAE	Polygonum arenastrum	Common knotweed	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
POLYGONACEAE	Polygonum hydropiperoides	Waterpepper	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POLYPODIACEAE	Polypodium californicum	California polypody	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Polypogon elongatus	Beard grass	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Polypogon interruptus	Ditch beard grass	I	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
POACEAE	Polypogon monspeliensis	Annual beard grass	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
DRYOPTERIDACEAE	Polystichum munitum	Western sword fern	N	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
SALICACEAE	Populus fremontii ssp. fremontii	Fremont cottonwood	N	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SALICACEAE	Populus nigra	Lombardy poplar	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
PORTULACACEAE	Portulaca oleracea	Common purslane	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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POTAMOGETONACEAE	Potamogeton nodosus	Long-leaved pondweed	N	○	○	●	○	○	○	○	○	○	○	○	○
POTAMOGETONACEAE	Potamogeton pusillus	Small pondweed	N	○	○	●	○	○	○	○	○	○	○	○	●
ROSACEAE	Potentilla glandulosa ssp. glandulosa	Sticky cinquefoil	N	○	○	○	○	○	○	○	○	○	○	○	○
LAMIACEAE	Prunella vulgaris var. lanceolata	Self-heal	N	○	○	○	○	○	○	○	○	○	○	○	○
ROSACEAE	Prunus sp.	Escaped ornamental	I	○	○	○	○	○	○	○	○	○	○	○	○
ROSACEAE	Prunus subcordata		N	○	○	○	○	○	○	○	○	○	○	○	○
PINACEAE	Pseudotsuga menziesii var. menziesii	Douglas-fir	N	○	○	○	○	○	○	○	○	○	○	○	○
DENNISTAEIDIACEAE	Pteridium aquilinum var. pubescens	Bracken fern	N	○	○	○	○	○	○	○	○	○	○	○	○
FAGACEAE	Quercus agrifolia var. agrifolia	Coast live oak	N	○	○	○	○	○	○	○	○	○	○	○	○
FAGACEAE	Quercus garryana var. garryana	Oregon oak	N	○	○	○	○	○	○	○	○	○	○	○	○
FAGACEAE	Quercus kelloggii	California black oak	N	○	○	○	○	○	○	○	○	○	○	○	○
FAGACEAE	Quercus lobata	Valley oak	N	○	○	○	○	○	○	○	○	○	○	○	○
FAGACEAE	Quercus wislizenii var. wislizenii	Interior live oak	N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus aquatilis var. capillaceus		N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus aquatilis var. subrigidus	Water buttercup	N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus californicus	California buttercup	N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus lobbii	Lobb's aquatic buttercup	N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus muricatus	Prickle-fruited buttercup	I	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus occidentalis	Western buttercup	N	○	○	○	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus orthorhynchus var. bloomeri	Buttercup	N	○	○	○	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Raphanus raphanistrum	Jointed charlock	I	○	○	○	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Raphanus sativus	Radish	I	○	○	○	○	○	○	○	○	○	○	○	○
RHAMNACEAE	Rhamnus californica	California coffeeberry	N	○	○	○	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes californicum var. californicum	Hillside gooseberry	N	○	○	○	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes menziesii	Canyon gooseberry	N	○	○	○	○	○	○	○	○	○	○	○	○

SOLANACEAE	Solanum nigrum	Black nightshade	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASTERACEAE	Solidago californica	California goldenrod	N	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASTERACEAE	Sonchus asper ssp. asper	Prickly sow thistle	I	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
ASTERACEAE	Sonchus oleraceus	Common sow thistle	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
CARYOPHYLLACEAE	Spergula arvensis ssp. arvensis	Starwort	I	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
CARYOPHYLLACEAE	Spergularia rubra	Sand-spurrey	I	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
CARYOPHYLLACEAE	Spergularia villosa	Sand-spurrey	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
LAMIACEAE	Stachys ajugoides var. ajugoides	Bugle hedge nettle	N	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
LAMIACEAE	Stachys ajugoides var. rigida	Rigid hedge nettle	N	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
CARYOPHYLLACEAE	Stellaria media	Common chickweed	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
CAPRIFOLIACEAE	Symphoricarpos albus var. laevigatus	Snowberry	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
CAPRIFOLIACEAE	Symphoricarpos mollis	Creeping snowberry	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
POACEAE	Taeniatherum caput-medusae	Medusa head	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASTERACEAE	Taraxacum officinale	Dandelion	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
SAXIFRAGACEAE	Tellima grandiflora	Fringe cups	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
RANUNCULACEAE	Thalictrum sp.	Meadow-rue	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APIACEAE	Tortilis arvensis	Japanese hedge-parsley	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
ANACARDIACEAE	Toxicodendron diversilobum	Western poison oak	N	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
ASTERACEAE	Tragopogon porrifolius	Oyster plant	I	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
PRIMULACEAE	Trientalis latifolia	Starflower	N	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FABACEAE	Trifolium bifidum	Clover	N	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FABACEAE	Trifolium campestre	Hop clover	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
FABACEAE	Trifolium depauperatum var. truncatum	Dwarf sack clover	N	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
FABACEAE	Trifolium dubium	Little hop clover	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
FABACEAE	Trifolium fragiferum	Strawberry clover	I	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

Family	Species	Common Name	N / I *	Tolay	Two Rock	Bloom field	Carroll Road	Valley Ford	Lake Adobe ville	Sears Road	Huntley Point
VERBENACEAE	Verbena scabra	Rough verbena	N	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Veronica americana	American brooklime	N	○	●	●	●	○	○	○	○
SCROPHULARIACEAE	Veronica anagallis-aquatica	Water speedwell	I	○	○	○	○	○	○	○	○
FABACEAE	Vicia benghalensis	Purple vetch	I	○	○	○	○	○	○	○	○
FABACEAE	Vicia sativa ssp. nigra	Common vetch	I	○	○	○	○	○	○	○	○
FABACEAE	Vicia sativa ssp. sativa	Common vetch	I	○	○	○	○	○	○	○	○
FABACEAE	Vicia tetrasperma		I	○	○	○	○	○	○	○	○
FABACEAE	Vicia villosa ssp. villosa	Winter vetch	I	○	○	○	○	○	○	○	○
APOCYNACEAE	Vinca major	Greater periwinkle	I	○	○	○	○	○	○	○	○
VIOLACEAE	Viola pedunculata	Johnny-jump-up	N	○	○	○	○	○	○	○	○
VITACEAE	Vitis californica	California wild grape	N	○	○	○	○	○	○	○	○
POACEAE	Vulpia bromoides	Vulpia	I	○	○	○	○	○	○	○	○
POACEAE	Vulpia myuros	Vulpia	I	○	○	○	○	○	○	○	○
BLECHNACEAE	Woodwardia fimbriata	Giant chain fern	N	○	○	○	○	○	○	○	○
ASTERACEAE	Wyethia angustifolia	Narrowleaf mule ears	N	○	○	○	○	○	○	○	○
ASTERACEAE	Wyethia glabra	Green mule ears	N	○	○	○	○	○	○	○	○
ASTERACEAE	Xanthium spinosum	Spiny cocklebur	N	○	○	○	○	○	○	○	○
ASTERACEAE	Xanthium strumarium	Cocklebur	N	○	○	○	○	○	○	○	○
LILIACEAE	Zigadenus fremontii	Death camas	N	○	○	○	○	○	○	○	○

*N = Native I = Introduced (Non-native) U = Identifiable only to genus.

Open circle = taxon not present; filled circle = taxon present

APPENDIX B - AGRICULTURAL IRRIGATION BOTANICAL RESOURCES

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APPENDIX A. Plant species list for agricultural irrigation component.

1. INTRODUCTION

The purpose of this technical memorandum is to provide information on existing botanical resources, special-status plant species, sensitive natural communities, and protected tree resources that occur or may occur within the proposed agricultural irrigation areas. Existing botanical resources, populations of special-status plant species, and sensitive natural communities were mapped within the agricultural irrigation study area. These data provide a basis for the assessment of impacts. A complete project description and project alternatives are presented in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS (HBA, 1996b).

2. SETTING: PROJECT AREA DESCRIPTIONS

The project study area, which is located in Sonoma and Marin counties, is divided into five relatively distinct geographic areas: the Geysers, Santa Rosa Plain/ Russian River, Sebastopol, South County, and West County geographic areas (HBA, 1996b). The agricultural irrigation study areas are located in the Sebastopol, South County, and West County geographic areas (Figures 3.1-1 and 3.1-2 HBA, 1996a). The Sebastopol study area is considered one component. The South County study area is subdivided into five components: Adobe Road, Baylands, Lakeville, North Petaluma Valley, and East of Rohnert Park. The West County study area is subdivided into three components: Americano Creek, Stemple Creek, and Miscellaneous.

SEBASTOPOL AGRICULTURAL IRRIGATION STUDY AREA

The Sebastopol study area is located west of the town of Sebastopol in Sonoma County. The Atascadero, Green Valley, and Purrington creeks are the major creeks that flow through the Sebastopol study area. Several unnamed creeks, channels, and drainages also occur in the study area. The Sebastopol study area consists primarily of agricultural communities such as row crops, orchards, and vineyards. Orchard crops include apple, crabapple, and peach. Unirrigated annual grasslands, which also include seasonal wetland, drainage, and riparian communities, are grazed by livestock.

SOUTH COUNTY AGRICULTURAL IRRIGATION STUDY AREA

The South County study area is located in the watershed of the Petaluma River along the western foothills of the Sonoma Mountains north of San Pablo Bay in Sonoma County. The foothills of the Sonoma Mountains support a patchwork of annual grassland and coast live oak woodland communities. The numerous creeks in the South County study area, including Copeland, Crane, Five, Hinebaugh, Lichau, Lynch, and Willow Brook, flow into the Petaluma River from the foothills east of the Petaluma River. Mixed riparian woodlands are found along creeks and drainages of the foothills. The South County study area supports a large agricultural community including pasture for livestock, dry-farmed oat hay, vineyards, and irrigated crops.

WEST COUNTY AGRICULTURAL IRRIGATION STUDY AREA

The West County study area includes portions of the Americano Creek and Stemple Creek watersheds in Sonoma and Marin counties. The topography of the West County area varies from rolling hills to steep, incised valleys. The western portion of the study area includes the upper reaches of the Estero Americano. The gently sloping, wind-swept hills

of the West County study area support treeless, annual grasslands; while within the steeper valley, stands of coast live oak/ interior live woodland and oak-bay-madrone woodland are found. The perennial and intermittent streams and drainages in the West County study area support mixed and willow riparian vegetation along their banks. Many of the valleys and low lying areas support seasonal wetlands, freshwater marshes, and vernal pools. Hillsides with shallow rocky soils support patches of northern coastal scrub. The West County study area is extensively cultivated. Land uses include pasture for livestock and irrigated crops.

3. METHODS

LITERATURE REVIEW AND CONSULTATIONS

Information on the biology, distribution, taxonomy, legal status, and other aspects of the special-status plant species was obtained from documents on file in the library of Sycamore Environmental Consultants, Inc. (Sycamore Environmental). Standard references used for the taxonomy of plants and plant community descriptions included Abrams (1923-1960); Barbour and Major (1977); Hickman, ed. (1993); Holland (1986), Mason (1957); Munz (1959); and Skinner and Pavlik (1994).

A computerized search of the California Natural Diversity Data Base (CNDDDB/RareFind, 1 September 1995) was conducted for Camp Meeker, Cotati, Glen Ellen, Novato, Petaluma, Petaluma River, Point Reyes NE, Sebastopol, Two Rock, Sears Point, and Valley Ford USGS 7.5-minute United States Geological Survey (USGS) topographic quadrangles to determine if there were any known occurrences of state- or federal-listed species recorded from the proposed agricultural irrigation study area. These reports are on file at the office of Harland Bartholomew & Associates, Inc. (HBA).

In addition to the CNDDDB/RareFind report, the following lists prepared by the California Department of Fish and Game (CDFG), Natural Diversity Data Base, were reviewed:

- *Special Plants List* (CDFG, January 1996); and
- *Endangered, Threatened, and Rare Plants of California* (CDFG, January 1996).

Two letters, one in 1994 and the other in 1995, were sent by HBA to the U.S. Fish and Wildlife Service (USFWS), Ecological Services, Sacramento Field Office, requesting file data on special-status plant species that could occur in the project study area. The response letters are on file at the office of HBA.

Other reference materials provided by HBA and Parsons Engineering Science (PES) included:

- Aerial photographs of the Baylands component (3 x 3 inch color slides, April 1994). (These photos were put onto Kodak Digital Science™ Photo CD by Sycamore Environmental);
- Blue line aerial photographs of the project study area (1" = 500 ± 5%, June 1990);
- Blue line topographic maps with proposed project facilities prepared by PES (1" = 500' and 1" = 6000');

- Blue line maps with parcel lines (1" = 4000'); and
- Documents and Technical Memoranda prepared by Merritt Smith Consulting (Merritt Smith) and Questa Engineering Corporation (Questa Engineering).

Consultations were conducted on one or more occasions with Caitlin Bean, CDFG Region 3; Betty Guggolz, Milo-Baker Chapter of the California Native Plant Society (CNPS); and Dr. Charles Quibell, Professor of Botany, Sonoma State University.

Existing policies regarding natural resources were also reviewed, including the Sonoma County Tree Ordinance (No. 4014, 13 June 1989).

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES EVALUATED

Special-Status Plant Species and Sensitive Natural Communities

A comprehensive list of special-status plants was compiled from the species listed in the USFWS 1995 letter and from the species that appeared on the CNDDDB/RareFind report. A pre-project meeting on 24 January 1994 was attended by the City, USFWS, CDFG, Sycamore Environmental, and HBA. Caitlin Bean of CDFG recommended that all CNPS List 4 species potentially occurring in the project study area be included in the species evaluated for this project. In addition, Ms. Bean requested that several other species of concern to CDFG also be included for evaluation in the EIR/EIS that were not currently recognized as a special-status plant species.

An initial list of special-status plant species was compiled in 1994 and was updated as new and revised listings became available from CDFG and the USFWS. From these data, a list was compiled of 182 special-status plant species that needed to be surveyed and evaluated in the EIR/EIS. A brief discussion of each special-status plant species is presented in the *Special-Status Plant and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Descriptions of sensitive natural communities are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a). The list of sensitive natural communities was derived from the CNDDDB/RareFind report and from site visits.

CNPS

Sycamore Environmental provided Betty Guggolz with Project Overview maps (1" = 6000') that presented overviews of all the project alternatives. Ms. Guggolz mapped

locations of Sonoma County sensitive plant records. Her personal list of sensitive plant records was compiled from plant lists prepared by historical and contemporary botanists and included CNPS-listed plants, and state- and federal-listed endangered, threatened, and rare species. Sycamore Environmental reviewed the locations of sensitive plant records mapped by Betty Guggolz. Her location data was incorporated into the summaries of known location data of special-status plant species to determine the total special-status plant species populations within the project study area (Section 4).

Protected Tree Resources

The Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh over nine inches (diameter breast height, defined as 4.5 feet above ground level) of the following species are protected: big-leaf maple (*Acer macrophyllum*), blue oak (*Q. douglasii*), California black oak (*Quercus kelloggii*), coast live oak (*Q. agrifolia*), coast redwood (*Sequoia sempervirens*), interior live oak (*Q. wislizenii*), Pacific madrone (*Arbutus menziesii*), oracle oak (*Q. morehus*), Oregon oak (*Q. garryana*), valley oak (*Q. lobata*), and California bay (*Umbellularia californica*). The ordinance also protects hybrids of these species.

FIELD SURVEYS

Botanists conducted field surveys to identify locations of special-status plant species and communities, to map plant communities, and to assist in the collection of data necessary for California Wildlife Habitat Relationships System (CWHR) analyses. Surveys of some or all sites were conducted by R. John Little, Ph.D., Theresa Fortner Ward, Susan Holve-Hensill, Nancy Coulson, and Ellen Piazza. Surveys in the South County and West County study areas were conducted from April 1995 through October 1995. Surveys in the Sebastopol study area were conducted from June 1995 through July 1995.

Field surveys were conducted on parcels within each of the three study areas (South County, West County, and Sebastopol). Permission was required for access to survey parcels within each study area because most of the land within the study area is private property. Because some landowners did not allow access to their property, it was not possible to conduct surveys on all of the parcels within the project study area. Two types of surveys were therefore conducted: on-site and off-site.

On-site surveys were conducted on parcels for which field teams had full access and off-site surveys were conducted for parcels where access was not obtained. On-site surveys included botanical surveys, plant community mapping, and data gathering for CWHR analysis. Off-site surveys consisted of observing parcels from adjacent roads; mapping plant communities onto aerial maps; and assisting HBA with the identification of plant species for CWHR. Detailed plant species lists could not be made for parcels evaluated via off-site surveys.

Botanical Surveys

Prior to conducting botanical surveys, botanists compiled a field notebook that included key characteristics, descriptions, illustrations, and habitat notes for each of the 182 special-status plant species that potentially occur in the project study area. CNDDDB/RareFind overlays were obtained from CDFG for the Camp Meeker, Cotati, Glen Ellen, Novato, Petaluma, Petaluma River, Point Reyes NE, Sebastopol, Two Rock, Sears Point, and Valley Ford USGS quadrangles. These quadrangles cover the entire South County, West County, and Sebastopol study areas. All CNDDDB/RareFind occurrences for each quad were displayed on the overlays. The overlays were used to identify known populations of special-status plants occurring on or near the proposed agricultural irrigation components.

During on-site botanical surveys, botanists compiled a comprehensive plant species list, mapped vegetation, and searched for sensitive natural communities and habitats where special-status plant species were likely to be found. Botanists walked transects on each parcel with a blueline aerial photo and a parcel map. Transects were 25 to 100 feet wide and were spaced to achieve 100% coverage of each parcel.

Plants that could not be identified in the field were collected for later identification. Voucher specimens were collected for most native species observed in the field, a process recommended by the California Botanical Society (Ferren *et al.*, 1995). Voucher specimens were also collected for many non-native species. These voucher specimens were processed in accordance with standard herbarium techniques (Lawrence, 1951; Radford *et al.*, 1974) and are maintained for reference in the Herbarium located at the office of Sycamore Environmental, Sacramento, CA. Duplicate specimens will be donated to Sonoma State University and the University of California, Berkeley.

During the pre-project meeting on 24 January 1994, Bill Cox of CDFG requested that separate plant species lists be prepared for each project component, to which the City agreed. Therefore, plant species lists were compiled for all species identified within agricultural irrigation component (Appendix A). Taxa noted in Appendix A as "sp." had insufficient material on collected specimens or available in the field to make a determination to species. Records of all species found in the project study area were managed and analyzed with Microsoft Access®, a relational database.

Plant Community Mapping

Plant communities were mapped during both on- and off-site surveys. The boundaries of different habitat types were mapped onto blueline copies of aerial photographs. The field maps were digitized into AutoCAD ® by Sycamore Environmental using USGS quadrangle maps as base maps. Acreages of plant communities were calculated by PES using ArcINFO™.

Names of plant communities were based on community descriptions by Holland (1986) and Shuford and Timossi (1989). A comparison of the community descriptions used by Sycamore Environmental for the Santa Rosa EIR/EIS (HBA, 1996b) and the descriptions used by Holland (1986) and Shuford and Timossi (1989) are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a). Plant communities occurring in each of the three study areas are described in Section 4 of this document.

Some sites in the project study area, including some portions of the Baylands, were mapped in the office. Areas mapped in the office included sections of parcels that were not visible from roads during off-site surveys, portions of parcels that were not considered suitable for irrigation, and sections of parcels not evaluated during on-site and off-site surveys. Plant communities were mapped in the field onto blue line aerial photographs. The mapped features were then digitized by Sycamore Environmental. The on-and off-site Baylands mapping was verified by comparing mapping to digitally imaged color slides of the Baylands component.

FLORISTIC ANALYSIS

The combined floras for the agricultural irrigation components were analyzed. Formal estimates of species diversity require the determination of the number of species present and their abundance (Barbour *et al.*, 1980). The number of species present, known as species “richness,” was determined for each agricultural irrigation component. In this document, the term “floristic diversity” refers to taxonomic richness, specifically the numbers of families, genera, or species present. The floristic analyses are based on species lists prepared during field surveys.

CALCULATION OF AREA OF IMPACT

Acreages of plant communities were calculated by PES using ArcINFOTM.

4. RESULTS

SEBASTOPOL AGRICULTURAL IRRIGATION STUDY AREA

The Sebastopol study area is located west of the town of Sebastopol along Atascadero Creek. Atascadero, Green Valley, and Purrington creeks flow through the Sebastopol study area. Several unnamed creeks, channels, and drainages are also included in the study area (Figures 3.1-1 and 3.1-2 in HBA, 1996a).

The plant communities identified and mapped within the Sebastopol study area include annual grassland, coastal redwood, freshwater marsh, non-wooded riparian, Oak-bay madrone woodland, coast live oak/interior live oak woodland (CLO/ILO woodland), mixed and willow riparian, and seasonally wet vegetation. Agricultural communities present in the Sebastopol study area include cropland, orchard, and vineyard. Other features mapped in the Sebastopol study area include eucalyptus groves and freshwater ponds. Plant species lists for the Sebastopol study area are presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

Most of the Sebastopol study area is under cultivation. Apple and peach orchards and vineyards are the primary crops in the study area. Orchards and vineyards are habitats dominated by a single species or cultivar that are planted in rows. Spacing between plantings are usually uniform and the understory is usually composed of low-growing grasses and other herbaceous plants (Schultze, 1988). Many of the understory plants associated with the orchards and vineyards in the Sebastopol study area are opportunistic, non-native species that are adapted to disturbed sites such as annual ryegrass (*Lolium multiflorum*), Italian thistle (*Carduus pycnocephalus*), Mediterranean barley, ripgut brome, wild radish, and yellow star thistle (*Centaurea solstitialis*).

The dominant plant community in uncultivated areas of the Sebastopol study area is annual grassland. Dominant plant species in the grassland communities are introduced grass species such as annual ryegrass, bromes (*Bromus diandrus* and *B. hordeaceus*), and oats (*Avena barbata* and *A. fatua*). Patches of native grasses occur within many of these predominantly annual grasslands. Native grass species occurring in the Sebastopol study area include California brome, California oatgrass, and purple needle-grass. The grassland communities also support native wildflowers including lupines, popcorn flower, valley tassels (*Castilleja attenuata*), and yarrow. Common non-native forbs include storksbill and wild geranium.

Table 4-1.

Acres of plant communities and other mapped features in the agricultural irrigation components.

Vegetative Communities/ Mapped features	South County					West County			Sebastopol
	Adobe Rd	Baylands	Lakeville	North Petaluma Valley	East of Rohnert Park	Americano Creek	Stemple Creek	Misc.	
Annual grassland	1174.03	698.43	2174.82	422	1325.28	3536.31	4681.59	260.64	361.38
Brackish marsh	.	.	.	.	.	74.55	.	.	.
CLO/ILO woodland	.86	.	.	3.44	61.21	.	.	.	34.67
Coastal redwood	.	.	.	.	.	.	.	.	13.98
Cropland	175.2	2168.52	669.02	53.88	738.56	741.67	1425.4	238.62	204.08
Cypress	.	.	2.34	.	.	1.31	20.39	.	.
Drainage	.56	4.15	6.74	5.29	4.1	8.93	10.48	.	.
Eucalyptus	4.65	5.78	117.52	2.75	3.73	76.75	116.65	27.02	6.11
Excavated ditch	.	28.69	.37	.3	.	.	.12	.	.
Freshwater marsh	.	.	.	.	.	.	.	.	36.24
Freshwater pond	1.41	.23	26.73	.	6.18	17.67	57.07	2.98	20.15
Freshwater seep	.	.	.	.	.3	4.72	1.41	.	.
^a Lombardy poplar	.5	.	.	.	.	.	.	.	.
Mixed riparian	1.03	.	1.97	3.18	31.93	.29	4.11	1.68	151.27
^a Monterey Pine	.	.	.	.	.	.	13.4	.	.
Native grassland	.	1.75	9.5	.	4.6	3.26	.	.	1.9
Non-wooded riparian	.55	.	4.02	.53	.49	10.13	3.45	.16	.3
Northern coastal scrub	.	.	.	.	.	4.87	.	.	.
^a Oak woodland	.28	.	11.84	.69	2.09	.	.51	.42	3.71
Oak-Bay-Madrone woodland	.	.	.	.	44.39	.	8.11	.	10.67
Orchard	15.69	.	.	.	6.72	.	.	13.49	693.46
Seasonally wet vegetation	.49	58.25	22.11	267.52	47.49	304.87	319.48	.29	154.84
^b Too steep	.03	.	8.61	.	.	.	.	.	.
^b Unable to view	.	.	.	.	.	66.47	.	.	.
Undetermined wetland vegetation	.	667.79	.	.	.	.	.	.	.
Urban	63.04	72.19	157.07	89.39	71.46	502.77	686.5	49.8	84.97
Vernal Pool	.	17.66	.77	.83	5.81	2.68	.99	.	.
Vineyard	.	.	74.07	.	.	.	.	.	546.82
Willow riparian	.6	.	1.78	2.62	2.1	24.67	17.76	.44	32.03
Total Acres	1438.92	3723.44	3289.28	852.42	2356.44	5381.92	7367.42	595.54	2356.58
Communities per Site	18	13	19	15	18	18	18	12	18

^a Small stands of trees; not vegetative communities.

^b The "Too steep" and "Unable to view" categories are in areas that are not suitable for irrigation.

Oak woodlands occur in many locations in the Sebastopol study area. Dominant tree species in these communities include California black, coast live, Oregon, and valley oaks, and California bay. These oak woodlands support understory shrub species such as California blackberry, California rose, Himalayan blackberry, and western poison oak.

coastal redwood occurs along Purrington Creek in the western portion of the Sebastopol study area. Tree species associated with the redwood community include California bay, big-leaf maple, and Pacific madrone. Plant species occurring in the understory of the redwood habitat include shrubs such as California rose, vines such as California man-root, and ferns such as giant chain fern.

Monotypic stands of non-native eucalyptus are common in the Sebastopol agricultural irrigation study area. Eucalyptus are planted in groves along roads and fence lines to serve as windbreaks and are established along many drainages and creeks in the area.

Well-developed mixed and willow riparian vegetation occurs along creeks in the Sebastopol study area supporting tree species such as arroyo, red, and shining willows; California buckeye; coast live oak; red alder (*Alnus rubra*), and white alder; and Oregon ash. Understory shrub species include blue elderberry, Himalayan blackberry, hawthorn (*Crataegus suksdorfii*), snowberry (*Symphoricarpos albus*), and western poison-oak. Herbaceous species occurring in the understory of the riparian areas include California figwort and common monkey-flower.

Non-wooded riparian vegetation occurs in many areas of the creeks and drainages in the Sebastopol study area. Vegetation in these areas consists primarily of grass species such as annual beard grass (*Polypogon monspeliensis*), canary grass, and manna grass; and patches of cattails (*Typha* sp.), rushes, and sedges. Hydrophytic species occurring in non-wooded riparian areas include American brooklime (*Veronica americana*), flowering quillwort (*Lilaea scilloides*), pennyroyal (*Mentha pulegium*), and water cress (*Rorippa nasturtium-aquaticum*).

Seasonally wet vegetation, freshwater marsh, and vernal pools occur in the Sebastopol study area. Species found in these wetland habitats include grass species such as annual beard grass, common velvet grass (*Holcus lanatus*), and manna grass; and native forbs, such as common meadowfoam. Freshwater marshes occur in areas along Atascadero Creek that retain water all year. Common species found in these freshwater marshes include rushes such as Baltic rush (*Juncus balticus*), brown-headed rush, western rush (*Juncus occidentalis*), and spreading rush; and sedges, such as Dudley's sedge, rusty sedge (*Carex subfusca*), and nutsedge (*Cyperus esculentus*).

SOUTH COUNTY AGRICULTURAL IRRIGATION STUDY AREA

The components of the South County agricultural irrigation study area are Adobe Road, Baylands, Lakeville, North Petaluma Valley, and East of Rohnert Park (Figures 3.1-1 and 3.1-2 in HBA, 1996a).

Adobe Road

The Adobe Road component is located along Adobe Road, north of Petaluma. Lynch Creek and several unnamed creeks, channels, and drainages flow through the Adobe Road component.

The plant communities identified and mapped within the Adobe Road component include annual grassland, CLO/ILO woodland, mixed and willow riparian, non-wooded riparian

vegetation, and seasonally wet vegetation (Map D-10 in HBA, 1996a). Agricultural communities present in the Adobe Road component include cropland and orchard. Other features mapped in the Adobe Road component include drainages, eucalyptus groves, excavated ditches, freshwater ponds, and Lombardy poplar. Plant species lists for the Adobe Road component are presented in Appendix A. Acreages of plant communities and other mapped features are presented in Table 4-1.

The dominant plant community throughout the Adobe Road component is annual grassland. Species composition in grasslands varies with factors such as management practices, types of livestock present, soil type, and slope (Kie, 1988). Dominant plant species in the grassland communities in the Adobe Road component include introduced grass species such as annual ryegrass, bromes, and oats. Common herbaceous species occurring in the grasslands include non-native forbs, such as bindweed (*Convolvulus arvensis*), black mustard (*Brassica nigra*), and wild radish (*Raphanus sativus*); and native forbs, such as dove weed (*Eremocarpus setigerus*) and hayfield tarweed (*Hemizonia congesta* ssp. *congesta*).

Oak woodlands occur on the steeper hillsides in the northern portion of the Adobe Road component. California black, coast live, interior live, Oregon, and valley oaks occur within riparian corridors along creeks and drainages and also as isolated trees on hillsides in the Adobe Road component.

Several monotypic stands of blue gum (*Eucalyptus globulus*) occur in the Adobe Road component. Eucalyptus trees have been planted in groves along roads and fence rows to serve as windbreaks and have also become established along some of the creeks and drainages in the area. Where naturalized along creeks and drainages in the project study area, eucalyptus trees tend to replace the natural riparian habitat. The eucalyptus groves are usually evenly aged with an open understory.

Mixed and willow riparian vegetation occurs along many of the creeks in the Adobe Road component. Mixed riparian vegetation in the Adobe Road component is dominated by California buckeye (*Aesculus californica*), coast live oak, and Oregon oak. The understory in the riparian habitats supports shrubs such as California blackberry (*Rubus ursinus*), Himalayan blackberry (*R. discolor*), western poison-oak (*Toxicodendron diversilobum*), and wood rose (*Rosa gymnocarpa*). The vegetation along some of the riparian corridors in the component was mapped as willow riparian vegetation. Willows, such as arroyo and shining willows (*Salix lasiolepis* and *S. lucida* ssp. *lasiandra*), are the dominant tree species in these riparian corridors. Himalayan blackberry and narrow-leaved willow (*S. exigua*) are common shrub species occurring in the riparian corridors.

Non-wooded riparian vegetation occurs along many of the creeks and drainages in the Adobe Road component. Non-wooded riparian vegetation consists primarily of grass species such as annual beard grass, dallis grass (*Paspalum dilatatum*), and mannagrass

(*Glyceria occidentalis* and *G. leptostachya*), interspersed with patches of rushes (*Juncus balticus*, *J. effusus*, and *J. occidentalis*) and sedges (*Carex dudleyi*). Other herbaceous species occurring along non-wooded riparian corridors include pennyroyal, western scouring rush (*Equisetum hyemale* ssp. *affine*), and willow herb (*Epilobium brachycarpum*). In some areas the natural creeks and drainages are channelized near cultivated fields.

Freshwater stock ponds have been created in several locations in the Adobe Road component. Many of the ponds are the result of the impoundment of natural creek channels. Although many of these ponds support only sparse vegetation, some support hydrophytic vegetation such as duckweed (*Lemna minuscula*), spike rush (*Eleocharis macrostachya*), and water starwort (*Callitriche marginata* and *C. verna*).

Baylands

The Baylands component is located in the floodplain of the Petaluma River north of San Pablo Bay. Historically, the Baylands area was tidal marsh along northern San Pablo Bay, but much of the area has been drained for agriculture. Soils in the Baylands are Reyes soils, which tend to be acidic and saline. Most of the Baylands component is under cultivation. Currently, dry-farmed oat hay is grown in the spring and the fields are left fallow during the rest of the year.

The plant communities identified and mapped within the Baylands component include annual grassland, native grassland, non-wooded riparian, seasonally wet vegetation, and vernal pools (Maps D-11 and Map D-13 in HBA, 1996a). The agricultural community present in the Baylands component was cropland. Other features mapped in the Baylands component include drainages, excavated ditches, freshwater ponds, and eucalyptus groves. Plant species lists for the Baylands component are presented in Appendix A. Acreages of plant communities and other mapped features are presented in Table 4-1.

The dominant plant community in uncultivated fields and along the edges of cultivated fields is annual grassland. Common grass species in these grasslands are annual ryegrass, Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), ripgut brome (*Bromus diandrus*), and oats. Native species, such as alkali ryegrass (*Leymus triticoides*), native barley (*Hordeum brachyantherum* ssp. *brachyantherum*), and salt grass (*Distichlis spicata*), were also found in these grasslands.

Few trees occur in the Baylands component. Tree dominated plant communities in the Baylands component are represented by eucalyptus groves. Eucalyptus groves occur along Lakeville Highway and along fence lines. Other non-native trees occur near many of the buildings in the area.

Most of the waterways in the Baylands component have been channelized. These excavated ditches support non-wooded riparian vegetation, including cattails, rushes, and

sedges. Common grass species growing in these waterways include annual beard grass, canary grass (*Phalaris aquatica* and *P. canariensis*), and manna grass.

Most of the wetland vegetation in the Baylands component was mapped as seasonally wet vegetation. Seasonally wet vegetation occurs within many of the cultivated fields in the Baylands component. Seasonally wet vegetation in the Baylands component may include plants species associated with brackish marsh, Seasonal wetland, and vernal pool habitats. Plant species that occur in wetland communities in the Baylands component include downingia (*Downingia concolor*), goldfields (*Lasthenia glaberrima*), prickly grass (*Crypsis schoenoides*), and purslane speedwell (*Veronica peregrina* ssp. *xalapensis*), and halophytic species such as pickleweed (*Salicornia virginica*) and salt grass.

Lakeville

The Lakeville component is located southeast of Petaluma, in the foothills of the Sonoma Mountains north of San Pablo Bay. Numerous creeks, channels, and drainages flow throughout the Lakeville component. Creeks within the component include Tolay Creek, several unnamed natural channels, and excavated ditches. The southern portion of the Lakeville component includes areas on Reyes soils. Agricultural uses of the land include dry-farmed oat hay; row crops, such as corn and pumpkins; and vineyards.

The plant communities identified and mapped within the Lakeville component include annual grassland, CLO/ILO woodland, mixed and willow riparian, native grassland, non-wooded riparian, seasonally wet vegetation, and vernal pools (Maps D-11, 12, and 13 in HBA, 1996a). Agricultural communities present in the Lakeville component include cropland and vineyard. Other features mapped in the Lakeville component include drainages, cypress groves, eucalyptus groves, and freshwater ponds. Plant species lists for the Lakeville component are presented in Appendix A. Acreages of plant communities and other mapped features are presented in Table 4-1.

The dominant plant community throughout the Lakeville component is annual grassland. Dominant plant species in these grassland communities are introduced grass species such as annual ryegrass, bromes, and oats. Patches of native grasses occur within many of these predominantly annual grasslands. Native grass species occurring in the Lakeville component include California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica* var. *californica*), slender hairgrass (*Deschampsia elongata*), and purple needle-grass (*Nassella pulchra*). The grassland communities also support native wildflowers including baby blue eyes (*Nemophila menziesii*), California poppy (*Eschscholzia californica*), cream cups (*Platystemon californica*), lupines (*Lupinus bicolor*, *L. formosus*, and *L. nanus*), popcorn flower (*Plagiobothrys glyptocarpus* var. *glyptocarpus* and *P. stipitatus* var. *micranthus*), and sun cups (*Camissonia ovata*). Common non-native forbs include geranium (*Geranium dissectum* and *G. molle*) and storksbill (*Erodium cicutarium* and *E. moschatum*).

Oak woodlands occur on the foothills northeast of Tolay Creek. Coast live oaks often occur within the mixed riparian corridors in the Lakeville component.

Monotypic stands of blue gum and Monterey cypress occur in the Lakeville agricultural irrigation component. The eucalyptus and cypress are planted in groves along roads and fence lines to serve as windbreaks and are established along many drainages and creeks in the area. Where naturalized along creeks and drainages in the study area, the eucalyptus trees tend to replace the natural riparian habitat. The groves are usually evenly aged with an open understory.

Mixed and willow riparian vegetation occurs along creeks in the Lakeville component and supports tree species such as big-leaf maple; California buckeye (*Aesculus californica*); coast live and Oregon oaks; and arroyo, red, and shining willows. Himalayan blackberry and western poison-oak are shrub species found in the understory of the riparian areas. Herbaceous species occurring in the understory of the riparian areas include California figwort (*Scrophularia californica* ssp. *californica*) and common monkey-flower (*Mimulus guttatus*).

Non-wooded riparian vegetation occurs in many areas of the creeks and drainages in the Lakeville component. Vegetation in these areas consists primarily of grass species such as annual beard grass, canary grass, mannagrass, and semaphore grass (*Pleuropogon californicus*); and patches of rushes and sedges. Other herbaceous species occurring in non-wooded riparian areas include pennyroyal and purslane speedwell. Some of the natural creeks and drainages within the Lakeville component are channelized for agriculture. These excavated ditches are used for irrigation water and to drain fields. Excavated ditches often support cattails, rushes, and sedges; and grass species such as annual beard grass, semaphore grass, and mannagrass.

Freshwater ponds occur on many parcels in the Lakeville component. Many of the ponds are the result of the impoundment of natural creek channels. Although many of these ponds support only sparse vegetation; some support hydrophytic vegetation such as cattails, duckweed, spike rush (*Eleocharis*), tules (*Scirpus acutus* var. *occidentalis*), and water plantain.

Seasonally wet vegetation occurs at many locations in the Lakeville component. These wetlands are vegetated by species adapted to temporarily wet habitats including brass buttons, button-celery (*Eryngium armatum*), common meadowfoam (*Limnanthes douglasii* ssp. *douglasii*), downingia, and tidy tips (*Layia platyglossa* and *L. gaillardoides*). The presence of halophytic species, such as pickleweed and saltgrass, indicates that some of the wetlands in the Lakeville component may be saline.

Freshwater seeps occur on many hillsides within the Lakeville component. Vegetation occurring in seeps includes hydrophytic plants, such as American, semaphore grass, and white brodiaea (*Triteleia hyacinthina*). Some of the seeps support sedges and rushes

including dense sedge (*Carex densa*), brown-headed rush (*Juncus phaeocephalus* var. *phaeocephalus*), and spreading rush (*Juncus patens*).

North Petaluma Valley

The North Petaluma Valley component is located northwest of the town of Petaluma, south of Highway 101. The Petaluma River flows through the North Petaluma Valley component. In the North Petaluma Valley component the Petaluma River is fed by an unnamed creek and several side drainages.

The plant communities identified and mapped within the North Petaluma Valley component include annual grassland, CLO/ILO woodland, mixed and willow riparian, non-wooded riparian, and seasonally wet vegetation (Map D-10 in HBA, 1996a). The agricultural community mapped in the North Petaluma Valley component was cropland. Other features mapped in the North Petaluma Valley study area include drainages and freshwater ponds. Plant species lists for the North Petaluma Valley component are presented in Appendix A. Acreages of plant communities and other mapped features are presented in Table 4-1.

The dominant plant community throughout the North Petaluma Valley component is annual grassland. Dominant plant species in these grassland communities are introduced grass species such as annual ryegrass, bromes, and oats. The grassland communities also support native wildflowers including California poppy and red maids (*Calandrinia ciliata*). Common non-native forbs include geranium, rough cat's ear (*Hypochaeris radicata*), and storksbill.

CLO/ILO woodland occurs in several small patches in the northwest portion of the study area. Scattered individual coast live and Oregon oaks also occur within the North Petaluma Valley component.

Vegetation along creeks and drainages in the North Petaluma Valley component includes willow riparian and non-wooded riparian vegetation. Willows, such as arroyo and shining, are the dominant tree species in the wooded riparian areas. Himalayan blackberry and narrow-leaved willow are common understory shrub species. Non-wooded riparian vegetation consisted primarily of rush and sedge patches. Other herbaceous species in non-wooded riparian areas include flowering quillwort, pennyroyal, and water cress.

The North Petaluma Valley component is located in the of the floodplain of the Petaluma River. Consequently, large portions of the grasslands in the North Petaluma Valley component support seasonally wet vegetation. Herbaceous species in seasonally wet areas include brass buttons, goldfields, prickly-fruited buttercup (*Ranunculus muricatus*), and semaphore grass.

East of Rohnert Park

The East of Rohnert Park component is located east of the town of Rohnert Park along Petaluma Hill Road. Several creeks, including Copeland, Crane, Five, Hinebaugh, Lichau, and Willow Brook, flow through the East of Rohnert Park area.

The plant communities identified and mapped within the East of Rohnert Park component include annual grassland, CLO/ILO woodland, freshwater seep, mixed and willow riparian, native grassland, non-wooded riparian, oak-bay-madrone woodland, seasonally wet vegetation, and vernal pools (Map D-9 in HBA, 1996a). The agricultural community mapped in the East of Rohnert Park component is cropland. Other features mapped in the East of Rohnert Park component include drainages, eucalyptus groves, and freshwater ponds. Plant species lists for the East of Rohnert Park component are presented in Appendix A. Acreages of plant communities and other mapped features are presented in Table 4-1.

The dominant plant community throughout the East of Rohnert Park component is annual grassland. Dominant grass species in the grassland community include introduced annual ryegrass, bromes, and oats. Patches of native grasses occur within many of these predominantly annual grasslands. Native grass species include blue wild ryegrass, California oatgrass, California brome, slender hairgrass (*Deschampsia elongata*), and purple needle-grass. The grassland communities also support native wildflowers including baby blue eyes, California poppy, lupines, popcorn flower, and yarrow (*Achillea millefolium*). Common non-native forbs include geranium, oyster plant (*Tragopogon porrifolius*), and storksbill.

CLO/ILO woodlands and oak-bay-madrone woodlands occur on many of the properties in the East of Rohnert Park component. These woodlands occur primarily on the steeper hillsides in the eastern portion of the component. Dominant tree species in these communities include California black, coast live, and Oregon oaks; California bay; and Pacific madrone. These woodlands support understory shrub species such as California rose, Himalayan blackberry, and western poison-oak. Herbaceous species in the understory of the oak woodlands include bur-chervil (*Anthriscus caucalis*), miner's lettuce (*Claytonia perfoliata*), and purple sanicle (*Sanicula bipinnatifida*).

Mixed and willow riparian vegetation occurs along creeks in the East of Rohnert Park component. Dominant tree species in the riparian corridors include arroyo, red, narrow-leaved, and shining willows; big-leaf maple; box elder (*Acer negundo*); California buckeye, coast live, Oregon, and valley oaks; and white alder (*Alnus rhombifolia*). Understory shrub species include blue elderberry (*Sambucus mexicana*), Himalayan blackberry, and blue elderberry (*Sambucus mexicana*). Herbaceous species occurring in the understory of the riparian areas include annual beard grass, common monkey-flower, water buttercup (*Ranunculus aquatilis*), and water cress.

Non-wooded riparian vegetation occurring along the creeks and drainages consists of patches of rushes and sedges interspersed with other hydrophytic plants such as canary grass, pennyroyal, prickly-pear, and semaphore grass.

Seasonally wet vegetation occurs at many locations in the East of Rohnert Park component. These wetlands are vegetated by species adapted to temporarily wet habitats including button-celery, brass buttons, common meadowfoam, downingia, and tidy tips.

Several freshwater ponds occur on parcels within the East of Rohnert Park component. The ponds are the result of the impoundment of natural creek channels. These ponds support hydrophytic species, such as sedges, spike rush, water buttercup, and water-starwort (*Callitriche marginata* and *C. verna*), along the shores and on the water surface.

WEST COUNTY AGRICULTURAL IRRIGATION STUDY AREA

Components of the West County agricultural irrigation study area are Americano Creek, Stemple Creek, and Miscellaneous (Figures 3.1-1 and 3.1-2 in HBA, 1996a).

Americano Creek

The Americano Creek component is located along the Americano Creek watershed in Sonoma County. Americano Creek flows into the Estero Americano at the western end of the Americano Creek component.

The plant communities identified and mapped within the Americano Creek component include annual grassland, brackish marsh, freshwater seep, mixed and willow riparian, native grassland, northern coastal scrub, non-wooded riparian, seasonally wet vegetation, and vernal pools (Maps D-3, 4, and 5 in HBA, 1996a). The agricultural community mapped in the Americano Creek component is cropland. Other features mapped in the Americano Creek component include cypress groves, drainages, eucalyptus groves and freshwater ponds. Plant species lists for the Americano Creek component are presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community throughout the Americano Creek component is annual grassland. Most of the parcels surveyed have been moderately to heavily grazed by livestock including cattle, horses, and sheep. Dominant plant species in the grassland communities are introduced grass species such as annual ryegrass, bromes, and oats. Legumes, such as clovers, are often seeded on lands grazed by livestock. Patches of native grasses occur within many of these predominantly annual grasslands. Native grass species occurring in the Americano Creek component include California brome, California oatgrass, and purple needle-grass. The grassland communities also support native wildflowers including California poppy, lupines, popcorn flower, and yarrow. Common

non-native forbs include common flax (*Linum usitatissimum*), storksbill, and wild geranium.

Brackish marsh vegetation occurs along the Estero Americano at the western end of the component. The brackish marsh vegetation is dominated by pickleweed, but also supports other halophytic native species such as native alkali heath (*Frankenia salina*) and spear oracle (*Atriplex patula*); and introduced species such as brass buttons and Mexican tea (*Chenopodium ambrosioides*).

freshwater seeps occur on many hillsides within the Americano Creek component. Vegetation occurring in seeps includes hydrophytic plants, such as American brooklime and semaphore grass. Some of the seeps support sedges and rushes including brown-headed rush, Dudley's sedge, spreading rush, and western rush (*Juncus occidentalis*).

Monotypic stands of native Monterey cypress (*Cupressus macrocarpa*) and non-native eucalyptus are common in the Americano Creek component. Eucalyptus and Monterey cypress are planted in groves along roads and fence lines to serve as windbreaks and are established along many drainages and creeks in the area. Monterey cypress is native to the Monterey Peninsula, but is widely planted and naturalized in other areas (Hickman, ed., 1993). Where naturalized along creeks and drainages in the project study area, eucalyptus and Monterey cypress tend to replace the natural riparian habitat.

Mixed and willow riparian vegetation occurs along creeks in the Americano Creek component and supports tree species such as arroyo, red, and shining willows; California buckeye; coast live oak; and Oregon ash (*Fraxinus latifolius*). Understory shrub species include blue elderberry, Himalayan blackberry, and western poison-oak. Herbaceous species occurring in the understory of the riparian areas include California figwort and common monkey-flower.

Non-wooded riparian vegetation occurs in many areas of the creeks and drainages in the Americano Creek component. Vegetation in these areas consists primarily of grass species such as annual beard grass, canary grass, mannagrass, and semaphore grass. The creeks and drainages also support patches of cattails, rushes, and sedges. Other herbaceous species occurring in non-wooded riparian areas include American brooklime, pennyroyal, and water cress.

Northern coastal scrub vegetation was mapped on some west-facing hillsides in the Americano Creek component. Northern coastal scrub habitats in the Americano Creek component are dominated by native coyote brush (*Baccharis pilularis*) and introduced scotch broom (*Cytisus scoparius*). Open areas between shrubs often support native grass species such as annual hairgrass (*Deschampsia danthonioides*), California brome, and purple needle-grass; and wildflowers such as California figwort.

Seasonally wet vegetation, freshwater seeps, and vernal pools occur at many locations in the Americano Creek component. These wetlands are vegetated by hydrophytic species including button-celery, brass buttons, common meadowfoam, goldfields, and tidy tips.

Stemple Creek

The Stemple Creek component is located in the Stemple Creek watershed in Sonoma County. Stemple Creek flows into the Estero de San Antonio west of the Stemple Creek component.

The plant communities identified and mapped within the Stemple Creek agricultural irrigation component include annual grassland, freshwater seep, mixed and willow riparian, non-wooded riparian, seasonally wet vegetation, and vernal pools (Maps D-7 and 8 in HBA, 1996a). The agricultural community mapped in the Stemple Creek component is cropland. Other features mapped in the Stemple Creek component include cypress groves, drainages, eucalyptus groves, excavated ditches, freshwater ponds, oaks, and Monterey pine groves. Plant species lists for the Stemple Creek component are presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community throughout the Stemple Creek component is annual grassland. Most of the areas surveyed have been moderately to heavily grazed by livestock. Dominant plant species in the grassland communities are introduced grass species such as annual ryegrass, bromes, and oats. Legumes, such as clovers, are often seeded on lands grazed by livestock. Patches of native grasses occur within many of these predominantly annual grasslands. Native grass species occurring in the Stemple Creek component include annual hairgrass, California brome, California oatgrass, native barley, purple needle-grass, and slender hairgrass. The grassland communities also support native wildflowers including California poppy, hayfield tarweed, lupines, popcorn flower, and yarrow. Common non-native forbs include common flax, storksbill, and wild geranium.

Monotypic stands of native Monterey cypress and Monterey pine (*Pinus radiata*), and non-native eucalyptus are common in the Stemple Creek component. Eucalyptus, Monterey cypress, and Monterey pine are planted in groves along roads and fence rows to serve as windbreaks and are established along many drainages and creeks in the area.

Mixed and willow riparian vegetation occurs along creeks in the Stemple Creek component and supports tree species such as arroyo, red, and shining willows; California buckeye; coast live oak; and wax myrtle (*Myrica californica*). Understory shrub species include blue elderberry, Himalayan blackberry, and western poison-oak. Herbaceous species occurring in the understory of the riparian areas include California figwort, Common monkey-flower, and Pacific sanicle (*Sanicula crassicaulis*).

Non-wooded riparian vegetation occurs in many areas of the creeks and drainages in the Stemple Creek component. Vegetation in these areas consists primarily of grass species

such as annual beard grass, canary grass, mannagrass, and semaphore grass; and patches of cattails, rushes, and sedges. Other herbaceous species occurring in non-wooded riparian areas include American brooklime, pennyroyal, and water cress.

Seasonally wet vegetation, freshwater seeps, and vernal pools occur in the Stemple Creek component. Wetland plant communities occurring in the Stemple Creek component have vegetation similar to wetland habitats in the Americano Creek component.

Miscellaneous

The Miscellaneous component consists of several small parcels northeast of the Americano Creek component.

The plant communities identified and mapped within the Miscellaneous agricultural irrigation component include annual grassland, mixed and willow riparian, non-wooded riparian, and seasonally wet vegetation. Agricultural communities present in the Miscellaneous component include cropland and orchard. Other features mapped in the Miscellaneous component include drainages, eucalyptus groves, oaks, and freshwater ponds. Plant species lists for the Miscellaneous component are presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

The dominant plant community throughout the Miscellaneous component is annual grassland. Dominant plant species in the grassland communities are introduced grass species such as annual ryegrass, bromes, and oats. Native grasses occurring in the Miscellaneous agricultural irrigation component include annual hairgrass, California oatgrass, and slender hairgrass. The grassland communities also support native wildflowers including blue-eyed grass (*Sisyrinchium bellum*), California poppy, and silver lupine (*Lupinus albifrons*).

Other plant communities occurring in the Miscellaneous component, including mixed and willow riparian, non-wooded riparian, and seasonally wet vegetation, have a similar species composition to the same plant communities found in other West County components (Refer to Americano Creek and Stemple Creek).

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES

Historic Records

Sebastopol

Information on the potential presence of special-status plant species in the agricultural irrigation components was derived from the CNDDB/RareFind report (1 September 1995), through consultation with the USFWS and with Betty Guggolz, and through observations during site visits.

The Sebastopol agricultural irrigation study area is located on the Camp Meeker and Sebastopol 7.5 minute USGS quadrangles. There were 120 occurrences for 24 plant species on the CNDDDB/RareFind report (1 September 1995) for the entire Sebastopol study area (Table 4-2). Records for the following seven species occur within the boundaries of agricultural irrigation parcels that occur within the Sebastopol study area:

- California beaked rush (*Rhynchospora californica*);
- Sebastopol meadowfoam (*Limnanthes vinculans*);
- Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*);
- Sonoma spineflower (*Chorizanthe valida*).
- Swamp harebell (*Campanula californica*); and
- Vine Hill manzanita (*Arctostaphylos densiflora*);
- Yellow larkspur (*Delphinium luteum*);

Three sensitive natural communities reported on CNDDDB/RareFind report for the Sebastopol study area include coastal brackish marsh, northern coastal salt marsh, and northern vernal pool. A description of these communities is found in the *Special-Status Plant and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Betty Guggolz (Personal communication, 1995) identified one record each of the following eight special-status plant species in the Sebastopol study area:

- California beaked-rush;
- Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*);
- Hayfield tarplant (*Hemizonia congesta* var. *leucocephala*);
- Round-headed beaked rush (*Rhynchospora globularis* var. *globularis*);

Table 4-2.

CNDDDB/RareFind occurrences of special-status plant species in
 Sebastopol study area quadrangles.

	Species name	USGS Quadrangle		
		Camp Meeker	Sebastopol	Total Records
1	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	4	2	6
2	<i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	8		8
3	<i>Arctostaphylos densiflora</i>		3	3
4	<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>	1	1	2
5	<i>Blennosperma bakeri</i>		15	15
6	<i>Calamagrostis crassiglumis</i>	1		1
7	<i>Campanula californica</i>		2	2
8	<i>Carex albida</i>		3	3
9	<i>Castilleja uliginosa</i>		2	2
10	<i>Ceanothus confusus</i>	1	1	2
11	<i>Chorizanthe valida</i>		1	1
12	<i>Clarkia imbricata</i>		3	3
13	<i>Cordylanthus tenuis</i> ssp. <i>capillaris</i>	3		3
14	<i>Delphinium bakeri</i>	1		1
15	<i>Delphinium luteum</i>	1	1	2
16	<i>Downingia pusilla</i>		7	7
17	<i>Fritillaria liliacea</i>	2		2
18	<i>Lasthenia burkei</i>		16	16
19	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>		2	2
20	<i>Limnanthes vinculans</i>	1	25	26
21	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>		6	6
22	<i>Pleuropogon hooverianus</i>	1	1	2
23	<i>Rhynchospora californica</i>	2		2
24	<i>Trifolium amoenum</i>	1	2	3
	Total records	27	93	120
	Sensitive Natural Communities			
	Coastal and Valley freshwater marsh		1	1
	Northern vernal pool		2	2
	Northern hardpan vernal pool		5	5

- Sebastopol meadowfoam;
- Sonoma alopecurus;
- Swamp harebell; and
- White sedge (*Carex albida*).

The locations of all of these species occur within the boundaries of three historical marshes: Atascadero Marsh, Perry Marsh, and Ross Marsh. Perry Marsh and Ross Marsh have been converted for agriculture, while parts of Atascadero Marsh still remain intact. A portion of Atascadero Marsh is included within the project study area; however, no special-status plant species were observed during field surveys in the Atascadero Marsh area.

South County

South County study area is located on the Cotati, Glen Ellen, Novato, Petaluma River, and Sears Point 7.5 minute USGS quadrangles. There were 30 occurrences for 20 plant species on the CNDDDB/RareFind report for the South County study area (Table 4-3). However, none of the occurrences are within the boundaries of the agricultural irrigation parcels. The nearest occurrences from South County irrigation parcels are 1.0 to 1.5 miles as follows:

- One occurrence of Marin knotweed (*Polygonum marinense*) occurs 1.0 mile west of the Baylands component; and
- One occurrence of soft bird's beak (*Cordylanthus mollis* ssp. *mollis*) occurs 1.5 miles west of the Baylands component.

Three sensitive natural communities reported on CNDDDB/RareFind for the South County agricultural irrigation quadrangles include coastal brackish marsh, northern coastal salt marsh, and northern vernal pool. A description of these communities is found in the *Special-Status Plants Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Three sensitive natural communities reported on CNDDDB/RareFind for the South County agricultural irrigation quadrangles include coastal brackish marsh, northern coastal salt marsh, and northern vernal pool. A description of these communities is found in the *Special-Status Plants Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Table 4-3.

CNDDDB/RareFind occurrences of special-status plant species in South County study area quadrangles.

	Species name	USGS Quadrangle ^a					
		Cotati	Glen Ellen	Novato	Petaluma River	Sears Point	Total Records
1	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	1					1
2	<i>Astragalus tener</i> var. <i>tener</i>				1		1
3	<i>Blennosperma bakeri</i>	1	1			2	4
4	<i>Ceanothus sonomensis</i>		1				1
5	<i>Chorizanthe valida</i>				1		1
6	<i>Cordylanthus mollis</i> ssp. <i>mollis</i>				2	1	3
7	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>			1			1
8	<i>Delphinium luteum</i>				1		1
9	<i>Downingia pusilla</i>		1				1
10	<i>Fritillaria liliacea</i>				1		1
11	<i>Hesperolinon congestum</i>			1	2		3
12	<i>Lasthenia burkei</i>	1					1
13	<i>Legenere limosa</i>		1				1
14	<i>Limnanthes vincularis</i>	2					2
15	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>			1	1		2
16	<i>Plagiobothrys mollis</i> var. <i>vestitus</i>				1		1
17	<i>Pleuropogon hooverianus</i>	1	1				2
18	<i>Polygonum marinense</i>				1		1
19	<i>Streptanthus glandulosus</i> ssp. <i>pulchellus</i>			1			1
20	<i>Trifolium amoenum</i>	1					1
	Total records	7	5	4	11	3	30
	Sensitive Natural Communities						
	Northern coastal salt marsh			4	1	2	7
	Coastal brackish marsh			1	1	1	3
	Northern vernal pool		1			1	2

^aThe Adobe Road component is located on Glen Ellen and Cotati USGS quadrangles.

The Baylands component is located on the Novato, Petaluma River, and Sears Point USGS quadrangles.

The Lakeville component is located on Sears Point and Petaluma River USGS quadrangles.

The North Petaluma Valley component is located on Cotati USGS quadrangle.

The East of Rohnert Park component is located on the Cotati USGS quadrangle.

Three sensitive natural communities reported on CNDDDB/RareFind for the South County agricultural irrigation quadrangles include coastal brackish marsh, northern coastal salt marsh, and northern vernal pool. A description of these communities is found in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Betty Guggolz (Personal communication, 1995) was not aware of any additional special-status plant locations occurring within the boundaries of the South County study area. However, she mapped the locations of five rare plant records that occur 0.5 to 2.5 miles outside the agricultural irrigation components, as follows:

- Three records of soft bird's beak occur approximately 0.5 mile, 1.0 mile, and 2.5 miles northwest of the Baylands component;
- One record of Marin knotweed occurs approximately 0.5 miles northwest of the Baylands component; and
- One record of California seablite (*Suaeda californica*) occurs approximately 1.5 miles west of the Lakeville component.

West County

West County study area is located on the Cotati, Petaluma, Point Reyes NE, Two Rock, and Valley Ford 7.5 minute USGS quadrangles. There were 39 records for 18 plant species on the CNDDDB/RareFind report (1 September 1995) for the West County study area (Table 4-4). Records for the following three species occur within the boundaries of agricultural irrigation parcels that occur within the West County study area:

- Fragrant fritillary (*Fritillaria liliacea*) and showy Indian clover (*Trifolium amoenum*) within the Americano Creek component;
- Showy Indian clover within the boundaries of the Stemple Creek component; and
- Showy Indian clover and Sebastopol meadowfoam within the Miscellaneous component.

Two sensitive natural communities reported for the West County study area on CNDDDB/ RareFind include coastal brackish marsh and northern vernal pool. A description of these communities is found in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996a).

Table 4-4.

CNDDB/RareFind occurrences of special-status plant species in West County
study area quadrangles.

	Species name	USGS Quadrangle ^a					
		Cotati	Petaluma	Point Reyes NE	Two Rock	Valley Ford	Total Records
1	<i>Agrostis clivicola</i> var. <i>punta-reyesensis</i>					1	1
2	<i>Agrostis blasdalei</i>					2	2
3	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	1			2		3
4	<i>Astragalus tener</i> var. <i>tener</i>		1				1
5	<i>Blennosperma bakeri</i>	1					1
6	<i>Ceanothus masonii</i>			3			3
7	<i>Chorizanthe valida</i>		1				1
8	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>					1	1
9	<i>Delphinium bakeri</i>			1			1
10	<i>Delphinium luteum</i>		1			3	4
11	<i>Fritillaria liliacea</i>			1	1		2
12	<i>Lasthenia burkei</i>	1					1
13	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>				1		1
14	<i>Limnanthes vinculans</i>	2			4		6
15	<i>Plagiobothrys mollis</i> var. <i>vestitus</i>		1				1
16	<i>Pleuropogon hooverianus</i>	1				1	2
17	<i>Rhynchospora californica</i>				1		1
18	<i>Trifolium amoenum</i>	1	1		1	4	7
	Total records	7	5	5	10	12	39
	Sensitive Natural Communities						
	Coastal brackish marsh					2	2
	Northern vernal pool		1	1			2

^aThe Americano Creek component is located on Two Rock and Valley Ford USGS quadrangles.

The Stemple Creek component is located on Cotati, Petaluma, Point Reyes NE, and Two Rock USGS quadrangles.

The Miscellaneous component is located on for Cotati and Two Rock USGS quadrangles.

Betty Guggolz (Personal communication, 1995) identified seven records of special-status plant locations in the West County study area, as follows:

- Four records of special-status plants occur within the boundaries of the Americano Creek component consisting of two occurrences of Sonoma alopecurus and two occurrences of showy Indian clover;
- Two records of hayfield tarplant (*Hemizonia congesta* ssp. *leucocephala*, CNPS List 3) occur within the boundaries of the Stemple Creek component; and
- One record of showy Indian clover (CNPS List 1B, Federal PE) occurs within the boundaries of the Miscellaneous component.

In addition, Betty Guggolz identified the location of one record of Sebastopol meadowfoam (*Limnanthes vinculans*), occurring approximately 0.5 miles north of the Miscellaneous component.

Field Records

Special-Status Plant Species

Special-status plant species in the agricultural irrigation study areas during field surveys resulted in the following observations:

- Twelve populations of hayfield tarplant;
- One population of Sebastopol meadowfoam; and
- One population of Gairdner's yampah.

A total of 15 previously unreported populations of hayfield tarplant (*Hemizonia congesta* var. *leucocephala*), one previously unreported population of Sebastopol meadowfoam, and one previously unreported population of Gairdner's yampah were located. The 15 new populations of hayfield tarplant represent a 68% increase over the number of populations previously reported in Sonoma and Marin counties (Table 4-5).

Two populations of hayfield tarplant were observed on parcels within the Americano Creek agricultural irrigation study area. These populations consisted of scattered individual plants, each occupying an area less than 100 ft x 100 ft area (Maps D-3 and D-4 in HBA, 1996a). Ten populations of hayfield tarplant were observed on parcels within the Stemple Creek component (Maps D-7 and D-8 in HBA, 1996a). These populations ranged in size from small populations consisting of a few individual plants to larger populations consisting of scattered plants in an area approximately 100 ft x 250 ft.

The population of Sebastopol meadowfoam (federal and state endangered) was observed in the East of Rohnert Park component (Map D-9 in HBA, 1996a). This Sebastopol meadowfoam was found near several common meadowfoam plants (*Limnanthes douglasii* ssp. *douglasii*) in a drainage within a small, fallow field adjacent to an urban area. There was only a single plant at this location.

The population of Gairdner's yampah was observed in the Stemple Creek component (Maps D-7 and D-8 in HBA, 1996a). This population consisted of less than 5 plants in an area 5 ft x 5 ft.

Table 4-5.

Records of special-status specie within agricultural components.

		UC ^a	ROPA ^b	CNDDB ^c	CNPS ^d	SYCAMORE ^e	Total historic and current populations ^f	% Increase of previous records in Sonoma & Marin cos. ^g
Hayfield tarplant (CNPS List 3) <i>Hemizonia congesta</i> var. <i>leucocephala</i>	MARIN	8	0	0	0	5	13	
	SONOMA	12	0	0	2	10	24	
	Total:	20	0	0	2	15	37	68% (15/22)
Sebastopol meadowfoam (Federal and State endangered) <i>Limnanthes vincularis</i>	MARIN	0	0	0	0	0	0	
	SONOMA	7	6	34	4	1	52	
	Total:	7	6	34	4	1	52	2% (1/51)
Gairdner's yampah (CNPS List 4) <i>Perideridia gairdneri</i> ssp. <i>gairdneri</i>	MARIN	2	*	0	0	1	3	
	SONOMA	7	*	0	0	0	7	
	Total:	9		0	0	1	10	11% (1/9)

^a University of California, Berkeley Herbarium.

^b Herbarium at Sonoma State University. Information on Gairdner's yampah not available for DEIR.

^c CNDDB/RareFind occurrences.

^d Represents known records from the project study area (Betty Guggolz, Personal communication 1995).

^e Populations observed in the project study area.

^f Based on total known populations.

^g New records found during 1994-1995 surveys by Sycamore Environmental compared to historic records in Sonoma and Marin counties.

Sensitive Natural Communities

Sensitive natural communities occurring in the agricultural irrigation components consist of the following:

- Brackish marsh;
- CLO/ILO woodland;
- Freshwater marsh;
- Freshwater seep;
- Native grassland; and
- Riparian habitats including mixed and willow riparian communities;
- Vernal pools.

Acreages of sensitive natural communities occurring in the agricultural irrigation components are presented in Table 4-6. (Acreages of plant communities located in the agricultural irrigation components are presented in Table 4-1.)

Protected Tree Resources

Protected tree resources occurring in each of the agricultural irrigation components are presented in Table 4-7. Nine protected tree species were observed in the agricultural irrigation components.

Table 4-6.

Sensitive natural community acreages.

Sensitive Natural Communities	South County					West County			Sebastopol
	Adobe Rd	Baylands	Lakeville	North Petaluma Valley	East of Rohnert Park	Americano Creek	Stemple Creek	Misc.	
Willow riparian	.6	.	1.78	2.62	2.1	24.67	17.76	.44	32.03
Mixed riparian	1.03	.	1.97	3.18	31.93	.29	4.11	1.68	151.27
Total riparian habitat	1.63	.	3.75	5.8	34.03	24.96	21.87	2.12	183.3
Brackish marsh	.	.	.	.	.	74.55	.	.	.
Freshwater marsh	.	.	.	.	.	.	.	.	36.24
Freshwater seep	.	.	.	.	.3	4.72	1.41	.	.
Vernal Pool	.	17.66	.77	.83	5.81	2.68	.99	.	.
Total wetland vegetation	.	17.66	.77	.83	6.11	81.95	2.4	.	36.24
CLO/ILO woodland	.86	.	.	3.44	61.21	.	.	.	34.67
Total woodland habitat	.86	.	.	3.44	61.21	.	.	.	34.67
Total native grassland	.	1.75	9.5	.	4.6	3.26	.	.	1.9
communities affected	2.49	19.41	14.02	10.07	105.95	110.17	24.27	2.12	256.11

Table 4-7.

Protected tree resources observed in the agricultural irrigation study areas.

Tree species	South County					West County			Sebas- topol
	Adobe Road	Baylands	Lakeville	North Petaluma Valley	East of Rohnert Park	Americano Creek	Stemple Creek	Misc.	
Big-leaf maple	x		x		x	x			x
Blue oak ^a									
California bay	x		x		x	x	x		x
California black oak	x				x	x			x
Coast live oak	x		x	x	x	x	x		x
Coast redwood	x					x			x
Interior live oak							x		
Oracle oak ^a									
Oregon oak	x		x	x	x		x	x	x
Pacific madrone	x				x	x			
Valley oak	x				x				x

^a Blue oak and oracle oak were not found in the agricultural irrigation study areas.

FLORISTIC ANALYSIS OF AGRICULTURAL IRRIGATION STUDY AREAS

Floristic data of vascular plants from all agricultural irrigation study areas were combined to determine the total number of species in each category. A total of 94 families, 314 genera, and 614 species comprise the combined flora (Table 4-8). California native species account for 67.3% (413/614) and introduced species account for 30.3% (186/614) of species identified in the agricultural irrigation study areas. Hayfield tarplant, Gairdner's yampah, and Sebastopol meadowfoam were the three special-status plant species found in the agricultural irrigation study areas.

Table 4-8.

Summary of the agricultural irrigation study area floras.

Category	Combined Agricultural Irrigation Floras
Approximate area (acres):	27,362
Number of species per acre:	0.02
Families	94
Genera	314
Species ^a	614
Native Species ^a	413
% ^b	67.3%
Introduced Species ^a	186
% ^b	30.3%
Special-Status Plant Species ^c	3

^a Includes subspecies and varieties. The numbers of native and introduced species do not include collections that were identifiable only to genus. Thus, the number shown for native and introduced species is a few less than the total species.

^b Since a few collections were identifiable only to genus, the percent native and introduced calculations are based on the ratio of total native and introduced to total species.

^c See Section 4, Special-Status Species and Sensitive Communities.

The number of species unique to each agricultural irrigation component is presented in Figure 4-1. “Unique” is defined as a species occurring in only one agricultural irrigation component. The greatest number of unique species (73 species) were found in the Americano Creek component. There were no unique species found in the Miscellaneous or North Petaluma Valley components.

The numbers of native and introduced species found in each agricultural irrigation component are presented in Figure 4-2. The greatest number of native species were found in the Americano Creek agricultural irrigation component (222 native species). The least number of native species were found in the Baylands (14 native species) and North Petaluma Valley (24 native species) components.

Figure 4-1. Number of unique species in each agricultural irrigation component.

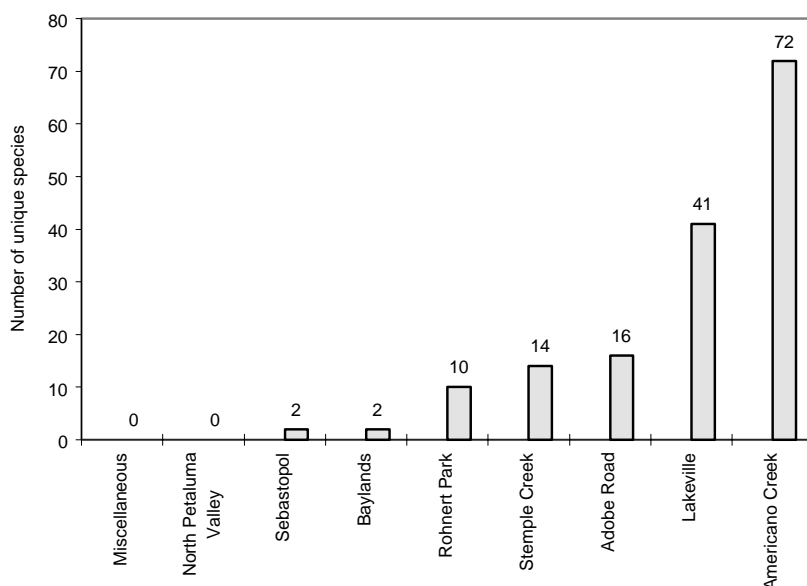
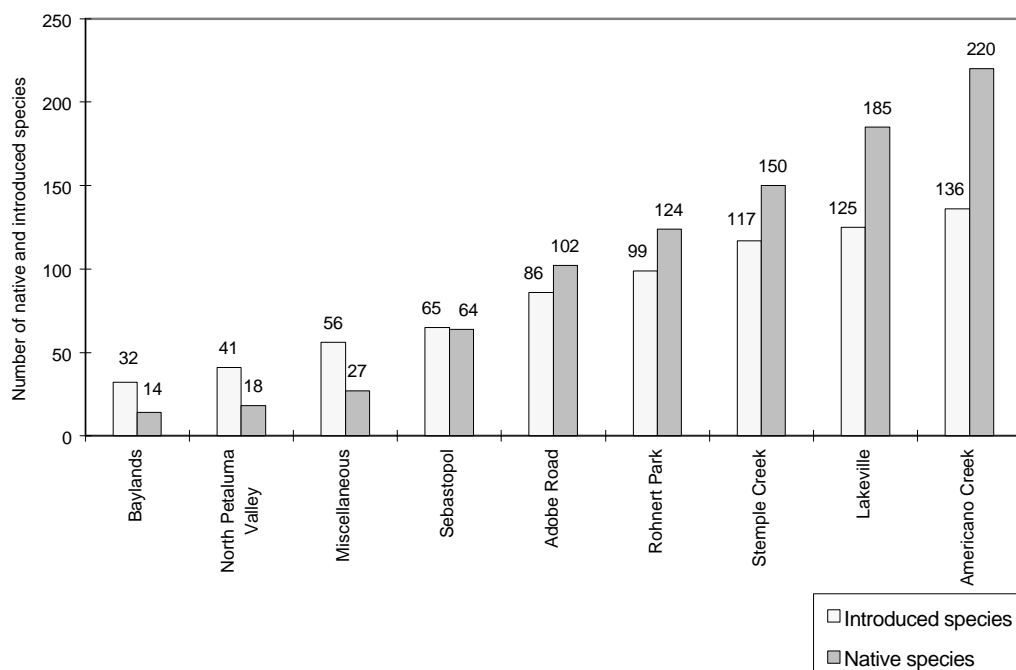


Figure 4-2. Number of native and introduced species found in each agricultural irrigation component.



Grass Species

An analysis of the grass family, Poaceae, was conducted because of the interest in reestablishing native grassland communities and for preserving native grass species (California Native Grass Association, undated). Native grasses were collected in all of the agricultural irrigation components and are a significant portion of the grass species collected in annual grasslands.

Taxonomic Summary for Poaceae

Taxonomic and other data for the combined agricultural irrigation flora for Poaceae are summarized in Table 4-9. A total of 66 grass species, representing 34 genera, were identified. Native grass species accounted for 36.4% (24/66) and introduced species accounted for 59.1% (39/66) of grass species identified in the agricultural irrigation components. A total of 10.7% (66/614) of all species identified were members of the Poaceae. No special-status grass species were found in the agricultural irrigation study areas.

Table 4-9

Summary of the combined agricultural irrigation grass species (Poaceae).

Category	Poaceae (Grasses)	% of Agricultural Irrigation Flora
Genera	34	10.8%
Species ^a	66	10.7%
Native Species ^a	24	5.8%
% ^b	36.4%	
Introduced Species ^a	39	21.0%
% ^b	59.1%	
Special-Status Plant Species	0	0

^a Includes subspecies and varieties.

^b Since a few collections were identifiable only to genus, the percent native (or introduced) calculation is based on the ratio of total native (or introduced) to total species.

5. IMPACT ANALYSIS

INTRODUCTION

This section discusses the methods and the significance criteria used to evaluate impacts and describes botanical resource impacts expected to result from implementation of the proposed project.

METHODS: DETERMINATION OF SIGNIFICANCE OF IMPACTS

Impacts to biological resources were evaluated for significance based on legal protection; local, state, and federal agency policies; and documented resource scarcity and sensitivity.

State and Federal Statutes

State and Federal statutes pertinent to botanical resources that need to be evaluated in an EIR/EIS include:

- Federal Endangered Species Act (16 U.S.C. 1531-1543).
- California Environmental Quality Act (P.R.C. 21000 et seq.).
- California Endangered Species Act (California Fish and Game Code 2050 et seq.).
- Native Plant Protection Act (California Fish and Game Code 1900-1913).

Federal Endangered Species Act

The Federal Endangered Species Act defines “take” (Section 9) and prohibits “taking” of a listed endangered or threatened species (16 USC 1532, 50 CFR 17.3). If a federally listed species could be harmed by a project, a Section 7 or 10 consultation must be initiated, and an Incidental Take Permit must be obtained (16 USC 1539, 50 CFR 13).

California Fish and Game Code

The California Fish and Game Code defines “take” (Section 86) and prohibits “taking” of a species listed as threatened or endangered under the California Endangered Species Act (California Fish and Game Code Section 2080) or otherwise fully protected (as defined in California Fish and Game Code Sections 3511, 4700, and 5050).

The CDFG also regulates activities that may impact streambeds or other wetland areas. Division 2, Chapter 6, Section 1601 of the Fish and Game Code states that

“...general plans sufficient to indicate the nature of a project for construction by, or on the behalf of, any governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or will use material from the streambeds designated by the department, shall be submitted to the department.”

The CDFG has stated that their jurisdiction is any wetland area that is within the 100-year floodplain. Completion of a Section 1601-03 Streambed Alteration Agreement with the CDFG is required before any work begins that will affect wetland areas within the 100-year floodplain.

Other Special-Status Plant Species Classifications

California species of special concern and species listed on California Native Plant Society (CNPS) lists 1B and 2, 3, and 4 were considered for this document.

Sensitive Natural Communities

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Sensitive natural communities occurring in the agricultural irrigation components include plant communities associated with native grassland, oak woodland, riparian habitat, and wetland habitats.

Native Grassland

Grazing pressures and the introduction of non-native annual species have contributed to the reduction or elimination of native bunch grasses from many areas of Sonoma and Marin counties. Annual, non-native grasses have replaced the native perennial bunchgrass prairies that once dominated lower elevations throughout North America. One of the main factors that shifted the competitive advantage from native to non-native grasses appears to be the inability of native grasses to successfully compete under heavy grazing conditions (Barbour and Major, 1977).

Oak Woodland

Oak woodlands provide habitat for a wide diversity of wildlife. Thirty-five percent of California's mammal species utilize oak woodlands for food and shelter (Pavlik *et al.*, 1991). Oaks have figured prominently in the history of California, providing food, fuel, and tools to both native Americans and pioneers. Oak woodlands are a significant natural resource providing erosion and landslide control, nutrient

cycling, ground water recharge, air and water quality, recreation, wood production, livestock grazing, aesthetic qualities, and wildlife habitat (Hagen, 1995). Although oak woodlands cover millions of acres throughout California, there is widespread concern about native oaks. An estimated 14,000 acres are lost each year (Hagen, 1995). Threats to oaks include urbanization, conversion of oak woodlands to agriculture, and fragmentation of natural habitats in rural areas.

Riparian Habitat

Riparian habitats are very important for the survival of wildlife providing food, shelter, and serving as migration and dispersal corridors (Sands, 1980; Warner and Hendrix, 1984). California has rich mammal, reptile, and amphibian faunas; many species of which are dependent upon riparian habitats. One quarter of California's mammals are limited to or are closely dependent upon riparian habitats. Half of the reptiles and 75% of the amphibians in California are closely associated with riparian systems. Through its influence on water quality, temperature, and nutrients; riparian vegetation determines the structure and functioning of stream ecosystems and fish communities. Most of California's original riparian vegetation has been lost. Only 15% of the riparian habitat in the Central Valley remains, and 75% of what remains has been degraded (Warner and Hendrix, 1984).

Wetland Habitat

Wetlands are protected under Section 404 of the Clean Water Act. Wetlands perform many important functions such as improving water quality, recharging ground water, providing natural flood control, and providing habitat for numerous species of wildlife, plants, and fish. Wetland habitats of concern in the agricultural irrigation study areas include brackish marsh, freshwater marsh, freshwater seeps, and vernal pools.

Protected Tree Resources

Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh of nine inches or greater of the following species are protected: big-leaf maple, black oak, blue oak, California bay, coast live oak, interior live oak, Pacific madrone, oracle oak, Oregon oak, coast redwood, and valley oak. The ordinance also protects hybrids of these species.

Agricultural uses that are exempt from the Sonoma County Tree Ordinance include the breeding, feeding, raising, and maintaining of poultry, fowl, rabbits, fur-bearing animals, and the like for other than domestic purposes; commercial hog and pig farming; dairies; commercial aquaculture; commercial mushroom farming; wholesale nurseries; greenhouses; wineries; and agricultural cultivation.

SIGNIFICANCE CRITERIA

The following significance criteria were used to evaluate impacts on botanical resources:

- Any loss of the habitat, individuals, or populations of federally listed endangered, threatened, or proposed plant species, or plant species that are federal candidates for listing.
- Any loss of the habitat, individuals, or populations of state listed endangered, threatened, rare, or proposed plant species.
- Any loss of the habitat, individuals, or populations of species occurring on List 1B of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Loss of greater than 15% of known and historic populations in Sonoma and Marin counties of species occurring on List 2, 3, or 4 of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Any loss of sensitive plant communities, as defined by CDFG, or other communities of recognized regional importance.
- Any loss of riparian habitats.

IMPACTS OF THE PROPOSED PROJECT ALTERNATIVES

Short-term vegetation impacts result from construction activities that involve creation of dust, habitat alteration, temporary vegetation removal, etc. Long-term impacts result when vegetation is permanently removed or destroyed, when land is cleared for construction, when special-status plant species are threatened, or when the integrity of a sensitive natural community is destroyed. Construction of temporary or permanent roads, dumping of trash or construction materials, dumping or removal of soil, and flooding or dewatering are examples of actions that can destroy the integrity of a sensitive natural community.

Short-term vegetation impacts associated with the proposed project would result from the construction of wastewater transmission lines to deliver reclaimed water to the agricultural irrigation components. Impacts associated with the construction of wastewater transmission lines are discussed in the *Wastewater Transmission Line Technical Memorandum* (Sycamore Environmental, 1996b).

Aquatic vegetation impacts resulting from the use of reclaimed water could occur from: a) conversion of existing habitat to more intensive uses (e.g., grasslands to cultivated crops); b) excess trace elements; c) increased soil salinity; and/or d) increased salinity of the Esteros.

Plant Communities

Acres of plant communities potentially affected by construction and maintenance of the proposed agricultural irrigation facilities are presented in Table 5-1.

Table 5-1.

Acreage of plant communities potentially affected by construction and maintenance of the proposed agricultural irrigation facilities.

Vegetative Communities	South County					West County			
	Adobe Rd	Baylands	Lakeville	North Petaluma Valley	East of Rohnert Park	Americano Creek	Stemple Creek	Misc.	Sebastopol
Annual grassland	388.0	693.3	744.3	326.1	948.8	2075.6	3734.5	209.5	230.6
Brackish marsh	.	.	.	.	.	3.2	.	.	.
CLO/ILO woodland	1.2	.	11.8	3.0	61.2	.	.	.	14.7
Coastal redwood	.	.	.	.	.	.	.	.	14.0
Eucalyptus	5.9	5.6	111.3	2.7	3.7	69.1	95.4	23.4	6.1
Freshwater marsh	.	.	.	.	.	.	.	.	0.6
Freshwater seep	.	.	.	.	0.4	4.7	1.4	.	.
Mixed riparian	5.5	.	1.7	3.2	30.7	0.3	3.9	1.7	106.6
Native grassland	.	1.8	9.5	.	4.6	3.3	.	.	.
Non-wooded riparian	9.0	117.8	480.4	0.6	106.0	169.3	122.0	0.1	0.3
Northern coastal scrub	.	.	.	.	.	4.9	.	.	.
Oak	0.4	.	.	91.6	2.1	.	0.3	0.2	3.7
Oak-Bay-Madrone woodland	.	.	.	.	44.4	.	.	.	10.3
Seasonally wet vegetation	0.1	55.7	18.7	267.3	47.6	231.7	302.8	0.3	137.8
Vernal Pool	.	29.6	0.8	0.8	71.9	9.7	1.0	.	.
Willow riparian	0.8	.	1.8	2.2	2.1	18.2	8.9	0.5	26.9
Total Acres	410.9	903.8	1380.2	697.5	1323.3	2589.8	4270.0	235.7	551.6
Communities per Site	8	6	9	9	12	11	9	7	11

Special-Status Plant Species

Selection of the Americano Creek component could affect two populations of hayfield tarplant (CNPS List 3). Two populations represent 5% (2/37) of all historic and current populations in Sonoma and Marin counties and 13% (2/15) of the previously unreported populations discovered by Sycamore Environmental in Sonoma and Marin counties during the surveys for this EIR/EIS.

Selection of the Stemple Creek component may affect ten populations of hayfield tarplant. Ten populations represent 27% (10/37) of all historic and current populations in Sonoma and Marin counties and 67% (10/15) of the previously unreported populations discovered by Sycamore Environmental in Sonoma and Marin counties during the surveys for this EIR/EIS.

In accordance with the significance criteria, if six populations (15% of all historic and current records in Sonoma and Marin counties) of hayfield tarplant were affected a significant impact would result.

Selection of the East of Rohnert Park component may affect one population of Sebastopol meadowfoam (federal and state endangered). In accordance with the significance criteria, any loss of Sebastopol meadowfoam will result in a significant impact.

Selection of the Stemple Creek component may affect one population Gairdner's yampah. One population represents 10% (1/10) of all historic and current populations. In accordance with the significance criteria, if two populations (15% of all historic and current records) of Gairdner's yampah were affected a significant impact would result.

The agricultural irrigation alternatives are not expected to be implemented for several years after the Santa Rosa Wastewater project is approved. Prior to implementation of the proposed project, an Irrigation and Conservation Management Program (ICMP) will be prepared for each parcel (HBA, 1996c). The development of a ICMP will require the preparation of a resource map which will include the verifying all previous biological and natural resource studies and conducting additional resource studies where data has not been collected (HBA, 1996c).

The total loss of all populations from all project components will need to be considered in order to compare impacts among various project alternatives.

Protected Tree Resources

Table 4-7 of this document presents a list of the protected tree species that occur on each irrigation study site. Protected tree species occur on all of the agricultural irrigation study sites except the Baylands component. The surveys conducted for this project determined the presence or absence of protected tree resources, but did not attempt to quantify the numbers of such trees present at each site. The number of trees subject to the Sonoma County Tree Ordinance will be determined during site-specific, pre-construction surveys.

Sensitive Natural Communities

Table 4-6 presents acreages of sensitive natural communities potentially affected by implementation of the agricultural irrigation component. In accordance with the significance criteria, any loss of sensitive communities is considered significant.

The total impact on sensitive natural communities from the proposed project will depend on which parcels are brought on-line to receive reclaimed water. Thus, the actual project impact cannot be determined at the present time.

Vegetation Effects Associated with Use of Reclaimed Water

Quality of Reclaimed Water

A summary of water quality data currently produced by the Santa Rosa Subregional System is presented in a report entitled *Reclaimed Water Quality* (Merritt Smith 1996a). A discussion of reclaimed water quality and its relationship to agricultural irrigation practices for the Santa Rosa EIR/EIS is presented in the *Irrigation Water Quality and Salt Management Leaching Requirements, South County and West County Reclamation Alternatives* Technical Memorandum (Questa Engineering, 1996a).

Reclaimed water has several potential affects on vegetation. Concentrations of salts and trace elements can reduce plant growth and diminish reproductive capacity (Maas, 1987). Dissolved salts and trace elements can also accumulate to toxic levels in the soil resulting in plant mortality, particularly during times of drought. In the short-term, the suitability of reclaimed water for irrigation is dependent on the direct potential adverse effects of soluble constituents on plant growth, and in the long-term, on the detrimental build-up of these constituents in the soil (Questa Engineering, 1996a).

Reviews on the effects of salt tolerance and trace elements on vegetation (e.g., Maas, 1987) concentrate on agricultural, horticultural, and ornamental crops. The data presented in Maas (1987) were derived from a taxonomically diverse group of agricultural, horticultural, and ornamental crop species representing both annual

and perennial growth habitats. Similar data are not available for California native species. However, the range of tolerance for salts and trace elements observed in agricultural, horticultural, and ornamental crops is believed to approximate the tolerance of native trees, shrubs, and herbaceous species. Therefore, the data and conclusions presented by Questa Engineering (1996a) are believed to be applicable to native vegetation found in the project study area in terms of the potential for adverse affect on plant growth.

The Questa Engineering report (1996a; Table 2) compares the quality of reclaimed water from the existing Santa Rosa wastewater treatment plant with irrigation water standards developed by the University of California Cooperative Extension and the United Nations Food and Agricultural Organization. The reclaimed water available for irrigation is within established guidelines for irrigation water quality. "No significant direct toxicity effects [on plants] are anticipated" (Questa Engineering, 1996a).

The gradual accumulation of salts in the soil can reduce crop yields. Periodic leaching of farmland to reduce soil salinity may be necessary to help maintain salinity within acceptable levels. In areas of moderate to high rainfall, the winter rain percolating through the soil is normally sufficient to flush accumulated salts (Questa Engineering, 1996a). Specific measures to assist farmers manage salinity by determining leaching requirements are discussed by Questa Engineering (1996a).

Trace Elements in Reclaimed Water

Questa Engineering (1996b) also conducted a trace element loading analysis for the West County and South County reclamation alternatives. The trace elements considered included arsenic, boron, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, and zinc. Their analysis was 'conservative' in that it assumed no leaching loss of metals, whereas in reality, "2 to 20 percent of the applied metals may leave the site in leachate or runoff" (Questa Engineering, 1996b). Questa Engineering (1996b) concluded that even after 25 years of loading, accumulation of nearly all metals in reclaimed water is very low and will not affect the productivity or toxicity level of the soil. After 25 years, the predicted (calculated) boron concentrations (0.479 mg/l) are just below the threshold where boron-sensitive plants show injury (0.50 mg/l). However, natural leaching is expected to preclude the buildup of boron. In summary, neither crops nor native species are expected to be affected by trace elements in reclaimed water.

Contingency Watering

Irrigation will normally be confined to agricultural lands and designated pasture. However, during unseasonably cool summers water requirements for established

crops will be reduced because of reduced evapotranspiration rates. Reclaimed water that would normally be applied to crops will need to be diverted to other lands, thus creating a need for 'contingency watering.' This situation could occur one out of every 10 years (Questa Engineering, 1995). Lands receiving water as a result of contingency watering will be required to adhere to the same mitigation measures that have been established for other agricultural lands irrigated with reclaimed water.

Reyes Soils

The Baylands component occurs on naturally acidic Reyes soils that range in pH from 4.0 to 6.0. Current agricultural practices in the Baylands, which include dry-farmed oat hay and pasture, tend prevent the re-establishment of habitat suitable for marsh species. Irrigated hay crops and irrigated pasture will be grown in the Baylands. These lands will be managed to maintain soil pH levels above 6.0 (Questa Engineering, 1996b). Management will involve the periodic application of lime to raise soil pH (reduce acidity) and over-irrigating to maintain a high water content in the subsoil (i.e., below lime application depths; Questa Engineering, 1995). The proposed management practices involving application of lime and over-irrigating will have a similar effect of preventing the establishment of native brackish marsh vegetation. Thus, there will be little or no change from current conditions.

Conversion of Grassland Communities From Use of Reclaimed Water

The use of reclaimed water could result in existing grassland communities being converted to another community type. For example, annual grasslands could be converted to irrigated pasture, cultivated row crops, vineyards, or orchards. Although the irrigation of annual grasslands will not result in a loss of grassland habitat, summer irrigation may produce a shift from annual to perennial species.

Although vegetation shifts are expected to occur in grassland communities converted to irrigated pasture, these impacts are not expected to be significant because non-native species currently dominate the existing grasslands and these communities are expected to be replaced by non-native, water-tolerant perennial species. Introduced perennial grass species occurring in the agricultural irrigation study areas that could become established in irrigated pasture include *Agrostis stolonifera*, *Cynodon dactylon*, *Dactylis glomerata*, *Echinochloa crus-galli*, *Holcus lanatus*, *H. mollis*, *Paspalum dilatatum*, *Phalaris aquatica*, and *Poa pratensis*. Farmers may also elect to enhance the forage capacity of irrigated pasture lands by sowing seed of non-native legumes such as alsike clover (*Trifolium hybridum*), red clover (*T. pratense*), white clover (*T. repens*), or vetch (*Vicia angustifolia*); or grass species such as *Festuca elatior*, *Hordeum vulgare*, or *Lolium perenne*.

Potential Impacts to Special-Status Plant Species and Sensitive Natural Communities

Special-status plant species occurring in the agricultural irrigation study areas include hayfield tarplant (*Hemizonia congesta* ssp. *leucocephala*) and Sebastopol meadowfoam (*Limnanthes vinculans*). Sensitive natural communities in the agricultural irrigation study areas include native grassland, oak woodland, riparian, and wetland (brackish marsh, freshwater marsh, freshwater seep, and vernal pool) habitats. The total number of populations of special-status plant species and acreages of sensitive natural communities that would be affected by agricultural irrigation components depends on several factors. These factors include the type of crops grown, current market prices for crops, and the amount of water that can be discharged into the Russian River (1%, 5%, or 10%). The *Cropping Scenarios for the West County and South Reclamation Alternatives* report (Questa Engineering, 1996c) presents a discussion of potential water consumption rates and acreage requirements. This report also discusses how water consumption rates and acreage requirements depend upon agricultural cropping alternatives.

Mitigation measures incorporated into the project design will avoid impacts to special-status plant species and sensitive natural communities (see following section). For example, setbacks will be required from biologically sensitive areas and monitoring will be conducted to ensure compliance. The primary impact that will occur from agricultural irrigation will be the conversion of grassland communities to agricultural uses (crops, orchards, and vineyards). The conversion of non-native grassland communities to cultivated agricultural crops, orchards, or vineyards will result in a long-term loss of grassland habitat.

Mitigation Measures Incorporated into Project Design

Mitigation measures are incorporated into the project design that will avoid impacts to sensitive botanical resources (species and communities; HBA, 1996c). These mitigation measures include the following: a) runoff will not be allowed onto parcels that are not scheduled to receive reclaimed water; b) biologically sensitive areas will not be irrigated; c) a minimum 30-foot setback will be established from any identified sensitive plant species habitat and all jurisdictional waters including isolated wetlands; d) a minimum 50-foot setback will be established around the upland riparian corridor of all linear waterways including streams, creeks, and rivers; and e) sensitive biological resources along pipelines, pump stations, and equipment staging areas will be avoided. In addition, farmers that accept reclaimed water for irrigation must use fencing to keep their livestock out of stream corridors (minimum 50-foot setback) and must also use adequate measures to prevent manure and other substances from entering streams.

If sensitive botanical resources cannot be avoided through project design or during construction, specific measures will be implemented (HBA, 1996c): all mitigation measures of the Sonoma and Marin County Tree ordinances will be met; if avoidance of a

sensitive plant species is not feasible, a qualified botanist will salvage individual specimens or seeds and revegetate following construction; where avoidance of other sensitive resources, excluding species protected under FESA or CESA, is not feasible, the affected habitat will be replaced at a minimum 3:1 ratio.

Estero Americano and Estero de San Antonio: Potential for Effects on Vegetation from Increased Salinity

Salinity of seawater ranges from $\pm 32,000$ mg/L (Merritt Smith, 1996b) to $\pm 35,000$ mg/L (Knutson and Woodhouse, 1982). (Note: salinity is usually expressed in mg/L or ppm; 1 mg/L = 1 ppm.) Sandbars periodically form at the mouths of esteros and can persist for years until flood events or other actions create an opening.

The salinity of an estero is influenced by whether the mouth of the estero is closed (blocked) by a sandbar or open (not blocked). Salinity within the Estero Americano and Estero de San Antonio increases when the sandbar is open and decreases when it is closed. Salinity in the Esteros also varies by the season with salinity decreasing in winter (with increased rainfall and runoff) and increasing in summer (with decreased inflow and increased evaporation). The potential impact from increased salinity as a result of irrigating agricultural lands with reclaimed water under bar closed and bar open conditions was evaluated by Merritt Smith (1996b).

In order to assess the potential for impact on vegetation in the Esteros, it is necessary to determine maximum salinity concentrations under existing and project conditions and to compare these concentrations with known tolerances of various plant species.

Table 5-2 summarizes existing calculated salinity values within the Estero Americano and the Estero de San Antonio. The data in Table 5-2 were derived by Sycamore Environmental from graphs prepared by Merritt Smith (1996b). Under existing conditions salinity concentrations are highest nearest the ocean (e.g., 1.01 mi) and decrease inland (4.62 mi and 7.37 mi) when the sandbar is open. For example, salinity at 1 mile for both Esteros when the sandbar is open is equal to the concentration of seawater, 32,000 mg/L. Salinity decreases with distance from the ocean as a result of runoff and inflow from creeks.

Table 5-2.

Existing Conditions: Irrigation and storage impacts on TDS in Estero Americano and Estero de San Antonio, summer inflow and bar-open and bar closed conditions. ¹

Estero Entrance Condition	Salinity ²		
	1 mi	4 mi	7 mi
Estero Americano			
Sandbar closed	30,300	27,500	17,250
Sandbar open	32,000	31,000	22,900
Estero de San Antonio			
Sandbar closed	28,300	22,600	17,500
Sandbar open	32,000	30,250	21,750

¹ Source: Merritt Smith, 1996b.

² Total dissolved solids (TDS) in mg/L.

Direct measurements of the highest and lowest TDS from Estero Americano during low and moderate runoff months range from 0 to 48,000 TDS (Table 1, Merritt Smith, 1996b). These represent actual measurements of the minimum and maximum data. Fewer data are available for the Estero de San Antonio. Therefore, only average TDS values (range of 0 for low flow to 28,000 TDS for moderate flows) are given by Merritt Smith (Table 2, 1966b). By comparison, the highest average TDS values for Estero Americano range from 0 for low flow to 30,021 for moderate flows. Higher TDS values are presumed to be present in the Estero de San Antonio in order to obtain an average of 28,000 TDS.

The maximum salinity concentrations evaluated for the EIR/EIS were derived from a 'link-node hydrodynamic' water quality model (Merritt Smith, 1966b, c). Water quality conditions in the Esteros were simulated under two watershed situations: a) existing conditions and b) irrigation associated with the 1 percent project design for the Russian River/Laguna discharge rate. A total of 36 potential conditions relating to effects on TDS in the Esteros were evaluated (Table 6.11, Merritt Smith, 1966c). The evaluations were based on various conditions including spring versus summer inflow, bar open versus bar closed, and wet versus average versus dry year.

The computer simulation shows that under the range of potential project conditions in Estero Americano, TDS would increase a maximum of 2,500 mg/L from existing conditions, which would occur when the sandbar is closed during the spring and summer inflows (Merritt Smith, 1996c). For the Estero de San Antonio, TDS would also increase a maximum of 2,500 mg/L which would occur throughout the Estero when the sandbar is closed during spring and summer inflows (Merritt Smith, 1996c). Table 5-3 presents the predicted maximum salinity concentrations that would occur in each Estero. The predicted increases in TDS over existing conditions vary depending on location in the Esteros and time of year.

Pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), and tufted hairgrass (*Deschampsia caespitosa*) are three halophytic species found in or along wet habitats of the Esteros. Each of these species is highly adapted to saline conditions. Pickleweed is the most salt-tolerant of all Pacific plants and can tolerate salinity more than twice the strength of seawater (Knutson and Woodhouse, 1982). Saltgrass is second only to pickleweed in its tolerance to salinity and can withstand salinity up to 50,000 ppm (ppm = mg/l; Knutson and Woodhouse, 1982). Tufted hairgrass is found in the upper third of the intertidal zone in brackish waters up to 20,000 ppm or in freshwater habitats (Knutson and Woodhouse, 1982).

Several lines of evidence suggest that there will be no significant impact on vegetation in the Esteros from proposed agricultural irrigation. First, the highest TDS recorded during studies for the EIR/EIS within Estero Americano during low and moderate runoff months were 47,000 and 48,000 ppm (Merritt Smith, 1996b). These values are higher than seawater and higher than the maximum impact under any project conditions (Table 5-3).

Second, the salinity range for common species found in and along the Esteros, such as pickleweed and saltgrass, is greater than seawater (35,000 ppm) and thus greater than the maximum project impact under any project conditions (Table 5-3).

Third, aquatic plants (as well as other types of organisms) in estuarine environments are subjected to great fluctuations in salinity. The range of salinity currently experienced in the Esteros exceeds the maximum and minimum range of salinity that would occur under any project conditions. Since the range of salinity tolerated by common halophytic species exceeds the maximum project impact, no significant impact on aquatic vegetation from increased salinity is anticipated to occur.

Table 5-3.

Project Conditions: TDS in Estero Americano and Estero de San Antonio, summer inflow and bar-open and bar closed conditions; simulation for dry year (includes affect of winter irrigation). ¹

Estero Entrance Condition	Salinity ²		
	1 mi	4 mi	7 mi
Estero Americano			
Sandbar closed	31,000	28,500	19,500
Sandbar open	32,250	31,400	24,900
Estero de San Antonio			
Sandbar closed	28,500	23,400	19,000
Sandbar open	32,100	30,500	23,600

¹ Source: Merritt Smith, 1996b.

² Total dissolved solids (TDS) in mg/L.

6. REPORT PREPARERS

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APPENDIX A.

Plant Species List for Agricultural Irrigation Component.

Appendix A. Agricultural Irrigation Plant Species List

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemle	Miscella neous
NYCTAGINACEAE	<i>Abronia umbellata</i> ssp. <i>breviflora</i>	Pink sand-verbena	N	○	○	○	○	○	○	○	○	○
ROSACEAE	<i>Acaena pinnatifida</i> var. <i>californica</i>	California acaena	N	○	○	○	○	○	○	○	○	○
ACERACEAE	<i>Acer macrophyllum</i>	Big-leaf maple	N	●	○	○	○	○	○	○	○	○
ACERACEAE	<i>Acer negundo</i> var. <i>californicum</i>	Box elder	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Achillea millefolium</i>	Yarrow	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Achyrochaena mollis</i>	Blow-wives	N	○	○	○	○	○	○	○	○	○
PTERIDACEAE	<i>Adiantum aleuticum</i>	Five-finger fern	N	○	○	○	○	○	○	○	○	○
PTERIDACEAE	<i>Adiantum jordanii</i>	California maiden-hair	N	○	○	○	○	○	○	○	○	○
HIPPOCASTANACEAE	<i>Aesculus californica</i>	California buckeye	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Agoseris apargioides</i> var. <i>apargioides</i>	Agoseris	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Agoseris apargioides</i> var. <i>eastwoodiae</i>	Agoseris	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Agoseris grandiflora</i>		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Agoseris heterophylla</i>		N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Agrostis elliotiana</i>	Bent grass	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Agrostis exarata</i>		N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Agrostis sp.</i>	Bent grass	U	○	○	○	○	○	○	○	○	○
POACEAE	<i>Agrostis stolonifera</i>		N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Agrostis stolonifera</i>	Creeping bent	I	○	○	○	○	○	○	○	○	○
SIMARUBACEAE	<i>Allanthus altissima</i>	Tree of heaven	I	○	○	○	○	○	○	○	○	○
POACEAE	<i>Aira caryophylla</i>	Silver European hairgrass	I	○	○	○	○	○	○	○	○	○
ALISMATACEAE	<i>Alisma lanceolatum</i>	Water plantain	I	○	○	○	○	○	○	○	○	○
ALISMATACEAE	<i>Alisma plantago-aquatica</i>	Water plantain	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Allium peninsulare</i>		N	○	○	○	○	○	○	○	○	○
BETULACEAE	<i>Alnus rhombifolia</i>	White alder	N	○	○	○	○	○	○	○	○	○
BETULACEAE	<i>Alnus rubra</i>	Red alder	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Alopecurus saccatus</i>	Foxtail	N	○	○	○	○	○	○	○	○	○
AMARANTHACEAE	<i>Amaranthus retroflexus</i>	Amaranth	I	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
ASTERACEAE	Ambrosia artemisiifolia	Common ragweed	I	○	○	○	○	●	○	○	○	○
ROSACEAE	Amelanchier sp.	Service-berry	N	○	○	○	○	○	○	●	○	○
POACEAE	Ammophila arenaria	European beachgrass	I	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Amsinckia menziesii var. intermedia	Fiddleneck	N	○	○	●	○	●	○	○	●	○
BORAGINACEAE	Amsinckia menziesii var. menziesii	Fiddleneck	N	○	○	●	○	●	○	○	●	○
PRIMULACEAE	Anagallis arvensis	Scarlet pimpernel	I	●	○	●	●	●	●	○	●	●
ASTERACEAE	Anaphalis margaritacea	Pearly everlasting	N	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Anchusa arvensis	Bugloss	I	○	○	○	○	○	○	○	○	●
APIACEAE	Angelica californica		N	○	○	○	○	○	○	○	○	○
APIACEAE	Angelica hendersonii		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Anthemis cotula	Mayweed	I	●	○	●	●	●	●	○	●	○
APIACEAE	Anthriscus caucalis	Bur-chervil	I	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Aquilegia formosa	Columbine	N	○	○	○	○	○	○	○	○	○
ERICACEAE	Arbutus menziesii	Pacific madrone	N	●	○	○	○	○	○	○	○	○
POACEAE	Aristida oligantha	Oldfield three-awn	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Artemisia californica	California sage brush	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Artemisia douglasiana	Mugwort	N	●	○	○	○	○	○	○	○	○
ASCLEPIADACEAE	Asclepias fascicularis	Narrow-leaf milkweed	N	○	○	○	○	○	○	○	○	○
DRYOPTERIDACEAE	Athyrium filix-femina var. cyclosorum	Lady fern	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Athyrium pusillus		N	○	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Atriplex patula	Spear oracle	N	○	○	○	○	○	○	○	○	○
POACEAE	Avena barbata	Slender wild oat	I	○	○	○	○	○	○	○	○	○
POACEAE	Avena fatua	Wild oat	I	○	○	○	○	○	○	○	○	○
POACEAE	Avena sativa	Cultivated oat	I	○	○	○	○	○	○	○	○	○
AZOLLACEAE	Azolla sp.	Mosquito fern	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Baccharis pilularis	Coyote brush	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Baccharis salicifolia	Mule fat	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Barbarea verna	Early winter cress	I	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Bellardia trixago	Bellardia	I	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/1*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
APIACEAE	<i>Berula erecta</i>	Cutleaf water-parsnip	N	○	○	●	○	○	○	●	○	○
POACEAE	<i>Brachypodium distachyon</i>		I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Brassica nigra</i>	Black mustard	I	●	●	●	●	●	○	●	●	○
BRASSICACEAE	<i>Brassica rapa</i>	Field mustard	I	○	○	○	○	○	○	○	○	○
POACEAE	<i>Briza maxima</i>	Quaking grass	I	●	○	○	○	○	○	○	○	○
POACEAE	<i>Briza minor</i>	Little quaking grass	I	●	○	○	○	○	○	○	○	○
LILIACEAE	<i>Brodiaea appendiculata</i>	Grassland brodiaea	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Brodiaea californica</i> var. <i>californica</i>	California brodiaea	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Brodiaea elegans</i> ssp. <i>elegans</i>	Harvest brodiaea	N	●	○	○	○	○	○	○	○	○
POACEAE	<i>Bromus carinatus</i> var. <i>carinatus</i>	California brome	N	●	○	○	○	○	○	○	○	○
POACEAE	<i>Bromus diandrus</i>	Ripgut brome	I	●	○	○	○	○	○	○	○	○
POACEAE	<i>Bromus hordeaceus</i>	Soft chess brome	I	●	○	○	○	○	○	○	○	○
POACEAE	<i>Bromus japonicus</i>	Japanese brome	I	○	○	○	○	○	○	○	○	○
POACEAE	<i>Bromus madritensis</i> ssp. <i>rubens</i>	Foxtail chess	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Cakile maritima</i>	Sea rocket	I	○	○	○	○	○	○	○	○	○
PORTULACACEAE	<i>Calandrinia ciliata</i>	Red maids	N	○	○	○	○	○	○	○	○	○
CALLITRICHACEAE	<i>Callitriche marginata</i>	Water-starwort	N	○	○	○	○	○	○	○	○	○
CALLITRICHACEAE	<i>Callitriche verna</i>	Water-starwort	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Calochortus luteus</i>	Mariposa lily	N	○	○	○	○	○	○	○	○	○
CALYCANTHACEAE	<i>Calycanthus occidentalis</i>	Spicebush	N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Calystegia collina</i> ssp. <i>collina</i>	Woolly morning-glory	N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Calystegia maculophylla</i>	Hairy morning-glory	N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Calystegia purpurata</i> ssp. <i>purpurata</i>	Western morning-glory	N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Calystegia purpurata</i> ssp. <i>saxicola</i>		N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	<i>Calystegia subcaulis</i> ssp. <i>subcaulis</i>		N	○	○	○	○	○	○	○	○	○
ONAGRACEAE	<i>Camissonia ovata</i>	Sun cup	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Capsella bursa-pastoris</i>	Shepherd's purse	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Cardamine californica</i>	Milk maids	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Cardaria chalapensis</i>	Lens-podded hoary cress	I	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/1*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebast spot	Ameri cano	Stemple	Miscella neous
ASTERACEAE	Carduus pycnocephalus	Italian thistle	I	●	○	●	●	●	●	●	●	●
CYPERACEAE	Carex aquatilis var. dives	Water sedge	N	○	○	●	○	●	○	●	●	○
CYPERACEAE	Carex densa	Dense sedge	N	○	○	○	○	○	○	○	○	○
CYPERACEAE	Carex dudleyi	Dudley's sedge	N	●	○	●	○	●	●	●	●	●
CYPERACEAE	Carex praegracilis	Clustered field-sedge	N	○	○	●	○	●	○	●	●	○
CYPERACEAE	Carex subfusca	Rusty sedge	N	○	○	●	○	○	●	○	○	○
ASTERACEAE	Carthamus baeiticus	Smooth distaff thistle	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	Carthamus lanatus	Woolly distaff thistle	I	●	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja affinis ssp. affinis	Indian paintbrush	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja ambigua ssp. ambigua	Johnny-nip	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja attenuata	Valley tassels	N	○	○	●	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja exserta ssp. exserta	Purple owl's clover	N	○	○	●	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja exserta ssp. latifolia	Purple owl's clover	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Castilleja rubicundula ssp. lithospermoides	Cream sacs	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Centaurea calcitrapa	Purple star-thistle	I	●	○	●	○	○	○	○	○	○
ASTERACEAE	Centaurea solstitialis	Yellow star-thistle	I	●	○	●	○	○	○	○	○	○
GENTIANACEAE	Centaureum davayi	Davy century	N	○	○	○	○	○	○	○	○	○
GENTIANACEAE	Centaureum muehlenbergii	Monterey century	N	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	Cerastium arvense	Field Chickweed	N	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	Cerastium glomeratum	Mouse-ear chickweed	I	●	○	○	○	○	○	○	○	○
CERATOPHYLLACEAE	Ceratophyllum demersum	Homewort	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Chamomilla suaveolens	Pineapple weed	I	○	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Chenopodium album	Lamb's quarters	I	●	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Chenopodium ambrosioides	Mexican tea	I	○	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Chenopodium berlandieri	Pitseed Goosefoot	N	○	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Chenopodium murale		I	○	○	○	○	○	○	○	○	○
LILIACEAE	Chlorogalum pomeridianum var. pomeridianum	Soap plant	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Chrysanthemum segetum	Corn chrysanthemum	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	Cichorium intybus	Chicory	I	●	○	○	○	○	○	○	○	○

Family	Species	Common Name	N / I *	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Misc nec
ASTERACEAE	Cirsium arvense	Canada thistle	I	○	○	○	○	○	○	●	○	○
ASTERACEAE	Cirsium cymosum	Peregrine thistle	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Cirsium occidentale		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Cirsium vulgare	Bull thistle	I	●	○	○	○	○	○	○	○	○
ONAGRACEAE	Clarkia amoena ssp. amoena	Godetia	N	●	○	○	○	○	○	○	○	○
ONAGRACEAE	Clarkia purpurea ssp. quadrivulnera		N	○	○	○	○	○	○	○	○	○
PORTULACACEAE	Claytonia parviflora ssp. parviflora	Miner's lettuce	N	○	○	○	○	○	○	○	○	○
PORTULACACEAE	Claytonia perfoliata ssp. perfoliata	Miner's lettuce	N	○	○	○	○	○	○	○	○	○
PORTULACACEAE	Claytonia perfoliata ssp. mexicana	Miner's lettuce	N	○	○	○	○	○	○	○	○	○
APIACEAE	Conium maculatum	Poison hemlock	I	●	○	○	○	○	○	○	○	○
CONVOLVULACEAE	Convolvulus arvensis	Bindweed	I	●	○	○	○	○	○	○	○	○
ASTERACEAE	Gnaphalium canadensis	Horseweed	N	○	○	○	○	○	○	○	○	○
CORNACEAE	Cornus sericea ssp. sericea	American dogwood	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Coronopus didymus	Swine cress	I	○	○	○	○	○	○	○	○	○
POACEAE	Cortaderia sp.	Pampas grass	I	○	○	○	○	○	○	○	○	○
BETULACEAE	Corylus cornuta var. californica	Hazelnut	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Cotoneaster pannosa	Cotoneaster	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	Cotula coronopifolia	Brass-buttons	I	○	○	○	○	○	○	○	○	○
CRASSULACEAE	Crassula aquatica	Water pigmy-weed	N	○	○	○	○	○	○	○	○	○
CRASSULACEAE	Crassula connata	Pigmy-weed	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Crataegus douglasii	Hawthorn	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Crataegus suksdorfii	Hawthorn	N	○	○	○	○	○	○	○	○	○
POACEAE	Cryptis alopecuroides	Prickle grass	I	○	○	○	○	○	○	○	○	○
POACEAE	Cryptis schoenoides	Prickle grass	I	○	○	○	○	○	○	○	○	○
CUPRESSACEAE	Cupressus macrocarpa	Monterey cypress	N	○	○	○	○	○	○	○	○	○
CUSCUTACEAE	Cuscuta salina	Dodder	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Cynara cardunculus	Artichoke thistle	I	○	○	○	○	○	○	○	○	○
POACEAE	Cynodon dactylon	Bermuda grass	I	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Cynoglossum grande	Hound's tongue	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
POACEAE	Cynosurus echinatus	Hedgehog dogtail	I	●	○	●	○	●	●	●	●	●
CYPERACEAE	Cyperus eragrostis	Nutsedge	N	●	○	●	○	●	○	○	●	●
CYPERACEAE	Cyperus esculentus	Nutsedge	N	○	○	●	○	○	●	●	○	○
FABACEAE	Cytisus scoparius	Scotch broom	I	○	○	○	○	○	●	●	●	○
POACEAE	Dactylis glomerata	Orchard grass	I	●	○	○	○	●	●	●	●	○
ALISMATACEAE	Damasonium californicum		N	○	○	○	●	○	○	○	●	○
POACEAE	Danthonia californica var. californica	California oatgrass	N	○	○	●	○	●	●	●	●	●
SOLANACEAE	Datura stramonium	Jimson weed	I	○	○	○	○	●	○	●	○	○
APIACEAE	Daucus carota	Queen Anne's lace	I	○	○	○	○	○	●	●	●	○
APIACEAE	Daucus pustillus	Rattlesnake weed	N	○	○	○	○	○	○	●	○	○
RANUNCULACEAE	Delphinium decorum ssp. decorum	Coast larkspur	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Delphinium hesperium ssp. hesperium	Western larkspur	N	○	○	○	○	○	○	○	●	○
RANUNCULACEAE	Delphinium nudicaule	Red larkspur	N	○	○	○	○	○	○	○	○	○
POACEAE	Deschampsia cespitosa	Tufted hairgrass	N	○	○	○	○	○	○	○	○	○
POACEAE	Deschampsia danthonioides	Annual hairgrass	N	○	○	○	○	●	○	○	●	●
POACEAE	Deschampsia elongata	Slender hairgrass	N	○	○	○	○	●	○	○	●	○
LILIACEAE	Dichelostemma capitatum ssp. capitatum	Blue dicks	N	○	○	○	○	●	○	○	○	○
LILIACEAE	Dichelostemma congestum	Ookow	N	○	○	○	○	○	○	●	○	○
LILIACEAE	Dichelostemma multiflorum	Wild hyacinth	N	○	○	○	○	○	○	○	○	○
CONVOLVULACEAE	Dichondra donelliana	Dichondra	N	○	○	○	○	○	○	○	○	○
DIPSACACEAE	Dipsacus fullonum	Wild teasel	I	○	○	○	○	●	○	○	○	○
LILIACEAE	Disporum hookeri	Hooker's fairy bell	N	○	○	○	○	●	○	○	○	○
POACEAE	Distichlis spicata	Saltgrass	N	○	○	○	○	○	○	○	○	○
PRIMULACEAE	Dodecatheon hendersonii	Mosquito bills	N	○	○	○	○	○	○	○	○	○
CAMPANULACEAE	Downingia concolor var. concolor		N	○	○	○	○	○	○	○	○	○
DRYOPTERIDACEAE	Dryopteris arguta	Wood fern	N	○	○	○	○	○	○	○	○	○
CRASSULACEAE	Dudleya cymosa	Common dudleya	N	○	○	○	○	○	○	○	○	○
CRASSULACEAE	Dudleya farinosa		N	○	○	○	○	○	○	○	○	○
POACEAE	Echinochloa colona	Barnyard grass	I	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Peaballuma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscellaneous
POACEAE	Echinochloa crus-galli	Barnyard grass	I	●	○	●	○	○	○	●	○	○
CYPERACEAE	Eleocharis acicularis var. acicularis	Spike rush	N	○	○	●	○	○	○	○	●	○
CYPERACEAE	Eleocharis macrostachya	Spike rush	N	●	○	●	○	●	●	●	●	●
POACEAE	Elymus glaucus	Blue wildrye	N	●	○	●	○	●	●	●	●	○
POACEAE	Elymus multisetus	Big squirmetail	N	○	○	○	○	○	○	○	○	○
ONAGRACEAE	Epilobium brachycarpum	Willow herb	N	●	●	●	○	○	○	●	○	○
ONAGRACEAE	Epilobium ciliatum ssp. glandulosum	Willow herb	N	●	○	●	○	○	○	●	●	○
ONAGRACEAE	Epilobium densiflorum	Fireweed	N	●	○	○	○	○	○	○	○	○
EQUISETACEAE	Equisetum arvense	Common horsetail	N	●	○	●	○	○	●	●	●	●
EQUISETACEAE	Equisetum hyemale ssp. affine	Western scouring-rush	N	●	○	●	○	○	○	○	○	○
EQUISETACEAE	Equisetum laevigatum	Smooth scouring-rush	N	○	○	○	○	○	○	○	○	○
EUPHORBACEAE	Eremocarpus setigerus	Dove weed	N	●	●	●	○	○	○	○	○	○
ASTERACEAE	Erigeron glaucus	Seaside daisy	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Erigeron philadelphicus	Fleabane daisy	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	Eriophyllum lanatum var. arachnoideum	Woolly-sunflower	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Eriophyllum staechadifolium	Seaside woolly sunflower	N	○	○	○	○	○	○	○	○	○
GERANIACEAE	Erodium botrys	Storksbill	I	●	○	●	○	●	○	○	○	○
GERANIACEAE	Erodium cicutarium	Storksbill	I	●	○	●	○	●	○	○	○	○
GERANIACEAE	Erodium macrophyllum	Roundleaf storksbill	N	○	○	○	○	○	○	○	○	○
GERANIACEAE	Erodium moschatum	White-stemmed filaree	I	●	○	●	○	●	○	○	○	○
APIACEAE	Eryngium aristulatum var. aristulatum	Coyote thistle	N	○	○	○	○	○	○	○	○	○
APIACEAE	Eryngium armatum	Coyote thistle	N	●	○	●	○	●	○	○	○	○
PAPAVERACEAE	Eschscholzia caespitosa	Poppy	N	○	○	○	○	○	○	○	○	○
PAPAVERACEAE	Eschscholzia californica	California poppy	N	●	○	●	○	●	○	○	○	○
MYRTACEAE	Eucalyptus globulus	Blue gum eucalyptus	I	●	○	●	○	●	○	○	○	○
POACEAE	Festuca arundinacea	Tall fescue	I	●	○	●	○	●	○	○	○	○
POACEAE	Festuca californica	California fescue	N	○	○	○	○	○	○	○	○	○
POACEAE	Festuca idahoensis	Blue bunchgrass	N	○	○	○	○	○	○	○	○	○
POACEAE	Festuca rubra	Red fescue	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
MORACEAE	Ficus carica	Edible fig	I	○	○	○	○	●	○	○	○	○
ASTERACEAE	Filego gallica	Herba impia	I	○	○	●	○	●	○	○	●	●
APIACEAE	Foeniculum vulgare	Fennel	I	●	●	●	○	●	●	●	●	●
ROSACEAE	Fragaria vesca	Wood strawberry	N	○	○	○	○	○	○	●	○	○
FRANKENIACEAE	Frankenia salina	Alkali heath	N	○	●	●	○	○	○	●	○	○
OLEACEAE	Fraxinus latifolia	Oregon ash	N	●	○	○	○	●	●	●	○	○
LILIACEAE	Fritillaria affinis var. affinis	Checker lily	N	●	○	○	○	○	○	○	○	○
RUBIACEAE	Galium aparine	Goose grass	N	○	○	●	○	●	○	○	●	○
RUBIACEAE	Galium tricornutum	Rough corn bedstraw	N	○	○	●	○	●	○	○	○	○
RUBIACEAE	Galium triflorum	Sweet-scented bedstraw	N	○	○	○	○	○	○	○	○	○
GARRYACEAE	Garrya elliptica	Silk tassel bush	N	○	○	○	○	○	○	●	○	○
POACEAE	Gastridium ventricosum	Nit grass	I	○	○	○	○	○	○	○	○	○
GERANIACEAE	Geranium carolinianum	Geranium	N	○	○	○	○	○	○	○	○	○
GERANIACEAE	Geranium dissectum	Geranium	I	●	○	●	○	●	○	○	○	○
GERANIACEAE	Geranium molle	Dove's-foot geranium	I	○	○	●	○	○	○	○	○	○
POACEAE	Glyceria leptostachya	Mannagrass	N	○	○	○	○	○	○	○	○	○
POACEAE	Glyceria occidentalis	Mannagrass	N	●	○	●	○	○	○	○	○	○
ASTERACEAE	Gnaphalium californicum	Everlasting	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Gnaphalium luteo-album	Cudweed	I	●	○	●	○	○	○	○	○	○
ASTERACEAE	Gnaphalium palustre	Cudweed	N	●	○	○	○	○	○	○	○	○
ASTERACEAE	Gnaphalium purpureum		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Grindelia camporum var. bracteosum	Gumplant	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Grindelia camporum var. camporum	Gumplant	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Grindelia hirsutula var. davyi	Gumplant	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Grindelia stricta	Gumplant	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Helenium puberulum	Sneezeweed	N	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Heliotropium curassavicum	Heliotrope	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Hemizonia congesta ssp. congesta	Hayfield tarweed	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Hemizonia congesta ssp. leucocephala	Hayfield tarplant	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebast apol	Ameri cano	Stemple	Miscella neous
APIACEAE	<i>Heracleum lanatum</i>	Cow parsnip	N	○	○	○	○	●	○	●	●	○
URTICACEAE	<i>Hesperocnide tenella</i>	Western nettle	N	○	○	○	○	○	○	○	○	○
ROSACEAE	<i>Heteromeles arbutifolia</i>	Toyon	N	○	○	○	○	○	○	●	○	○
ASTERACEAE	<i>Heterotheca sessiliflora</i> ssp. <i>bolanderi</i>	Goldenaster	N	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	<i>Heuchera micrantha</i>	Alumroot	N	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	<i>Heuchera pilosissima</i>	Alumroot	N	○	○	○	○	○	○	●	○	○
BRASSICACEAE	<i>Hirschfeldia incana</i>	Short-pod mustard	I	○	○	○	○	○	○	○	○	○
POACEAE	<i>Holcus lanatus</i>	Common velvet grass	I	●	○	●	○	○	●	●	●	●
POACEAE	<i>Holcus mollis</i>	Creeping velvet grass	I	○	○	●	○	○	●	●	○	○
ROSACEAE	<i>Holodiscus discolor</i>	Oceanspray	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Hordeum brachyantherum</i> ssp. <i>californicum</i>	Barley	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i>	Barley	N	●	○	●	○	○	●	●	●	●
POACEAE	<i>Hordeum jubatum</i>	Foxtail barley	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	Mediterranean barley	I	●	○	●	○	○	●	●	●	●
POACEAE	<i>Hordeum murinum</i> ssp. <i>glaucum</i>	Barley	I	●	○	●	○	○	○	○	○	○
POACEAE	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	Barley	I	●	○	●	○	○	●	●	●	●
APIACEAE	<i>Hydrocotyle umbellata</i>	Marsh-pennywort	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Hypochaeris glabra</i>	Smooth cat's-ear	I	●	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Hypochaeris radicata</i>	Rough cat's-ear	I	●	○	●	○	○	○	○	○	○
IRIDACEAE	<i>Iris douglasiana</i>		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Jaumea carnosa</i>	Fleshy jaumea	N	○	○	○	○	○	○	○	○	○
JUGLANDACEAE	<i>Juglans californica</i> var. <i>hindsii</i>	Northern CA black walnut	N	○	○	○	○	○	○	○	○	○
JUGLANDACEAE	<i>Juglans regia</i>	English walnut	I	○	○	○	○	○	○	○	○	○
JUNCACEAE	<i>Juncus balticus</i>	Baltic rush	N	●	○	●	○	○	○	○	○	○
JUNCACEAE	<i>Juncus bolanderi</i>	Bolander's rush	N	○	○	○	○	○	○	○	○	○
JUNCACEAE	<i>Juncus bufonius</i> var. <i>bufonius</i>	Toad rush	N	●	○	●	○	○	○	○	○	○
JUNCACEAE	<i>Juncus bufonius</i> var. <i>congestus</i>	Toad rush	N	○	○	○	○	○	○	○	○	○
JUNCACEAE	<i>Juncus effusus</i>		N	○	○	○	○	○	○	○	○	○
JUNCACEAE	<i>Juncus effusus</i> var. <i>brunneus</i>	Common rush	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Americano	Stemple	Miscellaneous
JUNCACEAE	<i>Juncus effusus</i> var. <i>pacificus</i>	Common rush	N	●	○	●	○	●	○	●	●	●
JUNCACEAE	<i>Juncus lesueurii</i>	Salt rush	N	○	○	●	○	○	○	○	○	○
JUNCACEAE	<i>Juncus mexicanus</i>	Mexican rush	N	●	○	●	○	○	○	●	●	●
JUNCACEAE	<i>Juncus occidentalis</i>	Western rush	N	●	○	●	○	●	○	●	●	○
JUNCACEAE	<i>Juncus patens</i>	Spreading rush	N	●	○	●	○	●	○	●	●	●
JUNCACEAE	<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	Brown-headed rush	N	○	○	●	○	○	○	○	○	○
JUNCACEAE	<i>Juncus phaeocephalus</i> var. <i>phaeocephalus</i>	Brown-headed rush	N	●	○	●	○	●	○	●	●	●
SCROPHULARIACEAE	<i>Kickxia elatine</i>	Ftuellin	I	○	●	○	○	○	○	○	○	○
POACEAE	<i>Koeleria macrantha</i>	Junegrass	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Lactuca saligna</i>	Willow lettuce	I	●	●	●	○	○	○	○	○	○
ASTERACEAE	<i>Lactuca scariola</i>	Prickly lettuce	I	●	●	●	○	●	○	●	●	○
ASTERACEAE	<i>Lagophylla ramosissima</i>		N	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Lamium purpureum</i>	Dead nettle	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Lasthenia californica</i>	Goldfields	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Lasthenia glaberrima</i>	Goldfields	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Lasthenia glabrata</i>		N	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Lathyrus hirsutus</i>	Caley pea	I	●	○	○	○	○	○	○	○	○
FABACEAE	<i>Lathyrus odoratus</i>	Sweet pea	I	○	○	●	○	○	○	○	○	○
FABACEAE	<i>Lathyrus polyphyllus</i>		N	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Lathyrus vestitus</i> var. <i>ochropetalus</i>	Wild pea	N	○	○	●	○	●	○	○	○	○
ASTERACEAE	<i>Layia galiardoides</i>	Tidy tips	N	○	○	●	○	●	○	○	○	○
ASTERACEAE	<i>Layia platyglossa</i>	Tidy Tips	N	○	○	●	○	●	○	○	○	○
LEMNACEAE	<i>Lemna minuscule</i>	Duckweed	N	●	○	●	○	○	○	○	○	○
BRASSICACEAE	<i>Lepidium nitidum</i>	Peppergrass	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Lessingia flaginifolia</i> var. <i>californica</i>	California-aster	N	●	○	●	○	○	○	○	○	○
POACEAE	<i>Leymus triticoides</i>	Alkali rye-grass	N	●	○	●	○	○	○	○	○	○
APIACEAE	<i>Ligusticum apiifolium</i>		N	○	○	○	○	○	○	○	○	○
JUNCAGINACEAE	<i>Lilaea scilloides</i>	Flowering quillwort	N	○	○	●	○	○	○	○	○	○
LIMNANTHACEAE	<i>Limnanthes douglasii</i> ssp. <i>nivea</i>		N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/1"	Adobe Road	Bay lands	Lake vilfe	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemle	Miscella neous
LIMNANTHACEAE	Limnanthes douglasii ssp. douglasii	Common meadowfoam	N	○	○	●	○	●	●	●	●	●
LIMNANTHACEAE	Limnanthes vincularis	Sebastopol meadowfoam	N	○	○	○	○	●	○	○	○	○
POLEMONIACEAE	Linanthus acicularis		N	○	○	○	○	○	○	○	○	○
POLEMONIACEAE	Linanthus ciliatus	Whisker brush	N	○	○	○	○	○	○	○	○	○
POLEMONIACEAE	Linanthus parviflorus		N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Linaria vulgaris	Butter-and-eggs	I	○	○	○	○	○	○	○	○	○
LINACEAE	Linum usitatissimum	Common flax	I	○	○	●	○	○	●	●	●	●
SAXIFRAGACEAE	Lithophragma cymbalaria	Mission starflower	N	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	Lithophragma heterophyllum	Woodland star	N	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	Lithophragma parviflorum		N	○	○	○	○	○	○	○	○	○
POACEAE	Lolium multiflorum	Italian ryegrass	I	●	●	●	●	●	●	●	●	●
POACEAE	Lolium perenne	Perennial ryegrass	I	○	○	○	○	○	○	○	○	○
APIACEAE	Lomatium caruifolium var. caruifolium		N	○	○	○	○	○	○	○	○	○
APIACEAE	Lomatium utriculatum	Common lomatium	N	●	○	●	○	○	○	○	○	○
CAPRIFOLIACEAE	Lonicera hispidula var. vacillans	Honeysuckle	N	●	○	●	○	●	●	●	○	○
CAPRIFOLIACEAE	Lonicera involucrata	Twinberry	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus angustissimus	Lotus	I	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus corniculatus	Birdfoot trefoil	I	●	●	●	○	●	●	●	●	●
FABACEAE	Lotus fomesissimus	Lotus	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus humistratus	Lotus	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus micranthus	Lotus	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus purshianus var. purshianus	Spanish clover	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lotus wrangelianus		N	○	○	○	○	○	○	○	○	○
ONAGRACEAE	Ludwigia peploides ssp. peploides	Marsh purslane	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus affinis		N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus albus var. albus	Silver lupine	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus arboreus	Yellow bush lupine	N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus argenteus var. heteranthus		N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus bicolor	Miniature lupine	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Americano	Stemle	Miscellaneous
FABACEAE	Lupinus formosus var. formosus	Summer lupine	N	●	○	●	○	○	○	●	○	○
FABACEAE	Lupinus latifolius var. latifolius	Broad-leaved lupine	N	●	○	●	○	○	○	○	○	○
FABACEAE	Lupinus microcarpus var. microcarpus	Chick lupine	N	○	○	○	○	●	○	○	○	○
FABACEAE	Lupinus microcarpus var. densiflorus		N	○	○	○	○	○	○	○	○	○
FABACEAE	Lupinus nanus	Douglas' annual lupine	N	○	○	●	○	○	○	○	●	○
FABACEAE	Lupinus pachytobus	Big pod lupine	N	○	○	○	○	●	○	○	○	○
FABACEAE	Lupinus succulentus	Arroyo lupine	N	○	○	●	○	○	○	○	○	○
JUNCACEAE	Luzula comosa		N	○	○	○	○	○	○	○	○	○
LYTHRACEAE	Lythrum hyssopifolium	Loosestrife	I	●	○	●	○	○	●	○	●	○
ASTERACEAE	Madia elegans ssp. elegans	Common madia	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	Madia gracilis	Slender tarweed	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	Madia sativa	Coast tarweed	N	○	○	●	○	○	○	○	○	○
ROSACEAE	Malus sylvestris	Apple	I	○	○	○	○	○	○	○	○	○
MALVACEAE	Malva neglecta	Common mallow	I	○	○	○	○	○	○	○	○	○
MALVACEAE	Malva nicaeensis	Bull mallow	I	○	○	○	○	○	○	○	○	○
MALVACEAE	Malva parviflora	Little mallow	I	○	○	○	○	○	○	○	○	○
MALVACEAE	Malvella leprosa	Alkali-mallow	N	○	○	○	○	○	○	○	○	○
CUCURBITACEAE	Marah fabaceus	California man-root	N	○	○	○	○	○	○	○	○	○
CUCURBITACEAE	Marah watsonii	Wild cucumber	N	○	○	○	○	○	○	○	○	○
LAMIACEAE	Marrubium vulgare	Horehound	I	○	○	○	○	○	○	○	○	○
FABACEAE	Medicago arabica	Spotted burclover	I	○	○	○	○	○	○	○	○	○
FABACEAE	Medicago polymorpha	California burclover	I	○	○	○	○	○	○	○	○	○
FABACEAE	Medicago sativa	Alfalfa	I	○	○	○	○	○	○	○	○	○
POACEAE	Melica californica	California melic	N	○	○	○	○	○	○	○	○	○
POACEAE	Melica geyeri	Melic	N	○	○	○	○	○	○	○	○	○
POACEAE	Melica imperfecta	Small-flowered melica	N	○	○	○	○	○	○	○	○	○
POACEAE	Melica torreyana	Melic	N	○	○	○	○	○	○	○	○	○
FABACEAE	Mellilotus indica	Sourclover	I	○	○	○	○	○	○	○	○	○
FABACEAE	Mellilotus officinalis	Yellow sweetclover	I	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
LAMIACEAE	Mentha pulegium	Pennyroyal	I	●	○	●	●	●	●	●	●	●
LAMIACEAE	Mentha suaveolens	Mint	I	○	○	●	○	●	○	●	○	○
SCROPHULARIACEAE	Minulus aurantiacus	Sticky monkey-flower	N	○	○	○	○	○	○	●	●	○
SCROPHULARIACEAE	Minulus guttatus	Common monkey-flower	N	●	○	●	○	●	●	●	●	○
LAMIACEAE	Monardella villosa ssp. villosa	Coyote-mint	N	○	○	○	○	○	○	●	○	○
PORTULACACEAE	Montia fontana	Water chickweed	N	○	○	●	○	○	○	○	○	○
BORAGINACEAE	Myosotis discolor	Forget-me-not	I	○	○	○	○	○	○	●	●	○
BORAGINACEAE	Myosotis verna	Forget-me-not	I	○	○	○	○	○	○	○	○	○
MYRICACEAE	Myrica californica	Wax myrtle	N	○	○	○	○	○	○	●	○	○
HYDROCHARITACEAE	Najas flexilis	Slender water-nymph	N	○	○	●	○	○	○	○	○	○
POACEAE	Nassella lepida	Foothill needle-grass	N	○	○	○	○	○	○	○	○	○
POACEAE	Nassella pulchra	Purple needle-grass	N	●	○	●	○	●	●	●	●	○
POLEMONIACEAE	Navaretia squarrosa	Skunkweed	N	○	○	●	○	○	○	●	●	●
HYDROPHYLLACEAE	Nemophila menziesii	Baby blue-eyes	N	○	○	●	○	●	○	○	○	○
HYDROPHYLLACEAE	Nemophila pedunculata	Meadow nemophila	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Oenleria carasiformis	Oso berry	N	○	○	○	○	○	○	○	○	○
APIACEAE	Oenanthe sarmentosa	Water parsley	N	○	○	○	○	○	○	○	○	○
OLEACEAE	Olea europaea	Olive	I	○	○	○	○	○	○	○	○	○
APIACEAE	Osmorhiza chilensis	Sweet-cicely	N	○	○	○	○	○	○	○	○	○
OXALIDACEAE	Oxalis corniculata	Creeping wood-sorrel	I	○	○	○	○	○	○	○	○	○
OXALIDACEAE	Oxalis pes-caprae	Bermuda buttercup	I	○	○	○	○	○	○	○	○	○
POACEAE	Parapholis incurva	Sickle grass	I	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Parentucella viscosa	Parentucella	I	○	○	●	○	○	○	○	○	○
POACEAE	Paspalum dilatatum	Dallis grass	I	●	○	○	○	○	○	○	○	○
PTERIDACEAE	Pellaea andromedifolia	Coffee fern	N	○	○	○	○	○	○	○	○	○
PTERIDACEAE	Pentagramma triangularis ssp. triangularis	Goldback fern	N	○	○	○	○	○	○	○	○	○
APIACEAE	Perideridia gairdneri		N	○	○	○	○	○	○	○	○	○
APIACEAE	Perideridia kelloggii	Kellogg's yampah	N	○	○	○	○	○	○	○	○	○
HYDROPHYLLACEAE	Phacelia californica	California phacelia	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	American	Stemle	Miscellaneous
HYDROPHYLLACEAE	Phacelia ramosissima var. ramosissima		N	○	○	○	○	○	○	○	●	○
HYDROPHYLLACEAE	Phacelia ramosissima var. latifolia		N	○	○	○	○	●	○	○	○	○
POACEAE	Phalaris aquatica	Harding grass	I	●	○	●	○	●	○	●	●	○
POACEAE	Phalaris canariensis	Canary grass	I	●	●	●	○	●	●	●	●	○
POACEAE	Phalaris lemmonii	Lemmon's canary grass	N	○	○	○	○	●	○	●	○	○
POACEAE	Phalaris minor	Harding grass	I	○	○	●	○	●	○	●	●	○
POACEAE	Phalaris paradoxa		I	○	○	●	○	○	○	○	○	○
VISCACEAE	Phoradendron macrophyllum	Big leaf mistletoe	N	○	○	●	○	○	○	○	○	○
VISCACEAE	Phoradendron villosum	Oak mistletoe	N	○	○	○	○	○	○	○	○	○
VERBENACEAE	Phyla nodiflora var. nodiflora	Garden lippia	N	○	○	●	○	○	●	○	○	○
ROSACEAE	Physocarpus capitatus	Ninebark	N	●	○	○	○	○	○	○	○	○
ASTERACEAE	Picris echinoides	Bristly ox-tongue	I	●	●	●	○	●	○	●	●	○
PINACEAE	Pinus attenuata	Knocone pine	N	○	○	○	●	○	○	○	○	○
PINACEAE	Pinus radiata	Monterey pine	N	○	○	○	○	○	○	○	○	○
PINACEAE	Pinus sabiniana	Gray pine	N	○	○	○	○	○	○	○	○	○
FABACEAE	Pisum sativum	Sugar pea	I	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Plagiobothrys glyptocarpus var. glyptocarpus	Popcornflower	N	○	○	●	○	●	○	○	○	○
BORAGINACEAE	Plagiobothrys nothofolius		N	○	○	○	○	○	○	○	○	○
BORAGINACEAE	Plagiobothrys stipitatus var. micranthus	Popcornflower	N	○	○	●	○	●	○	○	○	○
BORAGINACEAE	Plagiobothrys trachycarpus	Popcornflower	N	○	○	●	○	●	○	○	○	○
BORAGINACEAE	Plagiobothrys undulatus		N	○	○	○	○	○	○	○	○	○
PLANTAGINACEAE	Plantago erecta	Plantain	N	○	○	●	○	○	○	○	○	○
PLANTAGINACEAE	Plantago lanceolata	English plantain	I	●	○	●	○	○	○	○	○	○
PLANTAGINACEAE	Plantago major	Common plantain	I	●	○	●	○	○	○	○	○	○
PLATANACEAE	Platanus racemosa	Western sycamore	N	●	○	○	○	○	○	○	○	○
PAPAVERACEAE	Platystemon californicus	Cream cups	N	○	○	●	○	○	○	○	○	○
VALERIANACEAE	Plectritis brachystemon		N	○	○	○	○	○	○	○	○	○
POACEAE	Pleuropogon californicus	Semaphore grass	N	○	○	○	○	○	○	○	○	○
POACEAE	Poa annua	Annual bluegrass	I	●	○	○	○	○	○	○	○	○

Family	Species	Common Name	Ni" Road	Adobe Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebast apol	Ameri cano	Stemle	Miscella neous
POACEAE	Poa bulbosa	Bulbous bluegrass	I	○	○	○	○	○	○	○	○
POACEAE	Poa howellii	Bluegrass	N	○	○	○	○	○	●	○	○
POACEAE	Poa pratensis ssp. pratensis	Kentucky bluegrass	I	○	○	○	○	○	○	●	○
POACEAE	Poa secunda	Bluegrass	N	○	○	○	○	○	○	○	○
POLYGONACEAE	Polygonum arenastrum	Common knotweed	I	●	●	●	●	●	●	●	●
POLYGONACEAE	Polygonum hydropiperoides	Waterpepper	N	○	○	○	○	○	○	○	○
POLYPODIACEAE	Polypodium californicum	California polypody	N	○	○	○	○	○	○	○	○
POACEAE	Polypogon interruptus	Ditch beard grass	I	○	○	○	○	○	○	○	○
POACEAE	Polypogon monspeliensis	Annual beard grass	I	○	○	○	○	○	○	○	○
DRYOPTERIDACEAE	Polystichum munitum	Western sword fern	N	○	○	○	○	○	○	○	○
SALICACEAE	Populus fremontii ssp. fremontii	Fremont cottonwood	N	○	○	○	○	○	○	○	○
SALICACEAE	Populus nigra	Lombardy poplar	I	○	○	○	○	○	○	○	○
PORTULACACEAE	Portulaca oleracea	Common purslane	I	○	○	○	○	○	○	○	○
POTAMOGETONACEAE	Potamogeton natans	Floating-leaved pondweed	N	○	○	○	○	○	○	○	○
POTAMOGETONACEAE	Potamogeton nodosus	Long-leaved pondweed	N	○	○	○	○	○	○	○	○
POTAMOGETONACEAE	Potamogeton pusillus	Small pondweed	N	○	○	○	○	○	○	○	○
ROSACEAE	Potentilla anserina ssp. pacifica	Pacific cinquefoil	N	○	○	○	○	○	○	○	○
ROSACEAE	Potentilla glandulosa ssp. glandulosa	Sticky cinquefoil	N	○	○	○	○	○	○	○	○
LAMIACEAE	Prunella vulgaris var. lanceolata	Self-heal	N	○	○	○	○	○	○	○	○
ROSACEAE	Prunus emarginata	Bitter cherry	N	○	○	○	○	○	○	○	○
ROSACEAE	Prunus sp.	Escaped ornamental	I	○	○	○	○	○	○	○	○
ROSACEAE	Prunus subcordata		N	○	○	○	○	○	○	○	○
PINACEAE	Pseudotsuga menziesii var. menziesii	Douglas-fir	N	○	○	○	○	○	○	○	○
ASTERACEAE	Psilocarphus oregonus	Oregon woolly-heads	N	○	○	○	○	○	○	○	○
ASTERACEAE	Psilocarphus tenellus ssp. tenellus	Woolly-heads	N	○	○	○	○	○	○	○	○
DENNSTAEDTIACEAE	Pteridium aquilinum var. pubescens	Bracken fern	N	○	○	○	○	○	○	○	○
FAGACEAE	Quercus agrifolia var. agrifolia	Coast live oak	N	○	○	○	○	○	○	○	○
FAGACEAE	Quercus garryana var. garryana	Oregon oak	N	○	○	○	○	○	○	○	○
FAGACEAE	Quercus kelloggii	California black oak	N	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road lands	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
FAGACEAE	Quercus lobata	Valley oak	N	●	○	○	○	○	●	○	○	○
FAGACEAE	Quercus wislizenii var. wislizenii	Interior live oak	N	○	○	○	○	○	○	○	●	○
RANUNCULACEAE	Ranunculus aquatilis var. capillaceus		N	●	○	○	○	○	○	●	○	○
RANUNCULACEAE	Ranunculus aquatilis var. subrigidus	Water buttercup	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus californicus	California buttercup	N	●	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus lobbii	Lobb's aquatic buttercup	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus muricatus	Prickle-fruited buttercup	I	●	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus occidentalis	Western buttercup	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus orthorhynchus var. orthorhynchus		N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus orthorhynchus var. bloomeri	Buttercup	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	Ranunculus pusillus		N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Raphanus raphanistrum	Jointed charlock	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Raphanus sativus	Radish	I	●	○	○	○	○	○	○	○	○
RHAMNACEAE	Rhamnus californica	California coffeeberry	N	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes californicum var. californicum	Hillside gooseberry	N	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes menziesii	Canyon gooseberry	N	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes sanguineum	Red flowering currant	N	○	○	○	○	○	○	○	○	○
GROSSULARIACEAE	Ribes victoris	Victor's gooseberry	N	○	○	○	○	○	○	○	○	○
FABACEAE	Robinia pseudoacacia	Black locust	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Rorippa curvisiliqua	Water cress	N	○	○	○	○	○	○	○	○	○
BRASSICACEAE	Rorippa nasturtium-aquaticum	Water cress	N	●	○	○	○	○	○	○	○	○
ROSACEAE	Rosa californica	California rose	N	●	○	○	○	○	○	○	○	○
ROSACEAE	Rosa carolina	Dog rose	I	○	○	○	○	○	○	○	○	○
ROSACEAE	Rosa eglanteria	Sweet-brier	I	●	○	○	○	○	○	○	○	○
ROSACEAE	Rosa gymnocarpa	Wood rose	N	●	○	○	○	○	○	○	○	○
ROSACEAE	Rosa sp.	Rose	U	○	○	○	○	○	○	○	○	○
ROSACEAE	Rubus discolor	Himalayan blackberry	I	●	○	○	○	○	○	○	○	○
ROSACEAE	Rubus parviflorus	Thimbleberry	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Rubus ursinus	California blackberry	N	●	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
POLYGONACEAE	Rumex acetosella	Sheep sorrel	I	●	○	●	○	●	●	●	●	●
POLYGONACEAE	Rumex conglomeratus	Clustered dock	I	●	●	●	○	●	●	●	●	●
POLYGONACEAE	Rumex crispus	Curtly dock	I	●	●	●	●	●	●	●	●	●
POLYGONACEAE	Rumex pulcher	Fiddle dock	I	●	○	●	●	●	●	●	●	●
POLYGONACEAE	Rumex salicifolius	Willow dock	N	○	○	●	○	○	○	○	○	○
POTAMOGETONACEAE	Ruppia cirrhosa	Ditch grass	N	○	○	○	○	○	○	○	○	○
CHENOPODIACEAE	Salicornia virginica	Pickleweed	N	○	○	●	○	○	○	○	○	○
SALICACEAE	Salix exigua	Narrow-leaved willow	N	○	○	●	○	●	●	●	●	○
SALICACEAE	Salix gooddingii	Goodding's black willow	N	○	○	○	○	○	○	○	○	○
SALICACEAE	Salix laevigata	Red willow	N	●	○	●	○	●	○	○	○	○
SALICACEAE	Salix lasiolepis	Arroyo willow	N	●	○	●	○	●	○	○	○	○
SALICACEAE	Salix lucida ssp. lasiandra	Shining willow	N	●	○	●	○	●	○	○	○	○
CAPRIFOLIACEAE	Sambucus mexicana	Blue elderberry	N	○	○	○	○	○	○	○	○	○
ROSACEAE	Sanguisorba minor ssp. muricata	Garden burnet	I	○	○	○	○	○	○	○	○	○
APIACEAE	Sanicula arctopoides	Footsteps of spring	N	○	○	●	○	○	○	○	○	○
APIACEAE	Sanicula bipinnatifida	Purple sanicle	N	●	○	●	○	●	○	○	○	○
APIACEAE	Sanicula crassicaulis	Pacific sanicle	N	●	○	●	○	●	○	○	○	○
LAMIACEAE	Satureja douglasii	Yerba buena	N	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	Saxifraga californica	California saxifrage	N	●	○	●	○	○	○	○	○	○
APIACEAE	Scandix pecten-veneris	Venus' needle	I	●	○	●	○	●	○	○	○	○
CYPERACEAE	Scirpus acutus var. occidentalis	Tule	N	○	○	●	○	○	○	○	○	○
CYPERACEAE	Scirpus americanus	Bulrush	N	○	○	○	○	○	○	○	○	○
CYPERACEAE	Scirpus californicus	California bulrush	N	○	○	○	○	○	○	○	○	○
CYPERACEAE	Scirpus microcarpus	Bulrush	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Scrophularia californica ssp. californica	California figwort	N	●	○	●	○	○	○	○	○	○
CRASSULACEAE	Sedum spathulifolium		N	○	○	○	○	○	○	○	○	○
ASTERACEAE	Senecio milkianoides	German-ivy	I	●	○	●	○	○	○	○	○	○
ASTERACEAE	Senecio vulgaris	Groundsel	I	●	○	●	○	○	○	○	○	○
TAXODIACEAE	Sequoia sempervirens	Coast redwood	N	●	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Peratuma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemple	Miscella neous
RUBIACEAE	<i>Sherardia arvensis</i>	Field madder	I	○	○	○	○	●	○	●	●	○
MALVACEAE	<i>Sidalcea malvaeflora</i> ssp. <i>laciniata</i>	Checker mallow	N	○	○	●	○	○	○	●	●	○
CARYOPHYLLACEAE	<i>Silene gallica</i>	Windmill pinks	I	○	○	○	○	○	○	○	○	●
ASTERACEAE	<i>Silybum marianum</i>	Milk thistle	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Sinapis arvensis</i>	Charlock	I	○	○	○	○	○	○	○	○	○
BRASSICACEAE	<i>Sisymbrium officinale</i>	Hedge mustard	I	○	○	○	○	○	○	○	○	○
IRIDACEAE	<i>Sisyrinchium bellum</i>	Blue-eyed-grass	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Smilacina racemosa</i>	False Solomon's seal	N	○	○	○	○	○	○	○	○	○
LILIACEAE	<i>Smilacna stellata</i>		N	○	○	○	○	○	○	○	○	○
SOLANACEAE	<i>Solanum americanum</i>	Nightshade	N	○	○	○	○	○	○	○	○	○
SOLANACEAE	<i>Solanum douglasii</i>	Douglas' nightshade	N	○	○	○	○	○	○	○	○	○
SOLANACEAE	<i>Solanum nigrum</i>	Black nightshade	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Solidago californica</i>	California goldenrod	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Sonchus asper</i> ssp. <i>asper</i>	Prickly sow thistle	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Sonchus oleraceus</i>	Common sow thistle	I	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Spartium junceum</i>	Spanish broom	I	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	<i>Spergula arvensis</i> ssp. <i>arvensis</i>	Starwort	I	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	<i>Spergularia rubra</i>	Sand-spurrey	I	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	<i>Spergularia villosa</i>	Sand spurrey	I	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Stachys ajugoides</i> var. <i>ajugoides</i>	Bugle hedge nettle	N	○	○	○	○	○	○	○	○	○
LAMIACEAE	<i>Stachys ajugoides</i> var. <i>rigida</i>	Rigid hedge nettle	N	○	○	○	○	○	○	○	○	○
CARYOPHYLLACEAE	<i>Stellaria media</i>	Common chickweed	I	○	○	○	○	○	○	○	○	○
CAPRIFOLIACEAE	<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	Snowberry	N	○	○	○	○	○	○	○	○	○
CAPRIFOLIACEAE	<i>Symphoricarpos mollis</i>	Creeping snowberry	N	○	○	○	○	○	○	○	○	○
POACEAE	<i>Taeniatherum caput-medusae</i>	Medusa head	I	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Taraxacum officinale</i>	Dandelion	I	○	○	○	○	○	○	○	○	○
SAXIFRAGACEAE	<i>Tellima grandiflora</i>	Fringe cups	N	○	○	○	○	○	○	○	○	○
RANUNCULACEAE	<i>Thalictrum</i> sp.	Meadow-rue	N	○	○	○	○	○	○	○	○	○
FABACEAE	<i>Thermopsis macrophylla</i> var. <i>macrophylla</i>	False lupine	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/I*	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	American	Stemle	Miscellaneous
APIACEAE	Torilis arvensis	Japanese hedge-parsley	I	○	○	●	○	○	●	●	●	○
ANACARDIACEAE	Toxicodendron diversilobum	Western poison oak	N	●	○	●	○	●	●	●	●	○
ASTERACEAE	Tragopogon portifolius	Oyster plant	I	●	○	●	○	●	○	○	○	○
ZYGOPHYLLACEAE	Tribulus terrestris	Puncture vine	I	○	○	○	○	○	○	○	○	○
PRIMULACEAE	Trientalis latifolia	Starflower	N	○	○	○	○	○	○	○	○	○
FABACEAE	Trifolium bifidum	Clover	N	○	○	○	○	○	○	○	○	○
FABACEAE	Trifolium campestre	Hop clover	I	○	○	●	○	○	○	○	○	○
FABACEAE	Trifolium depauperatum var. truncatum	Dwarf sack clover	N	○	○	●	○	●	○	○	○	○
FABACEAE	Trifolium dubium	Little hop clover	I	●	○	●	○	●	○	○	○	○
FABACEAE	Trifolium fragiferum	Strawberry clover	I	●	○	●	○	○	○	○	○	○
FABACEAE	Trifolium fucatum	Sour clover	N	○	○	●	○	○	○	○	○	○
FABACEAE	Trifolium hirtum	Rose clover	I	○	○	●	○	○	○	○	○	○
FABACEAE	Trifolium oliganthum		N	○	○	●	○	○	○	○	○	○
FABACEAE	Trifolium pratense	Red clover	I	○	○	○	○	○	○	○	○	○
FABACEAE	Trifolium repens	White clover	I	●	○	●	○	○	○	○	○	○
FABACEAE	Trifolium subterraneum	Subterranean clover	I	●	○	●	○	○	○	○	○	○
FABACEAE	Trifolium variegatum	White-tipped clover	N	○	○	○	○	○	○	○	○	○
FABACEAE	Trifolium wilsonovii	Clover	N	●	○	●	○	○	○	○	○	○
FABACEAE	Trifolium wormskoldii	Clover	N	○	○	○	○	○	○	○	○	○
LILIACEAE	Trillium albidum		N	○	○	○	○	○	○	○	○	○
LILIACEAE	Trillium chloropetalum	Giant trillium	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Triphysaria eriantha ssp. rosea	Butter-and-eggs	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Triphysaria versicolor ssp. faucibarbat	Smooth owl's clover	N	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	Triphysaria versicolor ssp. versicolor	Triphysaria	N	○	○	○	○	○	○	○	○	○
LILIACEAE	Triteleia hyacinthina	White brodiaea	N	○	○	○	○	○	○	○	○	○
LILIACEAE	Triteleia laxa	Iturbide's spear	N	○	○	○	○	○	○	○	○	○
LILIACEAE	Triteleia peduncularis	Long-rayed brodiaea	N	○	○	○	○	○	○	○	○	○
POACEAE	Triticum aestivum	Wheat	I	○	○	○	○	○	○	○	○	○
TYPHACEAE	Typha angustifolia	Narrow-leaved cattail	N	○	○	○	○	○	○	○	○	○

Family	Species	Common Name	N/P	Adobe Road	Bay lands	Lake ville	North Petaluma Valley	East of Rohnert Park	Sebastapol	Ameri cano	Stemle	Miscellaneus
TYPHACEAE	<i>Typha domingensis</i>	Southern cattail	N	○	○	●	○	○	○	●	○	○
TYPHACEAE	<i>Typha latifolia</i>	Broad-leaved cattail	N	○	●	●	○	●	●	●	●	○
FABACEAE	<i>Ulex europaea</i>	Gorse	I	○	○	○	○	○	○	○	○	○
LAURACEAE	<i>Umbellularia californica</i>	California bay	N	●	○	●	○	●	●	●	●	○
URTICACEAE	<i>Urtica dioica</i> ssp. <i>holosericea</i>	Hoary nettle	N	●	○	●	○	●	○	○	●	○
URTICACEAE	<i>Urtica urens</i>	Dwarf nettle	I	○	○	●	●	●	○	○	●	○
VERBENACEAE	<i>Verbena lasiostachys</i> var. <i>scabrifolia</i>	Western verbena	N	●	○	○	○	○	○	○	○	○
VERBENACEAE	<i>Verbena scabra</i>	Rough verbena	N	●	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	<i>Veronica americana</i>	American brooklime	N	●	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	<i>Veronica anagallis-aquatica</i>	Water speedwell	I	○	○	○	○	○	○	○	○	○
SCROPHULARIACEAE	<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	Purslane speedwell	N	○	○	●	○	○	○	○	○	○
FABACEAE	<i>Vicia benghalensis</i>	Purple vetch	I	○	○	●	○	○	○	○	○	○
FABACEAE	<i>Vicia sativa</i> ssp. <i>nigra</i>	Common vetch	I	●	○	●	○	○	○	○	○	○
FABACEAE	<i>Vicia sativa</i> ssp. <i>sativa</i>	Common vetch	I	○	○	●	○	○	○	○	○	○
FABACEAE	<i>Vicia villosa</i> ssp. <i>villosa</i>	Winter vetch	I	○	○	●	○	○	○	○	○	○
APOCYNACEAE	<i>Vinca major</i>	Greater periwinkle	I	○	○	○	○	○	○	○	○	○
VIOLACEAE	<i>Viola pedunculata</i>	Johnny-jump-up	N	○	○	●	○	○	○	○	○	○
VITACEAE	<i>Vitis californica</i>	California wild grape	N	○	○	●	○	○	○	○	○	○
POACEAE	<i>Vulpia bromoides</i>	Vulpia	I	○	○	●	○	○	○	○	○	○
POACEAE	<i>Vulpia myuros</i>	Vulpia	I	○	○	●	○	○	○	○	○	○
BLECHNACEAE	<i>Woodwardia fimbriata</i>	Giant chain fern	N	●	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Wyethia angustifolia</i>	Narrowleaf mule ears	N	○	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Wyethia glabra</i>	Green mule ears	N	○	○	○	○	○	○	○	○	○
ASTERACEAE	<i>Xanthium spinosum</i>	Spiny cocklebur	N	●	○	●	○	○	○	○	○	○
ASTERACEAE	<i>Xanthium strumarium</i>	Cocklebur	N	●	○	●	○	○	○	○	○	○
LILIACEAE	<i>Zigadenus fremontii</i>	Death camas	N	○	○	●	○	○	○	○	○	○

*N = Native I = Introduced (Non-native) U = Identifiable only to genus.

Open circle = taxon not present; filled circle = taxon present

APPENDIX C - WASTEWATER TRANSMISSION PIPELINE BOTANICAL RESOURCES

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APPENDICES

Appendix A. Plant species list for wastewater transmission line component .

1. INTRODUCTION

The purpose of this technical memorandum is to provide information on existing botanical resources, special-status plant species, sensitive natural communities, and protected tree resources that occur or may occur within the proposed wastewater transmission pipeline corridors (pipeline corridors; pipeline component). Populations of special-status plant species and sensitive natural communities were mapped within the pipeline corridors. Only sensitive plant communities were mapped. These data provide a basis for the assessment of impacts. A complete project description and project alternatives are presented in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS (HBA, 1996b).

For this technical memorandum, pipeline corridors constitute the pipeline component 'study area' and are located in all of the five geographic study areas evaluated for this EIS/EIS (Geysers, Santa Rosa Plain/ Russian River, Sebastopol, South County, and West County). Pipeline corridors associated with different project alternatives are described in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS (HBA, 1996b). The subalternatives mentioned in this technical memorandum are also described in the EIR/EIS (HBA, 1996b). For example, pipeline corridors associated with Alternative 4 (as defined in HBA, 1996b) are located in the Santa Rosa Plain/ Russian River and Geysers geographic area and connect the existing Laguna Wastewater Treatment Plant with the Geysers recharge area. Pipelines associated with other alternatives connect proposed storage reservoirs with agricultural irrigation components. Pipeline corridors are approximately 30 feet wide measured from the road centerline toward the shoulder.

2. SETTING: PROJECT AREA DESCRIPTIONS

The Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area, components of which are located in Sonoma and Marin counties, is divided into five relatively distinct geographic areas. These are the Geysers, Santa Rosa Plain/ Russian River, Sebastopol, South County, and West County geographic areas (Figure 4.1-1a-1c in HBA, 1996a).

GEYSERS STUDY AREA

The Geysers study area (also referred to as the Geysers geographical area) includes the Geysers Steamfield and the areas surrounding the wastewater pipeline corridors that lead up to it from the vicinity of Santa Rosa, including Highway 128, Chalk Hill Road, and Pine Flat Road. A complete description of the Geysers study area is presented in the EIR/EIS (HBA, 1996b). The pipeline corridors within the Geysers study area cross several creeks including Brooks Creek, Sausal Creek, Maacama Creek, and Franz Creek. The northern portion of this study area is located at about the 1,600 foot elevation in the Mayacamas Mountains of Sonoma County, and includes the Geysers Known Geothermal Resource Area (KGRA). The geothermal steamfield within the KGRA includes the watersheds of Big Sulphur, Putah, and Kelsey creeks. The KGRA supports annual and native grasslands, chaparral, oak woodlands, mixed evergreen forest, and riparian woodland communities. The pipeline component terminates at the boundary of the KGRA, near the end of Pine Flat Road. Additional information on the Geysers geographical area is presented in Sycamore Environmental (1996b).

SANTA ROSA PLAIN/ RUSSIAN RIVER STUDY AREA

The Santa Rosa Plain/ Russian River study area is located in the Santa Rosa Plain, west of the City of Santa Rosa. The Laguna de Santa Rosa and Russian River are prominent habitat features in this study area. Annual grassland, riparian woodland, seasonal wetland, and vernal pool communities occur in the Santa Rosa Plains. The vernal pools in the Santa Rosa Plain represent the best remaining examples of this habitat type in the project study area.

SEBASTOPOL STUDY AREA

The Sebastopol study area is located west of the town of Sebastopol in Sonoma County. The Atascadero, Green Valley, and Purrington creeks are the major creeks that flow through this study area. Several unnamed creeks, channels, and drainages also occur in the study area. The Sebastopol study area consists primarily of agricultural communities

such as row crops, orchards, and vineyards. Orchard crops include apple, crabapple, and peach. Unirrigated annual grasslands, which also include seasonal wetland, drainage, and riparian communities, are grazed by livestock.

SOUTH COUNTY STUDY AREA

The South County study area is located in the watershed of the Petaluma River along the western foothills of the Sonoma Mountains north of San Pablo Bay in Sonoma County. The foothills of the Sonoma Mountains support a patchwork of annual grassland and coast live oak woodland communities. The numerous creeks in the South County study area, including Copeland, Crane, Five, Hinebaugh, Lichau, Lynch, and Willow Brook, flow into the Petaluma River from the foothills east of the Petaluma River. Mixed riparian woodlands are found along creeks and drainages of the foothills. The South County study area supports a large agricultural community including pasture for livestock, dry-farmed oat hay, vineyards, and irrigated crops.

WEST COUNTY STUDY AREA

The West County study area includes portions of the Americano Creek and Stemple Creek watersheds in Sonoma and Marin counties. The topography of the West County area varies from rolling hills to steep, incised valleys. The western portion of this study area includes the upper reaches of the Estero Americano. The gently sloping, wind-swept hills of the West County study area support treeless annual grasslands. Stands of coast live oak/ interior live woodland and oak-bay-madrone woodland occur within steep valleys. The perennial and intermittent streams and drainages in the West County study area support mixed and willow riparian vegetation along their banks. Many of the valleys and low lying areas support freshwater marshes, seasonal wetlands, and vernal pools. Hillsides with shallow rocky soils support patches of northern coastal scrub. The West County study area is extensively cultivated. Land uses include pasture for livestock and irrigated crops.

3. METHODS

LITERATURE REVIEW AND CONSULTATIONS

Information on the biology, distribution, legal status, taxonomy, and other aspects of the special-status plant species was obtained from documents on file in the library of Sycamore Environmental Consultants, Inc. (Sycamore Environmental). Standard references used for the taxonomy of plants and plant community descriptions included Abrams (1923-1960); Barbour and Major (1977); Hickman, ed. (1993); Holland (1986); Mason (1957); Munz (1959); and Skinner and Pavlik (1994).

A computerized search of the California Natural Diversity Data Base (CNDDDB/ RareFind, 1 September 1995) was conducted for the Camp Meeker, Cotati, Glen Ellen, Guerneville, Healdsburg, Jintown, Novato, Petaluma, Petaluma Point, Petaluma River, Point Reyes NE, Santa Rosa, Sears Point, Sebastopol, The Geysers, Two Rock, and Valley Ford 7.5-minute United States Geological Survey (USGS) topographic quadrangles to determine if there were any known occurrences of state- or federal-listed species recorded from the pipeline study area. These reports are on file at the office of Harland Bartholomew & Associates, Inc. (HBA).

In addition to the CNDDDB/RareFind report, the following lists prepared by the California Department of Fish and Game (CDFG), Natural Diversity Data Base, were reviewed:

- *Special Plants List* (CDFG, January 1996); and
- *Endangered, Threatened, and Rare Plants of California* (CDFG, January 1996).

Two letters, one in 1994 and the other in 1995, were sent by HBA to the U.S. Fish and Wildlife Service (USFWS), Ecological Services, Sacramento Field Office, requesting file data on special-status plant species that could occur in the project study area. The response letters are on file at the office of HBA.

Reference materials provided by HBA and Parsons Engineering Science, Inc. (PES) included:

- Blue line aerial photographs of the project study area (1" = 500' ± 5%, June 1990); and
- Blue line topographic maps with proposed project facilities prepared by PES (1" = 200' and 1" = 6000').

Consultations were conducted on one or more occasions with Caitlin Bean, CDFG Region 3; Betty Guggolz, Milo-Baker Chapter of the California Native Plant Society (CNPS); and Dr. Charles Quibell, Professor of Botany, Sonoma State University.

Existing policies regarding natural resources were also reviewed, including the Sonoma County Tree Ordinance (No. 4014, 13 June 1989).

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES EVALUATED

Special-Status Plant Species and Sensitive Natural Communities

A comprehensive list of special-status plants was compiled from the species listed in the USFWS 1995 letter and from the species that appeared on the CNDDDB/RareFind report. A pre-project meeting on 24 January 1994 was attended by the City, USFWS, CDFG, Sycamore Environmental, and HBA. Caitlin Bean of CDFG recommended that all CNPS List 4 species potentially occurring in the project study area be included in the species evaluated for this project. In addition, Ms. Bean requested that several other species of concern to CDFG also be included for evaluation in the EIR/EIS that were not currently recognized as a special-status plant species.

An initial list of special-status plant species was compiled in 1994 and was updated as new and revised listings became available from CDFG and the USFWS. From these data, a list was compiled (Table 1, *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum*) of 182 special-status plant species that needed to be surveyed and evaluated in the EIR/EIS. A brief discussion of each special-status plant species is presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Descriptions of sensitive natural communities are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d). The list of sensitive natural communities was derived from the CNDDDB/RareFind report and from site visits.

CNPS

Sycamore Environmental provided Betty Guggolz with Project Overview maps (1" = 6000') that presented overviews of all the project alternatives. Ms. Guggolz mapped locations of Sonoma County sensitive plant records. Her personal list of sensitive plant records was compiled from plant lists prepared by historical and contemporary botanists and included CNPS-listed plants, and state- and federal-listed endangered, threatened, and

rare species. Sycamore Environmental reviewed the locations of sensitive plant records mapped by Betty Guggolz.

Species records mapped by Ms. Guggolz located within a half mile of pipeline corridors are discussed in Section 1.D. Other species records mapped by Ms. Guggolz in the project study area are discussed in the *Reservoir, Agricultural Irrigation, and Geysers* technical memoranda (Sycamore Environmental, 1996a, b, and c). Sycamore Environmental incorporated her location data into the summaries of known location data of special-status plant species to determine the total special-status plant species populations within the project study area (Section 4).

Protected Tree Resources

The Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh over nine inches (diameter breast height, defined as 4.5 feet above ground level) of the following species are protected: big-leaf maple (*Acer macrophyllum*), blue oak (*Q. douglasii*), California black oak (*Quercus kelloggii*), coast live oak (*Q. agrifolia*), coast redwood (*Sequoia sempervirens*), interior live oak (*Q. wislizenii*), Pacific madrone (*Arbutus menziesii*), oracle oak (*Q. morehus*), Oregon oak (*Q. garryana*), valley oak (*Q. lobata*), and California bay (*Umbellularia californica*). The ordinance also protects hybrids of these species.

FIELD SURVEYS

Botanists conducted field surveys to identify locations of special-status plant species and sensitive natural communities, to map plant communities, and to assist in the collection of data necessary for California Wildlife Habitat Relationships System (CWHR) analyses. Surveys of pipeline segments were conducted from April through October 1995 by Theresa Fortner Ward, Susan Holve-Hensill, Nancy Coulson, and/or Ellen Piazza.

Field surveys were conducted in two steps. The first step consisted of conducting botanical surveys within highway and road rights-of way adjacent to proposed pipeline corridors. At the time these surveys were conducted, the pipeline alignments were not finalized. Therefore, a comprehensive plant species list was compiled for both sides of the road during these surveys. The second step involved conducting additional surveys to map potential special-status plant species habitat and sensitive natural communities along all pipeline corridors. By the time the additional surveys were conducted, the pipeline alignments though each of the project study areas had been finalized. Thus, botanists mapped habitat only on the side of the road that pipelines were proposed to be constructed. Pipeline corridors located on private property, for which access was not obtained, were evaluated via off-site surveys.

Botanical Surveys

Prior to conducting botanical surveys, botanists compiled a field notebook that included key characteristics, descriptions, habitat notes, and illustrations for each of 182 special-status species that could potentially occur in the project study area. CNDDB/ RareFind overlays were obtained from CDFG for the Camp Meeker, Cotati, Glen Ellen, Guerneville, Healdsburg, Jintown, Novato, Petaluma, Petaluma Point, Petaluma River, Point Reyes NE, Santa Rosa, Sears Point, Sebastopol, The Geysers, Two Rock, and Valley Ford USGS quadrangles. These quadrangles cover the entire Geysers, Santa Rosa Plain/ Russian River, Sebastopol, South County, and West County study areas. All CNDDB/RareFind occurrences for each quad were displayed on the overlays. The overlays were used to identify known populations of special-status plants occurring on or near the proposed pipeline corridors.

Plants that could not be identified in the field were collected for later identification. Voucher specimens were collected for most native species observed in the field, a process recommended by the California Botanical Society (Ferren *et al.*, 1995). Voucher specimens were also collected for many non-native species. These voucher specimens were processed in accordance with standard herbarium techniques (Lawrence, 1951; Radford *et al.*, 1974) and are maintained for reference in the Herbarium located at the office of Sycamore Environmental, Sacramento, CA. Duplicate specimens will be donated to Sonoma State University and the University of California, Berkeley.

During the pre-project meeting on 24 January 1994, Bill Cox of CDFG requested that separate plant species lists be prepared for each project component, to which the City agreed. Therefore, a plant species list was compiled for all species identified within the pipeline component (Appendix A). Records of all species found in the project study area were managed and analyzed with Microsoft Access®, a relational database.

Plant Community Mapping

Only sensitive natural communities were mapped for the pipeline component. Sensitive natural communities occurring along proposed pipeline corridors were mapped as a point with an associated number onto 1" = 1000' scale maps. The width and length of each sensitive natural community were recorded in the field to determine the area of impact.

Names of plant communities were based on community descriptions by Holland (1986) and Shuford and Timossi (1989). A comparison of the community descriptions used by Sycamore Environmental for the Santa Rosa EIR/EIS (HBA, 1996b) and the descriptions used by Holland (1986) and Shuford and Timossi (1989) are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

FLORISTIC SUMMARY

Botanical surveys within the pipeline component study area consisted of evaluating narrow, linear corridors. A floristic analysis, such as Sycamore Environmental performed for the *Agricultural Irrigation* and *Reservoir* technical memoranda (Sycamore Environmental, 1996a, c), was not conducted for the pipeline component. This is due to the fact that the pipeline component involved an evaluation of approximately 176 miles of narrow linear features which do not lend themselves to meaningful floristic comparisons. A combined species lists for all pipeline component segments is presented in Appendix A.

CALCULATION OF AREA OF IMPACT

Acreages of sensitive natural communities were determined by HBA. Acreages were calculated by multiplying the length of sensitive natural communities measured in the field along road segments, by a standard width of 30 feet measured from the centerline. This method of calculation results in a conservative impact estimate because the 30 foot width also includes 10-15 feet of road surface, and presumes that pipeline construction would affect the entire 30 foot width. However, the intent is to construct the pipelines in one lane of the road and/or in the shoulder (HBA, 1996b).

Impacts to riparian vegetation will be avoided at 36 streams because these streams will be crossed by tunneling beneath them (bore and jack; HBA, 1996b). Because most pipeline segments will be constructed in roads and/or shoulders, impacts to adjacent vegetation will largely be avoided. However, riparian vegetation, if present, could be affected at streams that are crossed by trenching.

4. RESULTS

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES

Historic Records

Historical information on the potential presence of special-status plant species in the pipeline study area was derived from CNDDDB/RareFind records (1 September 1995), and through consultations with the USFWS and Betty Guggolz. Historic records for the pipeline study area are discussed below according to the geographical area in which they occur.

Geysers

The Geysers study area, which includes the well field area, is located on the Healdsburg, Jintown, and The Geysers 7.5 minute USGS quadrangles. There were 32 records for 11 special-status plant species on the CNDDDB/RareFind report for the entire Geysers study area (Table 4-1). Records for the following three special-status species occur along proposed pipeline corridors within the Geysers study area. (The location of these records is along existing steamfield recharge pipeline routes):

- Mt. St. Helena morning glory (*Calystegia collina* ssp. *oxyphylla*);
- Socrates Mine jewel-flower (*Streptanthus brachiatus* ssp. *brachiatus*); and
- Burke's goldfields (*Lasthenia burkei*).

The only sensitive natural community reported on the CNDDDB/RareFind report for the Geyser study area quadrangles was Northern hardpan vernal pool. Descriptions of sensitive natural communities occurring in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Betty Guggolz (Personal communication, 1995) mapped locations of four special-status plant records along pipeline corridors in the Geysers study area as follows:

- Three records of Mt. St. Helena morning glory (*Calystegia collina* ssp. *oxyphylla*) occur along Pine Flat Road; and
- One record of Socrates Mine jewel-flower (*Streptanthus brachiatus* ssp. *brachiatus*) occurs along Pine Flat Road.

Other records of rare plants mapped by Ms. Guggolz in the Geysers study area are discussed in the *Geysers Technical Memorandum* (Sycamore Environmental, 1996b).

Santa Rosa Plain/ Russian River

The Santa Rosa Plain/ Russian River study area is located on the Cotati, Sebastopol, Santa Rosa, and Two Rock 7.5 minute USGS quadrangles. There were 126 records for 21 plant species on the CNDDDB/RareFind report for the Santa Rosa Plain/ Russian River study area (Table 4-2.). However, none of the records occur within pipeline corridors in the Santa Rosa Plain/ Russian River study area.

Four sensitive natural communities were reported on the CNDDDB/RareFind report for the Santa Rosa Plain/ Russian River quadrangles including coastal and valley freshwater marsh, northern hardpan vernal pool, northern vernal pool, and valley needle grassland. Descriptions of sensitive natural communities occurring in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Table 4-1.

CNDDDB/RareFind records of special-status plant species in the Geysers study area quadrangles.

	Species name	USGS Quadrangle			
		The Geysers	Healdsburg	Jimtown	Total Records
1	<i>Calystegia collina</i> ssp. <i>oxyphylla</i>			1	1
2	<i>Dichanthelium lanuginosum</i> var. <i>thermale</i>	6			6
3	<i>Downingia pusilla</i>		3		3
4	<i>Eriastrum brandegeae</i>	1			1
5	<i>Eriogonum nervulosum</i>	1			1
6	<i>Hesperolinon adenophyllum</i>	1			1
7	<i>Lasthenia burkei</i>		7	1	8
8	<i>Layia septentrionalis</i>	1			1
9	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>		3		3
10	<i>Navarretia leucocephala</i> ssp. <i>pliantha</i>		1		1
11	<i>Streptanthus brachiatus</i> ssp. <i>brachiatus</i>	6			6
	Total records	16	14	2	32
	Sensitive natural communities				
	Northern hardpan vernal pool		1		

Table 4-2.

CNDDDB/RareFind records of special-status plant species in the Santa Rosa Plain/ Russian River study area quadrangles.

	Species name	USGS Quadrangle				
		Cotati	Santa Rosa	Sebastopol	Two Rock	Total records
1	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	1		2	2	5
2	<i>Arctostaphylos densiflora</i>			3		3
3	<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>		3	1		4
4	<i>Blennosperma bakeri</i>	1	2	15		18
5	<i>Campanula californica</i>			2		2
6	<i>Carex albida</i>			3		3
7	<i>Castilleja uliginosa</i>			2		2
8	<i>Ceanothus confusus</i>		3	1		4
9	<i>Ceanothus divergens</i>		2			2
10	<i>Chorizanthe valida</i>			1		1
11	<i>Clarkia imbricata</i>			3		3
12	<i>Delphinium luteum</i>			1		1
13	<i>Downingia pusilla</i>			7		7
14	<i>Fritillaria liliacea</i>		2		1	3
15	<i>Lasthenia burkei</i>	1		16		17
16	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>			2	1	3
17	<i>Limnanthes vincularis</i>	2	3	25	4	34
18	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>			6		6
19	<i>Pleuropogon hooverianus</i>	1		1		2
20	<i>Rhynchospora californica</i>				1	1
21	<i>Trifolium amoenum</i>	1	1	2	1	5
	Total records	7	16	93	10	126
	Sensitive natural communities					
	Coastal and valley freshwater marsh			1		
	Northern vernal pool			2		
	Northern hardpan vernal pool			5		
	Valley needle grassland		1			

Betty Guggolz (Personal communication, 1995) did not map locations of special-status species within the Santa Rosa Plain/ Russian River study area. However, four special-status plant records occur along proposed pipeline corridors just south of the Santa Rosa Plain/ Russian River study area, as follows:

- Three records of Sebastopol meadowfoam (*Limnanthes vinculans*, state and federal endangered), consisting of two records along Canfield Road and one record along Gravestien Highway just west of Cotati; and
- One record of Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*) along Canfield Road.

Sebastopol

The Sebastopol geographical area is located on the Camp Meeker and Sebastopol 7.5 minute USGS quadrangles. There were 120 records for 24 special-status plant species on the CNDDB/RareFind report for the entire Sebastopol study area (Table 4-3). Records for the following seven special-status species occur along proposed pipeline corridors within the Sebastopol study area:

- California beaked rush (*Rhynchospora californica*);
- Sebastopol meadowfoam;
- Sonoma alopecurus;
- Sonoma spineflower (*Chorizanthe valida*);
- Swamp harebell (*Campanula californica*);
- Vine Hill manzanita (*Arctostaphylos densiflora*); and
- Yellow larkspur (*Delphinium luteum*).

The three sensitive natural communities reported on the CNDDB/RareFind report for the Sebastopol study area were coastal and valley freshwater marsh, northern coastal salt marsh, and northern vernal pool. Descriptions of sensitive natural communities occurring in the project study area are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Betty Guggolz (Personal communication, 1995) identified one record each of the following eight special-status plant species in the Sebastopol study area:

- California beaked-rush (*Rhynchospora californica*);
- Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*);
- Hayfield tarplant (*Hemizonia congesta* var. *leucocephala*);
- Round-headed beaked rush (*Rhynchospora globularis* var. *globularis*);
- Sebastopol meadowfoam;
- Sonoma alopecurus;
- Swamp harebell (*Campanula californica*); and
- White sedge (*Carex albida*).

Table 4-3.

CNDDDB/RareFind records of special-status plant species in Sebastopol study area quadrangles.

	Species name	USGS Quadrangle		
		Camp Meeker	Sebastopol	Total Records
1	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	4	2	6
2	<i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	8		8
3	<i>Arctostaphylos densiflora</i>		3	3
4	<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>	1	1	2
5	<i>Blennosperma bakeri</i>		15	15
6	<i>Calamagrostis crassiglumis</i>	1		1
7	<i>Campanula californica</i>		2	2
8	<i>Carex albida</i>		3	3
9	<i>Castilleja uliginosa</i>		2	2
10	<i>Ceanothus confusus</i>	1	1	2
11	<i>Chorizanthe valida</i>		1	1
12	<i>Clarkia imbricata</i>		3	3
13	<i>Cordylanthus tenuis</i> ssp. <i>capillaris</i>	3		3
14	<i>Delphinium bakeri</i>	1		1
15	<i>Delphinium luteum</i>	1	1	2
16	<i>Downingia pusilla</i>		7	7
17	<i>Fritillaria liliacea</i>	2		2
18	<i>Lasthenia burkei</i>		16	16
19	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>		2	2
20	<i>Limnanthes vinctans</i>	1	25	26
21	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>		6	6
22	<i>Pleuropogon hooverianus</i>	1	1	2
23	<i>Rhynchospora californica</i>	2		2
24	<i>Trifolium amoenum</i>	1	2	3
	Total records	27	93	120
	Sensitive natural communities			
	Coastal and valley freshwater marsh		1	1
	Northern vernal pool		2	2
	Northern hardpan vernal pool		5	5

The locations of all of these species occur within the boundaries of three historical marshes: Atascadero Marsh, Perry Marsh, and Ross Marsh. Although Perry Marsh and Ross Marsh have been converted for agriculture, parts of Atascadero Marsh remain intact. Part of Atascadero Marsh is included within the project study area; however, no special-status plant species were observed during field surveys in the Atascadero Marsh area.

South County

The South County study area is located on the Cotati, Glen Ellen, Novato, Petaluma River, and Sears Point 7.5 minute USGS quadrangles. There were 30 records for 20 special-status plant species on the CNDDDB/RareFind report for the entire South County study area (Table 4-4). However, none of these records occur within pipeline corridors in the South County study area.

Three sensitive natural communities reported on the CNDDDB/RareFind report for the South County study area include coastal brackish marsh, northern coastal salt marsh, and northern vernal pool. Descriptions of sensitive natural communities occurring in the project study area are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Betty Guggolz (Personal communication, 1995) was not aware of any additional special-status plant locations occurring within the boundaries of the South County pipeline corridors.

Table 4-4.

CNDDDB/RareFind records of special-status plant species in South County study area quadrangles.

	Species name	USGS Quadrangle					
		Cotati	Glen Ellen	Novato	Petaluma River	Sears Point	Total Records
1	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	1					1
2	<i>Astragalus tener</i> var. <i>tener</i>				1		1
3	<i>Blennosperma bakeri</i>	1	1			2	4
4	<i>Ceanothus sonomensis</i>		1				1
5	<i>Chorizanthe valida</i>				1		1
6	<i>Cordylanthus mollis</i> ssp. <i>mollis</i>				2	1	3
7	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>			1			1
8	<i>Delphinium luteum</i>				1		1
9	<i>Downingia pusilla</i>		1				1
10	<i>Fritillaria liliacea</i>				1		1
11	<i>Hesperolinon congestum</i>			1	2		3
12	<i>Lasthenia burkei</i>	1					1
13	<i>Legenere limosa</i>		1				1
14	<i>Limnanthes vincularis</i>	2					2
15	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>			1	1		2
16	<i>Plagiobothrys mollis</i> var. <i>vestitus</i>				1		1
17	<i>Pleuropogon hooverianus</i>	1	1				2
18	<i>Polygonum marinense</i>				1		1
19	<i>Streptanthus glandulosus</i> ssp. <i>pulchellus</i>			1			1
20	<i>Trifolium amoenum</i>	1					1
	Total records	7	5	4	11	3	30
	Sensitive natural communities						
	Northern coastal salt marsh			4	1	2	7
	Coastal brackish marsh			1	1	1	3
	Northern vernal pool		1			1	2

West County

The West County study area is located on the Cotati, Petaluma, Point Reyes NE, Two Rock, and Valley Ford 7.5 minute USGS quadrangles. There were 39 records for 18 special-status plant species on the CNDDDB/RareFind report for the entire West County study area (Table 4-5). Records for the following three special-status species occur along proposed pipeline corridors within the West County study area:

- Sebastopol meadowfoam;
- Showy Indian clover; and
- Sonoma alopecurus.

The two sensitive natural communities reported for the West County study area on the CNDDDB/RareFind report were coastal brackish marsh and northern vernal pool. Descriptions of sensitive natural communities occurring in the project study area are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Betty Guggolz (Personal communication, 1995) mapped two records of special-status plants within a half mile of the pipeline corridors in the West County study area, as follows:

- One record of Sonoma alopecurus occurs along Petaluma Valley - Ford Road; and
- One record of hayfield tarplant (*Hemizonia congesta* ssp. *leucocephala*, CNPS List 3) occurs along Tomales Petaluma Road.

Other records of rare plants mapped by Ms. Guggolz in the West County study area are discussed in the *Agricultural Irrigation Technical Memorandum* (Sycamore Environmental, 1996a).

Table 4-5.

CNDDDB/RareFind records of special-status plant species in West County study area quadrangles .

	Species name	USGS Quadrangle					
		Cotati	Petaluma	Point Reyes NE	Two Rock	Valley Ford	Total Records
1	<i>Agrostis clivicola</i> var. <i>punta-reyesensis</i>					1	1
2	<i>Agrostis blasdalei</i>					2	2
3	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	1			2		3
4	<i>Astragalus tener</i> var. <i>tener</i>		1				1
5	<i>Blennosperma bakeri</i>	1					1
6	<i>Ceanothus masonii</i>			3			3
7	<i>Chorizanthe valida</i>		1				1
8	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>					1	1
9	<i>Delphinium bakeri</i>			1			1
10	<i>Delphinium luteum</i>		1			3	4
11	<i>Fritillaria liliacea</i>			1	1		2
12	<i>Lasthenia burkei</i>	1					1
13	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>				1		1
14	<i>Limnanthes vincularis</i>	2			4		6
15	<i>Plagiobothrys mollis</i> var. <i>vestitus</i>		1				1
16	<i>Pleuropogon hooverianus</i>	1				1	2
17	<i>Rhynchospora californica</i>				1		1
18	<i>Trifolium amoenum</i>	1	1		1	4	7
	Total records	7	5	5	10	12	39
	Sensitive natural communities						
	Coastal brackish marsh					2	2
	Northern vernal pool		1	1			2

Field Records

Special-Status Plant Species

During botanical surveys in the pipeline component of the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area, botanists observed one previously unreported population of hayfield tarplant (*Hemizonia congesta* var. *leucocephala*), one previously unreported population of serpentine bird's beak, and two previously unreported locations of Rincon manzanita shrubs (Table 4-6).

The population of hayfield tarplant was observed along Seavey Road in the West County study area. This population consisted of less than 20 plants in an area approximately 10 ft x 10 ft.

The population of Mt. St. Helena morning glory (*Calystegia collina* ssp. *oxyphylla*) was observed near the top of and adjacent to Pine Flat Road. This population consisted of several plants alongside the paved road.

The population of serpentine bird's beak was observed along Pine Flat Road in the Geysers study area. This population consisted of less than five plants in ruderal roadside vegetation near chaparral habitat.

The Rincon manzanita shrubs were observed along Pine Flat Road in the Geysers study area. Collections were made from shrubs in chaparral habitat along upper Pine Flat Road.

Sensitive Natural Communities

Sensitive natural communities occurring in the pipeline study area consist of the following:

- Brackish marsh;
- CLO/ILO woodland.
- Riparian habitats including mixed and willow riparian communities; and
- Vernal pools.

Acreages of sensitive natural communities occurring in the pipeline study area are presented in Table 4-7.

Protected Tree Resources

Protected tree resources occurring in the pipeline study area are presented in Table 4-8. Ten of the eleven protected tree species were observed in pipeline corridors. These tree species are protected under the Sonoma County Tree Ordinance.

Table 4-6.

Records of special-status species in pipeline component.

	COUNTIES	UC ^a	ROPA ^b	CNDDDB ^c	CNPS ^d	SYCAMORE ^e	Total historic and current populations ^f	% Increase over previous records ^g
Rincon manzanita (CNPS List 1B)	MARIN	0	*	0	0	0	0	
<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>	SONOMA	8	*	8	0	2	18	
	Totals	8	*	8	0	2	18	12.5% (2/16)
Mt. St. Helena morning glory (CNPS List 4)	MARIN	*	*	0	0	0	0	
<i>Calystegia collina</i> ssp. <i>oxyphylla</i>	SONOMA	*	*	2	3	1	6	
	Totals	*	*	2	3	1	6	20% (1/5)
Serpentine bird's beak (CNPS List 4)	MARIN	0	*	0	0	0	0	
<i>Cordylanthus tenuis</i> ssp. <i>brunneus</i>	SONOMA	4	*	0	0	2	6	
	Totals	4	*	0	0	2	6	50% (2/4)
Hayfield tarplant (CNPS List 3)	MARIN	8	0	0	0	5	13	
<i>Hemizonia congesta</i> var. <i>leucocephala</i>	SONOMA	12	0	0	2	10	24	
	Totals	20	0	0	2	15	37	55% (15/27)

^a Herbarium at University of California, Berkeley. * Information unavailable for DEIR.

^b Herbarium at Sonoma State University, Rohnert Park. * Information unavailable for DEIR.

^c CNDDDB/RareFind records.

^d Represents known records from the project study area (Betty Guggolz, Personal communication 1995).

^e Populations observed in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area.

^f Based on total known populations.

^g New records found during 1994-1995 surveys by Sycamore Environmental compared to historic records in Sonoma and Marin counties. Locations of historic records may or may not be extant.

Table 4-7.

Acreages of sensitive natural communities.

Sensitive Community	Proposed Project Subalternatives ¹										
	2A	2B	2C	2D	3A	3B	3C	3D	3E	4	5A
Willow riparian	0.35	0.35	0.38	0.39	3.67	3.72	3.67	3.67	3.67	0.85	1.21
Mixed riparian	4.82	4.82	4.82	4.82	4.46	4.46	4.46	4.46	4.46	0.75	1.45
Total riparian habitat	5.17	5.17	5.2	5.21	8.13	8.18	8.13	8.13	8.13	1.6	2.66
Brackish marsh	0	0	0	0	0.96	0.96	0.96	0.96	0.96	0	0
Vernal pools	0.04	0.04	0.04	0.04	0	0	0	0	0	0	0
Total wetland vegetation	0.04	0.04	0.04	0.04	0.96	0.96	0.96	0.96	0.96	0	0
CLO/ ILO woodland	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	7.12	1.38
Total woodland habitat	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	7.12	1.38
Total acres of sensitive natural communities affected	6.93	6.93	6.96	6.97	10.81	10.86	10.81	10.81	10.81	8.72	4.04

¹ See EIR/EIS (HBA, 1996b) for a discussion of subalternatives.

Table 4-8.

Protected tree resources observed along pipeline subalternatives.

Tree species	2A	2B	2C	2D	3A	3B	3C	3D	3E	4	5 ^b
Big-leaf maple	X	X	X	X	X	X	X	X	X	X	
Blue oak	X	X	X	X						X	
California bay	X	X	X	X	X	X	X	X	X	X	
California black oak	X	X	X	X	X	X	X	X	X	X	
Coast live oak	X	X	X	X	X	X	X	X	X	X	
Coast redwood	X	X	X	X	X	X	X	X	X	X	
Interior live oak					X	X	X	X	X	X	
Oracle oak ^a											
Oregon oak	X	X	X	X	X	X	X	X	X	X	
Pacific madrone	X	X	X	X	X	X	X	X	X	X	
Valley oak	X	X	X	X	X	X	X	X	X	X	

^a Oracle oak was not found within pipeline corridors.

^b Subalternative 5 does not affect protected tree resources.

5. IMPACT ANALYSIS

INTRODUCTION

This section discusses the methods and the significance criteria used to evaluate impacts and describes botanical resource impacts expected to result from implementation of the proposed project.

METHODS: DETERMINATION OF SIGNIFICANCE OF IMPACTS

Impacts to biological resources were evaluated for significance based on legal protection; local, state, and federal agency policies; and documented resource scarcity and sensitivity.

State and Federal Statutes

State and Federal statutes pertinent to botanical resources that need to be evaluated in an EIR/EIS include:

- Federal Endangered Species Act (16 U.S.C. 1531-1543).
- California Environmental Quality Act (P.R.C. 21000 et seq.).
- California Endangered Species Act (California Fish and Game Code 2050 et seq.).
- Native Plant Protection Act (California Fish and Game Code 1900-1913).

Federal Endangered Species Act

The Federal Endangered Species Act defines “take” (Section 9) and prohibits “taking” of a listed endangered or threatened species (16 USC 1532, 50 CFR 17.3). If a federally listed species could be harmed by a project, a Section 7 or 10 consultation must be initiated, and an Incidental Take Permit must be obtained (16 USC 1539, 50 CFR 13).

California Fish and Game Code

The California Fish and Game Code defines “take” (Section 86) and prohibits “taking” of a species listed as threatened or endangered under the California Endangered Species Act (California Fish and Game Code Section 2080) or otherwise fully protected (as defined in California Fish and Game Code Sections 3511, 4700, and 5050).

The CDFG also regulates activities that may impact streambeds or other wetland areas. Division 2, Chapter 6, Section 1601 of the Fish and Game Code states that

“...general plans sufficient to indicate the nature of a project for construction by, or on the behalf of, any governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or will use material from the streambeds designated by the department, shall be submitted to the department.”

The CDFG has stated that their jurisdiction is any wetland area that is within the 100-year floodplain. Completion of a Section 1601-03 Streambed Alteration Agreement with the CDFG is required before any work begins that will affect wetland areas within the 100-year floodplain.

Other Special-Status Plant Species Classifications

California species of special concern and species listed on California Native Plant Society (CNPS) lists 1B and 2, 3, and 4 were considered for this document.

Sensitive Natural Communities

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Sensitive natural communities occurring in pipeline corridors include plant communities associated with oak woodland, riparian habitat, and wetland habitats.

Oak Woodland

Oak woodlands provide habitat for a wide diversity of wildlife. Thirty-five percent of California's mammal species utilize oak woodlands for food and shelter (Pavlik *et al.*, 1991). Oaks have figured prominently in the history of California, providing food, fuel, and tools to both native Americans and pioneers. Oak woodlands are a significant natural resource providing erosion and landslide control, nutrient cycling, ground water recharge, air and water quality, recreation, wood production, livestock grazing, aesthetic qualities, and wildlife habitat (Hagen, 1995). Although oak woodlands cover millions of acres throughout California, there is widespread concern about native oaks. An estimated 14,000 acres are lost each year (Hagen, 1995). Threats to oaks include urbanization, conversion of oak woodlands to agriculture, and fragmentation of natural habitats in rural areas.

Riparian Habitat

Riparian habitats are very important for the survival of wildlife providing food, shelter, and serving as migration and dispersal corridors (Sands, 1980; Warner and

Hendrix, 1984). California has rich mammal, reptile, and amphibian faunas; many species of which are dependent upon riparian habitats. One quarter of California's mammals are limited to or are closely dependent upon riparian habitats. Half of the reptiles and three-fourths of the amphibians in California are closely associated with riparian systems. Through its influence on water quality, temperature, and nutrients, riparian vegetation determines the structure and functioning of stream ecosystems and fish communities. Most of California's original riparian vegetation has been lost. Only 15% of the riparian habitat in the Central Valley remains, and three-fourths of what remains has been degraded (Warner and Hendrix, 1984).

Wetland Habitat

Wetlands are protected under Section 404 of the Clean Water Act. Wetlands perform many important functions such as improving water quality, recharging ground water, providing natural flood control, and providing habitat for numerous species of wildlife, plants, and fish. Wetland habitats of concern along proposed pipeline routes include brackish marsh and vernal pools.

Protected Tree Resources

Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh of nine inches or greater of the following species are protected: big-leaf maple, black oak, blue oak, California bay, coast live oak, interior live oak, Pacific madrone, oracle oak, Oregon oak, coast redwood, and valley oak. The ordinance also protects hybrids of these species.

SIGNIFICANCE CRITERIA

The following significance criteria were used to evaluate impacts on botanical resources:

- Any loss of the habitat, individuals, or populations of federally listed endangered, threatened, or proposed plant species, or plant species that are federal candidates for listing
- Any loss of the habitat, individuals, or populations of state listed endangered, threatened, rare, or proposed plant species.
- Any loss of the habitat, individuals, or populations of species occurring on List 1B of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Loss of greater than 15% of the known and historic populations in Sonoma and Marin counties of species occurring on List 2, 3, or 4 of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).

- Any loss of sensitive plant communities, as defined by CDFG, or other communities of recognized regional importance.
- Any loss of riparian habitats.

IMPACTS OF THE PROPOSED PROJECT ALTERNATIVES

Short-term vegetation impacts result from construction activities that involve creation of dust, habitat alteration, temporary vegetation removal, etc. Long-term impacts result when vegetation is permanently removed or destroyed, when land is cleared for construction, when special-status plant species are threatened, or when the integrity of a sensitive natural community is destroyed. Construction of temporary or permanent roads, dumping of trash or construction materials, dumping or removal of soil, and flooding or dewatering are examples of actions that can destroy the integrity of a sensitive natural community.

Short-term vegetation impacts associated with the proposed project would result from the construction of wastewater transmission lines to deliver reclaimed water to the agricultural irrigation components. Long-term impacts could result if vegetation were removed during construction and not replaced, due to the need to keep an area free of vegetation. However, most of the pipeline corridors are situated within the existing disturbed right-of-way of roads and highways, and therefore long-term vegetation impacts are expected to be minimal.

Plant Communities

The acreage of plant communities potentially affected by construction and maintenance of the proposed wastewater transmission pipelines is presented in Table 4-7 (Section 4).

Special-Status Plant Species

Selection of subalternatives 2A-2D (see EIR/EIS for description) and 5A (direct discharge pipeline) would not affect special-status plant species. Selection of subalternative 4 (Pine Flat Road) could affect two shrubs (or populations) of Rincon manzanita. Two populations represent 11% (2/18) of all historic and current populations in Marin and Sonoma counties. In accordance with the significance criteria, a significant impact would occur if three populations (15% of 18 historic and current records) were affected.

Selection of subalternative 4 (Pine Flat Road) could affect one population of Mt. St. Helena morning glory. One population represents 17% (1/6) of all historic and current populations in Marin and Sonoma counties. In accordance with the significance criteria, a significant impact would occur if one population (15% of 6 historic and current records) was affected.

Selection of subalternative 4 (Pine Flat Road) could affect one population of serpentine bird's beak. One population represents 17% (1/6) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, a significant impact would occur if one population (15% of 6 historic and current records) was affected.

Selection of subalternatives 3A-3E (Seavey Road) could affect one population of hayfield tarplant. One population represents 3% (1/37) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, a significant impact would occur if six populations (15% of 37 historic and current records) of hayfield tarplant were affected.

The total loss of all populations from all project components will need to be considered in order to compare impacts among various project alternatives.

Protected Tree Resources

Table 4-8 in this document presents a list of protected tree species that occur on each irrigation study site. Protected tree species occur in every pipeline alternative. The surveys conducted for this project determined the presence or absence of protected tree resources, but did not quantify the numbers of such trees present along proposed pipeline corridors. The number of trees subject to the Sonoma County Tree Ordinance will be determined during site-specific, pre-construction surveys.

Sensitive Natural Communities

Table 4-7 in this document presents acreages of sensitive natural communities potentially affected by implementation of the wastewater transmission pipeline component. In accordance with the significance criteria, any loss of sensitive communities is considered significant.

The total impact on sensitive natural communities from the proposed project will depend on which parcels are brought on-line to receive reclaimed water. Thus, the actual project impact cannot be determined at the present time.

Mitigation Measures Incorporated into Project Design

Mitigation measures are incorporated in project design that will avoid impacts to sensitive botanical resources (species and communities; HBA, 1996c). These mitigation measures include the provision that sensitive biological resources along pipelines, pump stations, and equipment staging areas will be avoided.

If sensitive botanical resources cannot be avoided through project design or during construction, specific measures will be implemented (HBA, 1996c): all mitigation

measures of the Sonoma and Marin County Tree ordinances will be met; if avoidance of a sensitive plant species is not feasible, a qualified botanist will salvage individual specimens or seeds and revegetate following construction; where avoidance of other sensitive resources, excluding species protected under FESA or CESA, is not feasible, the affected habitat will be replaced at a minimum 3:1 ratio.

6. REPORT PREPARERS

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APPENDIX A.

Plant Species List for Wastewater Transmission Line Component.

Appendix A. Wastewater Transmission Pipeline Plant Species List.

Family	Species	Common Name	N/ I*
MALVACEAE	<i>Abutilon theophrasti</i>	Velvet-leaf	I
FABACEAE	<i>Acacia</i> sp.	Acacia	I
ROSACEAE	<i>Acaena pinnatifida</i> var. <i>californica</i>	California acaena	N
ACERACEAE	<i>Acer macrophyllum</i>	Big-leaf maple	N
ACERACEAE	<i>Acer negundo</i> var. <i>californicum</i>	Box elder	N
ASTERACEAE	<i>Achillea millefolium</i>	Yarrow	N
POACEAE	<i>Achnatherum occidentale</i> ssp. <i>occidentale</i>	Needlegrass	N
ASTERACEAE	<i>Achyrochaena mollis</i>	Blow-wives	N
ROSACEAE	<i>Adenostoma fasciculatum</i>	Chamise	N
PTERIDACEAE	<i>Adiantum jordanii</i>	California maiden-hair	N
HIPPOCASTANACEAE	<i>Aesculus californica</i>	California buckeye	N
ASTERACEAE	<i>Agoseris grandiflora</i>		N
POACEAE	<i>Agrostis exarata</i>		N
POACEAE	<i>Agrostis stolonifera</i>	Creeping bent	I
SIMAROUBACEAE	<i>Ailanthus altissima</i>	Tree of heaven	I
POACEAE	<i>Aira caryophylla</i>	Silver European hairgrass	I
ALISMACEAE	<i>Alisma plantago-aquatica</i>	Water plantain	N
BETULACEAE	<i>Alnus rhombifolia</i>	White alder	N
BETULACEAE	<i>Alnus rubra</i>	Red alder	N
AMARANTHACEAE	<i>Amaranthus retroflexus</i>	Red-root amaranth	I
BORAGINACEAE	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	Fiddleneck	N
BORAGINACEAE	<i>Amsinckia menziesii</i> var. <i>menziesii</i>	Fiddleneck	N
PRIMULACEAE	<i>Anagallis arvensis</i>	Scarlet pimpernel	I
ASTERACEAE	<i>Anthemis cotula</i>	Dog-fennel	I
APIACEAE	<i>Anthriscus caucalis</i>	Bur-chervil	I
SCROPHULARIACEAE	<i>Antirrhinum vexillo-calyculatum</i>		N
APOCYNACEAE	<i>Apocynum androsaemifolium</i>	Bitter dogbane	N
ERICACEAE	<i>Arbutus menziesii</i>	Pacific madrone	N
ERICACEAE	<i>Arctostaphylos glauca</i>	Manzanita	N
ERICACEAE	<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>	Rincon manzanita	N

Family	Species	Common Name	N/ I*
ERICACEAE	Arctostaphylos stanfordiana ssp. stanfordiana	Stanford manzanita	N
ERICACEAE	Arctostaphylos viscida ssp. pulchella		N
ASTERACEAE	Artemisia douglasiana	Mugwort	N
ASTERACEAE	Artemisia suksdorfii	Coastal mugwort	N
POACEAE	Arundo donax	Giant reed	I
ASCLEPIADACEAE	Asclepias fascicularis	Narrow-leaf milkweed	N
ASCLEPIADACEAE	Asclepias speciosa	Showy milkweed	N
ASTERACEAE	Aster chilensis		N
DRYOPTERIDACEAE	Athyrium filix-femina var. cyclosorum	Lady fern	N
POACEAE	Avena barbata	Slender wild oats	I
POACEAE	Avena fatua	Wild oat	I
POACEAE	Avena sativa	Cultivated oat	I
AZOLLACEAE	Azolla sp.	Mosquito fern	N
ASTERACEAE	Baccharis pilularis	Coyote brush	N
BRASSICACEAE	Barbarea verna	Early winter cress	I
SCROPHULARIACEAE	Bellardia trixago	Bellardia	I
BERBERIDACEAE	Berberis sp.	Barberry	N
BETULACEAE	Betula occidentalis	Water birch	N
ASTERACEAE	Bidens frondosa	Sticktight	N
BRASSICACEAE	Brassica nigra	Black mustard	I
BRASSICACEAE	Brassica rapa	Field mustard	I
POACEAE	Briza maxima	Big quaking grass	I
POACEAE	Briza minor	Little quaking grass	I
LILIACEAE	Brodiaea elegans ssp. elegans	Harvest brodiaea	N
POACEAE	Bromus arenarius		I
POACEAE	Bromus carinatus var. carinatus	California brome	N
POACEAE	Bromus diandrus	Ripgut grass	I
POACEAE	Bromus hordeaceus	Soft chess brome	I
POACEAE	Bromus laevipes	Red brome	N
POACEAE	Bromus madritensis ssp. rubens	Foxtail chess	I
PORTULACACEAE	Calandrinia ciliata	Red maids	N
ASTERACEAE	Calendula officinalis	Pot-marigold	I
CALLITRICHACEAE	Callitriche verna	Water-starwort	N
CUPRESSACEAE	Calocedrus decurrens	Incense cedar	N
CALYCANTHACEAE	Calycanthus occidentalis	Spicebush	N

Family	Species	Common Name	N/ I*
CONVOLVULACEAE	Calystegia collina ssp. oxyphylla	Mt. St. Helena morning glor	N
ONAGRACEAE	Camissonia ovata	Sun cup	N
BRASSICACEAE	Capsella bursa-pastoris	Shepherd's purse	I
BRASSICACEAE	Cardamine californica	Milk maids	N
BRASSICACEAE	Cardamine oligosperma	Western bitter cress	N
BRASSICACEAE	Cardaria sp.	Hoary cress	I
ASTERACEAE	Carduus pycnocephalus	Italian thistle	I
CYPERACEAE	Carex aquatilis var. dives	Water sedge	N
CYPERACEAE	Carex barbarae	Santa Barbara sedge	N
CYPERACEAE	Carex praegracilis	Sedge	N
ASTERACEAE	Carthamus baeticus	Smooth distaff thistle	I
SCROPHULARIACEAE	Castilleja affinis ssp. affinis	Indian paintbrush	N
SCROPHULARIACEAE	Castilleja attenuata	Valley tassels	N
SCROPHULARIACEAE	Castilleja campestris	Field owl's clover	N
SCROPHULARIACEAE	Castilleja foliolosa	Woolly Indian paintbrush	N
RHAMNACEAE	Ceanothus crassifolius	Hoaryleaf ceanothus	N
RHAMNACEAE	Ceanothus cuneatus var. cuneatus	Buck brush	N
RHAMNACEAE	Ceanothus integerrimus	Deer brush	N
ASTERACEAE	Centaurea calcitrapa	Purple star-thistle	I
ASTERACEAE	Centaurea cyanus	Bachelor's button	I
ASTERACEAE	Centaurea solstitialis	Yellow star-thistle	I
GENTIANACEAE	Centaureum davyi	Davy century	N
CARYOPHYLLACEAE	Cerastium glomeratum	Mouse-ear chickweed	I
ROSACEAE	Cercocarpus betuloides var. betuloides	Mountain mahogany	N
ASTERACEAE	Chamomilla suaveolens	Pineapple weed	I
CHENOPODIACEAE	Chenopodium album	Lamb's quarters	I
LILIACEAE	Chlorogalum pomeridianum var. pomeridianum	Soap plant	N
ASTERACEAE	Chrysanthemum segetum	Corn chrysanthemum	I
ASTERACEAE	Cichorium intybus	Chicory	I
ASTERACEAE	Cirsium occidentale		N
ASTERACEAE	Cirsium vulgare	Bull thistle	I
ONAGRACEAE	Clarkia amoena ssp. huntiana	Farewell-to-spring	N
ONAGRACEAE	Clarkia concinna ssp. concinna	Red ribbons	N
ONAGRACEAE	Clarkia rubicunda		N
PORTULACACEAE	Claytonia exigua ssp. exigua		N

Family	Species	Common Name	N/ I
PORTULACACEAE	Claytonia perfoliata ssp. mexicana	Miner's lettuce	N
PORTULACACEAE	Claytonia perfoliata ssp. perfoliata	Miner's lettuce	N
RANUNCULACEAE	Clematis ligusticifolia	Virgin's bower	N
APIACEAE	Conium maculatum	Poison hemlock	I
CONVOLVULACEAE	Convolvulus arvensis	Bindweed	I
ASTERACEAE	Conyza canadensis	Horseweed	N
SCROPHULARIACEAE	Cordylanthus tenuis ssp. brunneus	Serpentine bird's-beak	N
POACEAE	Cortaderia sp.	Pampas grass	I
BETULACEAE	Corylus cornuta var. californica	Hazelnut	N
ROSACEAE	Cotoneaster pannosa	Cotoneaster	I
ASTERACEAE	Cotula coronopifolia	Brass-buttons	I
CRASSULACEAE	Crassula aquatica	Water pygmy-weed	N
CRASSULACEAE	Crassula connata	Pygmyweed	N
ROSACEAE	Crataegus suksdorfii	Hawthorn	N
CUPRESSACEAE	Cupressus macrocarpa	Monterey cypress	N
CUSCUTACEAE	Cuscuta pentagona	Dodder	N
POACEAE	Cynodon dactylon	Bermuda grass	I
BORAGINACEAE	Cynoglossum grande	Hound's tongue	N
POACEAE	Cynosurus echinatus	Hedgehog dogtail	I
CYPERACEAE	Cyperus eragrostis	Nutsedge	N
CYPERACEAE	Cyperus esculentus	Nutsedge	N
FABACEAE	Cytisus scoparius	Scotch broom	I
POACEAE	Dactylis glomerata	Orchard grass	I
SOLANACEAE	Datura stramonium	Jimson weed	I
APIACEAE	Daucus carota	Queen Anne's lace	I
RANUNCULACEAE	Delphinium nudicaule	Red Larkspur	N
PAPAVERACEAE	Dendromecon rigida	Bush poppy	N
POACEAE	Deschampsia cespitosa	Tufted hairgrass	N
POACEAE	Deschampsia elongata	Slender hairgrass	N
LILIACEAE	Dichelostemma capitatum ssp. capitatum	Blue dicks	N
DIPSACACEAE	Dipsacus fullonum	Wild teasel	I
POACEAE	Distichlis spicata	Saltgrass	N
PRIMULACEAE	Dodecatheon hendersonii	Mosquito bills	N
CRASSULACEAE	Dudleya cymosa	Common dudleya	N
POACEAE	Echinochloa colona	Barnyard grass	I

Family	Species	Common Name	N/ I*
POACEAE	Echinochloa crus-galli	Barnyard grass	I
CYPERACEAE	Eleocharis macrostachya	Common spikerush	N
POACEAE	Elymus elymoides	Squirreltail	N
POACEAE	Elymus glaucus	Blue wildrye grass	N
ONAGRACEAE	Epilobium brachycarpum	Fireweed	N
ONAGRACEAE	Epilobium ciliatum ssp. glandulosum	Fireweed	N
ONAGRACEAE	Epilobium densiflorum	Fireweed	N
EQUISETACEAE	Equisetum arvense	Common horsetail	N
EQUISETACEAE	Equisetum hyemale ssp. affine	Common scouring rush	N
EQUISETACEAE	Equisetum laevigatum	Smooth scouring rush	N
EUPHORBIACEAE	Eremocarpus setigerus	Dove weed	N
HYDROPHYLLACEAE	Eriodictyon californicum	Yerba santa	N
POLYGONACEAE	Eriogonum fasciculatum	California buckwheat	N
POLYGONACEAE	Eriogonum luteolum var. luteolum		N
POLYGONACEAE	Eriogonum nudum var. nudum	Buckwheat	N
POLYGONACEAE	Eriogonum vimineum	Wicker buckwheat	N
ASTERACEAE	Eriophyllum lanatum var. grandiflorum	Woolly-sunflower	N
GERANIACEAE	Erodium botrys	Broadleaf filaree	I
GERANIACEAE	Erodium cicutarium	Redstem filaree	I
GERANIACEAE	Erodium macrophyllum	Roundleaf storksbill	N
GERANIACEAE	Erodium moschatum	White-stemmed filaree	I
PAPAVERACEAE	Eschscholzia californica	California poppy	N
MYRTACEAE	Eucalyptus globulus	Blue gum eucalyptus	I
EUPHORBIACEAE	Euphorbia sp.		U
POACEAE	Festuca arundinacea	Tall fescue	I
POACEAE	Festuca californica	California fescue	N
POACEAE	Festuca idahoensis	Blue bunchgrass	N
MORACEAE	Ficus carica	Edible fig	I
APIACEAE	Foeniculum vulgare	Fennel	I
OLEACEAE	Fraxinus latifolia	Oregon ash	N
LILIACEAE	Fritillaria affinis var. affinis	Checker lily	N
RUBIACEAE	Galium aparine	Goose grass	N
GARRYACEAE	Garrya elliptica	Silk tassel bush	N
GARRYACEAE	Garrya fremontii	Silk tassel bush	N
POACEAE	Gastridium ventricosum	Nit grass	I

Family	Species	Common Name	N/I*
FABACEAE	Genista monspessulana	French broom	I
GERANIACEAE	Geranium dissectum	Geranium	I
GERANIACEAE	Geranium molle	Wild geranium	I
POACEAE	Glyceria occidentalis	Western manna grass	N
ASTERACEAE	Gnaphalium californicum	Everlasting	N
ASTERACEAE	Gnaphalium canescens ssp. beneclens	Everlasting	N
ASTERACEAE	Gnaphalium canescens ssp. microcephalum	Everlasting	N
ASTERACEAE	Gnaphalium luteo-album	Cudweed	I
ASTERACEAE	Grindelia camporum	Gumplant	N
ASTERACEAE	Hemizonia congesta ssp. leucocephala	Hayfield tarplant	N
ASTERACEAE	Hemizonia congesta ssp. luzulifolia	Hayfield tarplant	N
ASTERACEAE	Hemizonia fitchii	Tarweed	N
APIACEAE	Heracleum lanatum	Cow parsnip	N
LINACEAE	Hesperolinon micranthum	Dwarf flax	N
ROSACEAE	Heteromeles arbutifolia	Toyon	N
SAXIFRAGACEAE	Heuchera micrantha		N
ASTERACEAE	Hieracium albiflorum	Hawkweed	N
POACEAE	Holcus lanatus	Common velvet grass	I
ROSACEAE	Holodiscus discolor	Oceanspray	N
POACEAE	Hordeum brachyantherum ssp. brachyantherum		N
POACEAE	Hordeum marinum ssp. gussoneanum	Mediterranean barley	I
POACEAE	Hordeum murinum ssp. leporinum	Hare barley	I
ROSACEAE	Horkelia californica ssp. californica		N
HYPERICACEAE	Hypericum concinnum	Gold-wire	N
HYPERICACEAE	Hypericum perforatum	Klamathweed	I
HYPERICACEAE	Hypericum sp.		U
ASTERACEAE	Hypochaeris glabra	Smooth cat's-ear	I
ASTERACEAE	Hypochaeris radicata	Rough cat's-ear	I
IRIDACEAE	Iris sp.		N
JUGLANDACEAE	Juglans californica ssp. hindsii	Northern California black w	N
JUGLANDACEAE	Juglans regia	English walnut	I
JUNCACEAE	Juncus balticus	Baltic rush	N
JUNCACEAE	Juncus bolanderi	Bolander's rush	N
JUNCACEAE	Juncus bufonius var. bufonius	Toad rush	N
JUNCACEAE	Juncus effusus var. brunneus	Common rush	N

Family	Species	Common Name	N/I*
JUNCACEAE	<i>Juncus mexicanus</i>	Mexican rush	N
JUNCACEAE	<i>Juncus occidentalis</i>	Western rush	N
JUNCACEAE	<i>Juncus patens</i>	Spreading rush	N
JUNCACEAE	<i>Juncus phaeocephalus</i> var. <i>phaeocephalus</i>	Brown-headed rush	N
SCROPHULARIACEAE	<i>Keckiella lemmonii</i>		N
SCROPHULARIACEAE	<i>Kickxia elatine</i>	Fluellin	I
SCROPHULARIACEAE	<i>Kickxia spuria</i>		I
ASTERACEAE	<i>Lactuca ludoviciana</i>	Lettuce	I
ASTERACEAE	<i>Lactuca saligna</i>	Willow lettuce	I
ASTERACEAE	<i>Lactuca serriola</i>	Prickly lettuce	I
LAMIACEAE	<i>Lamium purpureum</i>	Red henbit	I
FABACEAE	<i>Lathyrus latifolius</i>	Perennial sweet pea	I
FABACEAE	<i>Lathyrus odoratus</i>	Sweet pea	I
FABACEAE	<i>Lathyrus vestitus</i> var. <i>ochropetalus</i>	Wild pea	N
ASTERACEAE	<i>Layia platyglossa</i>	Tidy-tips	I
LEMNACEAE	<i>Lemna minuscule</i>	Duckweed	N
LAMIACEAE	<i>Lepechinia calycina</i>	Pitcher sage	N
POACEAE	<i>Leymus triticoides</i>	Alkali rye-grass	N
JUNCAGINACEAE	<i>Lilaea scilloides</i>	Flowering quillwort	N
LIMNANTHACEAE	<i>Limnanthes douglasii</i> ssp. <i>douglasii</i>	Common meadowfoam	N
LIMNANTHACEAE	<i>Limnanthes douglasii</i> ssp. <i>nivea</i>	Common meadowfoam	N
POLEMONIACEAE	<i>Linanthus parviflorus</i>		N
SCROPHULARIACEAE	<i>Linaria vulgaris</i>	Butter-and-eggs	I
LINACEAE	<i>Linum usitatissimum</i>	Common flax	I
SAXIFRAGACEAE	<i>Lithophragma affine</i>	Woodland star	N
SAXIFRAGACEAE	<i>Lithophragma cymbalaria</i>	Mission starflower	N
POACEAE	<i>Lolium multiflorum</i>	Italian ryegrass	I
APIACEAE	<i>Lomatium californicum</i>		N
APIACEAE	<i>Lomatium dasycarpum</i>		N
APIACEAE	<i>Lomatium utriculatum</i>	Spring gold	N
CAPRIFOLIACEAE	<i>Lonicera hispidula</i> var. <i>vacillans</i>	Honeysuckle	N
FABACEAE	<i>Lotus angustissimus</i>	Lotus	I
FABACEAE	<i>Lotus corniculatus</i>	Birdfoot trefoil	I
FABACEAE	<i>Lotus humistratus</i>		N
FABACEAE	<i>Lotus purshianus</i> var. <i>purshianus</i>	Spanish lotus	N

Family	Species	Common Name	N/ I*
FABACEAE	<i>Lotus scoparius</i> var. <i>scoparius</i>	California broom	N
ONAGRACEAE	<i>Ludwigia hexapetala</i>	Water primrose	N
ONAGRACEAE	<i>Ludwigia peploides</i> ssp. <i>peploides</i>	Marsh purslane	N
FABACEAE	<i>Lupinus bicolor</i>	Miniature lupine	N
FABACEAE	<i>Lupinus luteolus</i>	Butter lupine	N
FABACEAE	<i>Lupinus microcarpus</i> var. <i>densiflorus</i>	Chick lupine	N
FABACEAE	<i>Lupinus nanus</i>	Douglas's lupine	N
LYTHRACEAE	<i>Lythrum hyssopifolium</i>	Loosestrife	I
ASTERACEAE	<i>Madia elegans</i>	Common madia	N
ASTERACEAE	<i>Madia sativa</i>	Coast tarweed	N
ROSACEAE	<i>Malus sylvestris</i>	Apple	I
MALVACEAE	<i>Malva neglecta</i>	Common mallow	I
MALVACEAE	<i>Malva nicaeensis</i>	Bull mallow	I
MALVACEAE	<i>Malva parviflora</i>	Cheeseweed	I
MALVACEAE	<i>Malva sylvestris</i>	High mallow	I
MALVACEAE	<i>Malvelia leprosa</i>	Alkali mallow	N
CUCURBITACEAE	<i>Marah fabaceus</i>	California man-root	N
LAMIACEAE	<i>Marrubium vulgare</i>	Horehound	I
FABACEAE	<i>Medicago polymorpha</i>	California bur clover	I
FABACEAE	<i>Medicago sativa</i>	Alfalfa	I
POACEAE	<i>Melica californica</i>	California melic	N
POACEAE	<i>Melica torreyana</i>		N
FABACEAE	<i>Melilotus alba</i>	White sweetclover	I
FABACEAE	<i>Melilotus indica</i>	Sourclover	I
LAMIACEAE	<i>Mentha pulegium</i>	Pennyroyal	I
LAMIACEAE	<i>Mentha suaveolens</i>	Mint	I
SCROPHULARIACEAE	<i>Mimulus aurantiacus</i>	Sticky monkey-flower	N
SCROPHULARIACEAE	<i>Mimulus guttatus</i>	Common monkeyflower	N
LAMIACEAE	<i>Monardella villosa</i> ssp. <i>villosa</i>	Coyote-mint	N
POACEAE	<i>Muhlenbergia rigens</i>	Deergrass	N
MYRICACEAE	<i>Myrica californica</i>	Wax myrtle	N
POACEAE	<i>Nassella pulchra</i>	Purple needle-grass	N
POLEMONIACEAE	<i>Navarretia leucocephala</i> ssp. <i>leucocephala</i>		N
POLEMONIACEAE	<i>Navarretia squarrosa</i>	Skunkweed	N
HYDROPHYLLACEAE	<i>Nemophila heterophylla</i>	Baby blue-eyes	N

Family	Species	Common Name	N/I*
POACEAE	<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky bluegrass	I
POACEAE	<i>Poa secunda</i>	Bluegrass	N
POLYGONACEAE	<i>Polygonum arenastrum</i>	Common knotweed	I
POLYGONACEAE	<i>Polygonum hydropiperoides</i>	Waterpepper	N
POLYPODIACEAE	<i>Polypodium californicum</i>	California polypody	N
POACEAE	<i>Polypogon monspeliensis</i>	Annual beard grass	I
DRYOPTERIDACEAE	<i>Polystichum munitum</i>	Western sword fern	N
SALICACEAE	<i>Populus fremontii</i> ssp. <i>fremontii</i>	Fremont cottonwood	N
PORTULACACEAE	<i>Portulaca oleracea</i>	Common purslane	I
ROSACEAE	<i>Potentilla glandulosa</i>	Sticky cinquefoil	N
LAMIACEAE	<i>Prunella vulgaris</i> var. <i>lanceolata</i>	Self-heal	N
ROSACEAE	<i>Prunus persica</i>	Peach	I
ROSACEAE	<i>Prunus</i> sp.	Escaped ornamental	I
PINACEAE	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	N
DENNSTAEDTIACEAE	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	Bracken fern	N
FAGACEAE	<i>Quercus agrifolia</i> var. <i>agrifolia</i>	Coast live oak	N
FAGACEAE	<i>Quercus berberidifolia</i>	Scrub oak	N
FAGACEAE	<i>Quercus chrysolepis</i>	Canyon live oak	N
FAGACEAE	<i>Quercus douglasii</i>	Blue oak	N
FAGACEAE	<i>Quercus dumosa</i>	Nuttall's scrub oak	N
FAGACEAE	<i>Quercus durata</i> var. <i>durata</i>	Leather oak	N
FAGACEAE	<i>Quercus garryana</i> var. <i>garryana</i>	Oregon oak	N
FAGACEAE	<i>Quercus kelloggii</i>	California black oak	N
FAGACEAE	<i>Quercus lobata</i>	Valley oak	N
FAGACEAE	<i>Quercus wislizenii</i> var. <i>wislizenii</i>	Interior live oak	N
ASTERACEAE	<i>Rafinesquia californica</i>	California chicory	N
RANUNCULACEAE	<i>Ranunculus aquatilis</i>	Water buttercup	N
RANUNCULACEAE	<i>Ranunculus californicus</i>	California buttercup	N
RANUNCULACEAE	<i>Ranunculus muricatus</i>	Pricklyseed buttercup	I
RANUNCULACEAE	<i>Ranunculus occidentalis</i>	Western buttercup	N
BRASSICACEAE	<i>Raphanus raphanistrum</i>	Jointed charlock	I
BRASSICACEAE	<i>Raphanus sativus</i>	Wild radish	I
RHAMNACEAE	<i>Rhamnus californica</i> ssp. <i>californica</i>	California coffeeberry	N
FABACEAE	<i>Robinia pseudoacacia</i>	Black locust	I
BRASSICACEAE	<i>Rorippa curvisiliqua</i>	Water cress	N

Family	Species	Common Name	N/ I*
BRASSICACEAE	Rorippa nasturtium-aquaticum	Water cress	N
ROSACEAE	Rosa californica	California rose	N
ROSACEAE	Rosa eglanteria	Sweet-brier	I
ROSACEAE	Rosa gymnocarpa	Wood rose	N
ROSACEAE	Rosa sp.	Rose	U
ROSACEAE	Rubus discolor	Himalayan blackberry	I
ROSACEAE	Rubus leucodermis	Blackcap raspberry	N
ROSACEAE	Rubus ursinus	California blackberry	N
POLYGONACEAE	Rumex acetosella	Sheep sorrel	I
POLYGONACEAE	Rumex conglomeratus	Clustered dock	I
POLYGONACEAE	Rumex crispus	Curly dock	I
POLYGONACEAE	Rumex pulcher	Fiddle dock	I
SALICACEAE	Salix babylonica	Weeping willow	I
SALICACEAE	Salix exigua	Narrow-leaved willow	N
SALICACEAE	Salix laevigata	Red willow	N
SALICACEAE	Salix lasiolepis	Arroyo willow	N
SALICACEAE	Salix lucida ssp. lasiandra	Shining willow	N
CHENOPODIACEAE	Salsola tragus	Russian thistle	I
CAPRIFOLIACEAE	Sambucus mexicana	Blue elderberry	N
ROSACEAE	Sanguisorba minor ssp. muricata	Garden burnet	I
APIACEAE	Sanicula bipinnatifida	Purple sanicle	N
APIACEAE	Sanicula crassicaulis	Pacific sanicle	N
APIACEAE	Scandix pecten-veneris	Venus' needle	I
ANACARDIACEAE	Schinus molle	Pepper tree	I
CYPERACEAE	Scirpus acutus var. occidentalis	Tule	N
SCROPHULARIACEAE	Scrophularia californica ssp. californica	California figwort	N
CRASSULACEAE	Sedum spathulifolium	Broadleaf stonecrop	N
ASTERACEAE	Senecio mikanioides	German-ivy	I
ASTERACEAE	Senecio vulgaris	Groundsel	I
TAXODIACEAE	Sequoia sempervirens	Coast redwood	N
MALVACEAE	Sidalcea malvaeflora ssp. laciniata	Checker mallow	N
CARYOPHYLLACEAE	Silene gallica	Windmill pink	I
ASTERACEAE	Silybum marianum	Milk thistle	I
BRASSICACEAE	Sinapis arvensis	Charlock	I
BRASSICACEAE	Sisymbrium officinale	Hedge mustard	I

Family	Species	Common Name	N/ I*
IRIDACEAE	<i>Sisyrinchium bellum</i>	Blue-eyed grass	N
SOLANACEAE	<i>Solanum americanum</i>	Nightshade	N
SOLANACEAE	<i>Solanum nigrum</i>	Black nightshade	I
SOLANACEAE	<i>Solanum xanti</i>		N
ASTERACEAE	<i>Sonchus asper</i> ssp. <i>asper</i>	Prickly sow thistle	I
ASTERACEAE	<i>Sonchus oleraceus</i>	Common sow thistle	I
POACEAE	<i>Sorghum halepense</i>	Johnsongrass	I
TYPHACEAE	<i>Sparganium eurycarpum</i> ssp. <i>eurycarpum</i>	Bur-reed	N
FABACEAE	<i>Spartium junceum</i>	Spanish broom	I
CARYOPHYLLACEAE	<i>Spergula arvensis</i> ssp. <i>arvensis</i>	Starwort	I
CARYOPHYLLACEAE	<i>Spergularia rubra</i>	Sand-spurrey	I
LAMIACEAE	<i>Stachys ajugoides</i> var. <i>rigida</i>	Hedge nettle	N
CARYOPHYLLACEAE	<i>Stellaria media</i>	Common chickweed	I
BRASSICACEAE	<i>Streptanthus glandulosus</i> ssp. <i>glandulosus</i>	Jewel flower	N
CAPRIFOLIACEAE	<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	Snowberry	N
CAPRIFOLIACEAE	<i>Symphoricarpos mollis</i>	Creeping snowberry	N
POACEAE	<i>Taeniatherum caput-medusae</i>	Medusahead	I
ASTERACEAE	<i>Taraxacum officinale</i>	Dandelion	I
BRASSICACEAE	<i>Thysanocarpus laciniatus</i>		N
APIACEAE	<i>Torilis arvensis</i>	Japanese hedge-parsley	I
ANACARDIACEAE	<i>Toxicodendron diversilobum</i>	Western poison oak	N
ASTERACEAE	<i>Tragopogon porrifolius</i>	Oyster plant	I
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	Puncture vine	I
LAMIACEAE	<i>Trichostema lanceolatum</i>	Vinegar weed	N
FABACEAE	<i>Trifolium dubium</i>	Shamrock	I
FABACEAE	<i>Trifolium fragiferum</i>	Strawberry clover	I
FABACEAE	<i>Trifolium fucatum</i>	Sour clover	N
FABACEAE	<i>Trifolium hirtum</i>	Rose clover	I
FABACEAE	<i>Trifolium incarnatum</i>	Crimson clover	I
FABACEAE	<i>Trifolium repens</i>	White clover	I
FABACEAE	<i>Trifolium subterraneum</i>	Subterranean clover	I
FABACEAE	<i>Trifolium willdenovii</i>	Clover	N
SCROPHULARIACEAE	<i>Triphysaria eriantha</i> ssp. <i>eriantha</i>	Butter-and-eggs	N
POACEAE	<i>Trisetum cernuum</i>		N
POACEAE	<i>Triticum aestivum</i>	Wheat	I

Family	Species	Common Name	N/ I*
TYPHACEAE	<i>Typha angustifolia</i>	Narrow-leaved cattail	N
TYPHACEAE	<i>Typha latifolia</i>	Broad-leaved cattail	N
FABACEAE	<i>Ulex europaea</i>	Gorse	I
LAURACEAE	<i>Umbellularia californica</i>	California bay	N
URTICACEAE	<i>Urtica dioica</i> ssp. <i>holosericea</i>	Hoary nettle	N
URTICACEAE	<i>Urtica urens</i>	Dwarf nettle	I
SCROPHULARIACEAE	<i>Verbascum blattaria</i>	Moth mullein	I
SCROPHULARIACEAE	<i>Verbascum thapsus</i>	Wolly mullein	I
SCROPHULARIACEAE	<i>Veronica americana</i>	American brooklime	N
FABACEAE	<i>Vicia benghalensis</i>	Purple vetch	I
FABACEAE	<i>Vicia sativa</i> ssp. <i>nigra</i>	Common vetch	I
FABACEAE	<i>Vicia sativa</i> ssp. <i>sativa</i>	Common vetch	I
FABACEAE	<i>Vicia tetrasperma</i>		I
FABACEAE	<i>Vicia villosa</i> ssp. <i>villosa</i>	Winter vetch	I
APOCYNACEAE	<i>Vinca major</i>	Greater periwinkle	I
VIOLACEAE	<i>Viola lobata</i> ssp. <i>integrifolia</i>	Pine-violet	N
VIOLACEAE	<i>Viola lobata</i> ssp. <i>lobata</i>		N
VIOLACEAE	<i>Viola pedunculata</i>	Johnny-jump-up	N
VIOLACEAE	<i>Viola purpurea</i> ssp. <i>quercetorum</i>	Mountain violet	N
VITACEAE	<i>Vitis californica</i>	California wild grape	N
POACEAE	<i>Vulpia microstachys</i>		N
POACEAE	<i>Vulpia myuros</i>	Vulpia	I
ASTERACEAE	<i>Wyethia angustifolia</i>	Narrowleaf mule ears	N
ASTERACEAE	<i>Wyethia glabra</i>	Green mule ears	N
ASTERACEAE	<i>Xanthium spinosum</i>	Spiny cocklebur	N
ASTERACEAE	<i>Xanthium strumarium</i>	Cocklebur	N
LILIACEAE	<i>Yucca brevifolia</i>	Joshua tree	N
LILIACEAE	<i>Zigadenus fremontii</i>	Death camas	N

*N = Native; I = Introduced (Non-native); U = Identifiable only to genus

APPENDIX D - GEYSERS BOTANICAL RESOURCES

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Appendix A. Plant species list for the Geysers steamfield component .	
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1. INTRODUCTION

The purpose of this technical memorandum is to provide information on existing botanical resources, special-status plant species, sensitive natural communities, and protected tree resources that occur or may occur within the Geysers geothermal steamfield recharge component (Geysers steamfield). Existing botanical resources, populations of special-status plant species, and sensitive natural communities were mapped within the Geysers steamfield. These data provide a basis for the assessment of impacts. A complete project description and project alternatives are presented in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS (HBA, 1996b).

The Geysers steamfield component consists of two water storage tanks, an access road, and distribution pipelines within the existing Geysers Known Geothermal Resource Area (Figure 4.1-2 in HBA, 1996a). For the purpose of this technical memorandum, the proposed water storage tank facilities, access road, and distribution pipeline corridors within the Geysers steamfield constitute the 'study area.' The distribution pipeline corridor study area was 60 feet wide.

2. SETTING: PROJECT AREA DESCRIPTIONS

The Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area, components of which are located in Sonoma and Marin counties, is divided into five relatively distinct geographic areas. These are the Geysers, Santa Rosa Plain/ Russian River, Sebastopol, South County, and West County geographic areas (Figure 4.1-1a-1c in HBA, 1996a). The Geysers steamfield is located in the Geysers geographical area.

The Geysers geographical area is located at about 1,600 feet elevation in the Mayacamas Mountains of northern Sonoma County. The Geysers study area includes the Geyser's Known Geothermal Resource area (KGRA), an area developed for geothermal energy production. Numerous roads and water pipelines have been built in the KGRA to support the steamfields. The Geysers steamfield includes the watersheds of Big Sulphur, Putah, and Kelsey creeks. The Geysers steamfield is vegetated with annual and native grasslands, chaparral, oak woodlands, mixed evergreen forest, and riparian woodland communities. Several special-status plant species occur on serpentine soils within the steamfield and around the hot springs in the steamfield area.

3. METHODS

LITERATURE REVIEW AND CONSULTATIONS

Information on the biology, distribution, taxonomy, legal status, and other aspects of the special-status plant species was obtained from documents on file in the library of Sycamore Environmental Consultants, Inc. (Sycamore Environmental). Standard references used for the taxonomy of plants and plant community descriptions included Abrams (1923-1960); Barbour and Major (1977); Hickman, ed. (1993); Holland (1986), Mason (1957); Munz (1959); and Skinner and Pavlik (1994).

A computerized search of the California Natural Diversity Data Base (CNDDDB/RareFind, 1 September 1995) was conducted for Healdsburg, Jintown, and The Geysers 7.5 minute United States Geological Survey (USGS) topographic quadrangles to determine if there were any known occurrences of state- or federal-listed species recorded from the Geysers steamfield. These reports are on file at the office of Harland Bartholomew & Associates, Inc. (HBA).

In addition to the CNDDDB/RareFind report, the following lists prepared by the California Department of Fish and Game (CDFG), Natural Diversity Data Base were reviewed:

- *Special Plants List* (CDFG, January 1996); and
- *Endangered, Threatened, and Rare Plants of California* (CDFG, January 1996).

Two letters, one in 1994 and the other in 1995, were sent by HBA to the U.S. Fish and Wildlife Service (USFWS), Ecological Services, Sacramento Field Office, requesting file data on special-status plant species that could occur in the project study area. The response letters are on file at the office of HBA.

Reference materials provided by HBA and Parsons Engineering Science (PES) included:

- Blue line aerial photographs of the project study area (1" = 500 ± 5%, June 1990);
- Blue line topographic maps with proposed project facilities prepared by PES (1" = 200' and 1" = 6000').

UNOCAL provided 1" = 200,' color topographic maps of the steamfield area. They also provided vegetation maps of the Big Sulphur Creek Leasehold area (no date).

Consultations were conducted on one or more occasions with Caitlin Bean, CDFG Region 3; Betty Guggolz, Milo-Baker Chapter of the California Native Plant Society (CNPS); and Dr. Charles Quibell, Professor of Botany, Sonoma State University.

Existing policies regarding natural resources were reviewed, including the Sonoma County Tree Ordinance (No. 4014, 13 June 1989).

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES EVALUATED

Special-Status Plant Species and Sensitive Natural Communities

A comprehensive list of special-status plants was compiled from the species listed in the USFWS 1995 letter and from the species that appeared on the CNDDDB/RareFind report. A pre-project meeting on 24 January 1994 was attended by the City, USFWS, CDFG, Sycamore Environmental, and HBA. Caitlin Bean of CDFG recommended that all CNPS List 4 species potentially occurring in the project study area be included in the species evaluated for this project. In addition, Ms. Bean requested that several other species of concern to CDFG also be included for evaluation in the EIR/EIS that were not currently recognized as a special-status plant species.

An initial list of special-status plant species was compiled in 1994 and was updated as new and revised listings became available from CDFG and the USFWS. From these data, a list was compiled (Table 1, *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum*) of 182 special-status plant species that needed to be surveyed and evaluated in the EIR/EIS. A brief discussion of each special-status plant species is presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d).

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Descriptions of sensitive natural communities are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d). The list of sensitive natural communities was derived from the CNDDDB/RareFind report and from site visits.

CNPS

Sycamore Environmental provided Betty Guggolz with Project Overview maps (1" = 6000') that presented overviews of all the project alternatives. Ms. Guggolz mapped locations of Sonoma County sensitive plant records. Her personal list of sensitive plant records was compiled from plant lists prepared by historical and contemporary botanists and included CNPS-listed plants, and state- and federal-listed endangered, threatened, and rare species. Sycamore Environmental reviewed the locations of sensitive plant records mapped by Betty Guggolz. Her location data were incorporated into the summaries of known locations of special-status plant species to determine the total special-status plant species populations within the project study area (Section 4).

Protected Tree Resources

The Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh over nine inches (diameter breast height, defined as 4.5 feet above ground level) of the following species are protected: big-leaf maple (*Acer macrophyllum*), blue oak (*Q. douglasii*), California black oak (*Quercus kelloggii*), coast live oak (*Q. agrifolia*), coast redwood (*Sequoia sempervirens*), interior live oak (*Q. wislizenii*), Pacific madrone (*Arbutus menziesii*), oracle oak (*Q. morehus*), Oregon oak (*Q. garryana*), valley oak (*Q. lobata*), and California bay (*Umbellularia californica*). The ordinance also protects hybrids of these species.

FIELD SURVEYS

Botanists conducted field surveys to identify locations of special-status plant species and sensitive natural communities, to map plant communities, and to assist in the collection of data necessary for California Wildlife Habitat Relationships System (CWHR) analyses. Surveys in the Geysers steamfield were conducted from 18 July to 21 July 1995 by R. John Little, Ph.D., Theresa Fortner Ward, Susan Holve-Hensill, and Ellen Piazza.

Surveys consisted of walking 60-foot wide transects along each proposed distribution pipeline corridor, and compiling a comprehensive plant species list. Surveys were also conducted in the area of the proposed water storage tanks. Botanical surveys of the Geysers steamfield area were facilitated through the kind assistance of UNOCAL staff.

Botanical Surveys

Prior to conducting botanical surveys, botanists compiled a field notebook that included key characteristics, descriptions, habitat notes, and illustrations for each of 182 special-status species that potentially occur in the project study area. CNDDDB/RareFind overlays were obtained from CDFG for the Camp Meeker, Cotati, Glen Ellen, Novato, Petaluma, Petaluma River, Point Reyes NE, Sebastopol, Two Rock, Sears Point, and Valley Ford USGS quadrangles. These quadrangles cover the entire South County, West County, and Sebastopol study areas. All CNDDDB/RareFind occurrences for each quad were displayed on the overlays. The overlays were used to identify known populations of special-status plants occurring on or near the proposed Geysers steamfield.

Plants that could not be identified in the field were collected for later identification. Voucher specimens were collected for most native species observed in the field, a process recommended by the California Botanical Society (Ferren *et al.*, 1995). Voucher specimens were also collected for many non-native species. These voucher specimens were processed in accordance with standard herbarium techniques (Lawrence, 1951; Radford *et al.*, 1974) and are maintained for reference in the Herbarium located at the

office of Sycamore Environmental, Sacramento, CA. Duplicate specimens will be donated to Sonoma State University and the University of California, Berkeley.

During the pre-project meeting on 24 January 1994, Bill Cox of CDFG requested that separate plant species lists be prepared for each project component, to which the City agreed. Therefore, a plant species list was compiled for all species identified within the Geysers steamfield component (Appendix A). Taxa noted in Appendix A as "sp." had insufficient material on collected specimens or available in the field to make a determination to species. Records of all species found in the project study area were managed and analyzed with Microsoft Access, a relational database.

Plant Community Mapping

Plant communities were mapped in the office from vegetation maps provided by UNOCAL (1' = 1,000"). The vegetation maps provided were digitized by Sycamore Environmental. Plant community acreages were calculated by PES by overlaying the proposed water storage tanks and distribution pipelines on the digitized basemaps.

Names of plant communities were based on community descriptions by Holland (1986) and Shuford and Timossi (1989). A comparison of the community descriptions used by Sycamore Environmental for the Santa Rosa EIR/EIS (HBA, 1996b), and the descriptions used by Holland (1986) and Shuford and Timossi (1989) are presented in the *Special-Status Plant Species and Sensitive Natural Communities Technical Memorandum* (Sycamore Environmental, 1996d). Plant communities occurring in the Geysers steamfield study area are described in detail in Section 4 of this document.

FLORISTIC SUMMARY

Botanical surveys within the Geysers steamfield consisted of evaluating narrow, linear corridors. A floristic analysis, such as Sycamore Environmental performed for the *Agricultural Irrigation and Reservoir* technical memoranda (Sycamore Environmental, 1996a, c), was not conducted for the Geysers steamfield component. This is due to the fact that the Geysers component involved an evaluation of narrow linear features which do not lend themselves to meaningful floristic comparisons. A summary of the Geysers steamfield flora is presented in Section 4, and a list of species collected is presented in Appendix A.

CALCULATION OF AREA OF IMPACT

Acreages of plant communities were calculated by HBA.

4. RESULTS

VEGETATION

The plant communities identified and mapped within the Geysers steamfield component include chaparral, canyon live oak series, foothill pine series, knobcone pine, McNab cypress manzanita, mixed riparian, oak-bay-madrone woodland, and oak woodland. Plant species lists for the Geysers steamfield are presented in Appendix A. Acreages of plant communities are presented in Table 4-1.

Vegetation in the Geysers well-field area consists of a mosaic of plant communities. Plant communities vary with slope aspect, elevation, substrate, and moisture.

Many of the proposed pipelines within the Geysers steamfield are located within the right-of-way of existing well-field pipelines and roads. The dominant vegetation type along the right-of-ways was annual grassland. These areas have been hydroseeded with various grass seed mixtures after the existing pipelines were constructed (Agricultural Development & Control, 1972). Dominant grasses in the right-of-ways included broomsedge bluestem (*Andropogon virginicus* var. *virginicus*), hedgehog dogtail (*Cynosurus echinatus*), bromes (*Bromus hordeaceus*, *B. diandrus*, and *B. rubens*), and orchard grass (*Dactylis glomerata*). Other herbaceous species common along the existing pipelines included introduced species such as bur-chervil (*Anthriscus caucalis*), Italian thistle (*Carduus pycnocephalus*), rose clover (*Trifolium hirtum*), and yellow star thistle (*Centaurea solstitialis*); and native species such as Monterey centaury (*Centaureum muehlenbergii*) and lupines (*Lupinus albifrons* var. *albifrons* and *L. nanus*).

Four types of chaparral occur in the Geysers well-field area: chamise chaparral, manzanita chaparral, mixed chaparral, and serpentine chaparral. These chaparral communities intergrade within the study area and are dominated by a mixture of chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos stanfordiana* ssp. *stanfordiana*) toyon (*Heteromeles arbutifolia*), and leather oak shrubs. Associated shrub species that occur in these chaparral communities include various species of ceanothus (*Ceanothus cuneatus* var. *cuneatus* and *C. integerrimus*), California coffeeberry (*Rhamnus californica* ssp. *californica*), coyote brush (*Baccharis pilularis*), pickeringia (*Pickeringia montana* var. *montana*), and western poison-oak (*Toxicodendron diversilobum*). Herbaceous species occurring in the chaparral communities included goldwire (*Hypericum concinnum*), lomatium (*Lomatium dasycarpum* and *L. californicus*), and annual grasses.

Table 4-1.

Acres of plant communities and other mapped
 features in the Geysers steamfield.

Plant community	Geysers steamfield (acres)
Oak-Bay-Madrone woodland	29.77
Oak woodland	15.32
Chaparral	13.8
Knobcone pine	3.82
Foothill pine series	3.23
Canyon live oak series	2.25
McNab cypress series	0.72
Mixed riparian	0.34
Total	69.25

Chamise chaparral, which is dominated by chamise shrubs, was the dominant type of chaparral throughout the study area. This community type is dominated by chamise but Stanford manzanita and buck brush (*Ceanothus cuneatus* var. *cuneatus*) are occasionally intermixed within the otherwise monotypic stands of chamise.

Manzanita chaparral, which is dominated by one or more species of manzanita shrubs, is found on deeper soils and at higher elevations than chamise chaparral (Hanes, 1977). Manzanita chaparral was common within the study area.

Mixed chaparral occurs on mesic sites and usually intergrades into mixed evergreen forest on moist, shady slopes or in draws (Shuford and Timossi, 1989). Mixed chaparral consists of an almost even mix of interior live oak, manzanita, chamise, and buck brush.

Serpentine chaparral is an open, low type of chaparral associated with serpentine soils (Hanes, 1977). The dominant shrubs in this community included chamise, toyon, and leather oak. Tree species associated with this community include scrub oak and gray pine. Serpentine soils have very low levels of important nutrients such as calcium, phosphorous, and nitrogen and high levels of magnesium, chromium, and nickel (Shuford and Timossi, 1989; Kozloff and Beidleman, 1994). Plant species occurring on these soils exhibit a number of growth responses to the combination of these stressful edaphic factors including xeromorphic foliage, dwarfing, and an increase in the size of the root system (Kruckeberg, 1984).

The Geysers steamfield is located in the watersheds of Big Sulphur, Putah, and Kelsey creeks. Proposed distribution pipelines cross creeks and drainages in several places. Vegetation along the creeks and drainages was mapped as riparian vegetation. The dominant tree species in these riparian communities were arroyo and red willows (*Salix lasiolepis* and *S. laevigata*), big-leaf maple, California bay, California buckeye (*Aesculus californica*), and white alder (*Alnus rhombifolia*). Understory shrub species included blue elderberry (*Sambucus mexicana*), California and Himalayan blackberry (*Rubus discolor* and *R. ursinus*), and spice bush (*Calycanthus occidentalis*). Herbaceous species associated with these riparian communities included common monkey flower (*Mimulus guttatus*), nutsedge (*Cyperus eragrostis* and *C. esculentus*), rushes such as spreading rush (*Juncus patens*) and Bolander's rush (*Juncus bolanderi*); ferns such as California maidenhair fern (*Adiantum jordanii*) and California polypody (*Polypodium californicum*); and grasses such as annual beard grass (*Polypogon monspeliensis*).

Oak-bay-madrone woodlands occur on many of the north facing slopes in the Geysers Well-field area. Dominant tree species were California bay; Pacific madrone; and California black, canyon live, interior live, and Oregon oaks. Other tree species are also interspersed within this community such as California buckeye, California nutmeg (*Torreya californica*), and gray pine (*Pinus sabiniana*). The understory of the Oak-bay-madrone woodlands were dominated by shrub species such as California wild rose (*Rosa californica*), California coffeeberry, manzanita, and western poison oak.

Four plant communities occur at the Geysers steamfield that do not occur in any other component. These include the Canyon live oak series, Foothill pine series, Knobcone pine, and McNab cypress manzanita. In the Canyon live oak series (Sawyer and Keeler-Wolf, 1995), Canyon live oak (*Quercus chrysolepis*) is the sole or dominant species in the tree canopy. Associated species can include big-leaf maple, black oak, California bay, Douglas-fir (*Pseudotsuga menziesii*), incense-cedar (*Calocedrus decurrens*), Pacific madrone, ponderosa pine (*Pinus ponderosa*), tan oak (*Lithocarpus densiflora*), and/or white fir (*Abies concolor*). The trees are usually less than 90 feet tall with a continuous canopy. Shrubs are infrequent and the ground layer sparse or absent.

In the Foothill pine series (Sawyer and Keeler-Wolf, 1995), gray (foothill) pine is the sole or dominant species in the tree canopy. Gray pine may also occur as an emergent tree over a shrub canopy. Associated species can include birch-leaf mountain-mahogany (*Cercocarpus betuloides*), coffeeberries (*Rhamnus* spp.), chamise, leather oak, manzanitas (*Arctostaphylos* spp.), scrub oak (*Quercus berberidifolia*), and/or buck brush. The trees are usually less than 60 feet tall in an open canopy. Shrubs are common or frequent and the ground layer sparse or grassy.

In the Knobcone pine series (Sawyer and Keeler-Wolf, 1995), Knobcone (*Pinus attenuata*) is the sole or dominant species in the tree canopy. Associated species can include Canyon live oak, Coulter pine (*Pinus coulteri*), gray pine, interior live oak,

lodgepole pine (*Pinus contorta*), and/or western white pine (*Pinus monticola*). The trees are usually less than 75 feet tall in a continuous, intermittent, or open canopy. Shrubs are infrequent or continuous and the ground layer sparse.

In the McNab cypress series (Sawyer and Keeler-Wolf, 1995), McNab cypress is the sole or dominant species in the tree or shrub canopy. Blue oak, foothill pine, interior live oak, knobcone pine, and/or Sargent cypress (*Cupressus sargentii*) may be present. The trees are usually less than 30 feet tall in a continuous, intermittent, or open canopy. Shrubs are infrequent or common and the ground layer sparse.

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES

Historic Records

Historical information on the potential presence of special-status plant species in the pipeline study area was derived from CNDDDB/RareFind records (1 September 1995), and through consultations with the USFWS and Betty Guggolz. Historic records for the Geysers steamfield area are discussed below.

The Geysers steamfield is located on The Geysers 7.5 minute USGS quadrangle. There were 16 records for 6 plant species on the CNDDDB/RareFind report for the Geysers steamfield. There were no sensitive communities records on the CNDDDB/RareFind report on the Geysers steamfield quadrangles. Records for the following six special-status species occur along proposed pipeline corridors within the Geysers steamfield area.

- Brandegee's eriastrum (*Eriastrum brandegeae*), one record
- Colusa layia (*Layia septentrionalis*) one record
- Geysers dichanthelium (*Dichanthelium lanuginosum* var. *thermale*), six records
- Glandular western flax (*Hesperolinon adenophyllum*), one record
- Snow Mountain buckwheat (*Eriogonum nervulosum*), one record
- Socrates' mine jewel flower (*Streptanthus brachiatus* ssp. *brachiatus*), six records.

Betty Guggolz (Personal communication, 1995) mapped locations of nine special-status plant species in the Geysers steamfield, as follows:

- Cobb Mountain lupine (*Lupinus sericatus*)
- Four-petaled pussypaws (*Calyptridium quadripetalum*)
- Freed's jewel-flower (*Streptanthus brachiatus* ssp. *hoffmanii*)
- Geyser's Dichanthelium (*Dichanthelium lanuginosum* var. *thermale*)
- Mt. St. Helena morning-glory (*Calystegia collina* ssp. *oxyphylla*)
- Serpentine milkweed (*Asclepias solanoana*)

- Snow Mountain buckwheat (*Eriogonum nervulosum*)
- Socrates Mine jewel-flower (*Streptanthus brachiatus* ssp. *brachiatus*)
- St. Helena fawn lily (*Erythronium helenae*).

Field Records

Special-Status Plant Species

Two special-status plant species were observed in the Geysers steamfield during field surveys (Table 4-2). Each of these species was identified to species of subspecies after they were collected in the field. These consisted of the following:

- Two populations of green monardella (*Monardella viridis* ssp. *viridis*, CNPS List 4);
- Two Rincon Ridge ceanothus shrubs (*Ceanothus confusus*, CNPS List 1B); and
- One population of serpentine bird's beak (*Cordylanthus tenuis* ssp. *brunneus*, CNPS List 4).

The populations of green monardella were observed along pipeline corridors within the steamfield area. Each population consisted of 2-3 plants in an area less than 2 ft x 2 ft. The two Rincon Ridge ceanothus were observed along pipeline corridors within the steamfield area in chaparral. The population of serpentine bird's beak was observed along a pipeline corridor within the steamfield area. The population consisted of less than five plants in an area approximately 2 ft x 2 ft.

In addition to the populations observed in the Geysers steamfield, Sycamore Environmental botanists observed one previously unreported population of serpentine bird's beak along Pine Flat Road. This population was discussed in *Appendix C Wastewater Transmission Pipeline Botanical Resources* (Sycamore Environmental, 1996c).

Sensitive Natural Communities

Three sensitive natural communities that were identified in the Geysers steamfield component include CLO/ILO woodland and riparian habitat (Table 4-3). Acreages of plant communities located in the Geysers steamfield are presented in Table 4-1.

Table 4-2.

Records of special-status species in the Geysers steamfield component.

	COUNTIES	UC ^a	ROPA ^b	CNDDDB ^c	CNPS ^d	EIR/EIS ^e	Total historic and current populations ^f	% Increase over previous records ^g
Rincon Ridge ceanothus (CNPS List 1B)	MARIN	*	*	0	0	0	0	
<i>Ceanothus confusus</i>	SONOMA	*	*	8	0	2	10	
	Totals	*	*	8	0	2	10	25% (2/8)
Serpentine bird's beak (CNPS List 4)	MARIN	0	*	0	0	0	0	
<i>Cordylanthus tenuis</i> ssp. <i>brunneus</i>	SONOMA	4	*	0	0	2	6	
	Totals	4	*	0	0	2	6	50% (2/4)
Green monardella (CNPS List 4)	MARIN	0	*	0	0	0	0	
<i>Monardella viridis</i> ssp. <i>viridis</i>	SONOMA	3	*	0	0	2	5	
	Totals	3	*	0	0	2	5	66% (2/3)

^a Herbarium at University of California, Berkeley. * Information unavailable for DEIR.

^b Herbarium at Sonoma State University, Rohnert Park. * Information unavailable for DEIR.

^c CNDDDB/RareFind records.

^d Represents known records from the project study area (Betty Guggolz, Personal communication 1995).

^e Populations observed in the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area.

^f Based on total known populations.

^g New records found during 1994-1995 surveys by Sycamore Environmental compared to historic records in Sonoma and Marin counties. Locations of historic records may or may not be extant.

Table 4-3.

Acreages of sensitive natural communities.

Sensitive Community	Geysers steamfield
Mixed riparian	0.34
Total riparian habitat	0.34
Oak woodland	15.32
Canyon live oak	2.25
Total woodland habitat	17.57
Total acres of sensitive natural communities	17.91

Protected Tree Resources

Ten of the eleven protected tree species were observed in the Geysers steamfield. These tree species are protected under Sonoma County Tree Ordinance. The following protected tree species were observed in the Geysers steamfield:

- Big-leaf maple
- Blue oak
- California bay
- California black oak
- Coast live oak
- Coast redwood
- Interior live oak
- Oregon oak
- Pacific madrone
- Valley oak

FLORISTIC SUMMARY

Floristic data of vascular plants from the Geysers steamfield were combined to determine the total number of species in each category. A total of 55 families, 123 genera, and 169 species comprise the Geysers steamfield flora (Table 4-4). California native species account for 77.5% (131/169) and introduced species account for 20.7% (35/169) of species identified in the Geysers steamfield. Green monardella and serpentine bird's beak were the two special-status plant species found in the Geysers steamfield.

Table 4-4.

Summary of the Geysers steamfield flora.

Category	Geysers Steamfield Flora
Families	55
Genera	123
Species ^a	169
Native Species ^a	131
% ^b	77.5%
Introduced Species ^a	35
% ^b	20.7%
Special-Status Plant Species ^c	3

^a Includes subspecies and varieties. The numbers of native and introduced species do not include collections that were identifiable only to genus. Thus, the number shown for native and introduced species is a few less than the total species.

^b Since a few collections were identifiable only to genus, the percent native and introduced calculations are based on the ratio of total native and introduced to total species.

^c See Table 4-2.

5. IMPACT ANALYSIS

INTRODUCTION

This section discusses the methods and the significance criteria used to evaluate impacts and describes botanical resource impacts expected to result from implementation of the proposed project.

METHODS: DETERMINATION OF SIGNIFICANCE OF IMPACTS

Impacts to biological resources were evaluated for significance based on legal protection; local, state, and federal agency policies; and documented resource scarcity and sensitivity.

State and Federal Statutes

State and Federal statutes pertinent to botanical resources that need to be evaluated in an EIR/ EIS include:

- Federal Endangered Species Act (16 U.S.C. 1531-1543).
- California Environmental Quality Act (P.R.C. 21000 et seq.).
- California Endangered Species Act (California Fish and Game Code 2050 et seq.)
- Native Plant Protection Act (California Fish and Game Code 1900-1913).

Federal Endangered Species Act

The Federal Endangered Species Act defines “take” (Section 9) and prohibits “taking” of a listed endangered or threatened species (16 USC 1532, 50 CFR 17.3). If a federally listed species could be harmed by a project, a Section 7 or 10 consultation must be initiated, and an Incidental Take Permit must be obtained (16 USC 1539, 50 CFR 13).

California Fish and Game Code

The California Fish and Game Code defines “take” (Section 86) and prohibits “taking” of a species listed as threatened or endangered under the California Endangered Species Act (California Fish and Game Code Section 2080) or otherwise fully protected (as defined in California Fish and Game Code Sections 3511, 4700, and 5050).

The CDFG also regulates activities that may impact streambeds or other wetland areas. Division 2, Chapter 6, Section 1601 of the Fish and Game Code states that

“...general plans sufficient to indicate the nature of a project for construction by, or on the behalf of, any governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or will use material from the streambeds designated by the department, shall be submitted to the department.”

The CDFG has stated that their jurisdiction is any wetland area that is within the 100-year floodplain. Completion of a Section 1601-03 Streambed Alteration Agreement with the CDFG is required before any work begins that will affect wetland areas within a 100-year floodplain.

Other Special-Status Plant Species Classifications

California species of special concern and species listed on California Native Plant Society (CNPS) lists 1B and 2, 3, and 4 were considered for this document.

Sensitive Natural Communities

Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species. Sensitive natural communities occurring in the Geysers steamfield include plant communities associated with native grassland, oak woodland, and riparian habitat.

Oak Woodland

Oak woodlands provide habitat for a wide diversity of wildlife. Thirty-five percent of California's mammal species use oak woodlands for food and shelter (Pavlik *et al.*, 1991). Oaks have figured prominently in the history of California, providing food, fuel, and tools to both native Americans and pioneers. Oak woodlands are a significant natural resource providing erosion and landslide control, nutrient cycling, ground water recharge, air and water quality, recreation, wood production, livestock grazing, aesthetic qualities, and wildlife habitat (Hagen, 1995). Although oak woodlands cover millions of acres throughout California, there is widespread concern about native oaks. An estimated 14,000 acres are lost each year (Hagen, 1995). Threats to oaks include urbanization, conversion of oak woodlands to agriculture, and fragmentation of natural habitats in rural areas.

Riparian Habitat

Riparian habitats are very important for the survival of wildlife providing food, shelter, and serving as migration and dispersal corridors (Sands, 1980; Warner and

Hendrix, 1984). California has rich mammal, reptile, and amphibian faunas; many species of which are dependent upon riparian habitats. One quarter of California's mammals are limited to or are closely dependent upon riparian habitats. Half of the reptiles and 75% of the amphibians in California are closely associated with riparian systems. Through its influence on water quality, temperature, and nutrients; riparian vegetation determines the structure and functioning of stream ecosystems and fish communities. Most of California's original riparian vegetation has been lost. Only 15% of the riparian habitat in the Central Valley remains, and 75% of what remains has been degraded (Warner and Hendrix, 1984).

Protected Tree Resources

Sonoma County Tree Ordinance (No. 4014, 13 June 1989) lists 11 protected tree species. Trees with a dbh of nine inches or greater of the following species are protected: big-leaf maple, black oak, blue oak, California bay, coast live oak, interior live oak, Pacific madrone, oracle oak, Oregon oak, coast redwood, and valley oak. The ordinance also protects hybrids of these species.

SIGNIFICANCE CRITERIA

The following significance criteria were used to evaluate impacts on botanical resources:

- Any loss of the habitat, individuals, or populations of federally listed endangered, threatened, or proposed plant species, or plant species that are federal candidates for listing.
- Any loss of the habitat, individuals, or populations of state listed endangered, threatened, rare, or proposed plant species.
- Any loss of the habitat, individuals, or populations of species occurring on List 1B of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Loss of more than 15% of the known and historic populations in Sonoma and Marin counties of species occurring on List 2, 3, or 4 of the California Native Plant Society Inventory (Skinner and Pavlik, 1995).
- Any loss of sensitive plant communities, as defined by CDFG, or other communities of recognized regional importance.
- Any loss of riparian habitats.

IMPACTS OF THE PROPOSED PROJECT ALTERNATIVES

Short-term vegetation impacts result from construction activities that involve creation of dust, habitat alteration, temporary vegetation removal, etc. Long-term impacts result

when vegetation is permanently removed or destroyed, when land is cleared for construction, when special-status plant species are threatened, or when the integrity of a sensitive natural community is destroyed. Construction of temporary or permanent roads, dumping of trash or construction materials, dumping or removal of soil, and flooding or dewatering are examples of actions that can destroy the integrity of a sensitive natural community.

Short-term vegetation impacts associated with the proposed project would result from the construction of wastewater transmission lines to deliver reclaimed water to the Geysers steamfield recharge area. Although long-term impacts could result if vegetation were removed during construction and not replaced due to the need to keep an area free of vegetation, most of the pipeline corridors are situated in the right-of way of existing access roads and the long-term impacts are expected to be minimal.

Plant Communities

Acres of plant communities potentially affected by construction and maintenance of the proposed Geysers steamfield component are presented in Table 4-1.

Special-Status Plant Species

Selection of the Geysers steamfield component could affect two populations of Rincon Ridge ceanothus. Two populations represent 20% (2/10) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, a significant impact would occur if two populations (15% of 10 historic and current records) were affected.

Selection of the Geysers steamfield component could affect two populations of serpentine bird's beak. Two populations represent 33% (2/6) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, a significant impact would occur if one population (15% of 6 historic and current records) were affected.

Selection of the Geysers steamfield component could affect two populations of green monardella. Two populations represent 40% (2/5) of all historic and current populations in Sonoma and Marin counties. In accordance with the significance criteria, a significant impact would occur if one population (15% of 5 historic and current records) were affected.

The total loss of all populations from all project components will need to be considered in order to compare impacts among various project alternatives.

Protected Tree Resources

Section 4 of this document presents a list of the protected tree species that occur in the Geysers steamfield study area. The surveys conducted for this project determined the presence or absence of protected tree resources, but did not attempt to quantify the numbers of such trees present. The number of trees subject to the Sonoma County Tree Ordinance will be determined during site-specific, pre-construction surveys.

Sensitive Natural Communities

Table 4-3 presents acreages of sensitive natural communities potentially affected by implementation of the Geysers steamfield component. In accordance with the significance criteria, any loss of sensitive communities is considered significant.

Mitigation Measures Incorporated into Project Design

Mitigation measures are incorporated in project design that will avoid impacts to sensitive botanical resources including species and communities (HBA, 1996c). These mitigation measures include the provision that sensitive biological resources along pipelines, pump stations, and equipment staging areas will be avoided.

If sensitive botanical resources cannot be avoided through project design or during construction, specific measures will be implemented (HBA, 1996c): all mitigation measures of the Sonoma and Marin County Tree ordinances will be met; if avoidance of a sensitive plant species is not feasible, a qualified botanist will salvage individual specimens or seeds and revegetate following construction; where avoidance of other sensitive resources, excluding species protected under FESA or CESA, is not feasible, the affected habitat will be replaced at a minimum 3:1 ratio.

6. REPORT PREPARERS

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7. LITERATURE CITED AND PERSONAL COMMUNICATIONS

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APPENDIX A.

Plant Species List for Geysers Steamfield Component.

Appendix A. Geysers Steamfield Plant Species List.

Family	Species	Common Name	N/ I*
FABACEAE	Acacia sp.	Acacia	I
ACERACEAE	Acer macrophyllum	Big-leaf maple	N
ASTERACEAE	Achillea millefolium	Yarrow	N
ROSACEAE	Adenostoma fasciculatum	Chamise	N
PTERIDACEAE	Adiantum aleuticum	Five-finger fern	N
PTERIDACEAE	Adiantum jordanii	California maiden-hair	N
HIPPOCASTANACEAE	Aesculus californica	California buckeye	N
POACEAE	Aira caryophylla	Silver European hairgrass	I
BETULACEAE	Alnus rhombifolia	White alder	N
POACEAE	Andropogon virginicus var. virginicus	Broomsedge bluestem	I
APIACEAE	Angelica californica		N
APIACEAE	Anthriscus caucalis	Bur-chervil	I
SCROPHULARIACEAE	Antirrhinum comutum		N
ERICACEAE	Arbutus menziesii	Pacific madrone	N
ERICACEAE	Arctostaphylos glauca	Manzanita	N
ERICACEAE	Arctostaphylos stanfordiana ssp. stanfordiana	Stanford manzanita	N
ERICACEAE	Arctostaphylos viscida ssp. pulchella		N
ASTERACEAE	Artemisia douglasiana	Mugwort	N
POACEAE	Avena barbata	Slender wild oats	I
POACEAE	Avena fatua	Wild oat	I
ASTERACEAE	Baccharis pilularis	Coyote brush	N
BRASSICACEAE	Brassica rapa	Field mustard	I
ASTERACEAE	Brickellia californica	Brickellia	N
LILIACEAE	Brodiaea californica var. californica	California brodiaea	N
LILIACEAE	Brodiaea elegans ssp. elegans	Harvest brodiaea	N
POACEAE	Bromus carinatus var. carinatus	California brome	N
POACEAE	Bromus diandrus	Ripgut grass	I
POACEAE	Bromus hordeaceus	Soft chess brome	I
POACEAE	Bromus madritensis ssp. rubens	Footail chess	I
CALYCANTHACEAE	Calycanthus occidentalis	Spicebush	N

Family	Species	Common Name	N/ I*
CONVOLVULACEAE	<i>Calystegia purpurata</i> ssp. <i>purpurata</i>	Western morning-glory	N
ASTERACEAE	<i>Carduus pycnocephalus</i>	Italian thistle	I
SCROPHULARIACEAE	<i>Castilleja foliolosa</i>	Woolly Indian paintbrush	N
RHAMNACEAE	<i>Ceanothus confusus</i>	Rincon Ridge ceanothus	N
RHAMNACEAE	<i>Ceanothus cuneatus</i> var. <i>cuneatus</i>	Buck brush	N
RHAMNACEAE	<i>Ceanothus integerrimus</i>	Deer brush	N
RHAMNACEAE	<i>Ceanothus jepsonii</i>	Musk brush	N
RHAMNACEAE	<i>Ceanothus oliganthus</i>		N
ASTERACEAE	<i>Centaurea calcitrapa</i>	Purple star-thistle	I
ASTERACEAE	<i>Centaurea solstitialis</i>	Yellow star-thistle	I
GENTIANACEAE	<i>Centaureum muhlenbergii</i>	Monterey centaury	N
ROSACEAE	<i>Cercocarpus betuloides</i> var. <i>betuloides</i>	Mountain mahogany	N
CHENOPODIACEAE	<i>Chenopodium botrys</i>	Jerusalem oak	I
LILIACEAE	<i>Chlorogalum pomeridianum</i> var. <i>pomeridianum</i>	Soap plant	N
ASTERACEAE	<i>Cirsium occidentale</i>		N
ASTERACEAE	<i>Cirsium vulgare</i>	Bull thistle	I
PORTULACACEAE	<i>Claytonia parviflora</i>	Miner's lettuce	N
PORTULACACEAE	<i>Claytonia perfoliata</i> ssp. <i>mexicana</i>	Miner's lettuce	N
RANUNCULACEAE	<i>Clematis ligusticifolia</i>	Virgin's bower	N
CONVOLVULACEAE	<i>Convolvulus arvensis</i>	Bindweed	I
SCROPHULARIACEAE	<i>Cordylanthus tenuis</i> ssp. <i>brunneus</i>	Serpentine bird's-beak	N
CUPRESSACEAE	<i>Cupressus macnabiana</i>	McNab cypress	N
POACEAE	<i>Cynosurus echinatus</i>	Hedgehog dogtail	I
CYPERACEAE	<i>Cyperus eragrostis</i>	Nutsedge	N
CYPERACEAE	<i>Cyperus esculentus</i>	Nutsedge	N
POACEAE	<i>Dactylis glomerata</i>	Orchard grass	I
CRASSULACEAE	<i>Dudleya cymosa</i>	Common dudleya	N
POACEAE	<i>Elymus glaucus</i>	Blue wildrye grass	N
POACEAE	<i>Elymus multisetus</i>	Big squinetail	N
EQUISETACEAE	<i>Equisetum laevigatum</i>	Smooth scouring rush	N
EUPHORBIACEAE	<i>Eremocarpus setigerus</i>	Dove weed	N
HYDROPHYLLACEAE	<i>Eriodictyon californicum</i>	Yerba santa	N
POLYGONACEAE	<i>Eriogonum luteolum</i> var. <i>luteolum</i>		N
POLYGONACEAE	<i>Eriogonum nudum</i> var. <i>nudum</i>	Buckwheat	N
ASTERACEAE	<i>Eriophyllum</i> sp.		N

Family	Species	Common Name	N/ I*
GERANIACEAE	<i>Erodium botrys</i>	Broadleaf filaree	I
PAPAVERACEAE	<i>Eschscholtzia californica</i>	California poppy	N
POACEAE	<i>Festuca arundinacea</i>	Tall fescue	I
POACEAE	<i>Festuca californica</i>	California fescue	N
POACEAE	<i>Festuca idahoensis</i>	Blue bunchgrass	N
ASTERACEAE	<i>Filago californica</i>	California fluffweed	N
OLEACEAE	<i>Fraxinus latifolia</i>	Oregon ash	N
RUBIACEAE	<i>Galium aparine</i>	Goose grass	N
GARRYACEAE	<i>Garrya fremontii</i>	Silk tassel bush	N
ASTERACEAE	<i>Gnaphalium palustre</i>	Lowland cudweed	N
ASTERACEAE	<i>Grindelia camporum</i>	Gumplant	N
ASTERACEAE	<i>Helenium bigelovii</i>	Sneezeweed	N
LINACEAE	<i>Hesperolinon micranthum</i>	Dwarf flax	N
LINACEAE	<i>Hesperolinon sparganium</i>		N
ROSACEAE	<i>Heteromeles arbutifolia</i>	Toyon	N
ASTERACEAE	<i>Hieracium albidum</i>	Hawkweed	N
ROSACEAE	<i>Holodiscus discolor</i>	Oceanspray	N
POACEAE	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	Hare barley	I
HYPERICACEAE	<i>Hypericum concinnum</i>	Gold-wire	N
JUNCACEAE	<i>Juncus balticus</i>	Baltic rush	N
JUNCACEAE	<i>Juncus effusus</i> var. <i>brunneus</i>	Common rush	N
JUNCACEAE	<i>Juncus patens</i>	Spreading rush	N
SCROPHULARIACEAE	<i>Keckiella lemmonii</i>		N
ASTERACEAE	<i>Lactuca serriola</i>	Prickly lettuce	I
FAGACEAE	<i>Lithocarpus densiflorus</i>	Tanbark oak	N
POACEAE	<i>Lolium multiflorum</i>	Italian ryegrass	I
POACEAE	<i>Lolium perenne</i>	Perennial ryegrass	I
CAPRIFOLIACEAE	<i>Lonicera hispidula</i> var. <i>vacillans</i>	Honeysuckle	N
FABACEAE	<i>Lotus corniculatus</i>	Birdfoot trefoil	I
FABACEAE	<i>Lotus crassifolius</i> var. <i>crassifolius</i>		N
FABACEAE	<i>Lotus purshianus</i> var. <i>purshianus</i>	Spanish lotus	N
FABACEAE	<i>Lupinus albus</i> var. <i>albus</i>	Silver lupine	N
ASTERACEAE	<i>Madia elegans</i>	Common madia	N
ASTERACEAE	<i>Madia gracilis</i>	Slender tarweed	N
ASTERACEAE	<i>Malacothrix floccifera</i>		N

Family	Species	Common Name	N/ I*
CUCURBITACEAE	<i>Marah fabaceus</i>	California man-root	N
POACEAE	<i>Melica californica</i>	California melic	N
POACEAE	<i>Melica torreyana</i>		N
SCROPHULARIACEAE	<i>Mimulus aurantiacus</i>	Sticky monkey-flower	N
SCROPHULARIACEAE	<i>Mimulus cardinalis</i>		N
LAMIACEAE	<i>Monardella villosa</i> ssp. <i>villosa</i>	Coyote-mint	N
LAMIACEAE	<i>Monardella viridis</i> ssp. <i>viridis</i>	Green monardella	N
HYDROPHYLLACEAE	<i>Nemophila menziesii</i> var. <i>atomaria</i>	Baby blue-eyes	N
PTERIDACEAE	<i>Pellaea andromedifolia</i>	Coffee fern	N
SCROPHULARIACEAE	<i>Penstemon heterophyllus</i> var. <i>heterophyllus</i>		N
PTERIDACEAE	<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	Goldback fern	N
POACEAE	<i>Phalaris</i> sp.	Canary grass	U
FABACEAE	<i>Pickeringia montana</i> var. <i>montana</i>	Pickeringia	N
PINACEAE	<i>Pinus attenuata</i>	Knobcone pine	N
PINACEAE	<i>Pinus sabiniana</i>	Gray pine	N
POLYGALACEAE	<i>Polygala californica</i>	Milkwort	N
POLYPODIACEAE	<i>Polypodium californicum</i>	California polypody	N
POACEAE	<i>Polypogon monspeliensis</i>	Annual beard grass	I
DRYOPTERIDACEAE	<i>Polystichum munitum</i>	Western sword fern	N
PINACEAE	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	N
DENNSTAEDTIACEAE	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	Bracken fern	N
FAGACEAE	<i>Quercus agrifolia</i> var. <i>agrifolia</i>	Coast live oak	N
FAGACEAE	<i>Quercus berberidifolia</i>	Scrub oak	N
FAGACEAE	<i>Quercus chrysolepis</i>	Canyon live oak	N
FAGACEAE	<i>Quercus douglasii</i>	Blue oak	N
FAGACEAE	<i>Quercus durata</i> var. <i>durata</i>	Leather oak	N
FAGACEAE	<i>Quercus kelloggii</i>	California black oak	N
FAGACEAE	<i>Quercus wislizenii</i> var. <i>wislizenii</i>	Interior live oak	N
RHAMNACEAE	<i>Rhamnus californica</i> ssp. <i>californica</i>	California coffeeberry	N
ANACARDIACEAE	<i>Rhus trilobata</i>	Skunkbrush	N
ROSACEAE	<i>Rosa californica</i>	California rose	N
ROSACEAE	<i>Rubus discolor</i>	Himalayan blackberry	I
ROSACEAE	<i>Rubus leucodermis</i>	Blackcap raspberry	N
ROSACEAE	<i>Rubus ursinus</i>	California blackberry	N
POLYGONACEAE	<i>Rumex pulcher</i>	Fiddle dock	I

Family	Species	Common Name	N/I*
SALICACEAE	<i>Salix exigua</i>	Narrow-leaved willow	N
SALICACEAE	<i>Salix laevigata</i>	Red willow	N
SALICACEAE	<i>Salix lasiolepis</i>	Arroyo willow	N
LAMIACEAE	<i>Salvia columbariae</i>		N
CAPRIFOLIACEAE	<i>Sambucus mexicana</i>	Blue elderberry	N
CARYOPHYLLACEAE	<i>Silene californica</i>	Indian pink	N
LAMIACEAE	<i>Stachys ajugoides</i> var. <i>rigida</i>	Hedge nettle	N
BRASSICACEAE	<i>Streptanthus brachiatus</i>	Jewel flower	N
CAPRIFOLIACEAE	<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	Snowberry	N
POACEAE	<i>Taeniatherum caput-medusae</i>	Medusahead	I
APIACEAE	<i>Torilis arvensis</i>	Japanese hedge-parsley	I
TAXACEAE	<i>Torreya californica</i>	California nutmeg	N
ANACARDIACEAE	<i>Toxicodendron diversilobum</i>	Western poison oak	N
ASTERACEAE	<i>Tragopogon porrifolius</i>	Oyster plant	I
FABACEAE	<i>Trifolium hirtum</i>	Rose clover	I
LILIACEAE	<i>Triteleia laxa</i>	Ithuriel's spear	N
TYPHACEAE	<i>Typha angustifolia</i>	Narrow-leaved cattail	N
TYPHACEAE	<i>Typha latifolia</i>	Broad-leaved cattail	N
LAURACEAE	<i>Umbellularia californica</i>	California bay	N
SCROPHULARIACEAE	<i>Verbascum thapsus</i>	Woolly mullein	I
VERBENACEAE	<i>Verbena lasiostachys</i> var. <i>scabrida</i>	Western verbena	N
FABACEAE	<i>Vicia ludoviciana</i> var. <i>ludoviciana</i>		N
FABACEAE	<i>Vicia villosa</i> ssp. <i>villosa</i>	Winter vetch	I
VIOLACEAE	<i>Viola lobata</i> ssp. <i>integrifolia</i>	Pine-violet	N
VITACEAE	<i>Vitis californica</i>	California wild grape	N
POACEAE	<i>Vulpia microstachys</i>		N
POACEAE	<i>Vulpia myuros</i>	Vulpia	I

*N = Native; I = Introduced (Non-native); U = Identifiable only to genus

**APPENDIX E - SPECIAL-STATUS PLANT
SPECIES AND SENSITIVE NATURAL
COMMUNITIES BOTANICAL RESOURCES**

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TABLES

Table 1. Summary of special-status plant species state, federal, and CNPS status and source.	5
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APPENDICES

Appendix A. Comparison of community classifications.	
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1. INTRODUCTION

The purpose of this technical memorandum is to provide information on special-status plant species and sensitive natural communities that occur or may occur within the Santa Rosa Subregional Long-Term Wastewater EIR/EIS project study area.

2. METHODS

LITERATURE REVIEW AND CONSULTATIONS

Information on the biology, distribution, taxonomy, legal status, and other aspects of the special-status plant species was obtained from documents on file in the library of Sycamore Environmental Consultants, Inc. (Sycamore Environmental). Standard references used for the taxonomy of plants and plant community descriptions included Abrams (1923-1960); Barbour and Major (1977); Hickman, ed. (1993); Holland (1986); Mason (1957); Munz (1959); and Skinner and Pavlik (1994).

A computerized search of the California Natural Diversity Data Base (CNDDB/RareFind, 1 September 1995) was conducted for the Camp Meeker, Cotati, Glen Ellen, Guerneville, Healdsburg, Jintown, Novato, Petaluma, Petaluma Point, Petaluma River, Point Reyes NE, Santa Rosa, Sears Point, Sebastopol, The Geysers, Two Rock, and Valley Ford 7.5-minute United States Geological Survey (USGS) topographic quadrangles to determine if there were any known occurrences of state- or federal-listed species recorded from the project study area. These reports are on file at Harland Bartholomew & Associates, Inc. (HBA), Sacramento, CA.

In addition to the CNDDB/RareFind report, the following lists prepared by the California Department of Fish and Game (CDFG), Natural Diversity Data Base, were reviewed:

- *Special Plants List* (CDFG, January 1996); and
- *Endangered, Threatened, and Rare Plants of California* (CDFG, January 1996).

Two letters, one in 1994 and the other in 1995, were sent by HBA to the U.S. Fish and Wildlife Service (USFWS), Ecological Services, Sacramento Field Office, requesting file data on special-status plant species that could occur in the project study area. The response letters are on file at the office of HBA.

Consultations were conducted on one or more occasions with Caitlin Bean, CDFG Region 3; Betty Guggolz, Milo-Baker Chapter of the California Native Plant Society (CNPS); and Dr. Charles Quibell, Sonoma State University.

SPECIAL-STATUS PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES EVALUATED

Special-Status Plant Species and Sensitive Natural Communities

A comprehensive list of special-status plants was compiled from the species listed in the USFWS 1995 letter and from the species that appeared on the CNDDDB/RareFind report. A pre-project meeting on 24 January 1994 was attended by the City, USFWS, CDFG, Sycamore Environmental, and HBA. Caitlin Bean of CDFG recommended that all CNPS List 4 species potentially occurring in the project study area be included in the species evaluated for this project. In addition, Ms. Bean requested that several other species of concern to CDFG also be included for evaluation in the EIR/EIS that were not currently recognized as a special-status plant species.

Descriptions of special-status plant species were primarily compiled from data contained in the CNPS electronic inventory (Skinner and Pavlik, 1995). Naming conventions follow *The Jepson Manual* (Hickman, ed., 1993). Since the USFWS uses taxonomic nomenclature that differs from names used in *The Jepson Manual*, both names are included in the species descriptions and the special-status plant species table. The current status of the special-status plant species is listed in Table 1.

The status of special-status plant species was derived from the 1995 USFWS letter, the *Special Plants List* (CDFG, January 1996); *Endangered and Threatened, and Rare Plants of California* (CDFG, January 1996); *Endangered and Threatened Wildlife and Plants* (USFWS, October 1995), *Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule* (USFWS, 28 February 1996), and Skinner and Pavlik (1995).

Some special-status plant species that appear on Table 1 are not described in Section C of this document because these species are considered to be synonyms of common taxa, or are too common to recognize as sensitive by CNPS.

Sensitive Natural Communities

A comprehensive list of sensitive natural communities that occur or may occur within the project study area was derived from the CNDDDB/RareFind report, knowledge of the project study area, and from site visits. Sensitive natural communities include rare communities, communities that are adversely affected by minimal disturbance, and communities that provide habitat for special-status plant or wildlife species.

Descriptions of the sensitive natural communities occurring in the project study area are presented in the Section 4 of this document. Descriptions of the sensitive natural communities were compiled from Holland (1986) and Shuford and Timossi (1989). The presence of sensitive natural communities in the project study area was determined from

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1994 and 1995 field work for this project. A comparison of the community descriptions used by Sycamore Environmental for the Santa Rosa EIR/EIS and the descriptions used by Holland and Shuford and Timossi are presented in Appendix A. A *Manual of California Vegetation* (Sawyer and Keeler-Wolf, 1995), a new treatment of California vegetative communities, became available in late 1995. Information in Sawyer and Keeler-Wolf (1995) was used to prepare several community descriptions in the Geysers Technical Memorandum (Sycamore Environmental, 1996d).

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Table 1.

Summary of special-status plant species state, federal, and CNPS status and
source.

Species	Common Name	State ^a	Federal ^b	CNPS ^c	Source ^d
<i>Abronia umbellata</i> ssp. <i>breviflora</i>	Pink sand-verbena	--	SC	1B	5
<i>Agrostis aristiglumis</i> (syn = <i>Agrostis microphylla</i>)	Awned bent grass	--	C	--	1
<i>Agrostis blasdalei</i> (Incl. <i>A. var. blasdalei</i> and <i>A. var. marinensis</i>)	Blasdale's bent grass	--	SC	1B	1,2,3,5
<i>Agrostis clivicola</i> var. <i>clivicola</i> (syn = <i>Agrostis densiflora</i>)	Coastal bluff bent grass	--	SC	--	1,4
<i>Agrostis clivicola</i> var. <i>punta-reyesensis</i> (syn = <i>Agrostis densiflora</i>)	Pt. Reyes bent grass	--	SC	--	1,2,4,5
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	Sonoma alopecurus	--	PE	1B	1,2,3,5
<i>Amsinckia lunaris</i>	Bent-flowered fiddleneck	--	--	4	4
<i>Antirrhinum subcordatum</i>	Dimorphic snapdragon	--	--	1B	2
<i>Antirrhinum virga</i>	Tall snapdragon	--	--	4	4
<i>Arabis blepharophylla</i>	Coast rock cress	--	--	4	4
<i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	Baker's manzanita	CR	SC	1B	1,2,3,5
<i>Arctostaphylos bakeri</i> ssp. <i>sublaevis</i>	The Cedars manzanita	--	--	1B	6
<i>Arctostaphylos canescens</i> ssp. <i>sonomensis</i>	Sonoma manzanita	--	--	1B	4
<i>Arctostaphylos densiflora</i>	Vine Hill manzanita	CE	SC	1B	1,2,3,5
<i>Arctostaphylos hispidula</i>	Howell's manzanita	--	--	4	4
<i>Arctostaphylos hookeri</i> ssp. <i>montana</i>	Mt. Tamalpais manzanita	--	SC	1B	1,2,3
<i>Arctostaphylos stanfordiana</i> ssp. <i>decumbens</i>	Rincon manzanita	--	--	1B	2
<i>Arctostaphylos stanfordiana</i> ssp. <i>raichei</i>	Raiche's manzanita	--	SC	1B	6
<i>Arctostaphylos virgata</i>	Marin manzanita	--	--	1B	5
<i>Asclepias solanoana</i>	Serpentine milkweed	--	--	4	6
<i>Aster lentus</i>	Suisun marsh aster	--	SC	1B	6
<i>Astragalus breweri</i>	Brewer's milk-vetch	--	--	4	4
<i>Astragalus clarianus</i>	Clara Hunt's milk-vetch	CT	PE	1B	1,2,3
<i>Astragalus clevelandii</i>	Cleveland's milk-vetch	--	--	4	4
<i>Astragalus rattanii</i> var. <i>rattanii</i>	Rattan's milk-vetch	--	--	4	6
<i>Astragalus tener</i> var. <i>tener</i>	Alkali milk-vetch	--	--	1B	2,5
<i>Blennosperma bakeri</i>	Sonoma sunshine	CE	FE	1B	1,2,3
<i>Blennosperma nanum</i> var. <i>robustum</i>	Pt. Reyes blennosperma	CR	SC	1B	1,3,5
<i>Calamagrostis bolanderi</i>	Bolander's reed grass	--	--	4	4
<i>Calamagrostis crassiglumis</i>	Thurber's reed grass	--	SC	2	1,3,5
<i>Calamagrostis ophitidis</i>	Serpentine reed grass	--	--	4	6

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Table 1 continued.

Species	Common Name	State ^a	Federal ^b	CNPS ^c	Source ^d
<i>Calandrinia breweri</i>	Brewer's calandrinia	--	--	4	6
<i>Calochortus raichei</i>	The Cedars fairy-lantern	--	SC	1B	1,3
<i>Calochortus tiburonensis</i>	Tiburon mariposa lily	CT	T	1B	1,3
<i>Calyptridium quadripetalum</i>	Four-petaled pussypaws	--	--	4	4
<i>Calystegia collina</i> ssp. <i>oxyphylla</i>	Mt. St. Helena morning-glory	--	SC	4	1,2,3
<i>Campanula californica</i>	Swamp harebell	--	SC	1B	1,2,3,5
<i>Cardamine pachystigma</i> var. <i>dissectifolia</i>	Dissected-leaf toothwort	--	--	3	6
<i>Carex albida</i>	White sedge	CE	PE	1B	1,2,3,5
<i>Carex californica</i>	California sedge	--	--	2	4
<i>Carex comosa</i>	Bristly sedge	--	--	2	6
<i>Castilleja leschkeana</i>	Pt. Reyes paintbrush	--	C*	--	1
<i>Castilleja neglecta</i> (C. <i>affinis</i> ssp. <i>neglecta</i>)	Tiburon Indian paintbrush	CT	Y	1B	1,3
<i>Castilleja uliginosa</i> (C. <i>miniata</i> ssp. <i>miniata</i>)	Pitkin Marsh Indian paintbrush	CE	SC	1A	1,2,3,5
<i>Ceanothus confusus</i>	Rincon Ridge ceanothus	--	SC	1B	1,2,3,5
<i>Ceanothus divergens</i>	Calistoga ceanothus	--	SC	1B	1,2,3,5
<i>Ceanothus foliosus</i> var. <i>vineatus</i>	Vine Hill ceanothus	--	SC	1B	1,3,5
<i>Ceanothus gloriosus</i> var. <i>gloriosus</i>	Point Reyes ceanothus	--	--	4	4
<i>Ceanothus gloriosus</i> var. <i>porrectus</i>	Mt. Vision ceanothus	--	SC	1B	1,3,5
<i>Ceanothus masonii</i>	Mason's ceanothus	CR	SC	1B	1,2,3,5
<i>Ceanothus sonomensis</i>	Sonoma ceanothus	--	SC	1B	1,2,3,5
<i>Chlorogalum pomeridianum</i> var. <i>minus</i>	Dwarf soaproot	--	--	1B	6
<i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	San Francisco Bay spineflower	--	SC	1B	6
<i>Chorizanthe cuspidata</i> var. <i>villosa</i>	Woolly-headed spineflower	--	--	1B	6
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	--	T	1B	6
<i>Chorizanthe valida</i>	Sonoma spineflower	CE	FE	1B	1,2,3
<i>Cirsium andrewsii</i>	Franciscan thistle	--	--	4	4
<i>Cirsium hydrophilum</i> var. <i>vaseyi</i>	Mt. Tamalpais thistle	--	SC	1B	1,3
<i>Clarkia concinna</i> ssp. <i>raichei</i>	Raiche's red ribbons; Tomales clarkia	--	SC	1B	1,3,5
<i>Clarkia imbricata</i>	Vine Hill clarkia	CE	PE	1B	1,2,3,5
<i>Collinsia corymbosa</i>	Round-headed chinese houses	--	--	1B	6
<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	Point Reyes bird's-beak	--	SC	1B	1,2,3,5
<i>Cordylanthus mollis</i> ssp. <i>mollis</i>	Soft bird's-beak	CR	PE	1B	1,2,3,5
<i>Cordylanthus tenuis</i> ssp. <i>brunneus</i>	Serpentine bird's-beak	--	--	4	6
<i>Cordylanthus tenuis</i> ssp. <i>capillaris</i>	Pennell's bird's-beak	CR	E	1B	1,2,3
<i>Cupressus goveniana</i> ssp. <i>pignata</i>	Pygmy cypress	--	SC	1B	1,3
<i>Cuscuta howelliana</i>	Bogg's Lake dodder	--	--	--	4
<i>Cypripedium californicum</i>	California lady's-slipper	--	--	4	4
<i>Cypripedium fasciculatum</i>	Clustered lady's-slipper	--	SC	4	4
<i>Cypripedium montanum</i>	Mountain lady's-slipper	--	--	4	4
<i>Delphinium bakeri</i>	Baker's larkspur	CR	C	1B	1,2,3,5
<i>Delphinium luteum</i>	Yellow larkspur	CR	C	1B	1,2,3,5

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Species	Common Name	State ¹	Federal ²	CNPS ³	Source ⁴
<i>Dichanthelium lanuginosum</i> var. <i>thermale</i> (<i>Panicum acuminatum</i> var. <i>acuminatum</i>)	Geyser's dichanthelium [panicum]	CE	SC	1B	3,5
<i>Dichondra occidentalis</i>	Western dichondra	--	--	4	4
<i>Dirca occidentalis</i>	Western leatherwood	--	--	1B	4
<i>Downingia pusilla</i>	Dwarf downingia	--	--	2	2
<i>Eleocharis parvula</i>	Small spikerush	--	--	4	4
<i>Elymus californicus</i>	California bottle-brush grass	--	--	4	4
<i>Eriastrum brandegeae</i>	Brandegee's eriastrum	--	SC	1B	6
<i>Erigeron angustatus</i>	Narrow-leaved daisy	--	--	1B	6
<i>Erigeron biolettii</i>	Streamside daisy	--	--	3	6
<i>Erigeron serpentinus</i>	Serpentine daisy	--	--	1B	6
<i>Erigeron supplex</i>	Supple daisy	--	SC	1B	1,3,4,5
<i>Eriogonum luteolum</i> var. <i>caninum</i>	Tiburon buckwheat	--	--	3	4
<i>Eriogonum nervulosum</i>	Snow Mountain buckwheat	--	SC	1B	1,2,3
<i>Eriogonum ternatum</i>	Ternate buckwheat	--	--	4	6
<i>Eryngium constancei</i>	Loch Lomond button celery	CE	FE	1B	2
<i>Erysimum franciscanum</i>	San Francisco wallflower	--	SC	4	1,3
<i>Erythronium helenae</i>	St. Helena fawn lily	--	--	4	6
<i>Fritillaria liliacea</i>	Fragrant fritillary	--	SC	1B	1,2,3,5
<i>Fritillaria purdyi</i>	Purdy's fritillary	--	--	4	4
<i>Gratiola heterosepala</i>	Bogg's Lake hedge-hyssop	CE	--	1B	6
<i>Grindelia maritima</i> (G. <i>hirsutula</i> var. <i>maritima</i>)	San Francisco gumplant	--	SC	1B	1,3,5
<i>Grindelia stricta</i> var. <i>angustifolia</i>	Marsh gumplant	--	--	4	6
<i>Gutierrezia californica</i>	California matchweed	--	--	--	1
<i>Helianthella castanea</i>	Diablo helianthella	--	SC	1B	2
<i>Helianthus exilis</i>	Serpentine sunflower	--	--	4	6
<i>Hemizonia congesta</i> ssp. <i>leucocephala</i>	Hayfield tarplant	--	--	3	4
<i>Hemizonia multicaulis</i> ssp. <i>multicaulis</i> (H. <i>congesta</i> ssp. <i>congesta</i>)	Seaside tarplant	--	SC	--	1,5
<i>Hemizonia multicaulis</i> ssp. <i>vernalis</i> (H. <i>congesta</i> ssp. <i>congesta</i>)	Tiburon tarplant	--	SC	--	1,5
<i>Hesperoxys sparsiflora</i> var. <i>brevifolia</i>	Short-leaved evax	--	--	4	6
<i>Hesperolinon adenophyllum</i>	Glandular western flax	--	SC	1B	2
<i>Hesperolinon bicarpellatum</i>	Two-carpellate western flax	--	SC	1B	1,3
<i>Hesperolinon congestum</i>	Marin western flax	CT	T	1B	1,2,3,5
<i>Holocarpha macradenia</i>	Santa Cruz tarplant	CE	C	1B	1,3
<i>Horkelia bolanderi</i>	Bolander's horkelia	--	SC	1B	2
<i>Horkelia cuneata</i> ssp. <i>sericea</i>	Kellogg's horkelia	--	SC	1B	1,3
<i>Horkelia marinensis</i>	Pt. Reyes horkelia	--	SC	1B	1,2,3,4
<i>Horkelia tenuiloba</i>	Thin-lobed horkelia	--	--	1B	4
<i>Lasthenia burkei</i>	Burke's goldfields	CE	FE	1B	1,2,3
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	Delta tule pea	--	SC	1B	5
<i>Layia carnosa</i>	Beach layia	CE	FE	1B	1,3

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Table 1 continued.

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<i>Layia septentrionalis</i>	Colusa layia	--	--	1B	2
<i>Legenere limosa</i>	Legenere	--	SC	1B	1,2,3,5
<i>Lessingia arachnoidea</i>	Crystal Springs lessingia	--	SC	1B	5
<i>Lessingia hololeuca</i>	Woolly-headed lessingia	--	--	3	6
<i>Lessingia micradenia</i> var. <i>micradenia</i>	Tamalpais lessingia	--	SC	1B	1,3
<i>Lilaeopsis masonii</i>	Mason's lilaeopsis	CR	SC	1B	5
<i>Lilium maritimum</i>	Coast lily	--	R	1B	1,3,4
<i>Lilium pardalinum</i> ssp. <i>pitkinense</i> (L. <i>pitkinense</i>)	Pitkin Marsh lily	CE	PE	1B	1,2,3,5
<i>Lilium rubescens</i>	Redwood lily	--	--	4	4
<i>Limnanthes douglasii</i> ssp. <i>sulphurea</i>	Point Reyes meadowfoam	CE	SC	1B	1,3
<i>Limnanthes vincularis</i>	Sebastopol meadowfoam	CE	FE	1B	1,2,3
<i>Linanthus acicularis</i>	Bristly linanthus	--	--	4	6
<i>Linanthus grandiflorus</i>	Large-flower linanthus	--	--	4	6
<i>Lomatium repostum</i>	Napa lomatium	--	--	4	4
<i>Lupinus eximius</i> (L. <i>arboreus</i> var. <i>eximius</i>)	San Mateo tree lupine	--	SC	3	6
<i>Lupinus sericatus</i>	Cobb Mountain lupine	--	--	1B	6
<i>Lupinus tidestromii</i> (Incl. L. <i>tidestromii</i> var. <i>layneae</i>)	Tidestrom's lupine	CE	FE	1B	1,3,5
<i>Madia nutans</i>	Nodding madia	--	--	4	4
<i>Micropus amphibolus</i>	Mt. Diablo cottonweed	--	--	4	4
<i>Microseris decipiens</i> (syn = <i>Stebbinsoseris decipiens</i>)	Santa Cruz microseris	--	SC	1B	1,3
<i>Monardella frutescens</i>	San Luis Obispo monardella	--	SC	1B	2,5
<i>Monardella undulata</i>	Curly-leaved monardella	--	--	4	6
<i>Monardella villosa</i> ssp. <i>globosa</i>	Robust monardella	--	--	1B	6
<i>Monardella viridus</i> ssp. <i>viridus</i>	Green monardella	--	--	4	4
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	Baker's navarretia	--	--	1B	2
<i>Navarretia leucocephala</i> ssp. <i>pauciflora</i>	Few-flowered navarretia	CT	PE	1B	2
<i>Navarretia leucocephala</i> ssp. <i>plieantha</i> (N. <i>plieantha</i>)	Many-flowered navarretia	CE	PE	1B	1,2,3,5
<i>Navarretia subuligera</i>	Awl-leaved navarretia	--	--	4	4
<i>Orobanche valida</i> ssp. <i>howellii</i>	Howell's broomrape	--	--	4	4
<i>Parvisedum leiocarpum</i>	Lake County stonecrop	CE	PE	1B	2
<i>Penstemon newberryi</i> var. <i>sonomensis</i>	Sonoma beardtongue	--	--	1B	4
<i>Pentachaeta bellidiflora</i>	White-rayed pentachaeta	CE	B	1B	5
<i>Perideridia gairdneri</i> ssp. <i>gairdneri</i>	Gairdner's yampah	--	SC	4	1,3,4,5
<i>Phacelia insularis</i> var. <i>continentis</i>	North Coast phacelia	--	SC	1B	1,3
<i>Piperia candida</i>	White-flowered rein orchid	--	--	4	6
<i>Pityopus californicus</i>	California pinefoot	--	--	4	4
<i>Plagiobothrys glaber</i>	Hairless popcorn-flower	--	--	1A	1
<i>Plagiobothrys mollis</i> var. <i>vestitus</i>	Petaluma popcorn-flower	--	SC*	1A	1,2,3,5
<i>Plagiobothrys strictus</i>	Calistoga popcorn flower	CT	PE	1B	6

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Table 1 continued.

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<i>Pleuropogon hooverianus</i>	North Coast semaphore grass	CR	SC	1B	1,2,3,5
<i>Poa năpensis</i>	Napa blue grass	CE	PE	1B	6
<i>Pogogyne douglasii</i> ssp. <i>parviflora</i> (<i>P. douglasii</i>)	Douglas pogogyne	--	--	3	6
<i>Polygonum marinense</i>	Marin knotweed	--	SC	3	1,2,3,5
<i>Potentilla hickmanii</i>	Hickman's cinquefoil	CE	PE	1B	1,2,3,5
<i>Quercus lobata</i>	Valley oak	--	--	--	4
<i>Ranunculus lobbii</i>	Lobb's aquatic buttercup	--	--	4	4
<i>Rhynchospora alba</i>	White beaked-rush	--	--	4	4
<i>Rhynchospora californica</i>	California beaked-rush	--	SC	1B	1,2,3,5
<i>Rhynchospora globularis</i> var. <i>globularis</i>	Round-headed beaked-rush	--	--	2	6
<i>Ribes divaricatum</i> var. <i>pubiflorum</i>	Straggly gooseberry	--	--	--	4
<i>Ribes victoris</i>	Victor's gooseberry	--	--	4	6
<i>Sidalcea calycosa</i> ssp. <i>rhizomata</i>	Point Reyes checkerbloom	--	--	1B	6
<i>Sidalcea hickmanii</i> ssp. <i>viridis</i>	Marin checkerbloom	--	SC	1B	1,3,4
<i>Sidalcea oregana</i> ssp. <i>valida</i>	Kenwood Marsh checkerbloom	CE	PE	1B	1,2,3,5
<i>Streptanthus batrachopus</i>	Tamalpais jewel-flower	--	SC	1B	1,3
<i>Streptanthus brachiatus</i> ssp. <i>brachiatus</i>	Socrates Mine jewel-flower	--	R	1B	1,2,3
<i>Streptanthus brachiatus</i> ssp. <i>hoffmanii</i>	Freed's jewel-flower	--	R	1B	6
<i>Streptanthus glandulosus</i> ssp. <i>pulchellus</i>	Mt. Tamalpais jewel-flower	--	--	1B	2
<i>Streptanthus glandulosus</i> var. <i>hoffmanii</i>	Secund jewel-flower	--	SC	1B	1,3
<i>Streptanthus morrisonii</i> ssp. <i>elatus</i>	Three Peaks jewel-flower	--	R	1B	4
<i>Streptanthus morrisonii</i> ssp. <i>hirtiflorus</i>	Dorr's Cabin jewel-flower	--	R	1B	1,3
<i>Streptanthus morrisonii</i> ssp. <i>kruckebergii</i>	Kruckeberg's jewel-flower	--	SC	1B	6
<i>Streptanthus morrisonii</i> ssp. <i>morrisonii</i>	Morrison's jewel-flower	--	SC	1B	1,3
<i>Streptanthus niger</i>	Tiburon jewel-flower	CE	E	1B	1,3
<i>Streptanthus tortuosus</i> var. <i>suffrutescens</i>	Mountain jewel flower	--	--	--	4
<i>Suaeda californica</i>	California seablite	--	E	1B	1,3
<i>Tracyina rostrata</i>	Beaked tracyina	--	--	1B	5
<i>Trifolium amoenum</i>	Showy Indian clover	--	PE	1B	1,2,3,5
<i>Triphysaria floribunda</i>	San Francisco owl's-clover	--	SC	1B	1,3,5
<i>Veratrum fimbriatum</i>	Fringed false-hellebore	--	--	4	6

* State status data derived from *Special Plants List* (CDFG, January 1996).

CE = State-listed Endangered

CT = State-listed Threatened

CR = State Candidate Rare

SC = Species of Concern: Species may warrant listing, but substantial biological information to support a proposed rule is lacking.

* CNPS = *CNPS Electronic Inventory* (Skinner and Pavlik, 1995).

* Source:

* Federal status derived from USFWS letter (16 February 1995) and updated with *Endangered and Threatened Wildlife and Plants* (USFWS, October 1995), and *Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule* (USFWS, 28 February 1996).

E = Endangered

T = Threatened

P = Proposed

C = Candidate: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

1. Potential distribution in Marin and Sonoma counties as determined by USFWS letter (9 February 1994).

2. CNDDDB/RareFind = California Natural Diversity Data Base (CDFG, 3 March 1995).

3. Letter from Cay Goude (USFWS, 16 February 1995; An update of Source # 1).

4. Species requested to be included by Ms. Caitlin Bean, CDFG Biologist, Region 3.

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5. CNDDB/RareFind = California Natural Diversity Database (CDFG, 1
September 1995).

6. CNPS = *CNPS Electronic Inventory* (Skinner and Pavlik, 1995).

3. RESULTS

FORMAT AND TERMS USED FOR SPECIAL-STATUS PLANT SPECIES DESCRIPTIONS

Scientific name (Author)

"common name"

Family

CNPS: CNPS status corresponds to the 1995 CNPS listing status.

State/Fed. Status: State status corresponds to the *Special Plants List* (CDFG, January 1996). Federal status corresponds to the USFWS letter (1995). For current status see Table 1.

Distribution: Lists known and historic distributions by county according to CNPS, 1995.

Study Area?: Historical presence or absence on study area quadrangles. If the species is known from study area quads, the quads on which the species occurs are listed.

Habitat: Lists habitats in which the special-status plant species is known to occur (CNPS, 1995).

Life Form: Describes plant duration and life form according to CNPS, 1995.

Blooming: Provides the months when each special-status plant is typically in bloom (CNPS, 1995).

Notes: The "notes" field presents additional information on some plant species (CNPS, 1995).

SPECIAL-STATUS PLANT SPECIES DESCRIPTIONS^a

***Abronia umbellata* Lam. ssp. *breviflora* (Standl.) Munz**
"pink sand-verbena" Nyctaginaceae

CNPS List: 1B
State/Fed. Status: /C2
Distribution: DNT, HUM, MEN, SON, OR
Study Area?: No
Habitat: CoDns

Life Form: Perennial herb
Blooming: July-October
Notes: Most occurrences have few plants. Threatened by vehicles, non-native plants, and foot traffic. State-listed as Endangered in OR.

Agrostis aristiglumis
Considered but rejected: A synonym of *A. microphylla*; a common taxon.

***Agrostis blasdalei* Hitchc.**
"Blasdale's bent grass" Poaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MEN, MRN, SCR, SON
Study Area?: Yes; Valley Ford
Habitat: CBScr, CoDns, CoPrr
Life Form: Perennial herb (rhizomatous)
Blooming: May-July

Notes: Known from fewer than fifteen occurrences. Historical occurrences need field surveys. Threatened by agriculture and recreation. Includes *A. blasdalei* var. *marinensis*, which is state-listed Rare.

Agrostis blasdalei* var. *blasdalei
See *Agrostis blasdalei*

Agrostis blasdalei* var. *marinensis
See *Agrostis blasdalei*.

Agrostis clivicola* var. *clivicola
Considered but rejected: A synonym of *A. densiflora*; a common taxon.

Agrostis clivicola* var. *punta-reyesensis
Considered but rejected: A synonym of *A. densiflora*; a common taxon.

***Alopecurus aequalis* Sobol. var. *sonomensis* Ruhlzoff**
"Sonoma alopecurus" Poaceae
CNPS List: 1B
State/Fed. Status: /PE
Distribution: MRN, SON
Study Area?: Yes; Sebastopol, Camp Meeker, Two Rock
Habitat: MshSw (freshwater), RpScr
Life Form: Perennial herb
Blooming: May-July

Notes: Known from fewer than five native occurrences. Two occurrences introduced in 1987 (485C, 485D), but as of 1993 both appear to have failed. Historical localities need field surveys. Threatened by cattle trampling, wetland habitat loss, and non-native plants. See *A. aequalis* in *The Jepson Manual*.

***Amsinckia lunaris* Macbr.**
"bent-flowered fiddleneck" Boraginaceae
CNPS List: 4
State/Fed. Status: None
Distribution: ALA, CCA, LAK, MRN, SCR, SHA, SIS
Study Area?: No
Habitat: CmWld, VFGrs
Life Form: Annual herb
Blooming: March-June
Notes: Most Bay Area records are old; current status unknown.

***Antirrhinum subcordatum* Gray**
"dimorphic snapdragon" Scrophulariaceae
CNPS List: 1B
State/Fed. Status: /C3c
Distribution: COL, GLE, LAK, TEH
Study Area?: No
Habitat: Chpdl, LCPfs / sometimes serpentine
Life Form: Annual herb
Blooming: April-July
Notes: Threatened by road maintenance and grazing. See *Proceedings of the American Academy of Arts and Sciences* 20:306 (1884) for original description.

***Antirrhinum virga* Gray**
"tall snapdragon" Scrophulariaceae
CNPS List: 4
State/Fed. Status: None
Distribution: LAK, MEN, NAP, SON
Study Area?: No
Habitat: Chpdl (rocky openings, often serpentine)
Life Form: Perennial herb
Blooming: June-July
Notes: See *Proceedings of the American Academy of Arts and Sciences* 7:373 (1868) for original description, and *Systematic Botany Monographs* 22:53-57 (1988) for taxonomic treatment.

***Arabis blepharophylla* H. & A.**
"coast rock cress" Brassicaceae
CNPS List: 4
State/Fed. Status: /C3c
Distribution: CCA, MRN, SCR, SFO, SMT, SON
Study Area?: No
Habitat: BUFRs, CBScr, CoPrr, CoScr
Life Form: Perennial herb
Blooming: February-April

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Notes: See *Rhodora* 43(511):348-349 (1941) for taxonomic treatment, and *Contributions from the Gray Herbarium* 204:149-154 (1973) for taxonomic information.

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Arctostaphylos bakeri Eastw. ssp. *bakeri*

"Baker's manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: CR/C2
Distribution: SON
Study Area?: Yes; Camp Meeker, Jintown
Habitat: BUFRs, Chprl / often serpentine
Life Form: Shrub (evergreen)
Blooming: February - April
Notes: Known from fewer than ten occurrences.
Threatened by road construction and widening, non-native plants, and dumping, and potentially by development.
See *Leaflets of Western Botany* 1:115 (1934) for original description.

Arctostaphylos bakeri Eastw. ssp. *sublaevis* Wells

"The Cedars manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: SON
Study Area?: No
Habitat: CCFrs, Chprl / serpentine seeps
Life Form: Shrub (evergreen)
Blooming: April-May
Notes: See *Four Seasons* 8(2):58-68 (1988) for original description.

Arctostaphylos canescens Eastw. ssp. *sonomensis* (Eastw.) Wells

"Sonoma manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: HUM, LAK, MEN, SON, TEH
Study Area?: Yes; Santa Rosa
Habitat: Chprl, LCFrs / sometime serpentine
Life Form: Shrub (evergreen)
Blooming: January-March
Notes: Much of Rincon Ridge (SON Co.) threatened by development. See *Four Seasons* 7 (3):42-46 (1985) for status update, and *Madroño* 35 (4):330-341 (1988) for revised nomenclature.

Arctostaphylos densiflora M. S. Baker

"Vine Hill manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: CE/C2
Distribution: SON
Study Area?: Yes; Sebastopol
Habitat: Chprl (acid marine sand)
Life Form: Shrub (evergreen)
Blooming: February-March
Notes: Known from only one extant occurrence on the Sonoma Barren near Forestville. Threatened by fungal infection. See *Leaflets of Western Botany* 1(4):31-32 (1932) for original description.

Arctostaphylos hispidula Howell

"Howell's manzanita" Ericaceae
CNPS List: 4
State/Fed. Status: /C3c
Distribution: DNT, HUM, SON, OR
Study Area?: No
Habitat: Chprl (serpentine or sandstone)
Life Form: Shrub (evergreen)
Blooming: March-April
Notes: Threatened by mining. Endangered in OR.

Arctostaphylos hookeri D. Don ssp. *montana* (Eastw.) Wells

"Mt. Tamalpais manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN
Study Area?: No
Habitat: Chprl, VFGrs / serpentine
Life Form: Shrub (evergreen)
Blooming: February-April
Notes: Known from fewer than twenty occurrences in the Mt. Tamalpais area. See *Madroño* 19(6):193-210 (1968) for revised nomenclature.

Arctostaphylos stanfordiana Parry ssp. *decumbens* Wells

"Rincon manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: SON
Study Area?: Yes; Santa Rosa, Guerneville
Habitat: Chprl (rhyolitic)
Life Form: Shrub (evergreen)
Blooming: February-April
Notes: Known from fewer than ten occurrences.
Seriously threatened by development, road construction, vehicles, and viticulture. See *Four Seasons* 4(2):16-17 (1972) for original description and 9(2):60-63 (1992) for revised nomenclature.

Arctostaphylos stanfordiana Parry ssp. *raichei* Knight

"Raiche's manzanita" Ericaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: LAK, MEN
Study Area?: No
Habitat: Chprl, LCFrs (openings) / rocky often serpentine
Life Form: Shrub (evergreen)
Blooming: February-April
Notes: Threatened by urbanization. See *Four Seasons* 7(3):6-20 (1985) for original description.

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Arctostaphylos virgata Eastw.

"Marin manzanita"

Ericaceae

CNPS List: 1B

State/Fed. Status: /C3c

Distribution: MRN

Study Area?: No

Habitat: BUFRs, CCFrs, Chprl, NCFrs / sandstone or granitic

Life Form: Shrub (evergreen)

Blooming: January-March

Notes: Known from fewer than twenty occurrences.

Threatened by fire suppression.

Asclepias solanoana Woodson

"serpentine milkweed"

Asclepiadaceae

CNPS List: 4

State/Fed. Status: None

Distribution: COL, GLE, LAK, MEN, NAP, SHA, SON, TEH, TRI, YOL

Study Area?: No

Habitat: Chprl, CmWld, LCFrs / serpentinite

Life Form: Perennial herb

Blooming: May-August

Notes: Not common where it occurs. Some occurrences threatened by grazing, vehicles, logging, mining, or geothermal development. See *Proceedings of the American Academy of Arts and Sciences* 10:76 (1874) for original description, and *Madroño* 24(3):159-177 (1977) for information on floral ecology.

Aster lentus Greene

"Suisun Marsh aster"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: CCA, NAP, SAC, SJQ, SOL

Study Area?: No

Habitat: MshSw (brackish and fresh water)

Life Form: Perennial herb (rhizomatous)

Blooming: May-November

Notes: Seriously threatened by marsh habitat alteration and loss. Intergrades into *A. chilensis*. USFWS uses the name *A. chilensis* var. *lentus*. See *Manual of the Botany of the Region of San Francisco Bay*, p. 180 (1894) by E. Greene for original description.

Astragalus breweri Gray

"Brewer's milk-vetch"

Fabaceae

CNPS List: 4

State/Fed. Status: None

Distribution: COL, LAK, MEN, MRN, NAP, SON, YOL

Study Area?: No

Habitat: Chprl, CmWld, Medws, VFGrs / often serpentinite, volcanic

Life Form: Annual herb

Blooming: April-June

Notes: Populations have been lost to development and road construction. See *Systematic Botany* 17(3):367-379 (1992) for distributional information.

Astragalus clarianus Jeps.

"Clara Hunt's milk-vetch"

Fabaceae

CNPS List: 1B

State/Fed. Status: CT/PE

Distribution: NAP, SON

Study Area?: No

Habitat: Chprl (openings), CmWld, VFGrs / serpentinite, volcanic, rocky, clay

Life Form: Annual herb

Blooming: March-April

Notes: Known from only five occurrences. Threatened by urbanization, recreational development, and non-native plants; largest known population covered by dredge material in 1990. See *Manual of the Flowering Plants of California*, p. 578 (1925) by W. L. Jepson for original description, and *Systematic Botany* 17(3):367-379 (1992) for distributional information.

Astragalus clevelandii Greene

"Cleveland's milk-vetch"

Fabaceae

CNPS List: 4

State/Fed. Status: None

Distribution: COL, LAK, NAP, SBT, YOL

Study Area?: No

Habitat: Chprl, CmWld / serpentinite seeps

Life Form: Perennial herb

Blooming: June-September

Astragalus rattanii Gray var. *rattanii*

"Rattan's milk-vetch"

Fabaceae

CNPS List: 4

State/Fed. Status: None

Distribution: COL, GLE, HUM, LAK, MEN, SON, TEH, TRI

Study Area?: No

Habitat: Chprl, CmWld, LCFrs / gravelly streambanks

Life Form: Perennial herb

Blooming: April-July

Notes: See *Systematic Botany* 17(3):367-379 (1992) for distributional information.

Astragalus tener Gray var. *tener*

"alkali milk-vetch"

Fabaceae

CNPS List: 1B

State/Fed. Status: None

Distribution: ALA*, CCA*, MER, MNT*, NAP, SBT*, SCL*, SFO*, SJQ*, SOL, SON*, STA*, YOL

Study Area?: Yes; Petaluma*

Habitat: Piyas, VFGrs (adobe clay), VnPIs (alkaline)

Life Form: Annual herb

Blooming: March-June

Notes: Last Bay Area collection in 1959. Threatened by habitat destruction, especially agricultural conversion, and protected only at Jepson Prairie Preserve (TNC), SOL Co. See *Proceedings of the American Academy of Arts and Sciences* 6:206 (1864) for original description, and *Systematic Botany* 17(3):367-379 (1992) for distributional information.

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Blennosperma bakeri Heiser

"Sonoma sunshine"

Asteraceae

CNPS List: 1B

State/Fed. Status: CE/FE

Distribution: SON

Study Area?: Yes; Sears Point, Santa Rosa, Cotati, Glen Ellen, Sebastopol

Habitat: VFGs (mesic), VnPIs

Life Form: Annual herb

Blooming: March-April

Notes: Threatened by urbanization, grazing, and agriculture. See *Madroño* 9:103-104 (1947) for original description.

Blennosperma nanum (Hook.) Blake var. robustum

J. T. Howell

"Point Reyes blennosperma"

Asteraceae

CNPS List: 1B

State/Fed. Status: CR/C2

Distribution: MEN, MRN

Study Area?: No

Habitat: CoPr, CoScr

Life Form: Annual herb

Blooming: March

Notes: Known from fewer than fifteen occurrences. Possibly threatened by grazing. Plants found near Fort Bragg in 1988 appear closest to this taxon. Some Pt. Reyes populations intermediate to var. *nanum*. See *Leaflets of Western Botany* 5:105-108 (1948) for original description.

Calamagrostis bolanderi Thurb.

"Bolander's reed grass"

Poaceae

CNPS List: 4

State/Fed. Status: None

Distribution: HUM, MEN, SON

Study Area?: No

Habitat: BgFns, CCFrs, CoScr, Medws (mesic), MshSw (freshwater); NCFrs

Life Form: Perennial herb (rhizomatous)

Blooming: June-August

Calamagrostis crassiglumis Thurb.

"Thurber's reed grass"

Poaceae

CNPS List: 2

State/Fed. Status: /C2

Distribution: DNT, HUM?, MEN, MRN, SON, WA, ++

Study Area?: Yes; Sebastopol

Habitat: CoScr (mesic), MshSw (freshwater)

Life Form: Perennial herb (rhizomatous)

Blooming: June-July

Notes: Known in CA from fewer than ten occurrences. Threatened by grazing at Pt. Reyes NS. State-listed as Threatened in WA. See *C. stricta* ssp. *inexpansa* in *The Jepson Manual*. See *Botany of California* 2:281 (1880) for original description.

Calamagrostis ophitidis (J. T. Howell) Nygren

"serpentine reed grass"

Poaceae

CNPS List: 4

State/Fed. Status: None

Distribution: LAK, MRN, NAP, SON

Study Area?: No

Habitat: Chprl, LCFrs, Medws, VFGs / serpentinite

Life Form: Perennial herb

Blooming: April-June

Calandrinia breweri Wats.

"Brewer's calandrinia"

Portulacaceae

CNPS List: 4

State/Fed. Status: None

Distribution: CCA, LAX, MEN, MNT, MPA, MRN, NAP, SBA, SBD, SCL, SCR, SCZ, SDG, SLO, SMT, SON, VEN, BA

Study Area?: No

Habitat: Chprl, CoScr / sandy or loamy, disturbed sites, and burns

Life Form: Annual herb

Blooming: March-June

Notes: Plant appears to be widely scattered but uncommon everywhere, and most collections are old. Field surveys needed. See *Proceedings of the American Academy of Arts and Sciences* 11:124 (1876) for original description.

Calochortus raichei Farwig & Girard

"The Cedars fairy-lantern"

Liliaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: SON

Study Area?: No

Habitat: CCFrs, Chprl / serpentinite

Life Form: Perennial herb (bulbiferous)

Blooming: May-August

Notes: Endemic to The Cedars near Guerneville. Potentially threatened by mining and road construction. See *Herbertia* 43(1):2-9 (1987) for original description, and *Fremonita* 15(2):18 (1987) for species account.

Calochortus tiburonensis Hill

"Tiburon mariposa lily"

Liliaceae

CNPS List: 1B

State/Fed. Status: CT/FT

Distribution: MRN

Study Area?: No

Habitat: VFGs (serpentinite)

Life Form: Perennial herb (bulbiferous)

Blooming: March-June

Notes: Known from only one occurrence at Ring Mtn. Preserve (TNC) on the Tiburon Peninsula. See *Madroño* 22(2):100-104 (1973) for original description, and *Journal of Ecology* 75:977-995 (1987) for population biology.

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Calyptidium quadrupetalum Wats.

"four-petaled pussypaws"

Portulacaceae

CNPS List: 4

State/Fed. Status: None

Distribution: GLE, LAK, NAP, SON, TEH, TRI

Study Area?: No

Habitat: Chprl, LCFrs / sandy or gravelly, usually serpentinite

Life Form: Annual herb

Blooming: April-June

Notes: Threatened by vehicles. See *Proceedings of the American Academy of Arts and Sciences* 20:356 (1885) for original description.

Calytorgia collina (Greene) Brummitt ssp. *oxyphylla* Brummitt

"Mt. Saint Helena morning-glory"

Convolvulaceae

CNPS List: 4

State/Fed. Status: /C2

Distribution: LAK, NAP SON

Study Area?: No

Habitat: Chprl (serpentinite)

Life Form: Perennial herb (rhizomatous)

Blooming: May-June

Notes: See *Kew Bulletin* 35(2):328 (1980) for original description.

Campanula californica (Kell.) Heller

"swamp harebell"

Campanulaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MEN, MRN, SCR*, SON

Study Area?: Yes; Sebastopol*

Habitat: BgFns, CCFrs, CoPrr, Medws, MshSw (freshwater), NCFrs / mesic

Life Form: Perennial herb (rhizomatous)

Blooming: June-September

Notes: Many occurrences have few plants. Threatened by grazing, development, and marsh habitat loss. See *Proceedings of the California Academy of Sciences* 12:158 (1861) for original description.

Cardamine pachystigma (Wats.) Roll. var. *dissectifolia* (Detl.) Roll.

"dissected-leaf toothwort"

Brassicaceae

CNPS List: 3

State/Fed. Status: None

Distribution: BUT, GLE, MEN, PLA, SON, TEH

Study Area?: Yes; The Geysers

Habitat: Chprl, LCFrs / usually serpentinite, rocky

Life Form: Perennial herb (rhizomatous)

Blooming: February-May

Notes: Move to List 1B? Location, rarity, and endangerment information needed. See *American Journal of Botany* 23:575 (1936) for original description, and *Harvard Papers in Botany* 4:43-48 (1993) for revised nomenclature.

Carex albida Bailey

"white sedge"

Cyperaceae

CNPS List: 1B

State/Fed. Status: CE/PE

Distribution: SON

Study Area?: Yes; Sebastopol, Camp Meeker

Habitat: BgFns, MshSw (freshwater)

Life Form: Perennial herb (rhizomatous)

Blooming: May-July

Notes: Known from only one confirmed extant occurrence at Pitkin Marsh, with fewer than 1,000 plants as of 1993; three historical occurrences extirpated by wetland drainage and spraying of chemical effluents. Threatened by competition with other plants, and potentially by altered hydrology. See *Memoirs of the Torrey Botanical Club* 1:9 (1889) for original description, and *Leaflets of Western Botany* 8(7):178-180 (1957) for taxonomic discussion.

Carex californica Bailey

"California sedge"

Cyperaceae

CNPS List: 2

State/Fed. Status: None

Distribution: MEN, SON, ID, OR, WA+

Study Area?: Yes; Sebastopol

Habitat: BgFns, CCFrs, CoPrr, Medws, MshSw (margins)

Life Form: Perennial herb (rhizomatous)

Blooming: May-August

Notes: Sensitive in ID. See *Memoirs of the Torrey Botanical Club* 1:9 (1889) for original description.

Carex comosa Boott

"bristly sedge"

Cyperaceae

CNPS List: 2

State/Fed. Status: None

Distribution: CCA, LAK, SBD(*?), SCR*, SFO*, SHA, SJQ, SON, ID, OR, WA, ++

Study Area?: No

Habitat: MshSw (lake margins)

Life Form: Perennial herb (rhizomatous)

Blooming: May-September

Notes: Fairly widely distributed, but apparently rarely collected. Threatened by marsh drainage. Endangered in ID, on review list in OR, and state-listed as Sensitive in WA.

Castilleja affinis H. & A ssp. *neglecta* (Zelle) Chuang & Heckard

"Tiburon Indian paintbrush"

Scrophulariaceae

CNPS List: 1B

State/Fed. Status: CT/FE

Distribution: MRN, NAP, SCL

Study Area?: No

Habitat: VFGrs / serpentinite

Life Form: Perennial herb, hemiparasitic

Blooming: April-June

Notes: Known from six occurrences. Protected in part at Ring Mtn. Preserve (TNC), MRN Co. Threatened by

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development, gravel mining, and grazing. State-listed as
C. neglecta; USFWS also uses this name.

Castilleja leschkeana

Considered but rejected: Not in CA; name misapplied to
C. chrymactis, native to Alaska, extinct waif in CA.

Castilleja neglecta

See *Castilleja affinis* ssp. *neglecta*.

Castilleja uliginosa Eastw.

"Pitkin Marsh Indian paintbrush"

Scrophulariaceae

CNPS List: 1A

Last Seen: 1987

State/Fed. Status: CE/C2

Distribution: SON*

Study Area?: Yes; Sebastopol*

Habitat: MshSw (freshwater)

Life Form: Perennial herb, hemiparasitic

Blooming: June-July

Notes: Known from two occurrences in Pitkin Marsh and
Trembley's Marsh. Last known remaining plant died in
1987, despite management efforts; field surveys needed,
although no access allowed by landowner after 1987. See
C. miniata ssp. *miniata* in *The Jepson Manual*. See
Leaflets of Western Botany 3:166-117 (1942) for original
description.

Ceanothus confertus J. T. Howell

"Rincon Ridge ceanothus"

Rhamnaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: LAK, MEN, NAP, SON

Study Area?: Yes; Santa Rosa, Sebastopol*, Guerneville

Habitat: CCFrs, Chprl, CmWld / volcanic or serpentinite

Life Form: Shrub (evergreen)

Blooming: February-April

Notes: Threatened by development. Closely related to *C.*
prostratus. See *Leaflets of Western Botany* 2:160-162
(1939) for original description.

Ceanothus divergens Parry

"Calistoga ceanothus"

Rhamnaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: LAK, NAP, SON

Study Area?: Yes; Santa Rosa

Habitat: Chprl (serpentinite or volcanic, rocky)

Life Form: Shrub (evergreen)

Blooming: February-March

Notes: Threatened by development in The Geysers
geothermal area. Closely related to *C. purpureus*.

Ceanothus foliosus Parry var. *vineatus* McMin

"Vine Hill ceanothus"

Rhamnaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MEN*, SON

Study Area?: Yes; Sebastopol

Habitat: Chprl

Life Form: Shrub (evergreen)

Blooming: March-May

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Notes: Nearly extirpated in SON Co.; now confirmed from only one native population. Known from one historical occurrence in MEN Co., but unable to relocate.

Ceanothus gloriosus J. T. Howell var. *gloriosus*
"Point Reyes ceanothus" Rhamnaceae
CNPS List: 4

State/Fed. Status: None
Distribution: MEN, MRN, SON
Study Area?: No
Habitat: CBScr, CCFrs, CoDns, CoScr / sandy
Life Form: Shrub (evergreen)
Blooming: March-May

Ceanothus gloriosus J. T. Howell var. *porrectus* J. T. Howell

"Mt. Vision ceanothus" Rhamnaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN
Study Area?: No
Habitat: CCFrs, CoPrr, CoScr, VFGrs
Life Form: Shrub (evergreen)
Blooming: March-May

Notes: Known from fewer than fifteen occurrences in the Mt. Vision area near Pt. Reyes. Some plants destroyed by quarrying; occurs in areas grazed by cattle.

Ceanothus masonii McMinn

"Mason's ceanothus" Rhamnaceae
CNPS List: 1B
State/Fed. Status: CR/C2
Distribution: MRN
Study Area?: Yes; Point Reyes NE
Habitat: Chprl (serpentinite, rocky)
Life Form: Shrub (evergreen)
Blooming: March-April

Notes: Known from approximately five occurrences. May be a variety of *C. gloriosus*. See *Madroño* 6:171-173 (1942) for original description.

Ceanothus sonomensis J. T. Howell

"Sonoma ceanothus" Rhamnaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: NAP, SON
Study Area?: No
Habitat: Chprl (sandy, serpentinite or volcanic)
Life Form: Shrub (evergreen)
Blooming: February-April

Notes: Known from approximately ten occurrences; only one occurrence known from NAP Co. Seriously threatened by development. Closely related to *C. cuneatus*.

Chlorogalum pomaridianum (DC.) Kunth var. *minus* Heay.

"dwarf soaproot" Liliaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: COL, LAK, SLO, SON, TEH
Study Area?: No
Habitat: Chprl (serpentinite)
Life Form: Perennial herb (bulbiferous)

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Blooming: May-August

Notes: See *Madroño* 5(5):144 (1940) for original description.

Chorizanthe cuspidata Wats. var. *cuspidata*

"San Francisco Bay spineflower" Polygonaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: ALA*, MRN, SCL?, SFO, SMT, SON

Study Area?: No

Habitat: CBScr, CoDns, CoPrr, CoScr / sandy

Life Form: Annual herb

Blooming: April-August

Notes: Plant may occur in SCL Co.; need more information. Closely related to *C. pungens*. Some plants from Point Reyes (MRN Co.) probably intermediate to var. *villosa*. See *C. cuspidata* in *The Jepson Manual*. See *Proceedings of the Davenport Academy of Natural Sciences* 4:60 (1884) for original description, and *Phytologia* 66(2):127-129 (1989) for taxonomic treatment.

Chorizanthe cuspidata Wats. var. *villosa* (Eastw.) Munz

"woolly-headed spineflower" Polygonaceae

CNPS List: 1B

State/Fed. Status: None

Distribution: MRN, SON

Study Area?: Yes; Valley Ford

Habitat: CoDns, CoPrr, CoScr / sandy

Life Form: Annual herb

Blooming: May-August

Notes: Endemic to coastline from Bodega Bay to Point Reyes. See *C. cuspidata* in *The Jepson Manual*. See *Bulletin of the Torrey Botanical Club* 30:485 (1903) for original description, and *Phytologia* 66(2):127-130 (1989) for taxonomic treatment.

Chorizanthe pungens Benth. var. *pungens*

"Monterey spineflower" Polygonaceae

CNPS List: 1B

State/Fed. Status: /FT

Distribution: MNT, SCR, SLO*

Study Area?: No

Habitat: Chprl (maritime), CmWld, CoDns, CoScr, VFGrs / sandy

Life Form: Annual herb

Blooming: April-June

Notes: Collected only once (1842) in SLO Co. Threatened by urbanization, recreational development, and recreational activities, and possibly by non-native plants. See *C. pungens* in *The Jepson Manual*. See *Phytologia* 66(2):123-125 (1989) for taxonomic treatment.

Chorizanthe valida Wats.

"Sonoma spineflower" Polygonaceae

CNPS List: 1B

State/Fed. Status: CE/FE

Distribution: MRN, SON*

Study Area?: Yes; Sebastopol*

Habitat: CoPrr (sandy)

Life Form: Annual herb

Blooming: June-August

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Notes: Thought extinct for 77 years; only known extant occurrence was rediscovered in 1980 at Point Reyes NS. Closely related to *C. pungens*. See *Proceedings of the American Academy of Arts and Sciences* 12:271 (1877) for original description, *Phytologia* 66(2):132-134 (1989) for taxonomic treatment, *Fremontia* 18(1):17-18 (1990) for species account, and *Madroño* 39(4):271-280 (1992) for ecological study.

maintenance. See *Madroño* 12:33-39 (1953) for original description.

Cirsium andrewsii (Gray) Jeps.
"Franciscan thistle" Asteraceae
CNPS List: 4
State/Fed. Status: None
Distribution: MRN, SFO, SMT, SON
Study Area?: No
Habitat: BUFrs, CBScr, CoScr / sometimes serpentine
Life Form: Perennial herb
Blooming: March-July

Cirsium hydrophilum (Greene) Jeps. var. *vaseyi* (Gray) J. T. Howell
"Mt. Tamalpais thistle" Asteraceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN
Study Area?: No
Habitat: BUFrs, Chprl / serpentine seeps
Life Form: Perennial herb
Blooming: May-July
Notes: Known from fewer than ten occurrences on Mt. Tamalpais. Threatened by road construction and non-native plants. See *Synoptical Flora of North America* 1(2):403-404 (1884) for original description.

Clarkia concinna Fisch. & Mey. (Greene) ssp. *raichei* G. Allen, V. Ford & L. Gottlieb
"Raiche's red ribbons" Onagraceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN
Study Area?: No
Habitat: CBScr
Life Form: Annual herb
Blooming: April-May
Notes: Known from only one occurrence near Tomales. See *Madroño* 37(4):305-310 (1990) for original description.

Clarkia imbricata Lewis & Lewis
"Vine Hill clarkia" Onagraceae
CNPS List: 1B
State/Fed. Status: CE/PE
Distribution: SON
Study Area?: Yes; Sebastopol
Habitat: Chprl, VFGrs / acidic sandy loam
Life Form: Annual herb
Blooming: June-August
Notes: Known from only two occurrences, one of which is introduced; a third, natural occurrence has been extirpated. Threatened by development and road

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Collinsia corymbosa Herder
"round-headed chinese houses"

Scrophulariaceae

CNPS List: 1B

State/Fed. Status: None

Distribution: HUM, MEN, MRN?, SFO*, SON

Study Area?: No

Habitat: CoDns

Life Form: Annual herb

Blooming: April-June

Notes: Scattered distribution. May intergrade with *C. bartsiiifolia* var. *bartsiiifolia*.

Cordylanthus maritimus Benth. ssp. *palustris* (Behr)

Chuang & Heckard

"Point Reyes bird's-beak"

Scrophulariaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: ALA*, HUM, MRN, SCL*, SMT*, SON, OR

Study Area?: Yes; Novato, Petaluma River, Valley Ford

Habitat: MshSw (coastal salt)

Life Form: Annual herb (hemiparasitic)

Blooming: June-October

Notes: Once rather common in proper habitat; now greatly reduced by development. Also threatened by foot traffic, non-native plants, altered hydrology, and cattle grazing and trampling. State listed as Endangered in OR. See *Brittonia* 25:135-158 (1973) for original description, and *Madroño* 41(4):316-327 (1994) for ecological discussion.

Cordylanthus mollis Gray ssp. *mollis*

"soft bird's-beak"

Scrophulariaceae

CNPS List: 1B

State/Fed. Status: CR/PE

Distribution: CCA, MRN*, NAP, SAC*, SOL, SON*

Study Area?: Yes; Petaluma River*, Sears Point*

Habitat: MshSw (coastal salt)

Life Form: Annual herb, hemiparasitic

Blooming: July-November

Notes: Known from ten occurrences. Threatened by erosion and marsh drainage. See *Proceedings of the American Academy of Arts and Sciences* 7:327-402 (1867) for original description, and *Madroño* 25:107 (1978) for rediscovery in NAP Co.

Cordylanthus tenuis Gray ssp. *brunneus* (Ieps.) Munz

"serpentine bird's-beak"

Scrophulariaceae

CNPS List: 4

State/Fed. Status: None

Distribution: LAK, NAP, SON

Study Area?: No

Habitat: CCFrs, Chprl, CmWld / serpentinite

Life Form: Annual herb, hemiparasitic

Blooming: July-August

Notes: See *Systematic Botany Monographs* 10:50-62 (1986) for taxonomic treatment.

Cordylanthus tenuis Gray ssp. *capillaris* (Penn.)

Chuang & Heckard

"Pennell's bird's-beak"

Scrophulariaceae

CNPS List: 1B

State/Fed. Status: CR/PE

Distribution: SON

Study Area?: Yes; Camp Meeker

Habitat: CCFrs, Chprl / serpentinite

Life Form: Annual herb, hemiparasitic

Blooming: June-July

Notes: Known from fewer than five occurrences near Occidental. Threatened by dumping, vehicles, and road maintenance, and potentially by development. See *Systematic Botany Monographs* 10:50-62 (1986) for taxonomic treatment.

Cupressus goveniana Gord. ssp. *piemaea* (Lemmon)

Bartel

"Pygmy cypress"

Cupressaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MEN, SON

Study Area?: No

Habitat: CCFrs (podzol-like soil)

Life Form: Tree (evergreen)

Blooming: N/A

Notes: Threatened by development and vehicles. See *Phytologia* 70(4):229-230 (1990) for revised nomenclature.

Cuscuta howelliana

Considered but rejected: Too common

Cypripedium californicum Gray

"California lady's-slipper"

Orchidaceae

CNPS List: 4

State/Fed. Status: /C3c

Distribution: BUT, DNT, HUM, MRN*, PLU, SHA, SIS, SON, TRI, OR

Study Area?: No

Habitat: BgFns, LCFrs / serpentinite seeps and streambanks

Life Form: Perennial herb (rhizomatous)

Blooming: April-August

Notes: Threatened by horticultural collecting and logging. Many protected populations on USFS land not reproducing. On watch list in OR. See *Fremontia* 17(2):17-19 (1989) for species account.

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Cypripedium fasciculatum Wats.

"clustered lady's-slipper"

Orchidaceae

CNPS List: 4

State/Fed. Status: /C2

Distribution: BUT, DNT, HUM, NEV, PLU, SCL,
SCR*, SHA, SIE, SIS, SMT, TEH, TRI, YUB, ID, OR,
UT, WA+

Study Area?: No

Habitat: LCFrs, NCFrs / usually serpentinite seeps and
streambanks

Life Form: Perennial herb (rhizomatous)

Blooming: March-July

Notes: Many occurrences but most contain few plants.
Threatened by logging and horticultural collecting.
Monitoring needed for protected populations on USFS
lands to assess reproduction, which may be inadequate.
Threatened in ID, a candidate for state listing in OR, and
state-listed as Threatened in WA. See *Proceedings of the
American Academy of Arts and Sciences* 17:380 (1882)
for original description, *Lindleyana* 2(1):553-57 (1987)
for distributional information, and *Fremontia* 17(2):17-19
(1989) for species account.

Life Form: Perennial herb

Blooming: March-May

Cypripedium montanum Lindl.

"mountain lady's-slipper"

Orchidaceae

CNPS List: 4

State/Fed. Status: /C3c

Distribution: DNT, HUM, MAD, MEN, MOD, MPA,
PLU, SIE, SIS, SMT, SON, TEH, TRI, TUO, OR, WA, ++

Study Area?: No

Habitat: BUFrs, LCFrs

Life Form: Perennial herb (rhizomatous)

Blooming: March-July

Notes: Many protected populations on USFS land not
reproducing. Possibly threatened by logging. On watch
list in OR. See *Fremontia* 17(2):17-19 (1989) for species
account.

Delphinium bakeri Ewan

"Baker's larkspur"

Ranunculaceae

CNPS List: 1B

State/Fed. Status: CR/C1

Distribution: MRN, SON*

Study Area?: Yes; Petaluma, Point Reyes NE, Camp
Meeker

Habitat: CoScr

Life Form: Perennial herb

Blooming: March-May

Notes: Known from fewer than five occurrences.
Threatened by agriculture and grazing, and potentially by
road maintenance. See *Bulletin of the Torrey Botanical
Club* 69:144 (1942) for original description.

Delphinium luteum Heller

"yellow larkspur"

Ranunculaceae

CNPS List: 1B

State/Fed. Status: CR/C1

Distribution: SON

Study Area?: Yes; Sebastopol*, Valley Ford*

Habitat: Chprl, CoPrr, CoScr

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Notes: Known from only two occurrences near Bodega Bay. Plants from MRN Co. apparently hybrids with *D. decorum* ssp. *decorum*; also hybridizes with *D. nudicaule*. Threatened by development and grazing. See *Bulletin of the Southern California Academy of Sciences* 2:68-69 (1903) for original description.

Blooming: March-May

Notes: Threatened by urbanization, agriculture, grazing, vehicles, and forestry.

Dichanthelium lanuginosum (Ell.) Gould var. *thermale*
(Boland.) Spellenberg

"Geyser's dichanthelium"

Poaceae

CNPS List: 1B

State/Fed. Status: CE/C2

Distribution: SON

Study Area?: Yes; The Geysers

Habitat: CCFrs, RpFrS, VFGrs / hydrothermally-altered soil

Life Form: Perennial herb

Blooming: June-August

Notes: Endemic to The Geysers geothermal area.

Threatened by energy development. A synonym of *Panicum acuminatum* var. *acuminatum* in *The Jepson Manual*. See *Madroño* 23(3):151 (1975) for taxonomic treatment.

Dichondra occidentalis House

"western dichondra"

Convolvulaceae

CNPS List: 4

State/Fed. Status: /C3c

Distribution: LAX?, MRN?, ORA, SBA, SCT, SCZ, SDG, SMI, SRO, VEN, BA

Study Area?: No

Habitat: Chprl, CmWld, CoScr, VFGrs

Life Form: Perennial herb (rhizomatous)

Blooming: January-May

Notes: Records for MRN Co. are questionable; report from LAX Co. needs confirmation. See *Muhlenbergia* 1:130-131 (1906) for original description.

Dirca occidentalis Gray

"western leatherwood"

Thymelaeaceae

CNPS List: 1B

State/Fed. Status: None

Distribution: ALA, CCA, MRN, SCL, SMT, SON

Study Area?: No

Habitat: BUFrS, CCFrs, Chprl, CmWld, NCFrs, RpFrS, RpWld / mesic

Life Form: Shrub (deciduous)

Blooming: January-April

Notes: Populations declining; not reproducing well.

Downingia pusilla (D. Don) Torr.

"dwarf downingia"

Campanulaceae

CNPS List: 2

State/Fed. Status: /C3c

Distribution: MER, MPA, NAP, PLA, SAC, SOL, SON, STA, TEH, SA

Study Area?: Yes; Sears Point, Glen Ellen, Sebastopol, Healdsburg

Habitat: VFGrs (mesic), VnPls

Life Form: Annual herb

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***Eleocharis parvula* (R. & S.) Link**

"small spikerush"

Cyperaceae

CNPS List: 4

State/Fed. Status: None

Distribution: BUT, CCA, GLE, HUM, NAP, ORA, SIS, SLO, SON, VEN, ++

Study Area?: No

Habitat: MshSw

Life Form: Perennial herb

Blooming: June-September

Notes: On review list in OR. See *Wasmann Journal of Biology* 33 (1-2):98 (1975) for a discussion of California distribution.

***Elymus californicus* (Bol.) Gould**

"California bottle-brush grass"

Poaceae

CNPS List: 4

State/Fed. Status: /C3c

Distribution: MNT, MRN, SCR, SMT, SON

Study Area?: No

Habitat: CmWld, NCFrs, RpWld

Life Form: Perennial herb

Blooming: June-August

***Eriastrum brandegeae* Mason**

"Brandegee's eriastrum"

Polemoniaceae

CNPS List: 1B

State/Fed Status: /C2

Distribution: COL, GLE, LAK, SCL, THE, TRI

Study Area?: Yes; The Geysers

Habitat: Chprl, CmWld / volcanic

Life Form: Annual herb

Blooming: May-August

Notes: Threatened by grazing, vehicles, recreation, and development. Includes *E. tracyi*, which is state-listed Rare. See *Madroño* 8:88-89 (1945) for original description.

***Erigeron angustatus* Greene**

"narrow-leaved daisy"

Asteraceae

CNPS List: 1B

State/Fed. Status: None

Distribution: LAK, NAP, SON

Study Area?: Yes; Camp Meeker

Habitat: Chprl (serpentine)

Life Form: Perennial herb

Blooming: May-September

Notes: See *Bulletin of the Southern California Academy of Sciences* 1:88 (1885) for original description, and *Phytologia* 72(3):157-208 (1992) for taxonomic treatment.

***Erigeron biolettii* Greene**

"streamside daisy"

Asteraceae

CNPS List: 3

State/Fed. Status: None

Distribution: HUM, MEN, MRN, NAP, SOL, SON

Study Area?: Yes; Camp Meeker

Habitat: BUFRs, CmWld, NCFrs / rocky, mesic

Life Form: Perennial herb

Blooming: June-September

Notes: Move to List 1B? Location, rarity, and

endangerment information needed, especially quad for MRN Co. Most collections are very old. Intergrades with *E. inornatus*. See *Manual of the Botany of the Region of San Francisco Bay*, p. 181 (1894) by E. Greene for original description, and *Phytologia* 72(2):157-208 (1992) for taxonomic treatment.

***Erigeron serpentinus* Nesom**

"serpentine daisy"

Asteraceae

CNPS List: 1B

State/Fed. Status: None

Distribution: SON

Study Area?: No

Habitat: Chprl (serpentine)

Life Form: Perennial herb

Blooming: May-August

Notes: Endemic to The Cedars. Similar to *E. angustatus*. See *Phytologia* 72(3):157-208 (1992) for original description.

***Erigeron supplex* Gray**

"supple daisy"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MEN, MRN*, SON

Study Area?: No

Habitat: CBScr, CoPrr

Life Form: Perennial herb

Blooming: May-June

Notes: Threatened by coastal development. See *Proceedings of the American Academy of Arts and Sciences* 24:83 (1889) for original description, and *Madroño* 33(4):308-309 (1986) for distributional information.

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

Reveal

"Tiburon buckwheat"

Polygonaceae

CNPS List: 3

State/Fed. Status: /C3c

Distribution: ALA, COL, LAK, MRN, NAP, SCL, SMT, SON*

Study Area?: Yes; Petaluma, Camp Meeker*

Habitat: Chprl, CoPrr, VFGRs / serpentine

Life Form: Annual herb

Blooming: June-September

Notes: Move to List 1B? Location information needed, especially quad for COL Co. Easily confused with var. *luteolum*. Threatened by development and non-native plants. Protected in part at Ring Mtn. Preserve (TNC), MRN Co. See *Flora Franciscana*, pp. 150-151 (1891) by E. Greene for original description, and *Phytologia* 66(4):378-379 (1989) for alternative treatment which restricts var. *caninum* to ALA and MRN counties.

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Eriogonum nervosum (S. Stokes) Reveal
"Snow Mtn. Buckwheat" Polygonaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: COL, GLE?, LAK, NAP, SON, YOL
Study Area?: Yes; The Geysers
Habitat: Chprl (serpentinite)
Life Form: Perennial herb (rhizomatous)
Blooming: June-September
Notes: Known from approximately twenty occurrences. Threatened by energy development, mining, and vehicles. See *Phytologia* 40:467 (1978) for revised nomenclature and 66(4):350 (1989) for taxonomic treatment.

Eriogonum ternatum Howell
"ternate buckwheat" Polygonaceae
CNPS List: 4
State/Fed. Status: None
Distribution: DNT, SIS, SON, TEH, OR
Study Area?: No
Habitat: LCFrs (serpentinite)
Life Form: Perennial herb
Blooming: June-August
Notes: On watch list in OR. See *Phytologia* 66(4):348-349 (1989) for taxonomic treatment.

Eryngium constancei Sheikh
"Loch Lomond button-celery" Apiaceae
CNPS List: 1B
State/Fed. Status: CE/FE
Distribution: LAK
Study Area?: No
Habitat: VnPls
Life Form: Annual/Perennial herb
Blooming: April-June
Notes: Only known occurrence protected at Loch Lomond ER (CDFO), but entire watershed not protected. Previously damaged by dredging of vernal lake. See *Madroño* 30(2):93-101 (1938) for original description.

Erysimum franciscanum G. Rossh.
"San Francisco wallflower" Brassicaceae
CNPS List: 4
State/Fed. Status: /C2
Distribution: MRN, SCL, SCR, SFO, SMT, SON
Study Area?: No
Habitat: CoDns, CoScr, VFGrs (often serpentinite or granitic)
Life Form: Perennial herb
Blooming: March-June
Notes: Rare and declining in SCR Co. Includes *E. franciscanum* var. *crassifolium*. Inland plants approach *E. capitatum*. See *Aliso* 4(1):118-121 (1958) for original description.

Erythronium helenae Appleg.
"St. Helena fawn lily" Liliaceae
CNPS List: 4
State/Fed. Status: None
Distribution: LAK, NAP, SON
Study Area?: No
Habitat: Chprl, CmWld, LCFrs, VFGrs / volcanic or serpentinite
Life Form: Perennial herb (bulbiferous)
Blooming: March-May
Notes: Approximately fifteen NAP Co. occurrences are all near Mt. St. Helena; rare in SON Co. Threatened by horticultural collecting, road construction, and geothermal development. See *Contributions from the Dudley Herbarium* 1:188 (1933) for original description.

Fritillaria illiacea Lindl.
"fragrant fritillary" Liliaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: ALA, CCA, MNT, MRN, SBT, SCL, SFO, SMT, SOL, SON
Study Area?: Yes; Novato, Point Reyes NE, Santa Rosa, Cotati*, Camp Meeker
Habitat: CoPrr, CoScr, VFGrs / often serpentinite
Life Form: Perennial herb (bulbiferous)
Blooming: February-April
Notes: Threatened by grazing and loss of habitat to agriculture and urbanization. Quite variable.

Fritillaria purdyi Eastw.
"Purdy's fritillary" Liliaceae
CNPS List: 4
State/Fed. Status: None
Distribution: COL, GLE, HUM, LAK, MEN, NAP, TEH, TRI, YOL
Study Area?: No
Habitat: Chprl, CmWld, LCFrs / serpentinite
Life Form: Perennial herb (bulbiferous)
Blooming: March-June

Gratiola heterosepala Mason & Bacig.
"Boggs Lake hedge hyssop" Scrophulariaceae
CNPS List: 1B
State/Fed. Status: CE/C3c
Distribution: FRE, LAK, LAS, MAD, MOD, PLA, SAC, SHA, SJQ, SOL, TEH, OR
Study Area?: No
Habitat: MshSw (lake margins), VnPls / clay
Life Form: Annual herb
Blooming: April-June
Notes: Threatened by agriculture, development, grazing, trampling, and vehicles. Known for one occurrence in OR, where state listed as Threatened. USFWS and BLM have completed draft conservation strategy. See *Madroño* 12:150-152 (1954) for original description.

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

M.A. Lane

"San Francisco gumplant"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MNT, MRN, SCR, SFO, SLO, SMT

Study Area?: No

Habitat: CBScr, CoScr, VFGrs / sandy, serpentinite

Life Form: Perennial herb

Blooming: August-September

Notes: Most collections are old; need current information on distribution and rarity. Threatened by coastal development and non-native plants. See *Pittonia* 2:289 (1892) for original description, and *Novon* 2(3):215-217 (1992) for revised nomenclature.

Grindelia stricta DC. var. *angustifolia* (Gray) M.A.

Lane

"marsh gumplant"

Asteraceae

CNPS List: 4

State/Fed. Status: None

Distribution: ALA, CCA, MNT, MRN, NAP, SCL, SFO, SMT, SOL, SON

Study Area?: No

Habitat: MshSw (coastal salt)

Life Form: Perennial herb

Blooming: August-October

Notes: Hybridizes with *G. camporum* var. *camporum*. See *Novon* 2(3):215-217 (1992) for revised nomenclature.

Gutierrezia californica

Considered but rejected: too common.

Helianthella castanea Greene

"Diablo helianthella"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: ALA, CCA, MRN*, SFO*, SMT

Study Area?: No

Habitat: BUFRs, Chprl, CmWld, CoScr, RpWld, VFGrs

Life Form: Perennial herb

Blooming: April-June

Notes: Threatened by urbanization, grazing, and fire suppression.

Helianthus exilis Gray

"serpentine sunflower"

Asteraceae

CNPS List: 4

State/Fed. Status: /C3c

Distribution: COL, GLE, LAK, NAP, SHA, SIS, SON, TEH, TRI

Study Area?: No

Habitat: Chprl, CmWld / serpentinite seeps

Life Form: Annual herb

Blooming: July-November

Notes: Difficult to distinguish from *H. bolanderi*, refer to that species in *The Jepson Manual*.

Hemizonia congesta ssp. *congesta*

See *Hemizonia congesta* ssp. *leucocephala*.

Hemizonia congesta DC. ssp. *leucocephala* (Tanowitz)

Kell

"Hayfield tarplant"

Asteraceae

CNPS List: 3

State/Fed. Status: None

Distribution: MEN, MRN, SON

Study Area?: Yes; Novato, Sebastopol, Camp Meeker, Valley Ford, Two Rock, Healdsburg

Habitat: CoScr, VFGrs

Life Form: Annual herb

Blooming: April-October

Notes: Move to List 1B? Precise location, rarity, and endangerment information needed. Intergrades with ssp. *congesta*; dried plants may be indistinguishable. Many herbarium collections are misidentified. Threatened by agriculture and urbanization. See *Bulletin of the Torrey Botanical Club* 110:15 (1983) for original description, and *Phytologia* 73(3):259-260 (1992) for revised nomenclature.

Hemizonia multicaulis ssp. *multicaulis*

Considered but rejected: A synonym of *H. congesta* ssp. *congesta*; a common taxon.

Hemizonia multicaulis ssp. *vernalis*

Considered but rejected: A synonym of *H. congesta* ssp. *congesta*; a common taxon.

Hesperoxys sparsiflora (Gray) Greene var. *brevifolia*

(Gray) Morefield

"short-leaved evax"

Asteraceae

CNPS List: 4

State/Fed. Status: None

Distribution: HUM, MEN, MRN, SCR, SFO, SON, OR

Study Area?: No

Habitat: CBScr (sandy), CoDns

Life Form: Annual herb

Blooming: April-June

Notes: On review list in OR. See *Synoptical Flora of North America* 1(2):229 (1884) for original description, and *Systematic Botany* 17:293-310 (1992) for revised nomenclature.

Hesperolinon adenophyllum (Gray) Small

"glandular western flax"

Linaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: HUM*, LAK, MEN

Study Area?: Yes; The Geysers

Habitat: Chprl, CmWld, VFGrs / serpentinite

Life Form: Annual herb

Blooming: May-August

Notes: Threatened by geothermal development, recreation, and grazing. See *Proceedings of the American Academy of Arts and Sciences* 8:624-625 (1873) for original description, and *University of California Publications in Botany* 32:235-314 (1961) for taxonomic treatment.

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Hesperolinon bicarpellatum (H. K. Sharsm.) H. K. Sharsm.

"two-carpellate western flax" Linaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: LAK, NAP, SON

Study Area?: No

Habitat: Chprl (serpentine)

Life Form: Annual herb

Blooming: May-July

Notes: Previously confused with *H. serpentinum*, which also occurs on serpentine soils in the same general area. Threatened by development and grazing. See *University of California Publications in Botany* 32:235-314 (1961) for taxonomic treatment.

Notes: Known from only five extant occurrences. Threatened by vehicles and possibly by development. See *Systematic Botany* 18(1):137-144 (1993) for taxonomic treatment.

Hesperolinon congestum (Gray) Small

"Marin western flax" Linaceae

CNPS List: 1B

State/Fed. Status: CT/FT

Distribution: MRN, SFO, SMT

Study Area?: Yes, Novato

Habitat: Chprl, VFGs / serpentine

Life Form: Annual herb

Blooming: May-July

Notes: Known from fewer than twenty occurrences. Protected in part at Ring Mtn. Preserve (TNC), MRN Co. Threatened by development and foot traffic. See *Proceedings of the American Academy of Arts and Sciences* 6:521 (1865) for original description, and *University of California Publications in Botany* 32:235-314 (1961) for taxonomic treatment.

Holocarpha macradenia (DC.) Greene

"Santa Cruz tarplant" Asteraceae

CNPS List: 1B

State/Fed. Status: CE/C1

Distribution: ALA*, CCA*, MNT, MRN*, SCR

Study Area?: No

Habitat: CoPr, VFGs / often clay

Life Form: Annual herb

Blooming: June-October

Notes: All extant CCA Co. occurrences are introduced; nearly half have failed as of 1995. Last remaining natural population in the S.F. Bay Area extirpated in 1993. Seriously threatened by urbanization, agriculture, non-native plants, and lack of appropriate ecological disturbance. See *Fremontia* 5(4):1516 (1978) for species account.

Horkelia bolanderi Gray

"Bolander's horkelia" Rosaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: COL*, LAK, MEN

Study Area?: No

Habitat: Chprl, LCPs, Medws, VFGs / edges, vernal mesic areas

Life Form: Perennial herb

Blooming: June-August

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Horkelia cuneata Lindl. ssp. sericea (Gray) Keck

"Kellogg's horkelia" Rosaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: ALA*, MRN*, MNT, SBA, SCR, SFO*, SLO, SMT
Study Area?: No
Habitat: CCPrs, Chprl (maritime), CoScr / sandy or gravelly, openings
Life Form: Perennial herb
Blooming: April-September
Notes: Historical occurrences need field surveys. Threatened by coastal development. Occurrence from the Crocker Hills probably last remaining location in S.F. Bay. Remaining plants less distinct from ssp. *cuneata* than those formerly occurring near San Francisco.

Horkelia marinensis (Elmer) Crum

"Point Reyes horkelia" Rosaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MEN, MRN, SCR, SMT
Study Area?: Yes; Valley Ford
Habitat: CoDns, CoPrr, CoScr / sandy
Life Form: Perennial herb
Blooming: May-September
Notes: Known from fewer than twenty occurrences. Populations from near Ft. Bragg, MEN Co. may be varietally distinct. Threatened by residential development. See *Systematic Botany* 18(1):137-144 (1993) for distributional information.

Horkelia tenuiloba (Torr.) Gray

"thin-lobed horkelia" Rosaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: MEN, MRN, SON
Study Area?: Yes; Sebastopol, Camp Meeker, Guerneville
Habitat: Chprl (mesic openings, sandy)
Life Form: Perennial herb
Blooming: May-July
Notes: See *Report of the Pacific Railroad Expedition* 4(5):84 (1857) for original description and *Systematic Botany* 18(1):137-144 (1993) for taxonomic treatment.

Lasthenia burkei (Greene) Greene

"Burke's goldfields" Asteraceae
CNPS List: 1B
State/Fed. Status: CE/FE
Distribution: LAK, MEN, SON
Study Area?: Yes; Sebastopol, Jintown, Healdsburg
Habitat: Medws (mesic), VnPls
Life Form: Annual herb
Blooming: April-June
Notes: Threatened by agriculture, urbanization, and grazing. See *Bulletin of the California Academy of Sciences* 2(6):151 (1887) for original description, and *American Journal of Botany* 56(9):1042-1047 (1969) for information on origin and relationships.

Lathyrus jepsonii Greene var. jepsonii

"Delta tule pea" Fabaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: ALA, CCA, FRE, MRN, NAP, SAC, SBT, SCL, SJQ, SOL
Study Area?: No
Habitat: MshSw (freshwater and brackish)
Life Form: Perennial herb
Blooming: May-September
Notes: Threatened by agriculture and water diversions. See *Pittonia* 2:158 (1890) for original description.

Layia carnosa (Nutt.) T. & G.

"beach layia" Asteraceae
CNPS List: 1B
State/Fed. Status: CE/FE
Distribution: HUM, MNT, MRN, SBA*, SFO*
Study Area?: No
Habitat: CoDns
Life Form: Annual herb
Blooming: May-July
Notes: Threatened by coastal development, vehicles, and non-native plants. Protected in part at Manila Dunes ACEC and Mattole Beach ACEC (both BLM), HUM Co.

Layia septentrionalis Keck

"Colusa layia" Asteraceae
CNPS List: 1B
State/Fed. Status: None
Distribution: COL, LAK, MEN, NAP, SON, SUT, TEH, YOL
Study Area?: Yes; The Geysers
Habitat: Chprl, CmWld, VFGrs / sandy, serpentinite
Life Form: Annual herb
Blooming: April-May
Notes: Threatened by development. See *Aliso* 4(1):106 (1958) for original description.

Legenere limosa (Greene) McVaugh

"legenere" Campanulaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: LAK, NAP, PLA, SAC, SMT, SOL, SON*, STA*, TEH
Study Area?: Yes; Glen Ellen*
Habitat: VnPls
Life Form: Annual herb
Blooming: May-June
Notes: Many historical occurrences extirpated. Threatened by grazing, development, and industrial forestry. See *Pittonia* 2:81 (1890) for original description, *North American Flora* 32(1):13-14 (1943) for revised nomenclature, and *Wasmann Journal of Biology* 33(1-2):91 (1975) for distributional information.

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Lessingia arachnoidea Greene

"Crystal Springs lessingia"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: SMT, SON?

Study Area?: Yes; Camp Meeker

Habitat: CmWld, CoScr, VFGrs / serpentinite, often roadsides

Life Form: Annual herb

Blooming: July-October

Notes: Known only from seven occurrences near Crystal Springs Reservoir (SMT Co.); occurrences from SON Co. need taxonomic verification. Threatened by non-native plants. See *Leaflets of Botanical Observation and Criticism* 2:29 (1910) for original description.

Lessingia hololeuca Greene

"woolly-headed lessingia"

Asteraceae

CNPS List: 3

State/Fed. Status: None

Distribution: ALA, MNT, MRN, NAP, SCL, SMT, SOL, SON, YOL

Study Area?: Yes; Petaluma River, Novato, Point Reyes NE, Camp Meeker

Habitat: CoScr, LCFrs, VFGrs / clay, serpentinite

Life Form: Annual herb

Blooming: June-October

Notes: Move to List 4? Need location, rarity, and endangerment information. Probably more widespread in the southern Sacramento Valley, southern North Coast Ranges, and northern S.F. Bay. Possibly threatened by grazing. See *Flora Franciscana*, p. 377 (1897) by E. L. Greene for original description; and *University of California Publications in Botany* 16:40 (1929) for taxonomic treatment.

Lessingia microdentata Greene var. microdentata

"Tamalpais lessingia"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MRN

Study Area?: No

Habitat: Chprl, VFGrs / usually serpentinite, often roadsides

Life Form: Annual herb

Blooming: June-September

Notes: Known from only four occurrences in the Mt. Tamalpais area. See *Leaflets of Botanical Observation and Criticism* 2:28 (1910) for original description, and *University of California Publications in Botany* 16:39-40 (1929) for taxonomic treatment.

Lilaeopsis masonii Math. & Const.

"Mason's lilaeopsis"

Apiaceae

CNPS List: 1B

State/Fed. Status: CR/C2

Distribution: ALA, CCA, MRN?, NAP, SAC, SJQ SOL

Study Area?: No

Habitat: MshSw (brackish or freshwater), RpScr

Life Form: Perennial herb

Blooming: April-October

Notes: Locally common in Suisun Bay. Threatened by erosion, channel stabilization, development, flood control projects, recreation, agriculture, and shading resulting from marsh succession. Many populations ephemeral, exploiting newly deposited or exposed sediments. Development of comprehensive management plan difficult due to large numbers of poorly coordinated planning efforts. Collection from Chicken Ranch Road, MRN Co. may be *L. occidentalis*. See *Madroño* 24:81 (1977) for original description.

Lilium maritimum Keil

"coast lily"

Liliaceae

CNPS List: 1B

State/Fed. Status: /C1

Distribution: MEN, MRN*, SFO?*, SMT*, SON

Study Area?: No

Habitat: BUFRs, CCFrs, CoPrr, CoScr, NCFrs

Life Form: Perennial herb (bulbiferous)

Blooming: May-July

Notes: Populations along Highway 1 are routinely disturbed by road maintenance; also threatened by urbanization, horticultural collecting, and habitat fragmentation. Hybridizes with *L. pardalinum* ssp. *pardalinum*. See *Proceedings of the American Academy of Arts and Sciences* 6:140 (1875) for original description.

Lilium pardalinum Keil ssp. pitkinense (Beane & Vollmer) M. Skinner

"Pitkin Marsh lily"

Liliaceae

CNPS List: 1B

State/Fed. Status: CE/PE

Distribution: SON

Study Area?: Yes; Sebastopol, Two Rock

Habitat: CmWld, Medws, MshSw (freshwater) / mesic, sandy

Life Form: Perennial herb (bulbiferous)

Blooming: June-July

Notes: Known from only two occurrences near Sebastopol, totaling 200 individual plants as of 1993. Most of marsh habitat has been destroyed; also threatened by horticultural collecting, grazing, and competition from other plants. State-listed as *L. pitkinense*.

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Lilium rubescens Wats.

"redwood lily"

Liliaceae

CNPS List: 4

State/Fed. Status: None

Distribution: DNT, HUM, LAK, MEN, NAP, SCR*,
SHA, SIS, SON, TRI

Study Area?: No

Habitat: BUFRs, Chprl, LCFrs, UCFrs / sometimes
serpentine

Life Form: Perennial herb (bulbiferous)

Blooming: June-July

Notes: Increasingly rare in southern portion of range.
Threatened by urbanization, horticultural collection, and
grazing. See *Proceedings of the American Academy of
Arts and Sciences* 14:256 (1879) for original description.

**Limnanthes douglasii R. Br. ssp. sulphurea (C. T.
Mason) C. T. Mason**

"Point Reyes meadowfoam"

Limnanthaceae

CNPS List: 1B

State/Fed. Status: CE/C2

Distribution: MRN, SMT

Study Area?: No

Habitat: CoPr, Medws (mesic), MshSw (freshwater),
VnPIs

Life Form: Annual herb

Blooming: March-May

Notes: Known from approximately ten occurrences.
Threatened by grazing, trampling, and non-native plants.
See *University of California Publications in Botany*
25:477 (1952) for original description.

Limnanthes viscidula Ornduff

"Sebastopol meadowfoam"

Limnanthaceae

CNPS List: 1B

State/Fed. Status: CE/FE

Distribution: NAP?, SON

Study Area?: Yes; Santa Rosa, Cotati, Sebastopol, Camp
Meeker*, Two Rock

Habitat: Medws, VFGrs, VnPIs / vernally mesic

Life Form: Annual herb

Blooming: April-May

Notes: Only NAP Co. occurrence (500A) may be
introduced; protected in part at Napa River ER (CDFG).
Threatened by urbanization, agriculture, and grazing. See
Brittonia 21:11-14 (1969) for original description.

Linanthus acicularis Greene

"bristly linanthus"

Polemoniaceae

CNPS List: 4

State/Fed. Status: None

Distribution: ALA, BUT, CCA?, FRE, HUM, LAK,
MEN, MRN, NAP, SMT, SON

Study Area?: No

Habitat: Chprl, CmWld, CoPr, VFGrs

Life Form: Annual herb

Blooming: April-July

Notes: Historical occurrences need verification. See
Pittonia 2:259 (1892) for original description.

Linanthus grandiflorus (Benth.) Greene

"large-flower linanthus"

Polemoniaceae

CNPS List: 4

State/Fed. Status: None

Distribution: ALA, KRN, MAD, MER, MNT, MRN,
SBA*, SCL, SCR, SFO, SLO, SMT, SON

Study Area?: No

Habitat: CBScr, CCFrs, CmWld, CoDns, CoPr, CoScr,
VFGrs / usually sandy

Life Form: Annual herb

Blooming: April-July

Notes: Many historical occurrences extirpated by
development; need information. Other taxa often
misidentified as *L. grandiflorus*. See *Pittonia* 2:260
(1892) for original description.

Lomatium repostum (Jeps.) Math.

"Napa lomatium"

Apiaceae

CNPS List: 4

State/Fed. Status: None

Distribution: LAK, NAP, SOL, SON

Study Area?: No

Habitat: Chprl, CmWld / serpentine

Life Form: Perennial herb

Blooming: April-May

Lupinus eximius Davy

"San Mateo tree lupine"

Fabaceae

CNPS List: 3

State/Fed. Status: /C2

Distribution: SMT, SON?

Study Area?: No

Habitat: Chprl, CoScr

Life Form: Shrub (evergreen)

Blooming: April-July

Notes: Move to List 1B? SON Co. plants need
taxonomic confirmation. Identification is very difficult;
study needed. See *L. arboreus* in *The Jepson Manual*.
USFWS uses the name *L. arboreus* var. *eximius*. See
Erythea 3:116 (1895) for original description.

Lupinus sericatus Kell.

"Cobb Mtn. Lupine"

Fabaceae

CNPS List: 1B

State/Fed. Status: /C3c

Distribution: COL, LAK, NAP, SON

Study Area?: Yes; The Geysers

Habitat: Chprl, CmWld, LCFrs

Life Form: Perennial herb

Blooming: March-June

Notes: Threatened by geothermal development, logging,
and road widening; will colonize disturbed sites. See
Fremontia 13(3):21-22 (1985) for account of re-
establishment project in The Geysers geothermal area.

Lupinus tidestromii Greene

"Tidestrom's lupine"

Fabaceae

CNPS List: 1B

State/Fed. Status: CE/FE

Distribution: MNT, MRN, SON

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Study Area?: No
Habitat: CoDns
Life Form: Perennial herb (rhizomatous)
Blooming: May-June
Notes: Seriously threatened by coastal development, trampling, and non-native plants; properly timed grazing may be beneficial. Includes *L. tidestromii* var. *layneae*. Only MNT Co. plants are state-listed Endangered as var. *tidestromii*. See *Erythea* 3:17 (1895) for original description.

Lupinus tidestromii var. *layneae*
See *Lupinus tidestromii*.

Madia nutans (Greene) Keck
"nodding madia" Asteraceae
CNPS List: 4
State/Fed. Status: None
Distribution: NAP, SON
Study Area?: No
Habitat: Chprl, CmWld / rocky, volcanic
Life Form: Annual herb
Blooming: April-May

Micropus amphibolus Gray
"Mt. Diablo cottonweed" Asteraceae
CNPS List: 4
State/Fed. Status: None
Distribution: ALA, CCA, LAK, MNT, MRN, NAP, SCR, SON
Study Area?: No
Habitat: BUFRs, CmWld, VFGs
Life Form: Annual herb
Blooming: April-May

Microseris decipiens
See *Stebbinsoseris decipiens*.

Monardella frutescens (Hooov.) Jokersi
"San Luis Obispo monardella" Lamiaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: SBA, SLO
Study Area?: No
Habitat: CoDns, CoScr (sandy)
Life Form: Perennial herb (rhizomatous)
Blooming: May-July
Notes: Threatened by coastal development and vehicles. Hybridizes with *M. crispera*. See *Leaflets of Western Botany* 5:179-182 (1949) for original description, and *Phytologia* 72(1):9-16 (1992) for revised nomenclature.

Monardella undulata Benth.
"curly-leaved monardella" Lamiaceae
CNPS List: 4
State/Fed. Status: None
Distribution: MNT, MRN, SBA, SCR, SFO, SLO, SMT, SON
Study Area?: No

Habitat: Chprl, CoDns, CoScr, LCFrs (ponderosa pine sandhills)
Life Form: Annual herb
Blooming: May-July
Notes: Threatened by coastal development, sand mining, and non-native plants.

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Monardella villosa Benth. ssp. *globosa* (Greene) Jøkerst
"robust monardella" Lamiaceae

CNPS List: 1B
State/Fed. Status: None
Distribution: ALA, CCA, HUM, LAK, MRN, NAP, SMT, SON
Study Area?: Yes; Valley Ford
Habitat: Chprl (openings), CmWld
Life Form: Perennial herb (rhizomatous)
Blooming: June-July
Notes: Known from ten occurrences. See *Pittonia* 5:82 (1902) for original description, and *Phytologia* 72(1):9-16 (1992) for revised nomenclature.

Monardella viridis Ieps. ssp. *viridis*
"green monardella" Lamiaceae

CNPS List: 4
State/Fed. Status: None
Distribution: LAK, NAP, SOL, SON
Study Area?: No
Habitat: BUFRs, Chprl, CmWld
Life Form: Perennial herb (rhizomatous)
Blooming: July-September
Notes: Hybridizes with *M. villosa* ssp. *villosa*.

Navarretia leucocephala Benth. ssp. *bakeri* (Mason)

Day
"Baker's navarretia" Polemoniaceae

CNPS List: 1B
State/Fed. Status: None
Distribution: COL, LAK, MEN, MRN, NAP, SOL, SON, TEH
Study Area?: Yes; Petaluma River, Santa Rosa, Sebastopol, Healdsburg
Habitat: CmWld, LCFrs, Medws (mesic), VFGrs, VnPls
Life Form: Annual herb
Blooming: May-July
Notes: *N. leucocephala* on review list in OR. See *Madroño* 8(6):198 (1946) for original description, and *Novon* 3(4):331-340 (1993) for revised nomenclature.

Navarretia leucocephala Benth. ssp. *pauciflora* (Mason)

Day
"few-flowered navarretia" Polemoniaceae

CNPS List: 1B
State/Fed. Status: CT/PE
Distribution: LAK, NAP
Study Area?: No
Habitat: VnPls (volcanic ash flow)
Life Form: Annual herb
Blooming: May-June
Notes: Known from approximately six occurrences. Threatened by altered hydrology, erosion, grazing, vehicles, and recreation. Intergrades rarely with ssp. *plieantha*. State-listed as *N. pauciflora*. See *Madroño* 8:200 (1946) for original description, and *Novon* 3(4):331-340 (1993) for revised nomenclature.

Navarretia leucocephala Benth. ssp. *plieantha* (Mason)

Day
"many-flowered navarretia" Polemoniaceae

CNPS List: 1B
State/Fed. Status: CE/PE
Distribution: LAK, SON
Study Area?: Yes; Healdsburg
Habitat: VnPls (volcanic ash flow)
Life Form: Annual herb
Blooming: May-June
Notes: Known from approximately seven occurrences. Threatened by grazing, development, and vehicles. Protected in part at Loch Lomond ER (CDFG). State-listed as *N. plieantha*. USFWS also uses this name. See *Madroño* 8:199 (1946) for original description, and *Novon* 3(4):331-340 (1993) for revised nomenclature.

Navarretia subulgera Greene

"awl-leaved navarretia" Polemoniaceae

CNPS List: 4
State/Fed. Status: None
Distribution: AMA, BUT, DNT, LAK, MEN, MOD, NAP?, SHA, TEH, OR
Study Area?: No
Habitat: Chprl, CmWld, LCFrs / rocky, mesic
Life Form: Annual herb
Blooming: April-August

Orobancha valida Ieps. ssp. *howellii* Heckard & Collins

"Howell's broomrape" Orobanchaceae

CNPS List: 4
State/Fed. Status: None
Distribution: GLE, LAK, MEN, NAP, SON, TEH
Study Area?: No
Habitat: Chprl (serpentine or volcanic)
Life Form: Perennial herb, parasitic
Blooming: June-September
Notes: Generally parasitic on *Garrya* spp. See *Madroño* 29(2):95-100 (1982) for original description.

Parvisedum latocarpum (H. K. Sharsm.) Clausen

"Lake County stonecrop" Crassulaceae

CNPS List: 1B
State/Fed. Status: CE/PE
Distribution: LAK
Study Area?: No
Habitat: CmWld, VFGrs. VnPls / vernal mesic depressions in volcanic outcrops
Life Form: Annual herb
Blooming: April-May
Notes: Known from approximately five occurrences. Extremely vulnerable to trampling; also threatened by grazing, altered hydrology, and development. See *Madroño* 5:192-194 (1940) for original description, and *Cactus and Succulent Journal* 18:58 (1946) for revised nomenclature.

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Penstemon newberryi Gray var. *sonomensis* (Greene)

Ieps.
"Sonoma beardtongue" Scrophulariaceae
CNPS List: 1B
State/Fed. Status: None
Distribution: LAK, NAP, SON
Study Area?: No
Habitat: Chprl (rocky)
Life Form: Perennial herb
Blooming: April-July

Pentachaeta bellidiflora Greene

"white-rayed pentachaeta" Asteraceae
CNPS List: 1B
State/Fed. Status: CE/PE
Distribution: MRN*, SCR*, SMT
Study Area?: No
Habitat: VFGs (often serpentine)
Life Form: Annual herb
Blooming: March-May
Notes: Known from only one extended occurrence bisected by Highway 280; historical occurrences lost to development. See *Bulletin of the California Academy of Sciences* 1:86 (1885) for original description, and *University of California Publications in Botany* 65:1-41 (1973) for taxonomic treatment.

Perideridia gairdneri (H. & A.) Math. ssp. *gairdneri*

"Gairdner's yampah" Apiaceae
CNPS List: 4
State/Fed. Status: /C2
Distribution: DNT, HUM, KRN, LAS, LAX*, MEN, MNT, MOD, MRN, NAP, ORA*, SBT, SCL, SCR, SDG*, SIS, SLO, SMT(*?), SOL, SON, TRI
Study Area?: No
Habitat: BUFRs, Chprl, VFGs, VnPls / mesic
Life Form: Perennial herb
Blooming: June-October
Notes: Endangered in the southern portion of its range; status of occurrences uncertain. Can be relatively common locally, especially in northern counties. Threatened by agriculture and urbanization. See *University of California Publications in Botany* 55:1-74 (1969) for taxonomic treatment.

Phacelia insularis Munz var. *continentalis* J. T. Howell

"North Coast phacelia" Hydrophyllaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MEN, MRN
Study Area?: No
Habitat: CBSer, CoDns / sandy
Life Form: Annual herb
Blooming: March-May
Notes: Known from approximately seven occurrences. Threatened by foot traffic, non-native plants, and grazing. See *American Midland Naturalist* 33:474 (1945) for original description.

Piperia candida Morgan & Ackerman

"white-flowered rein orchid" Orchidaceae
CNPS List: 4
State/Fed. Status: None
Distribution: DNT, HUM, MEN, SCR, SIS, SMT, SON, TRI, OR, WA+
Study Area?: No
Habitat: LCFrs, NCFrs / sometimes serpentine
Life Form: Perennial herb
Blooming: May-August
Notes: Difficult to identify from herbarium material. See *Lindleyana* 5(4):205-211 (1990) for original description.

Pityopus californicus (Eastw.) Copel. f.

"California pinefoot" Ericaceae
CNPS List: 4
State/Fed. Status: /C3c
Distribution: DNT, FRE, HUM, LAK, MEN, MRN, NAP, SIS, SON, TUL, OR
Study Area?: No
Habitat: BUFRs, LCFrs, NCFrs, UCFrs
Life Form: Perennial herb
Blooming: May-July
Notes: Threatened by logging.

Plagiobothrys glaber (Gray) Jtn.

"hairless popcorn-flower" Boraginaceae
CNPS List: 1A Last Seen: 1954
State/Fed. Status: /C3a
Distribution: ALA*, MER*, MRN*, SBT*, SCL*
Study Area?: No
Habitat: Medws (alkaline), MshSw (coastal salt)
Life Form: Annual herb
Blooming: March-May
Notes: All collections since 1930's located in the Hollister area; plant should be looked for there. Possibly a variety of *P. stipitatus*. See *Proceedings of the American Academy of Arts and Sciences* 17:227 (1882) for original description.

Plagiobothrys mollis (Gray) Jtn. var. *vestitus* (Greene) Jtn.

"Petaluma popcorn-flower" Boraginaceae
CNPS List: 1A Last Seen: 1888
State/Fed. Status: /C2*
Distribution: SON*
Study Area?: Yes; Petaluma*
Habitat: MshSw? (coastal salt), VFGs (mesic)
Life Form: Perennial herb
Blooming: June-July
Notes: Known only from the type collection near Petaluma. Field work needed.

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Plagiobothrys strictus (Greene) Ilt.

"Calistoga popcorn-flower"

Boraginaceae

CNPS List: 1B

State/Fed. Status: CT/C1

Distribution: NAP

Study Area?: No

Habitat: BUFRs, Medws, VFRs, VnPIs / alkaline areas
near thermal springs

Life Form: Annual herb

Blooming: March-June

Notes: Known from only two extant occurrences near
Calistoga. Threatened by urbanization, recreational
activities, and airport maintenance.

Manual See *Proceedings of the California Academy of
Sciences* IV 20:117 (1931) for revised nomenclature.

Pleurapogon hooverianus (L. Benson) J. T. Howell

"North Coast semaphore grass"

Poaceae

CNPS List: 1B

State/Fed. Status: CR/C2

Distribution: MEN, MRN, SON

Study Area?: Yes; Cotati, Sebastopol, Camp Meeker

Habitat: BUFRs, Medws, NCFrs, VnPIs / mesic

Life Form: Perennial herb (rhizomatous)

Blooming: May-August

Notes: Known from approximately twelve occurrences.
See *American Journal of Botany* 28:360 (1941) for
original description, *Leaflets of Western Botany* 4(10):247
(1946) for revised nomenclature, and *Taxon* 27(4):375
(1978) for alternate nomenclature.

Poa napaensis Beetle

"Napa blue grass"

Poaceae

CNPS List: 1B

State/Fed. Status: CE/C1

Distribution: NAP

Study Area?: No

Habitat: Medws, VFRs / alkaline, near hot springs

Life Form: Perennial herb

Blooming: May-August

Notes: Known from only two occurrences in the
Calistoga area. Threatened by development, recreational
activities, and airport maintenance. See *Leaflets of
Western Botany* 4:289 (1946) for original description.

Pogogyne douglasii Benth. ssp. *parviflora* (Benth.) J. T. Howell

"Douglas's pogogyne"

Lamiaceae

CNPS List: 3

State/Fed. Status: /C3c

Distribution: BUT?, LAK, MEN, NAP, SAC?, SON

Study Area?: Yes; Santa Rosa, Cotati, Sebastopol,
Healdsburg

Habitat: Chprl, Cmwld, LCFrs, Medws, MshSw, VFRs,
VnPIs / mesic

Life Form: Annual herb

Blooming: May-July

Notes: Move to List 4? Many new occurrences found
recently, but threatened by urbanization and agriculture;
some populations have been extirpated. Taxonomic
questions; is ssp. distinct? See *P. douglasii* in *The Jepson*

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Polygonum marinense Mertens & Raven

"Marin knotweed"

Polygonaceae

CNPS List: 3

State/Fed. Status: /C2

Distribution: MRN, NAP, SON

Study Area?: Yes; Petaluma River

Habitat: MshSw (coastal salt)

Life Form: Annual herb

Blooming: April-October

Notes: Move to List 1B? Known from fewer than fifteen occurrences. Taxonomic status uncertain, related to *P. aviculare*; possible synonym of *P. robertii*, a non-native plant. Immediate taxonomic study needed. Threatened by coastal development.

Potentilla hickmanii Eastw.

"Hickman's cinquefoil"

Rosaceae

CNPS List: 1B

State/Fed. Status: CE/PE

Distribution: MNT, SMT*, SON*

Study Area?: Yes; Two Rock*

Habitat: CBScr, CCFrs, Medws (vernally mesic),

MshSw (freshwater)

Life Form: Perennial herb

Blooming: April-August

Notes: Known from only one occurrence on the Monterey Peninsula, totaling 24 individual plants as of 1992. Seriously threatened by urbanization and recreational activities. See *Bulletin of the Torrey Botanical Club* 29:77-78 (1902) for original description, and *Fremontia* 21(1):25-29 (1993) for species account.

Quercus lobata

Considered but rejected: Too common.

Ranunculus lobbii Gray

"Lobb's aquatic buttercup"

Ranunculaceae

CNPS List: 4

State/Fed. Status: None

Distribution: ALA, CCA, MEN, MRN, NAP SCL, SOL, SON, OR+

Study Area?: No

Habitat: CnWld, NCFrs, VFGrs, VnPls / mesic

Life Form: Annual herb, aquatic

Blooming: March-May

Notes: Threatened by urbanization and agriculture.

Rhynchospora alba (L.) Vahl

"white beaked-rush"

Cyperaceae

CNPS List: 4

State/Fed. Status: None

Distribution: DNT?, LAS, MEN, NEV?, PLU, SON, ID,

++

Study Area?: No

Habitat: BgFns, MshSw (freshwater)

Life Form: Perennial herb (rhizomatous)

Blooming: July-August

Notes: Threatened in ID.

Rhynchospora californica Gale

"California beaked-rush"

Cyperaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: BUT, MPA, MRN, SON

Study Area?: Yes; Sebastopol, Two Rock

Habitat: BgFns, LCFrs, Medws (seeps), MshSw (freshwater)

Life Form: Perennial herb (rhizomatous)

Blooming: May-July

Notes: Known from fewer than ten occurrences. Threatened by marsh habitat loss. See *Rhodora* 46:272-273 (1944) for original description, and *Madroño* 33(2):150 (1986) for information on BUT Co. collection.

Rhynchospora globularis (Chapm.) Small var.

globularis

"round-headed beaked-rush"

Cyperaceae

CNPS List: 2

State/Fed. Status: None

Distribution: SON, ++

Study Area?: Yes; Sebastopol, Two Rock

Habitat: MshSw (freshwater)

Life Form: Perennial herb (rhizomatous)

Blooming: July-August

Notes: Seriously threatened by marsh habitat loss.

Ribes divaricatum var. *pubiflorum*

Considered but rejected: Too common.

Ribes victoris Greene

"Victor's gooseberry"

Grossulariaceae

CNPS List: 4

State/Fed. Status: None

Distribution: Yes; MEN, MRN, NAP, SOL, SON

Study Area?: No

Habitat: BUFRs, Chprl

Life Form: Shrub (deciduous)

Blooming: March-April

Sidalcea calycosa M. E. Jones ssp. *rhizomata* (Teps.)

Munz

"Point Reyes checkerbloom"

Malvaceae

CNPS List: 1B

State/Fed. Status: None

Distribution: MEN, MRN, SON

Study Area?: Yes; Petaluma, Valley Ford

Habitat: MshSw (freshwater, near coast)

Life Form: Perennial herb (rhizomatous)

Blooming: April-September

Notes: See *Manual of the Flowering Plants of California*, p. 629 (1925) by W. L. Jepson for original description.

Sidalcea hickmanii Greene ssp. *viridis* C. L. Hitchc.

"Marin checkerbloom"

Malvaceae

CNPS List: 1B

State/Fed. Status: /C2

Distribution: MRN, NAP, SMT, SON

Study Area?: No

Habitat: Chprl (serpentine)

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Life Form: Perennial herb
Blooming: May-June
Notes: Possibly threatened by development.
Sidalcea oregana (Nutt.) Gray ssp. *valida* (Greene)
C. L. Hitchc.
"Kenwood Marsh checkerbloom" Malvaceae
CNPS List: 1B
State/Fed. Status: CE/PE
Distribution: SON
Study Area?: No
Habitat: MshSw (freshwater)
Life Form: Perennial herb (rhizomatous)
Blooming: June-September
Notes: Known from only three small occurrences: one in Knights Valley and two in Kenwood Marsh. Threatened by grazing and hydrology alteration, and possibly by competition with native and non-native plants. See *Pitonia* 3:157-158 (1897) for original description, and *University of Washington Publications in Biology* 18:56-58 (1957) for revised nomenclature.

Stebbinsoseris decipiens (Chambers) Chambers
"Santa Cruz microseris" Asteraceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MNT, MRN, SCR
Study Area?: No
Habitat: BUFRs, CCFrs, Chprl, CoPrr, CoScr / open areas, sometimes serpentine
Life Form: Annual herb
Blooming: April-May
Notes: Known from fewer than twenty occurrences. Threatened by grazing. USFWS uses the name *Microseris decipiens*. See *Contributions from the Dudley Herbarium* 4:290-291 (1955) for original description, and *American Journal of Botany* 78(8):1015-1027 (1991) for revised nomenclature.

Streptanthus batrachopus Morrison
"Tamalpais jewel-flower" Brassicaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN
Study Area?: No
Habitat: CCFrs, Chprl / serpentine
Life Form: Annual herb
Blooming: April-June
Notes: Known from fewer than ten occurrences in the Mt. Tamalpais area. Similar plants from the southern North Coast Ranges may be an undescribed new taxon. Intergrades with *S. barbiger*.

Streptanthus brachiatus F. W. Hoffm. ssp. *brachiatus*
"Socrates Mine jewel-flower" Brassicaceae
CNPS List: 1B
State/Fed. Status: /C1
Distribution: NAP, SON
Study Area?: Yes; The Geysers
Habitat: CCFrs, Chprl / serpentine
Life Form: Perennial herb

Blooming: June
Notes: Known from fewer than ten occurrences. Plants from LAK Co. (517B, 533C) are more appropriately assigned to *S. brachiatus* ssp. *hoffmanii*. See *Madroño* 36(1):36 (1989) for revised nomenclature.

Streptanthus brachiatus F. W. Hoffm. ssp. *hoffmanii*
Dolan & LaPra
"Freed's jewel-flower" Brassicaceae
CNPS List: 1B
State/Fed. Status: /C1
Distribution: LAK, SON
Study Area?: No
Habitat: Chprl, CmWld / serpentine
Life Form: Perennial herb
Blooming: May-July
Notes: Known from approximately ten occurrences. See *Madroño* 36(1):36 (1989) for original description.

Streptanthus glandulosus Hook. ssp. *hoffmanii*
Kruckeberg
"secund jewel-flower" Brassicaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: SON
Study Area?: No
Habitat: Chprl, CmWld, VFGrs (often serpentine)
Life Form: Annual herb
Blooming: April-July
Notes: Historical occurrences need field surveys. See *S. glandulosus* ssp. *secundus* in *The Jepson Manual*. See *Madroño* 14(7):223 (1958) for original description, and *Systematic Botany* 19(4): 57-574 (1994) for discussion of *S. glandulosus* complex.

Streptanthus glandulosus Hook. ssp. *pulchellus*
(Greene) Kruckeberg
"Mt. Tamalpais jewel-flower" Brassicaceae
CNPS List: 1
State/Fed. Status: /C3c
Distribution: MRN
Study Area?: Yes; Novato
Habitat: Chprl, VFGrs / serpentine
Life Form: Annual herb
Blooming: May-July
Notes: Endemic to the Mt. Tamalpais area. See *Systematic Botany* 19(4):557-574 (1994) for discussion of *S. glandulosus* complex.

Streptanthus morrisanii F. W. Hoffm. ssp. *elatus* F. W. Hoffm.
"Three Peaks jewel-flower" Brassicaceae
CNPS List: 1B
State/Fed. Status: /C1
Distribution: LAK, NAP, SON
Study Area?: No
Habitat: Chprl (serpentine)
Life Form: Perennial herb
Blooming: June-September

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Notes: See *Streptanthus morrisonii* in *The Jepson Manual*. See Madroño 11 (6):228 (1952) for original description and 36(1):33-40 (1989) for additional information.

Streptanthus morrisonii F. W. Hoffm. ssp. *hirtiflorus*
 F. W. Hoffm.
 "Dorr's Cabin jewel-flower" Brassicaceae
 CNPS List: 1B
 State/Fed. Status: /C1
 Distribution: SON
 Study Area?: No
 Habitat: Chprl, CCFrs / serpentine
 Life Form: Perennial herb
 Blooming: June
 Notes: Known from only one small occurrence in The Cedars. See *Streptanthus morrisonii* in *The Jepson Manual*. See Madroño 11 (6):228 (1952) for original description and 36(1):33-40 (1989) for additional information.

Streptanthus morrisonii F. W. Hoffm. ssp. *kruckebergii*
 Dolan & LaPre
 "Kruckeberg's jewel-flower" Brassicaceae
 CNPS List: 1B
 State/Fed. Status: /C2
 Distribution: LAK, NAP, SON
 Study Area?: Yes; The Geysers
 Habitat: CmWld (serpentine)
 Life Form: Perennial herb
 Blooming: April-July
 Notes: Possibly threatened by gold mining activities. See *Streptanthus morrisonii* in *The Jepson Manual*. See Madroño 36(1):38 (1989) for original description.

Streptanthus morrisonii F. W. Hoffm. ssp. *morrisonii*
 "Morrison's jewel-flower" Brassicaceae
 CNPS List: 1B
 State/Fed. Status: /C2
 Distribution: SON
 Study Area?: No
 Habitat: Chprl (serpentine)
 Life Form: Perennial herb
 Blooming: May-September
 Notes: See *Streptanthus morrisonii* in *The Jepson Manual*. See Madroño 11 (6):225 (1952) for original description and 36(1):33-40 (1989) for additional information.

Streptanthus niger Greene
 "Tiburon jewel-flower" Brassicaceae
 CNPS List: 1B
 State/Fed. Status: CE/FE
 Distribution: MRN
 Study Area?: No
 Habitat: VFCrs (serpentine)
 Life Form: Annual herb
 Blooming: May-June
 Notes: Known from only three occurrences on the Tiburon Peninsula. Threatened by road construction, foot traffic, and development. See *Bulletin of the Torrey Botanical Club* 13:141 (1886) for original description and Madroño 14(7):217-227 (1958) for taxonomic treatment, and *Systematic Botany* 19(4):557-574 (1994) for discussion of *S. glandulosus* complex.

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Streptanthus tortuosus var. *suffrutescens*

Considered but rejected: Too common.

Suaeda californica Wats.

"California seablite"

Chenopodiaceae

CNPS List: 1B

State/Fed. Status: /PE

Distribution: ALA*, SCL*, SLO

Study Area?: No

Habitat: MshSw (coastal salt)

Life Form: Shrub (evergreen)

Blooming: July-October

Notes: Formerly known from San Francisco Bay area, where extirpated by development; now extant only in Morro Bay. Remains from adobe bricks indicate plant may once have occurred along the Petaluma River, SON Co. Threatened by recreation, erosion, and alteration of marsh habitat. Often confused with *S. esteroa* and *S. taxifolia* in southern California, but does not occur there.

Tracyina rostrata Blake

"beaked tracyina"

Asteraceae

CNPS List: 1B

State/Fed. Status: /C3c

Distribution: HUM, LAK, SON

Study Area?: No

Habitat: CmWld, VFGrs

Life Form: Annual herb

Blooming: May-June

Notes: Known from fewer than twenty occurrences.

Trifolium amoenum Greene

"showy Indian clover"

Fabaceae

CNPS List: 1B

State/Fed. Status: /PE

Distribution: ALA*, MEN*, MRN*, NAP*, SCL*, SOL*, SON(*?)

Study Area?: Yes; Petaluma*, Santa Rosa*, Cotati*, Sebastopol*, Camp Meeker*, Valley Ford*

Habitat: VFGrs (sometimes serpentine)

Life Form: Annual herb

Blooming: April-June

Notes: Rediscovered in 1993 by P. Connors; only one plant found, and subsequent surveys in 1994-1995 unsuccessful. Now only exists in cultivation. Historical habitat lost to urbanization and agriculture. See *Flora Franciscana*, p. 27 (1891) by E. Greene for original description, and *Fremontia* 22(2):3-7 (1994) for account of rediscovery.

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Triphysaria floribunda (Benth.) Chuang & Heckard
"San Francisco owl's clover" Scrophulariaceae
CNPS List: 1B
State/Fed. Status: /C2
Distribution: MRN, SFO, SMT
Study Area?: Yes; Point Reyes NE, Valley Ford
Habitat: CoPrr, VFGrs / serpentinite
Life Form: Annual herb
Blooming: April-May
Notes: Threatened by grazing and trampling. See
Systematic Botany 16(4):644-666 (1991) for revised
nomenclature.

Veratrum fimbriatum Gray
"fringed false-hellebore" Liliaceae
CNPS List: 4
State/Fed. Status: /C3c
Distribution: MEN, SON
Study Area?: No
Habitat: BgFns, CoScr, Medws, NCFrs / mesic
Life Form: Perennial herb
Blooming: July-September

* Data derived primarily from CNPS 1995; modifications and additions by Sycamore Environmental.

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GEOGRAPHIC CODES

[Counties, islands, states, and others]

ALA = Alameda
ALP = Alpine
AMA = Amador
ANA = Anacapa Isl. (VEN Co.)
BUT = Butte
CAL = Calaveras
CCA = Contra Costa
COL = Colusa
DNT = Del Norte
ELD = El Dorado
FAR = Farallon Isls. (SFO Co.)
FRE = Fresno
GLE = Glenn
HUM = Humboldt
IMP = Imperial
INY = Inyo
KNG = Kings
KRN = Kern
LAK = Lake
LAS = Lassen
LAX = Los Angeles
MAD = Madera
MPA = Mariposa
MRN = Marin
MEN = Mendocino
MER = Merced
MOD = Modoc
MNO = Mono
MNT = Monterey
NAP = Napa
NEV = Nevada
ORA = Orange
PLA = Placer
PLU = Plumas
RIV = Riverside
SAC = Sacramento
SBA = Santa Barbara
SBD = San Bernardino
SBR = Santa Barbara Isl. (SBA Co.)
SBT = San Benito
SCL = Santa Clara
SCM = San Clemente Isl. (LAX Co.)
SCR = Santa Cruz
SCT = Santa Catalina Isl. (LAX Co.)
SCZ = Santa Cruz Isl. (SBA Co.)
SDG = San Diego
SFO = San Francisco
SHA = Shasta
SIE = Sierra
SDG = San Diego

HABITAT CODES

SFO = San Francisco
SHA = Shasta
SIE = Sierra
SIS = Siskiyou
SJQ = San Joaquin
SLO = San Luis Obispo
SNI = San Miguel Isl. (SBA Co.)
SMT = San Mateo
SMI = San Nicolas Isl. (VEN Co.)
SOL = Solano
SON = Sonoma
SRO = Santa Rosa Isl. (SBA Co.)
STA = Stanislaus
SUT = Sutter
TEH = Tehama
TRI = Trinity
TUL = Tulare
TUO = Tuolumne
VEN = Ventura
YOL = Yolo
YUB = Yuba

AZ = Arizona
BA = Baja California
GU = Isla Guadalupe, Baja
ID = Idaho
NM = New Mexico
NV = Nevada
OR = Oregon
SA = South America
SO = Sonora, Mexico
TX = Texas
UT = Utah
WA = Washington
WY = Wyoming

+ = Occurs in this state and others
++ = Widespread outside of California
* = Extirpated from preceding quad or county
? = Uncertainty about distribution or identity
?* = Uncertainty about distribution, but extirpated if once present
(*?) = Occurrence confirmed, but possibly extirpated

AlpBR = Alpine boulder and rock field
AlpDS = Alpine dwarf scrub
BgFns = Bogs and fens
BUFRs = Broadleaved upland forest
CBScr = Coastal bluff scrub
CCFRs = Closed-cone coniferous forest
Chprl = Chaparral
ChScr = Chenopod scrub
CmWld = Cismontane woodland
CoDns = Coastal dunes
CoPrr = Coastal prairie
CoScr = Coastal scrub
DeDns = Desert dunes
GBGrS = Great Basin grassland
GBScr = Great Basin scrub
InDns = Inland dunes
JTWld = Joshua tree "woodland"
LCFRs = Lower montane coniferous forest
MDScr = Mojavean desert scrub
Medws = Meadows and seeps
MshSw = Marshes and swamps
NCFrs = North Coast coniferous forest
PbPln = Pebble (Pavement) plain
PJWld = Pinyon and juniper woodland
Plyas = Playas
RpFRs = Riparian forest
RpScr = Riparian scrub
RpWld = Riparian woodland
SCFRs = Subalpine coniferous forest
SDScr = Sonoran desert scrub
STWld = Sonoran thorn woodland
UCFRs = Upper montane coniferous forest
VFGrs = Valley and foothill grassland
VnPls = Vernal pools

(descriptor) = Pertains only to the habitat immediately preceding
/ descriptor = Pertains to all habitats preceding

OCCURRENCE OF SPECIAL-STATUS PLANT SPECIES

During surveys in the project study area, Sycamore Environmental botanists observed 15 previously unreported populations of hayfield tarplant, two populations of serpentine bird's beak, two populations of green monardella, two populations of Lobb's buttercup, two populations of Rincon manzanita, two populations of Rincon Ridge ceanothus, one population of bristly linanthus, one population of Gairdner's yampah, one population of Mt. St. Helena morning-glory, one population of Sebastopol meadowfoam, and one population of Victor's gooseberry. The population of Victor's gooseberry and one population of Lobb's buttercup occurred outside the project study area.

Storage Reservoir Component

Special-status plant species observed in the reservoir component of the project study area consisted of the following (see also Sycamore Environmental, 1996a):

- Two populations of hayfield tarplant;
- One population of bristly linanthus; and
- One population of Lobb's aquatic buttercup.

Agricultural Irrigation Component

Special-status plant species observed in the agricultural irrigation study area during field surveys consisted of the following (see also Sycamore Environmental, 1996b):

- Twelve populations of hayfield tarplant;
- One population of Sebastopol meadowfoam; and
- One population of Gairdner's yampah.

Wastewater Transmission Line Component

Special-status plant species observed in the wastewater transmission line component of the project study area consisted of the following (see also Sycamore Environmental, 1996c):

- One population of hayfield tarplant;
- One population of Mt. St. Helena morning-glory;
- Two Rincon manzanita; and
- One population of serpentine bird's beak.

Geysers Steamfield Component

Special-status plant species observed in the geyser component of the project study area consisted of the following (see also Sycamore Environmental, 1996d):

- Two populations of green monardella;
- Two Rincon Ridge ceanothus; and
- One population of serpentine bird's beak.

SENSITIVE NATURAL COMMUNITIES DESCRIPTIONS

Native Grassland

Description: Native grassland habitats are treeless areas dominated by native, perennial, bunchgrass species. Valley needlegrass grassland and serpentine bunchgrass are types of native grassland that are considered sensitive natural communities in Sonoma and Marin counties by CDFG (1 September 1995).

Annual, non-native grasses have replaced the native perennial bunchgrass prairies that once dominated lower elevations throughout North America. Grazing pressures and the introduction of non-native annual species have contributed to the reduction or elimination of native bunch grasses from many areas of Sonoma and Marin counties. Annual, non-native grasses have replaced the native perennial bunchgrass prairies that once dominated lower elevations throughout North America. One of the main factors that shifted the competitive advantage from native to non-native grasses appears to be the inability of native grasses to successfully compete under heavy grazing conditions (Heady, 1977).

Characteristic species: Native grass species occurring within the project study area include California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica* var. *californica*), Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*), Lemmon's canary grass (*Phalaris lemmonii*), mannagrass (*Glyceria leptostachya*), oldfield three-awn (*Aristida oligantha*), slender hairgrass (*Deschampsia elongata*), purple needlegrass (*Nassella pulchra*), and wild blue rye (*Elymus glaucus*).

Special-status plant species that occur in native grasslands include Colusa layia (*Layia septentrionalis*), woolly-headed lessingia (*Lessingia hololeuca*), San Francisco wallflower (*Erysimum franciscanum*), fragrant fritillary (*Fritillaria liliacea*), Santa Cruz tarplant (*Holocarpha macradenia*), hayfield tarplant (*Hemizonia congesta* ssp. *leucocephala*), bristly linanthus (*Linanthus acicularis*), Lake County stonecrop (*Parvisedum leiocarpum*), and Petaluma popcorn-flower (*Plagiobothrys mollis* var. *vestitus*). Bristly linanthus and hayfield tarplant were the only special-status plant species found in grasslands during surveys for this project.

Distribution in the project study area: Native grassland occurs in the Agricultural irrigation and Reservoir study areas.

Oak Woodland

Description: Oak woodlands have a predominance of oaks, open canopies, and grassy ground cover beneath and among the trees (Shuford and Timossi, 1989). Oak woodlands provide habitat for a wide diversity of wildlife. Thirty-five percent of California's mammal species utilize oak woodlands for food and shelter (Pavlik *et al.*, 1991). Oaks have figured prominently in the history of California, providing food, fuel, and tools to native Americans and pioneers. Oak woodlands are a significant natural resource providing erosion and landslide control, nutrient recycling, air and water quality, ground water recharge, recreation, wood production, livestock grazing, aesthetic qualities, and wildlife habitat (Hagen, 1995).

Characteristic species: Oak woodlands in the project study were mapped as Coast live oak/Interior live oak woodlands and oak woodland. Oaks present within the project study area include black oak (*Q. kelloggii*), canyon live oak (*Q. chrysolepis*), coast live oak (*Q. agrifolia*), interior live oak (*Q. wislizenii* var. *wislizenii*), scrub oak (*Q. berberidifolia*), leather oak (*Q. durata*), Oregon oak (*Q. garryana* var. *garryana*), and valley oak (*Quercus lobata*). Shrub species associated with oak woodlands in the project study area include manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), and toyon (*Heteromeles arbutifolia*). Herbaceous species include hedge nettle (*Stachys ajugoides*), miner's lettuce (*Claytonia perfoliata* ssp. *perfoliata*), and rough corn bedstraw (*Galium tricornutum*).

Special-status plant species that occur within oak woodlands include bent-flowered fiddleneck (*Amsinckia lunaris*), western dichondra (*Dichondra occidentalis*), western leatherwood (*Dirca occidentalis*), Diablo helianthella (*Helianthella castanea*), Napa lomatium (*Lomatium repostum*), robust monardella (*Monardella villosa* ssp. *globosa*), and green monardella (*Monardella viridis* ssp. *viridis*). Green monardella was found during surveys for this project.

Distribution in the project study area: Oak woodland occurs in the Agricultural irrigation, Reservoir, Wastewater transmission line, and Geysers study areas.

Riparian Woodland

Description: Riparian woodland is a complex habitat type associated with perennial or intermittent streams. Riparian woodland generally has closed canopies dominated by broad-leaved, winter deciduous trees. The composition of species in a riparian woodland is highly variable and often dependent on geographic location. Riparian woodland is

widespread throughout the Central Valley of California, lower foothills of the Cascades, Sierra Nevada, and Coast Range (Grenfell, 1988).

Due to their high value as wildlife habitat and movement corridors and scarcity on both a state and region-wide scale, riparian woodlands are considered a sensitive habitat type and monitored closely by CDFG.

Characteristic species: Willow riparian and Mixed riparian are two types of riparian woodlands that occur in the project study area. Willow riparian is dominated by red willow (*Salix laevigata*) and arroyo willow (*S. lasiolepis*), whereas Mixed riparian woodland is dominated by red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*). Evergreen hardwoods such as California bay and coast live oak commonly occur along the edges of riparian corridors where they gradually intergrade into adjacent grasslands. Further inland, red alder is replaced by white alder (*Alnus rhombifolia*), Fremont's cottonwood (*Populus fremontii*), and valley oak (*Quercus lobata*).

Shade-tolerant shrubs and herbs occur in the riparian understory. Understory species include poison oak, Himalayan blackberry (*Rubus discolor*), blue elderberry (*Sambucus mexicana*), snowberry (*Symphoricarpos albus* var. *laevigatus*), wild honeysuckle (*Lonicera hispidula* var. *vacillans*), mulefat (*Baccharis salicifolia*), and a variety of ferns.

Special-status plant species that occur in riparian woodlands include Western leatherwood (*Dirca occidentalis*), California bottle brush-grass (*Elymus californicus*), Diablo helianthella (*Helianthella castanea*), Geysers dichanthelium (*Dichanthelium lanuginosum* var. *thermale*), Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), Mason's lilaeopsis (*Lilaeopsis masonii*). However, none of these species were found during surveys for this project.

Distribution in the project study area: Riparian woodland occurs in the Agricultural irrigation, Geysers, Reservoir, and Wastewater transmission line study areas.

Wetland Habitats

Wetlands are protected under Section 404 of the Clean Water Act. Wetlands perform many important functions such as improving water quality, recharging ground water, providing natural flood control, and providing habitat for numerous species of wildlife, plants, and fish. Wetland habitats of concern in the reservoir study areas include brackish marsh and coastal salt marsh, freshwater seeps, and freshwater marshes.

Brackish Marsh

Description: Brackish marsh is a tidally influenced emergent wetland habitat dominated by salt tolerant plants (Lewis, 1982). Brackish marsh is usually found at the interior edges of coastal bays and estuaries or in coastal lagoons. Brackish marsh contains elements from both salt marsh and freshwater marsh plant communities. Brackish marsh has adapted to a unique set of ecological conditions including seasonal variations in the range of inundation, salinity of flooding waters, and the degree of desiccation to which the marsh plants and animals are exposed. Salinity may vary considerably and may increase at high tide or during seasons of low freshwater runoff or both.

Brackish marsh usually intergrades with coastal salt marshes toward the ocean along the interior edges of coastal bays and estuaries or in coastal lagoons. Occasionally, brackish marsh intergrades with freshwater marshes at the mouths of rivers (Madrone Associates, 1977).

Coastal brackish marsh is a type of salt marsh habitat that is considered a sensitive natural community in Sonoma and Marin counties by CDFG (1 September 1995).

Characteristic species: Typical plant species that occur in Brackish marsh include Harford's sedge (*Carex harfordii*), slough sedge (*Carex obnupta*), salt grass (*Distichlis spicata* var. *spicata*), and pickleweed (*Salicornia* sp.) (Holland, 1986). In areas of decreasing salinity, common cattail (*Typha latifolia*), baltic rush (*Juncus balticus*), and common reed (*Phragmites australis*) grow interspersed with a mixture of bulrushes (*Scirpus* spp.) (Barbour *et al.*, 1993).

Special-status plant species that may occur in brackish marsh in Sonoma and Marin counties include Suisun marsh aster (*Aster lentus*), Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*), soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*), small spikerush (*Eleocharis parvula*), and marsh gumplant (*Grindelia stricta* var. *angustifolia*). However, none of these species were found during surveys for this project.

Distribution in the project study area: Brackish marsh occurs in the Agricultural irrigation and Wastewater transmission line study areas.

Freshwater Seep

Description: Freshwater seeps are areas where water flows or 'seeps' out of the ground due to high groundwater tables or underground springs. Freshwater seeps are common at many locations throughout the project study area and may form permanently or temporarily wet conditions. Seepage from underground springs

produces an environment conducive to the growth of hydrophytic grasses, rushes, sedges, and herbaceous vegetation.

Characteristic species: Vegetation found in freshwater seeps of the project study area includes spike rush (*Eleocharis macrostachya*), toad rush (*Juncus bufonius* var. *bufonius*), baltic rush, spreading rush (*Juncus patens*), brown-headed rush (*Juncus phaeocephalus* var. *phaeocephalus*), prickle-fruited buttercup (*Ranunculus muricatus*), and water sedge (*Carex aquatilis* var. *dives*).

Few special-status plant species are associated exclusively with freshwater seeps. Special-status plant species that are known to occur in seeps include Mt. Tamalpais thistle (*Cirsium hydrophilum* var. *vaseyi*), California lady's-slipper (*Cypripedium californicum*), Geyser's dichanthelium (*Dichanthelium lanuginosum* var. *thermale*), and California beaked-rush (*Rhynchospora californica*) are species that may be associated with freshwater seeps. However, none of these species were found during surveys for this project.

Distribution in the project study area: Freshwater seeps occurs in the Agricultural irrigation and Reservoir study areas.

Freshwater Marsh

Description: Freshwater marsh vegetation is characterized by herbaceous plants adapted to perennially wet aquatic habitats (hydrophytes). Freshwater marsh occurs near the edges of rivers and lakes or in basins or depressions that flood periodically. The roots of these plants are adapted for anaerobic conditions during periods of inundation.

Coastal and Valley freshwater marsh are types of freshwater marsh habitat that are considered sensitive natural communities in Sonoma and Marin counties by CDFG (1 September 1995).

Freshwater marsh habitat occurs throughout California, but it is most common at elevations below 6,800 feet (Kramer, 1988). In the project study area, freshwater marsh habitat is found around farm ponds and adjacent to the margins of streams and estuaries. Freshwater marsh habitat occurs near the mouth of the Estero de Americano.

Characteristic species: Perennial monocots such as baltic rush and nutsedge (*Cyperus esculentus*) often dominate the upper fringes of marsh habitats, whereas cattails (*Typha angustifolia*) and tules (*Scirpus acutus* var. *occidentalis*) occur in deeper waters.

Many special-status plant species occur in freshwater marsh habitats. Special-status plant species that are known to occur in freshwater marsh habitats include Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), Bolander's reed grass (*Calamagrostis bolanderi*), Thurber's reed grass (*Calamagrostis crassiglumis*), swamp harebell (*Campanula californica*), white sedge (*Carex albida*), Pitkin Marsh Indian paintbrush (*Castilleja uliginosa*), and Pitkin Marsh lily (*Lilium pardalinum* ssp. *pitkinense*). However, none of these species were found during surveys for this project.

Distribution in the project study area: Freshwater marsh occurs in the Agricultural irrigation, Reservoir, and Wastewater transmission line study areas.

Vernal Pools

Description: Vernal pools are a type of seasonal wetland that form in depressions in grasslands and other habitats that are underlain with a clay hardpan or durapan. These depressions fill with water in the winter and slowly dry in the spring and summer. Vernal pools are characterized by four different stages. These stages include a filling stage in the fall, a holding stage in the winter, a drying stage in the spring, and a dry stage through the summer (Zedler, 1987). Vernal pools are classified according to the substrate on which they occur. These substrates include terrace soils, volcanic mudflows, and clay hardpan.

Vernal pools support unique ecosystems and several special-status plant species are endemic to vernal pools. Vernal pool plant species are characteristically native. Introduced species make up less than 7% of the total number of species found in vernal pools (Holland and Jain, 1977).

Northern vernal pool and Northern hardpan vernal pool are two types of sensitive vernal pool communities that are considered sensitive natural communities in Sonoma and Marin counties by CDFG (1 September 1995).

Characteristic species: Vernal pools in the study area are dominated by popcorn flower (*Plagiobothrys trachycarpus*), goldfields (*Lasthenia glaberrima*), meadowfoam (*Limnanthes douglasii* ssp. *douglasii*), downingia (*Downingia concolor*), and button-celery (*Eryngium armatum*). Other plant species occurring include flowering quillwort (*Lilaea scilloides*), tidy tips (*Layia platyglossa*), aquatic buttercups (*Ranunculus aquatilis* var. *subrigidus*), dwarf sack's clover (*Trifolium depauperatum* var. *truncatum*), and water star-wort (*Callitriche verna*).

Special-status plant species that may occur in vernal pools in Sonoma and Marin counties include dwarf downingia (*Downingia pusilla*), Sonoma sunshine (*Blennosperma bakeri*), Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), Loch Lomond button celery (*Eryngium constancei*), and Burke's goldfields (*Lasthenia*

burkei). However, none of these species were found during surveys for this project.

Distribution in the project study area: Vernal pools occur in the Agricultural irrigation study area.

4. REPORT PREPARERS

R. John Little, Ph.D., Botany, Claremont Graduate School, Claremont, CA. Over 20 years experience managing and conducting environmental projects involving impact assessment and preparation of numerous NEPA/CEQA compliance documents, Biological Assessments, and Caltrans Natural Environmental Assessments. Experience includes conducting special-status plant species surveys, jurisdictional wetland delineations, general biological surveys, 404 and 1601/1603 permitting, and Section 7 consultation.

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Jeff Little, A.A., Sacramento City College, Sacramento, CA. Experience includes preparation of AutoCAD graphics, GIS analysis, GPS mapping, database design, computer hardware and software technical service and support.

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Cynthia Little, Principal, Sycamore Environmental. Experience includes 15 years of office administration, editing, and quality control.

Responsibilities: Served as Senior Editor.

5. LITERATURE CITED AND PERSONAL COMMUNICATIONS

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APPENDIX A.

Comparison of Community Classifications

Sycamore Environmental Consultants, Inc.	Shuford & Timossi (1989)	Holland (1988)
Tree Dominated Communities		
Coast Live Oak/ Interior Live Oak Woodland	Oak Woodland and Oak Savannah	Coast Live Oak Woodland; Interior Live Oak Woodland
Oak-Bay-Madrone Woodland	Coast Live Oak - California Bay - Madrone Forest	Mixed North Slope Cismontane Woodland
Redwood Forest ¹	Coast Redwood Forest	Upland Redwood Forest
Riparian Communities		
Willow Riparian	Coastal Riparian Forest	North Coast Riparian Scrub
Mixed Riparian	No comparable community	No comparable community
Non-Wooded Riparian	No comparable community	No comparable community
Other Tree Dominated Communities and Associations		
California Buckeye ²	No comparable community	No comparable community
Eucalyptus	No comparable community	No comparable community
Lombardy Poplar ³	No comparable community	No comparable community
Monterey Cypress ³	No comparable community	No comparable community
Shrub Dominated Communities		
Northern Coastal Scrub	Northern Coastal Scrub: Coyote Brush - Sword Fern Scrub; Coastal Sage - Coyote Brush Scrub	Northern (Franciscan) Coastal Scrub
Chaparral: Chamise Chaparral; Manzanita Chaparral; Mixed Chaparral; Serpentine Chaparral	Chaparral: Chamise Chaparral; Manzanita Chaparral; Mixed Chaparral; Serpentine Chaparral	Chaparral: Chamise Chaparral; Montane Manzanita Chaparral; Mixed Montane Chaparral; Serpentine Chaparral
Grassland Communities		
Annual Grassland	Valley Grassland	Non-Native Grassland
Native Grassland	No comparable community	Native Grassland: Valley Needle Grassland; Serpentine bunchgrass; Valley Wildrye grassland
Coastal Prairie	Coastal Prairie	Coastal Terrace Prairie

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 APPENDIX E: SPECIAL-STATUS PLANT SPECIES AND SENSITIVE
 NATURAL COMMUNITIES BOTANICAL RESOURCES

APPENDIX A. (Continued)

Aquatic Communities		
Freshwater Seep	No comparable community	Freshwater Seep
Coastal Salt Marsh	Coastal Salt Marsh	Northern Coastal Salt Marsh
Brackish Marsh	No comparable community	Coastal Brackish Marsh
Freshwater Marsh	Bulrush-Cattail Marsh; Coastal Swale	Coastal and Valley Freshwater Marsh
Freshwater Ponds	No comparable community	No comparable community
Drainage	No comparable community	No comparable community
Vernal Pool	No comparable community	Northern Hardpan Vernal Pool; Northern Claypan Vernal Pool
Agricultural Communities		
Cropland	No comparable community	No comparable community
Orchard-Vineyard	No comparable community	No comparable community
Pasture	No comparable community	No comparable community

¹ Stands of planted trees and remnants of natural forest.

² Small stands of native trees.

³ Small stands of planted trees.