Appendix E
Biological Resources – Terrestrial

E.1 Common and Scientific Names of Species Mentioned in Draft PEIR Section 5.6 Biological Resources – Terrestrial

Table E-1
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Alkali bulrush	*Schoenoplectus americanus*
Alkali heath	*Frankenia salina*
Alkali mallow	*Malvella leprosa*
Alkali milk-vetch	*Astragalus tener* var. *tener*
Alkali weed	*Cressa truxillensis*
Alligatorweed	*Alternanthera philoxeroides*
Ambulia	*Limnophila indica, L. sessiliflora*
Anchored water hyacinth	*Eichhornia azurea*
Annual tule	*Isolepis cernua*
Antioch Dunes buckwheat	*Eriogonum nudum* var. *psychichola*
Antioch Dunes evening primrose	*Oenothera deltoides* ssp. *howellii*
Arroyo willow	*Salix lasiolepis*
Baker's navarretia	*Navarretia leucocephala* ssp. *bakeri*
Baltic rush	*Juncus balticus*
Barnyard grass	*Echinochloa crus-galli*
Beach suncup	*Camissonia cheiranthifolia* ssp. *cheiranthifolia*
Bearded popcorn-flower	*Plagiobothrys hystriculus*
Beggar's tick	*Bidens frondosa*
Bent flowered fiddleneck	*Amsinckia lunaris*
Bermuda grass	*Cynodon dactylon*
Big tarplant	*Blepharizonia plumosa*
Bigleaf maple	*Acer macrophyllum*
Bindweed	*Convolvulus arvensis*
Bitter cherry	*Prunus emarginata*
Black locust	*Robinia pseudoacacia*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Black oak	*Quercus kelloggii*
Black walnut	*Juglans sp*
Black willow	*Salix gooddingii*
Blackberry	*Rubus* sp.
Blessed milk thistle	*Silybum marianum*
Blue oak	*Quercus douglasii*
Bog yellowcress	*Rorippa palustris*
Bogg's Lake hedge-hyssop	*Gratiola heterosepala*
Bolander's water-hemlock	*Cicuta maculata* var. *bolanderi*
Box elder	*Acer negundo*
Brass buttons	*Cotula coronopifolia*
Brazilian peppertree	*Schinus terebinthifolius, S. molle*
Brazilian waterweed	*Egeria densa*
Brewer's calandrinia	*Calandrinia breweri*
Brewer's western flax	*Hesperolinon breweri*
Bristly sedge	*Carex comosa*
Brittlescale	*Atriplex depressa*
Broadleaf arrowhead	*Sagittaria latifolia*
Bull thistle	*Cirsium vulgare*
Bur-reed	*Sparganium eurycarpum*
Burhead	*Echinodorus berteroi*
Bush chinquapin	*Chrysolepis sempervirens*
Buttonbush	*Cephalanthus occidentalis*
California bulrush	*Schoenoplectus californicus*
California coffeeberry	*Rhamnus californica*
California jewelflower	*Caulanthus californicus*
California sycamore	*Platanus racemosa*
Canyon live oak	*Quercus chrysolepis*
Caper-fruited tropidocarpum	*Tropidocarpum capparideum*
Carquinez goldenbush	*Isocoma arguta*
California bay	*Umbellularia californica*
Carolina fanwort	*Cabomba caroliniana*
Cattail	*Typha* sp.
Ceanothus	*Ceanothus* sp.
Central coast iris	*Iris longipetala*
Chamise	*Adenostema fasciculatum*
Chamisso's lupine	*Lupinus chamissonis*
Chinese tallow	*Sapium sebiferum*
Chinese tamarisk	*Tamarix chinensis*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Chinese water spinach	*Ipomoea aquatic*
Coast Iris	*Iris longipetala*
Cocklebur	*Xanthium strumarium*
Columbian watermeal	*Wolffia brasiliensis*
Colusa grass	*Neostapfia colusana*
Common mallow	*Malva neglecta*
Common spikerush	*Eleocharis macrostachya*
Common spikeweed	*Centromadia pungens*
Congdon's tarplant	*Centromadia parryi* ssp. *congdonii*
Contra Costa goldfields	*Lasthenia conjugens*
Contra Costa wallflower	*Erysimum capitatum* ssp. *angustatum*
Cottonwood	*Populus* sp.
Cotulaleaf pincushionplant	*Navarretia cotulifolia*
Creeping water primrose	*Ludwigia peploides* ssp. *montevidensis*
Creeping wildrye	*Leymus triticoides*
Crownscale	*Atriplex coronata* var. *coronata*
Curly dock	*Rumex crispus*
Currant	*Ribes* sp.
Dallisgrass	*Paspalum dilatatum*
Deer brush	*Ceanothus integerrimus*
Deerweed	*Lotus scoparius*
Delta button-celery	*Eryngium racemosum*
Delta mudwort	*Limosella subulata*
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*
Delta woolly marbles	*Psilocarphus brevissimus* var. *multiflorus*
Diamond-petaled California poppy	*Eschscholzia rhombipetala*
Douglas fir	*Pseudotsuga menziesii*
Dwarf downingia	*Downingia pusilla*
Eel-grass pondweed	*Potamogeton zosteriformis*
Eurasian milfoil	*Myriophyllum spicatum*
Fennel	*Foeniculum vulgare*
Ferris' goldfields	*Lasthenia ferrisiae*
Ferris' milk-vetch	*Astragalus tener* var. *ferrisiae*
Fig	*Ficus carica*
Filaree	*Erodium* sp.
Floating water primrose	*Ludwigia peploides*
Foothill pine	*Pinus sabiniana*
Fox sedge	*Carex vulpinoidea*
Fragrant fritillary	*Fritillaria liliacea*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Fremont cottonwood	*Populus fremontii*
French tamarisk	*Tamarix gallica*
Gairdner's yampah	*Perideridia gairdneri* ssp. *gairdneri*
Giant reed	*Arundo donax*
Goodding's black willow	*Salix gooddingii*
Gooseberries	*Ribes* sp.
Goosefoot	*Chenopodium* sp.
Grand redstem	*Ammannia robusta*
Greenleaf manzanita	*Arctostaphylos patula*
Hairless popcorn flower	*Plagiobothrys glaber*
Hard-stem bulrush	*Schoenoplectus acutus*
Heartscale	*Atriplex cordulata*
Heckard's peppergrass	*Lepidium latipes* var. *heckardii*
Himalayan blackberry	*Rubus discolor*
Hispid bird's-beak	*Cordylanthus mollis* ssp. *hispidus*
Hogwallow starfish	*Hesperevax caulescens*
Hoover's cryptantha	*Cryptantha hooveri*
Huckleberry oak	*Quercus vacciniifolia*
Hydrilla	*Hydrilla verticillata*
Iodine bush	*Allenrolfea occidentalis*
Incense cedar	*Calocedrus decurrens*
Interior live oak	*Quercus wislizenii*
Italian ryegrass	*Lolium multiflorum*
Japanese dodder	*Cuscuta japonica*
Johnny-nip	*Castilleja ambigua* ssp. *ambigua*
Kern mallow	*Eremalche kernensis*
Knotweed	*Polygonum* sp.
Legenere	*Legenere limosa*
Lesser saltscate	*Atriplex minuscula*
Little mousetail	*Myosurus minimus* ssp. *apus*
Lobb's aquatic buttercup	*Ranunculus lobbii*
Lost Hills crownscale	*Atriplex vallicola*
Mahala mat	*Ceanothus prostratus*
Mallow	*Malva* sp.
Manzanita	*Arctostaphylos* sp.
Marsh skullcap	*Scutellaria galericulata*
Mason's lilaeopsis	*Lilaeopsis masonii*
Mexican or banana water lily	*Nymphaea mexicana*
Mosquito fern, water velvet	*Azolla pinnata*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Mountain mahogany	*Cercocarpus betuloides*
Mountain misery	*Chamaebatia foliolosa*
Mt. Diablo buckwheat	*Eriogonum truncatum*
Mt. Diablo fairy-lantern	*Calochortus pulchellus*
Mulefat	*Baccharis salicifolia*
Mustard	*Brassica* sp.
Narrow-leaved willow	*Salix exigua*
Nude buckwheat	*Eriogonum nudum*
Oregon ash	*Fraxinus latifolia*
Pacific cordgrass	*Spartina foliosa*
Pacific madrone	*Arbutus menziesii*
Palmate-bracted bird's-beak	*Cordylanthus palmatus*
Pampas grass	*Cortaderia selloana*
Pappose tarplant	*Centromadia parryi* ssp. *parryi, Centromadia parryi* ssp. *rudis*
Parrot feather	*Myriophyllum aquaticum*
Perennial pepperweed	*Lepidium latifolium*
Pickleweed	*Salicornia pacifica*
Pinemat manzanita	*Arctostaphylos nevadensis*
Poison hemlock	*Conium maculatum*
Poison oak	*Toxicodendron diversilobum*
Ponderosa pine	*Pinus ponderosa*
Pondweed	*Potamogeton* sp.
Purple loosestrife	*Lythrum salicaria*
Rabbit's-foot grass	*Polypogon monspeliensis*
Recurved larkspur	*Delphinium recurvatum*
Red gum	*Eucalyptus camaldulensis*
Red sesbania	*Sesbania punicea*
Redshank	*Adenostoma sparsifolium*
Red willow	*Salix laevigata*
Ripgut brome	*Bromus diandrus*
Rose-mallow	*Hibiscus lasiocarpos* var. *occidentalis*
Round-leaved filaree	*Erodium macrophyllum*
Sacramento Orcutt grass	*Orcuttia viscida*
Sago pondweed	*Stuckenia pectinatus*
Saline clover	*Trifolium hydrophilum*
Saltbush	*Atriplex* sp.
Saltcedar	*Tamarix ramosissima*
Saltgrass	*Distichlis spicata*
Salvinia	*Salvinia auriculata* (= *S. biloba, S. herzogii, S. molesta)*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Sanford's arrowhead	*Sagittaria sanfordii*
San Joaquin spearscale	*Atriplex joaquiniana*
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*
Santa Barbara sedge	*Carex barbarae*
Scrub oak	*Quercus berberidifolia*
Shining navarretia	*Navarretia nigelliformis ssp. radians*
Showy madia	*Madia radiata*
Side-flowering skullcap	*Scutellaria lateriflora*
Silky cryptantha	*Cryptantha crinita*
Silvery bush lupine	*Lupinus albifrons*
Slough thistle	*Cirsium crassicaule*
Small-flowered morning glory	*Convolvulus simulans*
Smallflower tamarisk	*Tamarix parviflora*
Small spikerush	*Eleocharis parvula*
Smartweed	*Polygonum* sp.
Snowbrush ceanothus	*Ceanothus velutinus*
Snow bush	*Ceanothus cordulatus*
Soft bird's beak	*Cordylanthus mollis* ssp. *mollis*
Solano grass	*Tuctoria mucronata*
Spiny redberry	*Rhamnus crocea*
Spiny-sepaled button-celery	*Eryngium spinosepalum*
Spongeplant	*Limnobium laevigatum, L. spongia*
Star-thistle	*Centaurea* sp.
Stinkbells	*Fritillaria agrestis*
Stonewort	*Chara* sp.
Succulent owl's clover	*Castilleja campestris ssp. succulenta*
Sugar pine	*Pinus lambertiana*
Suisun Marsh aster	*Symphyotrichum lentum*
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*
Sunflower	*Helianthus* sp.
Swamp smartweed	*Polygonum amphibium*
Swamp timothy	*Crypsis schoenoides*
Sweet marsh ragwort	*Senecio hydrophiloides*
Tamarisk	*Tamarix* sp.
Tan oak	*Lithocarpus densiflorus*
Telegraph weed	*Heterotheca grandiflora*
Toren's grimmia	*Grimmia torenii*
Toyon	*Heteromeles arbutifolia*
Tree of heaven	*Ailanthus altissima*

Table E-1 (continued)
Common and Scientific Names of Plant Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Common Name	Scientific Name
Tule	*Schoenoplectus* sp.
Tumbleweed	*Salsola tragus*
Uruguay water primrose	*Ludwigia hexapetala*
Valley oak	*Quercus lobata*
Vernal pool smallscale	*Atriplex persistens*
Vetch	*Vicia* sp.
Watergrass	*Echinochloa crus-galli*
Water hyacinth	*Eichhornia crassipes*
Water primrose	*Ludwigia* sp.
Watershield	*Brasenia schreberi*
Water smartweed	*Polygonum amphibium*
Waxy mannagrass	*Glyceria declinata*
White alder	*Alnus rhombifolia*
White fir	*Abies concolor*
Whorled marsh pennywort	*Hydrocotyle verticillata*
Wild barley	*Hordeum* sp.
Wild heliotrope	*Heliotropium curassavicum*
Wild lettuce	*Lactuca serriola*
Wild oat	*Avena* sp.
Wild radish	*Raphanus sativus*
Willow	*Salix* sp.
Willowherb	*Epilobium brachycarpum*
Wright's trichocoronis	*Trichocoronis wrightii* var. *wrightii*
Yarrow	*Achillea millefolium*
Yellow flag	*Iris pseudoacorus*
Yellow star-thistle	*Centaurea solstitialis*
Yerba mansa	*Anemopsis californica*
Yerba santa	*Eriodictyon californicum*

Sources: Calflora 2017; Cal-IPC 2010; CDFA 2017

Note: Scientific and common plant names follow the Jepson Manual (2nd Edition) (2012). Taxonomic updates and common plant names not provided in the Jepson Manual follow the Calflora Web site, which follows four nomenclature authorities for wild plants in California, as indicated on the Web site. Nomenclature for invasive species follows the Cal-IPC or CDFA Web site.

Table E-2
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Invertebrates	Antioch adrenid bee	*Perdita scitula antiochensis*
	Antioch Dunes anthicid beetle	*Anthicus antiochensis*
	Antioch Dunes halcitid bee	*Sphecodogastra antiochensis*
	Antioch efferian robberfly	*Efferia antiochi*
	Antioch multilid wasp	*Myrmosula pacifica*
	Antioch specid wasp	*Philanthus nasalis*
	Blennosperma vernal pool andrenid bee	*Andrena blennospermatis*
	Bridges' Coast Range shoulderband	*Helminthoglypta nickliniana bridgesi*
	California freshwater shrimp	*Syncaris pacifica*
	California linderiella	*Linderiella occidentalis*
	Callippe silverspot butterfly	*Speyeria callippe callippe*
	Conservancy fairy shrimp	*Branchinecta conservatio*
	Curved-foot hygrotus diving beetle	*Hygrotus curvipes*
	Delta green ground beetle	*Elaphrus viridis*
	Hairy water flea	*Dumontia oregonensis*
	Hurd's metapogon robberfly	*Metapogon hurdi*
	Lange's metalmark butterfly	*Apodemia mormo langei*
	Longhorn fairy shrimp	*Branchinecta longiantenna*
	Middlekauff's shieldback katydid	*Idiostatus middlekauffi*
	Midvalley fairy shrimp	*Branchinecta mesovallensis*
	Moestan blister beetle	*Lytta molesta*
	Monarch butterfly	*Danaus plexippus*
	Redheaded sphecid wasp	*Eucerceris ruficeps*
	Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*
	Sacramento anthicid beetle	*Anthicus sacramento*
	Sacramento Valley tiger beetle	*Cicindela hirticollis abrupta*
	San Bruno elfin butterfly	*Callophrys mossii bayensis*
	San Joaquin dune beetle	*Coelus gracilis*
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
	Vernal pool fairy shrimp	*Branchinecta lynchi*
	Vernal pool tadpole shrimp	*Lepidurus packardi*
Fish	American shad	*Alosa sapidissima*
	Bass	*Micropterus* spp.
	Bluegill	*Lepomis macrochiris*
	Bullheads	*Ameiurus* spp.
	California roach	*Hesperoleucus symmetricus*
	Catfish	*Ictalurus* spp.
	Chinook salmon	*Oncorhynchus tshawytscha*
	Common carp	*Cyprinis carpio*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Fish (cont.)	Crappie	*Pomoxis* spp.
	Delta smelt	*Hypomesus transpacificus*
	Fathead minnow	*Pimephales promelas*
	Golden shiner	*Notemigonus crysoleucas*
	Green sturgeon	*Acipenser medirostris*
	Green sunfish	*Lepomis cyanellus*
	Hardhead	*Mylopharodon conocephalus*
	Hitch	*Lavinia exilicauda*
	Inland silverside	*Menidia beryllina*
	Largemouth bass	*Micropterus salmoides*
	Longfin smelt	*Spirinchus thaleichthys*
	Northern anchovy	*Engraulis mordax*
	Pacific lamprey	*Lampetra tridentata*
	Prickly sculpin	*Cottus asper*
	Riffle sculpin	*Cottus gulosus*
	River lamprey	*Lampetra ayresii*
	Sacramento blackfish	*Orthodon microlepidotus*
	Sacramento perch	*Archoplites interruptus*
	Sacramento pikeminnow	*Ptychocheilus grandis*
	Sacramento splittail	*Pogonichthys macrolepidotus*
	Sacramento sucker	*Catostomus occidentalis*
	Starry flounder	*Platichthys stellatus*
	Steelhead	*Oncorhynchus mykiss irideus*
	Striped bass	*Morone saxatilis*
	Sunfish	*Lepomis* spp.
	Threadfin shad	*Dorosoma petenense*
	Tule perch	*Hysterocarpus traski*
	Western mosquitofish	*Gambusia affinis*
Amphibians	Black salamander	*Aneides flavipunctatus*
	Bullfrog	*Rana catesbiana*
	California red-legged frog	*Rana draytonii*
	California slender salamander	*Batrachoseps attenuatus*
	California tiger salamander	*Ambystoma californiense*
	Ensatina	*Ensatina eschscholtzii*
	Foothill yellow-legged frog	*Rana boylii*
	Pacific chorus frog	*Pseudacris regilla*
	Western spadefoot	*Spea hammondii*
	Western toad	*Bufo boreas*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Reptiles	Alameda whipsnake (=striped racer)	*Masticophis lateralis euryxanthus*
	Blunt-nosed leopard lizard	*Gambelia silus*
	California horned lizard	*Phrynosoma corantum (frontale population)*
	California mountain kingsnake	*Lampropeltis zonata (pulchra)*
	Coast horned lizard	*Phrynosoma blainvilli*
	Common garter snake	*Thamnophis sirtalis*
	Garter snake	*Thamnophis* sp.
	Giant garter snake	*Thamnophis gigas*
	Gopher snake	*Pituophis catenifer*
	Rubber boa	*Charina bottae*
	Sagebrush lizard	*Sceloporus graciosus*
	San Joaquin whipsnake	*Masticophis flagellum ruddocki*
	Sharp-tailed snake	*Contia tenuis*
	Side-blotched lizard	*Uta stansburiana*
	Silvery legless lizard	*Anniella pulchra pulchra*
	Western fence lizard	*Sceloporus occidentalis*
	Western pond turtle	*Actinemys marmorata*
	Western racer	*Coluber mormon*
	Western rattlesnake	*Crotalus oreganus*
	Western terrestrial garter snake	*Thamnophis elegans*
Birds	Acorn woodpecker	*Melanerpes formicivorus*
	Aleutian cackling goose	*Branta hutchinsii leucopareia*
	American avocet	*Recurvirostra americana*
	American bittern	*Botaurus lentiginosus*
	American crow	*Corvus branchyrhychos*
	American goldfinch	*Carduelis tristis*
	American kestrel	*Falco sparverius*
	American peregrine falcon	*Falco peregrinus anatum*
	American pipit	*Anthus rubescens*
	American robin	*Turdus migratorius*
	American widgeon	*Anas americana*
	Ash-throated flycatcher	*Myiarchus cinerascens*
	Bald eagle	*Haliaeetus leucocephalus*
	Band-tailed pigeon	*Columba fasciata*
	Bank swallow	*Riparia riparia*
	Barn owl	*Tyto alba*
	Belted kingfisher	*Ceryle alcyon*
	Bewick's wren	*Thryomanes bewickii*
	Black-crowned night-heron	*Nycticorax nycticorax*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Birds (cont.)	Black-headed grosbeak	*Pheucticus melanocephalus*
	Black-necked stilt	*Himantopus mexicanus*
	Black phoebe	*Sayornis nigricans*
	Black tern	*Chlidonias niger*
	Blue grosbeak	*Passerina caerulea*
	Blue grouse	*Dendragapus obscurus*
	Brewer's blackbird	*Euphagus cyanocephalus*
	Bufflehead	*Bucephala albeola*
	Bullock's oriole	*Icterus bullockii*
	Burrowing owl	*Athene cunicularia*
	Bushtit	*Psaltriparus minimus*
	California black rail	*Laterallus jamaicensis coturniculus*
	California brown pelican	*Pelecanus occidentalis californicus*
	California gull	*Larus californicus*
	California horned lark	*Eremophila alpestris actia*
	California least tern	*Sternula antillarum browni*
	California quail	*Callipepla californica*
	California spotted owl	*Strix occidentalis occidentalis*
	California towhee	*Melozone crissalis*
	Canada goose	*Branta canadensis*
	Canvasback	*Aythya valisineria*
	Cinnamon teal	*Anas cyanoptera*
	Common goldeneye	*Bucephala clangula*
	Common yellowthroat	*Geothlypis trichas*
	Cooper's hawk	*Accipiter cooperii*
	Coot	*Fulica americana*
	Double-crested cormorant	*Phalacrocorax auritus*
	Downy woodpecker	*Picoides pubescens*
	Dunlin	*Calidris alpine*
	Egret	*Ardea* sp.
	Eurasian collared-dove	*Streptopelia decaocto*
	European starling	*Sturnus vulgaris*
	Ferruginous hawk	*Buteo regalis*
	Gadwall	*Anas strepera*
	Golden eagle	*Aquila chrysaetos*
	Golden-crowned kinglet	*Regulus satrapa*
	Grasshopper sparrow	*Ammodramus savannarum*
	Great blue heron	*Ardea herodias*
	Great egret	*Ardea alba*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Birds (cont.)	Greater sandhill crane	*Grus canadensis tabida*
	Greater yellowlegs	*Tringa melanoleuca*
	Great horned owl	*Bubo virginianus*
	Grebe	Family Podicipedidae
	Green-winged teal	*Anas crecca*
	Gull	*Larus* sp.
	Hairy woodpecker	*Picoides villosus*
	House finch	*Carpodacus mexicanus*
	House sparrow	*Passer domesticus*
	Hutton's vireo	*Vireo huttoni*
	Killdeer	*Charadrius vociferus*
	Lazuli bunting	*Passerina amoena*
	Least Bell's vireo	*Vireo bellii pusillus*
	Least bittern	*Ixobrychus exilis*
	Least sandpiper	*Calidris minutilla*
	Le Conte's thrasher	*Toxostoma lecontei*
	Lesser sandhill crane	*Grus canadensis canadensis*
	Lesser yellowlegs	*Tringa flavipes*
	Loggerhead shrike	*Lanius ludovicianus*
	Long-billed curlew	*Numenius americanus*
	Long-billed dowitcher	*Limnodromus scolopaceus*
	Loon	*Gavia* sp.
	Mallard	*Anas platyrhynchos*
	Marsh wren	*Cistothorus palustris*
	Merlin	*Falco columbarius*
	Mountain plover	*Charadrius montanus*
	Mourning dove	*Zenaida macroura*
	Northern flicker	*Colaptes auratus*
	Northern goshawk	*Accipiter gentilis*
	Northern harrier	*Circus cyaneus*
	Northern pintail	*Anas acuta*
	Northern shoveler	*Anas clypeata*
	Northern spotted owl	*Strix occidentalis caurina*
	Oak titmouse	*Baeolophus inornatus*
	Olive-sided flycatcher	*Contopus cooperi*
	Orange-crowned warbler	*Vermivora celata*
	Osprey	*Pandion haliaetus*
	Pacific-slope flycatcher	*Empidonax difficilis*
	Pied-billed grebe	*Podilymbus podiceps*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Birds (cont.)	Prairie falcon	*Falco mexicanus*
	Purple martin	*Progne subis*
	Red crossbill	*Loxia curvirostra*
	Redhead	*Aythya americana*
	Red-shouldered hawk	*Buteo lineatus*
	Red-tailed hawk	*Buteo jamaicensis*
	Red-winged blackbird	*Agelaius phoeniceus*
	Ridgway's Rail	*Rallus longirostris obsoletus*
	Ring-necked duck	*Aythya collaris*
	Ring-necked pheasant	*Phasianus colchicus*
	Rock dove	*Columba liviato*
	Ruddy duck	*Oxyura jamaicensis*
	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*
	San Pablo song sparrow	*Melospiza melodia samuelis*
	Savannah sparrow	*Passerculus sandwichensis*
	Short-billed dowitcher	*Limnodromus griseus*
	Short-eared owl	*Asio flammeus*
	Snowy egret	*Egretta thula*
	Song sparrow "Modesto" population	*Melospiza melodia*
	Spotted towhee	*Pipilo maculatus*
	Steller's jay	*Cyanocitta stelleri*
	Suisun song sparrow	*Melospiza melodia maxillaris*
	Swainson's hawk	*Buteo swainsoni*
	Tree swallow	*Tachycineta bicolor*
	Tricolored blackbird	*Agelaius tricolor*
	Tule greater white-fronted goose	*Anser albifrons elgasi*
	Tundra swan	*Cygnus columbianus*
	Virginia rail	*Rullus limicola*
	Warbling vireo	*Vireo gilvus*
	Western grebe	*Aechmophorus occidentalis*
	Western meadowlark	*Sturnella neglecta*
	Western sandpiper	*Calidris maurim*
	Western scrub-jay	*Aphelocoma californica*
	Western snowy plover	*Charadrius alexandrines nivosus*
	Western tanager	*Piranga ludoviciana*
	Western wood-pewee	*Contopus sordidulus*
	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*
	Whimbrel	*Numenius phaeopus*
	White-breasted nuthatch	*Sitta carolinensis*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Birds (cont.)	White-faced ibis	*Plegadis chihi*
	White-fronted goose	*Anser albifrons*
	White-tailed kite	*Elanus leucurus*
	Wild turkey	*Meleagris gallopavo*
	Williamson's sapsucker	*Sphyrapicus thyroideus*
	Wilson's phalarope	*Phalaropus tricolor*
	Wood duck	*Aix sponsa*
	Wrentit	*Chamaea fasciata*
	Yellow-billed magpie	*Pica nuttalli*
	Yellow-breasted chat	*Icteria virens*
	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
	Yellow warbler	*Dendroica petechia brewsteri*
Mammals	Allen's chipmunk	*Neotamias senex*
	American badger	*Taxidea taxus*
	American beaver	*Castor canadensis*
	Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*
	Big free-tailed bat	*Nyctinomops macrotis*
	Black bear	*Ursus americanus*
	Black rat	*Rattus rattus*
	Black-tailed deer	*Odocoileus hemionus*
	Black-tailed jackrabbit	*Sylvilagus bachmani*
	Botta's pocket gopher	*Thomomys bottae*
	California ground squirrel	*Spermophilus beecheyi*
	California myotis	*Myotis californicus*
	California vole	*Microtus californicus*
	Coyote	*Canis latrans*
	Desert cottontail	*Sylvilagus audubonii*
	Douglas squirrel	*Tamiasciurus douglasii*
	Dusky-footed woodrat	*Neotoma fuscipes*
	Fresno kangaroo rat	*Dipodomys nitratoides exilis*
	Giant kangaroo rat	*Dipodomys ingens*
	Gray fox	*Urocyon cinereoargenteus*
	Hoary bat	*Lasiurus cinereus*
	Long-tailed vole	*Microtus longicaudus*
	Mink	*Mustela vison*
	Mule deer (=black-tailed deer)	*Odocoileus hemionus*
	Muskrat	*Ondatra zibethicus*
	Northern flying squirrel	*Glaucomys sabrinus*
	Norway rat	*Rattus norvegicus*

Table E-2 (continued)
Common and Scientific Names of Fish and Wildlife Species Mentioned in Draft PEIR Section 5.6 Biological Resources - Terrestrial

Type	Common Name	Scientific Name
Mammals (cont.)	Opossum	*Didelphis viginiana*
	Ornate shrew	*Sorex ornatus*
	Pallid bat	*Antrozous pallidus*
	Raccoon	*Procyon lotor*
	Ringtail	*Bassariscus astutus*
	Riparian brush rabbit	*Sylvilagus bachmani riparius*
	Riparian woodrat	*Neotoma fuscipes riparia*
	River otter	*Lutra canadensis*
	Salt marsh harvest mouse	*Reithrodontomys raviventris*
	San Joaquin kit fox	*Vulpes macrotis mutica*
	Striped skunk	*Mephitis mephitis*
	Suisun shrew	*Sorex ornatus sinuosus*
	Tipton's kangaroo rat	*Dipodomys nitratoides nitratoides*
	Townsend's big-eared bat	*Corynorhinus townsendii*
	Tule elk	*Cervus elaphus*
	Western gray squirrel	*Sciurus gresius*
	Western harvest mouse	*Reithrodontomys megalotis*
	Western mastiff bat	*Eumops perotis californicus*
	Western red bat	*Lasiurus blossevillii*

Sources: AmphibiaWeb 2017; AOU 2017; DFW 2017a; DFW 2017b; DFW 2017c; SSAR 2017; Xerces Society for Invertebrate Conservation 2017

Note: Scientific and common names of special-status species follow the California Department of Fish and Wildlife (DFW) Special Animal List (2017). Sources for common wildlife species names are the DFW Species Explorer data portal, the Xerces Society for Invertebrate Conservation, the Society for the Study of Amphibians and Reptiles, AmphibiaWeb, the American Ornithologists' Union, and the American Society of Mammalogists.

E.2 References

Adams, P. B., C. B. Grimes, S. T. Lindley, and M. L. Moser. 2002. Status review for North American green sturgeon, *Acipenser medirostris*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA.

Barnhart, R. A., M. J. Boyd, and J. E. Pequegnat. 1992. The ecology of Humboldt Bay, California: An estuarine profile. U.S. Fish and Wildlife Service.

Baxter, R. 1999. Osmeridae. pp. 179-216 in Orsi, J., (ed). Report on the 1980-1995 fish, shrimp, and crab sampling in the San Francisco Estuary, California. Interagency Ecological Program Technical Report 63.

Beamish, R. J., and T. G. Northcote. 1989. Extinction of a population of anadromous parasitic lamprey Lampetra tridentata upstream of an impassable dam. Canadian Journal of Fisheries and Aquatic Sciences 46:420-425.

Bennett, W. A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science. Vol. 3, Issue 2 (September 2005), Article 1.

Bennett, J., J. Hofius, C. Johnson, and T. Maurer. 2001. Tissue residues and hazards of waterborne pesticides for federally listed and candidate fishes of the Sacramento-San Joaquin River Delta, California: 1993–1995. U.S. Fish and Wildlife Service. Environmental Contaminants Division. Sacramento, CA. July 2001.

Benson, R. L., S. Turo, and B. W. McCovey Jr. 2007. Migration and movement patterns of green sturgeon (*Acipenser medirostris*) in the Klamath and Trinity rivers, California, USA. *Environmental Biology of Fishes* 79:269–279.

Brown, L. R., and D. Michniuk 2007. Littoral fish assemblages of the alien-dominated Sacramento–San Joaquin Delta, California 1980–1983 and 2001–2003. *Estuaries and Coasts* 30: 186–200.

Busby, P. J., T. C. Wainwright, G. J. Bryant., L. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Technical Memo NMFS-NWFSC-27. 261 pages.

Crain, P. K., K. Whitener, and P. B. Moyle. 2004. Use of a restored central California floodplain by larvae of native and alien fishes. In Feyrer, F., L. R. Brown, R. L. Brown, and J. J. Orsi, (eds.), Early Life History of Fishes in the San Francisco Estuary and Watershed. American Fisheries Society Symposium 39. Bethesda, Maryland. pp. 125–140.

California Department of Fish and Game (DFG). 1998. A status review of the spring run Chinook salmon in the Sacramento River drainage. Report to the Fish and Game Commission. Candidate species status report 98-1. Sacramento, CA. June.

———. 2001. *California's Living Marine Resources: A Status Report*. December.

California Department of Water Resources (DWR). 2005. Bulletin 250. Fish Passage Improvement. Available: http://www.water.ca.gov/fishpassage/publications/B250.cfm.

Erickson, D. L. and M. A. H. Webb. 2007. Spawning periodicity, spawning migration, and size at maturity of green sturgeon, *Acipenser medirostris*, in the Rogue River, Oregon. *Environmental Biology of Fishes* 79: 255–268.

Erickson, D. L., J. A. North, J. E. Hightower, J. Weber, and L. Lauck. 2002. Movement and habitat use of green sturgeon *Acipenser medirostris* in the Rogue River, Oregon, USA. *Journal of Applied Ichthyology* 18: 565–569.

Fairey, R., K. Taberski, S. Lamerdin, E. Johnson, R. P. Clark, J. W. Downing, J. Newman, and M. Petreas. 1997. Organochlorines and other environmental

contaminants in muscle tissues of sportfish collected from San Francisco Bay. *Marine Pollution Bulletin* 34: 1058–1071.

Feist, G. W., M. A. H. Webb, D. T. Gundersen, E. P. Foster, C. B. Schreck, A. G. Maule, and M. S. Fitzpatrick. 2005. Evidence of detrimental effects of environmental contaminants on growth and reproductive physiology of white sturgeon in impounded areas of the Columbia River. *Environmental Health Perspectives* 113: 1675–1682.

Fisher, F. 1994. Past and present status of Central Valley Chinook salmon. *Conservation Biology* 8(3):870–873.

Goodman, D. 2005. Selection equilibrium for hatchery and wild spawning fitness in integrated breeding programs. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 374–389.

Greenfield, B.K., J.A. Davis, R. Fairey, C. Roberts, D. Crane, and G. Ichikawa. 2005. Seasonal, interannual, and long-term variation in sport fish contamination, San Francisco Bay. Science of the Total Environment, 336(1-3):25-43.

Grimaldo L, Ross B, Sweetnam D. 1998. Preliminary results on the age and growth of delta smelt from different areas of the estuary using otolith microstructural analysis. IEP Newsletter 11(1):25–28. Available at: http://www.iep.ca.gov/newsletter.

Hallock, R. J., W. F. Van Woert, and L. Shapovalov. 1961. An evaluation of stocking hatchery-reared steelhead rainbow trout (*Salmo gairdnerii gairdnerii*) in the Sacramento River system. California Department of Fish and Game. Fish Bulletin No. 14. Herren, J. R., and S. S. Kawasaki. 2001. Inventory of water diversions in four geographic areas in California's Central Valley. In: R.L. Brown, ed., Contributions to the Biology of Central Valley Salmonids. Volume. 2. California Fish and Game. Fish Bulletin 179: 343-355.

Herren, J.R. and S.S. Kawasaki. 2001. Inventory of water diversions in four geographic areas in California's Central Valley. pp. 343-355 in Brown, R. L., (ed). Contributions to the Biology of Central Valley Salmonids. California Fish and Game. Fish Bulletin 179.

Israel, J. A., J. F. Cordes, M. A. Blumberg, and B. May. 2004. Geographic patterns of genetic differentiation among collections of green sturgeon. *North American Journal of Fisheries Management* 24: 922–931.

Jassby, A. D., J. E. Cloern. 2000. Organic matter sources and rehabilitation of the Sacramento-San Joaquin Delta (California, USA). *Aquatic Conservation: Marine and Freshwater Ecosystems* 10: 323–352.

Jassby, A. D., J. E. Cloern, B. E. Cole. 2002. Annual primary production: patterns and mechanisms of change in a nutrient-rich tidal ecosystem. *Limnology and Oceanography* 47: 698–712.

Kaufman, R. C., A. G. Houck, and J. J. Cech, Jr. 2008. Effects of dietary selenium and methylmercury on green and white sturgeon bioenergetics in response to changed environmental conditions. 5th Biennial CALFED Science Conference, October 22–24, 2008, Sacramento, CA.

Kelly, J. T., A. P. Klimley, and C. E. Crocker. 2007. Movements of green sturgeon, Acipenser medirostris, in the San Francisco Bay Estuary, California. *Environmental Biology of Fishes* 79: 281–295.

Kostow, K. 2002. Oregon lamprey: natural history status and analysis of management issues. Oregon Department of Fish and Wildlife, Corvallis, Oregon. 112 pp.

Kruse, G. O. and D. L. Scarnecchia. 2002. Assessment of bioaccumulated metal and organochlorine compounds in relation to physiological bismarkers in Kootenai River white sturgeon. *Journal of Applied Ichthyology* 18: 430–438.

Lindley, S. T., M. S. Mohr. 2003. Modeling the effect of striped bass on the population viability of Sacramento River winter-run Chinook salmon. *Fishery Bulletin* 101: 321–331.

Lindley, S. T., R. Schick, A. Agrawal, M. Goslin, T. E. Pearson, E. Mora, J. J. Anderson, B. May, S. Greene, C. Hanson, A. Low, D. McEwan, R. B. MacFarlane, C. Swanson, J. G. Williams. 2006. Historical population structure of Central Valley steelhead and its alteration by dams. San Francisco Estuary and Watershed Science. Volume 4, Issue 2, (February 2006), Article 3.

Luzier, C. W. et al. 2009. Proceedings of the Pacific Lamprey Conservation Initiative Work Session – October 28–29, 2009. U.S. Fish and Wildlife Service, Regional Office, Portland, OR, USA.

Maslin, P., M. Lennox, and W. McKinney. 1997. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (Oncorhynchus tshawytscha). California State University, Chico, Department of Biological Sciences. 89 pages.

McEwan, D. 2001. Central Valley Steelhead. In: Contributions to the Biology of Central Valley Salmonids. Brown, R. L. (ed.), Sacramento, CA: California Department of Fish and Game, Fish Bulletin, Vol. 179, pp. 1–43.

McEwan, D. and T. A. Jackson. 1996. Steelhead restoration and management plan for California. California Department of Fish and Game. Sacramento, CA.

Moyle, P. B. 2002. Inland fishes of California, 2nd edition. University of California Press, Berkeley and Los Angeles, CA. 502 pp.

Moyle, P. B., R. D. Baxter, T. Sommer, T. C. Foin, and S. A. Matern. 2004. Biology and population dynamics of Sacramento splittail (Pogonichthys macrolepidotus) in the San Francisco Estuary: A review. San Francisco Estuary and Watershed Science. Volume 2, Issue 2. Accessed April 13, 2017.

Nakamoto, R. J., T. T. Kisanuki, and G. H. Goldsmith. 1995. Age and growth of Klamath River green sturgeon (Acipenser medirostris). U.S. Fish and Wildlife Service Project 93-FP-13, Yreka, CA. 20 pp.

National Marine Fisheries Service (NMFS). 1997. National Marine Fisheries Service Proposed Recovery Plan for the Sacramento River Winter-run Chinook Salmon. NMFS, Southwest Region, Long Beach, CA.

———. 2009a. Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley Project and State Water Project. National Marine Fisheries Service, Southwest Region June 4, 2009.

———. 2009b. Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead. Appendix A: Central Valley Watershed Profiles. Sacramento Protected Resources Division. October 2009.

———. 2011. Essential Fish Habitat. Southwest Regional Office. Available: http://swr.nmfs.noaa.gov/hcd/HCD_webContent/EFH/sanfran_fmp.htm. Accessed January 25, 2011.

Nobriga, M. L., and P. Cadrett. 2003. Differences among hatchery and wild steelhead: evidence from Delta fish monitoring programs. *Interagency Ecological Program for the San Francisco Estuary Newsletter* 14:3:30–38.

Resources Agency. 2007. Pelagic Fish Action Plan. 84 pp.

Rosenfield, J. A. and Baxter, R. D. 2007. Population Dynamics and Distribution Patterns of Longfin Smelt in the San Francisco Estuary. *Transactions of the American Fisheries Society* 136(6): 1577–1592.

Shapovalov, L., and A. C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. *California Department of Fish and Game, Fish Bulletin* 98: 1–375.

Slater, S. B. 2008. Feeding Habits of Longfin Smelt in the Upper San Francisco Estuary. Presented at the 5th Biennial CALFED Science Conference 2008. October 22–24, 2008, Sacramento Convention Center, Sacramento, CA.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain rearing of juvenile chinook salmon: evidence of enhanced growth and survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58(2): 325–333.

Sommer, T., K. Reece, F. Mejia, and M. Morbriga. 2009. Delta smelt life-history contingents: a possible upstream rearing strategy. *IEP Newsletter* 22(1): 11–13.

Thompson, J. 2007. Clams – where, how and can we limit the damage. Presentation at the CALFED Science Program workshop: Defining a Variable Delta to Promote Estuarine Fish Habitat. June 11, 2007.

U.S. Fish and Wildlife Service (USFWS). 2001. Abundance and Survival of Juvenile Chinook Salmon in the Sacramento-San Joaquin Estuary: 1997 and 1998. Annual progress report Sacramento-San Joaquin Estuary.

Werner, I. 2007. Pyrethroids in the water column – is there reason for concern? Seminar, University of California, Davis, November 8.

Yoshiyama, R. M., F. W. Fisher, P. B. Moyle. 1998. Historical abundance and decline of Chinook salmon in the Central Valley region of California. North American Journal of Fisheries Management. 18: 487–521.

E.3 Special-Status Plant Species Accounts

The species accounts in this appendix provide an overview of federally or state-listed special-status plants known to occur or have an appreciable likelihood of occurring in the Delta and Suisun Marsh or that are otherwise likely to be substantially affected by the proposed Delta Plan Amendments (Proposed Project or proposed amendments). Additionally, this appendix identifies invasive weeds and noxious plants known to occur, or with the potential to occur, within the Primary Planning Area. Table E-3 also lists identified plant species that were removed from further discussion in the Draft Program Environmental Impact Report (PEIR) because they are not likely to be affected by the Proposed Project.

Table E-3
Special-status Plant Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments in the Primary Planning Area

Common Name	Scientific Name	Federal[a]	State[b]	CRPR[c]	Reason Not Likely Affected
Santa Clara thorn-mint	*Acanthomintha lanceolata*	–	–	4	Occurs only at higher elevation
Purdy's onion	*Allium fimbriatum* var. *purdyi*	–	–	4	Occurs only at higher elevation
Large-flowered fiddleneck	*Amsinckia grandiflora*	E	E	1B	Occurs only at higher elevation
Bent-flowered fiddleneck	*Amsinckia lunaris*	–	–	1B	Occurs only outside the range of the Delta and Suisun Marsh
California androsace	*Androsace elongata* ssp. *acuta*	–	–	4	Occurs only at higher elevation
Slender silver moss	*Anomobryum julaceum*	–	–	2	Occurs only at higher elevation
Twig-like snapdragon	*Antirrhinum virga*	–	–	4	Occurs only at higher elevation
Coast rock cress	*Arabis blepharophylla*	–	–	4	No suitable coastal habitat in the Delta
Modest rock cress	*Arabis modesta*	–	–	4	Occurs only at higher elevation
Mt. Diablo manzanita	*Arctostaphylos auriculata*	–	–	1B	No suitable chaparral habitat present in the Delta and Suisun Marsh
Contra Costa manzanita	*Arctostaphylos manzanita* ssp. *laevigata*	–	–	1B	Occurs only at higher elevation
Serpentine milkweed	*Asclepias solanoana*	–	–	4	Occurs only at higher elevation
Carlotta Hall's lace fern	*Aspidotis carlotta-halliae*	–	–	4	Occurs only at higher elevation
Brewer's milk-vetch	*Astragalus breweri*	–	–	4	Occurs only at higher elevation
Cleveland's milk-vetch	*Astragalus clevelandii*	–	–	4	Occurs only at higher elevation

Table E-3 (continued)
Special-status Plant Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments in the Primary Planning Area

Common Name	Scientific Name	Federal[a]	State[b]	CRPR[c]	Reason Not Likely Affected
Ocean bluff milk-vetch	*Astragalus nuttallii* var. *nuttallii*	–	–	4	No suitable coastal habitat in the Delta and Suisun Marsh
Big-scale balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*	–	–	1B	Occurs only at higher elevation
Oakland star-tulip	*Calochortus umbellatus*	–	–	4	Occurs only at higher elevation
Large-flowered mariposa lily	*Calochortus uniflorus*	–	–	4	No suitable forest or coastal habitat in the Delta and Suisun Marsh
Chaparral harebell	*Campanula exigua*	–	–	1B	No suitable serpentine habitat in the Delta and Suisun Marsh
Tiburon paintbrush	*Castilleja affinis* ssp. *Neglecta*	E	–	1B.2	No suitable serpentine habitat in the Delta and Suisun Marsh
Succulent owl's clover	*Castilleja campestris* ssp. *Succulenta*	T	E	1B	Occurs only outside the range of the Delta and Suisun Marsh
Lemmon's jewel flower	*Caulanthus coulteri* var. *lemmonii*	–	–	1B	Occurs only at higher elevation
Holly-leaved ceanothus	*Ceanothus purpureus*	–	–	1B	Occurs only at higher elevation
Brewer's clarkia	*Clarkia breweri*	–	–	4	Occurs only at higher elevation
Santa Clara red ribbons	*Clarkia concinna* ssp. *Automixa*	–	–	4	Occurs only at higher elevation
Serpentine collomia	*Collomia diversifolia*	–	–	4	Occurs only at higher elevation
Mt. Diablo bird's-beak	*Cordylanthus nidularius*	–	R	1B	No suitable serpentine habitat in the Delta and Suisun Marsh
Peruvian dodder	*Cuscuta obtusiflora var. glandulosa*	–	–	2B.2	Presumed extirpated
Livermore tarplant	*Deinandra bacigalupi*	–	–	1B	Occurs only at higher elevation
Hospital Canyon larkspur	*Delphinium californicum* ssp. *Interius*	–	–	1B	Occurs only at higher elevation
Gypsum-loving larkspur	*Delphinium gypsophilum* ssp. *gypsophilum*	–	–	4	Occurs only at higher elevation
Norris' beard moss	*Didymodon norrisii*	–	–	2	Occurs only at higher elevation
Western leatherwood	*Dirca occidentalis*	–	–	1B.2	No suitable habitat in the Delta and Suisun Marsh
Brandegee's eriastrum	*Eriastrum brandegeeae*	–	–	1B	Occurs only at higher elevation

Table E-3 (continued)
Special-status Plant Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments in the Primary Planning Area

Common Name	Scientific Name	Federal[a]	State[b]	CRPR[c]	Reason Not Likely Affected
Lime Ridge eriastrum	*Eriastrum ertterae*	–	–	1B.1	Known only to occur in Lime Ridge area
Streamside daisy	*Erigeron biolettii*	–	–	3	No suitable forest habitat in the Delta and Suisun Marsh
Tiburon buckwheat	*Eriogonum luteolum* var. *caninum*	–	–	1B.2	No suitable serpentine habitat in the Delta and Suisun Marsh
Kings River buckwheat	*Eriogonum nudum* var. *regirivum*	–	–	1B.2	Occurs only at higher elevation
Bay buckwheat	*Eriogonum umbellatum* var. *bahiiforme*	–	–	4	Occurs only at higher elevation
Jepson's woolly sunflower	*Eriophyllum jepsonii*	–	–	4	Occurs only at higher elevation
Spiny-sepaled button-celery	*Eryngium spinosepalum*	–	–	1B.2	Occurs only at higher elevation
Adobe-lily	*Fritillaria pluriflora*	–	–	1B	No suitable habitat in the Delta and Suisun Marsh
Purdy's fritillary	*Fritillaria purdyi*	–	–	4	Occurs only at higher elevation
Phlox-leaf serpentine bedstraw	*Galium andrewsii* ssp. *gatense*	–	–	4	Occurs only at higher elevation
Toren's grimmia	*Grimmia torenii*	–	–	1B.3	Occurs only at higher elevation
Nodding harmonia	*Harmonia nutans*	–	–	4	Occurs only at higher elevation
Diablo helianthella	*Helianthella castanea*	–	–	1B	Occurs only at higher elevation
Coast Iris	*Iris longipetala*	–	–	4	Occurs only outside the range of the Delta and Suisun Marsh
Northern California (Hinds) black walnut	*Juglans californica* var. *hindsii (Juglans hindsii)*	–	–	1B	No native populations within the Delta and Suisun Marsh
Ahart's dwarf rush	*Juncus leiospermus* var. *ahartii*	–	–	1B	Occurs only outside the range of the Delta and Suisun Marsh
Bristly leptosiphon	*Leptosiphon acicularis*	–	–	4	Occurs only at higher elevation
Serpentine leptosiphon	*Leptosiphon ambiguus*	–	–	4	Occurs only at higher elevation
Large-flowered leptosiphon	*Leptosiphon grandiflorus*	–	–	4	No suitable coastal habitat in the Delta and Suisun Marsh
Woolly-headed lessingia	*Lessingia hololeuca*	–	–	3	No suitable serpentine habitat in the Delta and Suisun Marsh
Spring lessingia	*Lessingia tenuis*	–	–	4	Occurs only at higher elevation

Table E-3 (continued)
Special-status Plant Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments in the Primary Planning Area

Common Name	Scientific Name	Federal[a]	State[b]	CRPR[c]	Reason Not Likely Affected
Hoover's lomatium	*Lomatium hooveri*	–	–	4	Occurs only at higher elevation
Napa lomatium	*Lomatium repostum*	–	–	4	Occurs only at higher elevation
Hall's bush-mallow	*Malacothamnus hallii*	–	–	1B	No suitable chaparral habitat within the Delta and Suisun Marsh
Heller's bush-mallow	*Malacothamnus helleri*	–	–	4	Occurs only at higher elevation
Mt. Diablo cottonweed	*Micropus amphibolus*	–	–	3	No suitable shrub or woodland habitat in the Delta and Suisun Marsh
Sylvan microseris	*Microseris sylvatica*	–	–	4	Occurs only at higher elevation
Sierra monardella	*Monardella candicans*	–	–	4	Occurs only at higher elevation
Robust monardella	*Monardella villosa* ssp. *globosa*	–	–	1B.2	Only occurs at higher elevation
Green monardella	*Monardella viridis* ssp. *Viridis*	–	–	4	Occurs only at higher elevation
Woodland woollythreads	*Monolopia gracilens*	–	–	1B.2	Occurs only at higher elevation
Hoary navarretia	*Navarretia eriocephala*	–	–	4	Occurs only at higher elevation
Lime Ridge navarretia	*Navarretia gowenii*	–	–	1B.1	Occurs only at higher elevation
Jepson's navarretia	*Navarretia jepsonii*	–	–	4	Occurs only at higher elevation
Adobe navarretia	*Navarretia nigelliformis* ssp. *nigelliformis*	–	–	4	Occurs only at higher elevation
Shining navarretia	*Navarretia nigelliformis ssp. radians*	–	–	1B.2	Occurs only at higher elevation
Mt. Diablo phacelia	*Phacelia phacelioides*	–	–	1B	Occurs only at higher elevation
Michael's rein orchid	*Piperia michaelii*	–	–	4	No suitable coastal habitat within the Delta and Suisun Marsh
Victor's gooseberry	*Ribes victoris*	–	–	4	Occurs only at higher elevation
Rock sanicle	*Sanicula saxatilis*	–	R	1B	Occurs only at higher elevation
Rayless ragwort	*Senecio aphanactis*	–	–	2	No suitable coastal or woodland habitat in the Delta and Suisun Marsh
Sweet marsh ragwort	*Senecio hydrophiloides*	–	–	4	Occurs only at higher elevation

Table E-3 (continued)
Special-status Plant Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments in the Primary Planning Area

Common Name	Scientific Name	Federal[a]	State[b]	CRPR[c]	Reason Not Likely Affected
Keck's checkerbloom	*Sidalcea keckii*	E	–	1B.1	No suitable serpentine habitat in the Delta and Suisun Marsh
Most beautiful jewel-flower	*Streptanthus albidus* ssp. *peramoenus*	–	–	1B	No suitable serpentine habitat in the Delta and Suisun Marsh
Mt. Diablo jewel-flower	*Streptanthus hispidus*	–	–	1B	No suitable serpentine habitat in the Delta and Suisun Marsh
Slender-leaved pondweed	*Stuckenia filiformis*	–	–	2.2	Occurs only at higher elevation
Showy Indian clover	*Trifolium amoenum*	E	–	1B	No suitable coastal habitat present in the Delta and Suisun Marsh
Coastal triquetrella	*Triquetrella californica*	–	–	1B	No suitable coastal habitat present in the Delta and Suisun Marsh
Dark-mouthed triteleia	*Triteleia lugens*	–	–	4	Occurs only at higher elevation
Oval-leaved viburnum	*Viburnum ellipticum*	–	–	2	Occurs only at higher elevation

Sources: CNDDB 2020, CNPS 2020

[a] **U.S. Fish and Wildlife Service—Federal Listing Categories:**
T = Threatened.
E = Endangered.
– = No status.

[b] **California Department of Fish and Game—State Listing Categories:**
R = Rare.
E = Endangered.
– = No status.

[c] **California Rare Plant Rank (CRPR) Listing Categories:**
1B = Plants rare, threatened, or endangered in California and elsewhere.
2 = Plants rare, threatened, or endangered in California, but more common elsewhere.
3 = Plants for which more information is needed—a review list.
4 = Plants of limited distribution—a watch list.

Extension:
.2 = Fairly endangered in California (20–80% of occurrences are threatened)

The special-status plant species accounts provided below present an overview of each species' listing status, known distribution in California and the Delta and Suisun Marsh, description of the plant, information on life history, habitat requirements, and known threats. The species are featured in alphabetical order by scientific name. Table E-4 below presents a comprehensive list of the special-status plant species known to occur or with potential to occur in the Delta and Suisun Marsh. Species that are known to occur in the Primary Planning Area or that have suitable habitat are described in more detail below Table E-4.

E.3.1 Alkali Milk-vetch

Alkali milk-vetch (*Astragalus tener* var. *tener*) is a CRPR 1B.2 species. Alkali milk-vetch was historically distributed throughout the southern Sacramento Valley, northern San Joaquin Valley, and San Francisco Bay Area but is believed to be extirpated from all historic occurrences except those in Alameda, Merced, Solano, and Yolo counties (CNPS 2020). Several reported occurrences are known from the Delta. Small groups of up to 20 plants are found on suitable habitat throughout the Tule Ranch in the southern part of the Yolo Bypass (Witham 2003).

Alkali milk-vetch is an herbaceous annual plant in the pea family (Fabaceae) (CNPS 2020). It is distinguished from Ferris' milk-vetch (*Astragalus tener* var. *ferrisiae*), which co-occurs, based on the morphology of its fruits. Alkali milk-vetch has short, stout, strongly curved pods (Liston 1990, 1992 as cited in USFWS 2001). Its elevation range is up to 2,000 feet.

The main threat to the survival of alkali milk-vetch is conversion of habitat to agricultural land uses (CNPS 2020). Competition from nonnative species is another threat. Livestock grazing is frequently mentioned as a possible threat in CNDDB occurrence reports, but some level of grazing may be beneficial to control competition from nonnative species. Because remaining populations are small and scattered, extirpation from random events such as flood, drought, or disease is also a concern (USFWS 2005).

E.3.2 Heartscale

Heartscale (*Atriplex cordulata*) is a CRPR 1B.2 species. Heartscale is endemic to California. Its range extends through the Central Valley from Glenn County in the north to Fresno County in the south (CNPS 2020). Heartscale is found in meadows, seeps, riparian wetlands, chenopod scrub, and valley and foothill grasslands in various soils that are either saline or alkaline (CNPS 2020).

Heartscale is a small- to medium-sized 4- to 20-inch- (10- to 50-centimeter) tall annual herb of the goosefoot family (Chenopodiaceae) that blooms from April to October (CNPS 2020). Heartscale can be found at elevations up to 1,840 feet (560 meters) (CNPS 2020).

Reported threats to heartscale include agriculture intensification, development, nonnative plants, overgrazing, and trampling (CNPS 2020).

Table E-4
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Bent flowered fiddleneck *Amsinckia lunaris*	–	–	1B.2	Found in coastal bluff scrub, cismontane woodland, and valley and foothill grassland; 0- to 1,600-foot elevation	Alameda, Contra Costa, Colusa, Lake, Marin, Napa, San Benito, Santa Clara, Santa Cruz, San Mateo, and Yolo counties	March–June	Could occur; suitable habitat is present, and species is known from the vicinity
Ferris' milk-vetch Astragalus tener var. ferrisiae	–	–	1B.1	Vernally mesic meadows and mildly alkaline flats in valley and foothill grassland, usually on dry, heavy clay or adobe soil; 0- to 2,500-foot elevation	Western edge of the Central Valley from Butte to Solano counties	April–May	Could occur; suitable habitat is present, and species is known from the vicinity
Alkali milk-vetch *Astragalus tener* var. *tener*	–	–	1B.2	Alkaline vernal pools and playas, and valley and foothill grassland with alkaline adobe clay soils; 3- to 2,000-foot elevation	Central Valley and eastern San Francisco Bay Area	March–June	Known to occur in the Primary Planning Area
Heartscale *Atriplex cordulata*	–	–	1B.2	Sandy, saline, or alkaline flats or scalds, in chenopod scrub, meadows, and valley and foothill grassland	Central Valley, from Kern County in the south to Butte and Glenn counties in the north, and from Alameda County, Contra Costa, and Solano counties in the west to Madera and Tulare counties in the east; believed to be extirpated from San Joaquin, Stanislaus, and Yolo counties and has not been reported from Sacramento County	April–October	Known to occur in the Primary Planning Area
Crownscale *Atriplex coronata* var. *coronata*	–	–	4.2	Alkaline soils in vernal pools, valley foothill grassland, and chenopod scrub	Central Valley, the foothills of the Sierra Nevada, and the inner south coast ranges	March–October	Known to occur in the Primary Planning Area

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Lost Hills crownscale *Atriplex coronata* var. *vallicola*	–	–	1B.2	Alkaline soils; chenopod scrub, valley and foothill grassland, and vernal pools	Fresno, Kings, Kern, Merced, San Luis Obispo, Tulare Counties	April-September	Unlikely to occur; nearly all known occurrences of this species in southwestern San Joaquin County.
Brittlescale *Atriplex depressa*	–	–	1B.2	Alkaline clay soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, or vernal pools; 3- to 1,050-foot elevation	Central Valley and Tulare Basin	May–October	Known to occur in the Primary Planning Area
Lesser saltscale *Atriplex minuscula*	–	–	1B.1	Alkaline sandy soils in chenopod scrub, playas, valley and foothill grassland; 45- to 600-foot elevation	Central Valley from Kern County to Stanislaus County and in Alameda and Butte counties	May–October	Could occur; suitable habitat is present, and species is known from the vicinity
Vernal pool smallscale *Atriplex persistens*	–	–	1B.2	Alkaline vernal pools; 30- to 400-foot elevation	Scattered locations throughout the Central Valley from Glenn County to Tulare County	June–October	Could occur; suitable habitat is present, and species is known from the vicinity
Big tarplant *Blepharizonia plumosa*	–	–	1B.1	Valley and foothill grassland; 100- to 1,600-foot elevation	Scattered locations throughout the inner Coast Ranges from Solano County to Stanislaus County	July–October	Could occur; suitable habitat is present, and species is known from the vicinity
Watershield *Brasenia schreberi*	–	–	2.3	Freshwater marshes and swamps	North Coast Ranges, Cascade Range, Sierra Nevada, and Central Valley	June–September	Unlikely to occur; presumed extirpated in the Delta and other known populations are found at higher elevations
Brewer's calandrinia *Calandrinia breweri*	–	–	4.2	Sandy or loamy soils on disturbed sites; burns in chaparral and coastal scrub; 30- to 4,000-foot elevation	Widely scattered locations from Shasta County to San Diego County, but always uncommon; many collections are old	March–June	Could occur; suitable habitat is present, and species is known from the vicinity
Round-leaved filaree *California macrophylla*	–	–	1B.2	Open sites, grassland, scrub, vertic clay, occasional serpentine; 50- to 4,000-foot elevation	Inner Coast Ranges of California and Central Valley	March-May	Could occur; suitable habitat is present, and known historical occurrences of species in the Delta

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Mt. Diablo fairy-lantern *Calochortus pulchellus*	–	–	1B.2	Openings in chaparral, coastal scrub, and associated grasslands; 100- to 2,800-foot elevation	Inner Coast Ranges in Alameda, Contra Costa, and Solano counties	April–June	Unlikely to occur; where found in the vicinity, it grows at higher elevations
Bristly sedge *Carex comosa*	–	–	2.1	Coastal prairie, marshes and swamps, valley and foothill grassland, on lake margins, and wet places; 0- to 2,100-foot elevation	Fairly widely distributed in California ranging from Shasta County to San Bernardino County	May–September	Known to occur in the Delta
Johnny-nip *Castilleja ambigua* ssp. *ambigua*	–	–	4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pool margins	Coastal counties from San Luis Obispo to Del Norte, Napa, Contra Costa, and Alameda counties	March–August	Could occur; suitable habitat is present and species is known from the vicinity
Lemmon's jewelflower Caulanthus lemmonii	–	–	1B.2	Grassland, chaparral, scrub	South Coastal Ranges, San Joaquin Valley, and San Francisco Bay Area	March-May	Unlikely to occur; where found in the vicinity, it grows at higher elevations
Congdon’s tarplant *Centromadia parryi* ssp. *congdonii*	–	–	1B.2	Alkaline, often heavy clay soils in mesic areas within grassland communities with ruderal and native alkali-tolerant plants; 0- to 600-foot elevation	Alameda, Contra Costa, Monterey, Santa Clara, Santa Cruz, San Luis Obispo, San Mateo, and Solano counties	June–November	Could occur; suitable habitat is present, and species is known from the vicinity
Pappose tarplant *Centromadia parryi* ssp. *parryi*	–	–	1B.2	Mesic areas in coastal prairie, meadow, and grassland habitats, often on alkaline substrates; 0- to 1,400-foot elevation	Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, and Sonoma counties	June–November	Could occur; suitable habitat is present, and species is known from the vicinity
Parry’s tarplant *Centromadia parryi* ssp. *rudis*	–	–	4.2	Mesic areas in coastal prairie, meadow, and grassland habitats, often on alkaline substrates; 0- to 300-foot elevation	Butte, Colusa, Glenn, Lake, Merced, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties	June–November	Could occur; suitable habitat is present, and species is known from the vicinity

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Hispid salty bird's-beak *Chloropyron molle* ssp. *hispidum*	–	–	1B.1	Mesic alkaline soils in meadows and seeps, playas, and valley and foothill grassland; 3- to 500-foot elevation	Scattered locations in San Joaquin Valley from Solano County to Kern County	June–September	Could occur; suitable habitat is present, and species is known from the vicinity
Soft salty bird's-beak *Chloropyron molle* ssp. *molle*	E	R	1B.2	Coastal salt marshes and swamps; 0- to 10-foot elevation	Endemic to the San Pablo Bay and Suisun Bay area; may have historically occurred in the Delta	July–September	Could occur; suitable habitat is present, and species is known from the vicinity
Palmate-bracted salty bird's-beak *Chloropyron palmatum*	E	E	1B.1	Alkaline soils in chenopod scrub and valley and foothill grassland; 15- to 500-foot elevation	Glenn, Colusa, Yolo, Alameda, Madera, and Fresno counties	June-August	Could occur; suitable habitat is present, and species is known from the vicinity
Bolander's water hemlock *Cicuta maculata* var. *bolanderi*	–	–	2.1	Coastal, fresh, or brackish marshes; 0- to 600-foot elevation	Contra Costa, Los Angeles, Marin, Sacramento, Santa Barbara, San Luis Obispo, and Solano counties	July–September	Known to occur in the Primary Planning Area
Slough thistle *Cirsium crassicaule*	–	–	1B.1	Chenopod scrub habitat or along sloughs in marshes, and swamps and riparian scrub habitat; 0- to 300-foot elevation	Kings, Kern, and San Joaquin counties	May–August	Known to occur in the Delta
Suisun thistle *Cirsium hydrophilum* var. *hydrophilum*	E	–	1B.1	Salt and brackish marshes; 0- to 3-foot elevation	Restricted to the Suisun Marsh in Solano County	June–September	Known to occur in Suisun Marsh
Small flowered morning glory *Convolvulus simulans*	–	–	4.2	Serpentine seeps in valley and foothill grassland; openings in chaparral and coastal scrub; 100- to 2,100-foot elevation	Fairly widely distributed in California, ranging from Contra Costa County to San Diego County	March–July	Could occur; suitable habitat is present, and species is known from the vicinity
Hoover's cryptantha *Cryptantha hooveri*	–	–	1A	Inland dunes and sandy soils in valley and foothill grassland; 30- to 500-foot elevation	Contra Costa, Merced, Stanislaus, Madera, and Kern counties	April–May	Unlikely; although there is a historical record from the city of Antioch, this species is presumed extinct by CNPS

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Recurved larkspur *Delphinium recurvatum*	–	–	1B.2	Alkaline soils in cismontane woodland and valley and foothill grassland; 10- to 2,500-foot elevation	Central Valley and foothills from Contra Costa County to Kern County	March–June	Known to occur in the Delta
Dwarf downingia *Downingia pusilla*	–	–	2.2	Vernally mesic sites in valley and foothill grassland and vernal pools; 3- to 1,500-foot elevation	Central Valley from Tehama County to Fresno County	March–May	Known to occur in the Primary Planning Area
Small spikerush *Eleocharis parvula*	–	–	4.3	Marshes and swamp; 0- to 10,000-foot elevation	Distributed in 14 counties in California from Siskiyou County to Orange County	June–August	Could occur; suitable habitat is present
Antioch Dunes buckwheat *Eriogonum nudum* var. *psychichola*	–	–	1B.1	Inland dunes; 0- to 60-foot elevation	Contra Costa County	July–October	Known to occur; known from single occurrence in Antioch Dunes, but species may also be present in other areas where conditions are favorable
Mt. Diablo buckwheat *Eriogonum truncatum*	–	–	1B.1	Sandy soils in chaparral, coastal scrub, and valley and foothill grasslands; 10- to 1,050-foot elevation	Alameda, Contra Costa, and Solano counties	April–December	Unlikely to occur; presumed extinct but rediscovered in Mt. Diablo State Park, the only known extant occurrence
Jepson's coyote-thistle *Eryngium jepsonii*	–	–	1B.2	Clay soils in valley and foothill grasslands or vernal pools	Alameda, Amador, Calaveras, Contra Costa, Fresno, Napa, San Mateo, Solano, Stanislaus, Tuolumne, Yolo Counties	April-August	Could occur; suitable habitat is present
Delta button-celery *Eryngium racemosum*	–	E	1B.1	Vernally mesic clay depressions in riparian scrub habitat; 10- to 100-foot elevation	Delta and floodplains	June–September	Known to occur in the Delta
Spiny-sepaled button-celery *Eryngium spinosepalum*	–	–	1B.2	Valley and foothill grassland and vernal pools; 250- to 3,000-foot elevation	Contra Costa, Fresno, Kern, Madera, Merced, San Luis Obispo, Stanislaus, Tulare, Tuolumne Counties	April-June	Unlikely; most known occurrences are at higher elevations

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Contra Costa wallflower *Erysimum capitatum* ssp. *angustatum*	E	E	1B.1	Inland dunes, generally on stabilized dunes of sand and clay near Antioch along the San Joaquin River; 0- to 70-foot elevation	Documented occurrences restricted to near Antioch Dunes National Wildlife Refuge	March–July	Known to occur in the Delta
Diamond-petaled California poppy *Eschscholzia rhombipetala*	–	–	1B.1	Alkaline and clay soils in valley and foothill grassland; 0- to 1,000-foot elevation	Rediscovered on Carrizo Plain in San Luis Obispo County by David Keil in 1992; not seen there since 1995; also found at Lawrence Livermore Laboratory in Alameda County 1997, where extant as of 2003; historical occurrences known from San Joaquin, Stanislaus, and Colusa counties	March–April	Could occur; suitable habitat is present, and species is known from the vicinity
San Joaquin spearscale *Extriplex joaquinana*	–	–	1B.2	Alkaline soils in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland; 3- to 2,750-foot elevation	Western edge of the Central Valley from Glenn County to Tulare County	April–October	Known to occur in the Primary Planning Area
Stinkbells *Fritillaria agrestis*	–	–	4.2	Chaparral, cismontane woodland, pinyon and juniper woodland, and valley and foothill grasslands; often found on clay soils, sometimes serpentinite soils; 30- to 5,000-foot elevation	Distributed in 20 counties in California from Mendocino County to Ventura County	March–June	Could occur; suitable habitat is present, and species is known from the vicinity
Fragrant fritillary *Fritillaria liliacea*	–	–	1B.2	Heavy clay soils (often with a serpentine influence) in cismontane woodland, coastal prairie, coastal scrub, and valley and foothill grassland	Found in all counties surrounding the San Francisco Bay region except for Napa County	February–April	Could occur; suitable habitat is present, and species is known from the vicinity

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Bogg's Lake hedge-hyssop *Gratiola heterosepala*	–	E	1B.2	Lake margin marshes and swamps and vernal pools in clay soils; 30- to 7,800-foot elevation	Fresno, Lake, Lassen, Madera, Merced, Modoc, Placer, Sacramento, Shasta, Siskiyou, San Joaquin, Solano, and Tehama counties	April–August	Could occur; suitable habitat is present, and species is known from the vicinity
Hogwallow starfish *Hesperevax caulescens*	–	–	4.2	Shallow vernal pools and mesic, clay soils in valley and foothill grassland; 0- to 1,500-foot elevation	Widespread in the Central Valley and south coast ranges from Tehama County to Kern County	March–June	Could occur; suitable habitat is present, and species is known from the vicinity
Brewer's western flax *Hesperolinon breweri*	–	–	1B.2	Rocky, serpentine soils in chaparral, cismontane woodland, and valley and foothill grassland; 100- to 3,000-foot elevation	Found only in the inner Coast Ranges of Contra Costa, Napa, and Solano counties	May–July	Unlikely to occur; plant is found primarily on serpentine soils that do not occur in the Delta
Rose-mallow *Hibiscus lasiocarpos* var. *occidentalis*	–	–	1B.2	Freshwater marshes and swamps; generally found on wetted riverbanks and low peat islands in sloughs; 0- to 100-foot elevation	Central Valley from Butte County to San Joaquin County	June–September	Known to occur in the Primary Planning Area
Central coast iris *Iris longipetala*	–	–	4.2	Grows in mesic coastal prairie, lower montane coniferous forest, and meadows and seeps; 0- to 2,000-foot elevation	Coast Ranges from Humboldt County to Monterey County	March–May	Unlikely to occur; many collections are old and need field surveys to verify; may hybridize with *Iris missouriensis*
Carquinez goldenbush *Isocoma arguta*	–	–	1B.1	Grows in alkaline soils on flats and low hills in valley and foothill grassland; often occurs on low benches near drainages and on mounds in swale areas	Solano County	August–December	Could occur; suitable habitat is present, and species is known from the vicinity.
Contra Costa goldfields *Lasthenia conjugens*	E	–	1B.1	Grows in vernal pools, swales, and other depressions in open grassland and woodland communities, often in alkaline soils	Alameda, Contra Costa, Mendocino, Monterey, Marin, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma counties	March–June	Could occur; suitable habitat is present, and species is known from the vicinity

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Ferris' goldfields *Lasthenia ferrisiae*	–	–	4.2	Alkaline and claypan vernal pools; 60- to 2,300-foot elevation	Distributed in 18 counties from Butte County to Ventura County	February–May	Could occur; suitable habitat is present, and species is known from the vicinity
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	–	–	1B.2	Freshwater and brackish marshes at sea level	Restricted to the Delta	May–September	Known to occur in the Primary Planning Area
Legenere *Legenere limosa*	–	–	1B.1	Bottoms of vernal pools and other wet depressions in grassland communities	Central Valley and north Coast Ranges from Shasta County to Santa Clara County	April–June	Known to occur in the Primary Planning Area
Heckard's peppergrass *Lepidium latipes* var. *heckardii*	–	–	1B.2	Alkaline flats and in alkaline grasslands along the edges of vernal pools	Glenn, Solano, and Yolo counties	March–May	Known to occur in the Delta
Mason's lilaeopsis *Lilaeopsis masonii*	–	R	1B.1	Freshwater and brackish marshes, riparian scrub, generally found in tidal zones, on depositional soils; 0- to 30-foot elevation	Restricted to the Delta	April–November	Known to occur in the Primary Planning Area
Delta mudwort *Limosella subulata*	–	–	2.1	Riparian scrub, freshwater marsh, brackish marsh, generally on mud banks of the Delta in marshy or scrubby riparian; 0- to 10-foot elevation	Restricted to the Delta	May–August	Known to occur in the Primary Planning Area
Showy madia *Madia radiata*	–	–	1B.1	Grows in cismontane woodland and valley and foothill grassland; 75- to 2,700-foot elevation	Scattered locations in the Coast Ranges from Contra Costa County to Ventura County; most collections are old and need field verification	March–May	Low potential; suitable habitat could be present at outer margins of the Delta but this species is generally found at higher elevations

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Little mousetail *Myosurus minimus* ssp. *apus*	–	–	3.1	Alkaline vernal pools and other wetland habitats in valley and foothill grassland and coastal sage scrub; 65- to 2,100-foot elevation	Scattered locations in the northern Sacramento Valley and inner north Coast Ranges, San Francisco Bay area, San Joaquin Valley from Stanislaus County to Tulare County, southern coast and southern Coast Ranges, Peninsular and Transverse ranges, and the Mohave Desert	March–June	Could occur; suitable habitat is present, and species is known from the vicinity
Cotulaleaf pincushionplant *Navarretia cotulifolia*	–	–	4.2	Adobe clay soils in chaparral, cismontane woodland, and valley and foothill grassland; 0- to 6,000-foot elevation	Distributed in 16 counties in Northern California from Mendocino County to San Benito County (possibly in Siskiyou County)	May–June	Could occur; suitable habitat is present, and species is known from the vicinity
Tehama navarretia *Navarretia heterandra*	–	–	4.3	Heavy soil, vernal pools, wet or drying flats; 0- to 3500-foot elevation	Butte, Colusa, Lake, Napa, Shasta, Tehama, Trinity, Yuba Counties	April-June	Could occur; suitable habitat is present
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	–	–	1B.1	Vernal pools and other wet depressions in cismontane woodland, lower montane coniferous forest, meadows, and valley and foothill grassland, in adobe or alkaline soils; 0- to 5,500-foot elevation	Colusa, Glenn, Lake, Mendocino, Marin, Napa, Solano, Sonoma, Sutter, Tehama, and Yolo counties	May–July	Could occur; suitable habitat is present, and species is known from the vicinity
Colusa grass *Neostapfia colusana*	T	E	1B.1	Large vernal pools with adobe clay soils; 15- to 4,000-foot elevation	Merced, Solano, Stanislaus, and Yolo counties	May–August	Could occur; suitable habitat is present, and species is known from the vicinity
Antioch Dunes evening primrose *Oenothera deltoides* ssp. *howellii*	E	E	1B.1	Inland dunes, remnant river bluffs, and sand dunes east of Antioch, along river bluffs, and in loose sand; 0- to 100-foot in elevation	Known from three native occurrences in Contra Costa and Sacramento counties	March–September	Known to occur in the Delta

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Gairdner's yampah *Perideridia gairdneri* ssp. *gairdneri*	–	–	4.2	Vernal pools and vernally mesic areas in broadleafed upland forest, chaparral, coastal prairie, and valley and foothill grasslands; 0- to 1,200-foot elevation	Distributed throughout the northern and southern Coast Ranges from Mendocino County to San Diego County; status of many occurrences is unknown	June–October	Could occur; suitable habitat is present, and species is known from the vicinity
Hairless popcorn flower *Plagiobothrys glaber*	–	–	1A	Coastal salt marsh and alkaline meadows and seeps	Historical occurrences are all located in the San Francisco Bay region; the last confirmed sighting was in 1954; possibly relocated near Antioch, but the identification of this collection is uncertain	March–May	Low potential; suitable habitat is present, but this species is presumed extirpated in California
Bearded popcorn-flower *Plagiobothrys hystriculus*	–	–	1B.1	Habitat and life history not well understood; probably grows in vernal pools or wet sites in grasslands	Known from only a few occurrences in the Montezuma Hills region of Solano County	April–May	Could occur; suitable habitat is present, and species was rediscovered in 2000 just outside of the Suisun Marsh in the Montezuma Hills
Marin knotweed *Polygonum marinense*	–	–	3.1	Coastal salt, brackish marshes, swamps; 0- 30-feet elevation	Marin, Napa, Solano, Sonoma Counties	April-August	Low potential to occur; suitable habitat may be present in Suisun Marsh but this species tends to be observed in more saline habitats.
Eel-grass pondweed *Potamogeton zosteriformis*	–	–	2.2	Marshes and swamps; 0- to 6,000-foot elevation	Contra Costa, Lake, Lassen, Modoc, and Shasta counties	June–July	Known to occur in the Delta
Delta woolly marbles *Psilocarphus brevissimus* var. *multiflorus*	–	–	4.2	Vernal pools; 0- to 1,500-foot elevation	Alameda, Napa, Santa Clara, San Diego, San Joaquin, Solano, Stanislaus, and Yolo counties	May–June	Could occur; suitable habitat is present, and species is known from the vicinity

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
California alkali grass *Puccinellia simplex*	–	–	1B.2	Alkaline, vernally mesic; sinks, flats, and lake margins; 6- to 3000 feet elevation	Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kings, Kern, Lake, Los Angeles, Madera, Merced, Napa, San Bernardino, Santa Clara, Santa Cruz, San Luis Obispo, Solano, Stanislaus, Tulare, Yolo	March-May	Known to occur in the Delta
Lobb's aquatic buttercup *Ranunculus lobbii*	–	–	4.2	Vernal pools in cismontane woodland, north coast coniferous forest, and valley and foothill grassland; 50- to 1,550-foot elevation	Alameda, Contra Costa, Mendocino, Marin, Napa, Santa Cruz, San Mateo, Solano, and Sonoma counties	February–May	Could occur; suitable habitat is present, and species is known from the vicinity
Sanford's arrowhead *Sagittaria sanfordii*	–	–	1B.2	Assorted shallow freshwater marshes and swamps; 0- to 2,000-foot elevation	Butte, Del Norte, Fresno, Kern, Merced, Orange, Sacramento, Shasta, San Joaquin, Tehama, and Ventura counties	May–October	Known to occur in the Delta
Marsh skullcap *Scutellaria galericulata*	–	–	2.2	Lower montane coniferous forest, meadows and seeps, marshes and swamps, wet places; 0- to 7,000-foot elevation	El Dorado, Lassen, Modoc, Nevada, Placer, Plumas, Shasta, Siskiyou, and San Joaquin counties	June–September	Could occur; suitable habitat is present, and species is known from the vicinity
Side-flowering skullcap *Scutellaria lateriflora*	–	–	2.2	Marshes and swamps, meadows and seeps; 0- to 1,500-foot elevation	Known in California from only three occurrences in Inyo, Sacramento, and San Joaquin counties	July–September	Known to occur in the Delta
Suisun Marsh aster *Symphyotrichum lentum*	–	–	1B.2	Marshes and swamps, often along sloughs; 0- to 10-foot elevation	Endemic to the Delta	May–November	Known to occur in the Primary Planning Area

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

Common Name Scientific Name	Federal[a]	State[b]	CRPR[c]	Habitat	Distribution in California	Flowering Period	Potential for Occurrence
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	–	–	2.1	Alkaline soils of marshes and swamps, meadows and seeps, riparian forest, and vernal pools, usually on mud flats; 15- to 1,500-foot elevation	Central Valley and south coast	May–September	Known to occur in the Primary Planning Area
Saline clover *Trifolium depauperatum* var. *hydrophilum*	–	–	1B.2	Salt marshes and in alkaline soils in moist valley and foothill grasslands and vernal pools; 0- to 1,000-foot elevation	Alameda, Colusa, Monterey, Napa, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, San Mateo, Solano, and Sonoma counties	April–June	Known to occur in the Primary Planning Area
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	–	–	1B.1	Mesic alkaline soils in valley and foothill grassland, vernal pools; 160- to 1,300-foot elevation	Scattered locations in the Central Valley and central West Coast	March–April	Could occur; suitable habitat is present, and species is known from the vicinity
Solano grass *Tuctoria mucronata*	E	E	1B.1	Alkaline/saline clay bottoms of vernal pools, lakes, and shallow playa pools; associated with other vernal pool and wetland plants, including the endangered Colusa grass (*Neostapfia colusana*)	Known from only three occurrences in Solano County	April–July	Could occur; suitable habitat is present, and species is known from the vicinity

Sources: CNDDB 2020; CNPS 2020

[a] **U.S. Fish and Wildlife Service—Federal Listing Categories:**
T: Threatened.
E: Endangered.
–: No status.

[b] **California Department of Fish and Game—State Listing Categories:**
R: Rare.
E: Endangered.
–: No status.

Table E-4 (continued)
Special-status Plant Species Known to Occur or with Potential to Occur in the Primary Planning Area

[c] **California Rare Plant Rank (CRPR) Listing Categories:**
1A: Presumed extinct.
1B: Plants rare, threatened, or endangered in California and elsewhere.
2: Plants rare, threatened, or endangered in California, but more common elsewhere.
3: Plants for which more information is needed—a review list.
4: Plants of limited distribution—a watch list.
Extensions:
1: Seriously endangered in California (>80 percent of occurrences are threatened and/or high degree and immediacy of threat).
2: Fairly endangered in California (20–80 percent of occurrences are threatened).
3: Not very endangered in California (<20 percent of occurrences are threatened or no current threats are known).

CNPS: California Native Plant Society
CRPR: California Rare Plant Rank
Delta: Sacramento–San Joaquin Delta.

E.3.3 Crownscale

Crownscale (*Atriplex coronata* var. *coronata*) is a CRPR 4.2 species and is endemic to California. Its range includes southern Sacramento Valley, the San Joaquin Valley, and the eastern Inner South Coast Ranges. There are documented occurrences of this plant species in Alameda, Contra Costa, Fresno, Glenn, Kings, Kern, Merced, Monterey, San Luis Obispo, Solano, and Stanislaus counties. Its blooming period is from March to October and occurs in alkaline, often clay soils, including grasslands and vernal pools.

E.3.4 Brittlescale

Brittlescale (*Atriplex depressa*) is a CRPR 1B.2 species and is endemic to California. Its range extends from Glenn and Colusa Counties in the north, to Merced County in the south. Yolo, Solano, Contra Costa, and Alameda Counties are within its range (CNDDB 2020, CNPS 2020). Brittlescale has been observed to occur in the Suisun Marsh and in the Delta near Byron. Brittlescale is found in meadows, seeps, and vernal pools, with alkaline clay soils (CNPS 2020).

Brittlescale is a small (less than 8 inches [20 centimeters]) annual herb of the goosefoot family (Chenopodiaceae) that blooms from June to October (CNPS 2020). Brittlescale is found at elevations of 3 to 1,050 feet (1 to 320 meters) (CNPS 2020).

The primary threat to brittlescale is the loss of suitable habitat within its range (CNPS 2020). Other threats include livestock grazing and trampling invasive species, and the periodic inundation of managed marshes to create habitat for waterfowl (CNDDB 2020).

E.3.5 Bristly Sedge

Bristly sedge (*Carex comosa*) is a CRPR 2.1 species. It is known from scattered occurrences in California, primarily in Northern California; it also occurs in Oregon, Washington, and elsewhere in North America. It occurs in marshes at the margins of sloughs and lakes (CNPS 2020). Threats to bristly sedge are road maintenance, marsh drainage, agriculture, grazing, competition from nonnative plants, and control treatments for water hyacinth (CNPS 2020).

E.3.6 Bolander’s water hemlock

Bolander’s water hemlock (*Cicuta maculata* var. *bolanderi*) is a CRPR 2.1 species. It is a perennial herb with a blooming period from July to September (CNPS 2020). It is known from occurrences along California’s South Coast and Central Coast regions and from Suisun Marsh. It grows in coastal brackish and freshwater marshes. Threats to Bolander’s water-hemlock are development, competition from nonnative plants, and hydrological alterations (CNPS 2020).

E.3.7 Slough thistle

Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*) is a CRPR 1B.1 species. It is listed as endangered under the ESA. It is not listed under CESA. USFWS recently designated critical habitat that specifies the protection of Suisun thistle populations in

three areas that contain the largest and most intact populations and habitat (72 *Federal Register* [FR] 18517).

In 1975, Suisun thistle was presumed to be extinct because it had not been observed for 15 years (62 FR 61916; USFWS 2009a); however, during extensive surveys conducted at the Suisun Marsh in 1989, this species was rediscovered at two locations (62 FR 61916; USFWS 2009a). Recent surveys have found Suisun thistle within relict undiked high tidal marshes at Rush Ranch, the Joice Inland portion of the Grizzly Island Wildlife Area, and the Peytonia Slough Ecological Reserve (Fiedler et al. 2007). Thousands of plants were observed at Rush Ranch, much smaller numbers were observed at Grizzly Island Wildlife Area, and the population at the Peytonia Slough Ecological Reserve had declined to a single plant in 1996 (USFWS 2009a).

Suisun thistle is a 3- to 7-foot-tall plant in the sunflower family. Most known occurrences are found in regularly flooded and permanently saturated habitats, along the banks of canals or ditches, within 50 to 100 feet of the high-water mark of natural tidal channels, as well as on tidal floodplains within tidal marshes. Habitat for the species does not occur within diked seasonal wetlands with drainage ditches that are dry part of the year. However, permanent ponds and perennially flooded tidal ditches that supply such ponds within managed marsh may potentially harbor *C. hydrophilum* var. *hydrophilum* (72 FR 18517).

Current threats to Suisun thistle include the nonnative and highly invasive perennial pepperweed, feral pigs, and fire during sensitive periods of the species' lifecycle (Fiedler et al. 2007; USFWS 2009a). Other potential but unquantified threats include hybridization with bull thistle (*Cirsium vulgare*) and seed predation by the introduced biocontrol thistle weevil (*Rhinocyllus conicus*) (Fiedler et al. 2007; USFWS 2009a).

E.3.8 Recurved larkspur

Recurved larkspur (*Delphinium recurvatum*) is a CRPR 1B.2 species. It is a perennial herb endemic to California with a blooming period during the months from March to June (CNPS 2020). It was formerly widespread in the Central Valley from Colusa County to Kern County, although it has been extirpated from the Sacramento Valley (Koontz and Warnock 2012 p. 1411). It occurs in chenopod scrub and grassland on poorly drained, fine, alkaline soils (Koontz and Warnock 2012 p. 1411). Natural community types that may provide habitat for recurved larkspur are grassland and seasonal alkali wetland complex. Threats to recurved larkspur are grazing and trampling (CNPS 2020).

E.3.9 Dwarf downingia

Dwarf downingia (*Downingia pusilla*) is a CRPR 2.2 species. In California, its range extends from southern Tehama County to Fresno County and from Sonoma County to Placer County. Throughout its distribution, dwarf downingia occurs in vernal pools, vernal swales, pools in seasonal streambeds, vernal marshes, tire ruts, hydrologically altered sloughs, and irrigation ponds.

Dwarf downingia is a small submerged to emergent aquatic annual plant in the bluebell family (Campanulaceae). It flowers from March to May (CNPS 2020; Schultheis 2012). Dwarf downingia seed dispersal is apparently aided by waterfowl, as it appeared spontaneously in vernal pools constructed as part of the Montezuma Wetlands Restoration Project (San Francisco Estuary Institute 2006).

Development, intensive agriculture, grazing, and invasive plant species, especially ryegrass are considered to be the primary threats to dwarf downingia (CNPS 2020). Additionally, the nonnative waxy mannagrass (Glyceria declinata) may pose a threat to this species and many other vernal pool species.

E.3.10 Antioch Dunes buckwheat

Antioch Dunes buckwheat (*Eriogonum nudum* var. *psychichola)* is a CRPR 1B.1 species. The species is endemic to California. It is known from a single occurrence in the Antioch Dunes and is possible threatened by non-native plants (CNPS 2020). It occurs in inland dunes at an elevation range of 0- to 60-feet and is restricted to sandy, well drained soils.

Antioch Dunes buckwheat is a perennial herb in the buckwheat (Polygonaceae) family. It flowers from June to October (CNPS 2020). It serves as the primary host plant for the endangered Lange's metalmark butterfly.

E.3.11 Delta Button-celery

Delta button-celery (*Eryngium racemosum*) is State listed as endangered and is a CRPR 1B.1 species. The species' elevation range is 10 to 100 feet. Delta button-celery, a perennial herbaceous member of the carrot family (Apiaceae), has prostrate or decumbent stems that are branched above the basal rosettes. The tiny flowers are produced in small heads subtended by spiny bracts, are white to faintly purplish, and bloom between June and September. This species is found on clay soils in seasonally inundated floodplain depressions in riparian scrub habitat. Disturbance also may be important in creating and maintaining, or conversely in eliminating, habitat for this species. Much of the occupied habitat is inundated periodically, and recently deposited fine sediment has been observed at several occupied sites (CNDDB 2020). Several occupied sites also experience grazing and various anthropogenic disturbances (e.g., from off-road vehicles, road maintenance). Delta button-celery is threatened by agricultural conversion and flood control activities (CNPS 2020).

E.3.12 Contra Costa Wallflower

Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*) is a CRPR 1B.1 species. Contra Costa wallflower is listed as endangered under the ESA and as endangered under CESA. USFWS has designated critical habitat that specifies the protection of Contra Costa wallflower populations at the Antioch Dunes National Wildlife Refuge (NWR), located within the Delta along the San Joaquin River (43 FR 39042, August 31, 1978).

Contra Costa wallflower grows naturally only in sand dune habitat along the San Joaquin River east of Antioch. It forms a persistent dormant seed bank. Areas of suitable habitat

(riverine or wind-blown sandy soils near Antioch) that do not contain visible vegetative, reproductive, or senescent/dead plants may support viable seed banks.

Contra Costa wallflower is an erect, coarse-stemmed, biennial herb in the mustard family (Brassicaceae). Plants grow from a somewhat woody caudex (trunk-like base) that typically elongates into multiple branched stems 8 to 32 inches tall in mature plants. The elongated woody base distinguishes this subspecies of *E. capitatum* from related subspecies. The lower leaves are lance-like to linear, up to 6 inches long and nearly half an inch wide, with minute teeth. Leaves taper to a petiole (leaf stalk) at the base.

The historic range of Contra Costa wallflower is unknown but likely encompassed the original Contra Costa interior dune field, which has been greatly reduced by historic sand mining and industrial development. Nonnative grasses and vegetation encroached on the sand dunes to crowd the few remaining endangered plants. Habitat improvement activities have included restoring dune, hand-clearing nonnative plant species, planting buckwheat seedlings, and restricting public access to avoid trampling and fire (USFWS 2001).

E.3.13 San Joaquin spearscale

San Joaquin spearscale (Extriplex joaquinana), has a CRPR of 1B.2. It is endemic to California and its range includes Glenn, Colusa and Yolo counties to the north; Contra Costa, Santa Clara, San Benito, Napa, Solano, and Alameda counties to the west; and Sacramento, Fresno, Merced, and San Joaquin counties to the south. It is an annual herb with a blooming period from April to October. San Joaquin spearscale occurs in alkali grassland and meadows and other seasonal wetlands with alkaline soils (CNPS 2020). Threats to this species include development, intensive agricultural, waterfowl management, and invasive plant species which lead to loss of habitat and degradation of the specific soils this species requires.

E.3.14 Diamond-petaled California poppy

Diamond-petaled California poppy (Eschscholzia rhombipetala) has a CRPR of 1B.1. It is endemic to California was known historically from the interior foothills of the North and South Coast Ranges but is currently known from only three locations in Alameda County and San Luis Obispo County (Hannan and Clark 2012). It is annual herb with a flowering period from March to April. The natural community type in the Delta that may provide habitat for diamond-petaled California poppy is grassland.

E.3.15 Fragrant fritillary

Fragrant fritillary (*Fritillaria liliacea*) has a CRPR of 1B.2. The species is known from the southern Sacramento Valley, southern North Coast Ranges, San Francisco Bay Area, and northern Central Coast (CNPS 2020). Its blooming period occurs February to April. Fragrant fritillary occurs in grasslands, coastal prairie, and open, grassy areas in coastal scrub and oak woodlands, often on serpentine soils (CNPS 2020). The natural community type in the study area that provides habitat for fragrant fritillary is grassland. Threats to fragrant fritillary are grazing, agriculture, urbanization, competition from nonnative plants, and possibly recreational activities (CNPS 2020).

E.3.16 Rose-mallow

Rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*) is a CRPR 1B.2 species. It is known from scattered occurrences in the Cascade Range foothills, Sacramento Valley and the Delta (Hill 2012b). It grows in freshwater marsh along river banks and sloughs (Hill 2012). Rose-mallow is a perennial rhizomatous herb that blooms from June to September (CNPS 2020). It can often be found in riprap on sides of levees (CNPS 2020). Threats to Rose-mallow are habitat disturbance, development, agriculture, recreational activities, weed control measures, erosion, and channelization of the Sacramento River and its tributaries (CNPS 2020).

E.3.17 Carquinez goldenbush

Carquinez goldenbush (*Isocoma arguta*) is a CRPR 1B.1 species. It is endemic to California, and is known only from a very limited geographic range in Solano County. Known occurrences of this species consist of small populations restricted to ephemeral drainages, within a very narrow elevation band between uplands and Suisun Marsh, or adjacent to a large alkaline playa.

Carquinez goldenbush is a very small shrub in the sunflower family (Asteraceae) with flowering heads that bloom from August to December and contain 10 to 13 yellow flowers (Chambers 2012). Carquinez goldenbush is threatened by development and agriculture (CNPS 2020).

E.3.18 Delta Tule Pea

Delta tule pea (*Lathyrus jepsonii var. jepsonii*) is a CRPR 1B.2 species. It is endemic to California and its current range extends from Sacramento and Solano Counties to the north, Napa and Sonoma Counties in the west, and Contra Costa and San Joaquin Counties in the south. It was historically reported as common in Suisun Marsh, but it is currently reported as occasional to rare in Suisun Marsh. It currently occurs throughout the Delta and along the Napa River.

Delta tule pea occurs on the borders of fresh and brackish marshes from 0 to 13 feet in elevation (CNPS 2020). Delta tule pea blooms from May to September (CNPS 2020).

The primary threat to Delta tule pea is the loss of marsh and floodplain habitat. Agriculture, water diversions, and erosion can potentially eliminate or degrade these habitats (CNPS 2020). Fishing and hunting access also pose a threat to Delta tule pea through trampling impacts (Witham and Kareofelas 1994).

E.3.19 Legenere

Legenere (*Legenere limosa*) is a CRPR 1B.1 species. Its range extends from southwestern Shasta County to southern Santa Clary County. The species has been documented to occur in the Delta and Suisun Marsh, in vernal pools, vernal swales, and alkaline flats. Throughout its distribution, legenere occurs in vernal pools, vernal swales, pools in seasonal streambeds, vernal marshes, and stock ponds (CNDDB 2020)

Legenere is a small aquatic annual herbaceous plant in the bellflower family (Campanulaceae) that is submerged to emergent during the wet season when habitat is ponded. It typically blooms between April and June (CNPS 2020).

Development, grazing, intensive agriculture, and exotic plant species (especially ryegrass) are the primary threats to legenere (Dawson et al. 2007, CNPS 2020). Additionally, the nonnative waxy mannagrass (Glyceria declinata) may pose a threat to legenere and many other vernal pool species.

E.3.20 Heckard's peppergrass

Heckard's peppergrass (*Lepidium latipes var. heckardii*) is a CRPR 1B.2 species. It is endemic to California and its reported range extends from Glenn and Colusa Counties in the north to Merced County to the south. Heckard's peppergrass has been observed west of the Yolo Bypass and around Suisun Marsh in the greater Jepson Prairie area (Witham 2006).

Little is known regarding the ecology of Heckard's peppergrass. Occurrence records and survey reports suggest that Heckard's peppergrass is closely associated with Sacramento Valley populations of alkali milk-vetch (Astragalus tener var. tener (CNDDB 2020). Heckard's peppergrass flowers March through May (CNPS 2020). Studies are needed to shed light on basic biological and ecological requirements such as pollination systems, seed dormancy and germination cues, dispersal vectors, and seed predation.

Development, waterfowl management, agricultural conversion, urban development, and exotic plant species are considered the primary threats to Heckard's peppergrass (Dawson et al. 2007; CNPS 2020). All of these threats lead to the loss of habitat or the degradation of conditions the plant requires to survive.

E.3.21 Mason's Lilaeopsis

Mason's lilaeopsis (*Lilaeopsis masonii*) is State listed as rare under the California Native Plant Protection Act. In addition, it is listed on CRPR 1B.1.

The range of Mason's lilaeopsis extends from Napa and Solano counties in the north to Contra Costa and Alameda counties in the south, and from Marin County in the west to Sacramento and San Joaquin counties in the east. Although population trends of Mason's lilaeopsis have not been documented, this species has been determined to be stable to declining (CNDDB 2020). According to CNPS, occurrences of Mason's lilaeopsis in California are highly limited, and the species is at serious risk throughout its range. Mason's lilaeopsis is found throughout the Delta and Suisun Marsh along rivers and sloughs (CNDDB 2020). Most occurrences are known from the central and west Delta. In the south Delta, occurrences are predominately along Old River and Middle River. In the north Delta, it occurs in the Cache Slough Complex and near Delta Meadows State Park.

Mason's lilaeopsis is a small (up to 3 inches tall), rhizomatous, perennial herb in the carrot family. The threadlike leaves with obscure internal cross-walls are tufted on creeping stems. The inflorescences consist of few-flowered umbels of tiny white or

maroon flowers (CNPS 2020). It flowers from April to November and produces narrow, grasslike, bright green leaves and small, inconspicuous flowers in umbels.

Mason's lilaeopsis grows in regularly flooded tidal zones; on mudbanks and flats along erosional creekbanks, sloughs, and rivers (Fiedler and Zebell 1993); and in freshwater marshes, brackish marshes, and riparian scrubs that are influenced by saline water. It is a colonizing species (i.e., it "exploits" newly deposited or exposed sediments). Mason's lilaeopsis occurs with other rare plants, such as delta mudwort (*Limosella subulata*), Suisun Marsh aster (*Symphyotrichum lentum*), and delta tule pea. It blooms from April through November (CNPS 2020).

Mason's lilaeopsis is threatened by erosion, bank and channel stabilization, flood-control projects, development, and agricultural conversion. In some areas, it is also threatened by trampling by fishermen and encroachment of water hyacinth (*Eichhornia crassipes*), an extremely invasive aquatic plant (CNPS 2020).

E.3.22 Delta mudwort

Delta mudwort (*Limosella subulata*) is a CRPR 2.1 species. Delta mudwort is an aquatic, perennial herb in the snapdragon family (Scrophulariaceae). Within California, it is only found in the Delta. It occurs in tidal zones of marshes, rivers, and creeks. It blooms from May to August (Wetherwax 2012, CNPS 2020).

Delta mudwort is threatened by habitat destruction, including alteration of hydrology and recreational activities, such as boating, which creates wakes that erode banks and shorelines. Fishing and hunting access also pose a threat to this species (Witham and Kareofelas 1994). Petroleum product spills could have a significant impact on tidal flat biota, and non-biodegradable litter such as plastics could collect near the tidal drift line, inhibiting plant establishment and growth (Witham and Kareofelas 1994).

E.3.23 Baker's navarretia

Baker's navarretia (*Navarretia leucocephala ssp. Bakeri*) is a CRPR 1B.1 species. It is known from the inner North Coast Ranges and western Sacramento Valley (CNPS 2020). It blooms from April to July and is found at an elevation range of about 15 feet to 5,000 feet (CNPS 2020). It occurs in vernal pools and swales on clay or alkali soils (CNDDB 2020). Threats to Baker's navarretia are agriculture, development, habitat alteration, and road construction (CNPS 2020).

E.3.24 Antioch Dunes Evening Primrose

Antioch Dunes evening primrose (*Oenothera deltoides* ssp*. howelli*) is a CRPR 1B.1 species. It is listed as endangered under the ESA and as endangered under CESA. USFWS has designated critical habitat that specifies the protection of Antioch Dunes evening primrose populations at the Antioch Dunes NWR, which is located in the Delta along the San Joaquin River (43 FR 39042, August 31, 1978).

The historic range of Antioch Dunes evening primrose is unknown and open to speculation. Presumably, it was limited to the sandy soil type (Oakley or Delhi sand) found near the town of Antioch and over a substantial portion of eastern Contra Costa

County. Nevertheless, no known evidence demonstrates that the subspecies historically occupied any area other than the Antioch Dunes proper. The subspecies has been transplanted to Brannan Island State Recreation Area. There are also two small colonies on Brown's Island in Contra Costa County. The most recently discovered population is located on private property north of Oakley. The subspecies now occurs in several locations near the confluence of the Sacramento and San Joaquin rivers. The only natural stand exists in the sand dunes near Antioch in Contra Costa County.

Antioch Dunes evening primrose is an herbaceous annual in the evening primrose family (Onagraceae). It grows 15 to 30 inches tall and is grayish green with spreading hairs and wavy-lobed leaves. White to pink flowers are 0.8 to 1.6 inches long, have obtuse tips in bud, and bloom between March and September. Antioch Dunes evening primrose occurs at elevations of zero to 100 feet on sandy bluffs and dunes (CNPS 2020).

The extent and quality of habitat for Antioch Dunes evening primrose has declined substantially as a result of recent land use changes and because of human disturbance and the spread of nonnative invasive plants. Inland dunes are now restricted to 67 acres within the approved boundary of the Antioch Dunes NWR, which includes 12 acres of land owned by the Pacific Gas and Electric Company and some lands on the adjoining properties owned by Kemwater North American Company and Georgia-Pacific (USFWS 2001). Because the primrose prefers disturbed sites with nearly pure sand, it is vulnerable to encroachment from nonnative weedy species, which has been identified as the primary threat to the primrose (USFWS 2001).

E.3.25 Bearded popcorn-flower

Bearded popcorn-flower (*Plagiobothrys hystriculus*) is a CRPR 1B.1 species. This species is endemic to California and it is present in the southern interior North Coast Range and the southern Sacramento Valley (Preston et al. 2010). It is an annual herb with a bloom period from April to May (CNPS 2020). Bearded popcorn-flower was presumed extinct until rediscovered in 2005 (Preston et al. 2010). It occurs in vernal pools and vernal swales and also in other vernally moist areas in grasslands (Preston et al. 2010). Threats to bearded popcorn-flower are disking, development, and competition with nonnative plants (CNPS 2020).

E.3.26 Eel-grass pondweed

Eel-grass pondweed (*Potamogeton zosteriformis*) is a CRPR 2.2 species. It is an aquatic annual herb with a blooming period in June to July (CNPS 2020). It is known in California from scattered occurrences in the southern interior North Coast Ranges, the Central Valley, and the Modoc Plateau (Hellquist et al. 2012 p. 1501). It grows in ponds, lakes and streams (Hellquist et al. 2012 p. 1501). Natural community types that provide potential habitat for eel-grass pondweed consist of nontidal perennial aquatic and nontidal freshwater perennial emergent wetland.

E.3.27 California alkali grass

California alkali grass (*Puccinellia simplex*) is as CRPR 1B.2 species. This annual grass is native to California but is also currently known to occur in Utah. It has a blooming period from March to May (CNPS 2020). The species occurs on alkaline soils in areas such as chenopod scrub, meadows, seeps, valley and foothill grasslands, and vernal pools. It is mainly documented to be present within the Central Valley, and there are scattered occurrences in the Coast Ranges and the western Mojave Desert. Threats to California alkali grass include changes in hydrology, urbanization, agricultural conversion, and habitat fragmentation (CNPS 2020).

E.3.28 Sanford's arrowhead

Sanford's arrowhead (*Sagittaria sanfordii*) is a CRPR 1B.2 species. This perennial rhizomatous herb is endemic to California and has a typical blooming period between the months of May to October (CNPS 2020). This species is known from widely scattered locations in the North Coast, Klamath ranges, Cascade Range foothills, Central Valley, and South Coast (Turner et al. 2012). It occurs in freshwater ponds, marshes, streams and ditches with standing or slow-moving water (CNPS 2020). Natural community types that provide potential habitat for Sanford's arrowhead are nontidal perennial aquatic and tidal and nontidal freshwater perennial emergent wetlands. Threats to Sanford's arrowhead are grazing, development, recreational activities, competition with nonnative plants, road widening, and channel alteration (CNPS 2020).

E.3.29 Marsh skullcap

Marsh skullcap (*Scutellaria galericulata*) is a CRPR 2.2 species. It occurs in the northern Sierra Nevada and Modoc Plateau (Olmstead 2012 p. 856). Disjunct populations have been reported from the Delta (CNDDB 2020). It is a perennial rhizomatous herb and its flowering time is from June to September. It occurs in marshes, wet meadows, and other wetland communities, often on streambanks (Olmstead 2012 p. 856, CNDDB 2020). Natural community types in the study area that provide potential habitat for marsh skullcap consist of tidal and nontidal freshwater perennial emergent wetland and valley/foothill riparian. Potential threats include hydrology alteration (CNPS 2020).

E.3.30 Side-flowering skullcap

Side-flowering skullcap (*Scutellaria lateriflora)* is a CRPR 2.2 species. It is a widespread but scattered species of swamps, marshes, and bogs in the central and eastern United States, but in California it is limited to a small area of the Delta. Side-flowering skullcap occurs in wet meadows, seeps, marshes and swamps (CNDDB 2020, CNPS 2020).

Side-flowering skullcap is a perennial rhizomatous herb in the mint family (Lamiaceae). Little is known about reproduction in this species, but based on similar species, it is probably insect-pollinated and reproduces by seed, but it may also spread vegetatively by rhizomes.

While side-flowering skullcap is deemed secure globally (CNDDB 2020), general threats to wetland habitats include development, intensive agriculture, and invasive plant species. In the Delta, side-flowering skullcap grows on logs, stumps, and other large woody material along shoreline that supports primarily riparian and marsh vegetation, and lack of shoreline coarse woody material may be a limiting factor in parts of the Delta.

E.3.31 Suisun Marsh aster

Suisun Marsh aster (*Symphyotrichum lentum*) is a CRPR 1B.2 species. The range of Suisun Marsh aster extends from Napa and Solano Counties in the north, to San Joaquin County in the south, to Contra Costa County in the west, and Sacramento County in the east. It is endemic to the Delta. Historically, it ranged from marshes in the East Bay portion of San Francisco Bay (California State Coastal Conservancy 2003) to the Sonoma and Napa Rivers (Goals Project 2000).

Suisun Marsh aster grows on the upper margins of brackish and freshwater marshes in the ecotone with terrestrial habitats (Goals Project 2000). It is found above erosional cuts and along the banks of sloughs and watercourses. Suisun Marsh aster is a perennial, rhizomatous herb in the sunflower family (Asteraceae) (Allen 2012). Some occurrences may be single plants with one to several main stems (Witham and Kareofelas 1994). It blooms from May through November, depending on environmental conditions.

Historically, the marsh habitat suitable for Suisun Marsh aster has been lost mostly through development, dredge disposal, agricultural conversion, and diking. Diked marshes generally lack rare tidal marsh species. It is believed that the conditions brought about by dikes favor robust generalist species that can better tolerate the extremes of inundation and dryness in diked wetlands (Goals Project 2000). Such habitat losses as a result of human activities still occur, but many of the large marshes are now parts of preserves or are otherwise in highly restrictive development zones. Current threats to Suisun Marsh aster include invasive plants, erosion, creek channelization, levee maintenance and construction, and possibly herbicide applications (CNPS 2020).

E.3.32 Wright's trichocoronis

Wright's trichocoronis (*Trichocoronis wrightii var. wrightii*) is a CRPR 2.1 species. It is an annual herb with a blooming period from May to September (CNPS 2020). It is known from scattered locations in the Central Valley and South Coast. It has been found in various wetland types, including alkaline meadow and floodplain wetlands, sometimes in drying mud (CNDDB 2020). Wright's trichocoronis is threatened by habitat loss to agriculture and urbanization (CNPS 2020).

E.3.33 Saline clover

Saline clover (*Trifolium depauperatum var. hydrophilum*) is a CRPR 1B.2 species. It is an annual herb endemic to California with a blooming period from April to June (CNPS 2020). It is known from the Sacramento Valley, the northwestern San Joaquin Valley, the San Francisco Bay Area, and the Central Coast (Vincent and Isely 2012 p. 795). It

occurs in marshes, vernal pools and swales, and iodine bush scrub, generally on saline or alkaline soils (CNDDB 2020). Threats to saline clover are development, trampling, road construction, and vehicles (CNPS 2020).

E.3.34 Caper-fruited tropidocarpum

Caper-fruited tropidocarpum (*Tropidocarpum capparideum*) is a CRPR 1B.1 species. It is an annual herb endemic to California and flowers from March to April (CNPS 2020). It is historically known from the northwest San Joaquin Valley and adjacent Diablo Range foothills and has recently been reported from Fresno, Monterey, and San Luis Obispo Counties (CNDDB 2020). It grows in alkali grasslands. Possible threats to caper-fruited tropidocarpum are grazing, military activities, competition with nonnative plants, and trampling (CNPS 2020).

E.3.35 Soft Salty Bird's-beak

Soft salty bird's-beak (*Chloropyron molle ssp. molle*) is a CRPR 1B.2 species. It is listed as endangered under the ESA and listed as rare under the California Native Plant Protection Act). The U.S. Fish and Wildlife Service (USFWS) recently designated critical habitat that specifies the protection of soft bird's-beak populations in the four areas that contain the largest and most intact populations and habitat (71 FR 67089, November 20, 2006).

Soft salty bird's-beak is a semiparasitic annual plant in the figwort family. It grows 10 to 16 inches tall and occurs in coastal salt marshes and brackish marshes. The species is restricted to a narrow tidal band, typically in a marsh's higher elevation zones, growing with species such as saltgrass, pickleweed (*Salicornia virginica*), jaumea (*Jaumea carnosa*), and spearscale (*Atriplex triangularis*). The remaining populations range in size from a single individual to more than 100,000 plants, and within populations the number of individuals fluctuates considerably from year to year, often by more than an order of magnitude.

Conversion of wetlands to other land uses has contributed to the decline of soft bird's-beak. Current threats to the remaining populations include competition from nonnative plants (in particular pepperweed [*Lepidium latifolium*]), alteration of wetland hydrology (including trenching of wetlands for mosquito abatement and diking), grazing and trampling, and erosion (CNDDB 2020; CNPS 2020).

E.3.36 Palmate-bracted Bird's-beak

Palmate-bracted bird's-beak (*Chloropyron palmatum*) is federally and State listed as endangered and is a CRPR 1B.1 species.

Seven known populations of palmate-bracted bird's-beak exist: four in the Sacramento Valley, one in the Livermore Valley, and two in the San Joaquin Valley. The elevation range of this species is 15 to 500 feet. There are no known occurrences of palmate-bracted bird's-beak in the Delta and Suisun Marsh, but suitable habitat exists around Clifton Court Forebay.

Palmate-bracted bird's-beak is a hemiparasitic annual herb species in the figwort family. Saltgrass is believed to be the host plant for this species. Palmate-bracted bird's-beak is glandular and softly hairy and is typically 4 to 12 inches tall. The flower corollas are whitish with pale lavender sides, and they bloom between June and September. This species grows in alkaline soils in chenopod scrub and valley and foothill grassland habitat. It is found primarily at the edges of channels with individuals scattered in seasonally wet depressions, alkali scalds, and grassy areas (CNDDB 2020).

Palmate-bracted bird's-beak is threatened by agricultural conversion, urbanization, industrial development, off-road vehicle use, altered hydrology, and grazing.

E.3.37 Boggs Lake Hedge-hyssop

Boggs Lake hedge-hyssop (*Gratiola heterosepala*) was State listed as endangered in November 1978 and is a CRPR 1B.2 species.

Boggs Lake hedge-hyssop is found in the northern portion of the Central Valley and in the foothills of the inner North Coast Ranges, Sierra Nevada, and Cascade Range from Fresno County north into Oregon (CNDDB 2020; CNPS 2020). The primary area of concentration is the Modoc Plateau.

Boggs Lake hedge-hyssop is an annual herb, less than 4 inches tall, in the figwort family. The upper portion of the plant is glandular-sticky. The leaves and sepals (outer floral structures) are truncate, the latter unequally fused. The small tubular flowers are yellow, except for the three white lower lobes, and are borne singly in the upper leaf-axils (CNPS 2020).

Boggs Lake hedge-hyssop grows on clay substrates in vernal pools, in small playa-type pools, in marshy areas, on the margins of reservoirs and lakes, and in artificial habitats such as borrow pits and cattleponds. It has been found in several types of vernal pools, such as those with northern basalt flow, northern claypan, northern hardpan, and northern volcanic ashflow or mudflow substrates (USFWS 2005). Habitat for this species is found in annual grassland, oak woodland, juniper woodland, and conifer forest communities. Boggs Lake hedge-hyssop co-occurs with other rare vernal pool species, such as dwarf downingia, little mousetail (*Myosurus minimus* ssp. *apus*), and possibly Heckard's peppergrass (*Lepidium latipes* var. *heckardii*).

Boggs Lake hedge-hyssop plants are threatened by agricultural conversion, urban development, intensive grazing and trampling, nonnative species, and off-road vehicles (CNPS 2020). Moderate grazing is believed to be a compatible use if it occurs after seeds are set (USFWS 2005).

E.3.38 Contra Costa Goldfields

Contra Costa goldfields (*Lasthenia conjugens*) is listed as Endangered by the USFWS (70 FR 46923, August 11, 2005) and is on the CRPR 1B.1. Eight units of Critical habitat were designated in 2006 (71 FR 7117) for the protection of Contra Costa Goldfield populations in Alameda, Contra Costa, and Solano counties in the Delta and Suisun Marsh and north in Napa and Mendocino counties.

Contra Costa goldfields inhabits seasonal wetlands including vernal pools and swales, moist flats and depressions in mesic grasslands with typically clay or alkaline soils generally below 200 feet, though some occurrences are recorded from above 1,000 feet. Historically Contra Costa goldfields was distributed from the North Coast, southern Sacramento Valley, and the San Francisco Bay to the south Coast in seven vernal pool regions, Central Coast, Lake-Napa, Livermore, Mendocino, Santa Barbara, Santa Rosa, and Solano-Colusa and outside of defined vernal pool regions in Contra Costa County. It is currently extant in Mendocino, Napa, Marin, Contra Costa, Alameda, Solano, and Monterey counties (USFWS 2005; USFWS 2008; USFWS 2010).

Contra Costa goldfields (*Lasthenia conjugens*) is a low herbaceous annual in the sunflower family with light green, hairless, opposite leaves. It grows to a height of 4 to 12 inches and the stem may be branched or unbranched. It produces yellow daisy-like flower heads with 6 to 13 ray flowers with numerous disc flowers from March through June (USFWS 2008; USFWS 2010). Contra Costa goldfields is threatened by urban development, conversion of land to agriculture, competition from nonnative plants, alteration of hydrology, and inappropriate grazing practices. The species has been extirpated from Santa Barbara and Santa Clara counties by agricultural land conversion, urbanization, and alteration of hydrology (USFWS 2005; USFWS 2010).

E.3.39 Colusa Grass

Colusa grass (*Neostapfia colusana*) is federally listed as Threatened, state listed as Endangered, and CRPR 1B.1. A recovery plan was established in 2005 (USFWS 2005) and critical habitat was designated in 2006 (71 FR 7117, February 10, 2006). Colusa grass is a covered species in the Habitat Conservation Plan for the Natomas Basin in Sacramento and Sutter Counties

Colusa grass grows in large or deep vernal pools with substrates of high mud content. It is found at the edges of alkaline basins and vernal pools in the Sacramento and San Joaquin valleys and on acidic soils of alluvial fans and stream terraces at the eastern margin of the San Joaquin Valley and adjacent foothills (USFWS 2005; USFWS 2009b). Currently, no more than 43 occurrences of Colusa grass remain extant. The majority of the extant occurrences are in the southern Sierra Foothills, where they are concentrated northeast of the City of Merced in Merced County and east of Hickman in Stanislaus County. The closest occurrence of Colusa grass to the Delta is immediately adjacent to the northwest boundary in Grasslands County Park south of Davis, also the location of Critical Habitat Unit 1 (CNPS 2020).

Colusa grass is a robust, tufted annual in the grass family (Poaceae) that grows 3-12 inches tall. The plant is pale-gray-green when young turning brown as it ages due to the hardening of sticky, glandular exudates on the stems. The lower portions of the stems lie on the ground; the upper portions are erect and terminate in dense cylindrical, spike-like inflorescences that superficially resemble small ears of corn. The blooming period is May to August (CNPS 2020; USFWS 2009b). The two biggest threats to Colusa grass agricultural conversion and development, especially in Stanislaus and Merced counties, respectively. Other threats are herbicide contaminated runoff, contaminated

groundwater by industrial chemicals, flood control and alteration of hydrology, inappropriate grazing practices, and competition from nonnative plants.

E.3.40 Solano Grass

Solano grass is listed as endangered under both the federal and California ESAs and is a CRPR 1B.1 species. USFWS has designated critical habitat that specifies protection of populations of Solano grass in one location immediately adjacent to the Delta in southern Yolo County (71 FR 7117, February 10, 2006).

Only two other populations are known, one located in Jepson Prairie and the other nearby on private land, in Solano County. Solano grass is endemic to the western Sacramento Valley, which was likely the extent of its historical range. Prior to the conversion of large areas to agriculture it may have been more widely distributed in seasonally flooded areas behind natural levees of watercourses in the western valley (USFWS 2009c).

Solano grass occurs in alkaline vernal pools or playa pools within annual grassland. It is a grayish-green, small, hairy, 1- to 8-inch-long semi-aquatic annual grass with decumbent stems that turn up only at the tips. The stems and leaves are covered with sticky, acrid secretions characteristic of the genus. The leaves lack ligules and the lemma bract terminates in a single sharp tooth. Solano grass blooms from June to July. The 0.3- to 4-inch flowering spike contains 7 to 19 overlapping spiklets and remains partially sheathed by the uppermost leaf (USFWS 2009c; USFWS 2009d).

Solano grass is threatened by destruction of habitat due to alteration of hydrology and invasion of vernal pools by nonnative plants. Other potential threats include grazing (71 FR 7117; USFWS 2009d).

E.3.41 References

Allen, G. A. 2012. Symphyotrichum. In B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California, second edition. Berkeley, CA: University of California Press. Pages 428–431.

California Natural Diversity Database (CNDDB). 2020. CNDDB: Multiple Occurrences per Page. Records search of plan area quadrangles. Accessed October 10, 2020.

California State Coastal Conservancy. 2003. Draft Programmatic Environmental Impact Statement/Environmental Impact Report, San Francisco Estuary Invasive Spartina Project: Spartina Control Program. Available: http://www.spartina.org.

California Invasive Plant Council (Cal-IPC). 2020. California Invasive Plant Inventory Database. Available: http://cal-ipc.org/paf/. Accessed June 2020.

CALFED Bay-Delta Program (CALFED). 2000a. *Ecosystem Restoration Program Plan Volume I: Ecological Attributes of the San Francisco Bay-Delta Watershed*. Sacramento, CA. July 2000.

———. 2000b. *Multi-Species Conservation Strategy. Programmatic EIS/EIR Technical Appendix*. Sacramento, CA. July 2000.

California Department of Food and Agriculture (CDFA). 2009. Noxious Weed Ratings per California Department of Food and Agriculture Plant Industry Policy Letter 89-2, April 28, 1989.

Chambers, K. L. 2012. Isocoma. In: B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.). The Jepson Manual: Vascular Plants of California, Second edition. Berkeley, CA: University of California Press. Pages 358–361.

California Native Plant Society (CNPS). 2020. Inventory of Rare and Endangered Plants. Accessed October 2020. http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi.

Dawson, K., K. Veblen, and T. Young. 2007. Experimental Evidence for an Alkali Ecotype of Lolium multiflorum, an Exotic Invasive Annual Grass in the Central Valley, CA, USA. Biological Invasions 9:327–334

DiTomaso, J. M., and E. A. Healy. 2003. *Aquatic and Riparian Weeds of the West*. University of California Agriculture and Natural Resources. Publication 3421. Sponsored by California Weed Science Society.

———. 2007. *Weeds of California and Other Western States*. University of California Agriculture and Natural Resources. Publication 3488. Sponsored by California Weed Science Society.

California Department of Water Resources (DWR). 2005a. *Flooded Islands Feasibility Study Baseline Report*. Sacramento, CA. Prepared by EDAW, Swanson Hydrology & Geomorphology, and Hanson Environmental. Prepared for submittal to California Bay-Delta Authority. February.

———. 2005b. *Flooded Islands Pre-Feasibility Study Report*. Sacramento, CA. Prepared by EDAW, Natural Heritage Institute, Moffatt & Nichol, RMA, and Hanson Environmental. Prepared for submittal to California Bay-Delta Authority. June 30.

Fiedler, P., and R. Zebell. 1993. *Restoration and Recovery of Mason's lilaeopsis: Phase I. Final report*. Submitted to California Department of Fish and Game, Sacramento, CA.

Fiedler, P., M. Keever, B. Grewell, and D. Partridge. 2007. Rare plants in the Golden Gate Estuary (California): the relationship between scale and understanding. *Australian Journal of Botany* 55: 206–220.

Goals Project. 2000. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish and Wildlife. Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. Oakland, CA: San Francisco Bay Regional Water Quality Control Board.

Hannan, G. L., and C. Clark. 2012. Eschscholzia. Pages 982–984 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press

Hellquist, C. B., R. F. Thorne, and R. R. Haynes. 2012. Potamogetonaceae. Pages 1500–1503 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Hickson, D., and T. Keeler-Wolf. 2007. Vegetation and Land Use Classification and Map of the Sacramento-San Joaquin River Delta. Prepared by Vegetation Classification and Mapping Program, California Department of Fish and Game, Sacramento, CA. Prepared for Bay Delta Region, California Department of Fish and Game, Sacramento, CA. February.

Hill, S. R. 2012. Hibiscus. Page 881 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Koontz, J. A., and M. J. Warnock. 2012. Delphinium. Pages 1136–1142 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Lower Putah Creek Coordinating Committee. 2005. *Lower Putah Creek Watershed Management Action Plan*. Phase 1 – Resource Assessments. Prepared by EDAW, Sacramento, CA. December.

Liston, A. 1990. Taxonomic notes on Astragalus sect. Leptocarpi subsect. Californici (Fabaceae). *Brittonia* 42: 100–104. Cited in USFWS 2001.

———. 1992. Isozyme systematics of Astragalus sect. Leptocarpi subsect. Californici (Fabaceae). *Systematic Botany* 17: 367–379. Cited in USFWS 2001.

Olmstead, R. G. 2012. Scutellaria. Pages 856–858 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press

Preston, R. E., B. D. Schafer, and M. Widdowson. 2010. Rediscovery of Plagiobothrys hystriculus (Boraginaceae) and Notes on Its Habitat and Associates. Madroño 57(4): 242–245.

PWA, EDAW, University of Washington School of Fisheries, Brown & Caldwell, Hultgren-Tillis Engineers, and MBK Engineers. 2006. *Dutch Slough Tidal Marsh Restoration Conceptual Plan & Feasibility Report*. Prepared for California State Coastal Conservancy. May 12.

San Francisco Estuary Institute. 2006. Second Annual Report: Montezuma Wetlands Restoration Project Technical Review Team. Oakland, CA. December.

Schultheis, L. M. 2012. Downingia. Pages 590–591 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Turner, C. E., R. R. Haynes, and C. B. Hellquist. 2012. Alismataceae. Pages 1288—1289 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Vincent, M. A., and D. Isely. 2012. Trifolium. Pages 789–798 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press

Wetherwax, M. 2012. Limosella. Pages 1245–1246 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), The Jepson Manual: Vascular Plants of California. Second edition. Berkeley, CA: University of California Press.

Witham, C.W., and G.A. Kareofelas. 1994. Botanical Resources Inventory at Calhoun Cut Ecological Reserve Following California's Recent Drought. Sacramento: California Department of Fish and Game.

Witham, C. W. 2003. *Tule Ranch Vernal Pools Botanical Resources Survey Report*. Yolo Basin Foundation. Davis, CA.

———. 2006. Greater Jepson Prairie Ecosystem Regional Management Plan. Chapter 3: Jepson Prairie Preserve. Fairfield, CA: Solano Land Trust. Available: http://www.vernalpools.org/gjpermp/.

U.S. Fish and Wildlife Service (USFWS). 2001. *Antioch Dunes National Wildlife Refuge: Draft Comprehensive Conservation Plan and Environmental Assessment*. Sacramento, CA.

———. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Region 1. Portland, OR.

———. 2008. *Contra Costa Goldfields (Lasthenia conjugens) 5-Year Review: Summary and Evaluation.* Sacramento Fish and Wildlife Office. Sacramento CA. September.

———. 2009a. *Cirsium hydrophilum* var. *hydrophilum* (Suisun Thistle) *5-Year Review: Summary and Evaluation*. Sacramento Fish and Wildlife Office. Sacramento, CA. January.

———. 2009b. *Species Account: Colusa Grass* Neostapfia colusana*.* Sacramento Fish and Wildlife Office. Sacramento CA. December 26.

———. 2009c. *Solano Grass (Orcuttia mucronata = Tuctoria mucronata) 5-Year Review: Summary and Evaluation.* Sacramento Fish and Wildlife Office. Sacramento CA. March.

———. 2009d. *Species Account: Solano Grass* Tuctoria mucronata. Sacramento Fish and Wildlife Office. Sacramento CA. December 17.

———. 2010. *Species Account: Contra Costa Goldfields* Lasthenis conjugens. Sacramento Fish and Wildlife Office. Sacramento CA. February 17.

———. 2020a. Federal Endangered and Threatened Species That Occur in or May Be Affected by Projects in the Sacramento/San Joaquin Delta. Sacramento Fish & Wildlife Office. Sacramento, CA. Accessed October 12, 2020.

———. 2020b. Federal Endangered and Threatened Species That Occur in or May Be Affected by Projects in the Sacramento/San Joaquin Delta. San Francisco Fish & Wildlife Office. San Francisco, CA. Accessed October 12, 2020.

E.4 Special-Status Terrestrial Wildlife Species Accounts

The species accounts in this appendix provide an overview of special-status wildlife species that are known to occur or that have an appreciable likelihood of occurring in the Delta and Suisun Marsh and are likely to be affected by the implementation of the proposed Delta Plan Amendments (Proposed Project or proposed amendments). Table E-5 lists identified wildlife species that were removed from further discussion in the Draft Program Environmental Impact Report (PEIR) because they are not likely to be affected by the Proposed Project.

Table E-5
Special-status Wildlife Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Reason Not Evaluated in PEIR
Invertebrates	San Bruno elfin butterfly	*Callophrys mossii bayensis*	E	–	–	Not likely to occur in the Delta and Suisun Marsh
	Monarch butterfly	*Danaus plexippus*	–	–	–	Not likely to occur in the Delta and Suisun Marsh
	Delta green ground beetle	*Elaphrus viridis*	T	–	–	Distribution limited to Jepson Prairie, which would not be affected by the Delta Plan Project
	Moestan blister beetle	*Lytta moesta*	–	–	–	Not likely to occur in the Delta and Suisun Marsh
	Callippe silverspot butterfly	*Speyeria callippe callippe*	E	–	G5 S1	Not likely to occur in the Delta and Suisun Marsh
Amphibians	Foothill yellow-legged frog	*Rana boylii*	–	SSC	–	Not likely to occur in the Delta and Suisun Marsh
Reptiles	Alameda whipsnake (=striped racer)	*Masticophis lateralis euryxanthus*	T	T	–	Not likely to occur in the Delta and Suisun Marsh
Birds	California gull	*Larus californicus*	–	WL - Nesting Colony	–	Does not nest in the Delta and Suisun Marsh
	Long-billed curlew	*Numenius americanus*	BCC	WL – Nesting	–	Does not nest in the Delta and Suisun Marsh
	San Pablo song sparrow	*Melospiza melodia samuelis*	BCC	SSC	–	Not likely to occur in the Delta and Suisun Marsh

Table E-5 (continued)
Special-status Wildlife Species That Are Not Likely to Be Affected by the Proposed Delta Plan Amendments

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Reason Not Evaluated in PEIR
Mammals	Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*	–	–	CNDDB -G3G4, T1, S1	Does not occur in the Delta and Suisun Marsh
	Hoary bat	*Lasiurus cinereus*	–	–	CNDDB -G5 S4?	No State or federal status; taxon does not meet CEQA/NEPA definition of a special-status species

Sources: CNDDB 2020; USFWS 2020a; USFWS 2020b

Notes: CEQA = California Environmental Quality Act; NEPA = National Environmental Policy Act.

[a] **Federal Status Listing Categories:**

BCC = U.S. Fish and Wildlife Service bird of conservation concern (no legal status, but may warrant future listing under the federal Endangered Species Act (ESA) without additional conservation efforts).

E = Listed as endangered under the ESA.

T = Listed as threatened under the ESA.

– = No status.

[b] **State Status Listing Categories:**

SSC = California species of special concern.

T = Listed as threatened under the California Endangered Species Act (CESA).

WL = California Department of Fish and Game watch list (list of species formerly listed as SSC, under ESA or CESA, or as Fully Protected).

– = No status.

[c] **Other Status Listing Categories:**

California Natural Diversity Database Conservation Status Ranks (shown only for species without legal status)

Global Rank:

G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 = Secure—Common; widespread and abundant.

G#G# = Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

T = Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

State Rank:

S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.

S4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

? = Inexact or Uncertain—Denotes inexact or uncertain numeric rank (The ? qualifies the character immediately preceding it in the S-rank.).

Table E-6 below presents a comprehensive list of the special-status fish and wildlife and their habitat associations for species known to occur or that have the potential to occur in the Delta and Suisun Marsh. Of the species listed in the table below, those that are federally listed and/or State listed or fully protected are described in more detail in the sections below. For each of the fish and wildlife species addressed below, information is provided on the legal status, distribution, relevant natural history, and threats. For listed species, information is also provided on relevant conservation efforts and guidance. Invertebrates are presented first, followed by vertebrates.

Table E-6
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Invertebrates	Blennosperma vernal pool andrenid bee	*Andrena blennospermatis*	—	—	G2 S2	Upland areas near vernal pools	Occurs in central California between Lake and San Joaquin counties; known from locations east and west of the Delta; could occur in vernal pool grasslands in the Delta
	Antioch dunes anthicid beetle	*Anthicus antiochensis*	—	—	G1 S1	Loose sand on sand bars and sand dunes	Likely extinct in Antioch Dunes; also known from Grand Island and southern Sacramento County; could occur in dune habitat in the Delta
	Sacramento anthicid beetle	*Anthicus sacramento*	—	—	G1 S1	Sandslip faces in willows; associated with riparian and other aquatic habitat	On Sacramento and lower San Joaquin rivers and tributaries from Butte County to San Joaquin County; could occur in sandy riparian habitat in the Delta
	Lange's metalmark butterfly	*Apodemia mormo langei*	E	—	G5 S1	Stabilized sand dunes along the San Joaquin River; endemic to the Antioch Dunes; host plant is nude buckwheat	Distribution limited to Antioch Dunes, in Contra Costa County
	Crotch bumble bee	*Bombus crotchii*	–	C	G2 S1S2	Open grassland and scrub. Able to persist in semi-natural habitats surrounded by intensely modified landscapes.	Historically found throughout California, including the Central Valley. Currently found in scattered locations throughout its historic range.
	Western bumble bee	*Bombus occidentalis occidentalis*	–	C	G4T3	Found in a range of habitats, including mixed woodlands, farmlands, urban areas, montane meadows and into the western edge of the prairie grasslands	Historically found throughout California, but now largely confined to high elevation sites and along the northern California coast.
	Conservancy fairy shrimp	*Branchinecta conservatio*	E	—	G2 S2	Vernal pools and swales	Occurs from Butte and Tehama counties to Ventura County; could occur in vernal pools in the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Invertebrates (cont.)	Longhorn fairy shrimp	*Branchinecta longiantenna*	E	—	G1 S1S2	Small, shallow vernal pools and swales in alkali soils or rock outcrops	Occurs from Contra Costa County south to San Luis Obispo County; could occur in small, shallow pools associated with alkali soils in the Delta
	Vernal pool fairy shrimp	*Branchinecta lynchi*	T	—	G3 S3	Vernal pools and other seasonal wetlands	Occurs in the Central Valley from Shasta County to Tulare County and the central and southern Coast Ranges from northern Solano County to Ventura County; known to occur in vernal pools near the eastern Delta and Clifton Court Forebay and north and east of the Suisun Marsh; could occur in vernal pools elsewhere in the Delta
	Midvalley fairy shrimp	*Branchinecta mesovallensis*	—	—	G2 S2S3	Vernal pools	Occurs in Central Valley from Sacramento and Solano counties south to Fresno County; could occur in vernal pools in the Delta
	Sacramento Valley tiger beetle	*Cicindela hirticollis abrupta*	—	—	G5 SH	Required fine to medium sand, terraced floodplains or low sandy water edge flats	Presumed extinct; therefore, unlikely to occur in the Delta
	San Joaquin Dune beetle	*Coelus gracilis*	—	—	G1 S1	Fossil dunes in western San Joaquin Valley	Occurred historically from Kings County north to Antioch Dunes; presumed extirpated from Antioch Dunes; unlikely to occur in the Delta because of lack of fossil dune habitat
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	—	G3 S2	Elderberry shrubs, typically in riparian habitats	Central Valley, including the Delta, below approximately 3,000-foot elevation; could occur throughout the Delta
	Hairy water flea	*Dumontia oregonensis*	—	—	G1G3 S1	Described in 2003 from a specimen taken from a vernal pool in southern Oregon; little is known about its natural history; subsequently detected in vernal pools located in Mather Field and Travis Air Force Base in California	Known to occur in a vernal pool less than 1 mile outside the Delta; could occur in vernal pools throughout the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Invertebrates (cont.)	Antioch efferian robberfly	*Efferia antiochi*	—	—	G1G2 S1S2	None known; robberfly larvae usually develop in the ground or in rotting wood, where they prey on other insect larvae	Antioch, Fresno, and Scout Island (in the San Joaquin River); the Delta is within the range of this species, but lack of specific habitat use limits an assessment of the potential for this species to occur
	Redheaded sphecid wasp	*Eucerceris ruficeps*	—	—	G1G3 S1S2	Interior dunes	Western Central Valley from Contra Costa County to Fresno County; could occur in the Delta
	Bridges' Coast Range shoulderband	*Helminthoglypta nickliniana bridgesi*	—	—	G3 S1S2	Open hillsides in grasses and weeds	Central and western Contra Costa and Alameda counties; unlikely to occur in the Primary Planning Area
	Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	—	—	G2 S2	Ponds; little is known about specifics of habitat associations	Recorded in central coastal California and southern Sacramento Valley; known from Cosumnes River Preserve; could occur in the Delta
	Curved-foot Hygrotus diving beetle	*Hygrotus curvipes*	—	—	G1 S1	Small seasonal pools; associated with alkaline plant communities	East Contra Costa and Alameda counties; could occur in the southern part of the Delta, in Contra Costa County
	Middlekauff's shieldback katydid	*Idiostatus middlekauffi*	–	—	G1G2 S1	Interior dunes	Known only from Antioch Dunes; could occur in dune habitat in the Delta
	Vernal pool tadpole shrimp	*Lepidurus packardi*	E	—	G4 S3S4	Vernal pools, swales, and other ephemeral wetlands	Northern, central, and portions of Southern California; could occur in the Delta and is known to occur in vernal pools near the Stone Lakes National Wildlife Refuge
	California linderiella	*Linderiella occidentalis*	—	—	G2G3 S2S3	Vernal pools, swales, and other ephemeral wetlands	Central Valley and central coastal California; could occur in the Delta and is known to occur in vernal pools near the Stone Lakes National Wildlife Refuge
	Molestan blister beetle	*Lytta molesta*	—	—	G2 S2	Often associated with dried vernal pools	Central California; known to occur in the southernmost portion of the Delta, in eastern Contra Costa County; could occur elsewhere in vernal pools near the Stone Lakes National Wildlife Refuge

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Invertebrates (cont.)	Hurd's metapogon robberfly	*Metapogon hurdi*	—	—	G1G3 S1S3	Sand dunes	Antioch Dunes and dunes near Fresno; could occur in the Delta but unlikely
	Antioch multilid wasp	*Myrmosula pacifica*	—	—	GH SH	Unknown	Presumed extinct; therefore, unlikely to occur in the Primary Planning Area
	Antioch adrenid bee	*Perdita scitula antiochensis*	—	—	G1 T1 S1	Interior sand dunes	Currently known only from Antioch Dunes; formerly occurred in Oakley; unlikely to occur in the Primary Planning Area
	Antioch specid wasp	*Philanthus nasalis*	—	—	G1 S1	Sand dunes and sand hills	Extirpated from Antioch Dunes, extant in sand hills in Santa Cruz County; unlikely to occur in the Primary Planning Area
	Antioch Dunes halcitid bee	*Sphecodogastra antiochensis*	—	—	G1 S1	Restricted to Antioch Dunes; host plant is *Oenothera deltoids howellii*	Distribution limited to Antioch Dunes, in Contra Costa County
Amphibians	California tiger salamander	*Ambystoma californiense*	T	T, WL	G2G3 S2S3	In winter, breeds in vernal pools and seasonal wetlands with a minimum 10-week inundation period; in summer, aestivates in grassland habitat, primarily in rodent burrows	Occurs from Yolo County to Kern County in the Central Valley and up to 2,000-foot elevation in the Sierra Nevada foothills, and from Sonoma County to Santa Barbara County on the coast; known to occur in the southernmost portion of the Delta near Clifton Court Forebay and in the western portion north of Suisun Bay in the Potrero Hills; could occur elsewhere in vernal pools
	California red-legged frog	*Rana draytonii*	T	SSC	G2G3 S2S3	Foothill streams with dense shrubby or emergent riparian vegetation, minimum 11-20 weeks of water for larval development, and upland refugia for aestivation	Occurs primarily in the foothills of the central Coast Ranges, with isolated populations in the Sierra Nevada; a few individuals have been documented in the southernmost portion of the Delta near Clifton Court Forebay; unlikely to occur in most areas because it has been extirpated from most of the Delta and valley floor

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Amphibians (cont.)	Western spadefoot	*Spea hammondii*	–	SSC	G3 S3	In winter, breeds in vernal pools and seasonal wetlands with a minimum 3-week inundation period; in summer, aestivates in grassland habitat, in soil crevices and rodent burrows	Range includes the Central Valley and southern Coast Ranges and foothills; could occur in vernal pools in the southern portion of the Delta near Clifton Court Forebay and in the northern portion near Stone Lake
Reptiles	Western pond turtle	*Actinemys marmorata*	–	SSC	G3G4 S3	Forages in ponds, marshes, slow-moving streams, sloughs, and irrigation ditches; nests in nearby uplands with low, sparse vegetation	Range spans across California west of the Sierra-Cascade crest, below 5,000 feet in elevation; documented throughout the Primary Planning Area, except along the Sacramento Deep Water Ship Channel
	Silvery legless lizard	*Anniella pulchra pulchra*	—	SSC	G3G4 S3	Associated with a variety of vegetation types on sandy soils with accessible moisture, primarily but not exclusively in semistabilized dunes	Patchily distributed from Antioch south along the coast, foothills, San Joaquin Valley, and southern Sierra Nevada; could occur in dunes and tailings in several locations in the Delta
	San Joaquin whipsnake	*Masticophis flagellum ruddocki*	—	SSC	G4 S2	Open habitats—grasslands, savannas, deserts, open-canopy scrub, chaparral, and pastures—with available rodent burrows for cover	Ranges across the San Joaquin Valley and associated foothills to the west; could occur in southern upland portion of the Delta
	Coast horned lizard	*Phrynosoma blainvilli*	—	SSC	G3G4 S3S4	Variety of open habitats, including chaparral, oak savanna, and grassland; found primarily in areas with sandy, friable soils, scattered shrubs, and abundant ant colonies	Range includes most of west-central and southwestern California below 8,000-foot elevation, including the entire Delta; could occur in stabilized dunes and the grasslands near Clifton Court Forebay and north of Stone Lake
	Giant garter snake	*Thamnophis gigas*	T	T	G2 S2	Forages in slow-moving streams, sloughs, ponds, marshes, inundated floodplains, rice fields, and irrigation and drainage canals; also requires upland refugia not subject to flooding during the snake's inactive season	Range spans the southern Sacramento and northern San Joaquin valleys; documented in several locations throughout the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds	Cooper's hawk	*Accipiter cooperii*	–	WL (nesting)	G5 S4	Nests and forages primarily in riparian woodlands and other wooded habitats	Year-round range spans most of the wooded portions of California; could occur throughout the Primary Planning Area where patches of suitable wooded habitat are present but likely in low numbers
	Tricolored blackbird	*Agelaius tricolor*	BCC	T	G2G3 S1S2	Nests colonially in large, dense stands of freshwater marsh, riparian scrub, and other shrubs and herbs; forages in grasslands and agricultural fields	Ranges primarily throughout the Central Valley and the central and southern coasts, with additional scattered locations throughout California; year-round resident; could occur throughout the Primary Planning Area
	Grasshopper sparrow	*Ammodramus savannarum*	–	SSC (nesting)	G5 S3	Nests and forages in dense grasslands; favors a mix of native grasses, forbs, and scattered shrubs	Breeding range spans much of the Central Valley and California coast, but populations are typically localized and disjunct; most individuals migrate, although some may be present year-round; known to occur in the Yolo Bypass Wildlife Area and the northeast and southeast portions of the Delta; may occur in other portions of the Primary Planning Area
	Tule greater white-fronted goose	*Anser albifrons elgasi*	–	SSC (wintering)	–	Forages primarily in marshes dominated by tules, bulrushes, and cattails; forages to a lesser extent in rice and other grain fields	Does not breed in California; wintering populations are concentrated primarily in Sacramento Valley wildlife refuges and surrounding rice fields; the Suisun Marsh, uplands in Grizzly Island Wildlife Area, and nearby duck clubs; and marginally the Napa Marshes; occurs primarily west of the Delta
	Golden eagle	*Aquila chrysaetos*	BCC	FP, WL	G5 S3	Nests and forages in a variety of open habitats, including grassland, shrubland, and cropland; most common in foothill habitats; rare foothill breeder; nests in cliffs, rock outcrops, and large trees	Winter range spans most of California; breeding range excludes the Central Valley floor; not expected to nest in the Primary Planning Area; nonbreeding individuals may forage throughout the area's uplands; most likely to occur in the scrub and grasslands of the southern portion near Clifton Court Forebay

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Great egret	*Ardea alba*	–	CFGC (rookeries)	G5 S4	Nests colonially in tall trees; forages in freshwater and saline marshes, shallow open water, and occasionally cropland or low, open upland habitats, such as pastures	Year-round range spans the Central Valley, central coast, and portions of Southern California; winter range expands to include the remainder of the coast; may nest and forage throughout the Primary Planning Area; rookeries have been documented throughout the Delta, especially on protected lands and instream islands
	Great blue heron	*Ardea herodias*	–	CFGC (rookeries)	G5 S4	Nests colonially in tall trees; forages in freshwater and saline marshes, shallow open water, and occasionally cropland or low, open upland habitats, such as pastures	Year-round range spans most of California except the eastern portion of the state and the highest elevations; winter range expands to include eastern California; nests and forages throughout the Primary Planning Area, especially on protected lands and instream islands
	Short-eared owl	*Asio flammeus*	–	SSC (nesting)	G5 S3	Nests on the ground among herbaceous vegetation, such as grasses or cattails; forages in grasslands, agricultural fields, and marshes	Breeding range is patchily distributed throughout the state and Delta, including portions of the Sacramento and San Joaquin valleys, northeastern California, and a few scattered coastal sites; Grizzly Island in the Suisun Marsh supports the only known breeding population in the planning area, although small numbers have been documented episodically at the Cosumnes River Preserve and in Byron in Contra Costa County
	Burrowing owl	*Athene cunicularia hypugea*	BCC	SSC (nesting)	G4 S3	Nests and forages in grasslands, agricultural fields, and low scrub habitats, especially where ground squirrel burrows are present; occasionally inhabits artificial structures and small patches of disturbed habitat	Year-round range includes the Central Valley and Delta and portions of the central coast, eastern California, and Southern California; may occur throughout the Primary Planning Area where habitat is suitable; documented on Brannan Island and near Suisun Bay and Clifton Court Forebay

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Redhead	*Aythya americana*	–	SSC (nesting)	–	Nests in freshwater emergent wetlands with dense patches of tules or cattails interspersed with open water more than 3 feet deep; forages by diving in deep open water	Year-round range is patchily distributed through portions of the Central Valley, northeastern California, and Southern California; not expected to nest in the Primary Planning Area, although a low potential exists at freshwater duck clubs that maintain summer water at depths greater than 3 feet with suitable surrounding marsh; known to nest in the Yolo Bypass, but no recent nesting records occur elsewhere in the Primary Planning Area
	Ferruginous hawk	*Buteo regalis*	BCC	WL	G4 S3S4	Forages most commonly in grasslands and shrublands; also forages in agricultural fields	Winter range spans most of California except the higher elevations of the Sierra Nevada and northern Coast Ranges; does not nest in California; may forage in winter throughout the uplands of the Primary Planning Area; most likely to occur in the scrub and grasslands of the southern portion near Clifton Court Forebay
	Swainson's hawk	*Buteo swainsoni*	BCC	T (nesting)	G5 S3	Nests in isolated trees, open woodlands, and woodland margins; forages in grasslands and agricultural fields	Breeding range spans the Central Valley and Delta west of the Suisun Marsh, northeastern California, and a few additional scattered sites; most of the population migrates south of California in fall, although a small number winters in the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Western snowy plover	*Charadrius alexandrinus nivosus*	T, BCC	SSC	G3 S2S3	Nests and forages on sandy and gravelly beaches along the coast and the shores of inland alkali lakes	Breeds in coastal California and near alkali lakes in eastern California and remnant alkali playas in the southern San Joaquin Valley; not expected to occur in the Delta or Suisun Marsh because these areas are outside of the species' known range; nesting has been documented in three Yolo County sites: the Yolo Bypass, Davis Sewage Ponds, and Woodland Sugar Ponds; no other recent records exist for the Delta or Sacramento Valley
	Mountain plover	*Charadrius montanus*	BCC	SSC (wintering)	G3 S2S3	Forages in short grasslands and plowed agricultural fields where vegetation is sparse and trees are absent	Winter range spans the western Central Valley, including areas of the Delta east of the Suisun Marsh, and portions of Southern California; does not breed in California; may occur throughout the Primary Planning Area where habitat is suitable
	Northern harrier	*Circus cyaneus*	–	SSC (nesting)	G5 S3	Nests on the ground among herbaceous vegetation, such as grasses or cattails; forages in grasslands, agricultural fields, and marshes	Breeding range encompasses much of lowland California; winter range expands to include the remaining lowland areas; may nest and forage throughout the Primary Planning Area; nesting has been documented in the eastern portion of the Suisun Marsh and near Clifton Court Forebay
	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	T, BCC	E	G5 S1	Nests in valley, foothill, and desert riparian forest with densely foliaged deciduous trees and shrubs, especially willows; other associated vegetation includes cottonwood trees, blackberry, nettle, and wild grape	Historically common but now a rare summer resident at isolated sites in Sacramento Valley in Northern California and along Kern and Colorado River systems in Southern California; occasionally documented in Colusa, Glenn, Butte, Sutter, and Yolo counties within the last 20 years

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Yellow warbler	*Dendroica petechia brewsteri*	–	SSC (nesting)	–	Nests and forages in early successional riparian habitats	Range includes coastal and Northern California and the Sierra Nevada below approximately 7,000 feet; mostly extirpated from the southern Sacramento and San Joaquin valleys; has recently been documented (1998–2002) in limited locations in the Delta during the breeding season
	Snowy egret	*Egretta thula*	–	CFGC (rookeries)	G5 S4	Nests colonially in dense marshes and low trees; forages in freshwater and saline marshes, shallow open water, and occasionally irrigated cropland or wet upland habitats	Year-round range spans the Central Valley, Delta, entire coast, central Coast Ranges, and southeastern California; winter range expands to include northeastern California; may nest and forage throughout the Primary Planning Area, especially on protected lands near marshes
	White-tailed Kite	*Elanus leucurus*	–	FP	G5 S3S4	Forages in ponds, marshes, slow-moving streams, sloughs, and irrigation ditches; nests in nearby uplands with low, sparse vegetation	Year-round range spans the Central Valley, Coast Ranges and coast, Sierra Nevada foothills, and Colorado River; may nest and forage throughout the Primary Planning Area; documented in the Delta along the Sacramento River west of Stone Lake, and in the north-central and east-central Delta
	California horned lark	*Eremophila alpestris actia*	–	WL	G5 S4	Nests and forages in open habitats with sparse vegetation, including grasslands and fallow agricultural fields	Year-round range spans most of lowland California; may nest and forage in the Primary Planning Area where habitat is suitable, particularly in the grasslands and alkali sink habitat in the southern portion near Clifton Court Forebay
	Merlin	*Falco columbarius*	–	WL (wintering)	G5 S3S4	Forages in a wide variety of habitats, but in the Central Valley is most common around agricultural fields and grasslands	Winter range encompasses most of California except the highest elevations; does not breed in California; may forage in winter throughout the Primary Planning Area

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Prairie falcon	*Falco mexicanus*	BCC	WL (nesting)	G5 S4	Forages most commonly in grasslands and low shrublands; also forages in agricultural fields	Year-round range includes eastern California, the Coast Ranges, and much of Southern California; winter range expands to include the Delta, Central Valley, and coast; low probability of nesting in the Primary Planning Area, with a higher likelihood of foraging in suitable habitats during postbreeding dispersal, migration, or winter; most likely to occur in the Delta in the southernmost portion near Clifton Court Forebay; known to nest near Byron in Contra Costa County, although this area is not generally included in the published breeding range
	American peregrine falcon	*Falco peregrinus anatum*	BCC	FP	G4 S3S4	Forages in a wide variety of habitats, but is most common near water, where shorebirds and waterfowl are abundant	Year-round range includes the Sierra Nevada, Cascade Range, northeastern California, Coast Ranges, and coast; winter range expands to include the Central Valley and the Delta and additional portions of eastern and Southern California; not expected to nest in the Delta because these areas are outside of the published breeding range; may forage in winter throughout these areas
	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	BCC	SSC	G5 S3	Primarily brackish marsh with dense and continuous wetland or riparian vegetation down to the water surface; however, to a lesser degree, also uses woody swamp and freshwater marsh; often found in rush, tall grass, and willow-dominated communities	Endemic to the greater San Francisco Bay Area with boundaries being Santa Clara County to the south, Carquinez Straight to the east, the Napa Marsh in southern Sonoma County to the north, and western Marin County to the west. CNDDB also documents several occurrences, some nesting, in the Suisun Marsh; however, subspecies identification may be suspect (Gardali and Evens 2008)

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Lesser sandhill crane	*Grus canadensis canadensis*	–	SSC (wintering)	–	Forages primarily in croplands with waste grain; also frequents grasslands and emergent wetlands	Winter range is concentrated in scattered patches in the Delta, northern Sacramento Valley, portions of the San Joaquin Valley (especially in Merced County), Carrizo Plain, and Southern California south of the Salton Sea; occurs more widely between these areas during migration; does not breed in California; may forage during winter throughout the Delta
	Greater sandhill crane	*Grus canadensis tabida*	–	T, FP	G5 S2	Forages primarily in croplands with waste grain; also frequents grasslands and emergent wetlands	Winter range includes the Central Valley and Delta, Carrizo Plain, Southern California south of the Salton Sea, and Colorado River; breeds in northeastern California; may forage during winter throughout the Delta
	Bald eagle	*Haliaeetus leucocephalus leucocephalus*	BCC	E, FP	G5 S3	Forages primarily in large inland fish-bearing waters with adjacent large trees or snags, and occasionally in uplands with abundant rabbits, other small mammals, or carrion	Breeding range includes the Sierra Nevada, Cascade Range, and portions of the Coast Ranges; winter range expands to include most of the state except southeastern California (although the species occurs along the Colorado River); not expected to nest in the Primary Planning Area; in winter, may forage in the Delta along large rivers and in areas managed for waterfowl
	Yellow-breasted chat	*Icteria virens*	–	SSC	G5 S3	Nests and forages in riparian thickets of willow and other brushy tangles near water and thick understory in riparian woodland	Breeding range includes the northern Sacramento Valley, Cascade Range, Sierra Nevada foothills, northwestern California, most of the Coast Ranges, the Colorado River, and other scattered sites, including part of the Delta; migrates south of California in fall; nests in patches of the Delta where habitat is suitable

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Least bittern	*Ixobrychus exilis*	BCC	SSC (nesting)	G5 S2	Nests and forages in cattail and bulrush marshes	Current breeding range is scattered in patches of the Sacramento and San Joaquin valleys, Clear Lake, marshes around several large lakes in eastern California, and portions of Southern California, where they also winter; known to occur on Joice Island in the Suisun Marsh; low probability of occurrence in other portions of the Delta, particularly the marshes in the southeast and central Delta, and potentially in private duck clubs; a few individuals have been documented in the Yolo Bypass, Freeport in Sacramento County, and Palm Tract in Contra Costa County, but the Delta is no longer a major population center for the species
	Loggerhead shrike	*Lanius ludovicianus*	BCC	SSC (nesting)	G4 S4	Nests in isolated shrubs and trees and woodland edges of open habitats; forages in grasslands, agricultural fields, and low scrub habitats	Breeding range spans much of lowland California, and winter range includes most lowland areas south of Glenn County. May occur throughout the Primary Planning Area, especially in the Clifton Court Forebay area
	California black rail	*Laterallus jamaicensis coturniculus*	BCC	T, FP	G3G4 S1	Nests and forages in saline, freshwater, or brackish emergent marshes with gently grading slopes and upland refugia with vegetative cover beyond the high-water line	Year-round range includes the Suisun Marsh, San Pablo Bay, Morro Bay, a few patches in the Sierra Nevada foothills, and portions of Southern California; winter range expands to include San Francisco Bay and the Marin County coast; several historic nesting occurrences documented in the southern half of the Delta
	Song sparrow "Modesto" population	*Melospiza melodia*	–	SSC	G5 S3	Nests and forages primarily in emergent marsh, riparian scrub, and early successional riparian forest habitats, and infrequently in mature riparian forest and sparsely vegetated ditches and levees	Year-round range includes the Delta east of the Suisun Marsh, the Sacramento Valley, and the northern San Joaquin Valley; known to forage in the Delta, along Threemile Slough; nests and forages throughout the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	Suisun song sparrow	*Melospiza melodia maxillaris*	BCC	SSC	G5 S3	Nests and forages in brackish water marshes dominated by cattails, tules, and pickleweed	Year-round range includes the marshes surrounding Suisun Bay, from the confluence of the Sacramento and San Joaquin rivers to the Carquinez Strait; not expected in the remainder of the Delta
	San Pablo song sparrow	*Melospiza melodia samuelis*	BCC	SSC	G5 S2	Coastal salt marshes dominated by pickleweed; nests in gumplant bordering slough channels	Year-round range includes the marshes surrounding San Pablo Bay and northern San Francisco Bay; unlikely to occur in the Primary Planning Area
	Osprey	*Pandion haliaetus*	–	WL	G5 S4	Forages exclusively in fish-bearing waters; nests in nearby trees or tall, constructed platforms	Breeding range includes most of Northern California, the central Coast Ranges, and the southern Sierra Nevada; winter range also includes the central coast and additional portions of Southern California; nests in the Delta and could forage throughout the Primary Planning Area in winter
	California brown pelican	*Pelecanus occidentalis californicus*	–	FP	G4 S3	Nests colonially on small to moderate sized coastal islands, just outside surf line, building nests with sticks on the ground	Usually found on the coast; may occur in the Delta near deeper water where it can forage
	Double-crested cormorant	*Phalacrocorax auritus*	–	WL (rookeries)	G5 S4	Forages in open water; breeds colonially in rock ledges and trees	Breeding range spans the Delta, the coast and offshore islands, Clear Lake, the Salton Sea, the Colorado River, and portions of northeastern California; winter range expands to include the Central Valley and additional portions of Southern California; may nest and forage throughout the Primary Planning Area; a rookery has been documented in the Delta, between Sacramento and Stone Lakes National Wildlife Refuge

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	White-faced Ibis	*Plegadis chihi*	–	WL (rookeries)	G5 S3S4	Forages in wetlands and irrigated or flooded croplands and pastures; breeds colonially in dense freshwater marsh	Year-round resident in scattered locations in the Central Valley and Southern California; also nests in northeastern California; breeds in the Yolo Basin Wildlife Area, but there is a low likelihood of nesting in the remainder of the Primary Planning Area; may forage there during winter and migration
	Purple martin	*Progne subis*	–	SSC (nesting)	G5 S3	Nests in tree cavities, bridges, utility poles, lava tubes, and buildings; forages in foothill and low montane oak and riparian woodlands, and less frequently in coniferous forests and open or developed habitats	Not expected in the Primary Planning Area except small numbers during migration; breeding range includes the Sierra Nevada, Cascade Range, portions of the Coast Ranges and coast, and parts of Southern California; migrates south of California in fall; extirpated from the Delta, and nesting in the Central Valley has been reduced to transportation structures in and around the city of Sacramento
	Ridgway's rail	*Rallus longirostris obsoletus*	E	E, FP	G5 S1	Nests and forages in dense cordgrass and cattail marshes with vegetated refugia during the highest tides	Year-round near coastal range, surrounds San Francisco and San Pablo bays, and documented at several locations in Suisun Bay; range does not include the Delta
	Bank swallow	*Riparia riparia*	–	T (nesting)	G5 S2	Nests in vertical banks or bluffs, typically adjacent to water, devoid of vegetation, and with friable, eroding soils; forages in a wide variety of habitats	Breeds in much of lowland and riparian California, with 75 percent nesting colonies along the Sacramento and Feather rivers and their tributaries; additional breeding locations are scattered throughout the northern and central portions of the state; migrates south of California in fall; low probability of nesting in much of the Primary Planning Area because suitable bank conditions are rare; however, one nesting colony has been documented in the Delta in Brannan Island State Recreation Area

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Birds (cont.)	California least tern	*Sternula antillarum browni*	E	E, FP	G4 S2	Prefers undisturbed nest sites on open or sparsely vegetated, sandy, or gravelly shores on beaches or near shallow-water estuaries where it often feeds; has reportedly also nested on landfills and paved areas	The Pacific Coast from San Francisco to Baja California; winters in Mexico; when feeding, follows schools of fish and is sometimes seen as far north as southern Oregon; documented nesting in the western portion of Delta in Suisun Bay
	Least Bell's vireo	*Vireo bellii pusillus*	E	E	G5 S2	Nests and roosts in low riparian thickets of willows and shrubs, usually near water but sometimes along dry, intermittent streams; other associated vegetation includes cottonwood trees, blackberry, mulefat , and mesquite (in desert)	Formerly a common and widespread summer resident throughout Sacramento and San Joaquin valleys, and in the coastal valleys and foothills from Santa Clara County south, but its numbers have drastically declined, and the species has vanished from much of its California range; does not occur in the Delta, but could expand range with riparian restoration
	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	–	SSC (nesting)	G5 S3	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds	Breeding range includes primarily the Central Valley, northeastern California, and portions of Southern California; most individuals migrate south of California in winter; may occur in freshwater marshes throughout the Delta, particularly in the southern half, but also known to occur in the northern portion of the Delta, south of the city of Sacramento
Mammals	Pallid bat	*Antrozous pallidus*	–	SSC	G5 S3	Deserts, grasslands, shrublands, woodlands, and forests; most common in open, dry habitats; roosts in rock crevices, oak hollows, bridges, and buildings	Year-round range spans nearly all of California; may roost and forage throughout the Delta, with the highest likelihood in the uplands surrounding Clifton Court Forebay

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Mammals (cont.)	Townsend's Big-eared bat	*Corynorhinus townsendii*	–	SSC	G3G4 S2	Typically roosts in caves; however, colonies of fewer than 100 individuals occasionally nest in buildings or bridges; forages in all habitats except alpine and subalpine, although most commonly in mesic forests and woodlands	Year-round range spans most of California except the highest elevations of the Sierra Nevada south of Lake Tahoe; low likelihood of occurrence in the Delta
	Western mastiff bat	*Eumops perotis californicus*	–	SSC	–	Roosts in trees, rock crevices, and buildings in small colonies of fewer than 100 individuals; forages in a variety of grassland, shrub, and wooded habitats, including riparian and urban areas, although most commonly in open, arid lands	Year-round range spans most of California, with records absent from the northwest and northeast portions of the state; may occur throughout the Delta
	Western red bat	*Lasiurus blossevillii*	–	SSC	G5 S3S4	Roosts primarily in tree foliage, occasionally shrubs; roosts in small family groups rather than large colonies as other bats; prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging, including grasslands, shrublands, and open woodlands	Year-round range spans the Central Valley, Sierra Nevada foothills, Coast Ranges, and coast except Humboldt and Del Norte counties; documented foraging in most habitat types in the Delta; roosting documented in the Delta in Brannan Island State Recreation Area
	Riparian woodrat	*Neotoma fuscipes riparia*	E	SSC	G5 S1	Riparian forest, particularly dense willow thickets with an oak overstory	Extirpated from most of historic range and now restricted to Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River; not expected in the Delta

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Type	Common Name	Scientific Name	Federal[a]	State[b]	Other Status[c]	Habitat	Range and Potential to Occur
Mammals (cont.)	Big free-tailed bat	*Nyctinomops macrotis*	–	SSC	G5 S3	Roosts on high cliffs or rocky outcrops in low-lying, arid areas in Southern California	Rare and not thought to breed in California; more common in New Mexico, southern Arizona, and Texas; one female specimen collected in Contra Costa County in 1979, but others are all located in south and southeastern California; also 1916 CNDDB record from Suisun City
	Salt marsh harvest mouse	*Reithrodontomys raviventris*	E	E, FP	G1G2 S1S2	Saline emergent marshes with low, dense cover of vegetation (especially pickleweed) and higher elevation refugia	Year-round range includes the marshes surrounding Suisun, San Pablo, and San Francisco bays, with the Collinsville-Antioch area forming the eastern limit of the range; not expected in the Delta
	Suisun shrew	*Sorex ornatus sinuosus*	–	SSC	G5 S1S2	Marshes bordering Suisun Bay and northern San Pablo Bay	Year-round range includes the marshes surrounding Suisun and San Pablo bays; not expected in the Delta
	Riparian brush rabbit	*Sylvilagus bachmani riparius*	E	E	G5 S1	Dense thickets of brush associated with riparian habitats	Extirpated from most of historic range and now restricted to Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River, and an adjacent portion of an overflow channel; not expected in the Delta
	American badger	*Taxidea taxus*	–	SSC	G5 S3	Drier open shrub, forest, and herbaceous habitats with friable soils	Year-round range spans all of California except the Humboldt and Del Norte coasts; documented in the Delta, north of Stone Lake; may occur elsewhere in the Delta, particularly in the southern portion near Clifton Court Forebay; most of the Delta, however, is too highly modified for this species
	San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	G4 S2	Grasslands and oak savannas with friable soils; home range sizes of 600–1,300 acres	Year-round range is fragmented throughout the San Joaquin Valley; breeding documented in May 2000 in the Delta near Clifton Court Forebay; not expected elsewhere in Delta because of lack of suitable habitat

Table E-6 (continued)
Special-status Wildlife Species Known to Occur or with Potential to Occur in the Primary Planning Area

Sources: CNDDB 2020; USFWS 2020a, 2020b

[a] **U.S. Fish and Wildlife Service—Federal Listing Categories:**

E: Listed as endangered under the federal Endangered Species Act (ESA).

T: Listed as threatened under the federal ESA.

BCC: U.S. Fish and Wildlife Service bird of conservation concern.

C: Candidate for listing.

–: No status.

[b] **California Department of Fish and Game—State Listing Categories:**

E: Listed as endangered under California Endangered Species Act (CESA).

T: Listed as threatened under CESA.

C: Candidate for listing

FP: Fully protected under the California Fish and Game Code.

SSC: California species of special concern.

WL: California Department of Fish and Game watch list.

CFGC: Rookeries protected under the California Fish and Game Code.

–: No status.

[c] Other Status (CNDDB Conservation Status Ranks) (shown only for species without legal status)

Global Rank:

GH: Possibly Extinct (species)—Missing; known from only historical occurrences but still some hope of rediscovery.

G1: Critically Imperiled—At very high risk of extinction because of extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2: Imperiled—At high risk of extinction because of very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3: Vulnerable—At moderate risk of extinction because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G5: Secure—Common; widespread and abundant.

G#G#: Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

T: Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

State Rank:

SH: Possibly Extirpated (Historical)—Species or community occurred historically in the state, and there is some possibility that it may be rediscovered.

S1: Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.

S2: Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

S3: Vulnerable—Vulnerable in the state because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty in the status of a species or community.

CNDDB: California Natural Diversity Database

Delta: Sacramento–San Joaquin Delta

E.4.1 Invertebrates

Lange's Metalmark Butterfly

Legal Status

Lange's metalmark butterfly (*Apodemia mormo langei*) is federally listed as endangered. No critical habitat has been designated for this species.

Distribution

Lange's metalmark butterfly was historically restricted to sand dunes along the southern bank of the Sacramento-San Joaquin River confluence and is currently found only at Antioch Sand Dunes in Contra Costa County. Most of the habitat is now part of the Antioch Dunes National Wildlife Refuge (USFWS 2008).

Relevant Natural History

All the life stages of Lange's metalmark butterfly are found close to the larval food plant, naked-stem buckwheat (*Eriogonum nudum* ssp. *auriculatum*). The eggs are deposited on buckwheat leaves near the leaf petiole throughout the mating flight that occurs during August and September. Larvae hatch during the rainy months. Larvae are known to feed only on buckwheat. The adults may use buckwheat, butterweed (*Senecio douglasii*) and snakeweed (*Gutierrezia divergens*) for nectar. Lange's metalmark butterfly also use lupine (*Lupinus albifrons*) for mating (USFWS 2008).

Unlike the many butterfly species that have several generations a year, Lange's metalmark has only one, and the fecundity of the wild individuals is low. Detailed life history and physiological requirements of this species are unknown. Several hundred to more than a thousand individuals have been recorded during population counts, however; there was a steeply declining trend from the late 1990s through the late 2000s (USFWS 2008).

Threats

Lange's metalmark butterflies are threatened by loss of dune habitat, by disturbance of dune habitat, and by an invasive vetch species that affects host plants (USFWS 2008).

Relevant Conservation Efforts and Guidance

A peak flight count of only 45 individuals in 2006 led to the implementation of several recovery actions, including aggressive habitat restoration and captive propagation of the butterfly (USFWS 2008).

Crotch Bumble Bee

Legal Status

In 2019, the California Fish and Game Commission determined that the petition to list the Crotch bumble bee (*Bombus crotchii*) as a candidate under the CESA was warranted. This species has no federal status.

Distribution

The crotch bumble bee currently has a limited distribution within southwestern portion of North American. This species occurs primarily within California but has also been documented in Baja California in Mexico and in Nevada. This species was historically common throughout most of the southern two-thirds of California, but is largely absent from most of that range, particularly the center of its past range. In the Central Valley, this species has declined in numbers particularly in areas associated within intensive agricultural operations (Xerces Society 2018).

Relevant Natural History

In California, this species inhabits open grassland and scrub habitats (Xerces Society 2018). They are generalist foragers and have been reported visiting a wide variety of flowering plants. B. crotchii has a very short tongue, and thus is best suited to forage at open flowers with short corollas. The plant families most associated with them include Fabaceae, Apocynaceae, Asteraceae, Lamiaceae, Boraginaceae (Xerces Society 2018). Note that these floral associations do not necessarily represent this species' preference for these plants over other flowering plants, but rather may represent the prevalence of these flowers in the landscape where this species occurs.

Very little is known about the hibernacula, or overwintering sites utilized by this species. Generally, bumble bees overwinter in soft, disturbed soil, or under leaf litter or other debris.

According to Thorp et al. (1983), the flight period for *B. crotchii* queens in California is from late February to late October, peaking in early April, with a second pulse in July. The flight period for workers and males in California is from late March through September; worker and male abundance peak in early July (Thorp et al. 1983).

Threats

The species is threatened primarily by habitat loss of grasslands and meadows, and agricultural intensification which has increased the use of insecticides (Xerces Society 2018). Changes in farming operations have led to practices such as elimination of pollinator friendly hedgerows, weed cover, and legume pastures which have further reduced the quality of habitat available to Crotch bumble bee. Other threats to this species include competition with managed honey bee hives used for agricultural pollination, and various parasites and diseases.

Western Bumble Bee

Legal Status

In 2019, the California Fish and Game Commission placed the western bumble bee (*Bombus occidentalis occidentalis*) as a candidate under the CESA. This species has no federal status.

Distribution

There are two subspecies of western bumble bee: *B. occidentalis mckayi*, which occurs in in Alaska and northwestern Canada, and *B. occidentalis occidentalis*, which occurs from southern British Columbia, southern Alberta, and southwestern Saskatchewan

south to multiple western U.S. states, including Arizona, New Mexico, and California. In California, it has been historically documented in Alameda, Alpine, Butte, Calaveras, Contra Costa, Del Norte, El Dorado, Fresno, Humboldt, Lake, Lassen, Madera, Marin, Mariposa, Mendocino, Modoc, Monterey, Napa, Nevada, Placer, Plumas, Sen Benito, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Tehama, Trinity, Tulare, Yolo, and Yuba counties (Xerces Society 2018). They are now largely confined to high elevation sites and a small handful of locations on the northern California coast (Xerces Society 2018).

Relevant Natural History

This species utilizes meadows and grasslands with abundant floral resources (Xerces Society 2018). They are generalist foragers and are reported to visit a wide variety of flowering plants. Western bumble bees have a very short tongue, and thus is best suited to forage at open flowers with short corollas. The plant genera most associated with this species in California include Cirsium, Erigonum, Solidago, Aster, Ceanothus, Centaurea, and Penstemon. Note that these floral associations do not necessarily represent their preference for these plants over other flowering plants, but rather may represent the abundance of these flowers in the landscape.

Threats

The species is threatened primarily by habitat loss of grasslands and meadows, and agricultural intensification which has increased the use of insecticides (Xerces Society 2018). Changes in farming operations have led to practices such as elimination of pollinator friendly hedgerows, weed cover, and legume pastures which have further reduced the quality of habitat available to Crotch bumble bee. Other threats to this species include competition with managed honey bee hives used for agricultural pollination, and various parasites and diseases (Xerces Society 2018).

Conservancy Fairy Shrimp

Legal Status

The Conservancy fairy shrimp (*Branchinecta conservatio*) was listed as endangered throughout its range under the federal ESA on September 19, 1994 (59 *Federal Register* [FR] 48136). In June 2012, USFWS published a 5-year review recommending that the species remain listed as endangered (USFWS 2012a). Revised critical habitat was designated on February 10, 2006 (71 FR 7118), although none of the critical habitat units are within the Delta. The Conservancy fairy shrimp has no State regulatory status.

Distribution

The historical distribution of the Conservancy fairy shrimp is not known, but the distribution of vernal pool habitats in the areas where the species is now known to occur was once more continuous and larger in area than today (USFWS 2005). The species is currently found in disjunct and fragmented habitats across the Central Valley of California from Tehama County to Merced County and at two Southern California locations on the Los Padres National Forest in Ventura County (USFWS 2005; USFWS 2007a; USFWS 2012a; CNDDB 2020).

Conservancy fairy shrimp is known to occur in suitable habitat in Yolo County more than 3 miles west of the western conveyance area, and in Solano County more than 8 miles west of the western conveyance area. Turbid-water playas and vernal pools that may support the species occur on alkaline soils from the DFG Tule Ranch Reserve southwest to the Montezuma Wetlands Mitigation Projects and from the Byron Airport to Discovery Bay. No critical habitat is present in the Delta.

Relevant Natural History

Conservancy fairy shrimp are omnivorous filter feeders that indiscriminately filter particles of the appropriate size from their surroundings, and in turn are prey to a wide variety of animals. The diet of Conservancy fairy shrimp consists of bacteria, unicellular algae, protists, and suspended plant and animal particles (Eriksen and Belk 1999). Animals feeding on Conservancy fairy shrimp are birds, fish, amphibians, dragonfly and damsel fly larvae, other insects, and vernal pool tadpole shrimp (Eriksen and Belk 1999; USFWS 2005).

Vernal pool crustaceans reproduce by producing cysts that consist of an embryo within a protective covering (Eriksen and Belk 1999). Cysts may remain viable for a long and undetermined number of years. During summer and fall months, vernal pool crustacean populations are present only as cysts in the dry pool bottom.

Inundation triggers some of the dormant cysts to hatch; other cysts remain dormant as a cyst bank, analogous to the seed bank of annual plants (USFWS 2005). After hatching, the life span and maturation rate of Conservancy fairy shrimp are similar to those of other fairy shrimp species. Conservancy fairy shrimp can reach maturity in about 6 or 7 weeks, and populations of adults can remain active for more than 4 months (Helm 1998). However, maturation and reproduction rates of vernal pool crustaceans are controlled by water temperature and can vary greatly (Eriksen and Brown 1980; Helm 1998).

Typical turbid-water habitats for Conservancy fairy shrimp in California are large, playa-type vernal pools or long inundation smaller vernal pools (Eng et al. 1990; USFWS 2007a). The pools generally last until June, but the Conservancy fairy shrimp adult life stage has typically been completed before then (Eng et al. 1990). They have been collected from early November to early April (Eng et al.1990). As with other vernal pool crustaceans, Conservancy fairly shrimp are sporadic in their distribution, often inhabiting only one or a few vernal pools in otherwise more widespread pool complexes. Pools within a complex typically are separated by distances on the order of 5 or more feet and may form dense, interconnected mosaics of small pools or a sparser scattering of larger pools (USFWS 2005). Conservancy fairy shrimp have been found in vernal pools ranging in size from 323 square feet to 88 acres at elevations ranging from 16 to 5,577 feet (USFWS 2005; USFWS 2007a).

The Conservancy fairy shrimp occupies the same vernal pool habitats as many of the other vernal pool species, including several other rare and endangered vernal pool crustaceans. This species has been found in association with the vernal pool fairy shrimp (*Branchinecta lynchi)*, federally listed as threatened; vernal pool tadpole shrimp (*Lepidurus packardii)*, federally listed as endangered; and California fairy shrimp (*Linderiella occidentalis)*, a species of concern. Although these species may all be found

in one general location, they have rarely been collected from the same pool at the same time. In general, Conservancy fairy shrimp have very large populations within a given pool, and it is usually the most abundant fairy shrimp when more than one species is present (USFWS 2005; USFWS 2007a).

Threats

The Conservancy fairy shrimp is threatened primarily by the habitat loss and fragmentation resulting from expansion of agricultural and developed land uses. Vernal pool habitat can also be lost or degraded by other activities that damage or puncture the hardpan (i.e., water-restrictive layer underlying the pool) or by activities that destroy or degrade uplands that contribute water to vernal pools. Besides habitat conversion, activities causing such loss or degradation include deep ripping of soils, water diversion or impoundment, and application of pesticides, fertilizers, or livestock wastes.

Additional threats are incompatible grazing practices (e.g., overgrazing, undergrazing, or cessation of grazing where it has historically occurred), replacement of native plants by nonnatives, and introduction of fish to vernal pools (Robins and Vollmar 2002; Marty 2005; Pyke and Marty 2005; USFWS 2005).

Relevant Conservation Efforts and Guidance

The Conservancy fairy shrimp is covered by the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005). This recovery plan addresses a large number of vernal pool-associated species through an ecosystem approach to recovery that is focused on habitat protection and management.

The Conservancy fairy shrimp is covered under the approved Natomas Basin, San Joaquin, and East Contra Costa County habitat conservation plans (HCP). Further, the species is proposed for coverage under the Solano County HCP.

Longhorn Fairy Shrimp

Legal Status

The longhorn fairy shrimp (*Branchinecta longiantenna*) was federally listed as endangered by USFWS on September 19, 1994 (59 FR 48136). In June 2012, USFWS published a 5-year review recommending that the species remain listed as endangered (USFWS 2012b). Revised critical habitat was designated on February 10, 2006 (71 FR 7118), and species by unit designations were published for Contra Costa, Alameda, Merced, and San Luis Obispo counties on February 10, 2006 (71 FR 7118). None of the critical habitat units are within the Delta.

Distribution

The known distribution of the longhorn fairy shrimp extends from Contra Costa and Alameda counties to San Luis Obispo County and also includes Merced County (USFWS 2005; CNDDB 2020). Within this geographic range, it is extremely rare in vernal pools and swales. Occurrences are rare and highly disjunct with specific pool characteristics largely unknown (USFWS 2005; USFWS 2007b; USFWS 2012b).

The closest populations to the Delta are in Contra Costa County (Vasco Caves Preserve) and Alameda County (Brushy Peak Preserve). These occurrences are in

seasonal pools that fill sandstone depressions in rocky outcrops that are not present anywhere within the Delta. This species also occurs in pools within alkali sink vegetation in other parts of its known range (USFWS 2005; USFWS 2007b; CNDDB 2020); although surveys have been conducted for at least 14 years, no longhorn fairy shrimp have been detected in similar pools in the Delta (USFWS 2005; USFWS 2007b). Critical habitat for this species is located outside the Delta, more than 5 miles southwest of Clifton Court Forebay.

Relevant Natural History

Longhorn fairy shrimp are omnivorous filter feeders that indiscriminately filter particles of the appropriate size from their surroundings, and in turn they are prey to a wide variety of animals. The diet of the longhorn fairy shrimp consists of bacteria, unicellular algae, protists, and suspended plant and animal particles (Eriksen and Belk 1999). Animals feeding on longhorn fairy shrimp likely include birds, fish, amphibians, dragonfly and damsel fly larvae, other insects, and vernal pool tadpole shrimp (Eriksen and Belk 1999; USFWS 2005).

Vernal pool crustaceans reproduce by producing cysts that consist of an embryo within a protective covering (Eriksen and Belk 1999). Cysts may remain viable for a long and undetermined number of years. During summer and fall months, populations of vernal pool crustaceans are present only as cysts in the dry pool bottom.

Inundation triggers some of the dormant cysts to hatch; other cysts remain dormant as a cyst bank, analogous to the seed bank of annual plants (USFWS 2005). After hatching, the life span and maturation rate of longhorn fairy shrimp are similar to those of other fairy shrimp species. The longhorn fairy shrimp can complete its life cycle in 3 to 7 weeks (Helm 1998). However, maturation and reproduction rates of vernal pool crustaceans are controlled by water temperature and can vary greatly (Eriksen and Brown 1980; Helm 1998).

Longhorn fairy shrimp have been reported to co-occur in the same general area with the vernal pool fairy shrimp (*Branchinecta lynchi*), but the species did not occupy the same vernal pools (Eng et al. 1990).

Threats

The longhorn fairy shrimp has likely experienced habitat loss and fragmentation as a result of the expansion of agricultural and developed land uses. However, it is now threatened by habitat loss and disturbance resulting from several site-specific activities at the few locations from which it is known: wind energy development, a water storage project, construction of a dirt access road, and land management activities (USFWS 2005). Additional threats to longhorn fairy shrimp may include incompatible grazing practices (e.g., overgrazing, undergrazing, or cessation of grazing where it has historically occurred) and replacement of native plants by nonnatives (Robins and Vollmar 2002; Marty 2005; Pyke and Marty 2005; USFWS 2005).

Relevant Conservation Efforts and Guidance

Longhorn fairy shrimp is covered by the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005). This recovery plan addresses a large

number of vernal pool–associated species through an ecosystem approach to recovery that is focused on habitat protection and management. The species is covered by the approved Natomas Basin, San Joaquin County, and East Contra Costa County HCPs.

Vernal Pool Fairy Shrimp

Legal Status

The vernal pool fairy shrimp (*Branchinecta lynchi*) is listed as threatened under the federal ESA throughout its range (59 FR 48136, September 19, 1994). In September 2007, USFWS published a 5-year review recommending that the species remain listed as threatened. Revised critical habitat was designated on February 10, 2006 (71 FR 7118). Portions of Critical Habitat Units 19A and 19B occur within the Delta, in the vicinity of Byron and Brentwood. This species is covered by the December 15, 2005, Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005).

The vernal pool fairy shrimp has no State regulatory status.

Distribution

The vernal pool fairy shrimp is found throughout the Central Valley and west to the central Coast Ranges, at sites 30 to 4,000 feet in elevation (USFWS 2005). The species has also been reported from the Agate Desert region of Oregon near Medford, and disjunct populations occur in San Luis Obispo, Santa Barbara, and Riverside counties.

Within this geographic range, the vernal pool fairy shrimp inhabits primarily vernal pools (Eng et al. 1990). It also occurs in other wetlands that provide habitat similar to vernal pools: alkaline rain-pools, ephemeral drainages, rock outcrop pools, ditches, stream oxbows, stock ponds, vernal swales, and some seasonal wetlands (Helm 1998). Occupied wetland habitats range in size from several square feet to more than 10 acres. This species is not found in riverine or other permanent waters.

The vernal pool fairy shrimp is known to occur in suitable habitat in and near the Delta in grasslands in the south near Clifton Court Forebay, and in the north, east of the eastern conveyance area. Critical habitat for this species is located within the Delta, less than 0.25 mile west of the western conveyance area. Only one unit, 19B, is partially within the Delta boundary.

Relevant Natural History

Vernal pool fairy shrimp are omnivorous filter feeders that indiscriminately filter particles of the appropriate size from their surroundings, and in turn they are prey to a wide variety of animals. The diet of vernal pool fairy shrimp consists of bacteria, unicellular algae, protists, and suspended plant and animal particles (Eriksen and Belk 1999). Animals feeding on vernal pool fairy shrimp are birds, fish, amphibians, dragonfly and damsel fly larvae, other insects, and vernal pool tadpole shrimp (Eriksen and Belk 1999; USFWS 2005).

Vernal pool crustaceans reproduce by producing cysts that consist of an embryo within a protective covering (Eriksen and Belk 1999). Cysts may remain viable for a very long and undetermined number of years. During summer and fall months, populations of vernal pool crustaceans are present only as cysts in the dry pool bottom.

Individuals go through the rest of their life cycle while pools are inundated. Inundation triggers some of the dormant cysts to hatch; other cysts remain dormant as a cyst bank, analogous to the seed bank of annual plants (USFWS 2005). After hatching, vernal pool fairy shrimp develop rapidly into adults, reaching sexual maturity in as little as 18 days, and complete their life cycle within 9 weeks (Helm 1998). However, maturation and reproduction rates can vary greatly with water temperature (Eriksen and Brown 1980; Helm 1998). Multiple episodes of cyst hatching may occur within a season if conditions are suitable (Helm 1998; Gallagher 1996). However, populations also often disappear early in the season, long before the vernal pools dry up.

Vernal pool fairy shrimp have been reported to co-occur in the same general area with longhorn fairy shrimp, but the species did not occupy the same vernal pools (Eng et al. 1990).

Threats

The vernal pool fairy shrimp is threatened primarily by the habitat loss and fragmentation resulting from expansion of agricultural and developed land uses. Vernal pool habitat can also be lost or degraded by other activities that damage or puncture the hardpan (i.e., water-restrictive layer underlying the pool) or by activities that destroy or degrade uplands that contribute water to vernal pools. Besides habitat conversion, activities causing such loss or degradation include deep ripping of soils, water diversion or impoundment, and application of pesticides, fertilizers, or livestock wastes. Additional threats include incompatible grazing practices (e.g., overgrazing, undergrazing, or cessation of grazing where it has historically occurred), replacement of native plants by nonnatives, and introduction of fish to vernal pools (Robins and Vollmar 2002; Marty 2005; Pyke and Marty 2005; USFWS 2005).

Relevant Conservation Efforts and Guidance

The vernal pool fairy shrimp is covered by the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005). This recovery plan addresses a large number of vernal pool-associated species through an ecosystem approach to recovery that is focused on habitat protection and management.

The vernal pool fairy shrimp is covered under the approved San Joaquin County, East Contra Costa and South Sacramento HCPs. In addition, the species is proposed for coverage under the Solano County HCP under development.

Valley Elderberry Longhorn Beetle

Legal Status

The valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*) is listed as threatened under the ESA (50 FR 52803) on August 8, 1980. In 2012, USFWS sought condition of a proposal that this species be removed from the endangered species list, but in 2014 it withdrew that proposal following a scientific review. Critical habitat was designated for this species in the initial listing of the species (50 FR 52803), although none is designated within the Delta.

Distribution

The VELB is endemic to the Central Valley at elevations below about 3,000 feet. It is found only in association with its host plants, the elderberry shrub (*Sambucus* spp.). In the Central Valley, the elderberry shrub is found primarily in riparian vegetation.

The VELB is known to occur in elderberry shrubs present in riparian woodland within 1.5 miles of the Delta. The species is also expected to occur in suitable habitat in other locations in the Delta.

Relevant Natural History

Adults feed on the foliage and possibly the flowers of elderberries from March to early June (USFWS 1991; USFWS 2006a). During this period, the beetles mate and lay eggs on the bark of elderberry shrubs. After the eggs hatch, the larvae bore into and feed on the pith of the stems (i.e., the soft tissue at the center of elderberry stems) and also may feed on the wood. The larval stage may last for 1 to 2 years. Immediately before pupating, larvae excavate exit holes in the stems and temporarily fill them. During mid-March to early June, after pupation, the adults emerge.

Threats

Substantial amounts of riparian habitat containing the host plant for the VELB have been lost, and host plants in remaining habitat have been lost and damaged. However, the greatest current threat to the VELB may be predation and displacement by the invasive Argentine ant (*Linepithema humile*) (Huxel 2000).

Relevant Conservation Efforts and Guidance

A recovery plan was prepared for this species during the 1980s (USFWS 1984), and regularly implemented conservation measures have included avoidance and minimization of effects on occupied habitat, elderberry transplantation and replacement plantings, and habitat preservation. In part as a result of these measures, extensive areas of habitat have been preserved (USFWS 2006a).

The VELB is covered under the San Joaquin County, East Contra Costa County, South Sacramento, and Yolo HCP. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

Vernal Pool Tadpole Shrimp

Legal Status

The vernal pool tadpole shrimp (*Lepidurus packardi*) was listed as endangered throughout its range under the federal ESA on September 19, 1994 (59 FR 48136). In September 2007, USFWS published a 5-year review recommending that the species remain listed as endangered. Revised critical habitat was designated on February 10, 2006 (71 FR 7118), although none is designated within the Delta.

Distribution

The vernal pool tadpole shrimp is endemic to the Central Valley, with most populations located in the Sacramento Valley. This species has also been reported from the Delta to the east side of San Francisco Bay.

Within this geographic range, vernal pool tadpole shrimp occur in a wide variety of seasonal habitats: vernal pools, ponded clay flats, alkaline pools, ephemeral stock tanks, and roadside ditches (CNDDB 2020; Helm 1998; Rogers 2001). Habitats where vernal pool tadpole shrimp have been observed range in size from small, clear, vegetated vernal pools to highly turbid pools to large winter lakes (Helm 1998; Rogers 2001). This species has not been reported in pools that contain high concentrations of sodium salts, but may occur in pools with high concentrations of calcium salts. The largest concentration of occurrences of vernal pool tadpole shrimp is found in the Southeastern Sacramento Vernal Pool Region, where the species occurs on a number of public and private lands in Sacramento County (USFWS 2005; USFWS 2007c).

The vernal pool tadpole shrimp is known to occur in suitable habitat in grasslands surrounding most of the Delta. Critical habitat for this species is in Sacramento, Solano, and Yolo counties, more than 5 miles from the Delta.

Relevant Natural History

Vernal pools and other ephemeral wetlands must dry out and be inundated again for the vernal pool tadpole shrimp cysts to hatch. Vernal pool tadpole shrimp dig in bottom sediments and scramble over objects as they forage. They are omnivores, and in turn they are consumed by a wide variety of animals. Their diet includes plants and various zooplankton, other fairy shrimp, and insect larvae (Eriksen and Belk 1999). Animals feeding on vernal pool tadpole shrimp include birds, fish, amphibians, and dragonfly larvae and other insects (Eriksen and Belk 1999; USFWS 2005).

Vernal pool crustaceans reproduce by producing cysts that consist of an embryo within a protective covering (Eriksen and Belk 1999). Cysts may remain viable for a substantial and undetermined number of years. During summer and fall months, vernal pool crustacean populations are present only as cysts in the dry pool bottom.

Individuals go through the rest of their life cycle while pools are inundated. Inundation triggers some of the dormant cysts to hatch, while other cysts remain dormant as a cyst bank, analogous to the seed bank of annual plants (USFWS 2005). Vernal pool tadpole shrimp hatch from cysts within several days (Ahl 1991). Vernal pool tadpole shrimp may take 3 to 4 weeks to mature, and longer to reproduce (Helm 1998; Ahl 1991; King 1996). (However, maturation and reproduction rates of vernal pool crustaceans are controlled by water temperature and can vary greatly.) Vernal pool tadpole shrimp will continue to grow as long as their vernal pool habitats remain inundated, in some cases for 6 months or longer. They periodically shed their shield like shells, which often can be found along the edges of vernal pools where vernal pool tadpole shrimp occur.

Vernal pool tadpole shrimp commonly co-occur with the fairy shrimp (*Linderiella occidentalis, Branchinecta conservatio, B. lindahli, B. coloradensis*) and the vernal pool fairy shrimp (*B. lynchi*). The midvalley fairy shrimp (*B. mesovallensis*) and longhorn fairy shrimp (*B. longiantenna*) both occur within the range of the vernal pool tadpole shrimp but are typically found in different habitats (USFWS 2005; USFWS 2007c).

Threats

The vernal pool tadpole shrimp is threatened primarily by the habitat loss and fragmentation resulting from expansion of agricultural and developed land uses. Vernal pool habitat can also be lost or degraded by other activities that damage or puncture the hardpan (i.e., water-restrictive layer underlying the pool) or by activities that destroy or degrade uplands that contribute water to vernal pools. Besides habitat conversion, activities causing such loss or degradation include deep ripping of soils, water diversion or impoundment, and application of pesticides, fertilizers, or livestock wastes. Additional threats are incompatible grazing practices (e.g., overgrazing, undergrazing, or cessation of grazing where it has historically occurred), replacement of native plants by nonnatives, and introduction of fish to vernal pools (Robins and Vollmar 2002; Marty 2005; Pyke and Marty 2005; USFWS 2005).

Relevant Conservation Efforts and Guidance

The vernal pool tadpole shrimp is covered by the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005). This recovery plan addresses a large number of vernal pool-associated species through an ecosystem approach to recovery that is focused on habitat protection and management.

The vernal pool tadpole shrimp is covered under the Natomas Basin, San Joaquin County, Soouth Sacramento, and East Contra Costa County HCPs. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

E.4.2 Amphibians

California Tiger Salamander

Legal Status

The California tiger salamander (*Ambystoma californiense*) (Central Population) is federally listed as threatened (69 FR 47211, August 4, 2004). In 2010, the California tiger salamander was designated as threatened under CESA. Critical habitat for the central population of California tiger salamander was designated by USFWS on August 23, 2005 (70 FR 49379 to 49458). A portion of one unit is located in the Delta, in Solano County at Jepson Prairie.

Distribution

The California tiger salamander, endemic to California, ranges across the Central Valley and the eastern foothills of the Sierra Nevada from Yolo County (possibly up to Colusa County) south to Kern County, and coastal grasslands from Sonoma County to Santa Barbara County at elevations ranging from approximately 10 to 3,500 feet above mean sea level.

California tiger salamander has been detected in the southern Delta near Clifton Court Forebay, and could occur in suitable habitat east of the Delta in Sacramento County and west of the Delta in Solano County.

Relevant Natural History

The California tiger salamander requires vernal pools, ponds (natural or human-made), or semipermanent calm waters (where ponded water is present for at least 10 to 12 weeks) for breeding and larval maturation. It also requires adjacent upland areas that contain small mammal burrows or other suitable refugia for aestivation (70 FR 49390, August 23, 2005; USFWS and DFG 2003).

Adult California tiger salamanders spend most of their lives underground in small mammal burrows, typically those of California ground squirrel (*Spermophilus beecheyi*) (Loredo et al. 1996). Adults emerge from underground retreats to feed, court, and breed during warm winter rains, typically from November through March. Adults may migrate long distances, up to a half-mile or more, to reach pools for breeding and egg laying (Jennings and Hayes 1994). (Reproduction may not occur in years with suboptimal conditions.) After hatching in approximately 10 to 14 days, the larvae continue to develop in the pools for several months until they metamorphose, which takes 60 to 94 days (69 FR 47215, August 4, 2004).

Following metamorphosis, juvenile salamanders seek refugia, typically mammal burrows, traveling distances of about 1 mile or more from their breeding sites (Austin and Shaffer 1992), in which they may remain until they emerge during a subsequent breeding season.

Threats

The alteration of either breeding ponds or upland habitat through the introduction of exotic predators (e.g., bullfrogs [*Rana catesbeiana*] and mosquitofish [*Gambusia affinis*]) or the construction of barriers that fragment habitat and reduce connectivity (e.g., roads, berms, certain types of fences) can be detrimental to the survival of the California tiger salamander (Jennings and Hayes 1994; Trenham et al. 2001). Other threats include vehicle-related mortality, especially during breeding migrations (Barry and Shaffer 1994), and rodent-control programs, which lead to loss of aestivation habitats (Loredo et al. 1996; USFWS 2017).

Relevant Conservation Efforts and Guidance

In 2017, USFWS released the recovery plan for the Central California Distinct Population Segment (DPS) of the California tiger salamander (USFWS 2017). The recovery strategy includes alleviating the threat of habitat loss and fragmentation through conservation of remaining aquatic and upland habitat for the species.

The California tiger salamander is covered under the San Joaquin County, South Sacramento, Yolo and East Contra Costa County HCPs. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

California Red-Legged Frog

Legal Status

The California red-legged frog (*Rana draytonii*, also known as *R. aurora draytonii*) is federally listed as threatened and is a California species of special concern.

USFWS designated critical habitat on March 17, 2010 (75 FR 12816). The Delta does not contain any designated critical habitat. However, if the proposed revision to expand the area of critical habitat becomes final, the Delta would include a small amount of critical habitat in grasslands southwest of Clifton Court Forebay (Unit CCS-2).

Distribution

The California red-legged frog is endemic to California and Baja California, Mexico (USFWS 2002). The species has been extirpated from 70 percent of its former range and now is found primarily in coastal drainages of central California, from Marin County south to northern Baja California, Mexico, and in isolated drainages in the Sierra Nevada, along the north coast, and in the northern Transverse Ranges. Populations remain in approximately 256 streams or drainages in 28 counties. This species is considered extirpated from the valley floor.

California red-legged frogs have been recorded on creeks, canals, and seasonal ponds in and within several miles of the southern Delta near Clifton Court Forebay.

Relevant Natural History

California red-legged frogs are aquatic breeders, using ponds, or pond like areas of marshes, creeks and streams, lagoons, and other slow-moving water for breeding and egg deposition. Aquatic breeding habitat does not include deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger in size). To be considered essential breeding habitat, the aquatic feature must have the capacity to hold water for a minimum of 20 weeks in all but the driest of years. This is the average amount of time needed for egg and tadpole development and metamorphosis so that juveniles can become capable of surviving in upland habitats (73 FR 53496). Typical habitat characteristics include water depth of at least 2.5 feet, emergent or shoreline vegetation, and absence of competitors or predators, such as bullfrogs (*Rana catesbeiana*) and largemouth bass (*Micropterus salmoides*) (Hayes and Jennings 1988).

Adults are highly aquatic, but also make use of terrestrial habitat, especially after precipitation events, for nonmigratory forays into adjacent upland habitats and for migratory overland movements to breeding sites. For example, in a study conducted by Bulger et al. (2003) at a coastal site in northern Santa Cruz County, California red-legged frogs typically remained within 16 feet of aquatic habitat during dry periods, but moved into upland habitat as far as 426 feet during summer rains. Overland routes were often highly oriented toward the nearest breeding pond and were typically traversed in direct, point-to-point movements with little to no preference or avoidance toward any particular topography or habitat type. California red-legged frogs were documented to migrate between breeding and nonbreeding aquatic sites at distances up to 2 miles.

Breeding typically begins between November and mid-December and lasts through April in most years, but is dictated by winter rainfall (Stebbins 2003; Jennings and Hayes 1994; Bulger et al. 2003). Breeding typically occurs in permanent ponds and may occur in streams where water moves relatively slowly (e.g., pools or backwaters) (Hayes and Jennings 1988) and in ponds that dry in late summer. Typically, the female deposits the mass of eggs on emergent vegetation (Storer 1925; Jennings and Hayes 1994); however, breeding has also been documented in ponds that lack emergent

vegetation (EBRPD 2007). Larvae typically hatch in 18 to 22 days and metamorphosis is usually completed in 4 to 5 months (EBRPD 2007; Jennings and Hayes 1994). In several documented cases, tadpoles have overwintered, then metamorphosed the following spring (Storer 1925; Fellers et al. 2001; EBRPD 2007). Males and females usually attain sexual maturity at 2 and 3 years, respectively (Jennings and Hayes 1994).

Threats

The most important threats to the California red-legged frog are habitat loss and alteration, introduced predators, water management, mismanagement of grazing livestock, chemical contamination from urban and industrial runoff, and extended drought conditions.

Relevant Conservation Efforts and Guidance

California red-legged frog is covered by the Recovery Plan for the California Red-Legged Frog (*Rana aurora draytonii*) (USFWS 2002). The recovery strategy of this plan is to (1) protect existing populations by reducing threats; (2) restore and create habitat that will be protected and managed in perpetuity; (3) survey and monitor populations and conduct research on the biology of and threats to the subspecies; and (4) reestablish populations of the subspecies within its historic range.

The California red-legged frog is covered under the San Joaquin County and East Contra Costa County HCPs. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

E.4.3 Reptiles

Giant Garter Snake

Legal Status

The giant garter snake (*Thamnophis gigas*) is federally and State listed as threatened. The State listed the giant garter snake as threatened on June 27, 1971 (DFG 2008a). USFWS listed the species as federally threatened on October 20, 1993 (58 FR 54053). Critical habitat has not been designated for this species. In June 2020, USFWS published a 5-year review recommending that the species remain listed as threatened (USFWS 2020c).

Distribution

The giant garter snake is endemic to wetlands in the Sacramento and San Joaquin valleys and was historically distributed throughout the San Joaquin Valley (Hansen and Brode 1980). The current distribution extends from near Chico in Butte County south to the Mendota Wildlife Area in Fresno County. Occurrence records indicate that garter snakes are currently distributed in 13 unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley (Hansen and Brode 1980; Brode and Hansen 1992; USFWS 1999a). These populations are isolated, without protected dispersal corridors to other adjacent populations, and are threatened by land use practices and other human activities, including development of wetland and suitable agricultural habitats.

No occurrences of giant garter snakes are known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode 1980). The resulting gap of approximately 62 miles separates the southern and northern populations, with no giant garter snakes known from the lowland regions of Stanislaus County (Hansen and Brode 1980; CNDDB 2020). Scattered records within the Delta suggest that giant garter snakes may have occupied this region at one time, but longstanding reclamation of wetlands for intense agricultural applications has eliminated most suitable habitat (Hansen 1986). Recent records within the Delta are haphazard, and repeated surveys at focused locations within the Delta have failed to identify any extant population clusters in the region (Hansen 1986; Patterson and Hansen 2002; Patterson 2005); however, the entire Delta has not been systematically surveyed.

Recent or historic records of giant garter snake have been documented in the Delta. In 2017, seven giant garter snakes were observed on each of two consecutive days basking among the rip-rap along the north shore of Jersey Island and in a recent trapping study started in 2018, a single young male giant garter snake was captured on Sherman Island. Although recent findings demonstrate that giant garter snake is extant in the Yolo Basin (Hansen 2007; Wylie et al. 2003; Wylie et al. 2004; Wylie and Amarello 2006), and potentially in other areas within or near the Delta, repeated attempts to assess local distribution have not been successful. There is concern that isolated populations may be subject to greater risk of extirpation (USFWS 2006b).

Relevant Natural History

The giant garter snake resides in marshes, ponds, sloughs, small lakes, low gradient streams, and other waterways, and in agricultural wetlands, including irrigation and drainage canals, rice fields, and the adjacent uplands (58 FR 54053, October 20, 1993). Habitat requirements include (1) adequate water during the snake's active season (early spring through midfall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* spp.), accompanied by vegetated banks for escape cover and foraging habitat during the active season; (3) basking habitat of grassy banks and openings in waterside vegetation; and (4) higher elevation uplands for cover and refuge from floodwaters during the snake's dormant season in the winter (Hansen and Brode 1980; Hansen 1998; USFWS 2006c). It feeds primarily on small fish, tadpoles, and frogs. In some rice-growing areas, giant garter snakes have adapted well to vegetated, artificial waterways and associated rice fields (Hansen and Brode 1993). The giant garter snake resides in small mammal burrows and soil crevices located above prevailing flood elevations throughout its winter dormancy period (USFWS 2006c). Burrows are typically located in sunny exposures along south- and west-facing slopes.

Giant garter snakes may hibernate up to 800 feet from water, and along waterways they may move considerable distances (e.g., up to 2 miles in a single day) (Hansen 1988; USFWS 2006c). Consequently, the size of their home ranges varies widely. Data based on radiotelemetry studies show that home range varies by location, with home range estimates varying from 10 to 203 acres in a seminative perennial marsh system and from 3 to 2,792 acres in a managed refuge (USFWS 1999a).

Owing to lack of habitat and emergent vegetative cover, giant garter snakes generally are not present in larger rivers and wetlands with sand, gravel, or rock substrates. In addition, the major rivers have been highly channelized, removing oxbows and backwater areas that probably at one time provided suitable habitat. Riparian woodlands can provide suitable habitat, but this is not likely because most have excessive shade, lack of basking sites, and absence of prey populations. Giant garter snake is also usually absent from most permanent waters that support established populations of predatory game fishes and from sites that undergo routine dredging, mechanical or chemical weed control, or compaction of bank soils (Hansen and Brode 1980; Rossman and Stewart 1987; Brode 1988; USFWS 1999a; USFWS 2006c).

Giant garter snakes are less active or dormant from October until April, when they emerge to breed and forage (Wylie et al. 1997). They give birth to live young from late July through early September (Hansen and Hansen 1990).

Giant garter snakes are vulnerable to predation from both native species (e.g., raccoons, egrets, herons) and nonnative species (e.g., bullfrogs, feral cats) (58 FR 54053 to 54065, October 20, 1993). Predation may be the reason that giant garter snakes tend to be absent from larger rivers that support predatory fish (Hansen and Brode 1980). They are also affected by parasites and contaminants.

Threats

Giant garter snake is threatened primarily by habitat conversion, fragmentation, and degradation resulting from urban development (58 FR 54053 to 54065, October 20, 1993). Human disturbance contributes to habitat degradation because giant garter snakes are diurnal predators that are disturbed by human activities. It is also threatened by incompatible agricultural practices such as intensive vegetation control along canal banks and changes in crop composition.

Relevant Conservation Efforts and Guidance

Conservation efforts for the giant garter snake have included restoration efforts on wildlife refuges and through mitigation banking. With the continued loss of habitat within the range of the species, the snake has become increasingly dependent on 10 refuges and wildlife management areas in the Central Valley (Czech 2006).

Hundreds of acres in the California refuge system are known to be occupied by the giant garter snake; however, thousands of acres of apparently suitable habitat in the refuge system are currently unoccupied (Czech 2006). This suggests that factors such as winter flooding and predation (especially by nonnative species such as bullfrogs) may be limiting this species' presence in some areas. The giant garter snake prefers summer flooding and winter drying; properties in the Central Valley refuge system are likely managed intensively for wintering waterfowl with a reversed water regime, resulting in habitat features that are problematic for conservation of the giant garter snake. These opposing requirements suggest that separate conservation areas for the snake are necessary. In 1995, the Colusa National Wildlife Refuge acquired 449 acres of fallow rice fields, and efforts to restore the ecological integrity have proven beneficial to the snake (Czech 2006).

Other wetland conservation efforts can also prove beneficial to giant garter snake under appropriate management regimes. Conservation of Central Valley wetlands occurs through a combination of publicly and privately managed refuges, mitigation banks, and duck clubs, which create a large network of wetland preserves throughout the historical range of the giant garter snake. A large percentage of these wetland conservation efforts, however, are geared toward waterfowl management, often placing greater emphasis on winter water than on the summer water upon which giant garter snakes depend (USFWS 1999a). With proper consideration given to design, location, and management, these efforts might also substantially benefit the giant garter snake and other wetland-dependent species (USFWS 1999a).

The giant garter snake is covered by the Draft Recovery Plan for the Giant Garter Snake (USFWS 2015). The giant garter snake is covered under the San Joaquin County, East Contra Costa County, South Sacramento, and Yolo HCPs. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

E.4.4 Birds

Tricolored Blackbird

Legal Status

The tricolored blackbird (Agelaius tricolor) is currently listed as threatened under the California Endangered Species Act. The tricolored blackbird has no federal regulatory status; however, the species is protected under the federal Migratory Bird Treaty Act and is designated as a Bird of Conservation Concern by the U.S. Fish and Wildlife Service (USFWS) (U.S. Fish and Wildlife Service 2002). A petition for federal listing under the Endangered Species Act was submitted to USFWS in 2015, but the petition was denied in 2019.

Distribution

The tricolored blackbird is a colonial nesting passerine bird that is largely restricted to California. The species forms some of the largest colonies of any North American passerine bird, which may number in the tens of thousands of breeding pairs. Most of the California breeding population of tricolored blackbird occurs in the Central Valley; breeding also occurs in the foothills of the Sierra Nevada south to Kern County, the coastal slopes from Sonoma County to the Mexican border, and sporadically in the Modoc Plateau. Wintering tricolored blackbirds often form huge, mixed species flocks that forage across the landscape. The Delta is recognized as major wintering areas for tricolored blackbirds (RHJV 2004). Tricolored blackbirds may make extensive movements during the breeding season and during winter. While the overall range of the tricolored blackbird has been largely unchanged since the 1930s (Neff 1937; Beedy et al. 1991), large gaps now exist in the species' former range.

Relevant Natural History

Tricolored blackbirds have three basic requirements for selecting their breeding colony sites: 1) Open, accessible water; 2) A protected nesting substrate, including flooded,

thorny, or spiny vegetation; and 3) A suitable foraging space providing adequate insect prey within five miles of the nesting colony (Beedy and Hamilton 1997).

The species typically nests in large, dense colonies twice per season, with the second attempt often in a different, more northerly location. The first nests in a colony generally occur in the densest vegetation, usually in the interior of the nesting habitat. Nest heights range from a few centimeters to about 1.5 meters above water or ground at colony sites in freshwater marshes (Neff 1937), and up to 3 meters in the canopies of willows (Salix spp.) and other riparian trees; nests are rarely built on the ground. Over time, the selection of nesting habitat has changed dramatically as freshwater marsh habitat has been removed. Some of the largest recent colonies are in silage and grain fields (Beedy and Hamilton 1997; Hamilton 2000), particularly triticale (a wheat–rye hybrid) fields in the San Joaquin Valley (Kyle and Kelsey 2011).

Threats

The most significant historical and ongoing threat to the tricolored blackbird is habitat loss and alteration. The initial conversion from native landscapes to agriculture removed vast wetland areas in the state and caused initial declines in populations. The more recent conversion of suitable agricultural lands to urban areas has permanently removed historical breeding and foraging habitat for this species. In urbanizing areas, habitat fragmentation and proximity to human disturbances has also led to abandonment of large historical colonies (Beedy and Hamilton 1997).

Entire colonies (up to tens of thousands of nests) in cereal crops and silage are often destroyed by harvesting and plowing of agricultural lands (Beedy and Hamilton 1997; Hamilton 2004; Cook and Toft 2005). While adult birds can fly away, eggs and fledglings cannot. The concentrations of a high proportion of the known population in a few breeding colonies increases the risk of major reproductive failures, especially in vulnerable habitats such as active agricultural fields. Other major threats to Tricolored blackbird colonies include human disturbances, predation, and exposure to toxins and contaminants.

Relevant Conservation Efforts and Guidance

The Tricolored Blackbird Working Group was established specifically to address the conservation of the tricolored blackbird across the state. In 2007, the group prepared a conservation strategy for this species (Tricolored Blackbird Working Group 2007). The tricolored blackbird is also a covered species in regional conservation plans, including the approved San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (San Joaquin Council of Governments 2000), the East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (East Contra Costa County 2006), the Natomas Basin Habitat Conservation Plan (Natomas Basin Conservancy 2003), South Sacramento Habitat Conservation Plan (Sacramento County et al. 2018), and Yolo Habitat Conservation Plan/Natural Community Conservation Plan (Yolo Habitat Conservancy 2018). It is proposed to be covered under the the Solano Multispecies Habitat Conservation Plan (Solano County Water Agency 2009) and the Butte Regional Conservation Plan (Butte County Association of Governments 2011).

Golden Eagle

Legal Status

Golden eagle (*Aquila chrysaetos*) is a fully protected species under the California Fish and Game Code Section 3511 and is protected under the federal Bald Eagle and Golden Eagle Protection Act. The fully protected status confers greater protection than State listing, which has provisions for take of listed species. Fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Most fully protected species have also been listed as threatened or endangered species under the State endangered species laws and regulations; however, several species, including golden eagle, remain only on the fully protected list.

Distribution

The golden eagle is a regular breeder in the western half of North America from Alaska south to Baja California (Kochert et al. 2002). California breeders remain in the state year round, and birds from northern states migrate south for the winter, including into California. The golden eagle is a resident breeder and migrant in oak woodlands and savannah immediately west of the Delta and Suisun Marsh (Zeiner et al. 1990a), and could forage in grasslands around the Delta and Suisun Marsh year round.

Relevant Natural History

Golden eagles favor open grasslands, foothills, and mountain terrain. They nest on cliffs and large oaks, sycamores, pines and other trees in open areas in areas with good prey availability, especially where updrafts are common, which aid in soaring. Breeding territories are typically large and found at low densities across the landscape (e.g., average territory size of 48 square miles in Northern California (Zeiner et al. 1990a), however, some of the highest breeding densities for this species (about 7 square miles per territory) are found in eastern Contra Costa County (Hunt et al. 1998).

Golden eagles prey mostly on rabbits and rodents, but also take other small animals and some carrion (Zeiner et al. 1990a).

Threats

Threats to golden eagles include direct sources such as trauma from collisions with wind power turbines and power lines and indirect sources such as lead poisoning (Kochert et al. 2002). Disturbance at nests and loss of habitat to human encroachment are other sources of threats.

Relevant Conservation Efforts and Guidance

Conservation efforts in the Delta and Suisun Marsh region are mostly focused on attempts to design wind power turbines that kill fewer raptors, and designing power poles that reduce electrocution risk. Public lands are managed to minimize nest disturbance during the breeding season. Golden eagles are covered under the Eastern Contra Costa County HCP and the San Joaquin County MSCP.

Swainson's Hawk

Legal Status

The Swainson's hawk (*Buteo swainsoni*) is listed as a threatened species under CESA (California Fish and Game Code, Section 2050 et seq.). The species was listed by the California Fish and Game Commission in 1983.

The Swainson's hawk has no federal regulatory status; however, the species is included on the USFWS list of Birds of Conservation Concern for Region 1. Species included on this list are those that USFWS considers potential candidates for federal listing. Critical habitat has not been designated for the Swainson's hawk.

Distribution

Swainson's hawks nest in the grassland plains and agricultural regions of western North America from southern Canada (and possibly in the northern provinces and territories, and Alaska) to northern Mexico. Other than a few documented small wintering populations in the United States (Herzog 1996; England et al. 1997), most Swainson's hawks winter primarily in the Pampas region of Argentina. The Central Valley population winters mainly between Mexico and central South America (FOSH 2011), with a small population that remains in the Delta (Herzog 1996).

Early accounts described Swainson's hawk as one of the most common raptors in California, occurring throughout much of lowland California, specifically the Central Valley, coastal valleys, Southern California deserts, and Great Basin deserts east of the Sierra Nevada (Sharp 1902). Although the species has successfully adapted to certain agricultural landscapes, other habitat loss has caused a substantial reduction in the breeding range and in the size of the breeding population in California (DFG 1980; England et al. 1997). Current breeding populations occur primarily in the Central Valley, but also in the Klamath Basin, the northeastern plateau, the Owens Valley, and rarely in the Antelope Valley (Grinnell and Miller 1944; DFG 1980; DFG 2007).

More than 60 percent of the Statewide Swainson's hawk population occurs within Sacramento, San Joaquin, Solano, and Yolo counties (DFG 2007). Although intensively farmed for more than 100 years, much of this area retains a relative abundance of nesting habitat—narrow riparian corridors along rivers and streams, remnant oak groves and trees, roadside trees—and an agricultural pattern that is conducive to Swainson's hawk foraging. Thus, the species is relatively common in the central portion of the Central Valley (Estep 2007; Estep 2008; DFG 2007).

A fairly dense nesting population of Swainson's hawk occurs in or near the northern and southern portions of the Delta (north of SR-12 and south of SR-4, respectively). These areas support a relatively abundant potential nesting habitat and an agricultural landscape that is suitable for Swainson's hawk foraging. In the northern portion, nest sites are distributed mainly east of the Deep Water Ship Channel in areas that support mainly annually rotated irrigated agricultural lands, hayfields, and irrigated pasturelands, and that include an abundance of potential nesting habitat, including riparian woodlands, roadside trees, tree rows, and isolated trees. The area immediately west of the Deep Water Ship Channel and the area immediately north of SR-12 support few potential nest trees, and thus fewer known nest sites. Similarly, the area south of SR-4

also supports a dense nesting population. The agricultural landscape in this area includes an abundance of alfalfa hay and annually rotated irrigated cropland and many potential nest trees, mostly along riparian corridors and roadside tree rows. Areas that lack nest sites typically also lack sufficient nest trees to support many nesting pairs.

The central Delta, the region between SR-12 and SR-4, supports fewer Swainson's hawk nests than the northern and southern areas. The agricultural landscape in the central Delta provides generally suitable foraging habitat for Swainson's hawks, although probably less of the high-value types of cover; the lack of nest sites is likely primarily associated with the lack of suitable nest trees in this area. However, it should also be noted that the survey effort has not been as extensive in the Central Delta as elsewhere in the Delta, and this may contribute in part to the lack of reported nesting territories in that area.

Relevant Natural History

Throughout much of its range, both in North and South America, the Swainson's hawk inhabits grasslands, prairies, shrub-steppes, and agricultural landscapes, including dry and irrigated row crops, alfalfa fields and hayfields, pastures, and rangelands. They nest in trees most often in riparian woodlands and farm shelterbelts (England et al. 1997), as well as in urban/suburban areas with large trees adjacent to suitable foraging habitat (James 1992; England et al. 1995). Suitable nest trees are usually deciduous and tall (up to 100 feet); in suburban/urban areas, however, most nest trees are conifers (England et al. 1995; England et al. 1997). In the Central Valley, Swainson's hawks usually nest in large native trees such as valley oak (*Quercus lobata*), cottonwood (*Populus fremontia*), walnut (*Juglans hindsii*), and willow (*Salix* spp.), and occasionally in nonnative trees, such as eucalyptus (*Eucalyptus* spp.). Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Stringers of remnant riparian forest along drainages contain most of the known nests in the Central Valley (DFG 1984; Schlorff and Bloom 1984; England et al. 1997). However, this appears to be a function of nest tree availability rather than dependence on riparian forest.

Swainson's hawks are essentially plains or open-country hunters, and they require large areas of open landscape for foraging. Historically, the species used the grasslands of the Central Valley and other inland valleys. With substantial conversion of these grasslands to farming operations, Swainson's hawks have shifted their nesting and foraging into those agricultural lands that provide low, open vegetation for hunting and high populations of rodents for prey. Fields lacking adequate prey populations, such as flooded rice fields, or those that are inaccessible to foraging birds, such as vineyards and orchards, are rarely used (DFG 1989; Babcock 1995; Swolgaard 2003). Meadow vole (*Microtus californicus*) is the principal prey item taken by Swainson's hawks in the Central Valley (DFG 1989).

The value of foraging habitat is a function of three factors: patch size (Swainson's hawks are sensitive to fragmented landscapes, and their use of a field will decline as suitable patch size decreases); prey accessibility (the ability of hawks to access prey depends on the structure of the vegetation and on land management activities); and prey availability, which refers to the abundance of prey populations in a field. Data on

minimum foraging-patch size are largely anecdotal, but are generally thought to be between 5 and 25 acres (Estep and Teresa 1992; DFG 1994). In the Central Valley, agricultural land use or specific crop type determine the foraging value of a field at any given time.

Important land cover or agricultural crops for foraging are alfalfa and other hay, grain, and row crops; bare fallow fields; dry land pasture; and annual grasslands. The matrix of these cover types across a large area creates a dynamic foraging landscape as temporal changes in vegetation result in changing foraging patterns and foraging ranges.

Hay crops, particularly alfalfa, provide the highest value because vegetation is low, resulting in high prey accessibility; prey populations are relatively large, resulting in high prey availability; and farming operations (e.g., weekly irrigation and monthly mowing during the growing season) enhance prey accessibility. Most row and grain crops are planted in winter or spring and have foraging value while the vegetation remains low, but become less suitable as vegetative cover and density increases. During harvest, vegetation cover is eliminated while prey populations are highest, substantially enhancing habitat suitability for the Swainson's hawk during this period. Some crop types, such as rice, orchards, and vineyards, provide little to no value because accessibility is reduced and prey populations are relatively low on lands that support these crop types.

Immediately upon arrival in breeding territories, breeding pairs begin constructing new nests or repairing old ones. One to four eggs are laid in mid-April to late April, and a 30- to 34-day incubation period follows. Nestlings begin to hatch by mid-May, with an approximately 20-day brooding period following. The young remain in the nest until they fledge 38 to 42 days after hatching (England et al. 1997). Studies conducted in the Sacramento Valley indicate that one or two, and occasionally three, young typically fledge from successful nests.

The rate of young fledged per nest in the Central Valley is among the lowest recorded in the species' entire range. This geographic difference in reproductive success may be related to the dietary reliance of Central Valley Swainson's hawks on small voles, which when consumed may not provide enough energy to meet the high demands of breeding adults and developing young; in other locations the hawks' diets include a higher proportion of gophers, rabbits, ground squirrels, and other larger mammals. The difference may also be caused by the energy demands on hawks from foraging in the Central Valley's dynamic agricultural landscape; birds must travel long distances to forage at times when growth of vegetation in agricultural fields reduces available foraging habitat near nests.

This species is also highly responsive to farming activities that expose and concentrate prey, such as cultivating, harvesting, and disking. During these activities, particularly late in the season, Swainson's hawks will hunt behind tractors, searching for exposed prey. Other activities, such as flood irrigation and burning, also expose prey and attract foraging Swainson's hawks.

Threats

Threats to Swainson's hawk include loss and fragmentation of foraging habitat, loss of nesting habitat, disturbance of nests, and pesticide poisoning in wintering habitat (DFG 2005).

Conversion from compatible to incompatible crop patterns reduces available foraging habitat and influences the distribution of nesting Swainson's hawks. Large regions of the Central Valley that have been converted to rice, vineyards, orchards, cotton, and other incompatible crop types support few nesting Swainson's hawks. The continued conversion of suitable agricultural landscapes (e.g., annually rotated irrigated cropland, hayfields, and pasturelands) to vineyards and other unsuitable cover types continues to reduce available foraging habitat locally and regionally.

Loss of riparian and other nesting habitat continues throughout the Central Valley from levee projects, agricultural practices, and local development along watercourses. A related issue is the loss and lack of regeneration of valley oak and other native trees. This is an ongoing problem in areas that have continued to support remnant valley oaks and oak groves. Nesting habitat continues to decline as these trees and small groves die off or are removed and not replaced through natural regeneration or replanting.

Relevant Conservation Efforts

Conservation efforts have focused on developing and implementing HCPs and natural community conservation plans. These regional conservation approaches can be an effective tool to managing and sustaining Swainson's hawk populations if sufficient suitable landscape is preserved (Estep and Teresa 1992).

Several HCPs cover Swainson's hawk, among them the Natomas Basin HCP, the San Joaquin County HCP, the South Sacramento, Yolo, and the East Contra Costa County HCP. In addition, the species is proposed for coverage in the Solano County HCP currently under development.

Western Snowy Plover

Legal Status

The western snowy plover (*Charadrius alexandrinus nivosus*) Pacific coast population is federally listed as threatened; the interior population is a California species of special concern. Critical habitat has been designated for the Pacific coast population western snowy plover; however, there is none designated in, or east of, San Francisco and San Pablo bays; therefore, there is none in the DP Planning Area.

Distribution

The Pacific coast population of western snowy plover is defined by USFWS as those individuals that nest adjacent to tidal waters of the Pacific Ocean, including all nesting birds on the mainland coast, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers (USFWS 2010b). DFG's description of the interior population of western snowy plover includes those individuals breeding in California's Central Valley. Western snowy plovers breed irregularly in the Central Valley; however, there are several historic (1960s to 1970s) and more recent (1998, 2006) extralimital breeding records from Yolo

County, including from the Yolo Bypass Wildlife Area in 2006 (Shuford et al. 2008). The western snowy plovers that occasionally breed in the Delta (i.e., estuarine) portions of the DP Planning Area meet the definitions of the Pacific coastal (USFWS) and interior (DFG) populations.

Relevant Natural History

Pacific coast plovers typically forage for small invertebrates in wet or dry beach-sand, among tide-cast kelp, and in low foredune vegetation. Some plovers use dry salt ponds and river gravel bars. The breeding season in the United States extends from March 1 through September 30, although courtship activities have been observed during February. Clutches are laid in shallow scrapes or depressions in the sand. Snowy plover chicks are precocial, leaving the nest within hours after hatching to search for food. Males attend the young until they fledge, which takes approximately 1 month. Females generally assist the male in caring for the last brood of the season. Adult plovers do not feed their chicks; rather, they lead them to suitable feeding areas (USFWS 2010b).

In the interior of California, western snowy plovers breed on flat, barren to sparsely vegetated land, often on the shores of alkaline and saline lakes, such as those found in the southern San Joaquin Valley and east of the crest of the Sierra Nevada. They will also breed next to agricultural and wastewater treatment ponds. Western snowy plover forage on terrestrial and aquatic invertebrates (Shuford et al. 2008).

Threats

Threats to western snowy plover include human-caused changes of water levels during the breeding season, elevated levels of heavy metals, and disturbance at nest sites (Shuford et al. 2008).

Relevant Conservation Efforts and Guidance

USFWS published a recovery plan for the Pacific coast population of western snowy plover in 2007.

Western yellow-billed cuckoo

Legal Status

The western yellow billed cuckoo (*Coccyzus americanus occidentalis*) is federally listed as threatened and State listed as endangered. Critical habitat has been proposed for this species but has not been formally adopted yet.

Distribution

The range of western yellow-billed cuckoo historically extended from southern British Columbia to the Rio Grande River in northern Mexico, and east to the Rocky Mountains. Currently, the only known populations of breeding western yellow-billed cuckoo are in several disjunct locations in California, Arizona, and western New Mexico. Yellow-billed cuckoos winter in South America from Venezuela to Argentina after a southern migration that extends from August to October. They migrate north in late June and early July.

Most riparian corridors in the Delta do not support sufficiently large riparian patches for cuckoo breeding; however, the species likely continues to migrate along the Sacramento River and other drainages to northern breeding sites in the Sutter Basin and Butte County.

Relevant Natural History

The yellow-billed cuckoo is a riparian obligate species. Its primary habitat association is willow-cottonwood riparian forest, but other tree species such as white alder (Alnus rhombifolia) and boxelder (Acer negundo) may be an important habitat element in some areas, including occupied sites along the Sacramento River. Nests are primarily in willow (Salix spp.) trees; however, other tree species are occasionally used, including Fremont cottonwood (Populus fremontii) and alder.

While yellow-billed cuckoos nest primarily in willow trees, Fremont cottonwood) trees are important foraging habitat, particularly as a source of insect prey. Studies indicate a highly significant association with relatively expansive stands of mature cottonwood-willow forests; however, yellow-billed cuckoos will occasionally occupy a variety of marginal habitats. Continuing habitat succession has also been identified as important in sustaining breeding populations. Meandering streams that allow for constant erosional and depositional processes create habitat for new rapidly growing young stands of willow, which create preferred nesting habitat conditions for western yellow-billed cuckoo. Lateral channel migration and point bar deposition that create new floodplains and channel bend cut-offs that create floodplain lakes are important processes that create viable western yellow-billed cuckoo habitat.

Threats

Historical declines of the western yellow-billed cuckoo are attributed to the removal of riparian forests in California for agricultural and urban expansion. Habitat loss and degradation continue to be the most significant threats to remaining populations. Habitat loss continues as a result of bank stabilization and flood control projects, urbanization along edges of watercourses, agricultural activities, and river management that alter flow and sediment regimes.

Relevant Conservation Efforts and Guidance

Efforts to protect and restore riparian systems can potentially preserve or create habitat for this species. Some regional habitat conservation planning efforts may provide protections, primarily through protection of existing occupied habitat. Western yellow-billed cuckoo is a covered species in some regional conservation plans including the approved San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, and the proposed Butte Regional Conservation Plan and Yolo County Habitat Conservation Plan/Natural Community Conservation Plan.

White-tailed Kite

Legal Status

The white-tailed kite (*Elanus leucurus*) is a fully protected species under the California Fish and Game Code Section 3511 and is protected under the federal Migratory Bird Treaty Act. Most fully protected species have also been listed as threatened or

endangered species under the State endangered species laws and regulations; however, several species, including white-tailed kite, remain only on the fully protected list. The white-tailed kite has no federal regulatory status and therefore no critical habitat has been designated for the white-tailed kite.

Distribution

The white-tailed kite is a resident of lowland areas west of the Sierra Nevada, including coastal valleys and foothills, from the head of the Sacramento Valley south to western San Diego County at the Mexico border. It is common to uncommon and a year-round resident in the Central Valley, in other lowland valleys, and along the entire length of the coast (Dunk 1995). Although white-tailed kite is probably resident through most of its breeding range, dispersal occurs during the nonbreeding season, leading to a winter range expansion that includes most of California (Dunk 1995).

White-tailed kite is distributed throughout the Delta, although relatively few nesting locations have been documented. CNDDB reports only six locations within the Delta. Recent surveys in Yolo and Sacramento counties have documented active nest sites in riparian habitats in the Yolo Bypass and along Steamboat and Georgiana sloughs and along the Sacramento River (Estep 2007; Estep 2008). Most nesting habitat for kites in the Delta consists of riparian woodlands and scrub along large and small drainages. Nesting distribution is limited by the dearth of suitable trees in much of the central Delta, and nesting density in that area is likely substantially lower than that found in the northern and southern portions of the Delta. However, overall, the species is likely underrepresented by reported occurrences throughout the Delta. Most of the Delta, including grassland, seasonal wetland, and agricultural cover types, is potential foraging habitat for kites.

Relevant Natural History

The white-tailed kite inhabits low-elevation, open grasslands, savanna-like habitats, agricultural areas, wetlands, and oak woodlands (Dunk 1995). They usually nest in trees with a dense canopy, but nest trees can vary from single, isolated trees to trees within large woodlands. Habitat elements that influence nest site selection and nesting distribution include habitat structure (usually a dense canopy) and prey abundance and availability (primarily the association with meadow vole), whereas the association with specific vegetation types (e.g., riparian, oak woodland) appears less important (Erichsen 1995; Dunk 1995).

The peak breeding season occurs from May through August but can start as early as January and may continue until October (Dunk 1995). The nest is usually placed near the top of a dense oak, willow, or other tree. Females typically lay a clutch of four eggs, with a range of three to six. The female incubates exclusively and performs most brooding while the male provisions the female and nestlings. Eggs are incubated for approximately 28 days. Young fledge in 35 to 40 days following hatching, with the peak fledging period occurring in June (Erichsen 1995).

The white-tailed kite preys mostly on voles but also takes other small, diurnal mammals and occasionally birds, insects, reptiles, and amphibians. Small mammal prey comprises 95 percent of the kite diet (Dunk 1995). It forages in undisturbed, open

grasslands, meadows, farmlands and emergent wetlands, ungrazed grasslands, fence rows and irrigation ditches adjacent to grazed lands (Dunk 1995). Cover types that appear to be preferred include alfalfa and other hay crops, irrigated pastures, and some cultivated habitats, particularly sugar beets and tomatoes, both of which can support relatively large populations of voles (DFG 1989) and that have been highly correlated with kite nest site densities (Erichsen et al. 1994). Kites also forage in dry pastures, annual grasslands, rice stubble fields, and occasionally in orchards (Erichsen 1995).

Threats

The primary threat to the white-tailed kite is habitat loss, fragmentation, and degradation (Dunk 1995). In the Central Valley, loss of nest trees and human disturbance of nest sites have degraded habitat. Although there are examples of kites nesting and roosting in urban areas, in general, the species is intolerant of noise and human activities and will abandon nesting areas that are subject to increasing levels of human disturbances. Kites are also sensitive to habitat fragmentation. Low-density urbanization or isolation of habitats, even if relatively large patches remain undisturbed, also leads to territory abandonment.

Relevant Conservation Efforts and Guidance

Few conservation efforts have been undertaken to conserve white-tailed kite populations. The lack of State or federal listing limits the extent of regulatory influence. There remain several significant data gaps regarding population status and trends, migration, dispersal from nesting sites, and other aspects of annual movements.

Protection typically occurs at the local project level pursuant to the California Environmental Quality Act. Although project-level mitigation may address protection of active sites and avoidance of take of this fully protected species, it does not address conservation or protection at a regional level.

American Peregrine Falcon

Legal Status

The American peregrine falcon (*Falco peregrines anatum*) was listed as an endangered species under both the federal Endangered Species Act and California Endangered Species Act in 1973 and 1971. The species was federally delisted 1999 and state delisted in 2009. The peregrine is still considered a state fully-protected species.

Distribution

The peregrine falcon is one of the most widely spread bird species, found on all continents except Antarctica. The subspecies breeding in California (*F. p. anatum*) is found throughout North America south of the tundra, excluding the coastal Pacific Northwest. It is an uncommon breeder in California though active nesting sites are found along the coast north of Santa Barbara, in the Sierra Nevada, and in other mountains of Northern California (DFG 2008b). During migration and in winter it is found inland throughout the Central Valley. It was more common historically throughout its range.

Relevant Natural History

The peregrine prefers areas with cliffs for nesting but has adapted to human-made structures, including bridges, buildings, and power lines and occasionally uses tree snags, cavities, or old nests of other raptors. It breeds early March to late August. For foraging it prefers open areas with good vantage points for perching, usually near water. Its prey is almost exclusively birds, primarily waterbirds and pigeons, which it typically captures in the air from a steep swift dive from above.

Threats

Beginning in the 1940s, widespread and long-term use of organochlorine pesticides in agriculture and forestry, particularly DDT in North America, caused eggshell thinning and embryo deformities in peregrine falcons. At its lowest, the population had been reduced to several hundred breeding pairs in the United States, and only two of these nested in California in 1970. One recent estimate described at least 250 pairs in California. Persistent pesticides and heavy metals including mercury and lead continue to pose a threat to populations. Collisions with structures or objects, electrified wire strikes, and degradation of habitat are other threats to the peregrine falcon.

Relevant Conservation Efforts

The Natomas Basin HCP covers the peregrine falcon.

Greater Sandhill Crane

Legal Status

The greater sandhill crane (*Grus canadensis tabida*) is State listed as threatened under CESA (California Fish and Game Code, Sections 2050 et seq.). The species was listed by the California Fish and Game Commission in 1983. The greater sandhill crane is also designated as a State fully protected species. The greater sandhill crane has no federal regulatory status. The greater sandhill crane has no federal regulatory status; therefore, no critical habitat has been designated for the species.

Distribution

The Central Valley population of greater sandhill cranes breeds in northeastern California, central and eastern Oregon, southwestern Washington, and southern British Columbia, and winters in the Central Valley of California (Littlefield and Ivey 2000). Within California, the breeding distribution is restricted to a six-county area in the northeastern corner of the State, comprising Siskiyou, Modoc, Shasta, Lassen, Plumas, and Sierra counties (Littlefield 1982; Littlefield 1989; DFG 2001).

Pogson and Lindstedt (1991) identified eight distinct wintering locations in the Central Valley from Chico/Butte Sink on the north to Pixley National Wildlife Refuge near Delano on the south, with more than 95 percent occurring within the Sacramento Valley between Butte Sink and the Delta. Use varies seasonally within this area, probably as a function of the winter flooding regime and food resources. Butte Sink has been reported to support a large segment of the population (more than 50 percent) during October and November. Greater sandhill cranes move into the Delta and Cosumnes River floodplain from the Butte Basin in October, and 3,000 to 4,000 cranes remain in the Delta region in October and November. The Delta population peaks in December and January, and an

estimated two-thirds of the population (5,000 to 6,000 cranes) resides in the Delta for the remainder of the winter (Pogson and Lindstedt 1988; Littlefield and Ivey 2000).

Populations of greater sandhill cranes have shifted over the years in response to changing agricultural patterns, particularly the increase in the number of vineyards. The islands and tracts traditionally used the most by cranes are Staten Island, Terminous Island, Canal Ranch, and New Hope Tract. Bouldin Island, Empire Tract, King Island, Grand Island, Tyler Island, Ryer Island, Brannan Island, Twitchell Island, Bradford Island, Venice Island, Manderville Island, and Webb, Holland, and Palm tracts are used by cranes occasionally to regularly (Pogson 1990; Littlefield and Ivey 2000).

The Cosumnes River floodplain, much of it protected within The Nature Conservancy's Cosumnes River Preserve, also supports substantial winter crane use. Use may have increased in this area as continued land conversion to vineyards on Delta islands has reduced habitat availability there (Littlefield and Ivey 2000).

Crane use depends entirely on agricultural crop patterns. Conversion to unsuitable crop types effectively eliminates crane habitat. Over the last two decades, a substantial amount of land on Delta islands has been converted to vineyards; this land conversion is among the most important conservation issues for greater sandhill crane (Littlefield and Ivey 2000). Several important traditionally used areas, such as portions of the Thompson-Folger Ranch along Peltier Road, have been converted to vineyards. Habitat loss from agricultural conversion and disturbances from increasing recreational activities in some areas threaten the long-term sustainability of key wintering areas for this species.

Relevant Natural History

Greater sandhill cranes are primarily birds of open freshwater wetlands. In California, nesting typically occurs in open grazed meadows. Wintering habitat is found almost entirely in agricultural fields and edges. Wintering habitat consists of three primary elements: foraging habitat, loafing habitat, and roosting habitat. Two principal types of foraging habitat are used during winter. In the Delta, harvested corn fields are the most commonly used foraging habitat along with winter wheat, alfalfa, pasture, and fallow fields (Pogson and Lindstedt 1988).

In the Butte Basin, harvested rice fields are the most commonly used foraging habitat, followed by winter wheat, harvested and unharvested corn, fallow fields, and grasslands (Pogson and Lindstedt 1988; Littlefield 2002).

Loafing generally occurs at midday when birds loosely congregate along agricultural field borders, levees, rice checks, or ditches, or in alfalfa fields or pastures. Cranes will often loaf in rocky uplands or along gravel roads where they collect grit, which is important to the cranes' digestion of grain seeds. During the late afternoon and evening, cranes begin to congregate into large, dense communal groups where they remain until the following morning. Roost sites, which provide protection from predators during the night, are typically within 2 to 3 miles of foraging and loafing areas, and thus available roosting sites are an essential component of winter habitat. Roosting habitat typically consists of shallowly flooded open fields of variable size (1 to 300 acres) or wetlands interspersed with uplands. Water depth is important and averages 4.5 inches. Littlefield (1993) reported cranes abandoning roosting sites when water depth reached 8 to 11

inches. He recommended that roost sites be a minimum of 20 acres in size with water maintained from early September to mid-March. If properly managed, roost sites are often used for many years.

Greater sandhill cranes are considered intolerant of excessive human disturbances, and the level of disturbance may play a role in habitat selection (Lovvorn and Kirkpatrick 1981).

Excessive disturbance has caused cranes to abandon foraging and roosting sites, and repeated disturbance may affect their ability to feed and store energy needed for survival. Ivey and Herziger (2003) documented disturbance of greater sandhill cranes on Staten Island, a high-use area, and found that aircraft, vehicles, hunting, and recreational activities (e.g., birding, walking, horseback riding, bicycling, boating) can cause cranes to run or fly away.

Threats

Threats to the wintering grounds of the greater sandhill crane include changes in water availability; flooding of fields for waterfowl, which reduces foraging habitat for cranes; conversion of cereal cropland to vineyards or other incompatible crop types; human disturbances; collision with power lines and other structures; disease; and urban encroachment (Littlefield and Ivey 2000).

The most important threat to wintering greater sandhill cranes is the loss of traditional winter habitat from urbanization and agricultural conversion. Although relatively limited urbanization has occurred to date within key crane areas, surrounding development and increased levels of human disturbances may threaten the long-term sustainability of important wintering lands. In the Delta region, the conversion of suitable agricultural foraging and roosting habitats to unsuitable cover types, particularly orchards and vineyards, has removed key habitats and altered the distribution and behavior of wintering greater sandhill cranes.

Greater sandhill cranes are sensitive to human presence and do not tolerate regular disturbances, including low-level recreational disturbances. Types of disturbances include hunting, birding, photography, operating equipment for habitat management, boating, and aircraft overflights. Disturbances cause birds to abandon otherwise suitable habitats, and may cause birds to deplete important energy stores they need to survive during wintering and migration. Only one predawn disruption is usually necessary before cranes abandon a site (Littlefield and Ivey 2000). Disturbance from hunting also poses a threat to cranes. Hunters who access hunting areas before dawn flush cranes from their roosts and hunter presence can keep cranes from roosting or foraging in an area (Ivey and Herziger 2003). Flooding of agricultural fields for waterfowl hunting also reduces available foraging habitat for wintering cranes.

Relevant Conservation Efforts and Guidance

Several important efforts have been made to protect and enhance wintering habitat for greater sandhill cranes. Among them is DFW's management of the Woodbridge Ecological Reserve. Purchased in 1985 specifically for management as a crane roosting

area, this site has been a traditional crane roost for decades and continues to be one of the most important roosts for this wintering population.

Management of Staten Island has also provided substantial benefit to greater sandhill cranes. The island has been managed for several decades to provide benefits to wildlife in conjunction with agricultural production. Use of the island by cranes has particularly increased since the 1980s and 1990s under the successful management of the private landowners and continues to be among the most important crane use areas in the Delta (Littlefield and Ivey 2000). In 2002, The Nature Conservancy established the Conservation Farms and Ranches Program to provide management oversight of Staten Island and to ensure long-term conservation of crane habitat on the island.

Beginning in 1984, The Nature Conservancy began acquiring lands that today encompass approximately 40,000 acres on the Cosumnes River Preserve. Portions of the preserve are managed specifically for winter crane use and have attracted up to 20 percent of the wintering population of greater sandhill cranes at certain times of the wintering season (Littlefield and Ivey 2000).

The San Joaquin County Multi-Species Conservation Program (SJMSCP) and South Sacramento HCP covers greater sandhill crane.

Bald Eagle

Legal Status

Bald eagle (*Haliaeetus leucocephalus*) is federally delisted and State listed as endangered and is a California fully protected species.

Distribution

Breeding range extends from Alaska to Florida. In the nonbreeding season, bald eagles occur generally throughout its breeding range except in the far north (e.g., northern Alaska and Canada).

Relevant Natural History

Breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds. Nests are usually in tall trees or on pinnacles or cliffs near water. The same nest may be used year after year, or a nesting pair may use alternate nest sites in successive years.

In winter, bald eagles may associate with waterfowl concentrations or congregate in areas with abundant food resources. Wintering eagles tend to avoid areas with high levels of nearby human activity.

Threats

Threats to bald eagle include collisions with wind turbines and electric utility lines, and indirect impacts such as lead poisoning from feeding off carrion that has been shot with lead bullets.

Relevant Conservation Efforts and Guidance

The bald eagle is a covered species in several HCPs; for example, PG&E's San Joaquin Valley Operations and Maintenance HCP and the Kern Water Bank HCP.

California Black Rail

Legal Status

The California black rail (*Laterallus jamaicensis coturniculus*) is listed as a threatened species under CESA. It was listed by the California Fish and Game Commission in 1971. It is also designated as a fully protected species in California. California black rail has no federal regulatory status; however, its listing status is currently under review.

Distribution

The historical range of the California black rail extended from San Francisco Bay throughout the Delta, along the coast to northern Baja California, other Southern California locales such as the Salton Sea, and along the lower Colorado River. Breeding records from early in the 20th century show California black rail populations existing on coastal marshes in San Diego, Los Angeles, and Santa Barbara counties. Loss of tidal marsh habitat has extirpated populations of California black rail from much of its coastal range, particularly in Southern California and much of the San Francisco Bay Area, since the 1950s (Zeiner et al. 1990a).

The species persists in remaining tidal marshes in the northern San Francisco Bay estuary, Tomales Bay, Bolinas Lagoon, the Delta, Morro Bay, the Salton Sea, and the lower Colorado River (Evens et al. 1991; Eddleman et al. 1994). Several small, isolated populations also still exist in southeastern California and western Arizona (Evens et al. 1991). The species has also been found more recently at several inland freshwater sites in the Sierra Nevada foothills in Butte, Yuba, and Nevada counties (Tecklin 1999; Aigner et al. 1995), and most recently in Clover Valley within the City of Rocklin, in southern Placer County (The California Black Rail Project 2006). Additional populations of California black rail have been detected recently at the Cosumnes River Preserve in south Sacramento County and Bidwell Park in Chico, Butte County (Central Valley Bird Club 2009). Additional recent unconfirmed sightings from rice fields in Butte Sink and Sutter County suggest that downslope movement from the foothill breeding population may have occurred. Evens et al. (1991) examined the relative abundance of rails at various locations within the species' range and determined that more than 80 percent of the remaining population is confined to the northern reaches of the San Francisco Bay Estuary.

Within the San Francisco Bay and Delta region, populations of California black rail are restricted primarily to the remaining tidal marshlands of the northern San Francisco Bay Estuary and the vicinity of Suisun and Napa marshes. In Suisun Marsh, California black rails have been found in high abundance at east Mallard Island and in moderate abundances at South Joice Island, Pacheco Creek, East Peyton Slough, Cutoff Island, and Southampton Bay. It is possible that a small population occurs in the vicinity of Little Honker Bay and on the north shore of Nurse Slough. California black rails were found in moderate abundances in the northern reaches of Suisun Bay in undiked marshes along the northern bank of Cutoff Slough from Beldon's Landing west to Suisun Slough.

The National Audubon Society's Important Bird Areas Program reports that most occurrences of California black rail in the Delta have been on instream islands greater than 15 acres that support marsh vegetation elevated above the high-tide and wave line (National Audubon Society 2009).

Overall, availability of Delta habitat is restricted to remnant wetland sites that are generally unavailable for agricultural uses. The small populations found in the central Delta likely represent a relatively small proportion of the San Francisco Bay and Delta region. However, those small populations that persist east of Suisun Marsh are important relative to the overall range and dispersal capabilities of the species.

Relevant Natural History

California black rails inhabit tidal saltwater, brackish, and freshwater marshes (Grinnell and Miller 1944; Zeiner et al. 1990a). A highly secretive and rarely observed bird, the California black rail appears to prefer coastal areas with tidal salt marshes dominated by dense pickleweed (*Salicornia* spp.) with an open structure below. Such locations provide a dense canopy for protective cover with nesting habitat and accessibility below the canopy (Evens and Page 1983). Rail nests consist of loosely made, deep cups either at ground level or a slightly elevated level. In tidal areas, nests are concealed in dense marsh vegetation near the upper limits of tidal flooding (Zeiner et al. 1990a). Rails are susceptible to predation by herons, egrets, northern harriers, short-eared owls, and several mammalian predators and so escape cover is critical to these birds. A dense canopy that provides optimal cover is essential for survival.

Away from coastal estuaries and salt marshes, California black rails are restricted to breeding in freshwater marshes with stands of tule, cattail, bulrush, and sedge (*Carex* spp.) (Eddleman et al. 1994). These sites are very shallow (usually less than 1 inch) but require a perennial water source. A relatively narrow range of conditions is required for occupancy and successful breeding. Water depth is an important parameter for successful nest sites because rising water levels can prevent nesting or flood nests and reduce access to foraging habitat (Eddleman et al. 1994). Too little water will lead California black rails to abandon the site until the water source is reestablished. Primary factors determining their presence are annual fluctuation in water levels and shallow water depth (less than 1 inch) (Eddleman et al. 1994; Rosenberg et al. 1991; Conway et al. 2002). No information is available on minimum patch size for the California black rail in the Central Valley and Delta region, but in the foothills of the central Sierra Nevada, rails are found in marshes ranging from 0.5 acre to 25 acres in size, with 32 percent of occupied sites in wetlands less than 0.75 acre (Tecklin 1999). The discovery of these Sierra Nevada populations suggests that the species is able to colonize isolated habitat patches (Aigner et al. 1995; Trulio and Evens 2000).

California black rails occur only in marshland, a habitat mostly destroyed or modified in the western United States since the mid-1800s (Zeiner et al. 1990a). Populations and numbers have declined and will continue to decline as loss and alteration of habitat continues. The species is currently confined to mostly pristine remnants of historical tidal marshlands, mainly along the large tributaries and shoreline of northern San Pablo Bay, along the Carquinez Strait, and throughout parts of Suisun Bay (Evens et al. 1991). The marshes of San Pablo and Suisun bays are important in that they are the

last large refuge areas for a viable population. No evidence exists that California black rails recolonize restored marshes for breeding (Evens et al. 1989).

The breeding season begins as early as February with pair formation and extends through approximately early to-mid-June. Egg-laying peaks around May 1 (Eddleman et al. 1994). The species is generally known as a medium-distance migrant that winters in Mexico and Central America; however, recently discovered inland populations in California are thought to be year-round residents. At these locations, juveniles disperse and adults relocate to other wetland breeding sites each year sometime during the nonbreeding season, between approximately August and February (Tecklin 1999).

Very little information is available on the foraging behavior of the California black rail. The species is assumed to be an opportunistic daytime feeder that forages exclusively within the wetland habitat, presumably on or near the ground at the edges of emergent vegetation. The diet consists of insects, small mollusks, amphipods, and other invertebrates, and seeds from bulrushes (*Schoenoplectus* spp.) and cattails (*Typha* spp.) (Eddleman et al. 1994).

Threats

Throughout the range of the California black rail, the species' primary threat is the loss and fragmentation of habitat from urbanization, flood control projects, agricultural practices, and hydrologic changes that affect water regimes. The most important historical threat is the draining of tidal marshes, which may be responsible for more than 90 percent of the population declines of this species.

At inland sites, agricultural practices, livestock grazing, and urbanization may threaten individual subpopulations. Use of pesticides, including those used for mosquito control programs, may also have unintended consequences for California black rails. These isolated subpopulations are also susceptible to metapopulation dynamics, including unpredictable environmental factors (Evens et al. 1991). Threats may also be posed by domestic cats and native predators as a result of hydrologic and vegetation changes that increase susceptibility to predation; pollution and its effect on freshwater marshes; and collisions with automobiles and utility lines.

Substantial data gaps relating to many aspects of the ecology of the California black rail exist: minimum patch size for successful breeding colonies, parameters of population sinks, sources of mortality, site fidelity and movement in winter, and winter diet and foraging ecology.

Relevant Conservation Efforts and Guidance

The California black rail is a covered species in several regional HCPs and natural community conservation plans, including those prepared for Butte, San Joaquin, and Yolo counties. Several management plans have outlined threats to California black rails and provided recommendations for conservation (Trulio and Evens 2000). Recommendations focus primarily on protecting high-quality habitats. However, few actual habitat protection or species conservation efforts specific to the California black rail have been undertaken to date.

The SJMSCP covers California black rail. In addition, the species is proposed for the Solano County HCP, currently under development.

Ridgway's Rail

Legal Status

Ridgway's rail (*Rallus longirostris obsoletus*) is listed as endangered under the federal ESA and CESA. Critical habitat has not been designated for this species.

Distribution

The historical distribution of Ridgway's rail in San Francisco Bay appears to have been restricted to marshes west of Suisun Bay; however, systematic survey data from the Suisun Marsh area were not available until the 1970s. Ridgway's rails have been consistently detected in the Suisun Marsh area since the 1970s, although abundance has been low. It is likely that low numbers of Ridgway's rail were present in this area before large-scale marsh reclamation.

Relevant Natural History

Throughout their distribution, Ridgway's rails occur within a range of salt and brackish marshes. In south and central San Francisco Bay and along the perimeter of San Pablo Bay, rails typically inhabit salt marshes dominated by pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*). Pacific cordgrass dominates the middle marsh zone throughout the south and central bay. In the north bay (Petaluma Marsh, Napa-Sonoma Marsh, Suisun Marsh), Ridgway's rails also inhabit tidal brackish marshes that vary significantly in vegetation structure and composition. Use of brackish marshes by Ridgway's rails is largely restricted to major sloughs and rivers of San Pablo Bay and Suisun Marsh and along Coyote Creek in south San Francisco Bay. Ridgway's rails have rarely been recorded in nontidal marsh areas (USFWS 2010d).

Rail foraging and refuge habitat encompasses the lower, middle, and high marsh zones, as well as the adjacent transitional zone. Lower and middle marsh zones provide foraging habitat at low tide. Small tidal channels with dense vegetation covering the banks provide important foraging habitat and hidden routes for travel close to nesting. Higher marsh areas (high marsh and transitional zones) with dense vegetation are used for nesting and high-tide refugia habitat. Ridgway's rails are relatively indiscriminate in their choice of nesting substrate and prefer to use the tallest cover regardless of plant in the upper-middle tidal marsh plain or high tidal marsh zones but not upland habitat transition zones bordering tidal marsh. Vegetation must be 20 inches high or greater near mean high water to allow for nest concealment and prevent tidal inundation.

Abundance of Ridgway's rails is positively correlated with channel density, and rails prefer locations with a greater number of tidal creeks, Grindelia shrubs, and higher elevations. Physical habitat characteristics critical to Ridgway's rails include marsh size, location relative to other marshes, presence of buffers or transitional zones between marshes and upland areas, marsh elevation, and hydrology.

Threats

Loss and degradation of tidal marsh habitats continues to be the most important threat to Ridgway's rail and other tidal marsh species. The loss of tidal marsh habitat through filling and diking has been largely curtailed. However, other current factors are associated with declining populations: nonnative invasive species, disturbance, environmental contaminants, sea level rise attributable to climate change, and risk of extinction attributable to vulnerability of small populations in the face of random naturally occurring events (USFWS 2010d).

Relevant Conservation Efforts and Guidance

Ridgway's rail (then referred to as the California Clapper Rail) is covered under the Tidal Marsh Ecosystem Recovery Plan (USFWS 2013).

Bank Swallow

Legal Status

The bank swallow (*Riparia riparia*) is listed as a threatened species under CESA. It was listed by the California Fish and Game Commission in 1989. The bank swallow has no federal regulatory status; therefore, no critical habitat has been designated for this species.

Distribution

The bank swallow is a neotropical migrant that winters in South America. The species forages over a wide range of land cover types and nests in bluffs or banks, usually adjacent to water.

During the breeding season the species occurs throughout the northern two-thirds of the United States, most of Canada, and into northern Alaska (Garrison 1999). Bank swallow historically occurred along the larger lowland rivers throughout California, with the exception of Southern California, where the species occurred principally along the coast and at the mouths of large rivers such as the Los Angeles River (Grinnell and Miller 1944). The current breeding range (about 50 percent of the historical range) is primarily confined to parts of the Sacramento Valley and northeastern California, including the banks of the Sacramento and Feather rivers; a few scattered colonies persist along the central and northern coast. The main stronghold of the bank swallow is along the banks of the Sacramento River and its major tributaries. This species has been documented nesting in the Delta on Brannan Island along Sevenmile Slough near its confluence with Threemile Slough, and it could occur elsewhere in the Delta.

Relevant Natural History

Foraging bank swallows take insects on the wing from over a variety of land cover types (Garrison 1999). They use holes dug in cliffs and riverbanks for cover. Bank swallows also nest in burrows that they dig in nearly vertical banks and cliff faces. For bank swallows to dig these burrows, they require substrates made up of soft soils such as fine sandy loam, loam, silt loam, and sand. Suitable banks for nesting also must be more than 3 feet above the ground or water for predator avoidance. Colonies of several to more than 3,000 bank swallows may nest at locations that have these qualities. Suitable nest sites are few and are scattered throughout the species' remaining

California range; they are found most often at coastal river mouths, large rivers (primarily in the Sacramento Valley), and occasionally in gravel and sand mines that provide and maintain nesting habitat (Grinnell and Miller 1944). Bank swallows usually initiate a single breeding attempt in April. They incubate their eggs for about 2 weeks and then care for their nestlings for another 3 weeks, until they are fledged (Garrison et al. 1999).

Threats

The greatest threat to the bank swallow has been loss of breeding sites along rivers and natural waterways resulting from conversion to concrete-lined flood control channels (in Southern California), and the application of riprap to natural riverbanks in the Central Valley. Other threats come from predators that have access to colonies, changes in gravel and sand mining operations that destroy or no longer create nesting habitat, and high spring floods that can scour out colonies along riverbanks (Garrison 1999).

Relevant Conservation Efforts and Guidance

A State recovery plan for the bank swallow was completed and adopted by the California Fish and Game Commission in 1992. The recovery plan identifies habitat preserves and a return to a natural, meandering riverine ecosystem as the two primary strategies for recovering the bank swallow. Also, California Partners in Flight has written a bird conservation plan that addresses riparian-associated birds, including bank swallow (RHJV 2004).

California Least Tern

Legal Status

California least tern (*Sternula antillarum browni*) is federally and State listed as endangered and is a California fully protected species. Critical habitat has not been designated for this species.

Distribution

The species nests from the San Francisco Bay Area south into Baja California. Most nesting sites are concentrated in Southern California (USFWS 2006d); nesting in San Francisco Bay was first confirmed in 1967. Nesting was documented in Contra Costa County in the 1980s, and there is one record from Suisun Marsh in 2006 (CNDDB 2020).

Relevant Natural History

California least tern prefers to nest on open or sparsely vegetated sandy or gravelly shores on beaches or near shallow-water estuaries, where it often feeds. Although it prefers undisturbed sites, it has reportedly also nested on landfills and paved areas (CNDDB 2020). California least tern lives along the coastline and migrates north into California to nest from April to May. When feeding, it follows schools of fish and is sometimes seen as far north as southern Oregon. California least tern feeds primarily in shallow estuaries or lagoons where small fish are abundant. Considerable feeding also takes place near shore in the open ocean (Cogswell 1977 as cited in Zeiner et al. 1990a), especially where lagoons are nearby, or at mouths of bays. Although this species is listed as endangered, its population numbers have increased from 600 pairs in 1973 to roughly 7,100 pairs in 2005, and USFWS believes it should now be relisted

as threatened (USFWS 2006d). The number of California least tern sites has nearly doubled since the time of listing. The species is known to occur in the DP Planning Area in Suisun Marsh.

Threats

Most terns rely on degraded habitat on the beaches of densely populated Southern California, where they are threatened by disturbance. Other treats include exotic plant species, which can invade barren nesting areas, and predation, including by species attracted by human disturbance, such as opossums, rats, and crows (USFWS 2006d).

Relevant Conservation Efforts and Guidance

USFWS published a recovery plan for the California least tern in 1985, but the plan is now considered outdated and has been recommended for updating (USFWS 2006d).

Least Bell's Vireo

Legal Status

The least Bell's vireo (*Vireo bellii pusillus*) is federally and State listed as endangered. Critical habitat for least Bell's vireo was designated in 1994 (59 FR 4845 to 4867, February 2, 1994). This critical habitat is located in Southern California and does not include areas in the DP Planning Area.

Distribution

Least Bell's vireo is a neotropical migrant species and is found in California and other states in the southwest and central western United States during the breeding season and during migration. Formerly, the vireo was known to breed from throughout the Sacramento and San Joaquin valleys, the Sierra Nevada foothills, and the Coast Ranges. It historically nested throughout riparian areas in the Central Valley and in other low-elevation riparian zones in California (RHJV 2004). The species was characterized as abundant at one time, but it is now absent from most of its historical range. By 1980, it was extirpated from the entire Central Valley (RHJV 2004).However, recent observations indicate that the species' range is expanding northward and that individuals are recolonizing areas that have been unoccupied by the species for decades (RHJV 2004). Least Bell's vireos successfully nested at the San Joaquin River National Wildlife Refuge in 2005 and 2006 (USFWS 2006e).

Relevant Natural History

Least Bell's vireo is a small, insectivorous bird. It feeds on a wide variety of insects by gleaning them from foliage and by catching them while hovering. This species nests in dense, low, shrubby vegetation, generally early successional stages in riparian areas, particularly cottonwood-willow forest but also brushy fields, young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brushlands, often near water in arid regions (Brown 1993).

Least Bell's vireos arrive in breeding habitats in California from mid-March to April (USFWS 1998a). Males establish and defend territories ranging in size from less than 1 acre to about 8 acres. Nest building by both members of a pair begins within several days of pair formation, and the nest takes 4 to 5 days to complete. Eggs are then laid

and incubated for approximately 2 weeks. After hatching, nestlings are fed by both parents for 10 to 12 days, until fledging. Fledglings continue to be cared for by both parents for about an additional 2 weeks and generally remain in the territory for the remainder of the season. Least Bell's vireos depart from late July until late September.

Threats

The primary threats to the least Bell's vireo are habitat loss and brood parasitism by the brown-headed cowbird (which is increased in areas with livestock) (RHJV 2004; USFWS 2006e). Threats also include habitat degradation caused by trampling of vegetation and nests by livestock and recreational activities, as well as habitat degradation resulting from the spread of invasive plans—in particular, giant reed (*Arundo donax*).

Relevant Conservation Efforts and Guidance

USFWS prepared a draft recovery plan for least Bell's vireo (USFWS 1998a). The species is also addressed in most habitat conservation and multiple species planning efforts in Southern California, including the Coachella Valley Multi-Species Habitat Conservation Plan (MSHCP), the Western Riverside MSHCP, the Camp Pendleton Resource Management Plan, and the Orange County Natural Community Conservation Plan. Recovery and management recommendations in these plans include continuing cowbird removal programs, nest monitoring for cowbird parasitism, and restoration of riparian vegetation.

E.4.5 Mammals

San Joaquin Valley (Riparian) Woodrat

Legal Status

The San Joaquin Valley (or riparian) woodrat (*Neotoma fuscipes riparia*) is federally listed as endangered and is a California species of special concern. Critical habitat has not been designated for this species. In July 2020, USFWS published a 5-year review recommending that the species remain listed as endangered (USFWS 2020d).

Distribution

Historically found along the San Joaquin, Stanislaus, and Tuolumne rivers, the San Joaquin Valley woodrat species likely occurred throughout the riparian forests of the northern San Joaquin Valley (USFWS 1998b). Its range has become much more restricted because of extensive modification and destruction of riparian habitat along streams in its former range in the Central Valley.

Relevant Natural History

The San Joaquin Valley woodrat is most abundant in areas with deciduous valley oaks and some live oaks and dense shrub cover. In riparian areas, the highest densities of woodrats and their houses are typically in willow thickets with an oak overstory. Riparian woodrats build and live in houses of sticks and other litter, the same as other populations of dusky-footed woodrats. These conical structures are commonly leaned up against the base of an oak or willow. They can also be found high up in trees, in crotches and cavities of trees, and in hollow logs. The woodrat is mostly active at night;

its diet is diverse and principally herbivorous, with leaves, fruits, twig tips, flowers, nuts, and fungi (USFWS 1998b). With their general dependence on terrestrial stick houses, riparian woodrats may be vulnerable to flooding. Although the woodrat can be arboreal and can escape flooding, its terrestrial houses, which are essential for survival, can be affected by flooding, potentially affecting population viability (USFWS 1998b).

Threats

Potential threats to the San Joaquin Valley woodrat include habitat conversion to agriculture, wildfire, disease, predation, flooding, drought, clearing of riparian vegetation, use of rodenticides, and browsing and trampling by ungulates (USFWS 1998b).

Relevant Conservation Efforts and Guidance

A recovery strategy for San Joaquin Valley woodrat was developed by USFWS and included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998b). This strategy relies on additional preservation, restoration, and enhancement of habitat, and possibly reintroduction of this woodrat to restored but unoccupied habitat. Reducing habitat fragmentation and conserving corridors of riparian habitat are important components of this strategy.

Salt Marsh Harvest Mouse

Legal Status

The salt marsh harvest mouse (*Reithrodontomys ravivenstris*) is listed as endangered under the federal ESA and CESA. It is also designated as a State fully protected species. Critical habitat has not been designated for this species.

Distribution

The historical range of the salt marsh harvest mouse likely included most of the marshland in the San Francisco Bay Area. Closely associated with saline habitats, this species' eastern distribution is generally considered to extend as far as approximately Collinsville. The waters of wetlands and marshes east of this point are considered too fresh to support the habitat of this species (USFWS 2010e). Today, the salt marsh harvest mouse potentially occupies an area representing approximately 15 percent of the historical salt marsh habitat that formerly existed in the San Francisco Bay Area (Dedrick 1989). Most remaining populations are small and separated by large areas of unsuitable habitat, the exception being habitat in Suisun Marsh, where they occur throughout suitable habitat, and the northern part of San Pablo Bay.

Reported occurrences of the salt marsh harvest mouse from within the Delta are restricted to salt and brackish tidal marshes along the northern edge of the Sacramento River and the southern edge of the San Joaquin River as far east as the vicinity of Collinsville and Antioch, west of Sherman Island. These reports are consistent with the range of the species as described by USFWS (USFWS 2010e).

Relevant Natural History

Salt marsh harvest mice depend on thick cover of native halophytes. They use pickleweed as their primary habitat as long as they have nonsubmerged, salt-tolerant vegetation for escape during the highest tides. Refuge is taken from high tides in the

upper zones of most marshes, usually in stands of fat hen and Australian salt bush (*Atriplex semibaccata*). These mice have also been found in the top zone of tidal marshes, and in transitional zones, which rarely flood (Shellhammer 1989). As a pure stand, salt grass (*Distichlis spicata*) has little habitat value for this species, though it may be advantageous as part of a component mixture (Shellhammer et al. 1982). The salt marsh harvest mouse does not use marshlands with low salinities and sparse pickleweed populations. This distinction is important, because most diked marshes within the Suisun Marsh exist where less saline conditions are encouraged to optimize habitat for waterfowl (Shellhammer et al. 1982).

Salt marsh harvest mice have shown an ability to disperse considerable distances (Geissel et al. 1988); however, they apparently do not move through unvegetated areas, and thus, fragmentation of salt marsh habitats results in limited dispersal opportunities. A corridor of suitable vegetation is required for movement and dispersal into adjacent habitats.

Threats

Loss and degradation of tidal marsh habitats continues to be the most important threat to the salt marsh harvest mouse and other tidal marsh species. Tidal marshes have been reduced by 84 percent since historical times (Dedrick 1989). The loss of tidal marsh habitat through filling and diking has been largely curtailed. However, other current factors are associated with declining populations: the conversion of salt marshes to brackish marshes by freshwater discharges from sewage treatment plants; introduction of nonnative cordgrass, bulrush, saltgrass, and other plant species; predation by nonnative red foxes and feral cats; and invasion of runoff, industrial discharges, and sewage effluent (Shellhammer et al. 1982). Probably the most important long-term issue is the predicted sea level rise of as much as 4 feet within this century.

Relevant Conservation Efforts and Guidance

The salt marsh harvest mouse is covered under the Tidal Marsh Ecosystem Recovery Plan (USFWS 2013).

Riparian Brush Rabbit

Legal Status

The riparian brush rabbit (*Sylvilagus bachmani riparius*) is listed as endangered under the federal ESA and CESA. It was initially listed as endangered by the State of California on May 29, 1994. USFWS proposed the species for listing under the federal ESA on November 21, 1997 (62 FR 62276), and reopened the proposal for further public input on April 13, 1998, to include survey data from the 1998 winter floods in its final determination on whether to list the species (63 FR 17981). USFWS issued its final determination to list the species as endangered on February 23, 2000 (65 FR 8881). In February 2020, DFW published a 5-year status review recommending no change in status for the species (DFW 2020).

Critical habitat has not been designated for this species because USFWS believed that such a designation would not provide any additional benefit beyond that provided by the

ESA listing as endangered and because the species was known to occur only within Caswell Memorial State Park (65 FR 8881, February 23, 2000).

Distribution

One of eight species of brush rabbit, the riparian brush rabbit occupies a range that is disjunct from the ranges of other brush rabbits, near sea level on the floor of the San Joaquin Valley (USFWS 1998b). Its historical distribution may have extended along portions of the San Joaquin River and its tributaries on the valley floor from at least Stanislaus County to the Delta (Orr 1935 as cited in USFWS 1998b). Populations were known to have occurred in riparian forests along the San Joaquin and Stanislaus rivers and some tributaries to the San Joaquin River on the valley floor. One population estimate within this historical range was about 110,000 individuals (USFWS 1998b).

The riparian brush rabbit is currently restricted to several populations at Caswell Memorial State Park, near Manteca in San Joaquin County, along the Stanislaus River, along Paradise Cut, a channel of the San Joaquin River in the southern part of the Delta, and a recent reintroduction on private lands adjacent to the San Joaquin River National Wildlife Refuge (Williams 1993; Williams and Basey 1986). A catastrophic flooding event in winter 1997 greatly reduced the numbers of riparian brush rabbit in Caswell Memorial State Park, spurring the development of a captive breeding and reintroduction program.

Relevant Natural History

Habitat for the riparian brush rabbit consists of riparian forests with a dense understory shrub layer. Brush rabbits have small home ranges that usually conform to the size of available brushy habitat (Basey 1990). Patch size is important and fragmentation of intact riparian forests is a major issue that restricts the species' occupancy and overall distribution. Brushy clumps smaller than 400 square yards are rarely occupied.

Flooding is a key issue for this species and is thought to be responsible for major population declines. Riparian brush rabbits are closely tied to brushy cover, rarely moving more than 3 feet from cover. Riparian brush rabbits will not cross large open areas, which limits their dispersal capabilities (USFWS 1998b). They are thus unable to disperse beyond the dense brush, making them susceptible to mortality during flood events (USFWS 1998b; Williams 1988). Riparian brush rabbits have limited ability to climb into bushes and trees. This trait probably is an important factor in the riparian brush rabbit's ability to survive, given that the riparian forests that are the species' preferred habitat are subject to inundation by periodic flooding (Chapman 1974; Williams 1988).

Riparian brush rabbits breed from January to May, a shorter breeding season than for other cottontails, which breed year-round. Riparian brush rabbits also have lower reproductive rates than other cottontail species. Five out of six rabbits do not survive to the next breeding season (USFWS 1998b).

Threats

The primary threats to the survival of the riparian brush rabbit are the limited extent of its existing habitat, extremely low numbers of individual animals, and few extant

populations. The small size of the remaining population of riparian brush rabbits, the species' behavior, and the highly limited and fragmented nature of remaining habitat restricts natural dispersal and puts the species at risk from a variety of environmental factors. The riparian brush rabbit is therefore considered at high risk of imminent extinction from several consequent threats related to population genetics, population dynamics, and environmental variability (USFWS 1998b). Specifically, populations may become more genetically homogenous because of inbreeding, causing higher vulnerability to disease and lower fitness in general. Small populations are also subject to a higher probability of extirpation from chance events, such as those related to extreme environmental conditions. Other related potential threats to this species are habitat conversion to agriculture, wildfire, disease, predation, flooding, clearing of riparian vegetation, and the use of rodenticides. The species also is at risk from the lack of elevated mounds with protective cover to serve as flood refuges within remaining riparian habitat.

Relevant Conservation Efforts and Guidance

A draft recovery plan has been prepared for upland and riparian species in the San Joaquin Valley, including the riparian brush rabbit (USFWS 1998b). The recovery plan includes three actions: establish an emergency plan and monitoring system to provide swift action to save individuals and habitat at Caswell Memorial State Park in the event of flooding, wildfire, or a disease epidemic; develop and implement a cooperative program with landowners; and reevaluate the status of the rabbit within 3 years of approval of the recovery plan.

San Joaquin Kit Fox

Legal Status

The San Joaquin kit fox (*Vulpes macrotis mutica*) is federally listed as endangered and State listed as threatened. In September 2020, USFWS published a 5-year review recommending that the species remain listed as endangered (USFWS 2020e). No critical habitat rules have been published for this species.

Distribution

Although the precise historical range of the San Joaquin kit fox is unknown, it is believed to have extended from Contra Costa and San Joaquin counties in the north to Kern County in the south and along the coast in Monterey, Santa Clara, and Santa Barbara counties. Within portions of this geographic range, the San Joaquin kit fox still occurs in seasonal wetland, alkali desert scrub, grassland, and valley-foothill hardwood vegetation. (A variety of open, level areas with loose-textured soil, scattered shrubby vegetation, and little human disturbance provide habitat.)

USFWS reports that the largest extant populations of kit foxes are in western Kern County on and around the Elk Hills and Buena Vista Valley and in San Luis Obispo County in the Carrizo Plain National Monument. Other relatively large populations have been reported from the central coast around Fort Hunter Liggett, Monterey County, and Camp Roberts, Monterey and San Luis Obispo counties. Occurrences further north are fewer and less frequent and include several in the Los Vaqueros watershed and surrounding area in Contra Costa County in the early 1990s (USFWS 1998b).

Relevant Natural History

The San Joaquin kit fox is a carnivore with a varied diet (USFWS 1998b; Zeiner et al. 1990b). Prey includes mice, ground squirrels, hares, cottontails, ground-nesting birds, and insects; these foxes also consume plant matter. The San Joaquin kit fox is active year-round and is primarily nocturnal. Its home range may be from 1 mile to several square miles, and home ranges may overlap among individuals.

Dens are used for cover. Kit foxes either dig their own dens, use those constructed by other animals, or use human-made structures (e.g., culverts, abandoned pipelines, or banks in sumps or roadbeds) (USFWS 2009). Kit foxes often change dens and may use many dens throughout the year.

Litters are born in February or March (USFWS 1998b). Pups emerge from the den after about a month. After 4 to 5 months, usually in August or September, young begin dispersing. Dispersal distances vary from several miles to much greater distances.

Threats

Loss and degradation of habitat by agricultural, industrial, and urban developments and associated practices continue, decreasing the carrying capacity of remaining habitat and threatening kit fox survival (USFWS 2009). Such losses contribute to kit fox declines through displacement, direct and indirect mortalities, barriers to movement, and reduction of prey populations. San Joaquin kit fox is also threatened by rodenticide use and by competitive displacement or predation by other species, such as the nonnative red fox (*Vulpes vulpes*), coyote (*Canis latrans*), domestic dog (*Canis familiaris*), bobcat (*Felis rufus*), and large raptors.

Relevant Conservation Efforts and Guidance

A recovery strategy for San Joaquin kit fox was developed by USFWS and was included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998b). This strategy relies on enhanced preservation and management of three core populations, and an important component of this preservation and management is sustaining and increasing habitat connectivity. Additional information on the distribution and movement of kit foxes is also a component of the recovery strategy, as is developing restoration and management prescriptions for the species. San Joaquin kit fox is a covered species under the East Contra Costa Habitat Conservation Plan and the San Joaquin County Multiple Species Conservation Plan.

USFWS has also developed recommendations for avoidance and minimization measures for implementation during ground-disturbing activities (USFWS 1999b). These measures aim to reduce effects on dens used by the San Joaquin kit fox.

E.4.6 References

Ahl, J. S. B. 1991. Factors affecting contributions of the tadpole shrimp, *Lepidurus packardi*, to its oversummering egg reserves. *Hydrobiologia* 212: 137–143.

Aigner, P., J. Tecklin, and C. Koehler. 1995. Probable breeding population of the black rail in Yuba County. *California Western Birds* 26: 157–160.

Austin, C. C., and H. B. Shaffer. 1992. Short-, medium-, and long-term repeatability of locomotor performance in the tiger salamander *Ambystoma californiense*. *Functional Ecology* 6(2): 145–153.

Babcock, K. W. 1995. Home range and habitat use of breeding Swainson's hawks in the Sacramento Valley of California. *Journal of Raptor Research* 29: 193–197.

Barry, S. J., and H. B. Shaffer. 1994. The status of the California tiger salamander (*Ambystoma californiense*) at Lagunita: a 50-year update. *Journal of Herpetology* 28: 159–164.

Basey, G. E. 1990. Distribution, Ecology, and Population Status of the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*). M.S. thesis. California State University, Stanislaus. Turlock, CA.

Beedy, E. C., S. D. Sanders, and D. Bloom. 1991. Breeding Status, Distribution, and Habitat Associations 19 of the Tricolored Blackbird (Agelaius tricolor) 1850–1989. Jones & Stokes Associates, Inc., 20 88-197. Sacramento, CA: Prepared for the U.S. Fish and Wildlife Service.

Beedy, E. C. and W. J. Hamilton, III. 1997. Tricolored Blackbird Status Update and Management Guidelines. Prepared for U.S. Fish and Wildlife Service and California Department of Fish and Game.

Brown, B. T. 1993. Bell's vireo (*Vireo bellii*). The Birds of North America Online. Edited by A. Poole. Accessed October 20, 2017. http://bna.birds.cornell.edu/bna/species/035.

Bulger, J. B., N. J. Scott Jr., and R. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs, *Rana aurora draytonii*, in coastal forests and grasslands. *Biological Conservation* 110: 85–95.

California Department of Fish and Game (DFG). 1980. *The Status of the Swainson's Hawk in California 1979*. Wildlife Management Branch, Nongame Wildlife Investigations. Job II-80.0. Sacramento, CA. Prepared by P. H. Bloom.

———. 1984. *Diurnal Raptor Eyrie Monitoring Program*. Project Report W-65-R-1, Job No. II-2.0. Nongame Wildlife Investigations. Sacramento, CA. Prepared by J. A. Estep.

———. 1989. *Biology, Movements, and Habitat Relationships of the Swainson's Hawk in the Central Valley of California, 1986–87*. Nongame Bird and Mammal Section Report. Sacramento, CA. Prepared by J. A. Estep.

———. 1994. *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California*. Sacramento, CA.

———. 2001. *Distribution of Greater Sandhill Crane Pairs in California 2000*. Sacramento, CA. Prepared by G. L. Ivey and C. P. Herziger.

———. 2005. *The Status of Rare, Threatened, and Endangered Plants and Animals in California 2000–2004*. Sacramento, CA.

———. 2007. *California Swainson's Hawk Inventory: 2005–2006*. Final report. Sacramento, CA. Prepared by D. A. Anderson, J. Dinsdale, and R. Schlorff.

———. 2008b. *Status Review of the American Peregrine Falcon (*Falco peregrinus anatum*) in California*. Wildlife Branch, Nongame Wildlife Program Report 2008-06.

California Department of Fish and Wildlife (DFW). 2020. Five-Year Status Review of Riparian Brush Rabbit (*Sylvilagus bachmani riparius*). Report to the Fish and Game Commission. Accessed October 8, 2020 https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=178638.

California Natural Diversity Database (CNDDB). 2020. Records search of plan area quadrangles. California Department of Fish and Game. Sacramento, CA.

Central Valley Bird Club. 2009. Birding Site Guide for Bidwell Park, Chico, and Cosumnes River Preserve. Accessed October 20, 2018. http://www.cvbirds.org/CVBirdsSites.htm.

Chapman, J. A. 1974. *Sylvilagus bachmani*. *Mammalian Species* 34: 1–4.

Cogswell, H. L. 1977. *Water Birds of California*. Berkeley, CA: University of California Press. Cited in Zeiner et al. 1990a.

Conway, C., C. Sulzman, and B. Raulston. 2002. *Population Trends, Distribution, and Monitoring Protocols for the California Black Rail*. Final report. Tucson, AZ: Arizona Fish and Wildlife Research Unit, University of Arizona, and Boulder City, NV: U.S. Bureau of Reclamation.

Cook, L. F. and C. A. Toft. 2005. Dynamics of Extinction: Population Decline in the Colonially Nesting Tricolored Blackbird (Agelaius tricolor). Bird Conservation International 15: 73–88.

Czech, B. 2006. Complexities of conservation: the giant garter snake. *Endangered Species Bulletin* November.

Dedrick, K. G. 1989. San Francisco Bay tidal marshland acreages: recent and historic values. Pages 383–398 in *Proceedings of the Sixth Symposium in Coastal and Ocean Management (Coastal Zone 1989)*. American Society of Engineers.

Dunk, J. R. 1995. White-tailed kite (*Elanus leucurus*). *The Birds of North America*, No. 178. Edited by A. Poole and F. Gill. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists' Union.

East Bay Regional Park District (EBRPD). 2007. *The Status of the California Tiger Salamander (*Ambystoma californiense*), California Red-Legged Frog (*Rana Draytonii*), Foothill Yellow-Legged Frog (*Rana Boylii*), and Other Aquatic Herpetofauna in the East Bay Regional Park District, California. Oakland, CA*. Prepared by S. Bobzien and J. E. DiDonato.

Eddleman, W. R., R. E. Flores, and M. L. Legare. 1994. Black rail (*Laterallus jamaicensis*). *The Birds of North America*, No. 123. Edited by A. Poole and F. Gill. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists' Union.

Eng, L. L., D. Belk, and C. H. Eriksen. 1990. Californian Anostraca: distribution, habitat, and status. *Journal of Crustacean Biology* 10: 247–277.

England, A. S., J. A. Estep, and W. R. Holt. 1995. Nest-site selection and reproductive performance of urban-nesting Swainson's hawks in the Central Valley of California. *Journal of Raptor Research* 29: 179–186.

England, A. S., M. J. Bechard, and C. S. Houston. 1997. Swainson's hawk (*Buteo swainsoni*). *The Birds of North America*, No. 265. Edited by A. Poole and F. Gill. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists' Union.

Erichsen, A. L. 1995. *The White-Tailed Kite (*Elanus leucurus*): Nesting Success and Seasonal Habitat Selection in an Agricultural Landscape*. Thesis. University of California, Davis. Davis, CA.

Erichsen, A. L., S. Smallwood, N. D. Ottum, and D. M. Fry. 1994. The white-tailed kite: GIS analysis of habitat selection in the Sacramento Valley, California, with implications for conservation of wildlife in agricultural landscapes. *Journal of Raptor Research* 28: 46.

Eriksen, C. H., and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Eureka, CA: Mad River Press.

Eriksen, C. H., and R. J. Brown. 1980. Comparative respiratory physiology and ecology of Phyllopod Crustacean. II. Anostraca. *Crustaceana* 39: 11–21.

Estep, J. A. 2007. *The Distribution, Abundance, and Habitat Associations of the Swainson's Hawk (*Buteo swainsoni*) in South Sacramento County*. Prepared by Estep Environmental Consulting for City of Elk Grove.

Estep, J. A. 2008. *The Distribution, Abundance, and Habitat Associations of the Swainson's Hawk (*Buteo swainsoni*) in Yolo County*. Prepared on behalf of Yolo Natural Heritage Program by Estep Environmental Consulting for Technology Associates International Corporation and Yolo County Habitat / Natural Community Conservation Plan JPA. March.

Estep, J. A., and S. Teresa. 1992. Regional conservation planning for the Swainson's hawk (*Buteo swainsoni*) in the Central Valley of California. *Wildlife 2001:*

Populations. Edited by D. R. McCullough and R. H. Barrett, 775–789. New York, NY: Elsevier Applied Science.

Evens, J., and G. W. Page. 1983. *The Ecology of Rail Populations at Corte Madera Ecological Preserve.* Final report to Main Audubon Society at Point Reyes Bird Observatory. Petaluma, CA.

Evens, J. G, G. W. Page, L. Stenzel, R. W. Stallcup, and R. P. Henderson. 1989. *Distribution and Relative Abundance of the California Black Rail in the Tidal Marshes of the San Francisco Bay Estuary*. Report to California Department of Fish and Game. Petaluma, CA: Point Reyes Bird Observatory.

Evens, J. G., G. W. Page, S. A. Laymon, and R. W. Stallcup. 1991. Distribution, relative abundance and status of the California black rail in western North America. *Condor* 93: 952–966.

Fellers, G. M., A. E. Launer, G. Rathbun, S. Bobzien, J. Alvarez, D. Sterner, R. B. Seymour, and M. Westphal. 2001. Overwintering tadpoles in the California red-legged frog (*Rana aurora draytonii*). *Herpetological Review* 32(3): 156–157.

Friends of the Swainson's Hawk (FOSH). 2011. Interview with Mike Bradbury answering frequently asked questions (FAQ) about Central Valley Swainson's hawk. Accessed October 20, 2017. http://www.swainsonshawk.org/FAQ.html.

Gallagher, S. P. 1996. Seasonal occurrence and habitat characteristics of some vernal pool Branchiopoda in Northern California, U.S.A. *Journal of Crustacean Biology* 16: 323–329.

Garrison, B. A. 1999. Bank swallow (*Riparia riparia*). *The Birds of North America*, No. 414. Edited by A. Poole and F. Gill. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists' Union.

Geissel, W. H., H. S. Shellhammer, and H. T. Harvey. 1988. The ecology of the salt marsh harvest mouse (*Reithrodontomys raviventris*) in a diked salt marsh. *Journal of Mammalogy* 69: 696–703.

Grinnell, J., and A. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club. *Pacific Coast Avifauna* 27.

Hansen, E. C. 2007. *Implementation of Priority 1 Recovery Tasks for the Giant Garter Snake (*Thamnophis gigas*) in Merced County, California*. Report prepared for U.S. Fish and Wildlife Service pursuant to FWS Agreement No. 802706G120. April 15.

Hansen, G. E. 1986. *Status of the Giant Garter Snake* Thamnophis couchii gigas *(Fitch) in the Southern Sacramento Valley during 1986*. Final report for California Department of Fish and Game, Standard Agreement No. C-1433.

———. 1998. *Cherokee Canal Sediment Removal Project Post-Construction Giant Garter Snake (*Thamnophis gigas*) Surveys*. Final report for California Department of Water Resources, Contract No. B-81535.

Hansen, R. W., and G. E. Hansen. 1990. *Thamnophis gigas* reproduction. *Herpetological Review* 21(4): 93–94.

Hansen, G. E., and J. M. Brode. 1993. *Results of Relocating Canal Habitat of the Giant Garter Snake (*Thamnophis gigas*) during Widening of State Route 99/70 in Sacramento and Sutter Counties, California*. Final report for Caltrans Interagency Agreement 03E325 (FG7550) (FY 87/88-91-92).

Hayes, M. P., and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): implications for management. *Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America, July 19–21, 1988*. R. C. Szaro, K. E. Severson, and D. R. Patton, technical coordinators, 144–158. U.S. Forest Service General Technical Report 166.

Helm, B. 1998. Biogeography of eight large branchiopods endemic to California. Ecology, Conservation, and Management of Vernal Pool Ecosystems. *Proceedings from a 1996 Conference*. Edited by C. W. Witham, E. Bauder, D. Belk, W. Ferren, and R. Ornduff, 124–139. Sacramento, CA: California Native Plant Society.

Herzog, S. K. 1996. Wintering Swainson's hawks in California's Sacramento–San Joaquin River Delta. *Condor* 98: 876–879.

Hunt, W. G., R. E. Jackman, T. L. Hunt, D. E. Driscoll, and L. Culp. 1998. *A Population Study of Golden Eagles in the Altamont Pass Wind Resource Area: Population Trend analysis 1997*. Report to National Renewable Energy Laboratory, Subcontract XAT-6-16459-01. Predatory Bird Research Group. University of California, Santa Cruz, CA.

Huxel, G. 2000. The effect of the Argentine ant on the threatened valley elderberry longhorn beetle. *Biological Invasions* 2: 81–85.

James, P. C. 1992. Urban-nesting of Swainson's hawks in Saskatchewan. *Condor* 94: 773–774.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game Contract #8023. Inland Fisheries Division. Rancho Cordova, CA.

King, J. L. 1996. *The Evolution of Diversity in Ephemeral Pool Crustaceans: From Genes to Communities*. Ph.D. dissertation. Department of Zoology, University of California, Davis. Davis, CA.

Kochert, M. N., K. Steenhof, C. L. Mcintyre, and E. H. Craig. 2002. Golden eagle (*Aquila chrysaetos*). *The Birds of North America*, No. 684. Edited by A. Poole and F. Gill. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists' Union.

Kyle, K. and R. Kelsey. 2011. *Results of the 2011 Tricolored Blackbird Statewide Survey*.

Littlefield, C. D. 1982. *The Status and Distribution of Greater Sandhill Cranes in California, 1981*. California Department of Fish and Game Administrative Report 82-1. Sacramento, CA.

———. 1989. *Status of Greater Sandhill Crane Breeding Populations in California, 1988*. Nongame Bird and Mammal Section Report. Sacramento, CA: California Department of Fish and Game.

———. 2002. Winter foraging habitat of greater sandhill cranes in Northern California. *Western Birds* 33: 51–60.

Littlefield, C. D., and G. L. Ivey. 2000. *Conservation Assessment for Greater Sandhill Cranes Wintering on the Cosumnes River Floodplain and Delta Regions of California*. Galt, CA: The Nature Conservancy.

Loredo, I., D. Van Vuren, and M. L. Morrison. 1996. Habitat use and migration behavior of the California tiger salamander. *Journal of Herpetology* 30: 282–285.

Lovvorn, J. R., and C. M. Kirkpatrick. 1981. Roosting behavior and habitat of migrant greater sandhill cranes. *The Journal of Wildlife Management* 45(4): 842–857.

Marty, J. T. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Conservation Biology* 19: 1626–1632.

Neff, J. A. 1937. Nesting Distribution of the Tricolored Red-Wing. Condor 39: 61–81.

Orr, R. T. 1935. Description of three new races of brush rabbit from California. Pages 27–30 in Proceedings for the Biological Society of Washington. Cited in USFWS 1998b.

Patterson, L. 2005. *Giant Garter Snake Surveys for the in-Delta Storage Program Year and Summary Report*. Sacramento, CA: California Department of Water Resources.

Patterson, L., and E. Hansen. 2002. *Giant Garter Snake Habitat Evaluations for the Delta Wetlands Islands*. Prepared for California Department of Water Resources, Sacramento, CA. November.

Pogson, T. H. 1990. *Distribution, Abundance and Behavior of Greater Sandhill Cranes (*Grus canadensis tabida*) Wintering in California's Central Valley*. Master's thesis. University of Alaska. Fairbanks, AK. September.

Pogson, T. H., and S. M. Lindstedt. 1988. *Abundance, Distribution, and Habitat of Central Valley Population Greater Sandhill Cranes during Winter*. Prepared for U.S. Fish and Wildlife Service. Portland, OR.

———. 1991. Distribution and abundance of large sandhill cranes, *Grus canadensis*, wintering in California's Central Valley. *Condor* 93: 266–278.

Pyke, C. R., and J. T. Marty. 2005. Cattle grazing mediates climate change impacts on ephemeral wetlands. *Conservation Biology* 19: 1619–1625.

RHJV (Riparian Habitat Joint Venture). 2004. *The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian Associated Birds in California*. Version 2.0. California Partners in Flight. Accessed October 20, 2017. http://www.prbo.org/calpif/pdfs/riparian_v-2.pdf.

Robins, J. D., and J. E. Vollmar. 2002. Livestock grazing and vernal pools. *Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool grasslands*. Edited by J. E. Vollmar, 401–430. Berkeley, CA: Vollmar Consulting.

Rogers, C. 2001. Revision of the nearctic Lepidurus (Notostraca). *Journal of Crustacean Biology* 21(4): 991–1006.

Rosenberg, K. V., R. D. Ohmart, W. C. Hunter, and B. W. Anderson. 1991. *The Birds of the Lower Colorado River*. Tucson, AZ: University of Arizona Press

Rossman, D. A., and G. R Stewart. 1987. Taxonomic reevaluation of *Thamnophis couchii* (Serpentes: Colubridae). *Occasional Papers of the Museum of Zoology, Louisiana State University, Baton Rouge* 63: 1–25.

Sacramento County, City of Rancho Cordova, City of Galt, Sacramento County Water Agency, and Southeast Connector Joint Powers Authority. 2018. South Sacramento Habitat Conservation Plan. February 2018. Available: https://www.southsachcp.com/sshcp-chapters---final.html

Schlorff, R., and P. H. Bloom. 1984. Importance of riparian systems to nesting Swainson's hawks in the Central Valley of California. *California Riparian Systems: Ecology, Conservation, and Productive Management*. Edited by R. E. Warner and K. M. Hendrix, 612–618. Berkeley, CA: University of California Press.

Sharp, C. S. 1902. Nesting of Swainson's hawk. *Condor* 4: 116–118.

Shellhammer, H. S. 1989. Salt marsh harvest mice, urban development, and rising sea levels. *Conservation Biology* 3(1): 59–65.

Shellhammer, H. S., R. Jackson, W. Davilla, A. M. Gilroy, H. T. Harvey, and L. Simons. 1982. Habitat preferences of salt marsh harvest mice (*Reithrodontomys raviventris*). *The Wasmann Journal of Biology* 40(1–2): 102–114.

Shuford, W. D., S. Abbot, and T. D. Ruhlen. 2008. Snowy plover (*Charadrius alexandrinus*) (interior population). *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California*. Studies of Western Birds 1. Edited by W. D. Shuford and T. Gardali. Camarillo, CA: Western Field Ornithologists and Sacramento, CA: California Department of Fish and Game.

Stebbins, R. C. 2003. *A Field Guide to Western Reptiles and Amphibians*. Third edition. New York, NY: Houghton Mifflin Company.

Storer, T. I. 1925. A synopsis of the amphibia of California. *University of California Publications in Zoology* 27: 1–342.

Swolgaard, C. A. 2003. *Nesting Density and Habitat Use of Swainson's Hawk in a Vineyard Landscape in the Northern San Joaquin Valley, California*. Master's thesis. California State University, Sacramento. Sacramento, CA.

Tecklin, J. 1999. *Distribution and Abundance of the California Black Rail (*Laterallus jamaicensis coturniculus*) in the Sacramento Valley Region with Accounts of Ecology and Call Behavior of the Subspecies*. Draft report for California Department of Fish and Game, Contract Nos. FG6154WM and FG6154-1WM.

The California Black Rail Project. 2006. *The California Black Rail Report: A Newsletter for Landowners Cooperating with the California Black Rail Study Project* 4(1).

Thorp, R. W., D. S. Horning, Jr., and L. L. Dunning. 1983. Bumble bees and cuckoo bumble bees of California. Bulletin of the California Insect Survey 23: 1-79.

Trenham, P. C., W. D. Koenig, and H. B. Shaffer. 2001. Spatially autocorrelated demography and interpond dispersal in the salamander *Ambystoma californiense*. *Ecology* 82: 3519–3530.

Tricolored Blackbird Working Group. 2007. Conservation Plan for the Tricolored Blackbird (Agelaius tricolor). Edited by Susan Kester, Sustainable Conservation, San Francisco, CA.

Trulio, L. A., and J. G. Evens. 2000. California black rail. *Goals Project. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish and Wildlife*. Edited by P. R. Olofson, 341–345. Prepared by San Francisco Bay Area Wetlands Ecosystem Goals Project. San Francisco Bay Regional Water Quality Control Board. Oakland, CA.

U.S. Fish and Wildlife Service (USFWS). 1984. *Valley Elderberry Longhorn Beetle Recovery Plan*. Portland, OR.

———. 1991. *The Distribution, Habitat, and Status of the Valley Elderberry Longhorn Beetle* Desmocerus californicus dimorphus *Fisher (Insecta: Coleoptera: Cerambycidae)*. Sacramento, CA. Prepared by C. B. Barr.

———. 1998a. *Draft Recovery Plan for Least Bell's vireo (*Vireo bellii pusillus*)*. Region 1. Portland, OR.

———. 1998b. *Recovery Plan for Upland Species of the San Joaquin Valley, California*. Region 1. Portland, OR.

———. 2002. *Recovery Plan for the California Red-Legged Frog (*Rana aurora [draytonii*]).* Region 1. Portland, OR.

———. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*.

———. 2006a. *Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) 5-Year Review: Summary and Evaluation*. Sacramento, CA.

———. 2006b. *Giant Garter Snake (*Thamnophis gigas*) 5-Year Review: Summary and Evaluation*. Sacramento, CA.

———. 2006c. *Species Account: Giant Garter Snake (*Thamnophis gigas*)*. Sacramento Fish and Wildlife Office. Sacramento, CA.

———. 2006d. *California Least Tern (*Sternula antillarum browni*) Five Year Review: Summary and Evaluation*. Carlsbad, CA. September.

———. 2006e. *Least Bell's Vireo (*Vireo bellii pusillus*) 5-Year Review: Status and Evaluation*. Carlsbad, CA.

———. 2007a. *Conservancy Fairy Shrimp,* Brachinecta conservatio, *5-Year Review*. Accessed October 20, 2017. https://ecos.fws.gov/docs/five_year_review/doc1148.pdf.

———. 2007b. *Longhorn Fairy Shrimp,* Brachinecta longiantenna, *5-Year Review.* Accessed October 20, 2017. https://www.fws.gov/cno/es/images/graphics/longhorn%20fs_5-yearreview_cno%20final%2025sept07.pdf.

———. 2007c. *Vernal Pool Tadpole Shrimp,* Lepidurus packardi, *5-Year Review*. Accessed October 20, 2017. https://www.fws.gov/cno/es/images/Graphics/VP%20Tadpole%20Shrimp_5%20yr%20review%20FINAL%20CNO%2027Sept07.pdf.

———. 2008. *Lange's Metalmark Butterfly Species Account*. Last updated September 15, 2008. Sacramento Fish and Wildlife Office. Sacramento, CA.

———. 2009. *Species Account: San Joaquin Kit Fox,* Vulpes macrotis mutica*.* Accessed October 20, 2017. https://ecos.fws.gov/ecp/species/2873.

———. 2010b. *Western Snowy Plover,* Charadrius alexandrinus nivosus. Endangered Species Division, Sacramento Fish and Wildlife Office. Sacramento, CA. Accessed October 20, 2017. http://www.fws.gov/arcata/es/birds/WSP/plover.html.

———. 2010d. *Species Account: California Clapper Rail,* Rallus longirostris obsoletus*.* Site updated October 20, 2017. Accessed March 8, 2010. https://ecos.fws.gov/ecp/species/4240.

———. 2010e. *Salt Marsh Harvest Mouse,* Reithrodontomys raviventris*.* Endangered Species Division, Sacramento Fish and Wildlife Office, Sacramento, CA.

———. 2012a. *Conservancy Fairy Shrimp,* Brachinecta conservatio, *5-Year Review*. Accessed April 14, 2017. https://ecos.fws.gov/docs/five_year_review/doc4012.pdf.

———. 2012b. *Longhorn Fairy Shrimp,* Brachinecta longiantenna, *5-Year Review.* Accessed April 14, 2017 https://ecos.fws.gov/docs/five_year_review/doc4011.pdf.

———. 2013. *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California*. Accessed April 13, 2017. https://www.fws.gov/sfbaydelta/documents/tidal_marsh_recovery_plan_v1.pdf.

———. 2015. Revised *Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*).* Sacramento, CA.

———. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense). Pacific Southwest Region, Sacramento, California.

———. 2020a. Federal Endangered and Threatened Species That Occur in or May Be Affected by Projects in the Sacramento/San Joaquin Delta. Sacramento Fish & Wildlife Office. Sacramento, CA. Accessed October 12, 2020.

———. 2020b. Federal Endangered and Threatened Species That Occur in or May Be Affected by Projects in the Sacramento/San Joaquin Delta. San Francisco Fish & Wildlife Office. San Francisco, CA. Accessed October 12, 2020.

———. 2020c. Giant Gartersnake (*Thamnophis gigas*)*, 5-Year Review.* Accessed October 8, 2020 https://ecos.fws.gov/docs/five_year_review/doc6423.pdf.

———. 2020d. Riparian Woodrat (Neotoma fuscipes riparia), *5-Year Review.* Accessed October 8, 2020 https://ecos.fws.gov/docs/five_year_review/doc6443.pdf.

———. 2020e. San Joaquin kit fox (*Vulpes macrotis mutica*), *5-Year Review.* Accessed October 8, 2020 https://ecos.fws.gov/docs/five_year_review/doc6647.pdf.

U.S. Fish and Wildlife Service and California Department of Fish and Game (USFWS and DFG). 2003. *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander*. USFWS California/Nevada Operations Office and DFG Office of the Director. October.

Williams, D. F. 1988. *Ecology and Management of the Riparian Brush Rabbit in Caswell Memorial State Park*. Final report. Interagency Agreement 4-305-6108. Lodi, CA: California Department of Parks and Recreation.

———. 1993. *Population Censuses of Riparian Brush Rabbits and Riparian Woodrats at Caswell Memorial State Park during January 1993*. Final report. Lodi, CA: California Department of Parks and Recreation.

Williams, D. F., and G. E. Basey. 1986. *Population Status of the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)*. Sacramento, CA: California Department of Fish and Game, Wildlife Management Division, Nongame Bird and Mammal Section Report.

Wylie, G. D., and M. Amarello. 2006. *Results of 2006 Monitoring for Giant Garter Snakes (*Thamnophis gigas*) for the Bank Protection Project on the Left Bank of the Colusa Basin Drainage Canal in Reclamation District 108, Sacramento Riverbank Protection Project, Phase II*. Dixon, CA: U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station. December.

Wylie, G. D., M. L. Casazza, and J. K. Daugherty. 1997. *1996 Progress Report for the Giant Garter Snake Study*. Preliminary report. Washington, DC: U.S. Geological Survey, Biological Resources Division.

Wylie, G. D., M. L. Casazza, and L. Martin. 2004. *Monitoring Giant Garter Snakes in the Natomas Basin: 2003 Results*. Dixon, CA: U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station. January.

Wylie, G. D., M. L. Casazza, and M. Carpenter. 2003. Diet of bullfrogs in relation to predation on giant garter snakes at Colusa National Wildlife Refuge. *California Fish and Game* 89(3): 139–145.

Xerces Society. 2018. A Petittion to the State of California Fish and Game Commission to List the Crotch bumble bee (*Bombus crotchii*), Franklin's bumble bee (*Bombus franklini*), Suckley cuckoo bumble bee (*Bombus suckleyi*), and western bumble bee (*Bombus occidentalis occidentalis*) as Endangered under the California Endagnered Species Act. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161902&inline.

Yolo Habitat Conservancy. Yolo Habitat Conservation Plan/Natural Community Conservation Plan. Prepared by ICF. April 2018. Available: https://www.yolohabitatconservancy.org/documents.

Zeiner, D. C., W. F. Laudenslayer, K. E. Mayer, and M. White (eds.). 1990a. *California's Wildlife, Volume II: Birds.* Sacramento, CA: California Department of Fish and Game, California Statewide Wildlife Habitat Relationships System.

———. 1990b. *California's Wildlife, Volume III: Mammals.* Sacramento, CA: California Department of Fish and Game, California Statewide Wildlife Habitat.

This page intentionally left blank