Appendix L

Biological Resources – Vegetation and Wildlife

Draft
Program Environmental Impact Statement/Report

Draft
April 2011

Attachments

Exhibits

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Attachment

Scientific and Common Names of Plant Species

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Biological Resources – Vegetation and Wildlife Appendix

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Table 1 Scientific and Common Names of Plant Species	
Scientific Name	Common Name
Acer negundo ssp. *californica*	California box elder
Ailanthus altissima	**Tree-of-heaven**
Allenrolfea occidentalis	Iodine bush
Alnus rhombifolia	White alder
Artemisia douglasiana	Mugwort
Arundo donax	**Giant reed**
Astragalus tener var. *tener*	Alkali milk-vetch
Atriplex cordulata	Heartscale
Atriplex depressa	Brittlescale
Atriplex minuscula	Lesser saltscale
Atriplex persistens	Vernal pool smallscale
Atriplex subtilis	Subtle orache
Atriplex vallicola	Lost Hills crownscale
Bromus diandrus	**Ripgut brome**
Bromus madritensis* ssp. *rubens	**Mediterranean barley and red brome**
Calycanthus occidentalis	Spice bush
Carex barbarae	Santa Barbara sedge
Carpenteria californica	Tree anemone
Castilleja campestris ssp. *succulenta*	Succulent owl's-clover
Catalpa bignonioides	**Catalpa**
***Centaurea* spp.**	**Star thistle**
Cephalanthus occidentalis var. *californicus*	California buttonbush
Chamaesyce hooveri	Hoover's spurge
Cirsium hydrophilum var. *hydrophilum*	Suisun thistle
Cirsium vulgare	**Bull thistle**
Conyza canadensis	Horseweed
Cordylanthus mollis ssp. *hispidus*	Hispid bird's-beak
Cordylanthus mollis ssp. *mollis*	Soft bird's-beak
***Cortaderia* sp.**	**Pampas grass**
Cynodon dactylon	**Bermuda grass**
Delphinium recurvatum	Recurved larkspur
Distichlis spicata	Saltgrass
Eichhornia crassipes	**Water hyacinth**
Elaeagnus angustifolia	**Russian olive**
Eleocharis quadrangulata	Four-angled spikerush

Table 1 Scientific and Common Names of Plant Species (cont'd)	
Epilobium brachycarpum	Panicled willow herb
Epilobium spp.	Willow herb
Erodium cicutarium	**Red-stemmed filaree**
Erodium macrophyllum	Round-leaved filaree
Eryngium racemosum	Delta button-celery
Eryngium spinosepalum	Spiny-sepaled button-celery
Eucalyptus globulus	**Blue gum**
Euthamia occidentalis	Western goldenrod
Ficus carica	**Edible fig**
Fraxinus latifolia	Oregon ash
Gratiola heterosepala	Bogg's Lake hedge-hyssop
Helianthus sp.	Sunflower
Hordeum marinum* ssp. *gussoneanum	**Mediterranean barley**
Hordeum murinum* ssp. *leporinum	**Foxtail barley**
Imperata brevifolia	California satintail
Juncus mexicanus	Mexican rush
Layia munzii	Munz' tidy-tips
Lepidium latifolium	**Perennial pepperweed**
Leptosiphon serrulatus	Madera leptosiphon
Leymus triticoides	Creeping wildrye
Limnobium spongia	**Sponge plant**
Ludwigia hexapetala	**Water primrose**
Lupinus spp.	Lupines
Melia azedarach	**Chinaberry**
Morus alba	**White mulberry**
Myriophyllum aquaticum	**Parrot feather**
Myriophyllum spicatum	**Water milfoil**
Navarretia prostrata	Prostrate navarretia
Neostapfia colusana	Colusa grass
Nicotiana glauca	**Tree tobacco**
Orcuttia inaequalis	San Joaquin Orcutt grass
Orcuttia pilosa	Hairy Orcutt grass
Pinus contorta ssp. *murrayana*	Lodgepole pine
Pinus ponderosa	Ponderosa pine
Pinus sabiniana	Foothill pine
Platanus racemosa	Western sycamore

Table 1 Scientific and Common Names of Plant Species (cont'd)	
Polygonum spp.	Smartweed
Populus fremontii	Fremont cottonwood
Populus nigra* var. *italiana	**Lombardy poplar**
Potamogeton crispus	**Curly leaf pond weed**
Potamogeton filiformis	Slender-leaved pondweed
Pseudobahia bahiifolia	Hartweg's pseudobahia
Quercus douglasii	Blue oak
Quercus lobata	Valley oak
Quercus wislizeni	Interior live oak
Ricinus communis	**Castor bean**
Rosa californica	California wild rose
Rubus armeniacus (= R. discolor)	**Himalayan blackberry**
Rubus ursinus	California blackberry
Rumex crispus	**Curly dock**
Sagittaria sanfordii	Sanford's arrowhead
Salix exigua	Narrow-leaved willow
Salix gooddingii	Goodding's black willow
Salix laevigata	Red willow
Salix lasiolepis	Arroyo willow
Salix spp.	Willow
Sambucus nigra ssp. *caerulea (= S. mexicana)*	Blue elderberry
Sapium sebiferum	**Chinese tallow**
Scirpus (= Schoenoplectus) acutus var. *occidentalis*	Tule
Sesbania punicea	**Red sesbania**
Sporobolus airoides	Alkali sacaton
Suaeda spp.	Seablite
***Tamarix* sp.**	**Salt cedar**
Trichocoronis wrightii	Wright's trichocoronis
Tropidocarpum capparideum	Caper-fruited tropidocarpum
Typha spp.	Cattail
Urtica dioica	**Stinging nettle**
Vitis californica	Wild grape
Vulpia myuros	**Foxtail fescue**
Xanthium strumarium	Cocklebur

Note: Bold font indicates species is nonnative.

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Attachment

Scientific and Common Names of Animal Species

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Table 2. Scientific and Common Names of Animal Species	
Scientific Name	**Common Name**
Invertebrates	
Branchinecta conservatio	Conservancy fairy shrimp
Branchinecta longiantenna	Longhorn fairy shrimp
Branchinecta lynchi	Vernal pool fairy shrimp
Corbicula fluminea	Asian clam
Dreissena polymorpha	Zebra mussels
Dreissena rostriformis bugensis	Quagga mussels
Eriocheir sinensis	Chinese mitten crab
Lepidurus packardi	Vernal pool tadpole shrimp
Potamopyrgus antipodarum	New Zealand mud snail
Amphibians and Reptiles	
Actinemys marmorata	Western pond turtle
Ambystoma californiense	California tiger salamander
Anniella pulchra	Silvery legless lizard
Bufeo boreas	western toad
Coluber constrictor mormon	Western racer
Gambelia sila	Blunt-nosed leopard lizard
Masticophis flagellum ruddocki	San Joaquin whipsnake
Pituophis catenifer	Gopher snake
Pseudacris regilla	Pacific chorus frog
Rana catesbeiana	Bullfrog
Rana draytonii	California red-legged frog
Sceloporus occidentalis	Western fence lizard
Spea hammondii	Western spadefoot
Thamnophis elegans	Western terrestrial garter snake
Thamnophis gigas	Giant garter snake
Trachemys scripta elegans	Red-eared slider
Uta stansburiana	Side-blotched lizard
Birds	
Agelaius phoeniceus	Red-winged blackbird
Agelaius tricolor	Tricolored blackbird
Aix sponsa	Wood duck
Ammodramus savannarum	Grasshopper sparrow
Anas platyrhychos	Mallard
Aquila chrysaetos	Golden eagle
Ardea alba	Great egret
Ardea herodias	Great blue heron
Asio flammeus	Short-eared owl
Athene cunicularia	Burrowing owl
Aythya americana	Redhead
Baeolophus inornatus	Oak titmouse
Buteo jamaicensis	Red-tailed hawk
Buteo lineatus	Red-shouldered hawk

Table 2. Scientific and Common Names of Animal Species (cont'd)	
Buteo swainsonii	Swainson's hawk
Cardeulis tristis	American goldfinch
Charadrius montanus	Mountain plover
Charadrius vociferus	Killdeer
Chen rossii	Ross's goose
Cistothorus palustris	Marsh wren
Circus cyaneus	Northern harrier
Coccyzus americanus occidentalis	Western yellow-billed cuckoo
Colaptes auratus	Northern flicker
Contopus cooperi	Olive-sided flycatcher
Contopus sordidulus	Western wood-pewee
Corvus brachyrhynchos	American crow
Dendroica petechia	Yellow warbler
Elanus leucurus	White-tailed kite
Epidonax difficilis	Pacific-slope flycatcher
Eremophilia alpestris	Horned lark
Euphagus cyanocephalus	Brewer's blackbird
Falco peregrines anatum	American peregrine falcon
Geothlypis trichas	Common yellowthroat
Grus canadensis canadensis	Lesser sandhill crane
Grus canadensis tabida	Greater sandhill crane
Haliaeetus leucocephalus	Bald eagle
Icterus bulockii	Bullock's oriole
Ixobrychus exilis	Least bittern
Lanius ludovicianus	Loggerhead shrike
Melospiza melodia	Song sparrow
Myiarchus cinerascens	Ash-throated flycatcher
Passerculus sandwichensis	Savannah sparrow
Passerina amoena	Lazuli bunting
Passerina caerulea	Blue grosbeak
Phalacrocorax auritus	Double-crested cormorant
Phasianus colchicus	Ring-necked pheasant
Pica nuttalli	Yellow-billed magpie
Picoides pubescens	Downy woodpecker
Pipilo maculatus	Spotted towhee
Psaltriparus minimus	Bushtit
Riparia riparia	Bank swallow
Sayornis nigricans	Black phoebe
Sitta carolinensis	White-breasted nuthatch
Strix occidentalis occidentalis	California spotted owl
Sturnus vulgaris	European starling
Tachycineta bicolor	Tree swallow
Thryomanes bewickii	Bewick's wren
Vermivora celata	Orange-crowned warbler

Table 2. Scientific and Common Names of Animal Species (cont'd)	
Zenaida macroura	Mourning dove
Vireo bellii pusillus	Least bell's vireo
Vireo gilvus	Warbling vireo
Xanthocephalus xanthocephalus	Yellow-headed blackbird
Mammals	
Ammospermophilus nelsoni	Nelson's (San Joaquin) antelope squirrel
Antrozous pallidus	Pallid bat
Bassariscus astutus	Ringtail
Canis latrans	Coyote
Corynorhynus townsendii	Townsend's big-eared bat
Dipodomys nitratoides exilis	Fresno kangaroo rat
Dipodomys spp.	Kangaroo rats
Euderma maculatum	Spotted bat
Eumops perotis californicus	Western (California) mastiff bat
Lasiurus blossevillii	Western red bat
Lontra canadensis	River otter
Mephitis mephitis	Striped skunk
Microtus californicus	California vole
Neotoma fuscipes riparia	Riparian (San Joaquin) woodrat
Ondatra zibethicus	Common muskrat
Peromyscus maniculatus	Deer mouse
Procyon lotor	Raccoon
Rattus norvegicus	Norway rat
Spermophilus beecheyi	California ground squirrel
Sylvilagus audobonii	Desert cottontail
Sylvilagus bachmani riparius	Riparian brush rabbit
Taxidea taxus	American badger
Thomomys bottae	Botta's pocket gopher
Vulpes macrotis mutica	San Joaquin kit fox

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Attachment

CNDDB Wide Tabular Report

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California Department of Fish and Game
Natural Diversity Database
CNDDB Wide Tabular Report
Arena,Biola,BlissRch,BroadviewF,DeltaRch,Firebaugh,FirebaughNE,FresnoN,Friant,GravellyFord,Gregg,Gustine,Herndon,Ingomar,Jamesan,LanesBrg,LtlTableMtn,Madera,MendotaDam,MillertonLakeW,MillertonLakeE,
Newman,Oxalis,PosoFarm,SanLuisRch,SandyMush,SantaRitaBrg,Stevinson,Tranquility,TurnerRch

Name (Scientific/Common)	CNDDB Ranks	Other Lists	Listing Status	Total EO's	Element Occ Ranks A	B	C	D	X	U	Population Status Historic >20 yr	Recent <=20 yr	Presence Pres. Extant	Poss. Extirp.	Extirp.
Actinemys marmorata western pond turtle	G3G4 S3	CDFG: SC	Fed: None Cal: None	355 S:27	4	17	1	0	0	5	4	23	27	0	0
Agelaius tricolor tricolored blackbird	G2G3 S2	CDFG: SC	Fed: None Cal: None	424 S:29	4	1	1	0	4	19	14	15	25	0	4
Ambystoma californiense California tiger salamander	G2G3 S2S3	CDFG: SC	Fed: Threatened Cal: None	1002 S:56	5	11	3	2	4	31	14	42	52	1	3
Ammospermophilus nelsoni Nelson's antelope squirrel	G2 S2	CDFG:	Fed: None Cal: Threatened	253 S:2	0	0	0	0	0	2	2	0	2	0	0
Anniella pulchra pulchra silvery legless lizard	G3G4T3T4Q S3	CDFG: SC	Fed: None Cal: None	46 S:2	0	0	1	1	0	0	0	2	2	0	0
Antrozous pallidus pallid bat	G5 S3	CDFG: SC	Fed: None Cal: None	398 S:2	0	0	0	0	0	2	1	1	2	0	0
Aquila chrysaetos golden eagle	G5 S3	CDFG:	Fed: None Cal: None	116 S:1	0	0	0	0	0	1	1	0	1	0	0
Ardea alba great egret	G5 S4	CDFG:	Fed: None Cal: None	34 S:1	0	0	0	0	0	1	1	0	1	0	0
Ardea herodias great blue heron	G5 S4	CDFG:	Fed: None Cal: None	131 S:1	0	0	0	0	0	1	1	0	1	0	0
Astragalus tener var. tener alkali milk-vetch	G1T1 S1.1	CNPS: 1B.2	Fed: None Cal: None	66 S:9	0	4	0	1	0	4	2	7	9	0	0
Athene cunicularia burrowing owl	G4 S2	CDFG: SC	Fed: None Cal: None	1182 S:11	2	1	3	2	1	2	3	8	10	1	0
Atriplex cordulata heartscale	G2? S2.2?	CNPS: 1B.2	Fed: None Cal: None	58 S:21	2	3	1	0	1	14	9	12	20	0	1
Atriplex depressa brittlescale	G2Q S2.2	CNPS: 1B.2	Fed: None Cal: None	52 S:7	0	4	0	0	0	3	1	6	7	0	0
Atriplex joaquiniana San Joaquin spearscale	G2 S2.1	CNPS: 1B.2	Fed: None Cal: None	91 S:3	0	1	0	0	0	2	2	1	3	0	0

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Atriplex minuscula lesser saltscale	G1 S1.1	CNPS: 1B.1	Fed: None Cal: None	27 S:11	3	3	1	0	0	4	3	8	11	0	0
Atriplex persistens vernal pool smallscale	G2 S2.2	CNPS: 1B.2	Fed: None Cal: None	33 S:11	1	2	0	0	0	8	1	10	11	0	0
Atriplex subtilis subtle orache	G2 S2.2	CNPS: 1B.2	Fed: None Cal: None	24 S:7	2	0	0	0	0	5	4	3	7	0	0
Atriplex vallicola Lost Hills crownscale	G1 S1.1	CNPS: 1B.2	Fed: None Cal: None	57 S:2	0	0	0	0	0	2	2	0	2	0	0
Branchinecta conservatio Conservancy fairy shrimp	G1 S1	CDFG:	Fed: Endangered Cal: None	29 S:4	0	1	0	0	0	3	0	4	4	0	0
Branchinecta longiantenna longhorn fairy shrimp	G1 S1	CDFG:	Fed: Endangered Cal: None	11 S:2	0	0	0	0	0	2	0	2	2	0	0
Branchinecta lynchi vernal pool fairy shrimp	G3 S2S3	CDFG:	Fed: Threatened Cal: None	595 S:49	6	11	5	3	0	24	0	49	49	0	0
Branchinecta mesovallensis midvalley fairy shrimp	G2 S2	CDFG:	Fed: None Cal: None	99 S:4	1	0	0	0	0	3	1	3	4	0	0
Branta hutchinsii leucopareia cackling (=Aleutian Canada) goose	G5T4 S2	CDFG:	Fed: Delisted Cal: None	19 S:3	0	0	0	0	0	3	3	0	3	0	0
Buteo swainsoni Swainson's hawk	G5 S2	CDFG:	Fed: None Cal: Threatened	1677 S:55	6	19	4	1	1	24	20	35	54	1	0
Calicina mesaensis Table Mountain harvestman	G1 S1	CDFG:	Fed: None Cal: None	1	0	0	0	0	0	1	1	0	1	0	0
Carpenteria californica tree-anemone	G2 S2.2	CNPS: 1B.2	Fed: None Cal: Threatened	12 S:2	1	1	0	0	0	0	0	2	2	0	0
Castilleja campestris ssp. succulenta succulent owl's-clover	G4?T2 S2.2	CNPS: 1B.2	Fed: Threatened Cal: Endangered	88 S:17	6	2	2	2	1	4	3	14	16	1	0
Caulanthus californicus California jewel-flower	G1 S1.1	CNPS: 1B.1	Fed: Endangered Cal: Endangered	63 S:1	0	0	0	0	1	0	1	0	0	0	1

Arena,Biola,BlissRch,BroadviewF,DeltaRch,Firebaugh,FirebaughNE,FresnoN,Friant,GravellyFord,Gregg,Gustine,Herndon,Ingomar,Jamesan,LanesBrg,LtlTableMtn,Madera,MendotaDam,MillertonLakeW,MillertonLakeE, Newman,Oxalis,PosoFarm,SanLuisRch,SandyMush,SantaRitaBrg,Stevinson,Tranquility,TurnerRch

Name (Scientific/Common)	CNDDB Ranks	Other Lists	Listing Status	Total EO's	Element Occ Ranks A	B	C	D	X	U	Population Status Historic >20 yr	Recent <=20 yr	Presence Pres. Extant	Poss. Extirp.	Extirp.
Chamaesyce hooveri Hoover's spurge	G2 S2.1	CNPS: 1B.2	Fed: Threatened Cal: None	29 S:1	1	0	0	0	0	0	1	0	1	0	0
Charadrius montanus mountain plover	G2 S2?	CDFG: SC	Fed: None Cal: None	40 S:3	0	2	1	0	0	0	0	3	3	0	0
Circus cyaneus northern harrier	G5 S3	CDFG: SC	Fed: None Cal: None	42 S:4	2	1	0	0	0	1	1	3	4	0	0
Cismontane Alkali Marsh	G1 S1.1		Fed: None Cal: None	4 S:2	0	0	0	0	0	2	2	0	2	0	0
Coastal and Valley Freshwater Marsh	G3 S2.1		Fed: None Cal: None	60 S:3	0	0	0	0	0	3	3	0	3	0	0
Coccyzus americanus occidentalis western yellow-billed cuckoo	G5T3Q S1	CDFG:	Fed: Candidate Cal: Endangered	112 S:1	0	0	0	0	1	0	1	0	0	1	0
Cordylanthus mollis ssp. hispidus hispid bird's-beak	G2T2 S2.1	CNPS: 1B.1	Fed: None Cal: None	29 S:16	4	2	2	0	0	8	11	5	16	0	0
Cordylanthus palmatus palmate-bracted bird's-beak	G1 S1.1	CNPS: 1B.1	Fed: Endangered Cal: Endangered	24 S:8	0	6	0	0	2	0	2	6	6	1	1
Cryptantha hooveri Hoover's cryptantha	GH SH	CNPS: 1A	Fed: None Cal: None	3 S:1	0	0	0	0	0	1	1	0	1	0	0
Delphinium recurvatum recurved larkspur	G2 S2.2	CNPS: 1B.2	Fed: None Cal: None	79 S:6	0	0	1	0	1	4	2	4	5	1	0
Desmocerus californicus dimorphus valley elderberry longhorn beetle	G3T2 S2	CDFG:	Fed: Threatened Cal: None	201 S:4	1	1	1	0	0	1	1	3	4	0	0
Dipodomys nitratoides exilis Fresno kangaroo rat	G3T1 S1	CDFG:	Fed: Endangered Cal: Endangered	12 S:5	0	0	0	0	4	1	4	1	1	3	1
Downingia pusilla dwarf downingia	G3 S3.1	CNPS: 2.2	Fed: None Cal: None	117 S:1	0	0	0	0	0	1	1	0	1	0	0
Efferia antiochi Antioch efferian robberfly	G1G3 S1S3	CDFG:	Fed: None Cal: None	4 S:2	0	0	0	0	0	2	2	0	2	0	0

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Eremophila alpestris actia California horned lark	G5T3Q S3	CDFG:	Fed: None Cal: None	75 S:3	0	0	0	1	0	2	0	3	3	0	0
Eriastrum hooveri Hoover's eriastrum	G3 S3.2	CNPS: 4.2	Fed: Delisted Cal: None	47 S:4	0	1	2	0	1	0	4	0	3	0	1
Eryngium racemosum Delta button-celery	G2Q S2.1	CNPS: 1B.1	Fed: None Cal: Endangered	26 S:17	3	5	2	0	0	7	12	5	17	0	0
Eryngium spinosepalum spiny-sepaled button-celery	G2 S2.2	CNPS: 1B.2	Fed: None Cal: None	60 S:4	1	1	0	0	0	2	2	2	4	0	0
Euderma maculatum spotted bat	G4 S2S3	CDFG: SC	Fed: None Cal: None	68 S:1	0	0	0	0	0	1	1	0	1	0	0
Eumops perotis californicus western mastiff bat	G5T4 S3?	CDFG: SC	Fed: None Cal: None	293 S:10	0	0	1	0	0	9	2	8	10	0	0
Falco columbarius merlin	G5 S3	CDFG:	Fed: None Cal: None	25 S:1	0	1	0	0	0	0	0	1	1	0	0
Falco mexicanus prairie falcon	G5 S3	CDFG:	Fed: None Cal: None	456 S:1	0	0	0	0	0	1	1	0	1	0	0
Gambelia sila blunt-nosed leopard lizard	G1 S1	CDFG:	Fed: Endangered Cal: Endangered	301 S:30	0	0	1	0	0	29	13	17	30	0	0
Gratiola heterosepala Boggs Lake hedge-hyssop	G3 S3.1	CNPS: 1B.2	Fed: None Cal: Endangered	87 S:6	2	0	1	0	0	3	2	4	6	0	0
Great Valley Mixed Riparian Forest	G2 S2.2		Fed: None Cal: None	68 S:1	0	0	0	0	0	1	1	0	1	0	0
Imperata brevifolia California satintail	G2 S2.1	CNPS: 2.1	Fed: None Cal: None	27 S:1	0	0	0	0	0	1	1	0	1	0	0
Lasiurus blossevillii western red bat	G5 S3?	CDFG: SC	Fed: None Cal: None	117 S:3	0	0	0	0	0	3	0	3	3	0	0
Lasiurus cinereus hoary bat	G5 S4?	CDFG:	Fed: None Cal: None	235 S:4	0	0	0	0	0	4	3	1	4	0	0

Name (Scientific/Common)	CNDDB Ranks	Other Lists	Listing Status	Total EO's	Element Occ Ranks A	B	C	D	X	U	Population Status Historic >20 yr	Recent <=20 yr	Presence Pres. Extant	Poss. Extirp.	Extirp.
Layia munzii Munz's tidy-tips	G1 S1.1	CNPS: 1B.2	Fed: None Cal: None	21 S:3	0	0	0	0	0	3	3	0	3	0	0
Lepidurus packardi vernal pool tadpole shrimp	G3 S2S3	CDFG:	Fed: Endangered Cal: None	249 S:16	4	4	1	0	0	7	0	16	16	0	0
Leptosiphon serrulatus Madera leptosiphon	G1? S1?	CNPS: 1B.2	Fed: None Cal: None	21 S:5	0	0	0	0	0	5	4	1	5	0	0
Linderiella occidentalis California linderiella	G3 S2S3	CDFG:	Fed: None Cal: None	367 S:26	2	7	1	0	0	16	0	26	26	0	0
Lupinus citrinus var. citrinus orange lupine	G2T2 S2.2	CNPS: 1B.2	Fed: None Cal: None	61 S:1	1	0	0	0	0	0	0	1	1	0	0
Lytta moesta moestan blister beetle	G2 S2	CDFG:	Fed: None Cal: None	12 S:1	0	0	0	0	1	0	1	0	0	1	0
Lytta molesta molestan blister beetle	G2 S2	CDFG:	Fed: None Cal: None	17 S:6	0	0	0	0	0	6	6	0	4	2	0
Masticophis flagellum ruddocki San Joaquin whipsnake	G5T2T3 S2?	CDFG: SC	Fed: None Cal: None	68 S:2	0	2	0	0	0	0	0	2	2	0	0
Metapogon hurdi Hurd's metapogon robberfly	G1G3 S1S3	CDFG:	Fed: None Cal: None	2 S:1	0	0	0	0	0	1	1	0	0	1	0
Monolopia congdonii San Joaquin woollythreads	G3 S3.2	CNPS: 1B.2	Fed: Endangered Cal: None	87 S:1	0	0	0	0	1	0	1	0	0	1	0
Mylopharodon conocephalus hardhead	G3 S3	CDFG: SC	Fed: None Cal: None	16 S:2	0	0	0	0	0	2	2	0	2	0	0
Myotis yumanensis Yuma myotis	G5 S4?	CDFG:	Fed: None Cal: None	256 S:3	0	0	0	0	0	3	0	3	3	0	0
Navarretia prostrata prostrate vernal pool navarretia	G2? S2.1?	CNPS: 1B.1	Fed: None Cal: None	30 S:4	3	0	0	0	0	1	1	3	4	0	0
Neostapfia colusana Colusa grass	G3 S3.1	CNPS: 1B.1	Fed: Threatened Cal: Endangered	61 S:4	0	1	0	0	3	0	1	3	1	2	1

Name (Scientific/Common)	CNDDB Ranks	Other Lists	Listing Status	Total EO's	Element Occ Ranks A	B	C	D	X	U	Population Status Historic >20 yr	Recent <=20 yr	Presence Pres. Extant	Poss. Extirp.	Extirp.
Northern Basalt Flow Vernal Pool	G3 S2.2		Fed: None Cal: None	28 S:4	1	0	0	0	0	3	4	0	4	0	0
Northern Claypan Vernal Pool	G1 S1.1		Fed: None Cal: None	21 S:6	0	0	1	0	0	5	6	0	6	0	0
Northern Hardpan Vernal Pool	G3 S3.1		Fed: None Cal: None	126 S:9	1	1	1	2	0	4	8	1	9	0	0
Orcuttia inaequalis San Joaquin Valley orcutt grass	G2 S2.1	CNPS: 1B.1	Fed: Threatened Cal: Endangered	47 S:10	2	2	1	2	3	0	3	7	7	0	3
Orcuttia pilosa hairy orcutt grass	G2 S2.1	CNPS: 1B.1	Fed: Endangered Cal: Endangered	34 S:6	0	1	2	2	1	0	5	1	5	0	1
Perognathus inornatus inornatus San Joaquin pocket mouse	G4T2T3 S2S3	CDFG:	Fed: None Cal: None	109 S:6	0	0	0	0	1	5	5	1	5	0	1
Phrynosoma coronatum (frontale population) coast (California) horned lizard	G4G5 S3S4	CDFG: SC	Fed: None Cal: None	97 S:3	1	1	0	0	0	1	1	2	3	0	0
Plegadis chihi white-faced ibis	G5 S1	CDFG:	Fed: None Cal: None	19 S:1	0	0	0	0	0	1	1	0	1	0	0
Potamogeton filiformis slender-leaved pondweed	G5 S1S2	CNPS: 2.2	Fed: None Cal: None	12 S:1	0	0	0	0	0	1	1	0	1	0	0
Pseudobahia bahiifolia Hartweg's golden sunburst	G2 S2.1	CNPS: 1B.1	Fed: Endangered Cal: Endangered	24 S:6	3	2	0	0	1	0	1	5	5	0	1
Rana draytonii California red-legged frog	G4T2T3 S2S3	CDFG: SC	Fed: Threatened Cal: None	993 S:1	0	0	0	1	0	0	0	1	1	0	0
Riparia riparia bank swallow	G5 S2S3	CDFG:	Fed: None Cal: Threatened	190 S:1	0	0	0	0	0	1	1	0	1	0	0
Sagittaria sanfordii Sanford's arrowhead	G3 S3.2	CNPS: 1B.2	Fed: None Cal: None	62 S:10	0	0	0	0	0	10	10	0	10	0	0
Spea hammondii western spadefoot	G3 S3	CDFG: SC	Fed: None Cal: None	406 S:36	5	9	6	2	0	14	1	35	36	0	0

Name (Scientific/Common)	CNDDB Ranks	Other Lists	Listing Status	Total EO's	Element Occ Ranks A	B	C	D	X	U	Population Status Historic >20 yr	Recent <=20 yr	Presence Pres. Extant	Poss. Extirp.	Extirp.
Sycamore Alluvial Woodland	G1 S1.1		Fed: None Cal: None	17 S:2	0	0	1	0	0	1	0	2	2	0	0
Taxidea taxus American badger	G5 S4	CDFG: SC	Fed: None Cal: None	413 S:9	1	0	0	0	0	8	9	0	9	0	0
Thamnophis gigas giant garter snake	G2G3 S2S3	CDFG:	Fed: Threatened Cal: Threatened	223 S:25	2	2	0	0	0	21	18	7	25	0	0
Trichocoronis wrightii var. wrightii Wright's trichocoronis	G4T3 S1.1	CNPS: 2.1	Fed: None Cal: None	9 S:2	1	0	0	0	0	1	1	1	2	0	0
Tropidocarpum capparideum caper-fruited tropidocarpum	G1 S1.1	CNPS: 1B.1	Fed: None Cal: None	19 S:1	0	0	0	0	0	1	1	0	1	0	0
Valley Sacaton Grassland	G1 S1.1		Fed: None Cal: None	9 S:5	1	1	3	0	0	0	5	0	5	0	0
Valley Sink Scrub	G1 S1.1		Fed: None Cal: None	29 S:6	1	0	1	2	0	2	6	0	6	0	0
Vulpes macrotis mutica San Joaquin kit fox	G4T2T3 S2S3	CDFG:	Fed: Endangered Cal: Threatened	950 S:24	0	1	1	0	0	22	10	14	24	0	0
Xanthocephalus xanthocephalus yellow-headed blackbird	G5 S3S4	CDFG: SC	Fed: None Cal: None	9 S:1	0	0	0	0	0	1	1	0	1	0	0

Attachment

Sacramento Fish and Wildlife Office Federal Endangered and Threatened Species List

Draft
Biological Resources – Vegetation and Wildlife Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 090114064553

Database Last Updated: December 24, 2008

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Critical habitat, Conservancy fairy shrimp (X)

Branchinecta longiantenna

Critical habitat, longhorn fairy shrimp (X)

longhorn fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)

vernal pool tadpole shrimp (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)

Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana aurora draytonii

California red-legged frog (T)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Thamnophis gigas
giant garter snake (T)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides exilis
Critical habitat, Fresno kangaroo rat (X)
Fresno kangaroo rat (E)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Castilleja campestris ssp. succulenta
Critical habitat, succulent (=fleshy) owl's-clover (X)
succulent (=fleshy) owl's-clover (T)

Chamaesyce hooveri
Critical habitat, Hoover's spurge (X)
Hoover's spurge (T)

Cordylanthus palmatus
palmate-bracted bird's-beak (E)

Neostapfia colusana
Colusa grass (T)
Critical habitat, Colusa grass (X)

Orcuttia inaequalis
Critical habitat, San Joaquin Valley Orcutt grass (X)
San Joaquin Valley Orcutt grass (T)

Orcuttia pilosa
Critical habitat, hairy Orcutt grass (X)
hairy Orcutt grass (E)

Pseudobahia bahiifolia
Hartweg's golden sunburst (E)

Candidate Species

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

JAMESAN (359B)
TRANQUILLITY (360A)
FRIANT (378B)
LANES BRIDGE (379A)
GREGG (379B)
HERNDON (379C)
FRESNO NORTH (379D)
MADERA (380A)

GRAVELLY FORD (380C)
BIOLA (380D)
FIREBAUGH NE (381A)
POSO FARM (381B)
FIREBAUGH (381C)
MENDOTA DAM (381D)
OXALIS (382A)
MILLERTON LAKE WEST (398C)
MILLERTON LAKE EAST (398D)
LITTLE TABLE MTN. (399D)
BLISS RANCH (401C)
SANDY MUSH (402A)
TURNER RANCH (402B)
DELTA RANCH (402C)
SANTA RITA BRIDGE (402D)
SAN LUIS RANCH (403A)
INGOMAR (403B)
ARENA (422C)
GUSTINE (423C)
STEVINSON (423D)
NEWMAN (424D)

County Lists

No county species lists requested.

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.

- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential

to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 14, 2009.

Attachment

Special Status Species Tables

Draft
Biological Resources – Vegetation and Wildlife Appendix

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Alkali milk-vetch *Astragalus tener* var. *tener*	--	--	1B.2	Alkaline vernal pools and playas, and valley and foothill grassland with alkaline adobe clay soils; 3–2,000 feet elevation	Central Valley and eastern San Francisco Bay Area	March – June	Could occur; documented occurrences in Great Valley Grasslands State Park
Heartscale *Atriplex cordulata*	--	--	1B.2	Alkaline or saline sites in chenopod scrub, meadows and seeps, and valley and foothill grassland with sandy soils; 3–1,250 feet elevation	Western edge of the Central Valley	April – October	Known to occur; documented occurrences in Great Valley Grasslands State Park, south of the Restoration Area in Reaches 5 and 4B2, north of the Eastside Bypass, and in the Chowchilla Bypass, and Reach 2A
Brittlescale *Atriplex depressa*	--	--	1B.2	Alkaline clay soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, or vernal pools; 3–1,050 feet elevation	Central Valley and Tulare Basin	May – October	Could occur; documented occurrences in Great Valley Grasslands State Park, south of the Restoration Area in Reaches 5 and 4B2 and north of the Eastside Bypass
San Joaquin spearscale *Atriplex joaquiniana*	--	--	1B.2	Alkaline soils in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland; 3–2,750 feet elevation	Western edge of the Central Valley from Glenn to Tulare County	April – October	Could occur; suitable habitat present in the West Bear Creek Area and from south of the Restoration Area in Reach 5
Lesser saltscale *Atriplex minuscula*	--	--	1B.1	Alkaline, sandy soils in chenopod scrub, playas, and valley and foothill grassland; 50–700 feet elevation	Southern San Joaquin Valley	May – October	Known in Reach 3; documented occurrences in Great Valley Grasslands State Park and the Freitas Unit of San Luis National Wildlife Refuge (NWR)

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Vernal pool smallscale *Atriplex persistens*	--	--	1B.2	Alkaline vernal pools; 30–400 feet elevation	Scattered locations throughout the Central Valley from Glenn, Merced, Stanislaus, and Tulare counties	June – October	Known to occur in Reach 5; also documented occurrences in the Bear Creek Unit of San Luis NWR, north of Eastside Bypass
Subtle orache *Atriplex subtilis*	--	--	1B.2	Valley and foothill grassland; 130–330 feet elevation	Known from fewer than 20 occurrences, including locations in Fresno, King, Madera, and Merced counties	June – August (rarely to October)	Known to occur in Chowchilla and Eastside bypasses; suitable habitat present
Lost Hills crown scale *Atriplex vallicola*	--	--	1B.2	Alkaline vernal pools, alkaline soils in chenopod scrub and valley and foothill grassland; 160–2,100 feet elevation	Lost Hills, vicinity of McKittrick in Kern County, and scattered locations in Fresno and Merced counties	April – August	Could occur; suitable habitat present and species known south of Mendota Pool
Succulent owl's-clover *Castilleja campestris* ssp. *succulenta*	T	E	1B.2	Vernal pools, often acidic; 160–2,500 feet elevation	Southern Sierra Nevada foothills, eastern San Joaquin Valley, Fresno, Madera, Merced, Mariposa, San Joaquin, and Stanislaus counties	April – May	Could occur; suitable habitat present and species known adjacent to Reach 1A
California jewelflower *Caulanthus californicus*	E	E	1B.1	Shadscale scrub, valley and foothill grassland, pinyon-juniper woodland, 0–3,000 feet elevation	From Fresno to Kern County and San Luis Obispo to Ventura County	February – May	Unlikely; one historic occurrence in the Fresno North quadrangle, but it has been extirpated; no other documented occurrences in the vicinity
Hoover's spurge *Chamaesyce hooveri*	-T	--	1B.2	Vernal pools; 80–820 feet elevation	Central Valley from Butte County to Tulare County	July – September (rarely to October)	Could occur; suitable habitat present and species known from the Turner Ranch quadrangle

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	--	--	1B.1	Mesic alkaline soils in meadows and seeps, playas, and valley and foothill grassland; 3–500 feet elevation	Scattered locations in San Joaquin Valley from Solano County to Kern County	June – September	Could occur; documented occurrences in the West Bear Creek area of the San Luis NWR
Palmate-bracted bird's-beak *Cordylanthus palmatus*	E	E	1B.1	Alkaline soils in chenopod scrub and valley and foothill grassland; 15–500 feet elevation	Glenn, Colusa, Yolo, Alameda, Madera, and Fresno counties	May – October	Could occur; suitable habitat present and species known to occur at the Alkali Sink Ecological Area and Mendota Wildlife Area (between Chowchilla Bypass and Reach 3)
Hoover's cryptantha *Cryptantha hooveri*	--	--	1A	Inland dunes and sandy soils in valley and foothill grassland; 30–500 feet elevation	Contra Costa, Merced, Stanislaus, Madera, and Kern counties	April – May	Unlikely; although a historic record from the Bliss Ranch quadrangle, this species is presumed extinct by CNPS
Recurved larkspur *Delphinium recurvatum*	--	--	1B.2	Alkaline soils in cismontane woodland and valley and foothill grassland; 10–2,500 feet elevation	Central Valley and foothills from Contra Costa to Kern County	March – June	Could occur; suitable habitat present and species known from encompassing quadrangles
Dwarf downingia *Downingia pusilla*	--	--	2.2	Vernally mesic sites in valley and foothill grassland and vernal pools; 3–1,500 feet elevation	Inner North Coast Ranges, the southern Sacramento Valley, and the northern and central San Joaquin Valley	March – May	Could occur; suitable habitat present and species known from the Friant quadrangle
Four-angled spikerush *Eleocharis quadrangulata*	--	--	2.2	Freshwater marshes and swamps; 100–1,600 feet elevation	Butte, Merced, Shasta, and Tehama counties	May – September	Could occur; suitable habitat present and species reported from encompassing quadrangles in McBain and Trush (2002), but not documented in CNDDB or CNPS

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Round-leaved filaree *Erodium macrophyllum*	--	--	1B.1	Clay soils in cismontane woodland and valley and foothill grassland; 50–4,000 feet elevation	Distributed in 25 counties in California from Humboldt to San Diego County	March – May	Could occur; suitable habitat present and species documented in the Ingomar quadrangle
Delta button-celery *Eryngium racemosum*	--	E	1B.1	Vernally mesic clay depressions in riparian scrub habitat; 10–100 feet elevation	San Joaquin River Delta and floodplains	June – September	Known to occur in many locations in Eastside and Mariposa bypasses, Reaches 4B1, 4B2, and 5; documented occurrences in Great Valley Grasslands State Park and the West Bear Creek Unit of San Luis NWR
Spiny-sepaled button-celery *Eryngium spinosepalum*	--	--	1B.2	Vernal pools and valley and foothill grassland; 250–850 feet elevation	Southern and eastern San Joaquin Valley	April – May	Known to occur in Reach 1A; suitable habitat present
Bogg's Lake hedge-hyssop *Gratiola heterosepala*	--	E	1B.2	Lake margin marshes and swamps and vernal pools in clay soils; 30–7,800 feet elevation	Fresno, Lake, Lassen, Madera, Merced, Modoc, Placer, Sacramento, Shasta, Siskyou, San Joaquin, Solano, and Tehama counties	April – August	Could occur; suitable habitat present and species known from encompassing quadrangles
California satintail *Imperata brevifolia*	--	--	2.1	Mesic sites in chaparral, coastal scrub, Mojavean desert scrub, meadows and seeps (often alkali), and riparian scrub; 0–1,650 feet elevation	San Joaquin Valley, south coast, San Gabriel and San Bernardino Mountains, and Mojave Desert from Fresno to Riverside County; also reported from Tehama, Butte, Lake, and Sonoma counties in northern California	September–May	Could occur; suitable habitat present and species documented in the Fresno North quadrangle

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Munz's tidy-tips *Layia munzii*	--	--	1B.2	Alkaline clay soils in chenopod scrub and valley and foothill grassland; 150–2,600 feet elevation	Western San Joaquin Valley and foothills from Fresno County to San Luis Obispo County	March – April	Known to occur in Reach 3; suitable habitat present
Madera leptosiphon *Leptosiphon serrulatus*	--	--	1B.2	Woodlands and lower montane coniferous forest; 950–4,300 feet elevation	Fresno, Madera, Mariposa, Tulare, and Kern counties	April – May	Could occur; documented in the vicinity of the Restoration Area in the Friant, Madera, and Millerton Lake West quadrangles, including occurrences at Millerton Lake
San Joaquin woollythreads *Monolopia congdonii*	E	--	1B.2	Alkali sinks and valley and foothill grassland with sandy soils; 200–2,650 feet elevation	Southwest San Joaquin Valley from San Benito and Fresno counties to Santa Barbara, San Louis Obispo, and Kern counties	February – May	Unlikely; historic record of this species in the Tranquility quadrangle, but this record several miles from the river and possibly extirpated (last seen in 1935)
Little mousetail *Myosurus minimus* ssp. *apus*	--	--	3.1	Alkaline vernal pools and other wetland habitats in valley and foothill grassland and coastal sage scrub; 65–2,100 feet elevation	Scattered locations in the northern Sacramento Valley and Inner North Coast Ranges, San Francisco Bay Area, San Joaquin Valley from Stanislaus to Tulare County, southern coast and southern Coast Ranges, the Peninsular and Transverse Ranges, and the Mohave Desert	March – June	Could occur; suitable habitat present and species known from encompassing quadrangles

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Prostrate navarretia *Navarretia prostrata*	--	--	1B.1	Vernally mesic sites in coastal scrub, alkaline soils in valley and foothill grassland, and vernal pools; 50–650 feet elevation.	Alameda, Merced, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Riverside, and San Bernardino counties	April – July	Known to occur in Reach 5; suitable habitat present
Colusa grass *Neostapfia colusana*	T	E	1B.1	Large vernal pools with adobe clay soils; 15–4,000 feet elevation	Merced, Solano, Stanislaus, and Yolo counties	May – August	Could occur; suitable habitat present and species known from the Sandy Mush and Turner Ranch quadrangles
San Joaquin Valley Orcutt grass *Orcuttia inaequalis*	T	E	1B.1	Vernal pools; 30–2,500 feet elevation	Eastern San Joaquin Valley from Stanislaus to Tulare County; also reported in Solano County	April – September	Known to occur in Reach 1A; suitable habitat present
Hairy Orcutt grass *Orcuttia pilosa*	E	E	1B.1	Vernal pools; 175–650 feet elevation	Butte, Glenn, Madera, Merced, Stanislaus, and Tehama counties	May – September	Could occur; suitable habitat present and species known from north of Reach 1A
Slender-leaved pondweed *Potamogeton filiformis*	--	--	2.2	Assorted shallow freshwater marsh and swamp habitats; 950–7,050 feet elevation	Central Sierra Nevada, San Joaquin Valley, San Francisco Bay Area, and Modoc Plateau	May – July	Known; documented occurrences in the West Bear Creek area
Hartweg's golden sunburst *Pseudobahia bahiifolia*	E	E	1B.1	Clay, often acidic, soils in cismontane and valley and foothill grassland habitats, especially on northern and northeastern aspects in mima mound topography; 50–500 feet elevation	Eastern San Joaquin Valley from Stanislaus and Tuolumne counties to Fresno County; also a historic record in Yuba County	March – April	Unlikely; species is known from the Millerton Lake West and Friant quadrangles, but the specific edaphic and topographic habitat requirements not expected to be present

Table 1.
Special-Status Plant Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Species	Listing Status			Habitat	Distribution in California	Flowering Period	Potential for Occurrence
	Fed.	State	CNPS				
Sanford's arrowhead *Sagittaria sanfordii*	--	--	1B.2	Assorted shallow freshwater marshes and swamps; 0–2,000 feet elevation	Butte, Del Norte, Fresno, Kern, Merced, Orange, Sacramento, Shasta, San Joaquin, Tehama, and Ventura counties	May – October	Known to occur in Reach 1A at the DFG Milburn Ecological Reserve, Mendota Pool, and Eastside Bypass; suitable habitat in Restoration Area
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; 15–1,500 feet elevation	Central Valley and south coast	May – September	Known to occur in Chowchilla Bypass; reported occurrence in Great Valley Grasslands State Park
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	--	--	1B.1	Mesic alkaline soils in valley and foothill grassland, vernal pools; 160–1,300 feet elevation	Scattered locations in the Central Valley and central west coast	March – April	Could occur; suitable habitat present and documented occurrence south of Reach 1A

Sources: CNDDB 2009, CNPS 2009

Notes:

U.S. Fish and Wildlife Service (USFWS) Federal Listing Categories:
T = Federally listed as threatened.
E = Federally listed as endangered.

California Department of Fish and Game (DFG) State Listing Category:
E = California listed as endangered.

California Native Plant Society (CNPS) Listing Categories:
1A = Presumed extinct in California.
1B = Plants rare, threatened, or endangered in California and elsewhere.
2 = Plants rare, threatened, or endangered in California but more common elsewhere.
3 = Plants for which more information is needed – a review list.

Extensions:
1 = Seriously endangered in California (>80% of occurrences are threatened and/or high degree and immediacy of threat).
2 = Fairly endangered in California (20–80% of occurrences are threatened).

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Invertebrates				
Conservancy fairy shrimp	*Branchinecta conservatio*	USFWS: endangered Designated critical habitat	Vernal pools and swales	Known to occur in suitable habitat on the San Luis National Wildlife Refuge (NWR) complex in Reaches 4B2 and 5 and Eastside Bypass
Longhorn fairy shrimp	*Branchinecta longiantenna*	USFWS: endangered Designated critical habitat	Vernal pools and swales	Known to occur in suitable habitat on the San Luis NWR complex in Reach 5
Vernal pool fairy shrimp	*Branchinecta lynchi*	USFWS: threatened Designated critical habitat	Vernal pools and other seasonal wetlands	Known to occur in suitable habitat on the San Luis NWR complex in Reaches 4B1, 4B2, and 5, and Chowchilla and Eastside bypasses
Vernal pool tadpole shrimp	*Lepidurus packardi*	USFWS: endangered Designated critical habitat	Vernal pools, swales, and other ephemeral wetlands	Known to occur in suitable habitat on the San Luis NWR complex and at the Great Valley Grasslands State Park in Reaches 4B1, 4B2, and 5, and Chowchilla and Eastside bypasses
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	USFWS: threatened	Elderberry shrubs, typically in riparian habitats	Known to occur in elderberry shrubs present in the riparian woodland in Reach 1A; expected to occur in suitable habitat in other locations in the Restoration Area
Amphibians				
California tiger salamander	*Ambystoma californiense*	USFWS: threatened Designated critical habitat CA: species of special concern	Small ponds, lakes, or vernal pools in grasslands or oak woodlands	Known to occur in suitable habitat on the San Luis NWR complex and at the Great Valley Grasslands State Park in Reaches 4B1, 4B2, and 5, and Chowchilla Bypass; other occurrences reported adjacent to Restoration Area in Reach 1A

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Western spadefoot	*Spea hammondii*	CA: species of special concern	Vernal pools and seasonal wetlands in upland with burrows and other belowground refuge	Known to occur in suitable habitat on the San Luis NWR complex and at the Great Valley Grasslands State Park in Reaches 4B1, 4B2, and 5; other occurrences reported adjacent to Restoration Area in Reach 1A
California red-legged frog	*Rana aurora draytonii*	USFWS: threatened CA: species of special concern	Aquatic habitats, such as creeks, streams, and ponds	Unlikely to occur; no longer occurs on the floor of the Central Valley
Reptiles				
Western pond turtle	*Actinemys marmorata marmorata*	CA: species of special concern	Ponds, marshes, rivers, streams, sloughs; nests in nearby uplands with suitable soils	Known to occur in suitable habitat on the San Luis NWR complex, in the Mendota Wildlife Area, and at Mendota Pool; expected to occur in suitable habitat in other locations in the Restoration Area
Blunt-nosed leopard lizard	*Gambelia sila*	USFWS: endangered CA: endangered, fully protected	Open habitats with scattered low bushes on alkali flats, plains, washes, and arroyos	Known to occur in Chowchilla Bypass and adjacent to Reach 3
California horned lizard	*Phrynosoma coronatum frontale*	CA: species of special concern	Grasslands, brushlands, woodlands, and open coniferous forests	Could occur in suitable habitat
Silvery legless lizard	*Anniella pulchra pulchra*	CA: species of special concern	Loose soil or thick leaf litter in chaparral, woodland, and riparian areas	Known to occur in suitable habitat on the San Luis NWR complex and near the confluence of Willow Slough
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	CA: species of special concern	Open, dry vegetation in valley grasslands and saltbush scrub	Could occur; suitable habitat present in Restoration Area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Giant garter snake	*Thamnophis gigas*	USFWS: threatened CA: threatened	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during its inactive season	Known to occur in suitable habitat on the San Luis NWR complex and in the Mendota Wildlife Area; reported from Mendota Pool; expected to occur in suitable habitat in other locations in the Restoration Area
Birds				
Redhead	*Aythya americana*	CA: species of special concern	Nests in freshwater emergent wetlands with dense patches of tules or cattails interspersed with areas of deep, open water; forages in open water	Uncommon but regular breeder in Central Valley; known to nest at Mendota Pool and also occurs at the San Luis NWR and Mendota Wildlife Area; expected in the Restoration Area
American white pelican	*Pelecanus erythrorhynchos*	CA: species of special concern	Nests in protected inland wetlands; forages in shallow inland waters, including marshes and along lakes or rivers and in shallow coastal marine areas	Common in winter throughout Central Valley; expected in the Restoration Area
Least bittern	*Ixobrychus exilis*	CA: species of special concern	Nests in dense emergent vegetation in fresh and brackish marsh	Uncommon but regular breeder in suitable habitat in the San Joaquin Valley; expected in the Restoration Area
Double-crested cormorant (rookery)	*Phalacrocorax auritus*	CA: watch list	Forages in inland ponds and lakes; nests in riparian forests	Known to occur in suitable habitat on the San Luis NWR complex; known along Reach 1A at DFG's Milburn Ecological Reserve
Great blue heron (rookery)	*Ardea herodias*	CA: CNDDB tracked	Colonial nester in tall trees, cliff sides, and sequestered spots on marshes; common over most of North America	Rookeries known to occur at base of Friant Dam, Milburn and Rank Island Ecological Reserves in Reach 1A

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Great egret (rookery)	*Ardea alba*	CA: CNDDB tracked	Nests in colonies with other species, in shrubs and trees over water, and on islands; feeds in variety of wetlands, including marshes, swamps, streams, rivers, ponds, lakes, tide flats, canals, and flooded fields	Rookeries known to occur at base of Friant Dam, Milburn and Rank Island Ecological Reserves in Reach 1A
White-faced ibis (rookery)	*Plegadis chihi*	CA: species of special concern	Freshwater marshes with tules, rushes, and cattails, and flooded agricultural fields	Known to occur in suitable habitat on the San Luis NWR complex and other sites in the Restoration Area
Cackling (Aleutian) Canada goose	*Branta hutchinsii leucopareia*	USFWS: delisted CA: CNDDB tracked	Nests in the Aleutian Islands, winters in the Central Valley south to Merced	Known to winter in suitable habitat on the San Luis NWR complex and other suitable sites in the Restoration Area
Cooper's hawk	*Accipiter cooperii*	CA: watch list	Nests primarily in deciduous riparian forests; may also occupy dense canopied forests from gray pine-oak woodland to ponderosa pine; forages in open woodlands	Potential nesting habitat present in Restoration Area; known to occur in suitable habitat in the San Joaquin Valley
Sharp-shinned hawk	*Accipiter striatus*	CA: watch list	Dense to open canopy pine or mixed conifer forest, riparian habitats, and grassland with scattered trees; permanent resident in parts of the Sierra Nevada, Cascade, Klamath, and North Coast Ranges; usually nests in conifers	Potential foraging and wintering habitat is present in Restoration Area
Golden eagle (nesting and wintering)	*Aquila chrysaetos*	CA: watch list and fully protected species	Nests on cliff faces with suitable ledges or in large trees in open areas; forages over open terrain	Uncommon winter visitor throughout the Central Valley; known to occur in suitable habitat on the San Luis NWR complex and other areas along the San Joaquin River

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Ferruginous hawk (wintering)	*Buteo regalis*	CA: species of special concern	Forages in open grasslands and agricultural fields	Known to occur during winter in suitable habitat on the San Luis NWR complex
Swainson's hawk (nesting)	*Buteo swainsoni*	CA: threatened	Forages in grasslands and agricultural fields; nests in open woodland or scattered trees	Known to nest in suitable habitat on the San Luis NWR complex and Great Valley Grasslands State Park and other areas along the San Joaquin River
Northern harrier (nesting)	*Circus cyaneus*	CA: species of special concern	Forages and nests in grassland, agricultural fields, and marshes	Known to occur in suitable habitat on the San Luis NWR complex and other areas along the San Joaquin River
White-tailed kite (nesting)	*Elanus leucurus*	CA: fully protected species	Forages in grasslands and agricultural fields; nests in isolated trees or small woodland patches	Known to occur in suitable habitat in Lost Lake Park; expected to occur in suitable habitat in Restoration Area
Bald eagle (nesting and wintering)	*Haliaeetus leucocephalus*	USFWS: delisted CA: endangered and fully protected	Forages along inland waters; nests in adjacent large, old-growth trees or snags	Known to nest in suitable habitat on Lake Millerton and Chowchilla Bypass and occurs during winter and migration in the San Luis NWR complex
Merlin (wintering)	*Falco columbarius*	CA: watch list	Forages in open woodlands, savannas, edges of grasslands and deserts, farms, and ranches	Known to occur in suitable habitat on the San Luis NWR complex
Prairie falcon	*Falco mexicanus*	CA: watch list and fully protected species	Nests on cliffs overlooking a large, open area; forages in open habitats	Uncommon visitor in suitable habitat in the Study Area; expected in the Restoration Area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
American peregrine falcon	*Falco peregrinus anatum*	USFWS: delisted CA: endangered and fully protected	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes; permanent resident in the north and south Coast Ranges; winters in the Central Valley southward through the Transverse and Peninsular ranges; feeds almost exclusively on birds	Known to occur at the San Luis NWR; expected to occur in suitable habitat in Restoration Area
Lesser sandhill crane (wintering)	*Grus canadensis canadensis*	CA: species of special concern	Forages in grasslands, pastures, and agricultural fields (particularly recently disturbed grain fields); roosts in a variety of wetlands with shallow water depths	Known to winter at the Merced NWR; expected to occur in suitable habitat in Restoration Area
Greater sandhill crane (nesting and wintering)	*Grus canadensis tabida*	CA: threatened, fully protected species	Shallow lakes and freshwater marshes	Known to occur during winter in suitable habitat on the San Luis NWR complex and along the San Joaquin River; no nesting habitat
Mountain plover (wintering)	*Charadrius montanus*	CA: species of special concern	Open plains or rolling hills with short grasses or sparse vegetation	Known to occur in winter in suitable habitat near Tranquility
Long-billed curlew	*Numenius americanus*	CA: watch list	Nests in open grassland in the prairie region and far northeastern California; winters in range of wetland habitats, foraging in pastures, agricultural fields, and tidal estuaries	Common winter resident in the Central Valley in wet habitats, including San Luis NWR; expected in the Restoration Area
Black tern	*Chlidonias niger*	CA: species of special concern	Nests semicolonially in protected marshes and rice fields; forages on fish and insects	Uncommon visitor in suitable habitat in the Study Area, including San Luis NWR; expected during the nonbreeding season in the Restoration Area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Western yellow-billed cuckoo (nesting)	*Coccyzus americanus occidentalis*	USFWS: candidate CA: endangered	Inhabits wide, dense riparian forests with a thick understory of willows for nesting; prefers sites with a dominant cottonwood overstory for foraging	Known to nest in suitable habitat in Restoration Area
Short-eared owl (nesting)	*Asio flammeus*	CA: species of special concern	Tall (ungrazed) grasslands and marshes with dense vegetation	Known to occur in suitable habitat on the San Luis NWR complex, where it possibly also nests
Burrowing owl (burrow sites)	*Athene cunicularia hypugea*	CA: species of special concern	Grasslands and agricultural fields	Known to occur in suitable habitat along Chowchilla Bypass and on the San Luis NWR complex and at Mendota Pool
Loggerhead shrike (nesting)	*Lanius ludovidianus*	CA: species of special concern	Forages in grasslands and agricultural fields; nests in scattered shrubs and trees	Known to nest in suitable habitat on the San Luis NWR complex; expected to nest in other suitable habitat
Willow flycatcher	*Empidonax traillii*	USFWS: endangered (*E. t. iextimus*) CA: endangered	Riparian habitats and large wet meadows with abundant willows during migration	Known as rare spring and uncommon fall migrants in riparian habitats of the San Luis and West Bear Creek units of the San Luis NWR
Least Bell's vireo (nesting)	*Vireo bellii pusillus*	USFWS: endangered CA: endangered	Cottonwood-willow forest, oak woodland, shrubby thickets, and dry washes with willow thickets	Known to nest in suitable habitat on the San Joaquin River NWR in the San Luis NWR complex
California horned lark	*Eremophila alpestris actia*	CA: watch list	Grasslands and agricultural areas, especially sparsely vegetated or barren areas	Known to nest in suitable habitat on the San Luis NWR complex
Bank swallow (nesting)	*Riparia riparia*	CA: threatened	Forages in various habitats; nests in banks or bluffs, typically adjacent to water	Known to nest in suitable habitat near Mendota Pool

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Yellow warbler (nesting)	*Dendroica petechia brewsteri*	CA: species of special concern	Riparian woodlands.	No recent nesting records, but potential nesting habitat present; known to occur during migration in suitable habitat on the San Luis NWR complex and other sites in the Restoration Area
Yellow-breasted chat (nesting)	*Icteria virens*	CA: species of special concern	Dense riparian thickets of willows, vine tangles, and dense brush associated with streams, swampy ground and the borders of small ponds	Potential nesting habitat present in Restoration Area; known to occur during migration in suitable habitat in the San Joaquin Valley
Grasshopper sparrow (nesting)	*Ammodramus savannarum*	CA: species of special concern	Grassland, especially moderately open grassland with scattered shrubs	Known to breed in the Los Banos Wildlife Area, the North Grasslands Wildlife Area, the San Luis NWR complex, and the Mendota Wildlife Area
Tricolored blackbird (nesting colony)	*Agelaius tricolor*	CA: species of special concern	Forages in grasslands and agricultural fields; nests in freshwater marsh, riparian scrub, and other dense shrubs and herbs	Known to occur in suitable habitat on the San Luis NWR complex and other sites in the Restoration Area
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	CA: species of special concern	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds; its range extends as far west as central-interior British Columbia, moving directly south through the central-interior west coast to northeastern Baja California	Known to occur in suitable habitat throughout San Joaquin Valley, including the San Luis NWR complex; potential nesting habitat present in Restoration Area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Mammals				
Pallid bat (roosting)	*Antrozous pallidus*	CA: species of special concern	Deserts, grasslands, shrublands, woodlands, and forests; most common in open, dry habitats with rocky areas for roosting	Could occur in the Restoration Area, but highly associated with oak woodlands in the Central Valley
Townsend's big-eared bat	*Corynorhinus townsendii*	CA: species of special concern	Forages along edges of a variety of habitats; roosts in caves, tunnels, mines, trees, and buildings	No records known from the Restoration Area, although could occur in suitable habitat
Spotted bat	*Euderma maculatum*	CA: species of special concern	Shrub-steppe grasslands	Known to occur near Friant Dam
Western red bat	*Lasiurus blossevillii*	CA: species of special concern	From Shasta County south to Mexico, west of the Sierra Nevada/Cascade crest and deserts; the winter range includes western lowlands and coastal regions south of San Francisco Bay; roosting habitat includes forests and woodlands from sea level up through mixed conifer forests	Known to occur in Restoration Area along Reach 3, north of Mendota Wildlife Area
Hoary bat	*Lasiurus cinereus*	CA: CNDDB tracked	Prefers woodlands and coniferous forests, but hunts over open areas and lakes; noncolonial	Could occur in the Restoration Area, roosting in riparian trees and foraging over open water and in open woodland habitats
Yuma myotis	*Myotis yumanensis*	CA: CNDDB tracked	Roosts colonially in caves, tunnels, trees, and buildings; inhabits arid regions; distributed throughout the western United States, Mexico, and Canada	Known to occur in Restoration Area along Reach 3, north of Mendota Wildlife Area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Western mastiff bat (roosting)	*Eumops perotis californicus*	CA: species of special concern	Crevices on cliffs faces, boulders, and buildings, usually with space for at least a 10-foot vertical drop	Known to occur in suitable habitat in the San Joaquin Valley
Riparian brush rabbit	*Sylvilagus bachmani riparius*	USFWS: endangered CA: endangered	Dense thickets of brush associated with riparian or chaparral habitats	No records known from the Restoration Area, although could occur in suitable habitat; recently reintroduced on private land adjacent to the San Joaquin River NWR
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	CA: threatened	Arid grasslands with loamy soils and moderate shrub cover	Could occur if suitable habitat is present in Restoration Area; reported south of Mendota Pool
Giant kangaroo rat	*Dipodomys ingens*	USFWS: endangered CA: endangered	Annual grasslands and shrubland habitats with sparse vegetative cover	Unlikely to occur in the Restoration Area; although historically known from the region, now known to occur only in the Kettleman Hills in Kings County and western Kern County
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	USFWS: endangered Designated critical habitat CA: endangered	Alkali desert scrub habitats between 200 and 300 feet elevation	Known to occur in suitable habitat at the Alkali Sink Ecological Reserve and Mendota Wildlife Area near the Restoration Area, although may be extirpated along the San Joaquin River
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	CA: CNDDB tracked	Inhabits grassland and scrub habitats in Central and San Joaquin valleys; associated with friable soils	Known to occur in suitable habitat in and in the immediate vicinity of the Restoration Area
San Joaquin (riparian) woodrat	*Neotoma fuscipes riparia*	USFWS: endangered CA: species of special concern	Riparian forests	No records known from the Restoration Area, although could occur in suitable habitat
San Joaquin kit fox	*Vulpes macrotis mutica*	USFWS: endangered CA: threatened	Saltbush scrub, grasslands, oak savannas, and freshwater scrub	Known to occur in suitable habitat on the San Luis NWR complex and other sites in the Restoration area

Table 2.
Special-Status Wildlife Species Known or with Potential to Occur in the San Joaquin River Restoration Area (contd.)

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Ringtail	*Bassariscus astutus*	CDFG: fully protected	Wooded and brushy areas, especially near water courses	Could occur in the Restoration Area; species distribution not well known; unlikely to occur on the valley floor, but could occur in Reach 1
American badger	*Taxidea taxus*	CA: species of special concern	Scrub habitats	Known to occur in suitable habitat in the San Joaquin Valley; reported from Reaches 4B2 and 5

Sources: CNDDB 2007, USFWS 2007
Key:
CA = California
CDFG = California Department of Fish and Game
CNDDB = California National Diversity Database
DWR = California Department of Water Resources
NWR = National Wildlife Refuge
USFWS = U.S. Fish and Wildlife Service

Attachment

Species Accounts

Draft
Biological Resources – Vegetation and Wildlife Appendix

Table of Contents

List of Abbreviations and Acronyms

CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society's
DFG	California Department of Fish and Game
ESA	Federal Endangered Species Act
NWR	National Wildlife Refuge
USFWS	U.S. Fish and Wildlife Service

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1.0 Approach

Information was compiled and reviewed to develop lists of and to describe special-status plant and wildlife species that are known to exist, could potentially exist, or historically existed in the Restoration Area. Several data sources were used to develop these lists, including records from the California Department of Fish and Game's (DFG) California Natural Diversity Database (CNDDB) (CNDDB 2009), the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Plants of California (CNPS 2009), and U.S. Fish and Wildlife Service (USFWS) species lists. The following U.S. Geological Survey 7.5-minute quadrangles encompass the Restoration Area (within approximately 1,500 feet of the San Joaquin River and bypass systems) and its vicinity and were searched in the CNDDB and CNPS inventory: Arena, Biola, Bliss Ranch, Broadview Farms, Delta Ranch, Firebaugh, Firebaugh Northeast, Fresno North, Friant, Gravelly Ford, Gregg, Gustine, Herndon, Ingomar, Jamesan, Lanes Bridge, Little Table Mountain, Madera, Mendota Dam, Millerton Lake West, Millerton Lake East, Newman, Oxalis, Poso Farm, San Luis Ranch, Sandy Mush, Santa Rita Bridge, Stevinson, Tranquility, and Turner Ranch. These quadrangles provided adequate coverage of the Restoration Area and its vicinity.

Special-status species as defined in this document are plants and wildlife that are legally protected under the Federal Endangered Species Act (ESA) or California Endangered Species Act (CESA) or other State regulations and species that are considered sufficiently rare by the scientific community to warrant conservation concern.

Special-status plants and wildlife are species in the following categories:

- Species listed, proposed for listing, or candidates for possible future listing as threatened or endangered under the ESA
- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA
- Plants designated as rare under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.)
- Plants considered by CNPS to be "rare, threatened, or endangered in California" (Lists 1B and 2 in CNPS 2001)
- Wildlife considered species of special concern or watch list species by DFG
- Wildlife designated as fully protected by the California Fish and Game Code
- Wildlife species tracked by the CNDDB

For each of the plant and wildlife species addressed below, information is provided on the legal status, distribution, natural history, and threats. For listed species, information is also provided on relevant conservation efforts and guidance.

2.0 Special-Status Plants

Based on the results of database searches and review of existing environmental documentation, 35 special-status plant species were identified as having potential to occur in the Restoration Area, including 10 species that have been previously documented in the Restoration Area or its vicinity or both. Descriptions of these potentially occurring special-status plant species are provided below. Species descriptions are derived primarily from The Jepson Manual (Hickman 1993) and from the information available online at The Jepson Flora Project: Jepson Interchange for California Floristics (JFP 2009); additional habitat, known occurrence, and distribution information is from the CNDDB and CNPS records, Inventory of Rare and Endangered Plants of California (sixth edition) (CNPS 2001), Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a), and Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005), as well as information contained in the San Joaquin River Restoration Study Background Report (McBain and Trush 2002).

2.1 Dicots

Dicots are one of two major groups of flowering plants. Dicots generally have an embryo with two cotyledons, which give rise to two seed leaves. The mature leaves have veins in a net-like pattern, and the flowers have four or five parts. Twenty-eight species of dicots were identified as having potential to occur in the Restoration Area or its vicinity or both. Descriptions of these potentially occurring special-status species are provided below.

2.1.1 Alkali Milk-Vetch

Alkali milk-vetch (*Astragalus tener* var. *tener*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Alkali milk-vetch is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

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 2007). Its elevation range is up to 2,000 feet. It has been documented in the vicinity of the Restoration Area in the Gustine, San Luis, and Stevinson quadrangles (CNDDB 2007). This species is also reportedly present at four locations in the Restoration Area, its vicinity, or both in the West Bear Creek area of

Great Valley Grasslands State Park (Hoopes et al. 1996, cited in McBain and Trush 2002).

Natural History

Alkali milk-vetch is distinguished from other members of the genus that occur in the area by its strongly deflexed fruit. The geographic ranges of the other varieties of this species (Ferris' milk-vetch (*A. tener* var. *ferrisae*) and coastal dunes milk-vetch (*A. tener* var. *titi*)) do not include the Restoration Area or its vicinity.

Threats

The predominant identified threat to the survival of alkali milk-vetch is conversion of habitat to agricultural land uses (CNPS 2007). 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).

2.1.2 Heartscale

Heartscale (*Atriplex cordulata*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Heartscale is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

Heartscale is distributed throughout the Great Valley region up to 1,250 feet in elevation; however, it may be extirpated from some counties, including San Joaquin, Stanislaus, and Yolo. It was historically known from 51 quadrangles in its range and is believed to be extirpated from seven of these. One documented heartscale occurrence (CNDDB Occurrence 16) is mapped as a 1-mile-radius circle that overlaps the Restoration Area (Figure 2c in the Biological Resources - Vegetation and Wildlife appendix). Therefore, the occurrence is located somewhere in the circle but cannot be defined with any greater accuracy and may not be in the Restoration Area. This occurrence was last observed in 1989 but is presumed to be extant.

This species has also been reported to occur in the vicinity of the Restoration Area in Great Valley Grasslands State Park (McBain and Trush 2002). Another documented location (CNDDB Occurrence 74) is mapped immediately adjacent but outside of the Restoration Area in San Luis National Wildlife Refuge (NWR) near Bear Slough in Reach 4B1. CNDDB Occurrence 22 is mapped as a polygon touching the Restoration Area boundary in Reach 2A on the south side of Shields Avenue west of Fresno; however, this occurrence is believed to be extirpated because no suitable habitat remains

at the location. Several other occurrences are also documented in the vicinity of the Restoration Area in the quadrangles encompassing the project reaches (CNDDB 2007, CNPS 2007).

Natural History

Heartscale is an annual herb in the goosefoot family (*Chenopodiaceae*). It has erect stems that are typically 4–20 inches long. This species blooms between May and October, but as with all members of the goosefoot family, the flowers do not have petals and are not showy. Heartscale is similar to crownscale (*A. coronata* var. *coronata*) but can be distinguished from crownscale by its fruit bracts, which are generally widest below the middle, and its cordate (heart-shaped) leaf bases. Heartscale is found in chenopod scrub, desert scrub, and grassland habitats in sandy soils that are moderately alkaline or saline.

Threats

Development and conversion of habitat to agricultural uses appear to be the predominant threats to the survival of heartscale (CNPS 2007). Grazing and trampling are frequently mentioned as disturbances to known populations, but these do not seem to be serious threats.

2.1.3 Brittlescale

Brittlescale (*Atriplex depressa*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Brittlescale is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. This species is identified under the synonym *A. parishii* ssp. *depressa* in A California Flora (Munz 1959) but is currently recognized as a distinct species from *A. parishii*.

Distribution

Brittlescale is distributed throughout the San Joaquin Valley (except for San Joaquin County) and in the western Sacramento Valley at elevations up to 1,050 feet. It is known from 30 quadrangles across its range and is possibly extirpated from four of these quadrangles. It is documented in the Bliss Ranch, Jamesan, Stevinson, Sandy Mush, and Tranquility quadrangles in the vicinity of the Restoration Area. One CNDDB occurrence (Occurrence 73) is immediately adjacent to the Restoration Area in Reach 4B1, and one is just outside the Restoration Area at Reach 4B2, where it co-occurs with heartscale. All other documented locations are well outside the Restoration Area. Brittlescale has also been reported from the Restoration Area, its vicinity, or both in Great Valley Grasslands State Park in the West Bear Creek area (Hoopes et al. 1996, cited in McBain and Trush 2002).

Natural History

Brittlescale is an annual herb in the goosefoot family. Its stems are prostrate to decumbent and much branched. It is closely related to lesser saltscale (*A. miniscula*) and Parish's brittlescale (*A. parishii*). The ranges and habitats of these three species overlap and all three co-occur, but brittlescale can be distinguished from Parish's brittlescale by having glabrous to densely scaly stem tips as opposed to woolly stem tips. Lesser saltscale has erect stems, whereas stems of brittlescale are prostrate to decumbent. Brittlescale blooms between May and October and grows in alkaline clay soils in chenopod scrub, meadows and seeps, playa, vernal pool, and valley and foothill grassland habitats.

Threats

Identified threats to brittlescale are development, grazing, and trampling (CNPS 2007).

2.1.4 San Joaquin Spearscale

San Joaquin Spearscale (*Atriplex joaquiniana),* also known as valley spearscale, is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

San Joaquin spearscale is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

The geographic range of San Joaquin spearscale includes the southern Sacramento Valley, San Joaquin Valley, the eastern slope of the Inner South Coast Ranges, and the western edge of the Central Valley from Glenn to Tulare County (Hickman 1993). In this range, the species is known from 91 locations (i.e., CNDDB occurrences), and at almost all of these locations the species is presumed to be extant (CNDDB 2008). However, 26 of these occurrences have not been visited in the last 20 years (CNDDB 2009).

San Joaquin spearscale has not been documented as occurring in the Restoration Area. However, a CNDDB occurrence of the species (CNDDB Occurrence 52) (CNDDB 2007) has been mapped within approximately 0.5 mile of the Restoration Area in Reach 5 (Figure 2g in the Biological Resources - Vegetation and Wildlife appendix). This occurrence was last observed in 1989 and is presumed to be extant.

Natural History

An annual in the goosefoot family (*Chenopodiaceae*), San Joaquin spearscale has ascending branches, and plants reach heights from 4 inches to more than 3 feet (Hickman 1993). It blooms between April and October (CNPS 2009) and grows at elevations of 0–1,000 feet in alkaline soils in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland.

Threats

San Joaquin spearscale is threatened primarily by habitat conversion to agricultural and developed land uses and by incompatible grazing practices (CNPS 2009). Other threats may include disturbance of habitat by road and levee maintenance, and competition from nonnative invasive plants.

2.1.5 Lesser Saltscale

Lesser saltscale (*Atriplex miniscula)* is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Lesser saltscale is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

Lesser saltscale is distributed throughout the San Joaquin Valley (except for San Joaquin County) and is also known from Butte County. It grows at elevations of 50–700 feet. It is known from 27 quadrangles and believed extirpated from five of them. Lesser saltscale has been documented in the Bliss Ranch, Firebaugh Northeast, Gravelly Ford, Jamesan, Mendota Dam, Poso Farm, and Sandy Mush quadrangles. One CNDDB occurrence (Occurrence 13) is mapped as a 1-mile-radius circle that overlaps the Restoration Area in Reach 3 (Figure 2d in the Biological Resources - Vegetation and Wildlife appendix). This determination means that lesser saltscale was found somewhere in that circle but that its location cannot be defined with any greater accuracy, so it may not be found in the Restoration Area at this location. Lesser saltscale also is reportedly present in the Restoration Area or its vicinity in Great Valley Grasslands State Park (McBain and Trush 2002) and the Freitas Unit of the San Luis NWR.

Natural History

Lesser saltscale is an annual herb in the goosefoot family. The plants are typically less than 15 inches tall with many ascending to erect branches. Lesser saltscale is closely related and similar to brittlescale and Parish's brittlescale, and all three species co-occur. Lesser saltscale has ascending to erect stems, whereas brittlescale and Parish's brittlescale have stems that are prostrate to decumbent. Lesser saltscale blooms between May and October and grows in sandy alkaline soils in chenopod scrub, playa, and valley and foothill grassland habitats.

Threats

Identified threats to lesser saltscale are development, grazing, and trampling; however, grazing and trampling appear to have only minor effects (CNPS 2007).

2.1.6 Vernal Pool Smallscale

Vernal pool smallscale (*Atriplex persistens)* is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Vernal pool smallscale is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

Historically, the known distribution of vernal pool smallscale was restricted to the San Joaquin Valley vernal pool region of Merced, Stanislaus, and Tulare counties. Since 1990, the species has also been discovered in Colusa, Glenn, Madera, and Solano counties (USFWS 2005, CNPS 2007). Its elevation range is 30–400 feet. Vernal pool smallscale is believed to be extirpated from three of the 17 quadrangles in which it has been documented. It has been reported in the West Bear Creek Unit of the San Luis NWR and is documented in the vicinity of the Restoration Area in the Gustine, San Luis Ranch, Sandy Mush, and Stevinson quadrangles (CNDDB 2007, CNPS 2007). One of these occurrences (CNDDB Occurrence 32) is located near (approximately 0.4 mile from) the Restoration Area at the downstream end of Reach 4B, but all other occurrences are several miles outside the Restoration Area.

Natural History

Vernal pool smallscale is an annual herb species in the goosefoot family. It blooms between July and October and is found in alkaline vernal pools.

Threats

Identified threats to vernal pool smallscale include flood control activities and conversion of habitat to agricultural uses (CNPS 2007).

2.1.7 Subtle Orache

Subtle orache (*Atriplex subtilis)* is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Subtle orache is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20 to 80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered, threatened, or rare. Subtle orache was described in 1997 (Stutz and Chu 1997) and is tracked in CNPS's Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2009, Stutz and Chu 1997). However, in the next edition of *The Jepson Manual*, it will likely be treated as a synonym of *Atriplex minuscula* and not as a distinct species (JFP 2008).

Distribution

The geographic range of subtle orache is primarily in the San Joaquin Valley (although it has also been reported from a location in Butte County). Within this range, it is known from 24 locations (i.e., CNDDB occurrences). It is presumed to be extant at 23 of these locations (CNDDB 2008); however, more than 40 percent of these occurrences have not been observed in the last 20 years (CNDDB 2009). CNDDB occurrences of subtle orache (CNDDB Occurrences 19 and 5) (CNDDB 2008) have been mapped in the Restoration Area, in the Chowchilla and Eastside bypasses (Figures 2 and 2e, respectively, in the Biological Resources - Vegetation and Wildlife appendix). Both are presumed to be extant; however, CNDDB Occurrence 5 has not been observed since 1921.

Natural History

An annual in the goosefoot family (*Chenopodiaceae*), subtle orache reaches up to 16 inches in height, and blooms between June and August (rarely to October) (CNPS 2009). It grows at elevations of 130 to 330 feet in valley and foothill grassland.

Threats

Subtle orache is threatened primarily by habitat conversion to agricultural or developed land uses.

2.1.8 Lost Hills Crown Scale

Lost Hills crown scale (*Atriplex vallicola)* is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Lost Hills crown scale is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated

Distribution

The geographic range of the Lost Hills crown scale is within the San Joaquin Valley and includes the Lost Hills, the vicinity of McKittrick in Kern County, and scattered locations in Fresno and Merced counties (CNDDB 2008, CNPS 2009). Within this geographic range, it is known from 57 locations (i.e., CNDDB occurrences), and at 56 of these locations the species is presumed to be extant (CNDDB 2008). However, more than one-third of these occurrences have not been visited in the last 20 years (CNDDB 2009).

Lost Hills crown scale has not been documented in the Restoration Area. However, a CNDDB occurrence of Lost Hills crown scale (CNDDB Occurrence 6) (CNDDB 2008) has been mapped within approximately 0.41 mile of the Restoration Area in Reach 3 (Figure 2d in the Biological Resources - Vegetation and Wildlife appendix). This occurrence has not been observed since 1938, and its exact location is not known; therefore, it has been mapped as a 1-mile radius circle.

Natural History

An annual in the goosefoot family (*Chenopodiaceae*), Lost Hills crown scale may grow up to 8 inches tall (Hickman 1993). It blooms between April and August. Other aspects of this species' life history have not been documented. It grows at elevations of 160–2,100 feet in alkaline vernal pools, and in alkaline soils in chenopod scrub and valley and foothill grassland (CNPS 2009).

Threats

Lost Hills crown scale is threatened primarily by habitat conversion, energy development, and incompatible grazing practices (CNDDB 2008). Additional threats include habitat disturbance by use of off-road vehicles, construction and maintenance of electric transmission lines, and flooding for waterfowl management (USFWS 1998a).

Relevant Conservation Efforts and Guidance

Although Lost Hills crown scale is not a listed species, it was considered in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a). Measures proposed for its conservation include surveys of potential habitat throughout its geographic range, taxonomic studies, conservation of occupied habitat (in areas of at least 160 acres and with at least 1,000 individuals), and reevaluation of its status after recommended surveys and studies have been completed (USFWS 1998a). It also may benefit from recovery actions directed at listed plant and wildlife species, because many of these occur in the same areas as Lost Hills crown scale.

2.1.9 Succulent Owl's Clover

Succulent owl's clover (*Castilleja campestris* ssp. *succulenta*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Succulent owl's clover is Federally listed as threatened and State listed as endangered, and is a CNPS List 1B.2 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. Critical habitat for succulent owl's clover is designated within and immediately adjacent to the Restoration Area in Reach 1A. This species has been known by the synonyms Orthocarpus succulentus and O. campestris var. succulentus.

Distribution

Succulent owl's clover is discontinuously distributed through the southern Sierra Nevada foothills and eastern San Joaquin Valley in Fresno, Madera, Merced, Mariposa, San Joaquin, and Stanislaus counties at elevations of 160–2,500 feet. It has been documented in the vicinity of the Restoration Area in the Fresno North, Friant, Lanes Bridge, and Millerton Lake West quadrangles. There are no documented occurrences within the Restoration Area, but CNDDB Occurrence 40 is only 700 feet outside of the Restoration Area boundary in Reach 1, on the east side of Friant Road south of Friant Dam. CNDDB Occurrence 7 is within 500 feet of the Restoration Area boundary in Reach 1, along Friant Road; however, the species was last seen here in 1938 and may be extirpated

because the site had been disked and the species was absent when a visit to relocate the occurrence was made in 1981.

Natural History

Succulent owl's clover is a succulent, annual herb species in the figwort family (*Scrophulariaceae*). It has brittle narrow leaves and is typically 4–12 inches tall. Succulent owl's clover is distinguished from the other subspecies of Castilleja campestris (*C. campestris* ssp. *campestris*) by its leaves and bracts, which are lanceolate, thick, and brittle, as opposed to linear, thin, and flexible. Succulent owl's clover occurs in vernal pool habitat, often in acidic conditions.

As with many related species, succulent owl's clover is a hemiparasite, meaning that it obtains water and nutrients by forming root grafts with other host plants but manufactures its own food through photosynthesis (Chuang and Heckard 1991). Research on related species of *Castilleja* indicates that many different plants can serve as hosts for a single species or even a single plant individual of *Castilleja*. Seed germination does not require the presence of a host, as root connections form only after plants reach the seedling stage. In fact, some seedlings can survive to maturity without attaching to a host's roots, but in general reproduction is enhanced by root connections (Atsatt and Strong 1970).

The flower corollas are generally deep yellow to orange and are produced between April and May. The extent to which succulent owl's clover is self-pollinating (as opposed to out-crossing through pollination by insets) is uncertain (USFWS 2005). Little is known about the demography of succulent owl's clover, although the number of mature plants in populations can fluctuate by more than two orders of magnitude from year to year (CNDDB 2009).

Threats

Urbanization, agriculture, and flood control are the primary threats to this species (CNPS 2007). Grazing and trampling are frequently suggested as threats, but some level of grazing may benefit this species by controlling nonnative competitors.

2.1.10 California Jewelflower

California jewelflower (*Caulanthus californicus*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

California jewelflower is Federally and State listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat has not been designated for California jewelflower.

Distribution

California jewelflower grows at elevations of 0 to 3,000 feet in shadscale scrub, valley and foothill grassland, and pinyon-juniper woodland (CNPS 2009). Its geographic range is in the southern San Joaquin Valley, but it was formerly much more widespread. Within

this geographic range, it is known from 63 locations (i.e., CNDDB occurrences). At only 33 of these locations is the species presumed to be extant (and almost 90 percent of the occurrences that are presumed to be extant have been visited in the last 20 years) (CNDDB 2008).

California jewelflower has not been documented as occurring in the Restoration Area. However, a CNDDB occurrence of California jewelflower (CNDDB Occurrence 38) (CNDDB 2008) has been mapped approximately 0.8 mile south of the Restoration Area in Reach 1A (Figure 2a in the Biological Resources - Vegetation and Wildlife appendix). This occurrence has been extirpated.

Natural History

An annual in the mustard family (*Brassicaceae*), California jewelflower grows to about 4 inches in height (Hickman 1993). Its seeds germinate in the fall when the rainy season begins, but additional seedlings may continue to emerge for several months (USFWS 1998a). California jewelflower seedlings develop into rosettes (clusters of leaves at ground level) during the winter months. This species blooms between February and May, and seed set continues until the plants die, which may occur as late as May in years of favorable rainfall and temperatures.

Both plant size and population size of California jewelflower vary substantially depending on site and weather conditions (USFWS 1998a). The species probably forms a persistent seed bank (DFG 2005a).

Threats

California jewelflower is threatened primarily by conversion of its habitat to agricultural or developed land uses, and by energy development activities (USFWS 1998a, CNPS 2009). It also may be threatened by competition from nonnative plants and by incompatible grazing practices.

Relevant Conservation Efforts and Guidance

Efforts to conserve California jewelflower have included Federal and State listing of the species as endangered, surveys of potential habitat to document additional populations or to relocate previously documented populations whose exact location was not known, research studies of the species' biology and ecology, and experimental introduction efforts (USFWS 1998a). A recovery strategy for California jewelflower has been developed by USFWS and was included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a). This strategy includes monitoring of known populations, additional surveys in the vicinity of historical occurrences, preservation of known populations that are on private land, and reintroduction of the species to regions from which it has been extirpated.

2.1.11 Hoover's Spurge

Hoover's spurge (*Chamaesyce hooveri*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hoover's spurge is Federally listed as threatened and is a CNPS List 1B.2 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20 to 80 percent of known occurrences are threatened. Critical habitat for Hoover's spurge is designated within and immediately adjacent to the Restoration Area in Reaches 4B1 and 4B2. This species has been known by the synonyms *Euphorbia hooveri* and *E. platyspermum*. *Chamaesyce platysperma*, also known by the synonym *E. platyspermum*, is recognized as a separate species known in California from only five CNDDB occurrences in the Sonoran Desert region.

Distribution

Hoover's spurge is discontinuously distributed through the Central Valley in Tehama, Glenn, Butte, and Colusa counties and Stanislaus, Merced, and Tulare counties. Its elevation range is 80 to 820 feet. It has been documented in the vicinity of the Restoration Area in the Turner Ranch Quadrangle. Its presence has not been documented in the Restoration Area.

Natural History

Hoover's spurge is a small, prostrate annual herb species in the spurge family (*Euphorbiaceae*) that forms mats from a few inches to a few feet in diameter. This species is found in relatively large, deep vernal pools among the rolling hills, remnant alluvial fans, and depositional stream terraces of the eastern Sacramento and San Joaquin valleys (Stone et al. 1988).

Hoover's spurge does not appear to grow in standing water, and therefore its seeds probably germinate after water recedes from pools (Alexander and Schlising 1997, cited in USFWS 2005). It produces small flowers singly in the leaf axils, and these typically bloom during July and August. However, phenology varies among years and among sites, even for those populations in close proximity (Stone et al. 1988). Hoover's spurge is probably pollinated by insects. The glands on the cyathium (associated with the flower) produce nectar (Wheeler 1941). Beetles, flies, bees and wasps, and butterflies and moths have been observed visiting flowers of Hoover's spurge and may potentially serve as pollinators (Stone et al. 1988; Alexander and Schlising 1997, cited in USFWS 2005). Seed set apparently begins soon after flowering and large plants may produce several hundred seeds (Stone et al. 1988).

Like other annual plants of vernal pools, the number of mature plants in Hoover's spurge populations varies considerably among years. In fact, mature plants can be absent from populations in some years and be abundant in subsequent years (CNDDB 2009). This indicates that populations rely on the soil seed bank for their persistence.

Threats

Conversion of habitat to agricultural land uses, competition from nonnative species, and grazing are recognized as threats to Hoover's spurge (CNPS 2007). Some level of grazing, however, may benefit this species by controlling nonnative competitors.

2.1.12 Hispid Bird's-Beak

Hispid bird's-beak (*Cordylanthus mollis* ssp. *hispidus*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hispid bird's-beak is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. Hispid bird's-beak is also known by the synonym C. hispidus.

Distribution

The distribution of hispid bird's-beak is discontinuous through the central and southern Central Valley with documented occurrences in Alameda, Fresno, Kern, Merced, Placer, and Solano counties at elevations up to 500 feet. It has been recorded in the West Bear Creek area in the San Luis and Kesterson Units of the San Luis NWR and is documented in the Gustine, Ingomar, San Luis Ranch, and Delta Ranch quadrangles in the vicinity of the Restoration Area. All of these occurrences are outside of the Restoration Area.

Natural History

Hispid bird's-beak is a hemiparasitic annual herb species in the figwort family. The plants are typically 4–12 inches tall, bristly, and much branched. The whitish flowers bloom between June and September. This species grows in mesic alkaline sites in meadows, playas, and valley and foothill grassland habitats.

Threats

The predominant threats to the survival of hispid bird's-beak are agricultural conversion and development (CNPS 2007). Grazing is another recognized threat, but grazing is probably not a substantial threat unless excessive.

2.1.13 Palmate-Bracted Bird's-Beak

Palmate-bracted bird's-beak (*Cordylanthus palmatus*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Palmate-bracted bird's-beak is Federally and State listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. No critical habitat has been designated for this species.

Distribution

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 15–500 feet. It has been documented in the vicinity of the Restoration Area in the Firebaugh Northeast, Poso Farm, and Tranquility quadrangles,

including at the Alkali Sink Ecological Area and Mendota NWR approximately 4 miles south of Reach 2A. It has also been documented near Reach 3 of the Restoration Area between the San Joaquin River and the Chowchilla Bypass. All of the documented occurrences are outside of the Restoration Area.

Natural History

Palmate-bracted bird's-beak is a hemiparasitic annual herb species in the figwort family. It is believed that saltgrass (*Distichlis spicata*) is the host plant for this species. Palmate-bracted bird's-beak is glandular and softly hairy and is typically 4–12 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 (USFWS 1998a, cited in McBain and Trush 2002).

Threats

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

2.1.14 Hoover's Cryptantha

Hoover's cryptantha (*Cryptantha hooveri*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hoover's cryptantha is a CNPS List 1A species. This designation indicates that it is a California endemic that is presumed by CNPS to be extinct. It is not Federally or State listed as endangered or threatened, nor is it State-listed as rare; therefore, no critical habitat is designated. The species was last seen in 1939 and recent surveys have been unsuccessful (CNPS 2009).

Distribution

The geographic range of Hoover's cryptantha is in the northern and central San Joaquin Valley. Within this range, it is known from three locations (i.e., CNDDB occurrences), and at two of these locations the species is presumed to be extant (CNDDB 2008). However, the exact location of these occurrences is not known, and they have not been visited or relocated during the last 70 years (CNDDB 2009). Hoover's cryptantha has not been documented as occurring in the Restoration Area.

Natural History

An annual in the borage family (*Boraginaceae*), Hoover's cryptantha is 2–8 inches tall (Hickman 1993) and blooms between April and May (CNPS 2009). It grows at elevations of 30–500 feet on inland dunes, dry sandy flats, and other sandy soils in valley and foothill grassland.

Threats

Hoover's cryptantha is presumed to be extinct. Although it is possible that undocumented populations of this species still exist, the locations of any remaining populations and the threats to them are unknown.

2.1.15 Recurved Larkspur

Recurved larkspur (*Delphinium recurvatum*) is a perennial herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Recurved larkspur is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

The geographic range of recurved larkspur includes much of the Central Valley, portions of the Inner South Coast Ranges, and portions of the western Mojave Desert (Hickman 1993). The species is also cultivated in and beyond this range. Within its range, without being cultivated, it is known from 79 locations (i.e., CNDDB occurrences), and at 77 of these locations the species is presumed to be extant (CNDDB 2008). However, about 60 percent of these occurrences have not been visited in the last 20 years (CNDDB 2009). Recurved larkspur has not been documented as occurring in the Restoration Area.

Natural History

A perennial in the buttercup family (*Ranunculaceae*), recurved larkspur is typically 7 inches to 2 feet tall (Hickman 1993) and blooms between March and June (CNPS 2009). It grows at elevations of 10–2,500 feet in alkaline soils in cismontane woodland and valley and foothill grassland. Recurved larkspur hybridizes with several other species of delphinium (*D. gypsophilum*, *D. hesperium*, *D. parryi*, and *D. variegatum*); thus, it may be confused with these species (Flora of North America Editorial Committee 1997).

Threats

Recurved larkspur is threatened primarily by conversion of its habitat to agricultural land uses, and also by incompatible grazing practices (CNPS 2009).

2.1.16 Dwarf Downingia

Dwarf downingia (*Downingia pusilla*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Dwarf downingia is a CNPS List 2.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered in California, with 20–80 percent of known occurrences threatened, but considered more common elsewhere. It

is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

The geographic range of dwarf downingia includes the Inner North Coast Ranges, the southern Sacramento Valley, and the northern and central San Joaquin Valley. Its geographic range also includes Chile (Hickman 1993). Within this range, it is known from 117 locations (i.e., CNDDB occurrences), and at 110 of these locations the species is presumed to be extant (CNDDB 2008). However, more than 20 percent of these occurrences have not been visited in the last 20 years (CNDDB 2008). Dwarf downingia has not been documented as occurring in the Restoration Area.

Natural History

An annual in the harebell family (*Campanulacaeae*), dwarf downingia is typically 1–6 inches tall and blooms between March and May. It grows at elevations of 0–1,500 feet in vernally mesic sites in vernal pools and valley and foothill grasslands. As with many vernal pool species, the size of dwarf downingia populations fluctuates substantially from year to year depending on the amount and timing of rainfall.

Threats

Dwarf downingia is threatened primarily by conversion of its habitat to agricultural or urban land uses, incompatible grazing activities, disturbance of habitat by off-road vehicle activities, and industrial forestry (CNPS 2009).

Relevant Conservation Efforts and Guidance

Although dwarf downingia is not Federally listed, it may benefit from some of the recovery actions directed at listed species in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005). Critical habitat has also been established for Federally listed species associated with vernal pools (including some locations within the Restoration Area).

2.1.17 Round-Leaved Filaree

Round-leaved filaree (*Erodium macrophyllum*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Round-leaved filaree is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. In the second edition of The Jepson Manual, this species will be its own genus with the name California macrophylla and the common name of California filaree (JFP 2009).

Distribution

The geographic range of round-leaved filaree extends from southern Utah to California and northern Mexico (Hickman 1993). In California the species' geographic range

includes the Sacramento Valley, the northern San Joaquin Valley, the central and western Coast Ranges, the south coast, and Santa Cruz Island. Within its range in California, round-leaved filaree is known from 93 locations (i.e., CNDDB occurrences), and at 90 of these locations the species is presumed to be extant (CNDDB 2008). However, almost 60 percent of the occurrences that are presumed to be extant have not been visited in the last 20 years (CNDDB 2008). Round-leaved filaree has not been documented as occurring in the Restoration Area.

Natural History

An annual to biennial in the geranium family (*Geraniaceae*), round-leaved filaree has a stem less than 2 inches tall and leaves up to 6 inches long (Hickman 1993). It blooms between March and May (CNPS 2009). It grows at elevations of 10–100 feet in soils with high clay content in cismontane woodland and valley and foothill grassland.

Threats

Round-leaved filaree is threatened primarily by conversion of its habitat to agricultural or developed land uses, competition from nonnative plants, disturbance of habitat by off-road vehicle activities, pipeline construction, and foraging of feral pigs (CNPS 2009). It also may be threatened by incompatible grazing activities.

2.1.18 Delta Button-Celery

Delta button-celery (*Eryngium racemosum*) is an herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Delta button-celery is Federally listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. No critical habitat has been designated for this species in the Restoration Area or vicinity.

Distribution

Of approximately 26 occurrences of Delta button-celery recorded in the CNDDB, several have been extirpated, including all occurrences in San Joaquin County and most in Stanislaus County. Most of the extant occurrences are in Merced County along the San Joaquin River, including four in the West Bear Creek Unit and several in Great Valley Grasslands State Park. The species' elevation range is 10–100 feet. This species has been documented in the Gustine, San Luis Ranch, Sandy Mush, Stevinson, and Turner Ranch quadrangles. The CNDDB has mapped 36 polygon locations of Delta button-celery within the Restoration Area in Reaches 4B1, 4B2, and 5 (Figures 2f and 2g in the Biological Resources - Vegetation and Wildlife appendix). These polygons correspond to approximately three-quarters of all occurrences that are presumed to be extant.

Natural History

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 2007). Several occupied sites also experience grazing and various anthropogenic disturbances (e.g., from off-road vehicles, road maintenance).

Threats

Delta button-celery is threatened by agricultural conversion and flood control activities (CNPS 2007).

2.1.19 Spiny-Sepaled Button-Celery

Spiny-sepaled button-celery (*Eryngium spinosepalum*) is an herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Spiny-sepaled button-celery is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. In portions of its geographic range, this species may intergrade with two other button-celery species: E. castrense and E. vaseyi (Hickman 1993).

Distribution

The geographic range of spiny-sepaled button-celery is in the eastern San Joaquin Valley and adjacent Sierra Nevada foothills (Hickman 1993). Within this range, it is known from 60 locations (i.e., CNDDB occurrences), and at 56 of these locations the species are presumed to be extant (and more than 90 percent of the occurrences that are presumed to be extant have been visited in the last 20 years) (CNDDB 2008).

A CNDDB occurrence of spiny-sepaled button-celery (CNDDB Occurrence 30) has been mapped in the Restoration Area at Reach 1A (CNDDB 2008) (Figure 2a in the Biological Resources - Vegetation and Wildlife appendix). This occurrence is presumed to be extant, but it has not been visited since 1928. Because its exact location has not been documented, CNDDB maps Occurrence 30 as a 1-mile-radius circle.

Natural History

An annual to short-lived perennial in the carrot family (*Apiaceae*), spiny-sepaled button-celery is typically 1 to 2.5 feet tall (Hickman 1993) and blooms between April and May (CNPS 2009). It grows at elevations of 250–850 feet in vernal pools and valley and foothill grassland.

Threats

Spiny-sepaled button-celery is threatened primarily by conversion of its habitat to agricultural or developed land uses, incompatible grazing practices, disturbance of habitat by road maintenance activities, and hydrological alterations of its habitat (CNPS 2009).

Relevant Conservation Efforts and Guidance

Although spiny-sepaled button-celery is not Federally listed, it was considered in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005) and may benefit from some of the recovery actions directed at listed species. Critical habitat has also been established for Federally listed species associated with vernal pools (including some locations within the Restoration Area).

2.1.20 Bogg's Lake Hedge-Hyssop

Bogg's Lake hedge-hyssop (*Gratiola heterosepala*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Bogg's Lake hedge-hyssop is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. It is also State listed as endangered.

Distribution

The geographic range of Bogg's Lake hedge-hyssop includes portions of several different regions: the Inner North Coast Ranges, the central Sierra Nevada foothills, the Sacramento Valley, and the Modoc Plateau (Hickman 1993). Within this range, it is known from 87 locations (i.e., CNDDB occurrences), and at 85 of these locations the species is presumed to be extant (and more than 90 percent of the occurrences that are presumed extant have been visited in the last 20 years) (CNDDB 2008). Bogg's Lake hedge-hyssop has not been documented as occurring in the Restoration Area.

Natural History

A semiaquatic annual in the snapdragon family (*Scrophulariaceae*), Bogg's Lake hedge-hyssop is typically less than 4 inches tall (Hickman 1993). It grows at elevations of 30–7,800 feet in marshes, vernal pools, and margins of lakes in clay soils. Populations of Bogg's Lake hedge-hyssop, like those of many vernal pool species, fluctuate in abundance from year to year depending on the amount of rainfall (Corbin et al. 1994 and Kaye et al. 1990, both cited in USFWS 2005; CNDDB 2008). When a vernal pool containing Bogg's Lake hedge-hyssop seeds does not fill sufficiently, the seeds may not germinate. Estimates of some populations have fluctuated from no plants in a dry year to thousands in a wet year. Seeds germinate when pools become inundated, and growth begins underwater. The plants complete a rapid life cycle during the period when vernal pools have begun to dry but still contain shallow water (Corbin 1994 and Kaye et al. 1990, both cited in USFWS 2005). They bloom between April and August (CNPS 2009). Fruits mature within 1–2 weeks of the onset of flowering (Corbin 1994 and Kaye et al. 1990, both cited in USFWS 2005). Seeds may remain dormant for more than 1 year (USFWS 2005).

Threats

Bogg's Lake hedge-hyssop is threatened primarily by conversion of its habitat to agricultural or developed land uses, and by incompatible grazing practices (CNPS 2009). It also is threatened by disturbance of habitat by off-road vehicle use, and by competition from nonnative plants.

Relevant Conservation Efforts and Guidance

Although Bogg's Lake hedge-hyssop is not Federally listed, it was considered in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005) and may benefit from some of the recovery actions directed at listed species. Critical habitat has also been established for Federally listed species associated with vernal pools (including some locations within the Restoration Area). Because most occurrences of Bogg's Lake hedge-hyssop are on public land or on preserves (USFWS 2005), management actions are particularly important for the conservation of this species.

2.1.21 Munz's Tidy-Tips

Munz's tidy-tips (*Layia munzii*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Munz's tidy-tips is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

The geographic range of Munz's tidy-tips is in the southern San Joaquin Valley and the Inner South Coast Ranges (Hickman 1993). Within this range, it is known from 21 locations (i.e., CNDDB occurrences), and at 19 of these locations the species is presumed to be extant (CNDDB 2008). However, of the occurrences that are presumed to be extant, more than 90 percent have not been visited in the last 20 years (CNDDB 2008).

A CNDDB occurrence of Munz's tidy-tips (Occurrence 1) has been mapped in the Restoration Area in Reach 3 (CNDDB 2008). Another CNDDB occurrence of Munz's tidy-tips (Occurrence 2) (CNDDB 2008) has been mapped within approximately 0.5 mile of the Restoration Area in Reach 3. Both of these occurrences are presumed to be extant, but they were last visited in 1941 and their exact locations are not known (and thus, their locations are mapped by the CNDDB as a 1-mile-radius circle) (CNDDB 2008).

Natural History

An annual in the sunflower family (*Astgeraceae*), Munz's tidy-tips is 3–20 inches tall (Hickman 1993) and blooms between March and April (CNPS 2009). It grows at elevations of 150–2,600 feet in alkaline clay soils in chenopod scrub and valley and foothill grassland. Populations may be evident only in wet years (Flora of North America Editorial Committee 2007).

Threats

Munz's tidy-tips is considered threatened by competition from nonnative plants (CNPS 2009) and by conversion of habitat to agricultural or developed land uses (USFWS 1998a).

Relevant Conservation Efforts and Guidance

Although Munz's tidy-tips is not a listed species, it was considered in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a). Measures proposed for its conservation include surveys of potential habitat throughout its geographic range, conservation of occupied habitat (in areas of at least 160 acres and with at least 1,000 individuals), and reevaluation of its status after recommended surveys have been completed (USFWS 1998a). Munz's tidy-tips also may benefit from recovery actions directed at listed plant and wildlife species, because many of these occur in the same areas as Munz's tidy-tips.

2.1.22 Madera Leptosiphon

Madera leptosiphon (*Leptosiphon serrulatus*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Madera leptosiphon is a CNPS List 1B.2 species. This designation indicates it is a California endemic considered by CNPS to be fairly endangered because 20 to 80 percent of known occurrences are threatened. This species was previously known as Linanthus serrulatus, and this was the name used in the 1993 edition of The Jepson Manual. Members of the genus Linanthus that are annuals having calyx membranes that are obscure or much narrower than the ribs were separated into the genus Leptosiphon.

Distribution

Madera leptosiphon is known from Fresno, Madera, Mariposa, Tulare, and Kern counties at elevations of 950 to 4,300 feet. It has been documented in the vicinity of the Restoration Area in the Friant, Madera, and Millerton Lake West quadrangles, including occurrences at Millerton Lake, but there are no known occurrences in the Restoration Area.

Natural History

This annual herb species is a member of the phlox family (*Polemoniaceae*) and has erect stems that are typically 2 to 8 inches tall. It produces funnel-shaped, white flowers in head-like clusters between April and May. This species is typically found in open areas within woodland or chaparral vegetation communities.

Threats

Madera leptosiphon is threatened by development (CNPS 2007).

2.1.23 San Joaquin Woollythreads

San Joaquin woollythreads (*Monolopia congdonii*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

San Joaquin woollythreads is Federally listed as endangered and is a CNPS List 1B.2 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20 to 80 percent of known occurrences are threatened. It is not State listed as endangered, threatened, or rare. In *The Jepson Manual*, this species was treated as *Lembertia congdonii* (Hickman 1993). Critical habitat has not been proposed for San Joaquin woollythreads.

Distribution

The geographic range of San Joaquin woollythreads is in the southwestern San Joaquin Valley (Hickman 1993). Within that range, it is known from 87 locations (i.e., CNDDB occurrences), and at 65 of these locations the species is presumed to be extant (and only seven of these have not been visited in the last 20 years) (CNDDB 2008). San Joaquin woollythreads has not been documented as occurring in the Restoration Area.

Natural History

An annual in the sunflower family (*Asteraceae*), San Joaquin woollythreads is 2 to 12 inches tall (Hickman 1993). It grows at elevations of 200–2,650 feet in alkali sinks and valley and foothill grassland with sandy soils (CNPS 2009).

Germination of seeds of San Joaquin woollythreads may begin as early as November but usually occurs in December and January (USFWS 1998a). Plants bloom between February and May, shed seed immediately upon maturity, and then die and break apart. The species apparently forms a substantial seed bank in the soil.

Threats

San Joaquin woollythreads is threatened by conversion of its habitat to agricultural or developed land uses (and for energy development), incompatible grazing activities, activities associated with energy development, and off-road vehicle activities (CNPS 2009).

Relevant Conservation Efforts and Guidance

As part of efforts to conserve San Joaquin woollythreads, extensive surveys of potential habitat for this species have been conducted on public lands, and its ecology has been researched (USFWS 1998a). A recovery strategy for the species is provided in Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a). Measures proposed for the recovery of San Joaquin woollythreads include monitoring of occupied habitat and additional conservation of occupied habitat (in areas of at least 160 acres and with at least 1,000 individuals) (USFWS 1998a).

2.1.24 Little Mousetail

Little mousetail (*Myosurus minimus* ssp. *apus*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Little mousetail is a CNPS List 3.1 species. This designation indicates that it is a species about which additional information is needed, but that may be seriously endangered in California. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. Although treated as a subspecies of M. minimus by CNPS, little mousetail was considered a variety of this species in The Jepson Manual (Hickman 1993); in Flora of North America, little mousetail is not distinguished as a variety or subspecies, although the designation of the species by others is discussed along with its possible origin through past hybridization between *M. minimus* and *M. sessilis* (Flora of North America Editorial Committee 1997). In the second edition of The Jepson Manual, little mousetail may be added as a subspecies or variety of *M. minimus* (JFP 2009).

Distribution

The geographic range of little mousetail is in the Central Valley and along the south coast. Within this range, it is known from 24 locations (i.e., CNDDB occurrences), and at all of these locations the species is presumed to be extant (CNDDB 2008). However, more than 60 percent of these occurrences have not been visited in the last 20 years (CNDDB 2008). Little mousetail has not been documented as occurring in or near the Restoration Area.

Natural History

An annual in the buttercup family (*Ranunculaceae*), little mousetail is 1 to 5 inches tall and blooms between March and June (CNPS 2009), which appears to be about 2 months after seeds germinate (USFWS 2005). It grows at elevations of 65 to 2,100 feet in alkaline vernal pools and other wetland habitats in valley and foothill grassland and coastal sage scrub. Little mousetail seeds can remain dormant in the soil for more than 1 year (USFWS 2005).

Threats

Little mousetail is threatened primarily by conversion of its habitat to agricultural or developed land uses, incompatible grazing practices, and activities by off-road vehicles (CNPS 2009).

Relevant Conservation Efforts and Guidance

Although little mousetail is not Federally listed, it was considered in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005) and may benefit from some of the recovery actions directed at listed species. Critical habitat has also been established for Federally listed species associated with vernal pools (including some locations within the Restoration Area).

2.1.25 Prostrate Navarretia

Prostrate navarretia (*Navarretia prostrata*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Prostrate navarretia is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. It is also known as prostrate vernal pool navarretia.

Distribution

The geographic range of prostrate navarretia extends from the central south coast to the Inner South Coast Ranges, the Peninsular Ranges, and the western San Joaquin Valley (Hickman 1993). Within this range, it is known from 30 locations (i.e., CNDDB occurrences), and at 21 of these locations the species is presumed to be extant (and only four of these locations have not been visited in the last 20 years) (CNDDB 2008). An occurrence of *prostrate navarretia* (Occurrence 25) is mapped in the Restoration Area in Reach 5 (CNDDB 2008). Occurrence 25 is presumed to be extant and was last visited in 1999.

Natural History

An annual in the phlox family (*Polemoniaceae*), prostrate navarretia is characteristically prostrate with branches 1–3 inches long (Jepson 1943, Hickman 1993), and it blooms between April and July (CNPS 2009). It grows at elevations of 50–650 feet in vernally mesic sites in coastal scrub, alkaline soils in valley and foothill grassland, and vernal pools.

Threats

Like many other vernal pool and grassland species, prostrate navarretia is threatened primarily by conversion of its habitat to agricultural or developed land uses, but it also may be threatened by incompatible grazing practices and competition from nonnative plants.

2.1.26 Hartweg's Golden Sunburst

Hartweg's golden sunburst (*Pseudobahia bahiifolia*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hartweg's golden sunburst is Federally and State listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat has not been designated for Hartweg's golden sunburst.

Distribution

The geographic range of Hartweg's golden sunburst extends along the central Sierra Nevada foothills and the eastern San Joaquin Valley (Hickman 1993). Within this geographic range, it is known from 24 locations (i.e., CNDDB occurrences), and at 19 of these locations the species is presumed to be extant (and 16 of the occurrences that are presumed to be extant have been visited in the last 20 years) (CNDDB 2008).

Hartweg's golden sunburst has not been documented as occurring in the Restoration Area. However, two CNDDB occurrences of Hartweg's golden sunburst (Occurrences 21 and 26) have been mapped within approximately 0.2 and 1.0 mile of the Restoration Area in Reach 1A (CNDDB 2008) (Figure 2a in the Biological Resources - Vegetation and Wildlife appendix). These occurrences are both presumed extant and were last observed in 2001 and 2004, respectively.

Natural History

An annual in the sunflower family (*Asteraceae*), Hartweg's golden sunburst is typically 2–8 inches tall (Hickman 1993). It probably germinates after fall and early winter rains, and it blooms between March and April (CNPS 2009). It grows at elevations of 50–500 feet in shallow, well-drained soils in cismontane and valley and foothill grassland habitats, especially in areas with mima mound topography (62 Federal Register (FR) 5542–5551, February 6, 1997).

Threats

Hartweg's golden sunburst is threatened primarily by conversion of its habitat to agricultural or developed land uses (CNPS 2009). It also may be threatened by competition from nonnative invasive plant species and by incompatible grazing practices.

2.1.27 Wright's Trichocoronis

Wright's trichocoronis (*Trichocoronis wrightii* var. *wrightii*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Wright's trichocoronis is a CNPS List 2.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered in California, with more than 80 percent of known California occurrences threatened, but considered more common elsewhere. Some confusion and uncertainty have arisen about whether this species is actually native to California and whether California plants are a distinct species from plants found in Texas. This species is undergoing a name change that will be implemented in the forthcoming edition of The Jepson Manual. The new name will be T. wrightii; the species will no longer be recognized as a variety.

Distribution

Wright's trichocoronis has a disjunct distribution in Colusa and Sutter counties in the Sacramento Valley, in San Joaquin and Merced counties in the San Joaquin Valley, and in Riverside County in southern California. It grows at elevations of 15 to 1,500 feet. This species' presence has been documented (CNDDB Occurrence 8) in the Restoration

Area in the Merced NWR. Wright's trichocoronis also has been reported to be present in the Restoration Area or its vicinity, or both, in Great Valley Grasslands State Park (Hoopes et al. 1996, cited in McBain and Trush 2002). It has been documented in the vicinity of the Restoration Area in the San Luis Ranch and Los Banos quadrangles in the Los Banos Wildlife Area.

Natural History

An annual herb species, Wright's trichocoronis is a member of the sunflower family (*Asteraceae*) and is generally less than 12 inches tall. Each plant produces one to a few small flowering heads between May and September. Each flower head contains 75–125 disk flowers with white and maroon throats and white lobes. Wright's trichocoronis grows in marshes, meadows, riparian forests, and vernal pools in alkaline soils, typically in mudflats of drying lakes, pools, riverbeds, and alkali meadows.

Threats

The primary threat to Wright's trichocoronis is habitat loss resulting from agricultural conversion and urbanization.

2.1.28 Caper-Fruited Tropidocarpum

Caper-fruited tropidocarpum (*Tripidocarpum capparideum*) is an annual herb that is native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Caper-fruited tropidocarpum is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. In the early 1990s, this species was presumed extinct because it was last observed in the 1950s (Hickman 1993). Since that time, however, extant populations of the species have been documented (CNDDB 2008, Jepson Flora Project 2009).

Distribution

The geographic range of caper-fruited tropidocarpum extends from the Mt. Diablo area and the Inner South Coast Ranges to the San Joaquin Valley (CNPS 2009). Within this range, it is known from 19 locations (i.e., CNDDB occurrences), and at 11 of these locations the species is presumed to be extant (CNDDB 2008). However, nearly two-thirds of the occurrences that are presumed to be extant have not been visited in the last 20 years (CNDDB 2008).

Caper-fruited tropidocarpum has not been documented as occurring in the Restoration Area. However, a CNDDB occurrence of this species (Occurrence 22) has been mapped within approximately 0.8 mile of the Restoration Area in Reach 1A (CNDDB 2008) (Figure 2a in the Biological Resources - Vegetation and Wildlife appendix). Occurrence 22 is presumed extant, but it was last observed in 1930 and its exact location is not known (CNDDB 2008). Because the exact location of this occurrence is not known, it has been mapped by CNDDB as a 5-mile-radius circle.

Natural History

An annual in the mustard family (*Brassicaeae*), caper-fruited tropidocarpum is typically 4–20 inches tall (Hickman 1993) and blooms from March to April (CNPS 2009). It grows at elevations of 160–1,300 feet in mesic alkaline soils in valley and foothill grassland and in vernal pools (CNPS 2009).

Threats

Caper-fruited tropidocarpum may be threatened by incompatible grazing and military activities and by competition from nonnative plants (CNPS 2009).

2.2 Monocots

Monocots are one of two major groups of flowering plants. Monocots generally have an embryo with one cotyledon. Monocots generally have leaves with parallel veins and the flower parts are in multiples of three. Seven species of monocots were identified as having potential to occur in the Restoration Area or its vicinity or both. Descriptions of these potentially occurring special-status species are provided below.

2.2.1 Four-Angled Spikerush

Four-angled spikerush (*Eleocharis quadrangulata*) is a perennial species found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Until recently, four-angled spikerush was a CNPS List 2.2 species. This designation indicated that it was a California endemic considered by CNPS to be fairly endangered in California, with 20–80 percent of known occurrences threatened, but considered more common elsewhere. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. Four-angled spikerush is no longer listed by CNPS because CNPS has determined that this species is nonnative (CNPS 2009). It also will be considered a nonnative species in the revised edition of The Jepson Manual because no collections predate 1948, most collections are from disturbed sites, and the species is widely distributed in North America (JFP 2009).

Distribution

Four-angled spikerush is widely distributed in North America (Flora of North America Editorial Committee 2002). Its geographic range extends from northeastern North America to Florida and northern and central Mexico. In California, the geographic range of four-angled spikerush includes much of the Central Valley (Hickman 1993). Within this range, the species occurs at multiple locations in Tehama, Butte, and Merced counties (Consortium of California Herbaria 2008). Four-angled spikerush has not been documented as occurring in the Restoration Area.

Natural History

A rhizomatous perennial in the rush family (*Cyperaceae*), four-angled spikerush typically has culms 1.5 to 3 feet high and blooms between May and September. In California, it grows at elevations of 100–1,600 feet in freshwater marshes.

Threats

The threats to four-angled spikerush are not well understood. Four-angled spikerush has been affected by habitat conversion to developed and agricultural land uses, habitat fragmentation, and habitat disturbance. However, the establishment and spread of this species in California may also have been facilitated by this habitat disturbance and alteration.

2.2.2 California Satintail

California satintail (*Imperata brevifolia*) is a perennial species native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

California satintail is a CNPS List 2.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered in California, with more than 80 percent of known California occurrences threatened, but considered more common elsewhere. It is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. The species was mistakenly classified as a noxious weed in California from 1960 to 2004 (CNPS 2009).

Distribution

The geographic range of California satintail extends from California to northern Mexico and Texas (Hickman 1993). This species is also planted as an ornamental in this and other regions. In California, the range of California satintail includes the Central Valley, the south coast, the San Gabriel Mountains, the San Bernardino Mountains, and the Mojave Desert. Within the California portion of its range, it is known from 27 locations (i.e., CNDDB occurrences), and at 26 of these locations the species is presumed to be extant (CNDDB 2008). However, 80 percent of the occurrences that are presumed to be extant have not been visited in the last 20 years (CNDDB 2008). Occurrences in Butte, Tehama, and Lake counties may represent escapes from ornamental plantings (CNPS 2009).

California satintail has not been documented as occurring in the Restoration Area. However, a CNDDB occurrence of California satintail (Occurrence 22) has been mapped within approximately 0.8 mile of the Restoration Area in Reach 1A (CNDDB 2008) (Figure 2a in the Biological Resources - Vegetation and Wildlife appendix). Occurrence 22 is presumed to be extant, but it was last observed in 1893, and its exact location is not known (and thus its location is mapped by the CNDDB as a 5-mile-radius circle) (CNDDB 2008).

Natural History

A rhizomatous perennial (i.e., a perennial with belowground stems) in the grass family (*Poaceae*), California satintail is typically 3–5 feet tall (Hickman 1993) and blooms between September and May (CNPS 2009). It grows at elevations of 0–1,650 feet in mesic sites in chaparral, coastal scrub, Mojavean desert scrub, meadows and seeps (often alkali), and riparian scrub.

Threats

California satintail is threatened primarily by conversion of its habitat to agricultural or developed land uses (CNPS 2009).

2.2.3 Colusa Grass

Colusa grass (*Neostapfia colusana*) is an annual species native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Colusa grass is Federally listed as threatened and State listed as endangered, and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat is designated for this species, and is in and adjacent to Reaches 4B1 and 4B2 of the Restoration Area. This species has been recognized by the synonyms Anthochloa colusana, Stapfia colusana, and Davyella colusana.

Distribution

Colusa grass is currently known from approximately 40 populations in Merced, Stanislaus, Solano, and Yolo counties, including occurrences in and near the Arena Plains Unit of the San Luis NWR. The elevation range of this species is 15 to 4,000 feet. It has been documented in the vicinity of the Restoration Area in the Sandy Mush and Turner Ranch quadrangles. There are no known occurrences in the Restoration Area.

Natural History

An annual member of the grass family (*Poaceae*), Colusa grass is typically 4 to 12 inches tall and blooms between May and July. It grows in large or deep vernal pools with adobe clay soils. It has been found in northern claypan and northern hardpan pool types. The species grows primarily in large pools that retain water until late spring (Stone et al. 1988).

The life history of Colusa grass is similar to that of other members of the *Orcuttieae*. Germination may not take place until after several months of inundation (Keeley 1998). Although germination has not been investigated in the field, Colusa grass seeds are considered to germinate in late spring when little standing water remains. Seedlings produce one or two juvenile leaves underwater, followed by multiple decumbent stems with terrestrial leaves. Plants probably begin to flower within several weeks (usually between May and July), and are wind pollinated. Seeds are dispersed by water, which

breaks up inflorescences (Reeder 1965; Crampton 1976; Griggs 1980, 1981). These seeds can remain dormant for at least 3 or 4 years (Griggs 1980, Keeley 1998).

As with most annual plants of vernal pools, the number of mature plants in Colusa grass populations varies considerably from year to year, and the number of seeds in the soil seed bank may be more than tenfold the number of mature plants. In general, years of above-average rainfall promote higher numbers of mature plants in populations of *Orcuttieae*, but population responses vary by pool and by species (Griggs 1980, Griggs and Jain 1983). The number of mature plants has been observed to vary by one to four orders of magnitude among successive years and to return to previous levels even after 3–5 consecutive years when no mature plants were present (Griggs 1980, Griggs and Jain 1983, Holland 1987).

Threats

The biggest threat to survival of Colusa grass is conversion of habitat to agricultural land uses. Development, flood control, overgrazing, and competition from nonnative species are also recognized threats. Other observed threats at specific sites include poultry manure, herbicides, and groundwater contamination by industrial chemicals (USFWS 2005).

2.2.4 San Joaquin Valley Orcutt Grass

San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*) is an annual species native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

San Joaquin Valley Orcutt grass is Federally and State listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat for this species is designated immediately adjacent to Reach 1A of the Restoration Area.

Distribution

San Joaquin Valley Orcutt grass is restricted to the vernal pool region of the eastern San Joaquin Valley, from Stanislaus County to Tulare County, at elevations up to 2,500 feet. Most of the extant occurrences are concentrated in two small areas of eastern Merced County. A CNDDB occurrence (Occurrence 21) is mapped as a 1-mile-radius circle overlapping the Restoration Area in Reach 1A, and another nearby occurrence (Occurrence 53) is just outside the Restoration Area boundary on the east side of Friant Road in a location that also supports succulent owl's clover. This Orcutt grass is also known from Big Table Mountain and Kennedy Table and has been documented elsewhere in the vicinity of the Restoration Area in the Fresno North, Friant, Lanes Bridge, and Millerton Lake East quadrangles, outside the Restoration Area.

Natural History

San Joaquin Valley Orcutt grass is a small, grayish-green, tufted annual of the grass family. It is found on alluvial fans, stream terraces, and tabletop lava flows in northern

claypan, northern hardpan, and northern basalt flow vernal pools. The species grows primarily in large pools that retain water until late spring (Stone et al. 1988). This species has been recognized by the synonym O. californica var. inaequalis.

The life history of San Joaquin Valley Orcutt grass is similar to that of other species in its genus (*Orcuttia*). Seeds germinate underwater in winter, after being colonized by aquatic fungi (Griggs 1980, 1981; Griggs and Jain 1983; Keeley 1998). Plants then grow underwater for 3 months or more (Keeley 1998). Initially, a basal rosette of juvenile leaves is produced, and subsequently floating leaves are produced. These floating leaves form as water in the pool warms and remain as long as the standing water lasts (Griggs 1980, 1981; Hoover 1941; Keeley 1998; Reeder 1982). As pools dry, typically in June or July, Orcutt grasses begin producing terrestrial leaves. Inflorescences appear a few days after the water evaporates, as early as May and sometimes even in mid-April. The flowers are wind pollinated. Most flowers and seed are produced in June and July; however, flowering may continue into September in wet years (Griggs 1980, 1981). Seed production may vary two- to threefold among years (Griggs 1980, Griggs and Jain 1983). During autumn rains, inflorescences break apart, which scatters seeds that then may be dispersed further by water (Griggs 1980, 1981; Reeder 1965). As with populations of other vernal pool annuals, the number of mature plants in San Joaquin Valley Orcutt grass populations fluctuates dramatically from year to year.

Threats

Survival of San Joaquin Valley Orcutt grass is seriously threatened by agricultural conversion, urbanization, overgrazing, channelization and other hydrological modifications, and competition from nonnative plants (CNPS 2007, USFWS 2005). Grasshopper herbivory during large outbreaks threatens some populations.

2.2.5 Hairy Orcutt Grass

Hairy Orcutt grass (*Orcuttia pilosa*) is an annual species native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hairy Orcutt grass is Federally and State listed as endangered and is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat for this species is designated in and immediately adjacent to Reach 1A of the Restoration Area.

Distribution

Distribution of hairy Orcutt grass is discontinuous through the Central Valley and southern Sierra Nevada foothills, with populations in the north in Tehama, Glenn, and Butte counties and southern populations in Madera, Merced, and Stanislaus counties. Its elevation range is 175–650 feet. This species has been documented in the vicinity of the Restoration Area in the Gregg, Herndon, Lanes Bridge, and Madera quadrangles. There are no known occurrences in the Restoration Area; the nearest documented occurrence

(CNDDB Occurrence 28) is located approximately 3,000 feet outside the Reach 1A boundary.

Natural History

Hairy Orcutt grass is a yellow-green, tufted annual of the grass family. This species is found in vernal pools in undulating topography on remnant alluvial fans and stream terraces. The species grows primarily in large pools that retain water until late spring (Stone et al. 1988).

The life history of hairy Orcutt grass is similar to that of other species in its genus (*Orcuttia*). Seeds germinate underwater in winter, after being colonized by aquatic fungi (Griggs 1980, 1981; Griggs and Jain 1983; Keeley 1998). Plants then grow underwater for 3 months or more (Keeley 1998). Initially, a basal rosette of juvenile leaves is produced, and subsequently floating leaves are produced. These floating leaves form as water in the pool warms and remain as long as the standing water lasts (Griggs 1980, 1981; Hoover 1941; Keeley 1998; Reeder 1982). As pools dry, typically in June or July, Orcutt grasses begin producing terrestrial leaves. Inflorescences appear a few days after the water evaporates, as early as May and sometimes even in mid-April. Although flowers are predominantly wind pollinated, bees have been observed visiting the inflorescences of hairy Orcutt grass to gather pollen. Most flowers and seed are produced in June and July; however, flowering may continue into September in wet years (Griggs 1980, 1981). Individual plants may produce up to 10,000 seeds, and seed production may vary two- to threefold among years (Griggs 1980, Griggs and Jain 1983). During autumn rains, inflorescences break apart, which scatters seeds that may then be dispersed farther by water (Griggs 1980, 1981; Reeder 1965).

As with populations of other vernal pool annuals, the number of mature plants in hairy Orcutt grass populations fluctuates dramatically from year to year. In some populations, the number of mature plants has varied by up to four orders of magnitude over time (Griggs 1980, Griggs and Jain 1983). For example, two populations that had no visible plants for three successive years exceeded 10,000 individual plants in the fourth year (Griggs 1980, Griggs and Jain 1983).

Threats

The biggest threats to survival of hairy Orcutt grass are habitat conversion to agricultural uses and development (CNPS 2007). Cattle grazing and competition from nonnative species are additional recognized threats. Some populations are vulnerable to extinction from random catastrophic events because of their small sizes.

2.2.6 Slender-Leaved Pondweed

Slender-leaved pondweed (*Potamogeton filiformis*) is a perennial herb native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Slender-leaved pondweed (*Potamogeton filiformis*) is a CNPS List 2.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly

endangered in California because 20–80 percent of the known occurrences are threatened, but considered more common elsewhere. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated. This species has been known by the synonym Potamogeton filiformis var. macounii but is currently undergoing a name change; Stuckenia filiformis will be the new name in the forthcoming edition of The Jepson Manual.

Distribution

Slender pondweed has a disjunct distribution across several regions—the Modoc Plateau, the Sierra Nevada, the Central Valley, and the central coast—at elevations from 900 to 7,000 feet. This species has been documented in the vicinity of the Restoration Area along Reach 2A in the West Bear Creek area in the Ingomar Quadrangle. None of these occurrences are within the Restoration Area. It also has been reported at four locations in the Restoration Area or its vicinity (or both) in Great Valley Grasslands State Park (Hoopes et al. 1996, cited in McBain and Trush 2002).

Natural History

A perennial aquatic herb species, slender pondweed is a member of the pondweed family (*Potamogetonaceae*). The nonshowy flowers are produced in spikes from May to July. This species is found in shallow freshwater marsh and swamp habitats at the edges of lakes and drainage channels.

Threats

Primary threats to slender pondweed are hydrological modifications and habitat loss resulting from urbanization (CNPS 2007).

2.2.7 Sanford's Arrowhead

Sanford's arrowhead (*Sagittaria sanfordii*) is a perennial herb native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Sanford's arrowhead is a CNPS List 1B.2 species. This designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20–80 percent of known occurrences are threatened. This species is not Federally or State listed as endangered or threatened, nor is it State listed as rare; therefore, no critical habitat is designated.

Distribution

The distribution of Sanford's arrowhead is disjunct across many regions—the Sacramento and San Joaquin valleys, northwestern California, and the south coast—at elevations between 950 and 7,050 feet. An occurrence of this species (CNDDB Occurrence 12) has been documented in the Restoration Area along Reach 2B at Mendota Pool, but the species has not been observed there since 1948. This site was searched in 1980, but no plants were found. Another CNDDB occurrence (Occurrence 10), located near the Merced NWR, overlaps the Restoration Area in Reach 4B, but this population also has not been seen since 1948. Both occurrences are presumed to be

extant, however. There are additional records of this species in the vicinity of the Restoration Area from the Delta Ranch, Gustine, Firebaugh, Fresno North, Ingomar, Jamesan, Mendota Dam, San Luis Ranch, Tranquility, and Turner Ranch quadrangles, but all are outside the Restoration Area.

Natural History

Sanford's arrowhead is an emergent (i.e., rooted in water but emerging above the water surface) perennial herb species in the water plantain family (*Alismataceae*). The flowers have three white petals each and the blooming period is between May and October. This species grows in shallow freshwater marsh habitat in ponds, ditches, and other standing or slow-moving waters.

Threats

The primary threats to Sanford's arrowhead are hydrological modifications and development (CNPS 2007).

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3.0 Special-Status Wildlife

Based on the results of database searches and review of existing environmental documentation, 66 special-status animal species were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status animal species are provided below. Species descriptions are derived primarily from information in CNDDB records; existing species accounts available from DFG, USFWS, and others; recovery plans for special-status species with potential to occur in the Restoration Area; relevant scientific literature; and information contained in the San Joaquin River Restoration Study Background Report (McBain and Trush 2002).

3.1 Invertebrates

Five invertebrate species were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status species are provided below.

3.1.1 Conservancy Fairy Shrimp

The Conservancy fairy shrimp (*Branchinecta conservatio*) is a vernal pool crustacean found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The Conservancy fairy shrimp is Federally listed as endangered, and critical habitat has been designated for this species.

Distribution

The range of the Conservancy fairy shrimp extends from the northern Sacramento Valley to the San Joaquin Valley. Within this range, Conservancy fairy shrimp occur in vernal pools, swales, and lakes (Helm 1998). Observations also suggest that this species is generally found in pools that are relatively large and turbid (Eriksen and Belk 1999, Helm 1998, King 1996). These pools may be more than several acres in size.

Conservancy fairy shrimp is known to occur in suitable habitat in the San Luis NWR complex in Reaches 4B2 and 5 and the Eastside Bypass. Critical habitat for this species is in and adjacent to the Chowchilla Bypass, the Eastside Bypass, the Mariposa Bypass, and Reaches 4B2 and 5 of the Restoration Area (Figure 5c in the Biological Resources - Vegetation and Wildlife appendix).

Natural History

Conservancy 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 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 very 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).

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, 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 species also has been or is proposed to be covered by several regional habitat conservation plans (HCPs).

3.1.2 Longhorn Fairy Shrimp

The longhorn fairy shrimp (*Branchinecta longiantenna*) is a vernal pool crustacean found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The longhorn fairy shrimp is Federally listed as endangered, and critical habitat has been designated for this species.

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 2008). Within this geographic range, it is extremely rare in vernal pools and swales. This species is known to occur in suitable habitat in the San Luis NWR complex in Reach 5. Critical habitat for this species is in and adjacent to Reaches 4B2 and 5 of the Restoration Area (Figure 5c in the Biological Resources - Vegetation and Wildlife appendix).

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 very 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 longhorn fairy shrimp are similar to those of other fairy shrimp species. The longhorn fairy shrimp can complete its life cycle in 3–7 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).

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 and replacement of native plants by nonnatives (Robins and Vollmar 2002, Marty 2005, Pyke and Marty 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. In addition, much of the species'

known occupied habitat has been partially or fully protected on land managed by the East Bay Regional Parks District, USFWS, and the Carrizo National Monument.

3.1.3 Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) is a vernal pool crustacean found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The vernal pool fairy shrimp is Federally listed as threatened, and critical habitat has been designated for this species.

Distribution

The vernal pool fairy shrimp is found throughout the Central Valley and west to the central Coast Ranges, at sites 30–4,000 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, Belk, and Eriksen 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 the San Luis NWR complex in Reaches 4B1, 4B2, and 5, and the Chowchilla and Eastside bypasses. Critical habitat for this species is near Reach 1A, and adjacent to the Chowchilla Bypass, the Eastside Bypass, the Mariposa Bypass, and Reaches 4B2 and 5 of the Restoration Area (Figures 5a and 5c in the Biological Resources - Vegetation and Wildlife appendix).

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 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 very 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.

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 completing 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.

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, 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 species also has been or is proposed to be covered by several regional HCPs.

3.1.4 Vernal Pool Tadpole Shrimp

The vernal pool tadpole shrimp (*Lepidurus packardi*) is a vernal pool crustacean found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The vernal pool tadpole shrimp is Federally listed as endangered, and critical habitat has been designated for this species.

Distribution

The vernal pool tadpole shrimp is endemic to the Central Valley with most populations in the Sacramento Valley. This species has also been reported from the Sacramento–San Joaquin River Delta (Delta) to the east side of San Francisco Bay, and from scattered localities in the San Joaquin Valley from San Joaquin County to Madera County (Rogers 2001).

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 2008, 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 vernal pool tadpole shrimp is known to occur in suitable habitat in the San Luis NWR complex and at the Great Valley Grasslands State Park in Reaches 4B1, 4B2, and 5, and the Chowchilla and Eastside Bypasses. Critical habitat for this species is in and adjacent to the Chowchilla Bypass, the Eastside Bypass, the Mariposa Bypass, and Reaches 4B2 and 5 of the Restoration Area (Figure 5c in the Biological Resources - Vegetation and Wildlife appendix).

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 very 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.

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). After hatching, 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.

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, 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 species also has been or is proposed to be covered by several regional HCPs.

3.1.5 Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*) is a Federally threatened species endemic to the Central Valley. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The VELB is Federally listed as threatened, and critical habitat has been designated for this species. In 2006, USFWS recommended that this species be delisted (USFWS 2006a).

Distribution

The VELB is endemic to the Central Valley. 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 within the riparian woodland in Reach 1A. The species is also expected to occur in suitable habitat in other locations in the Restoration Area.

Natural History

Adults feed on the foliage and possibly the flowers of elderberries from March to early June (Barr 1991, USFWS 2006b). During this period the beetles mate, and they 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

The VELB has experienced substantial loss of riparian habitat containing its host plant, and damage and loss of host plants in remaining habitat. However, its greatest current threat 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). As noted above, the species has been recommended for delisting.

3.2 Amphibians

Three amphibian species were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status species are provided below.

3.2.1 California Tiger Salamander

The California tiger salamander (*Ambystoma californiense*) (Central Population) is a California species of special concern, endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The California tiger salamander is Federally listed as threatened and is a California species of special concern. The final rule listing this species as threatened includes a special rule exemption for existing routine ranching activities.

Critical habitat for California tiger salamander was designated by USFWS on August 23, 2005 (70 FR 49379–49458, August 23, 2005). As defined in the USFWS critical habitat designation, the primary constituent elements for California tiger salamander are aquatic breeding habitat, upland habitat, and dispersal habitat. Designated critical habitat includes approximately 12,000 acres near Millerton Lake in Units 1a, 1b, and 2. Units 1a and 1b are west of State Route 41 and generally north of the San Joaquin River. The eastern boundary is approximately the western side of Millerton Lake, and the northern boundary is south of Berry Hill along O'Neal Road. Unit 2 is northeast of Fresno, southwest of Millerton Lake, east of Friant Road, and generally west of Academy.

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 (Shaffer and Fisher 1991).

Surveys have detected the presence of this species at the West Bear Creek Unit of the San Luis NWR and at Great Valley Grasslands State Park (McBain and Trush 2002). Critical habitat for this species is in and adjacent to Reach 1A of the Restoration Area (Figure 5a in the Biological Resources - Vegetation and Wildlife appendix).

Natural History

The California tiger salamander requires vernal pools, ponds (natural or human-made), or semipermanent calm waters (where ponded water is present for a minimum of 3 to 4

months) for breeding and larval maturation. It also requires adjacent upland areas that contain small mammal burrows or other suitable refugia for aestivation.

Adult California tiger salamanders spend most of their lives underground in small mammal burrows, typically those of Beechey's (=California) ground squirrels (*Spermophilus beecheyi*) (Loredo, Van Vuren, and Morrison 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 10–14 days the larvae continue to develop in the pools for several months until they metamorphose, which takes a minimum of 10 weeks (Anderson 1968, Feaver 1971).

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, Orloff 2007), 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, and certain types of fences) can be detrimental to the survival of the California tiger salamander (Jennings and Hayes 1994; Trenham, Koenig, and Shaffer 2001). Other threats include vehicular-related mortality, especially during breeding migrations (Barry and Shaffer 1994), and rodent-control programs, which lead to loss of aestivation habitats (Loredo, Van Vuren, and Morrison 1996).

Relevant Conservation Efforts and Guidance

The California tiger salamander is not covered by the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005). However, this recovery plan addresses a large number of vernal pool–associated species through an ecosystem approach focused on habitat protection and management. Thus, the California tiger salamander likely will benefit from many of these recovery actions.

3.2.2 Western Spadefoot

The western spadefoot (*Spea hammondii*) is a relatively smooth-skinned toad found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The western spadefoot is a California species of special concern.

Distribution

The western spadefoot inhabits the Central Valley as far north as Redding, adjacent foothills and valleys, and the central and south coastal region of California from Monterey Bay to Baja California (Stebbins 2003, Morey 1985). Since 1990, it has

inhabited Alameda, Butte, Calaveras, Fresno, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Benito, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Tulare, Ventura, and Yolo counties (USFWS 2007a). The species is found in grasslands, open chaparral, and pine-oak woodland and uses vernal pools and seasonal wetlands for breeding.

This species is known to occur in suitable habitat in the San Luis NWR complex and at the Great Valley Grasslands State Park in Reaches 4B1, 4B2, and 5. Other occurrences have been reported adjacent to the Restoration Area in Reach 1A.

Natural History

The western spadefoot is a medium-sized toad that feeds on invertebrates. Insects, especially caterpillars and beetles, are the primary components of the adult's diet (Morey and Guinn 1992), although the toad also eats worms, ants, and other invertebrates (Stebbins 1972). Adult forms are entirely terrestrial except during the breeding season and prefer areas of open vegetation and short grasses with sandy or gravelly soils (Stebbins 2003). Generally, adults spend spring and summer in self-constructed burrows in loose soil or in small mammal burrows (Stebbins 1951). Dormancy can last as long as 8–9 months (Jennings and Hayes 1994).

Although they emerge from burrows primarily in late fall to early spring, adults also may be observed outside their burrows during periods of higher rain falls in other months (Morey and Guinn 1992). Vernal pools, seasonal wetlands, or pools in ephemeral stream courses that last longer than 3 weeks are used for breeding (Stebbins 2003, Jennings and Hayes 1994).

Depending on the temperature regime and annual rainfall, egg laying may occur between late February and late May (Storer 1925, Burgess 1950, Feaver 1971, Stebbins 1985). Females lay their eggs in irregular clusters of eggs attached to plant stems and larger detritus (Storer 1925, Stebbins 1985).

Eggs hatch in 0.6 to 6 days, depending on temperature (Brown 1967), and larval development can take 3 to 11 weeks (Burgess 1950, Feaver 1971). Metamorphosis rates can vary depending on the water depth and volume in the pool to allow advancement of metamorphosis in quickly drying water bodies (Denver 1998; Denver, Mirhadi, and Phillips 1998). After tadpoles metamorphose to adults and spend up to a few days near the pond margin, they disperse or burrow into the adjacent soils (Morey 1985).

Threats

Declines of the western spadefoot throughout its range have been documented (Jennings and Hayes 1994, Drost and Fellers 2005, Fisher and Shaffer 1996). Loss of habitat, primarily in the form of urbanization and intense agriculture, is a primary concern for decreases in population abundance (Davidson, Shaffer, and Jennings 2002), although nonnative predators also have been implicated (Fisher and Shaffer 1996, Adams 1999).

3.2.3 California Red-Legged Frog

The California red-legged frog (*Rana draytonii*, also known as *R. aurora draytonii*) is a highly aquatic frog species endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The California red-legged frog is Federally listed as threatened and a California species of special concern.

Revised critical habitat has been proposed for the California red-legged frog. As defined in the USFWS critical habitat designation (73 FR 53491–53680, September 16, 2008), the primary constituent elements for California red-legged frog are aquatic breeding habitat, nonbreeding aquatic habitat, upland habitat, and dispersal habitat. The Restoration Area does not lie within designated (2006) or proposed (2008) critical habitat for California red-legged frog.

Distribution

The California red-legged frog is endemic to California and Baja California, Mexico (USFWS 2002a). 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 unlikely to occur within the Restoration Area, as it is considered extirpated from the valley floor.

Natural History

Habitat for California red-legged frog includes ponds, stream courses, permanent pools, and intermittent streams (Storer 1925, Hayes and Jennings 1988, USFWS 2002a). 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). However, California red-legged frog will at least transiently use a wider variety of habitats, including temporary pools and streams, permanent watercourses, ponds, concrete-lined pools, isolated wells, stock ponds absent of shoreline vegetation, and refuse piles near ponds (Jennings, pers. comm., 2003). Habitat requirements vary with frog life stage and may also vary based on presence or absence of predators. However, permanent aquatic habitat is essential to the survival of local populations of California red-legged frog.

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, Scott, and Seymour (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 approximately 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, Scott, and Seymour 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 (Bobzien, DiDonato, and Alexander 2000). Larvae typically hatch in 6 to 22 days and metamorphosis is usually completed in 4 to 5 months (Bobzien, DiDonato, and Alexander 2000; Jennings and Hayes 1994). In several documented cases, tadpoles have overwintered, then metamorphosed the following spring (Storer 1925; Fellers et al. 2001; Bobzien, DiDonato, and Alexander 2000). Males and females usually attain sexual maturity at 2 and 3 years, respectively (Jennings and Hayes 1994).

Threats

The most significant 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 2002a). 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.

3.3 Reptiles

Six species of reptiles were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status species are provided below.

3.3.1 Western Pond Turtle

The western pond turtle (*Actinemys* (=*Clemmys*) *marmorata*) is freshwater turtle native to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The western pond turtle is a California species of special concern.

Distribution

The western pond turtle is the only freshwater turtle native to California (Storer 1930). Western pond turtles are habitat generalists. They have been observed in slow-moving rivers and streams (e.g., in oxbows), lakes, reservoirs, permanent and ephemeral wetlands, stock ponds, and sewage treatment plants.

The range of western pond turtle along the Pacific coast extends from Washington to northern Baja California, Mexico (Jennings and Hayes 1994). Throughout its range, including the San Joaquin Valley, populations are on the decline and recruitment is limited.

This species is known to occur in suitable habitat in the San Luis NWR complex, in the Mendota Wildlife Area, and at Mendota Pool. It is expected to occur in suitable habitat in other locations in the Restoration Area.

Natural History

Western pond turtles regularly utilize upland terrestrial habitats, most often during the summer and winter, especially for egg laying (females), overwintering, and overland dispersal (Reese 1996, Holland 1994). Females have been reported ranging as far as 500 meters (1,640 feet) from a watercourse to find suitable nesting habitat (Reese and Welsh 1997). Nest sites are most often situated on south- or west-facing slopes, are sparsely vegetated with short grasses or forbs, and are scraped in sands or hard-packed, dry, silt, or clay soils (Holland 1994; Rathbun, Siepel, and Holland 1992; Holte 1994, Reese and Welsh 1997). Western pond turtles exhibit high site fidelity, returning in sequential years to the same terrestrial site to nest or overwinter (Reese 1996).

Western pond turtles forage in aquatic habitats. They are omnivorous feeders; their diet includes invertebrates, carrion (e.g., dead fish), and even plant matter. They prefer aquatic habitat with refugia such as undercut banks and submerged vegetation (Holland 1994), and they require emergent basking sites such as mud banks, rocks, logs, and root wads to thermoregulate their body temperatures (Holland 1994, Bash 1999).

Females lay their eggs between late April and late July, although they lay primarily in June and July. Natural incubation times vary, ranging from 80 to 100 or more days in California. In northern California and Oregon, hatchlings remain in the nest after hatching and overwinter, emerging in the spring. In southern and central California, those that do not overwinter emerge from the nest in the early fall (Holland 1994).

Threats

Threats to the western pond turtle include habitat loss resulting from development, agriculture, dams, diversions, and fire suppression, as well as overexploitation and introduced exotic species.

3.3.2 Blunt-Nosed Leopard Lizard

The blunt-nosed leopard lizard (*Gambelia sila*) is a large lizard endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The blunt-nosed leopard lizard is Federally and State listed as endangered, and is a fully protected species under the California Fish and Game Code.

Distribution

The blunt-nosed leopard lizard, historically found throughout the San Joaquin Valley and adjacent foothills from San Joaquin County to eastern San Luis Obispo County, currently occupies isolated and scattered areas of undeveloped habitat on the San Joaquin Valley floor and in the eastern foothills of the Coast Ranges.

Blunt-nosed leopard lizards are found in areas with sandy soils and scattered vegetation and are usually absent from thickly vegetated habitats (DFG 1992). On the floor of the San Joaquin Valley, they are usually found in nonnative grassland, valley sink scrub habitats, valley needlegrass grassland, alkali playa, and valley saltbush scrub (USFWS 1998a).

There are several records of this species occurring near Mendota Pool.

Natural History

Blunt-nosed leopard lizards are large, opportunistic predatory lizards, feeding primarily on insects (grasshoppers, crickets and moths) and other small lizards, even their own kind (Montanucci 1965; Kato, Rose, and O'Farrell 1987a; Germano and Williams 1994).

Blunt-nosed leopard lizards use small rodent burrows for shelter, predator avoidance, and behavioral thermoregulation. These burrows may be either abandoned ground squirrel tunnels or occupied or abandoned kangaroo rat tunnels (Montanucci 1965). Each lizard may use several burrows, avoiding those with predators or other leopard lizards. The average size of home ranges varies from about 0.5 to 4 acres (Tollestrup 1983; Kato, Rose, and O'Farrell 1987b).

Breeding activity of blunt-nosed leopard lizards generally begins within a month after emergence from dormancy, usually the end of April, and continues through the beginning of June, and occasionally to the end of June (USFWS 1998a). During adverse conditions, reproduction may be delayed up to 2 months or even forgone for a season. Incubation lasts about 2 months and young hatch from early July through early August (Montanucci 1965, Tollestrup 1982).

Threats

Habitat disturbance, fragmentation, and loss are the greatest threats to populations of blunt-nosed leopard lizard (USFWS 1998a). Cultivation, habitat modification for petroleum and mineral extraction, pesticide applications, use of off-road vehicles, and construction for transportation, communication, and irrigation infrastructure all have been

resulting in pervasive habitat disturbance, fragmentation, and loss throughout the San Joaquin Valley (Stebbins 1954; Montanucci 1965; USFWS 1980, 1985a; Germano and Williams 1993). These activities present ongoing threats to the survival of blunt-nosed leopard lizards (USFWS 1998a).

Relevant Conservation Efforts and Guidance

A recovery plan was first prepared by USFWS in 1980 and revised in 1985 (USFWS 1985b) and 1998 (USFWS 1998a). Conservation efforts have included habitat and population surveys, studies of population demographics, habitat management, land acquisition, and development of management plans for public lands (USFWS 1998a). Current recovery efforts focus on three important factors: (1) determining appropriate habitat management and compatible land uses for blunt-nosed leopard lizards, (2) protecting additional habitat for the species in key locations of its range, and (3) determining more precisely how populations are affected by environmental variation (USFWS 1998a).

3.3.3 Coast (California) Horned Lizard

The coast (California) horned lizard (*Phrynosoma coronatum frontale*) is a flat-bodied lizard endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The coast (California) horned lizard (Phrynosoma coronatum frontale) is a California species of special concern.

Distribution

On sandy soils, the coast (California) horned lizard occurs in a variety of open vegetation types: coastal scrub, oak savanna, coniferous and broadleaf woodlands, and grasslands (Stebbins 2003). Historically, the species ranged throughout the Central Valley and Coast Ranges, at elevations ranging from near sea level to as high as 6,500 feet, from Sonoma County south to Santa Barbara, Kern, and Los Angeles counties. Within this range, the species appears to be restricted to localized populations because of its close association with loose soils that have a high sand content. However, local abundance and geographic distribution are poorly understood for this region.

There is a CNDDB record for this species in the vicinity of the Restoration Area, at the Alkali Sink Ecological Reserve in Mendota. Although there are no CNDDB records of coast (California) horned lizard within the Restoration Area, suitable habitat is present and thus its presence is likely.

Natural History

Lizards in the genus *Phrynosoma* primarily eat ants (Meyers and Herrel 2005). Although ants in the genera *Pogomyrmex* and *Messor* (specifically harvester ants) comprise approximately 95 percent of the coast horned lizard's diet (Suarez, Richmond, and Case 2000), other insects are also consumed (Stebbins 2003). Coast horned lizards are most active from April and May through October, and typically utilize small mammal burrows

or loose soils as refugia or when hibernating (as summarized in Jennings and Hayes 1994).

Threats

Primary threats to coast horned lizard are conversion of habitat to agricultural and developed land uses, development and land conversion of key habitat, introduction and spread of the nonnative Argentine ant, roadway mortality related to basking behavior, and domestic cats. Argentine ants reduce the abundance of native ants (Holway et al. 2002), and do not provide a suitable surrogate food source because of their small size and aggressive mobbing behavior, and possibly also because of chemical compounds that reduce their palatability (Suarez, Richmond, and Case 2000; Suarez and Case 2002).

3.3.4 Silvery Legless Lizard

The silvery legless lizard (*Anniella pulchra pulchra*) is a small slender lizard found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The silvery legless lizard is a California species of special concern.

Distribution

The silvery legless lizard is found along the west coast of North America, from the south shore of the San Joaquin River in California south through the Coast Ranges, the San Joaquin Valley, the southern Sierra Nevada, and the Transverse and Peninsular Ranges to Baja California Norte, Mexico (Stebbins 2003). Within this extensive range, the species has a scattered, discontinuous distribution.

Generally, the silvery legless lizard is restricted to moist, loose, sandy soils (Burt 1931, Kuhnz 2004) in vegetation types that include interior dunes, chaparral, oak woodland, and riparian vegetation.

Suitable habitat is present within the Restoration Area in the San Luis NWR complex and near the confluence of Willow Slough.

Natural History

The silvery legless lizard resembles a small snake up to 6 or more inches in length (Stebbins 2003, Miller 1944). Silvery legless lizards are likely to be active for most of the year (Morey 2000). Mating occurs in late spring or early summer, and live young are born in the fall.

Silvery legless lizards forage at the soil/leaf litter interface for insects and spiders (Miller 1944, Van Denburgh 1922); they also most likely mate at the soil/litter interface (Kuhnz 2004). They burrow into the sand through mostly horizontal burrows that are typically within several inches of the ground surface but can be as deep as 18 inches (Kuhnz 2004, Miller 1944). Individuals also can be found beneath cover such as stones, boards, logs, or other objects (Van Denburgh 1897, 1922; Klauber 1932, 1939; Gorman 1957; Cunningham 1959). Moisture appears to be an important component of suitable habitat

(Miller 1944). The home range size of this species has not been documented, but is likely to be quite small, and its dispersal may be relatively limited (Morey 2000), as it is for the closely related black legless lizard (*A. p. nigra*) (Kuhnz 2004).

Threats

Several threats to persistence of silvery legless lizard exist: habitat loss by conversion to developed land uses; habitat fragmentation; habitat degradation by nonnative invasive plants and insects, specifically hottentot fig (aka iceplant, *Carpobrotus edulis*) and Marram grass (*Amnophila arenaria*); sand mining; use of off-road vehicles; trampling; and depredation by domestic pets (cats).

3.3.5 San Joaquin Whipsnake

The San Joaquin whipsnake (*Masticophis flagellum ruddocki*) is a slender fast-moving snake endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The San Joaquin whipsnake is a California species of special concern.

Distribution

The known range of San Joaquin whipsnake extends 8 miles west of Arbuckle in Colusa County southward to the Kern County portion of the San Joaquin Valley and westward into the South Coast Ranges. An isolated population also occurs at the Sutter Buttes (Stebbins 1985, Jennings and Hayes 1994). This species inhabits open hillsides with little or no tree cover, oak and pine woodlands, grassy areas, dunes, and saltbush scrub vegetation.

Suitable habitat is present within the Restoration Area.

Natural History

The San Joaquin whipsnake feeds on rodents, lizards, eggs, and other snakes (Palermo 2000). It typically uses rodent burrows, rocks, or bushes for refugia. San Joaquin whipsnake hibernates below ground during winter. Snakes mate in April and May, then lay eggs in June and July, and these young hatch in late August to early September.

Threats

San Joaquin whipsnake is threatened by habitat loss resulting from conversion of natural vegetation to agricultural and developed land uses (Jennings and Hayes 1994).

3.3.6 Giant Garter Snake

The giant garter snake (*Thamnophis gigas*) is a highly aquatic snake endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The giant garter snake is Federally and State listed as threatened.

Distribution

The giant garter snake historically occurred throughout the Central Valley of California, but the current range of the giant garter snake is confined to the Sacramento Valley, and isolated sites in the San Joaquin Valley and potentially in the Delta (Hansen and Brode 1980; Stebbins 2003; USFWS 1999a, 1999b). It inhabits sloughs, low-gradient streams, marshes, ponds, agricultural wetlands (e.g., rice fields), irrigation canals and drainage ditches, and adjacent uplands.

Although many of the populations of giant garter snake in the northern part of the range from Stockton (San Joaquin County) to Chico (Butte County) are relatively stable, the southernmost populations at the Mendota Wildlife Area (Fresno County) and the Grassland Wetlands (Merced County) are small, fragmented, unstable, and probably decreasing (USFWS 2006c). No sightings of giant garter snakes south of the Mendota Wildlife Area, within the historic range of the species, have occurred since the time of listing (Hansen 2002). This species has been observed at the San Luis, Kesterson, and West Bear Creek units of the San Luis NWR and documented in the Mendota Wildlife Area (Dickert 2005) and south of the San Joaquin River in Fresno Slough (USFWS 2006c).

Natural History

The giant garter snake is a very aquatic, large snake (up to 5 feet in length). It primarily feeds on small fish, tadpoles, and frogs. Snakes use emergent vegetation and crevasses and burrows in adjacent uplands for cover (USFWS 1999a, 1999b). They also use adjacent uplands for foraging, basking, refuge from flood waters, and hibernation.

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.

Giant garter snakes are less active or dormant from October until April, when they emerge to breed and forage (Wylie, Casazza, and Daugherty 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, and herons) and nonnative species (e.g., bullfrogs, feral cats) (58 FR 54053–54065, October 20, 1993; Carpenter, Casazza, and Wylie 2002). Predation may be the reason that giant garter snakes tend to be absent from larger rivers that support predatory fish (Hansen 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 54053–54065, October 20, 1993; Dickert 2005). (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

The Restoration Area is located within the San Joaquin Valley Recovery Unit, as described in the draft recovery plan for the species (USFWS 1999a, 1999b). Recovery plan recommendations for this area include development and implementation of a management plan benefiting giant garter snake, restoration of wetland habitat for this species, and maintenance of compatible agricultural practices.

Standard avoidance measures have been developed by USFWS, including avoidance of construction activities within 200 feet of the banks of potential aquatic habitat. If ground-disturbing activity must occur in potential upland habitat located within 200 feet of potential aquatic habitat, the work should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move above ground and avoid danger.

Visual surveys of bankside vegetation can be conducted either from a boat or on foot along suitable ecotones. Ground surveys are most likely to be effective during the springtime when individuals are still concentrated near overwintering sites. Ground surveys should be done daily, concurrently with trapping, and should be performed by two people. Trapping surveys are generally conducted using floating funnel traps (modified eelpots) placed in waterways along the edge of bankside vegetation (Casazza, Wylie, and Gregory 2000). These trap lines should consist of at least 50 traps, should be run for 14–30 continuous days from mid-March through June, and should be checked daily (USFWS 1999a, 1999b).

3.4 Birds

Thirty-seven species of birds were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status species are provided below.

3.4.1 Redhead

Redhead (*Aythya americana*) is a medium-sized diving duck found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Redhead is considered a species of special concern by DFG, during the breeding season.

Distribution

Redheads breed in wetlands from Alaska and Canada to Mexico. They winter in coastal areas from southern Canada to Central America. The historic breeding range of redhead included the Central Valley, the Modoc Plateau, and portions of the Great Basin and southern California (Beedy and Deuel 2008). Some breeding by redheads continues in all of these regions, and small numbers of redheads continue to nest in the Central Valley. Redheads are known to nest in the Restoration Area at Mendota Pool, and nesting also occurs at the San Luis NWR and Mendota Wildlife Area (Beedy and Deuel 2008).

Natural History

In winter and during migration, redheads forage and rest on large bodies of water. They forage mainly by diving in water greater than 3 feet (Beedy and Deuel 2008). Their diet consists mostly of submerged aquatic plants; they also eat some aquatic invertebrates, snails, and insects (such as grasshoppers).

Redheads nest in California from April through August. They nest in freshwater emergent wetlands with dense patches of tules or cattails interspersed with areas of deep, open water. They are solitary nesters that often parasitize the nests of other ducks (including redheads) and waterbirds (Beedy and Deuel 2008). Nests are secured to tall vegetation and may be placed over water or on ground.

Threats

The primary threats to breeding redheads in California are habitat loss and degradation, exposure to pesticides and other contaminants, and possibly hunting (Beedy and Deuel 2008). (Redheads are managed as a "Harvest" species in California, and two can be legally taken per licensed hunter per day.)

3.4.2 American White Pelican

The American white pelican *(Pelecanus erythrorhynchos*) is a large aquatic bird found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The American white pelican is a California species of special concern, during the breeding season.

Distribution

The American white pelican breeds primarily in the interior of North America on the prairies of the United States and Canada, and patchily south and west in the intermountain West on lakes and marshes; it no longer breeds in the Central Valley (Shuford 2008a).

However, this species is common throughout the Central Valley during winter. Although there are no records in the CNDDB of American white pelican in the study area, the species commonly winters in the San Luis NWR (USFWS 2001) and is expected to forage in suitable habitat within the Restoration Area.

Natural History

The American white pelican feeds on fish. Fish that spawn in shallow waters or are concentrated or stranded by receding water levels are particularly vulnerable to pelican predation (Shuford 2008a). Wintering birds forage in shallow inland waters, including marshes, as well as along lakes or rivers and in shallow coastal marine areas. They often forage cooperatively in flocks. Wintering American white pelicans roost near on ground near the water's edge.

Threats

The primary threats to the American white pelican affect breeding habitat (Shuford 2008a). Because the American white pelican breeds and forages colonially, entire localized populations are vulnerable to alterations in water regime that affect nesting habitat and fish availability, environmental contaminants, and disease.

3.4.3 Least Bittern

The least bittern (*Ixobrychus exilis*) is a small wading bird found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The least bittern is a California species of special concern, during the breeding season.

Distribution

The least bittern breeds in portions of the western and eastern United States, Mexico, and northern Central America (Sterling 2008). Most birds migrate to winter in the neotropics.

The historic distribution of least bittern included most of the Central Valley (Sterling 2008). The present distribution of the least bittern in California includes isolated marsh areas in northeastern portions of the state and the Central Valley, and along the south coast. Although there are no records in the CNDDB of least bittern in the study area, this species is a regular though uncommon breeder in San Joaquin Valley marshes, including the Mendota area (Sterling 2008); recent breeding records from the San Luis NWR are lacking. The species is likely to nest in suitable marsh habitat in the Restoration Area.

Natural History

The least bittern breeds in freshwater and brackish marshes with dense emergent vegetation throughout North America (Sterling 2008). The species is migratory and is probably resident in California only during the spring and summer, although its secretive nature makes determining presence during the winter difficult.

Least bittern also forages in emergent wetlands. It eats mainly small fish, aquatic and terrestrial invertebrates; it also eats amphibians, small mammals, and miscellaneous insects (Granholm 2005a).

Threats

The primary threat to least bittern is the loss and degradation of freshwater habitat, including vegetation removal for waterfowl management (Sterling 2008).

3.4.4 Double-Crested Cormorant

The double-crested cormorant (*Phalacrocorax auritus*) is a large waterbird found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The double-crested cormorant is a State-listed watch list species.

Distribution

The double-crested cormorant is a common resident in waterways and water bodies throughout California. Foraging habitat includes almost any significant water source, from ponds and streams to the open ocean. Nesting habitat includes steep slopes, cliff faces, tall trees (such as those found in riparian forests), and tall human-made structures such as transmission towers beside water.

The species is known to occur in suitable habitat in the San Luis NWR complex. It is also known along Reach 1A at DFG's Milburn Ecological Reserve.

Natural History

The double-crested cormorant forages for fish by diving and pursuing prey beneath the water. Cormorants usually forage within 5 to 10 miles of roost or nest colonies. They roost near water in dead trees, on offshore rocks and islands, or on human-made structures. They nest in colonies, and the nests may be on the ground, in trees, or on human-made structures (as described above). Double-crested cormorants breed mostly from April to July or August.

Threats

When breeding, double-crested cormorants are sensitive to disturbance by humans. At the approach of humans, they will flee their nests, leaving the contents to scavenging gulls or crows (Ainley 2000).

In California, double-crested cormorant populations appear to have increased during the last 20–40 years (Shuford and Gardali 2008). For this reason, double-crested cormorant has been removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.5 Great Blue Heron and Great Egret

Great blue heron (*Ardea herodias*) and great egret (*A. alba*) are large wading birds commonly found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Great blue heron (*Ardea herodias*) and great egret (*A. alba*) rookeries are included on DFG's Special Animals list (DFG 2008) and are tracked in the CNDDB.

Distribution

The great blue heron and the great egret are common over most of North America. Great blue heron nests in tall trees, cliffsides, and sequestered spots on marshes. Great egret nests in shrubs and trees over water, and on islands. Both species feed in a variety of wetlands: marshes, swamps, streams, rivers, ponds, lakes, tidal flats, canals, and flooded fields.

These species are common year-round residents in the Central Valley. Rookeries for both of these species are known to occur at the base of Friant Dam and at Milburn and Rank Island Ecological Reserves in Reach 1A of the Restoration Area.

Natural History

The great blue heron and great egret forage in shallow waters, and flooded and irrigated croplands, for invertebrates, fish, amphibians, and small mammals. Herons and egrets forage primarily within 5 to 10 miles of roosts or nests. Both species nest in colonies (sometimes with each other), and for nesting, both species prefer tall trees near water. The breeding season is from March to July for great egret and from February to July or later for great blue heron.

Threats

Threats to great blue heron and great egret include loss of wetland habitat and disruption to nesting colonies by human disturbance.

3.4.6 White-Faced Ibis

The white-faced ibis (*Plegadis chih*) is a wading bird found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The white-faced ibis is a State-listed watch list species.

Distribution

The white-faced ibis feeds in freshwater marshes with tules, rushes, and cattails, and flooded agricultural fields (Granholm 2005b). This species nests in dense, fresh emergent wetland (Ryder and Manry 1994). Breeding and wintering populations have greatly increased in California since the 1980s (Shuford and Gardali 2008).

White-faced ibis is known to occur in suitable habitat in the San Luis NWR complex and at other sites in the Restoration Area; nesting colonies have been documented in the past at the Mendota Wildlife Area south of the Restoration Area.

Natural History

White-faced ibis is a wading bird that forages in shallow water and muddy fields (Granholm 2005b). It feeds on aquatic and moist-soil invertebrates such as earthworms, larval insects, snails, and bivalves; and also on amphibians and small fish. It probes deep in mud with its long bill, and also feeds in shallow water or on the water surface. It roosts in marshes in dense emergent vegetation such as cattails (*Typha* spp.) or bulrushes (*Scirpus* spp.).

Threats

Habitat loss has affected the white-faced ibis in the Central Valley. However, both the breeding and wintering populations of this species have increased greatly in California since the 1980s (Shuford and Gardali 2008). Consequently, the white-faced ibis has been removed from DFG's list of species of special concern, and placed on a watch list.

3.4.7 Cackling (Aleutian) Canada Goose

The cackling (Aleutian) Canada goose (*Branta hutchinsii leucopareia*) is a waterfowl species found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The cackling (Aleutian) Canada goose has been Federally delisted; it is still included on DFG's Special Animals list (DFG 2008) and is tracked in the CNDDB, but has no other Federal or State status. (This species was recently separated from the Canada goose into a separate species, cackling goose (Mowbray et al. 2002).)

Distribution

Preferred habitats for the cackling (Aleutian) Canada goose include lacustrine, fresh emergent wetlands, and moist grasslands, croplands, pastures, and meadows (Granholm 2005c). This species nests on low coastal floodplain of the Yukon-Kuskokwim Delta. It occurs during winter in the Central Valley south to Merced, as well as in Del Norte County and in the Delta.

Cackling (Aleutian) Canada goose is known to winter in suitable habitat in the San Luis NWR and at other sites in the Restoration Area.

Natural History

While wintering in California's Central Valley, cackling (Aleutian) Canada geese forage primarily in pasture, corn, wheat, rice and other grain crops, wetlands, and grasslands, and typically prefer short vegetation. Wintering geese roost in large ponds and lakes, flooded fields, and rice checks. Although they feed primarily on grasses and wetland sedges during their Alaskan summer, they forage primarily on seeds and agricultural grains while in California in fall and winter (NatureServe 2008).

Threats

Loss of habitat adversely affects cackling (Aleutian) Canada goose in wintering habitats (including the San Joaquin Valley) (NatureServe 2007). The species also is vulnerable to hunting.

3.4.8 Cooper's Hawk

The Cooper's hawk (*Accipiter cooperii*) is a medium sized hawk native to North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The Cooper's hawk is a State-listed watch list species.

Distribution

The Cooper's hawk is distributed throughout the continental United States and parts of southern Canada. Cooper's hawks are solitary birds that forage in open woodlands and nest in tall trees in woodland and woodland edge habitat, including riparian forests, and dense canopied forests from gray pine–oak woodland to ponderosa pine.

The species is known to occur in suitable habitat throughout the San Joaquin Valley. Potential nesting habitat is present in the Restoration Area.

Natural History

The Cooper's hawk feeds on small birds (especially young birds during nesting season), amphibians, reptiles, and small mammals (Polite 2005a). It uses dense vegetation as cover in which to hide in and from which to attack prey, and it also soars and makes low gliding flights in search of prey. Cooper's hawks usually forage and nest near riparian vegetation or open water, in home ranges that are typically several hundred acres in size. The breeding season for Cooper's hawks is between March and August, and it nests in deciduous trees.

Threats

The Cooper's hawk has been affected by habitat loss and fragmentation; however, its abundance has not been declining recently in the Central Valley (NatureServe 2008). Breeding populations have increased in California and expanded into urban areas (Shuford and Gardali 2008). For this reason, the Cooper's hawk has been removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.9 Sharp-Shinned Hawk

The sharp-shinned hawk (*Accipiter striatus*) is a small hawk native to North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The sharp-shinned hawk is a State-listed watch list species during the breeding season.

Distribution

Sharp-shinned hawk is widely distributed in North and South America. It is found in dense to open-canopy pine or mixed conifer forest, riparian habitats, and grassland with scattered trees. It is a permanent resident in parts of the Sierra Nevada, Cascade Range, Klamath Range, and North Coast Ranges. This species usually nests in conifers.

Potential foraging and wintering habitat is present in the Restoration Area.

Natural History

The sharp-shinned hawk eats primarily small birds, but also small mammals, reptiles, amphibians, and insects (Polite and Pratt 2005a). It typically forages along edges of woodlands and fields, and my hunt by darting out from cover or during low, gliding flights. It roosts and winters in woodlands, and typically uses dense stands in proximity to open areas.

Threats

In the Central Valley, the sharp-shinned hawk has experienced habitat loss, and while wintering in Central America, it may be affected by exposure to organochlorine pesticides (NatureServe 2008). However, there does not appear to be any evidence of persistent population decline in this species in California (Shuford and Gardali 2008). For

this reason, the sharp-shinned hawk has been removed from the list of species of special concern and reclassified to a watch list species.

3.4.10 Golden Eagle

The golden eagle (*Aquila chrysaetos*) is a large raptor common in western North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The golden eagle is a State watch list species and a fully protected species under the California Fish and Game Code; it is also protected by the Federal Bald and Golden Eagle Protection Act.

Distribution

The golden eagle occurs throughout most of California as a resident, migrant, or wintering species. This species nests on cliff faces with suitable ledges or in large trees in open areas. Golden eagles forage over vegetation that is open and low. This species is a winter visitor on the Central Valley floor but does not breed there.

Within the Restoration Area, golden eagles are uncommon winter visitors to the West Bear Creek, San Luis, Kesterson, and Arena Plains units of the San Luis NWR complex, and have also been observed at Great Valley Grasslands State Park (McBain and Trush 2002).

Natural History

Golden eagles feed primarily on rabbits and rodents. They hunt while soaring or from a perch, and may hunt cooperatively (NatureServe 2008). They forage over large areas; this is indicated by their large territory size, which can average 21–51 miles in the western United States.

Threats

The golden eagle has been experiencing loss of foraging and nesting habitat, shooting, and human disturbance of nests. However, its abundance has remained relatively stable during recent decades (Shuford and Gardali 2008). Consequently, the golden eagle was recently removed from DFG's list of species of special concern, and placed on a watch list.

3.4.11 Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is a large raptor found in western North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The ferruginous hawk is a State-listed watch list species.

Distribution

Ferruginous hawk breeds in grassland or shrubsteppe regions on flat and rolling terrain in most western states except California. It winters in California and other parts of the

Southwest, where foraging habitat includes open grasslands, shrub steppes, deserts, and agricultural fields (Bechard and Schmutz 1995).

This species is known to occur during winter in suitable habitat in the San Luis NWR complex.

Natural History

The ferruginous hawk is an uncommon winter resident and migrant to the Central Valley (Polite and Pratt 1999). It feeds on small mammals such as rabbits and rodents. It searches for its prey on low flights over the ground, while hovering, and from perches. It roosts in open areas, usually an isolated tree or telephone pole.

Threats

The ferruginous hawk has lost habitat because of habitat conversion to developed land uses and incompatible agricultural land uses (e.g., vineyards) (NatureServe 2008). However, there appears to be no documented evidence of substantial declines in numbers of this hawk wintering in California (Shuford and Gardali 2008). Consequently, the ferruginous hawk has been removed from DFG's list of species of special concern and reclassified as a watch list species.

3.4.12 Swainson's Hawk

The Swainson's hawk (*Buteo swainsoni*) is a slender raptor found in the Central Valley. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The Swainson's hawk is State listed as a threatened species.

Distribution

The Swainson's hawk breeds in North America and winters in southern South America and parts of Mexico (with the exception of a small population that overwinters in the Delta). It occurs throughout the lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. It nests in riparian forest and woodlands, or in isolated trees, and forages in grassland and agricultural vegetation.

Swainson's hawks have been observed throughout the San Luis NWR complex from early spring until late summer, in the vicinity of the Chowchilla Canal on the San Joaquin River east of Mendota and upstream of the Gravelly Ford Gauging Station. Nests have been documented in riparian vegetation at the West Bear Creek Unit of the San Joaquin River NWR, at Great Valley Grasslands State Park, and in the Mendota Pool area (RHJV 2004, McBain and Trush 2002).

Natural History

Swainson's hawks arrive at nesting areas in the Central Valley in late February and early March. Their breeding season extends from late March to late July, and then they begin departing for wintering areas in early September.

Swainson's hawks feed primarily on small mammals during the breeding season, but also feed on insects (more so during the nonbreeding season). Swainson's hawk foraging ranges during the breeding season have been estimated at approximately 1,000–7,000 acres (Bechard 1982, Estep 1989, Johnsgard 1990), and Swainson's hawks may forage considerable distances (up to 18 miles) from their nests (Estep 1989).

Prey abundance and accessibility (for capture) are the most important features determining the suitability of hawk foraging habitat. In addition, agricultural operations (e.g., mowing, flood irrigation) have a substantial influence on the accessibility of prey and thus create important foraging opportunities for Swainson's hawk (Estep 1989). Crops that are tall and dense enough to preclude the capture of prey (e.g., corn) do not provide suitable habitat except around field margins, but prey in these habitats is accessible during and immediately after harvest. Other crops (e.g., tomato, sugar beet) are tall and dense enough to inhibit but not to prevent the capture of prey during the growing season, and also provide valuable foraging opportunities during their harvest. Alfalfa, idle cropland, and most ruderal land and grassland have low and or open vegetation that does not impede prey capture, but prey abundance varies among these habitats, as does the frequency of agricultural operations (which are absent from ruderal land and grassland).

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 2005a).

Relevant Conservation Efforts

Several HCPs cover Swainson's hawk including the Natomas Basin HCP, the San Joaquin County HCP, and the East Contra Costa County HCP. Recommended conservation measures (focused on minimizing impacts) have been published by DFG (1994), and the Swainson's hawk is also a focal species in the *Riparian Bird Conservation Plan* (RHJV 2004), which includes recommendations for improving riparian nesting habitat and adjacent agricultural foraging habitat for this species and other riparian obligate bird species.

Standardized survey protocols for Swainson's hawk have been published by the Swainson's Hawk Technical Advisory Committee (2000).

3.4.13 Northern Harrier

The northern harrier (*Circus cyaneus*) is a medium-sized raptor common throughout North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The northern harrier is a California species of special concern year round.

Distribution

In North America, the northern harrier breeds from northern Alaska and Canada to the mid to lower latitudes of the United States and in northern Baja California (Davis and

Niemela 2008). Populations from the northern portion of this range winter from southern Canada to Central America. The northern harrier forages and nests in open habitat—grassland, agricultural fields, and marshes—throughout California. It is a year-round resident in portions of the Central Valley, where the largest populations in California are found.

The northern harrier is known to occur in suitable habitat in the San Luis NWR complex and other areas along the San Joaquin River.

Natural History

Northern harriers are year-round residents of the San Joaquin Valley (Davis and Niemela 1990). Their breeding season extends from March through August. They nest on the ground in patches of dense vegetation.

In open habitats, northern harriers feed on a variety of small- to medium-sized vertebrates (e.g., voles (*Microtus* spp.), birds, lizards). Based on data from other states, the northern harrier may travel several miles during foraging, and its home range may be hundreds or even a thousand acres in size (Polite 2005b). It uses dense vegetation for cover and roosts on the ground.

Threats

The primary threats to northern harriers are loss and degradation of foraging and breeding habitat (Davis and Niemela 2008). Degradation includes human disturbance, incompatible agricultural practices (e.g., livestock grazing of nesting habitat during the breeding season, viticulture), reduction of prey abundance because of use of rodenticides, and predation by nonnative species (e.g., feral cats).

3.4.14 White-Tailed Kite

The white-tailed kite (*Elanus leucurus*) is a raptor found in western North America and parts of South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The white-tailed kite is a fully protected species under the California Fish and Game Code.

Distribution

The white-tailed kite is a resident of lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills, to western San Diego County at the Mexico border. Scattered trees in grasslands, oak woodlands, savannas, and riparian scrub provide suitable nesting habitat for this species. Preferred foraging habitats include wetlands and grasslands, particularly herbaceous lowlands with minimal shrub and tree growth.

White-tailed kites have been observed in Lost Lake Park and are likely to nest in the Restoration Area (McBain and Trush 2002).

Natural History

White-tailed kites forage primarily on small rodents, which have highly variable populations (Dunk 1995, NatureServe 2008). Some large shrubs or trees are required for nesting. The white-tailed kite breeds from February through October. The breeding season peaks between May and August. The female incubates a clutch for 28 days. Young leave the nest after 30 or more days. When eggs or young are in the nest, white-tailed kites mostly forage within a mile of nests. After they are fledged, white-tailed kites disperse widely. Communal night roosts are common in winter.

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.

3.4.15 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large raptor found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The bald eagle has been delisted from the ESA, but it is still listed as endangered under the CESA and is a fully protected species under the California Fish and Game Code. The bald eagle is also protected under the Federal Bald and Golden Eagle Protection Act.

Distribution

The geographic range of the bald eagle includes most of North America from Alaska and Canada to northern Mexico (64 FR 36454–36464, July 6, 1999; Buehler 2000). In the contiguous United States, the breeding distribution is concentrated in the Cascade Range of Washington, Oregon, and northern California; the Rocky Mountains; the Great Lakes region; Maine; the Atlantic coast; Florida; the Gulf Coast in Louisiana and Texas; and central Arizona (Buehler 2000). The species' winter range includes coastal Alaska and Canada, southern mainland Canada, and nearly the entire continental United States.

Bald eagles breed or winter throughout California except in the desert areas (Zeiner et al. 1990a). Most breeding activity occurs in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties (Zeiner et al. 1990a). California's breeding population of Bald Eagles is resident year round in most areas where the climate is relatively mild (Jurek 1988). Bald eagles nest in only a few scattered locations south of the northern Sacramento Valley.

Bald eagles are annual winter residents within the San Luis NWR complex and at Millerton Lake, and a few have been observed foraging along the river near Rank Island (McBain and Trush 2002).

Natural History

Bald eagles are generalized and opportunistic scavengers and predators. Common prey items include fish, waterfowl, and jackrabbits; various types of carrion, such as fish,

mammals, and waterbirds, are also significant components of the diet (Zeiner et al. 1990a, Buehler 2000). Bald eagles feed both gregariously and individually on abundant prey, such as spawning fish (Zeiner et al. 1990a). Diurnal perches used during foraging usually have a good view of the surrounding area and are often the highest perch sites available (Buehler 2000). In general, foraging habitat consists of large bodies of water or free-flowing rivers with abundant fish and adjacent snags and other perches (Zeiner et al. 1990a).

Many bald eagles from nesting territories in the northwestern United States migrate south to winter in California (Buehler 2000). Bald eagles often roost communally during the winter, typically in mature trees or snags that are isolated from human disturbance. Communal night roosting sites are often different from diurnal perch sites. Night roost sites often possess different habitat components than daytime-use areas, including day perch sites: day perches are generally snags or dead-topped trees, but night roost groves generally have live trees and a more closed canopy. Night roosts are often in sites that are sheltered from the weather by landforms and in areas of coniferous stands that provide insulation from the weather (Buehler 2000).

Threats

Previous declines of bald eagle populations resulted from persecution, shooting, egg collection, habitat loss and disturbance, and widespread use of DDT and other pesticides that led to eggshell thinning and reproductive failure. Most of these threats still affect bald eagles to some extent. Bald eagles are also particularly susceptible to electrocution on power lines because of their large wingspan. They are also sensitive to human disturbance during the breeding season; such disturbance can cause abandonment or relocation of nest sites (Buehler 2000).

Relevant Conservation Efforts and Guidance

A regional recovery plan covering California, *The Pacific Bald Eagle Recovery Plan* was produced by the U.S. Fish and Wildlife Service in 1986 (USFWS 1986). In its 1999 review of eagle status, USFWS concluded that the recovery goals for the species had been met or exceeded, and the species has since been Federally delisted. USFWS has subsequently provided the *National Bald Eagle Management Guidelines* (USFWS 2007b). These guidelines are intended to encourage the continued conservation of bald eagle and include recommendations for avoiding disturbance of nest and roost sites.

3.4.16 Merlin

The merlin (*Falco columbarius*) is a small raptor found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The merlin is a State-listed watch list species during wintering.

Distribution

The merlin forages in open woodlands, savannas, edges of grasslands and deserts, farms, and ranches (Warkentin et al. 2005). This species breeds in the northwest United States and Canada and winters in California.

This species is known to occur during winter in suitable habitat in the San Luis NWR complex.

Natural History

In the Central Valley, the merlin is an uncommon winter migrant from September to May (Polite 1999). It feeds primarily on small birds, small mammals, and insects. For cover, it uses dense tree stands close to open water.

Threats

In the Central Valley, the merlin has experienced habitat loss (NatureServe 2008). However, the number of merlins migrating and wintering in California has increased in recent decades (Shuford and Gardali 2008). For this reason, the merlin has been removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.17 Prairie Falcon

The prairie falcon (*Falco mexicanus*) is a medium-sized raptor found in western North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The prairie falcon is a State-listed watch list species during the breeding season.

Distribution

The prairie falcon is an uncommon permanent resident in California from the southeastern deserts northwest throughout the Central Valley and along the Inner Coast Ranges and the Sierra Nevada. Preferred habitat includes annual and perennial grasslands, savannas, rangeland, some agricultural fields, alpine areas, and desert scrub. Nests are typically placed on a sheltered ledge of a cliff overlooking a large, open area.

There are no records in the CNDDB of prairie falcon in the study area, and this species is uncommon in winter throughout the western portion of the San Joaquin Valley. It has been documented foraging in the study area.

Natural History

The prairie falcon feeds primarily on small birds, mammals, and reptiles (Polite and Pratt 2005b). It hunts by diving from a perch or from searching flights. Prairie falcon requires sheltered ledges for cover and nesting. Its home range varies from 10 to more than 100 square miles.

Threats

In the Central Valley, the prairie falcon may be affected by human disturbance (NatureServe 2008); however, the population size of this species appears to be stable in California (Shuford and Gardali 2008). For this reason, the prairie falcon has been

removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.18 American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) is a raptor found throughout North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The American peregrine falcon has been delisted from the ESA, but it is still listed as endangered under the CESA and is a fully protected species under the California Fish and Game Code.

Distribution

The American peregrine falcon is found throughout North America. It nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations; it is also established in cities, where it nests on bridges and tall buildings. Open water, wetlands, and riparian areas are important foraging habitat.

Although this species has been documented at the San Luis NWR complex (McBain and Trush 2002), the CNDDB lists no records of this species breeding in the Restoration Area quadrangles, and breeding is unlikely (CNDDB 2007).

Natural History

The American peregrine falcon occurs in the Central Valley during winter (Polite and Pratt 2005c). It primarily feeds on birds by swooping in flight upon flying prey. It requires a protected ledge for cover.

Threats

Historically, habitat loss and organochlorine pesticides have been the primary threats affecting the American peregrine falcon. However, this species has recently been increasing in abundance in California (DFG 2005a). About 20 percent of nests are now on buildings or bridges, and thus, human disturbance now causes greater adverse effects on this species.

3.4.19 Lesser Sandhill Crane

The lesser sandhill crane (*Grus Canadensis canadensis*) is a large crane widely distributed North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The lesser sandhill crane is a California species of special concern, during wintering.

Distribution

Lesser sandhill cranes use wetland, moist grassland, and agricultural vegetation, and are widely distributed in North America from Hudson Bay to Mexico. In California, the lesser sandhill crane winters in the Sacramento Valley, the Delta, the San Joaquin Valley, the Tulare Basin, the Carrizo Plain, and the Imperial Valley (Littlefield 2008).

The lesser sandhill crane is known to winter at the Merced NWR (Littlefield 2008). In fact, most lesser sandhill cranes wintering in California concentrate near the Merced NWR in autumn, but later disperse to the northwest and southwest.

Natural History

This species is a winter resident and migrant in California from mid-September to early April (Littlefield 2008).

Lesser sandhill cranes are omnivores that consume invertebrates, amphibians, reptiles, small mammals, and birds, and a variety of plant parts (Littlefield 2008). Waste grains and other seeds are the primary foods in winter. Lesser sandhill cranes forage in grasslands, pastures, and agricultural fields (particularly grain fields that have been recently disturbed by harvesting, tilling, or discing). The lesser sandhill crane uses pastures, moist grasslands, and shallow wetlands for loafing. It roosts at night in flocks (Littlefield 2008). Roost sites are in a variety of wetlands; water depths at roost sites are shallow (generally less than 6 inches).

Threats

In California, the lesser sandhill crane is threatened primarily by changing agricultural practices that decrease this species' preferred foraging habitats (Littlefield 2008).

3.4.20 Greater Sandhill Crane

The greater sandhill crane (*Grus canadensis tabida*) is a large crane widely distributed North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The greater sandhill crane is State listed as threatened and is fully protected under the California Fish and Game Code.

Distribution

The greater sandhill crane nests in open areas of wet meadows that are often interspersed with emergent marsh; cranes usually build their nests over shallow water. When foraging, this species prefers open shortgrass plains, grain fields, and open wetlands (Grinnell and Miller 1944). Moist sites such as wet meadows, shallow wetlands, and freshwater margins are preferred foraging areas, but grasslands, croplands with grain or corn stubble, and other wet or dry agricultural fields also are used.

The greater sandhill crane was formerly a fairly common breeder in northeastern California (Grinnell and Miller 1944). It is now greatly reduced in numbers and only a few hundred birds now breed in Siskiyou, Modoc, and Lassen counties, and in Sierra Valley in Plumas County (Remsen 1978, Zeiner et al. 1990a). Most of the state's breeding population migrates south to winter in emergent wetlands and flooded agricultural fields of the Central Valley and Imperial Valley (Zeiner et al. 1990a). Only about 5 percent of the Central Valley's historical wetlands and native grasslands remain in existence (Frayer, Peters, and Pywell 1989); the greater sandhill crane's wintering areas now are primarily in wetlands and irrigated pastures of San Joaquin, Sacramento,

Butte, Merced, Kern, Sutter, and Stanislaus counties, and in the Imperial Valley of southern California (DFG 2005b).

This species occurs along the San Joaquin River and at the San Luis NWR complex during winter (McBain and Trush 2002).

Natural History

The greater sandhill crane feeds on grasses, forbs, and especially cereal crops (newly planted or harvested), and it uses its long bill to probe the soil for roots, tubers, seeds, grains, earthworms, and insects and occasionally larger prey (Terres 1980). Freshwater is a requirement for drinking and bathing. Cranes roost for safety in open expanses of shallow water at night, and fly to feeding areas in large flocks in the daytime.

Greater sandhill cranes winter in the Central Valley from September through October and migrate northward in March and April. Migrant and wintering birds sometimes range up to several miles between night roosts and foraging areas (Walkinshaw 1973).

Threats

Habitat loss and degradation are the biggest threat to the greater sandhill crane. Collisions with power lines have also been a concern for birds wintering in the foggy Central Valley.

Relevant Conservation Efforts and Guidance

DFG has produced a recovery strategy for greater sandhill crane (DFG 2005b). This strategy includes managing State wildlife areas to provide wintering habitat, managing recreation in habitat to avoid effects on greater sandhill cranes, and monitoring crane reproduction and mortality to determine the need for additional actions.

3.4.21 Mountain Plover

The mountain plover (*Charadrius montanus*) is a shorebird found in open, sparsely vegetated habitats or grasslands in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The mountain plover is a California species of special concern during the wintering season.

Distribution

The mountain plover is endemic to open, sparsely vegetated habitats or grasslands in North America. The breeding range is the dry tablelands of the western Great Plains and the Colorado Plateau. The winter range extends from northern California (rarely) through southern California, southern Arizona, and central and coastal Texas to north-central Mexico (Cogswell 1977, Knopf 1996). This species does not breed in California, but approximately 70 percent of the continental population winters in the state. The major wintering areas in California are in the Sacramento, San Joaquin, and Imperial valleys.

This species is known to occur during winter in suitable habitat near Tranquility in the vicinity of the Restoration Area.

Natural History

Mountain plovers are present in the San Joaquin Valley from September to mid-March (Hunting and Edson 2008). Wintering mountain plovers in California forage for invertebrates in agricultural fields (particularly fallow or recently tilled fields, and in alfalfa). In these fields, where they may spend up to 75 percent of the time, they are exposed to pesticides, but there is no evidence that reproductive success or survival has been affected.

Threats

Habitat loss and degradation is the primary threat affecting the mountain plover (Hunting and Edson 2008). In the Central Valley, habitat conversion to developed land uses and agricultural crops that do not provide habitat (e.g., vineyards) is the primary threat.

3.4.22 Long-Billed Curlew

The long-billed curlew (*Numenius americanus*) is a shorebird found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The long-billed curlew is a State-listed watch list species during the breeding season.

Distribution

The long-billed curlew nests in the prairie region and far northeastern California in open habitats, primarily in short-grass or mixed-prairie habitat with flat to rolling topography. During winter the species is relatively common in a range of wetland habitats in the central and southern portions of the Central Valley (primarily in flooded and unflooded cultivated rice (*Oryza sativa*), managed wetlands, evaporation ponds, sewage ponds, and grassland habitats), the Imperial Valley, and western portions of the Mojave Desert, and in coastal California in tidal estuaries and sandy beaches (Dugger and Dugger 2002).

Although there are no records in the CNDDB of long-billed curlew in the study area, this species is a common nonbreeder during summer and winter in the region, including at the San Luis NWR Complex (USFWS 1996, 2006a), and it is likely to forage in open wetlands in the Restoration Area.

Natural History

The prey of the long-billed curlew varies among habitats. In open grassland habitats it forages on invertebrates, primarily earthworms.

Threats

The long-billed curlew has been experiencing habitat loss and degradation. (Both invasion by nonnative plants and incompatible agricultural practices may be contributing to degradation of its habitat.) However, there is not sufficient information to determine whether this species has been declining in abundance in California (Shuford and Gardali 2008). For this reason, the long-billed curlew has been removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.23 Black Tern

Black tern (*Chlidonias niger*) is a small tern found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Black tern is a California species of special concern, during the breeding season.

Distribution

In North America, the black tern nests widely across central and southern Canada and the northern United States, and the southern limit of its breeding range is in California's Central Valley (Shuford 2008b). It migrates to winter primarily in northern and middle South America. The species historically nested in ephemeral wetlands and flooded pastures throughout the Central Valley; however, this range has been substantially reduced. In the San Joaquin Valley, because of habitat loss and reduction of rice acreage in the San Joaquin Valley, current nesting habitat has been reduced to two small areas of rice fields in Fresno and Merced counties (Shuford 2008b).

Although there are no records in the CNDDB, the species has been documented as an occasional visitor to the study area, including the San Luis NWR complex (USFWS 1996, 2006a). It is likely to use wetland habitat in the Restoration Area for foraging during the nonbreeding season.

Natural History

The black tern occurs as a migrant and summer resident in California from mid-April to mid-October (Shuford 2008b). This species feeds on both insects and fish, and forages primarily in wetlands. During early May to early August, it nests semicolonially in protected marshes. Nests are usually built on small mounds or on floating substrates that are anchored to emergent or submerged vegetation.

Threats

The lack of protection for nesting habitat (from habitat conversion and incompatible agricultural and water management practices) is currently the primary threat to breeding populations of black tern in the Central Valley (Shuford 2008b).

3.4.24 Western Yellow-Billed Cuckoo

The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a neotropical migrant found in North and South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The western yellow-billed cuckoo is a candidate species for Federal listing and is State listed as endangered.

Distribution

Yellow-billed cuckoo breeds throughout much of North America and winters in South America (Hughes 1999). The California breeding range of western yellow-billed cuckoo is restricted to the Sacramento Valley, the South Fork of the Kern River, the lower

Colorado River Valley, and sometimes the Prado Basin in Riverside and San Bernardino counties (Gaines and Laymon 1984). Most recent Sacramento Valley records are from the Sacramento River from Todd Island in Tehama County south to Colusa State Park in Colusa County; and the Feather River in Yuba and Sutter counties (Gaines and Laymon 1984).

In the late 1960s, a few yellow-billed cuckoos were observed regularly near the confluence of the Tuolumne and San Joaquin rivers, but this area was subsequently subject to intensive logging and no cuckoos have been observed in recent years (Reeve, pers. comm., 1998, cited in McBain and Trush 2002). The yellow-billed cuckoo has been considered a rare migratory species during the spring in Stanislaus County (Reeve 1988). This species has potential to nest in suitable habitat in the Restoration Area.

Natural History

Yellow-billed cuckoos are occasional brood parasites; they will lay eggs in nests of other cuckoos or in nests of other species.

In the western United States, yellow-billed cuckoos breed in broad, well-developed, low-elevation riparian woodlands composed primarily of mature cottonwoods (*Populus* spp.) and willows (*Salix* spp.). Typical nest sites in California have moderately high canopy closure and low total ground cover, and are close to water (Laymon and Halterman 1987). Along the Sacramento River in Glenn County, yellow-billed cuckoos have also been documented nesting in walnut orchards adjacent to riparian habitats (Gaines and Laymon 1984).

In spring, yellow-billed cuckoos arrive in California from late May to until late June. Their breeding season extends from mid-June until mid-August. Fall migration begins in late August and lasts until mid-September.

Yellow-billed cuckoo nest sites are associated with large and wide patches of riparian habitat (Laymon and Halterman 1989). Home ranges are large; in one study they averaged 42 acres (Laymon and Halterman 1987), and they include riparian vegetation that is typically more than 300 feet wide and rarely less than 50 acres in area (Laymon and Halterman 1989). Optimal stands are greater than 200 acres.

During the breeding season, yellow-billed cuckoos prey on caterpillars, grasshoppers, and katydids (Hughes 1999). Also, small frogs and fruit such as blackberries (*Rubus* spp.), wild grapes (*Vitis* spp.), and elderberries (*Sambucus* spp.) may be important food sources.

Threats

In California, yellow-billed cuckoo is threatened by the loss or degradation of suitable large tracts of riparian habitat, pesticide poisoning, and possibly also reduced prey abundance resulting from widespread application of pesticides (Gaines and Laymon 1984).

Relevant Conservation Efforts and Guidance

Conservation projects of the Central Valley Project have preserved habitat for yellow-billed cuckoo (DFG 2005a). This species also has been included in habitat conservation

and multispecies conservation planning efforts in southern California. These efforts have focused on conserving suitable breeding habitat by preserving and restoring large patches of riparian vegetation.

3.4.25 Short-Eared Owl

Short-eared owl (*Asio flammeus*) is a medium-sized owl commonly found in grasslands. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Short-eared owl (*Asio flammeus*) is a California species of special concern, during the breeding season.

Distribution

Small resident populations of short-eared owls occur in the Great Basin region of California and in the Delta, but most recent breeding from coastal central California and the San Joaquin Valley has been episodic (Roberson 2008). It is associated with short vegetation types: freshwater emergent wetlands, grasslands, and irrigated pastures. It also may breed in tall (ungrazed) grasslands and marshes with dense vegetation. It is known to occur in suitable habitat in the San Luis NWR complex, where it possibly also nests. Also, south of the Restoration Area it has recently nested in the Mendota Wildlife Area (Roberson 2008).

Natural History

Short-eared owls reside year-round in the Central Valley (Polite 2005c). They feed primarily on small mammals but also eat insects, amphibians, reptiles, and birds. Short-eared owls search for prey during low, gliding flights, and also hunt from a perch. Trees, posts, and low mounds may be used as perches. They require dense vegetation, tall grasses, ditches, or wetlands for cover for resting and roosting. Short-eared owls breed during March–July and nest on the ground.

Threats

Habitat loss and degradation are the primary threats affecting short-eared owls in California (Roberson 2008).

3.4.26 Burrowing Owl

Burrowing owl (*Athene cunicularia*) is a small owl found in North and South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Burrowing owl is a California species of special concern during the breeding season and at some wintering sites.

Distribution

Burrowing owls usually inhabit desert and grassland vegetation, and in some cases, urban and agricultural landscapes. Their habitats are flat, open areas characterized by low-

stature vegetation (Johnsgard 1988; Gervais, Rosenberg, and Comrack 2008). Because burrowing owls require underground burrows or artificial structures for shelter and nesting, they are associated with other burrowing animals such as ground squirrels, badgers, and some smaller canids. These habitat components are required year round.

This species breeds throughout North America. In California, the burrowing owl occurs in the Central Valley, the inner and outer coastal regions, portions of the San Francisco Bay Area, the southern California coast, from southern California to the Mexico border, the Imperial Valley, and in portions of the desert and high desert habitats in southeastern and northeastern California.

This species is known to nest in suitable habitat in the San Luis NWR complex. It is expected to nest in other suitable habitat in the Restoration Area.

Natural History

Burrowing owls are opportunistic feeders (Gervais, Rosenberg, and Comrack 2008). Large arthropods (e.g., beetles and grasshoppers) and small mammals are important food items. Burrowing owls hover while hunting; after catching their prey they return to perches on fence posts or the ground. Burrowing owls commonly perch on fence posts or on mounds outside the burrow. They are active day and night, but are usually less active in the peak of the day.

Burrowing owls often form loose colonies, with nest burrows 50–3,000 feet apart (Ross 1974, Gleason 1978). The home range size for this species is not well documented, but published estimates vary from 0.05 to 1.86 square miles (Haug and Oliphant 1990). The breeding season for burrowing owl is March to late August; the season tends to last longer in the northern part of the range (Gervais, Rosenberg, and Comrack 2008). The incubation period is 28–30 days. The female performs all the incubation and brooding and is believed to remain continually in the burrow while the male does all the hunting. The young fledge at 44 days but remain near the burrow and join the adults in foraging flights at dusk.

Burrowing owls tend to be resident where food sources are stable and available year round. They are year-round residents in the San Joaquin Valley (and in winter, the population increases with the addition of individuals that breed in northern portions of the continent) (Gervais, Rosenberg, and Comrack 2008). They disperse or migrate south in areas where food becomes seasonally scarce. In resident populations, nest-site fidelity is common, with many adults renesting each year in their previous year's burrow; young from the previous year often establish nest sites near their natal sites (Gervais, Rosenberg, and Comrack 2008).

Threats

The primary threat to burrowing owl is loss of wintering and breeding habitat as a result of development and other land use changes. Poisoning of ground squirrels has also contributed to population reductions.

3.4.27 Loggerhead Shrike

Loggerhead shrike (*Lanius ludovidianus*) is a predatory passerine found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Loggerhead shrike is a California species of special concern during the breeding season.

Distribution

Loggerhead shrike breeds from southern Alberta, Saskatchewan, and Manitoba; widely through much of the United States; and south to western Mexico (Humple 2008). They are widely distributed in the San Joaquin Valley. This species forages in grasslands and agricultural fields and nests in scattered shrubs and trees. Habitat features that increase shrike abundance, survival, and reproductive success are hunting perches, low nesting trees and shrubs, thorny vegetation, and/or barbed wire on which to impale their prey.

This species is known to nest in suitable habitat in the San Luis NWR complex, and is expected to nest in other suitable habitat in the Restoration Area.

Natural History

Loggerhead shrikes select a variety of prey: insects, reptiles, mammals, and birds. They hunt by perching and scanning their surroundings, taking prey from the ground of from mid-air, and often impaling prey for easier manipulation or storage (Humple 2008).

Shrikes are year-round residents in California. They may breed as early as late January and to as late as July. Loggerhead shrikes will abandon nests if disturbed by humans during egg-laying or early in incubation. Shrikes are generally tolerant of human activity near nests later in the breeding season, however, and nest abandonment is not generally a significant factor in nest failure (Collister 1994).

The territory size of loggerhead shrikes varies with habitat quality, prey abundance and availability, and density of hunting perches; territories can range from several acres to nearly 50 acres (Yosef 1996). Home ranges are somewhat greater than territories and vary seasonally.

Threats

Threats responsible for loggerhead shrike declines in California are not well understood. In the Central Valley, habitat loss and fragmentation is a primary threat (Humple 2008).

3.4.28 Willow Flycatcher

The willow flycatcher (*Empidonax traillii*) is small passerine usually found in riparian habitats. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The willow flycatcher including all its subspecies, is State listed as endangered. The subspecies that breeds in the Central Valley (little willow flycatcher, *E. t. brewsteri*) is not Federally listed as threatened or endangered. (The southwestern willow flycatcher

(*E.t. extimus*) is Federally listed as endangered, but it does not breed in the Restoration Area or its vicinity.)

Distribution

The willow flycatcher, which is a neotropical migrant, is usually found in riparian habitats and large wet meadows with abundant willow thicket during the breeding season and during migration (Sedgwick 2000). The species generally nests in willows, alders, and cottonwoods or other dense riparian deciduous vegetation. The species will also nest in nonnative trees such as tamarisk (RHJV 2004).

The willow flycatcher breeds throughout western North America. In California it is found along the western Sierra Nevada from El Dorado County to Madera County; in the Cascade Range and northern Sierra Nevada in Trinity, Shasta, Tehama, Butte, and Plumas counties; and along the eastern Sierra Nevada from Lassen County to Inyo County. Recent nesting has been documented along the Sacramento River in riparian restoration sites (RHJV 2004).

Within the San Joaquin River floodplain, willow flycatchers are rare spring and uncommon fall migrants in riparian habitats of the San Luis and West Bear Creek units of the San Luis NWR. There are no CNDDB records of this species and no recent breeding has been documented in the San Joaquin Valley (RHJV 2004, McBain and Trush 2002).

Natural History

Willow flycatchers arrive in California in May–June (Gaines 2005). They feed on insects and occasionally on fruits and seeds. They forage for these insects from perches in thickets of willow (*Salix* spp.) or other riparian shrubs, or low perches in herbaceous vegetation. Patches of willows or other dense riparian vegetation are also required for cover and nesting. Territories (and probably home ranges) are from less than 1 to several acres in size. Willow flycatchers lay eggs in June, incubate eggs for almost 2 weeks, and then nestlings fledge about another 2 weeks later.

Threats

Threats to the willow flycatcher include habitat loss and habitat degradation resulting from trampling of vegetation and nests by livestock and recreational activities, and brood parasitism by the brown-headed cowbird (which is increased in areas with livestock) (RHJV 2004).

Relevant Conservation Efforts and Guidance

In northern California, surveys to document the distribution and abundance of little willow flycatcher (*E. t. brewsteri*) have been conducted by DFG and the U.S. Forest Service (USFS) since the early 1990s (DFG 2005a). In southern California, the southwestern willow flycatcher (*E. t. extimis*) is covered by several habitat conservation and multispecies conservation plans, and cowbird control programs also have been implemented (e.g., along the Kern River), and a recovery plan has been prepared for this Federally listed subspecies (USFWS 2002b).

3.4.29 Least Bell's Vireo

The least Bell's vireo (*Vireo bellii pusillus)* is small passerine usually found in riparian habitats. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The least Bell's vireo is Federally and State listed as endangered. Critical habitat for least Bell's vireo was designated in 1994 (59 FR 4845–4867, February 2, 1994). This critical habitat is located in southern California, and does not include areas in the San Joaquin Valley.

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. 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). Formerly, the vireo was known to breed from throughout the Sacramento and San Joaquin valleys, the Sierra Nevada foothills, and in 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, and by 1980, was extirpated from the entire Central Valley (RHJV 2004).

However, recent observations indicate that the species' range is expanding northward and individuals are currently recolonizing areas that have been unoccupied for decades (RHJV 2004). Least Bell's vireos successfully nested at the San Joaquin River NWR in 2005 and 2006 (USFWS 2006d).

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.

Least bell's vireos arrive in breeding habitats in California from mid-March to April (USFWS 1998b). 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. The nest is usually constructed in a fork between branches about 3 feet above the ground. 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

2006d). Threats also include habitat degradation caused by trampling of vegetation and nests by livestock and recreational activities, and habitat degradation resulting from the spread of invasive plans, in particular giant reed (*Arundo donax*).

Relevant Conservation Efforts and Guidance

USFWS has prepared a draft recovery plan for least Bell's vireo (USFWS 1998b). Least Bell's vireo is also addressed in most habitat conservation and multiple species planning efforts in southern California (DFG 2005a). These plans include 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. Resolution of land use conflicts, such as from livestock grazing within riparian corridors, water diversion, and developed parks adjacent to suitable vireo habitat, will require additional planning and management actions.

3.4.30 California Horned Lark

The California horned lark (*Eremophila alpestris actia*) is passerine found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The California horned lark is a State-listed watch list species.

Distribution

California horned lark nests and forages in grasslands and agricultural areas, especially sparsely vegetated or barren areas. This species is known to nest in suitable habitat in the San Luis NWR complex.

Natural History

The California horned lark is a year-round resident in the Central Valley (Green 2005). This species inhabits relatively flat ground with short vegetation (often less than 4 inches high) or bare ground, and is found in both grassland and fallow agricultural habitats (Zeiner et al. 1990a). It forages by walking along the ground searching for food that includes seeds, insects, snails, and spiders. The California horned lark nests on the ground during March–July, and nesting territories range from 2 to 13 acres.

Threats

The California horned lark has been experiencing habitat loss (NatureServe 2008). However, there is insufficient evidence to conclude that this species has experienced substantial declines in abundance recently (Shuford and Gardali 2008). For this reason, the California horned lark has been removed from DFG's list of species of special concern and reclassified to a watch list species.

3.4.31 Bank Swallow

The bank swallow (*Riparia riparia*) is passerine found in North and South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The bank swallow is State listed as threatened.

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 (DFG 2005). Its main stronghold is along the banks of the Sacramento River and its major tributaries (DFG 2005). This species has been documented nesting in the vicinity of the Restoration Area near Mendota Pool, and is expected to occur elsewhere in the Restoration Area.

Natural History

Foraging bank swallows take insects on the wing from over a variety of land cover types (Garrison et al. 1999, DFG 2005). They use holes dug in cliffs and river banks for cover. Bank swallows also nest in burrows that they dig in nearly vertical banks/cliff faces. For bank swallows to dig these burrows, they require substrates comprised 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 to avoid predators. Colonies of several to more than 3,000 bank swallows nest at these locations. Suitable nest sites are few and are scattered throughout the species' remaining California range; they are most often found 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, DFG 2005a).

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 (DFG 2000, 2005a). 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).

3.4.32 California Yellow Warbler

California yellow warbler (*Dendroica petechia brewsteri*) is passerine found in North and South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

California yellow warbler is a California species of special concern during the breeding season.

Distribution

The yellow warbler consists of three groups of subspecies, and it is the aestiva group that occurs in continental North America (Heath 2008). This group migrates to winter from northern Mexico to central South America. Its historical breeding range included the entire Central Valley. The yellow warbler has been largely extirpated from the Central Valley as a breeder. It nests and forages in dense riparian woodlands.

There are no recent nesting records for this species in the Restoration Area, but potential nesting habitat is present. It is known to occur during migration in suitable habitat in the San Luis NWR complex and other sites in the Restoration Area.

Natural History

The yellow warbler occurs in California primarily as a migrant and summer resident from late March through early October (Heath 2008, Lowther et al. 1999). It feeds on insects and spiders. From late March through early October, yellow warblers breed in riparian vegetation in close proximity to water, and establish and defend territories that (on average) are less than 1 acre. From year to year, yellow warblers show a high degree of site fidelity.

Threats

Habitat loss and cowbird parasitism are the primary threats affecting the yellow warbler in California (Heath 2008).

3.4.33 Yellow-Breasted Chat

Yellow-breasted chat (*Icteria virens*) is passerine found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Yellow-breasted chat is a California species of special concern during the breeding season.

Distribution

The yellow-breasted chat winters from Baja California and south Texas to central Guatemala (Comrack 2008). Its breeding range extends from British Columbia to North Dakota and south to Baja California and west Texas. Historically, the yellow-breasted chat bred throughout much of California (below 5,000 feet) and almost all of the Central Valley (Comrack 2008). Currently, it breeds in only a small portion of the Sacramento Valley, and very few locations in the San Joaquin Valley. It is associated with dense riparian thickets of willows, vine tangles, and dense brush associated with streams, swampy ground, and the borders of small ponds.

Potential nesting habitat for this species is present in the Restoration Area. It is also known to occur during migration in suitable habitat in the San Joaquin Valley.

Natural History

The yellow-breasted chat occurs in the Central Valley as a migrant and summer resident primarily from late March to late September. It forages in dense thickets, gleaning insects and spiders off of leaves and twigs, and also feeds fruits (Eckerle and Thompson 2001). It also requires dense cover near water for cover.

The yellow-breasted chat breeds from later April through early August (Eckerle and Thompson 2001, Comrack 2008). Yellow-breasted chat nests are located within several feet of the ground in dense shrub cover. It establishes and defends a territory that may be 1 to several acres in size (based on territory sizes documented in the eastern United States). Females incubate their eggs and incubate them for 11–12 days; subsequently, both parents feed the nestlings until they fledge at approximately 9 days.

Threats

Habitat loss and nest parasitism by brown-headed cowbird (*Molothrus ater*) are the primary threats affecting the yellow-breasted chat (Comrack 2008).

3.4.34 Grasshopper Sparrow

The grasshopper sparrow (*Ammodramus savannarum*) is passerine found throughout North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The grasshopper sparrow is a California species of special concern during the breeding season.

Distribution

The grasshopper sparrow occurs throughout North America from southern Canada to Mexico. The historic and current breeding distribution of grasshopper sparrow includes much of the Central Valley and of California's coastal regions.

This species is known to breed in the Los Banos Wildlife Area, the North Grasslands Wildlife Area, the San Luis NWR complex, and the Mendota Wildlife Area (Unitt 2008). Thus, it breeds in the vicinity of or in the Restoration Area at multiple locations.

Natural History

The grasshopper sparrow is present in California primarily as a summer resident from March to September (Unitt 2008). During that time, its breeding season extends from mid-March to August. Grasshopper sparrows in California prefer short to middle-height, moderately open grassland with scattered shrubs.

Grasshopper sparrows eat grasshoppers, other insects, and seeds (Dobkin and Granholm 2005, Unitt 2008). This species forages on the ground or on low vegetation, and bare ground may be an important component of its habitat. Dense herbaceous cover may be necessary for concealment. Based on data from other states, territories are probably about several acres in size and home ranges may be much larger (100 acres or more).

Threats

The primary threat affecting the grasshopper sparrow in the Central Valley is loss of habitat because of conversion to developed land uses or incompatible agricultural practices (e.g., viticulture) (Unitt 2008).

3.4.35 Tricolored Blackbird

Tricolored blackbird (*Agelaius tricolor*) is passerine largely endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Tricolored blackbird is a California species of special concern during the breeding season.

Distribution

Tricolored blackbird nests in freshwater marsh, riparian scrub, and other dense shrubs and herbs, foraging in grasslands and agricultural fields. This species is largely endemic to California, and more than 99 percent of the global population occurs in the state, with scattered nesting records outside the state. More than 75 percent of the breeding population is found in the Central Valley, although populations move around from year to year, following food resources (Hamilton 1998, Beedy and Hamilton 1999).

This species is known to nest in suitable habitat in the San Luis NWR complex and other sites in the Restoration Area.

Natural History

Tricolored blackbird is a colonial nesting species. Basic requirements affecting blackbirds' selection of breeding colony sites are open, accessible water; a protected nesting substrate (including either flooded or thorny or spiny vegetation); and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony (Beedy and Hamilton 1999). Insect prey includes beetles, weevils, and grasshoppers; and

larvae of caddisflies, moths, butterflies, and, especially in current rice-growing areas, dragonflies.

Most tricolored blackbirds forage within 5 kilometers (3.1 miles) of their colony sites (Orians 1961), but commute distances of up to 15 kilometers (9.3 miles) have been reported (Beedy and Hamilton 1999). Short-distance foraging (i.e., within sight of the colony) for nestling provisioning also is common. Both sexes are known to provision the nestlings (Beedy and Hamilton 1999).

Proximity to suitable foraging habitat appears to be extremely important for the establishment of colony sites, as tricolored blackbirds always forage, at least initially, in the field containing the colony site (Cook 1996). However, usually only a minor fraction of the area within the commuting range of a colony provides suitable foraging habitat. For example, within a 5-kilometer (3-mile) radius there may be low-quality foraging habitats such as cultivated row crops, orchards, vineyards, and heavily grazed rangelands in association with high-quality foraging areas such as irrigated pastures, lightly grazed rangelands, vernal pools, and recently mowed alfalfa fields (Beedy and Hamilton 1999).

Threats

The primary threat affecting tricolored blackbirds in the Central Valley has been habitat loss from urbanization and unsuitable agricultural uses (which include vineyards, orchards, and row crops). Other threats includes destruction of tricolored blackbird nesting colonies by agricultural practices (such as harvesting of silage and plowing of weedy fields). Nesting colonies can also be substantially affected by predation by bird and mammal predators.

3.4.36 Yellow-Headed Blackbird

The yellow-headed blackbird (*Xanthocephalus xanthocephalus*) is passerine largely found in western and central North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The yellow-headed blackbird is a California species of special concern during the breeding season.

Distribution

Yellow-headed blackbird nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds. Its range extends as far west as central-interior British Columbia, moving directly south through the central-interior west coast to northeastern Baja California (Jaramillo 2008).

There is a CNDDB record for this species at Dos Palos, in the vicinity of the Restoration Area. Potential nesting habitat is present in emergent wetland habitat in the Restoration Area.

Natural History

The yellow-headed blackbird occurs in the Central valley primarily as a migrant and summer resident (Jamarillo 2008). It feed on seeds and insects and uses dense emergent wetland vegetation for roosting and resting cover (Granholm 2005d). Yellow-headed blackbirds breed from mid-April to late July. They usually nest in colonies and may forage 1 mile or further from nest sites.

Threats

Habitat loss is the primary threat affecting the yellow-headed blackbird in California (Jamarillo 2008).

3.5 Mammals

Fifteen species of mammals were identified as having potential to occur in the Restoration Area. Descriptions of these potentially occurring special-status species are provided below.

3.5.1 Pallid Bat

Pallid bat (*Antrozous pallidus*) is a bat species found throughout California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Pallid bat is a California species of special concern.

Distribution

Pallid bat occurs throughout California except for the higher elevations of the Sierra Nevada from Shasta to Kern counties. This species is locally common at lower elevations in California, particularly warm and arid regions below 6,000 feet with rocky areas for roosting, but has been found up to 10,000 feet in the Sierra Nevada. It inhabits rocky, arid deserts and canyonlands, grasslands, shrublands, woodlands, and forests. This species could forage in the Restoration Area.

Natural History

The pallid bat is a large gleaning bat that eats primarily large insects including crickets, grasshoppers, and beetles, and in some areas scorpions. They roost in rock crevices, tree hollows, mines, caves, and a variety of anthropogenic structures, including vacant, unoccupied buildings. The pallid bat may switch day roosts on a daily or seasonal pattern (USFS 1997). During spring through fall, they roost in colonies that range from 20 to 100 individuals. During winter, they generally hibernate alone or in small groups. Pallid bats generally mate between October and February, and give birth between March and July to one to three offspring.

Threats

Threats to the pallid bat include loss of habitat (particularly roosting habitat) resulting from conversion to developed or agricultural uses, mining activities, and timber harvests.

They are also threatened by human disturbance of roost sites, extermination in buildings, and pesticide use (USFS 1997).

3.5.2 Townsend's Big-Eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) is a bat species found throughout California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Townsend's big-eared bat is a California species of special concern.

Distribution

Townsend's big-eared bat occurs in a variety of vegetation types throughout California, but it is most commonly associated with desert scrub, mixed conifer forest, pine forest, and pinon-juniper woodlands. Within these vegetation types, the bats are specifically associated with limestone caves, mines, lava tubes, and buildings (Dalquest 1947, 1948; Graham 1966; Pearson, Koford, and Pearson 1952; Kunz and Martin 1982; Pierson, Rainey, and Koontz 1991; Dobkin, Gettinger, and Geredes 1995).

This species occurs from near sea level to well above 3,160 meters (10,367 feet) above sea level (Pearson, Koford, and Pearson 1952; Nagorsen and Brigham 1993). Once considered common throughout its range in California, the Pacific Townsend's big-eared bat is considered to be uncommon and declining (Pierson 1988, Pierson and Rainey 1996, Zeiner et al. 1990b).

No records of this species are known from the Restoration Area, although it could forage there.

Natural History

Townsend's big-eared bat is a medium-sized bat with overtly large ears and characteristic bilateral horseshoe-shaped lumps on the muzzle. Townsend's big-eared bat eats primarily moths (Pierson et al. 1999). It roosts in caves, mines, buildings, and other structures (e.g., bridges) (Zeiner et al. 1990b). Night roosts of this species often include other bat species.

During hibernation, Townsend's big-eared bat typically prefers sites with relatively cold (but above freezing) temperatures in quiet, undisturbed places. Hibernation sites are often in the more interior, thermally stable portions of caves and mines, or in buildings.

Threats

Townsend's big-eared bats are threatened by loss or disturbance of roosting habitat (particularly roosting habitat) by mining and mine reclamation, water impoundments, recreational caving, loss of building roosts, and bridge replacement (Kunz and Martin 1982, Pierson et al. 1999). This species is highly sensitive to roost disturbance by human activities (Williams 1986). Pesticide contamination may also threaten this species in agricultural areas (Geluso, Altenbach, and Wilson 1976).

3.5.3 Spotted Bat

Spotted bat (*Euderma maculatum*) is a bat species found throughout western North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Spotted bat is a California species of special concern.

Distribution

Spotted bat inhabits semiarid regions of the western United States and northern Mexico. Preferred habitat for spotted bat includes shrub-steppe grasslands, desert scrub, and pinyon pine–juniper, and pine forests. The species roosts primarily in crevices in rocky cliffs and canyons.

In California it is found in the southern and eastern portions of the state and is known to occur near Friant Dam. It is likely to forage in the Restoration Area.

Natural History

Spotted bats are medium-sized bats with a distinctive white spots and relatively large ears (Wilson and Ruff 1999, WBWG 2005a). They feed on moths and a variety of other insects. Males and females are capable of long distance (12 miles in British Columbia, 48 miles in Arizona) and rapid (30 miles per hour) flight; thus foraging ranges can be large.

Spotted bats appear to be solitary animals but occasionally roost or hibernate in small groups (WBWG 2005a). Roost sites are cracks, crevices, and caves, usually high in fractured rock cliffs. In British Columbia and Arizona, bats showed high roost fidelity, using the same roosts nightly.

Spotted bats likely breed in late summer, with females giving birth to a single pup in early summer (May or June) (WBWG 2005a). Postpartum females have been captured from June to late August. It is unknown whether spotted bats migrate or hibernate locally.

Threats

Little is known about possible threats to spotted bats because of lack of knowledge of this species (WBWG 2005a). However, as with other bats, loss of foraging habitat and loss or disturbance of roosting habitat may threaten this species.

3.5.4 Western Red Bat

Western red bat (*Lasiurus blossevillii*) is a bat species found throughout North and South America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Western red bat is a California species of special concern.

Distribution

Western red bat is widely distributed in North and South America, and is found throughout California west of the crest of the Cascades and Sierra Nevada.

The western red bat roosts in trees, and is closely associated with cottonwoods in riparian areas at elevations below 6,500 feet. Especially favored roosts are found where leaves form a dense canopy above and branches do not obstruct the bats' flyway below. Western red bats are also known to roost in orchards, especially in the Sacramento Valley of California. There is a high association with the Sacramento and San Joaquin rivers.

Western red bat is known to occur within the Restoration Area along Reach 3, north of the Mendota Wildlife Area.

Natural History

Western red bat forages in riparian forests, over water between intact riparian forest edges, and over large gravel bars (WBWG 2005b). Red bats have been observed foraging around street and floodlights and will also forage in small clearings. These bats often forage in groups.

Typically solitary roosters (WBWG 2005b), western red bats roost primarily in trees, but may also roost under leaft liter or in caves. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas.

The western red bat mates in the fall; females become pregnant in spring and give birth in summer (WBWG 2005b). They migrate, moving from the Central Valley toward the coast during winter. Although they hibernate, these bats may arouse from hibernation in winter to forage.

Threats

The western red bat is threatened primarily by the loss of riparian habitat (WBWG 2005b). The intensive use of pesticides on agricultural crops may constitute a threat to roosting western red bats and may significantly reduce the amount of insect prey available. In addition, controlled burns or major disturbances of the litter layer (e.g., grading) may be another significant mortality factor for red bats that roost in leaf litter during cool temperatures.

3.5.5 Hoary Bat

Hoary bat (*Lasiurus cinereus*) is a bat species found throughout California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Hoary bat is included on DFG's Special Animals list (DFG 2008) and tracked in the CNDDB.

Distribution

Hoary bat is found throughout California. This species prefers woodlands and coniferous forests, but hunts over open areas and lakes. Hoary bat could occur in the Restoration Area, where it may roost in riparian trees and forage over open water and in open woodland habitats.

Natural History

Hoary bats are large bats with brown to grey fur "frosted" with tinges of white. Hoary bats reportedly have a strong preference for moths, but are also known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps (WBWG 2005c). Reported predators include jays, kestrels, and snakes, and likely include hawks and owls as well.

Hoary bats are typically solitary roosters. Like red bats, they roost during days and also roost high (10–15 feet) in trees. Roosts are generally at the edge of clearings. Hoary bats are not attracted to houses or other human structures. However, some atypical roost locations have been reported (e.g., in caves, under wood, on the side of buildings).

Although the hoary bat is thought to be migratory (migrating in fall and spring), wintering sites have not been well documented, and no specific migration routes have been discerned (WBWG 2005c). Hoary bats probably mate in the fall, with delayed implantation and birth in the following May through July.

Threats

Loss of roosting habitat is likely the greatest threat to the hoary bat (WBWG 2005c). Use of pesticides on roosting and foraging habitat may also be a potential source of mortality to roosting bats and their insect prey. Near developed land uses, where scrub jays thrive in association with humans, this bird may pose a major threat to sleeping or hibernating hoary bats.

3.5.6 Yuma Myotis

The Yuma myotis (*Myotis yumanensis*) is a bat species found throughout western North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The Yuma myotis is included in the DFG's Special Animals list (DFG 2008).

Distribution

The Yuma myotis is a small bat associated with rivers and streams in arid regions throughout the western United States, Mexico, and Canada (WBWG 2005d). The Yuma myotis occurs in a variety of vegetation types including riparian, desert scrub, and forest and will roost in a variety of habitats including riparian, scrub, desert, and forest environments, in bridges, buildings, cliffs, caves, mines, and trees.

This species is known to occur within Restoration Area along Reach 3, north of Mendota Wildlife Area.

Natural History

The Yuma myotis is a small bat that feeds primarily upon a variety of aquatic emergent insects including caddis flies (WBWG 2005d). This species roosts colonially in caves, tunnels, trees, and buildings. Females form maternity colonies that number in the thousands, while males roost solitarily in the summertime. They mate in the fall, and give birth in the spring and summer to a single offspring.

Threats

The Yuma myotis may be threatened by closure loss or disturbance of roosting habitat (e.g., abandoned mines, caves, and buildings) and loss of riparian foraging habitat (WBWG 2005d). Because this species frequently occurs in buildings and other structures, it also is vulnerable to pest control activities.

3.5.7 Western Mastiff Bat

Western mastiff bat (*Eumops perotis californicus*) is a bat species found in the southwestern United States and northern Mexico. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

Western mastiff bat is a California species of special concern.

Distribution

The Western mastiff bat is associated with open, semiarid to arid landscapes across the southwestern United States and northern Mexico. Vegetation types providing foraging habitat include open ponderosa pine forest, oak woodlands, chaparral, coastal scrub, grasslands, dry desert washes and river floodplains, and agricultural areas. For roosting, the Western mastiff bat requires high rock faces or a similar feature (e.g., a large building).

In California, the geographic range of the mastiff bat is from the Oregon border to the southern part of the state. Distribution is likely dependent on the availability of suitable roosting habitat, with the species being present only where there are significant rock features (Davis and Schmidly 1994).

This species is known to occur in suitable habitat in the San Joaquin Valley. CNDDB records exist for this species in the vicinity of the Restoration Area near Fresno and Mendota. Suitable foraging and roosting habitat for this species is present in the Restoration Area, but because of the absence of cliff faces, it is not likely to breed there.

Natural History

Western mastiff bat is a large bat that forages over large areas (up to 15 miles from roost sites), and regularly forages at 100–200 feet above the ground, and may forage up to 2,000 feet above the ground (Wilson and Ruff 1999, WBWG 2005e). Thus, insects carried aloft by thermal currents probably furnish an important portion of their diet. Moths are their primary prey.

The Western mastiff bat roosts in small colonies (typically of fewer than 20 individuals) (WBWG 2005e). However, maternity colonies may contain up to several hundred females. The Western mastiff bat generally roosts under exfoliating rock slabs (e.g., granite, sandstone or columnar basalt). The roost entrances typically are horizontally oriented, have moderately large openings, and face downward so they can be entered from below.

This species does not enter prolonged hibernation, and is nonmigratory, moving only relatively short distances seasonally (Wilson and Ruff 1999, WBWG 2005e). It mates in late winter to early spring and gives birth in summer.

Threats

Threats to this species include loss and disturbance of roosting habitat (including by rock climbers), and landscape-scale effects on foraging habitat, including urban expansion and possibly the consequences of widespread pesticide applications (WBWG 2005e).

3.5.8 Riparian Brush Rabbit

The riparian brush rabbit (*Sylvilagus bachmani riparius*) is a rodent found in the San Joaquin Valley. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The riparian brush rabbit is Federally and State listed as endangered.

Distribution

The species inhabits riparian vegetation along the lower portions of the San Joaquin and Stanislaus Rivers in the northern San Joaquin Valley, California. Because the subspecies was not described until after it is believed to have been extirpated from most of its historical range, definitive information on its former distribution is lacking. It apparently has been extirpated from the Delta and most of the lower San Joaquin River and its tributaries, the Stanislaus, Tuolumne, and Merced rivers (Williams 1986). The range of the subspecies probably extended farther upstream than the Merced River, assuming that suitable habitat historically occurred along the length of the San Joaquin River system (Williams and Basey 1986).

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 NWR (Williams 1993, Williams and Basey 1986). A catastrophic flooding event in winter 1997 greatly reduced the numbers of riparian brush rabbit in Caswell State Memorial Park, spurring the development of a captive breeding and reintroduction program.

Although suitable habitat is likely to be present in the Restoration Area, this species is not likely to occur because of its limited distribution.

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). This species rarely moves more than a meter from cover. Riparian brush rabbits will not cross large open areas, which limits their dispersal capabilities (USFWS 1998a).

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

Threats

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 1998a). 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 recovery plan approval.

3.5.9 San Joaquin (Nelson's) Antelope Ground Squirrel

The San Joaquin (Nelson's) antelope ground squirrel (*Ammospermophilus nelsoni*) is a rodent found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The San Joaquin (Nelson's) antelope ground squirrel is State listed as threatened.

Distribution

The historical distribution of the San Joaquin (Nelson's) antelope ground squirrel included the western and southern portions of the Tulare Basin, the San Joaquin Valley, and the contiguous areas to the west in the upper Cuyama Valley and on the Carrizo and Elkhorn plains. In the San Joaquin Valley, the species ranged from western Merced County southward along the western side of the San Joaquin Valley to its southern end (USFWS 1998a). In the San Joaquin Valley, San Joaquin antelope ground squirrels are associated with open, gently sloping land with shrubs. Typical vegetation includes saltbushes and ephedra (USFWS 1998a).

This species was documented in the early 1900s in the vicinity of the Restoration Area near Mendota (CNDDB 2009). There are no recent records within the vicinity of the Restoration Area; however, potentially suitable habitat is present and thus there is a possibility that this species may be present.

Natural History

San Joaquin antelope squirrels are omnivores that consume green vegetation, fungi, insects, and seeds (USFWS 1998a). They live in burrows, either of their own construction

or ones dug by kangaroo rat. Preferred locations for burrows are in the side of drainages, roadside berms, and under shrubs.

San Joaquin antelope squirrels breed during late winter through early spring (USFWS 1998a). Young are born between March and April, are first seen above ground when about 30 days of age, and are weaned from late April to late May. The timing, nature, and distance of dispersal are not well documented.

Threats

Habitat loss and fragmentation are the primary threats to San Joaquin antelope squirrel (USFWS 1998a). Other threats include disturbance and degradation of habitat by petroleum production and grazing.

Relevant Conservation Efforts and Guidance

A recovery strategy for San Joaquin antelope squirrel has been developed by USFWS and was included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998a). This strategy relies on enhanced preservation and management of four core populations in the southern and western San Joaquin Valley (not in the Restoration Area or its vicinity). An important component of this preservation and management is sustaining and increasing habitat connectivity. Additional information on the distribution of San Joaquin antelope squirrels in the western San Joaquin Valley is also a component of the recovery strategy, as is developing management prescriptions for the species and monitoring its abundance.

3.5.10 Fresno Kangaroo Rat

The Fresno kangaroo rat (*Dipodomys nitratoides exilis*) is a rodent found in the southern Central Valley. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The Fresno kangaroo rat is Federally and State listed as endangered. Critical habitat has been established in and near the Mendota Wildlife Area, which is south of the Restoration Area.

Distribution

The Fresno kangaroo rat has narrow habitat requirements, only occupying alkali desert scrub vegetation at elevations of 200–300 feet (DFG 1992). The Fresno kangaroo rat, the smallest of California's kangaroo rats, historically occurred in north-central Merced County, southwestern Madera County, and central Fresno County.

This species is believed to exist only in a small area in western Fresno County and is considered by some to be extirpated along the San Joaquin River (McBain and Trush 2002). They were captured at the Alkali Sink Ecological Reserve and Mendota Wildlife Management Area near the Restoration Area in 1981, 1985, and 1992, but extensive trapping since 1993 in Fresno and Madera counties have not documented additional kangaroo rats (McBain and Trush 2002). Critical habitat for this species is about 1.75

miles southeast of Reaches 2A and 2B of the Restoration Area (Figure 5b in the Biological Resources - Vegetation and Wildlife appendix).

Natural History

Fresno kangaroo rats feed primarily on seeds, but they also eat some types of green, herbaceous vegetation, and insects (USFWS 1998a). They construct burrows for shelter, and are nocturnal and active year round within home ranges that may vary from less than 0.1 acre to several acres in size.

Breeding probably is initiated in winter after the onset of the rainy season (USFWS 1998a). Most females born the previous season probably do not give birth until mid-February or early March. Young remain continuously in the burrow until they are about 6 weeks old.

Threats

The primary threats affecting the Fresno kangaroo rat are habitat loss because of conversion to developed or agricultural land uses, and incompatible grazing practices, and potentially the illegal use of rodenticides (USFWS 1998a). Flooding of habitat by the San Joaquin River has also been considered a potential threat.

Relevant Conservation Efforts and Guidance

A recovery strategy for Fresno kangaroo rat has been developed by USFWS and was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998a). This strategy relies on additional preservation, restoration, and enhancement of habitat, and possibly reintroduction of Fresno kangaroo rats to restored but unoccupied habitat. Obtaining additional information on the distribution and abundance of Fresno kangaroo rats is also a component of the recovery strategy, as is developing management prescriptions for the species and continued monitoring of its abundance.

3.5.11 San Joaquin Pocket Mouse

The San Joaquin pocket mouse (*Perogrnathus inornatus inornatus*) is a rodent endemic to California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The San Joaquin pocket mouse is included on DFG's Special Animals list (DFG 2008) and tracked in the CNDDB.

Distribution

The San Joaquin pocket mouse is endemic to California and occurs in the Sacramento and San Joaquin valleys, the Inner Coast Ranges, the foothills of the western Sierra Nevada and the Tehachapi Mountains, and the western Mojave Desert (Best 1993). It has lost much of its historic range in the San Joaquin Valley as a result of agricultural and urban development, and is listed as a Sensitive Species by the U.S. Bureau of Land Management (Laabs and Allaback 2001). It inhabits grassland and scrub vegetation in the

Central Valley, including the San Joaquin Valley, and is associated with friable soils in areas up to 1,500 feet in elevation (Williams 1986).

This species is known to occur in suitable habitat within and in the immediate vicinity of Reach 3 of the Restoration Area.

Natural History

The San Joaquin pocket mouse feeds primarily on a variety of seeds, but will also consume insects when seeds are less available (Best 1993). It forages almost exclusively at night, under and in shrubs, and spends the day below ground in a burrow. They generally do not travel far to forage and stay out of relatively open areas (Laabs and Allabeck 2001).

The species enters torpor during periods of low temperatures and/or low food availability, and is not active above ground during much of the winter (Best 1993). The breeding season for the San Joaquin pocket mouse is from March to July (Jameson and Peeters 1988).

Threats

The primary threats to the San Joaquin pocket mouse are continued habitat loss and incompatible farming practices.

3.5.12 San Joaquin Valley (Riparian) Woodrat

The San Joaquin Valley (or riparian) woodrat (*Neotoma fuscipes riparia*) is a rodent found in the San Joaquin Valley. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The San Joaquin Valley (or riparian) woodrat is Federally listed as endangered and is a California species of special concern.

Distribution

Historically found along the San Joaquin, Stanislaus, and Tuolumne rivers, this species likely occurred throughout the riparian forests of the northern San Joaquin Valley (USFWS 1998a). 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. The only verified extant population is restricted to about 250 acres of riparian forest in Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River (USFWS 1998a).

There are no documented CNDDB occurrences of San Joaquin Valley woodrat within or in the vicinity of the Restoration Area, although it could occur in suitable habitat.

Natural History

This species 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 1998a).

Threats

Potential threats to this species include habitat conversion to agriculture, wildfire, disease, predation, flooding, drought, clearing of riparian vegetation, use of rodenticides and browsing and trampling by ungulates (USFWS 1998a).

Relevant Conservation Efforts and Guidance

A recovery strategy for San Joaquin Valley woodrat has been developed by USFWS and was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998a). 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. Collaboration with landowners and levee maintenance districts is also a component of the recovery strategy.

3.5.13 San Joaquin Kit Fox

The San Joaquin kit fox (*Vulpes macrotis mutica*) is a small canid found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The San Joaquin kit fox is Federally listed as endangered and State listed as threatened.

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.)

The San Joaquin kit fox has been observed in and adjacent to the West Bear Creek Unit (McBain and Trush 2002). Numerous additional CNDDB records exist for this species within and adjacent to the Restoration Area, including records of active dens, although most of these records are more than 15 years old (CNDDB 2009). However, this species is likely to be present in suitable habitat within the Restoration Area.

Natural History

The San Joaquin kit fox is a carnivore with a varied diet (USFWS 1998a, Ahlborn 2000). Prey include 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

primarily nocturnal. Its home range may be from 1 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 (culverts, abandoned pipelines, or banks in sumps or roadbeds) (USFWS 2007c). Kit foxes often change dens and many dens may be used throughout the year.

Litters are born in February or March (USFWS 1998a). 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 2007c). 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 has been developed by USFWS and was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998a). 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.

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

3.5.14 Ringtail

The ringtail (*Bassariscus astutus*) is a small carnivore found in California. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The ringtail is a California Fully Protected Species. Trapped for its fur in historic times, the ringtail was given Fully Protected status in California in 1968, meaning that it cannot be taken other than for scientific purposes under permit from the California Department of Fish and Game.

Distribution

Ringtails are slender cat-like mammals with a long, black-and-white ringed tail. Ringtails range throughout much of the western United States, including most of California, and can be found in a variety of habitats including riparian areas, rocky hillsides, and chaparral. They are a common to uncommon permanent resident at low to middle elevations and are active year round. They are not typically found more than one kilometer from permanent water (Belluomini 1980, CDFG 2005c). Highly suitable habitat for ringtails consists of a mixture of forest and shrubland in close association with rocky areas and riparian habitats (CDFG 2005c). Trapp (1972) discussed the ringtail's adaptation to rough, broken terrain, including naked soles of the feet providing traction on smooth surfaces, the ability to rotate hindfeet in a half circle, dexterous forefeet with limited opposability of the first 2 digits, and numerous behavioral adaptations.

Information on the current distribution of ringtail cats was collected by Sue Orloff (1980) from sighting records, museum specimens, and recent literature. There are no records of ringtail within the Restoration Area or immediate vicinity reported to the CNDDB or in Orloff's summary report. Her review found that the fewest number of ringtail occurrence reports were in the Mojave and Colorado Deserts, the east slopes of the Sierra Nevada, the San Joaquin Valley, and northeastern California. The highly developed agricultural portions of the San Joaquin Valley are considered unsuitable for ringtail (Orloff 1980). Closest occurrences to the Restoration Area are recorded from the foothills of Madera County east of the Restoration Area (Orloff 1980). Riparian forest and scrub within the Restoration Area provides potentially suitable habitat although the likelihood of occurrence is low due to surrounding agricultural land uses that are unsuitable and the paucity of sightings in the vicinity.

Natural History

The ringtail is a nocturnal omnivore, eating insects, fruit, berries, small mammals, birds, and reptiles (Belluomini 1980, Jameson and Peeters 2004). Typically, they forage near water on the ground, among rocks, and in trees. Hollow trees, logs, snags, cavities in talus and other rocky areas, and other recesses are used for cover. In California, home ranges have been estimated to vary from 44-515 ha (109-1280 ac) (Grinnel et al. 1937). Average home ranges of 20-43 ha (49-106 ac) were reported for a small number of ringtails in Texas (Toweill and Teer 1981). Also in Texas, densities of 61 km² (16/mi²) have been reported (Taylor 1954, Toweill and Teer 1981). Density is estimated as high as 10.5 to 20.5/km² (27.2 to 53.1 /mi²) in the California Central Valley (Belluomin 1980, Poglayen-Neuwall and Toweill 1988).

Ringtails breed during spring denning in rock recesses, hollow trees, logs, snags, abandoned burrows, or woodrat nests. Young are reportedly born in May and June (Walker et al. 1968) with one litter per year ranging in size from 1-5 young. Gestation is from 40-50 days. Females may drive males away from the nest 3-4 days prior to giving birth.

Probable predators include bobcats, raccoons, foxes, and especially large owls. Potential competition for food exists between ringtails and many sympatric species (e.g., raccoons, gray foxes, coyotes, barn owls, great horned owls, rattlesnakes, gopher snakes).

Threats

There is little information available regarding threats to ringtail populations. It is assumed that the primary threat to ringtail, particularly in California, is habitat loss and degradation as a result of urbanization and development. Trapping and shooting may have threatened ringtail populations historically.

3.5.15 American Badger

The American badger (*Taxidea taxus*) is a mustelid found in North America. The legal status, distribution, natural history, and predominant threats to this species are described below.

Legal Status

The American badger is a California species of special concern.

Distribution

The geographic range of the American badger extends throughout California except for the northwestern forested regions (Larsen 1987). This species is most abundant in drier areas of shrub, forest, and herbaceous habitats, but can be found anywhere with friable soils and a suitable prey base (Orloff 2002). American badgers have decreased substantially in abundance throughout their range since historic times, particularly in the Central Valley and the northern Coast Ranges.

This species has been documented in Reaches 4B2 and 5.

Natural History

The American badger is a carnivore that spends much of its time underground, where it preys primarily upon ground squirrels (*Spermophilus* spp.) and pocket gophers (*Thomomys* spp.), although it may also eat other rodents, reptiles, birds, eggs, insects, and carrion (Williams 1986). American badgers may dig extensively within levees, fields, and other areas with high concentrations of fossorial rodents (Jameson and Peeters 2004).

American badgers are active year round, although they tend to have smaller home ranges in winter than in other seasons. Mating takes place in late summer, and young are born in spring within a burrow complex, usually in areas with a sparse cover of vegetation (Jameson and Peeters 2004).

Threats

Threats to the American badger include urban and agricultural development; use of indiscriminate trapping and poisoning to control rodent populations, causing both loss of prey base and secondary pesticide accumulation; and deliberate killing for animal control purposes.

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Attachment

Invasive Vegetation Monitoring and Management Plan

Draft Biological Resources – Vegetation and Wildlife Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011

Table of Contents

List of Abbreviations and Acronyms

GIS	geographic information system
GPS	global positioning system
SJRRP	San Joaquin River Restoration Program

1.0 Introduction

This plan focuses on management of invasive nonnative riparian plants. The monitoring plan described below would be implemented from 2010 through 2020 and evaluated for the need for further monitoring at the end of the monitoring period.

1.1 Management of Invasive Nonnative Riparian Plants

Invasive riparian plant species have the potential to substantially reduce the effectiveness of San Joaquin River restoration actions mandated by the Settlement. The native riparian vegetation in portions of the study area, especially in Reach 1, has been replaced by invasive species, including red sesbania, giant reed, tamarisk, Chinese tallow, and others. All these invasive species cause a general habitat degradation by displacing native riparian species such as willows and Fremont cottonwood and thereby reducing food source quality for native insects (allochtonous food source for salmonids) and wildlife that depend on the native species. The invasive plants also have the ability to rapidly colonize bare areas, choking the channel and increasing the hydraulic roughness of the channel, river bank and floodplain, potentially causing increased flood hazard. In addition, red sesbania has the potential to significantly affect restoration success, because (1) it is a particularly aggressive invader; (2) it is known to be toxic to livestock, humans, invertebrates and fish (although it is not known whether red sesbania would have a direct toxic effect on Chinook salmon, adults, larvae or eggs, at least an indirect effect on salmon food sources is expected); (3) red sesbania colonizes gravel bars and is expected to tie up gravel resources that are required for spawning by Chinook salmon; and (4) red sesbania rapidly colonizes gravel bars and can cause an increase in hydraulic roughness, because it colonizes unvegetated low roughness areas, where native species will not grow, and forms dense thickets. It likely alters the river hydraulics and adversely affects flow required for moving juvenile salmonids through the system.

Invasive riparian species are expected to rapidly respond to changes in the river and floodplain environment that result from restoration actions such as releasing restoration flows; constructing various water control structures, fish screens, and bypasses; and creating frequently inundated floodplain habitat. Unless the spread of invasive riparian species is controlled, achievement of the restoration objectives of the Settlement could be seriously compromised by invasive species.

The purpose of monitoring invasive nonnative riparian plants is to help guide control measures targeting these species, and to evaluate the success of these control measures.

The following sections describe the attributes of vegetation monitoring that will guide management components, as well as a strategy to update these monitoring components through adaptive management, and public outreach components associated with the monitoring activities.

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2.0 Invasive Vegetation Monitoring

2.1 Purpose

The San Joaquin River between Friant Dam and the Merced River will be monitored for nonnative invasive plants. The purpose of the monitoring is to determine whether invasive species have spread to areas that previously were not infested with nonnative invasive plants, to assess the effectiveness of control measures, and to help guide new control efforts. Invasive nonnative riparian plants have the potential to compromise implementation success of the San Joaquin River Restoration Program (SJRRP) and could potentially also spread in response to the additional flows released as the result of the SJRRP.

2.2 Methods

Data on invasive plants will be collected concurrently with the collection of native vegetation establishment data described above in Section 3. However, because these data are only collected at six sites only, surveys for seedlings of invasive plants will also be conducted.

A comprehensive survey for invasive nonnative plants will be conducted of the mainstem San Joaquin River between Friant Dam and Merced River and the bypass system. The survey will be conducted at all publicly accessible lands, state or federal properties, and properties accessible by collaborating local agencies. Biologists who are trained in the identification of the target species will survey these areas on foot, by automobile, and by boat, whichever is most convenient and efficient at the site. Where feasible, all areas will be surveyed with binoculars, and occurrences will be mapped using global positioning system (GPS) and recent aerial photographs. The approximate extent or, for small infestations, number of individuals will be noted at each occurrence. The geographic information system (GIS) layer of occurrences mapped during previous surveys (initiated in 2008) will be loaded into the GPS units, to allow new occurrences to be distinguished from existing ones. The same GIS layer will also be printed as an overlay onto the aerial photograph where new occurrences will be mapped. In addition, any areas where invasive control measures were implemented will be shown in the GIS, such that these areas can be specifically surveyed to assess the effectiveness of the control measures implemented at these sites.

Surveys will target the following priority species that will be denoted in the GPS units and on data sheets by a four-letter abbreviation containing the first two letters of the genus and of the species (listed in decreasing order of concern):

SEPU = *Sesbania punicea* (red sesbania)
TASP = *Tamarix* species (salt cedar)
ARDO = *Arundo donax* (giant reed)
SASE = *Sapium sebiferum* (Chinese tallow)

Other nonnative plants may locally become invasive in riparian areas (e.g., perennial pepperweed, pampas grass, blue gum, northern catalpa), but they are currently not considered species that have the potential to compromise the successful implementation of the SJRRP, or are species that are not expected to increase significantly as the result of the SJRRP operations. However, any obvious significant new infestations of these species will be noted during the surveys, because they could potentially become a greater problem in the future.

2.3 Location and Frequency

Locations and frequencies of the native vegetation establishment monitoring (where invasives will also be monitored) have been described in Table 1.

Surveys for invasive nonnative riparian plants will be conducted of all accessible areas along the mainstem of the San Joaquin River between Friant Dam and the Merced River in all bypasses, once every 2 years.

2.4 Thresholds

Thresholds of response are species-specific and also depend on the location of the new infestation that has been discovered. Any new red sesbania infestation downstream of the extent of the previously known infestations will require an immediate response with eradication measures. New infestations of the other three priority species in areas where these species were not found previously will be addressed with control measures prior to the next growing season. New infestations of other invasive plants will be addressed when they appear to become a significant threat to the successful implementation of the SJRRP.

Management Reponses

Management responses will be species-specific and will also depend on the size of the plants and of the infestation, and will include mechanical and chemical treatment of infestations. These methods have been described in the “Management Measures” chapters of this Vegetation Management Plan. For example, measures of the four highest priority species include a combination of mechanical and chemical treatment. In all cases, each site will be visited at least within one year of the initial treatment, and the plants will

be treated again, if necessary. Briefly, the responses to the priority species could include the following:

- Red sesbania infestations of a small number of plants (e.g., up to 20 plants) will be removed by mechanical means (hand pulling). Larger infestations of red sesbania will be sprayed with a glyphosate formulation approved for aquatic applications.
- Infestations of giant reed will be controlled by cutting and removing stems, and by treating the stems with glyphosate applications.
- Infestations of salt cedar will be treated using chemical control (e.g., imazapyr).
- Treatment of Chinese tallow depends on the size of the plants. Poles and mature plants will be cut and removed and stumps will be treated with glyphosate. Seedlings and saplings will be directly treated with glyphosate.

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3.0 Update Strategy

The monitoring program will be reviewed every four years to ensure that the monitoring program is still appropriate for any changed conditions. If changed conditions or monitoring results indicate that the monitoring program requires updating, a revision of the program will be proposed. This update strategy will be fully complementary and integrated with the overall adaptive management plan to be developed in the near future.

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4.0 Public Outreach

Public outreach components will include access for monitoring activities, vegetation control activities, and invasive species.

The public outreach associated with the invasive vegetation monitoring plan will be fully complementary and integrated with the overall public outreach plan to be developed in the near future.

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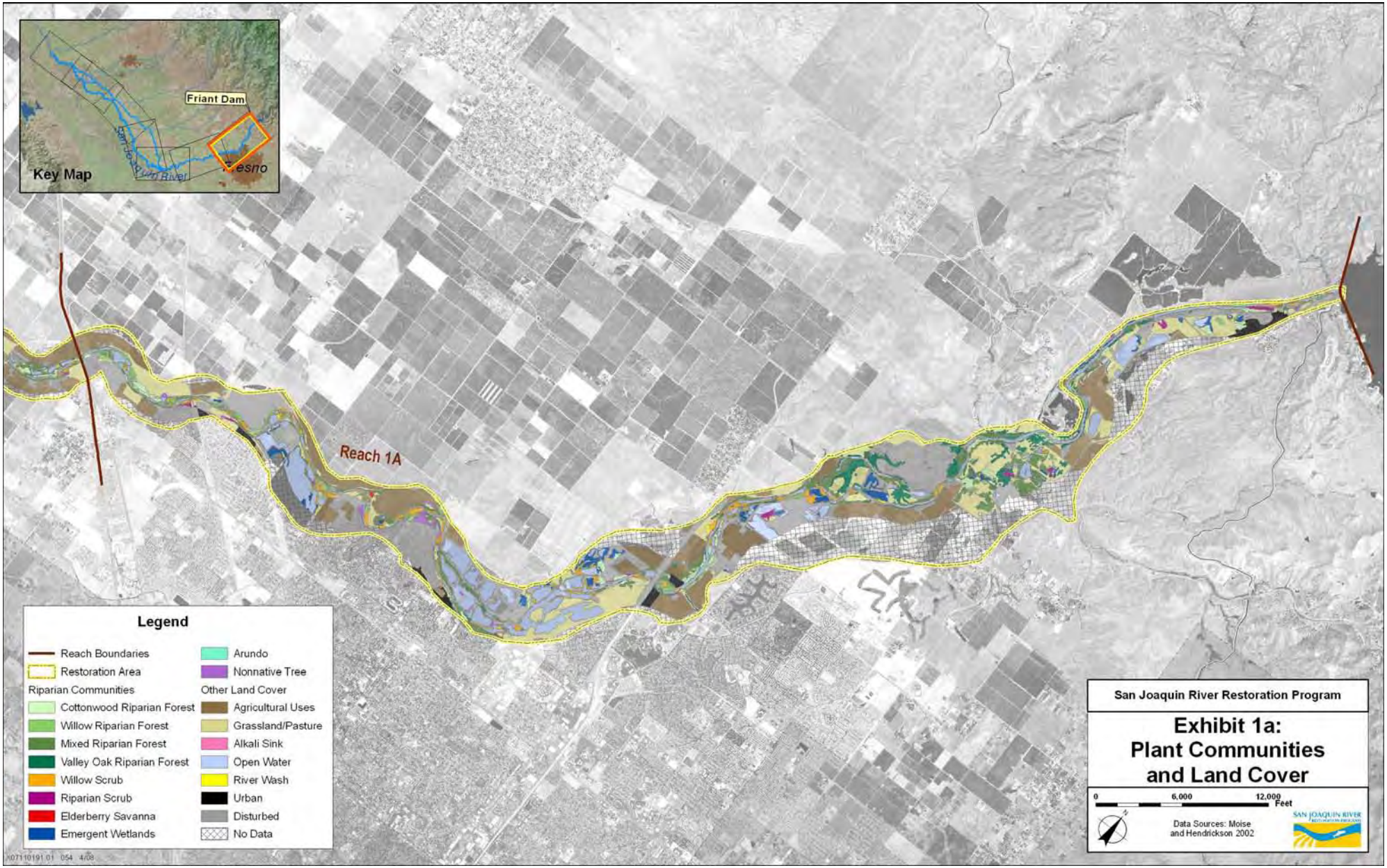
Exhibit

Plant Communities and Land Cover

Biological Resources Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 1A
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data
San Joaquin River Restoration Program
Exhibit 1a:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
Data Sources: Moise
and Hendrickson 2002


Key Map
Friant Dam
Fresno
Reach 2A
Reach 1B
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data
San Joaquin River Restoration Program
Exhibit 1b:
Plant Communities
and Land Cover
0
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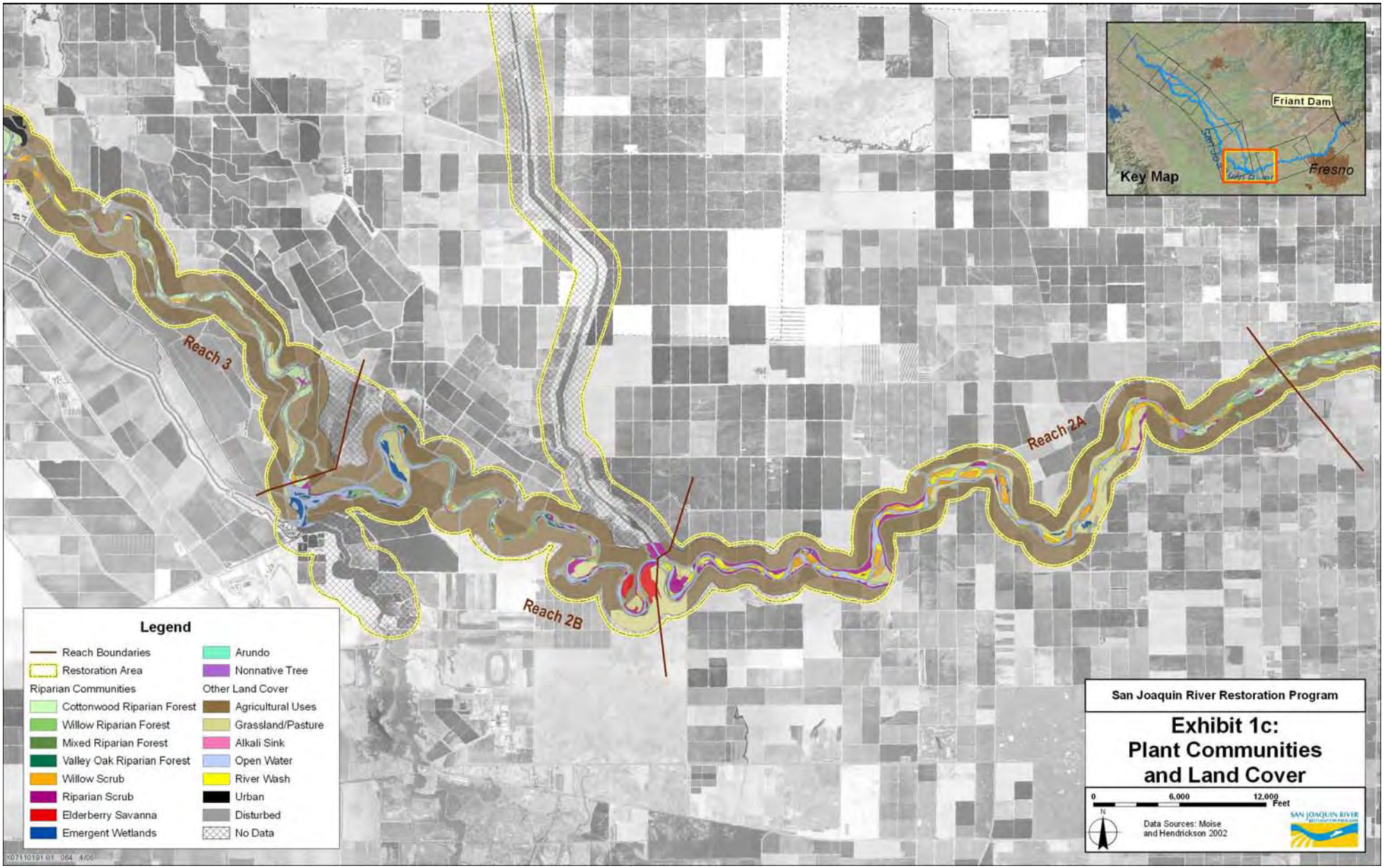
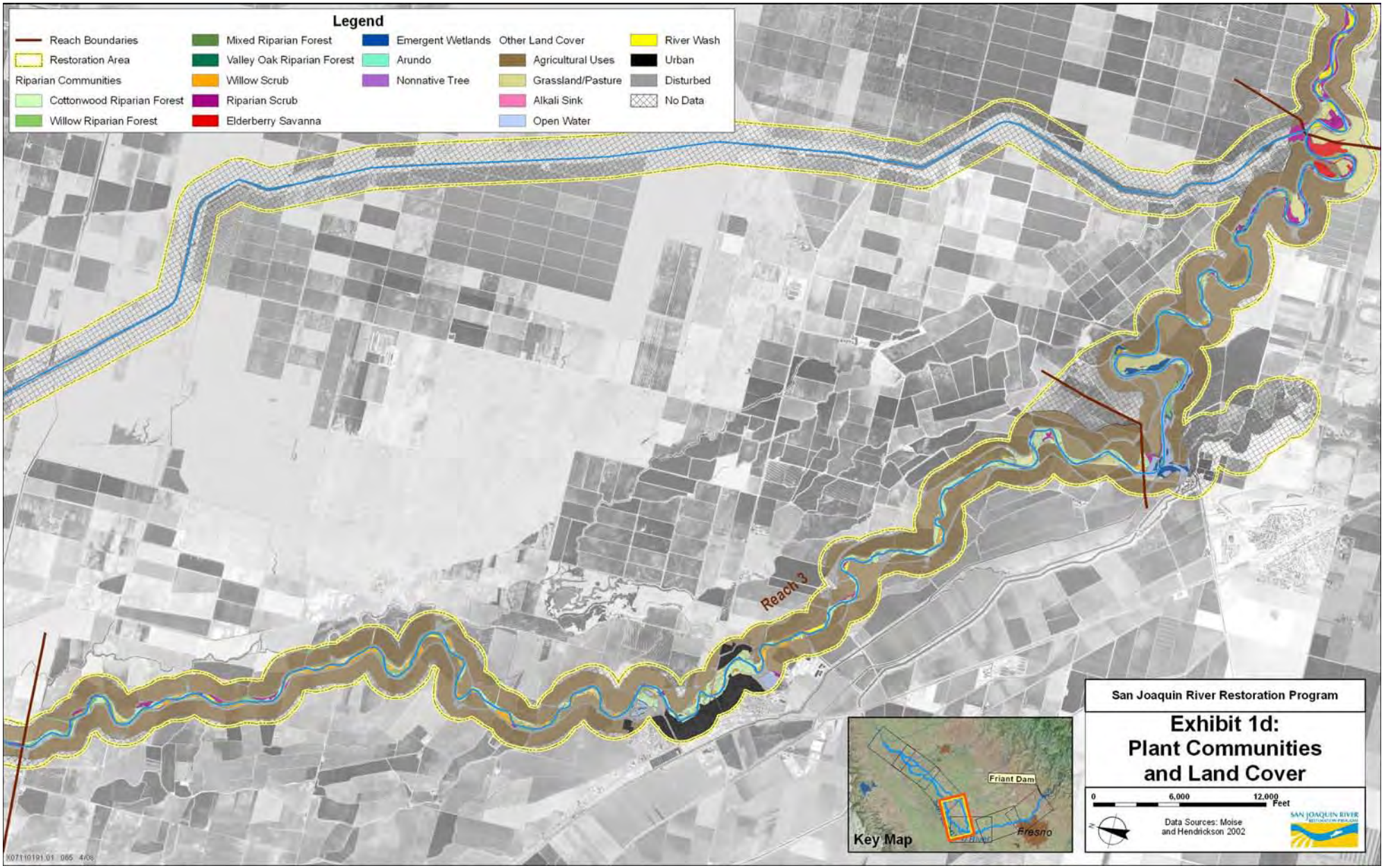
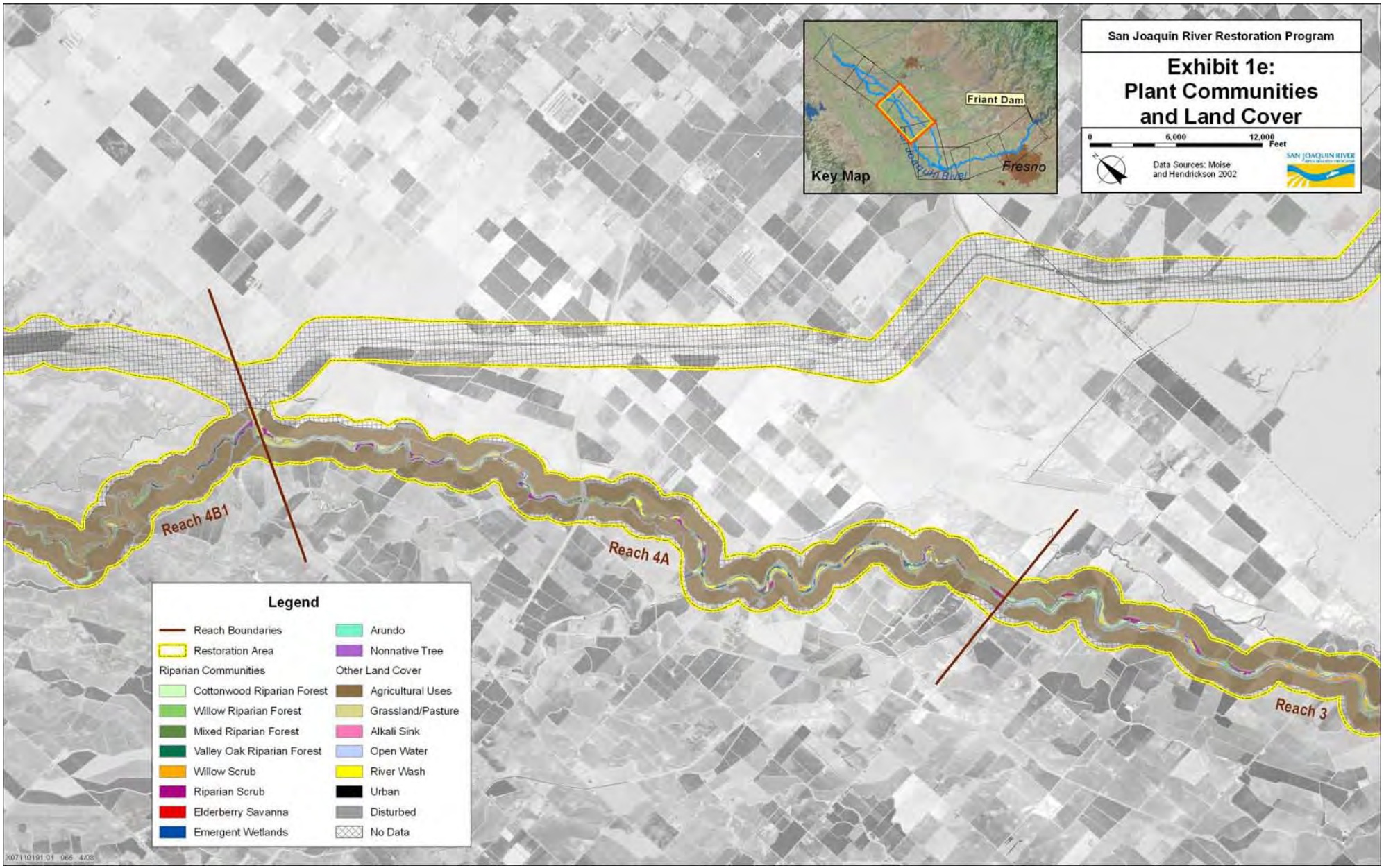
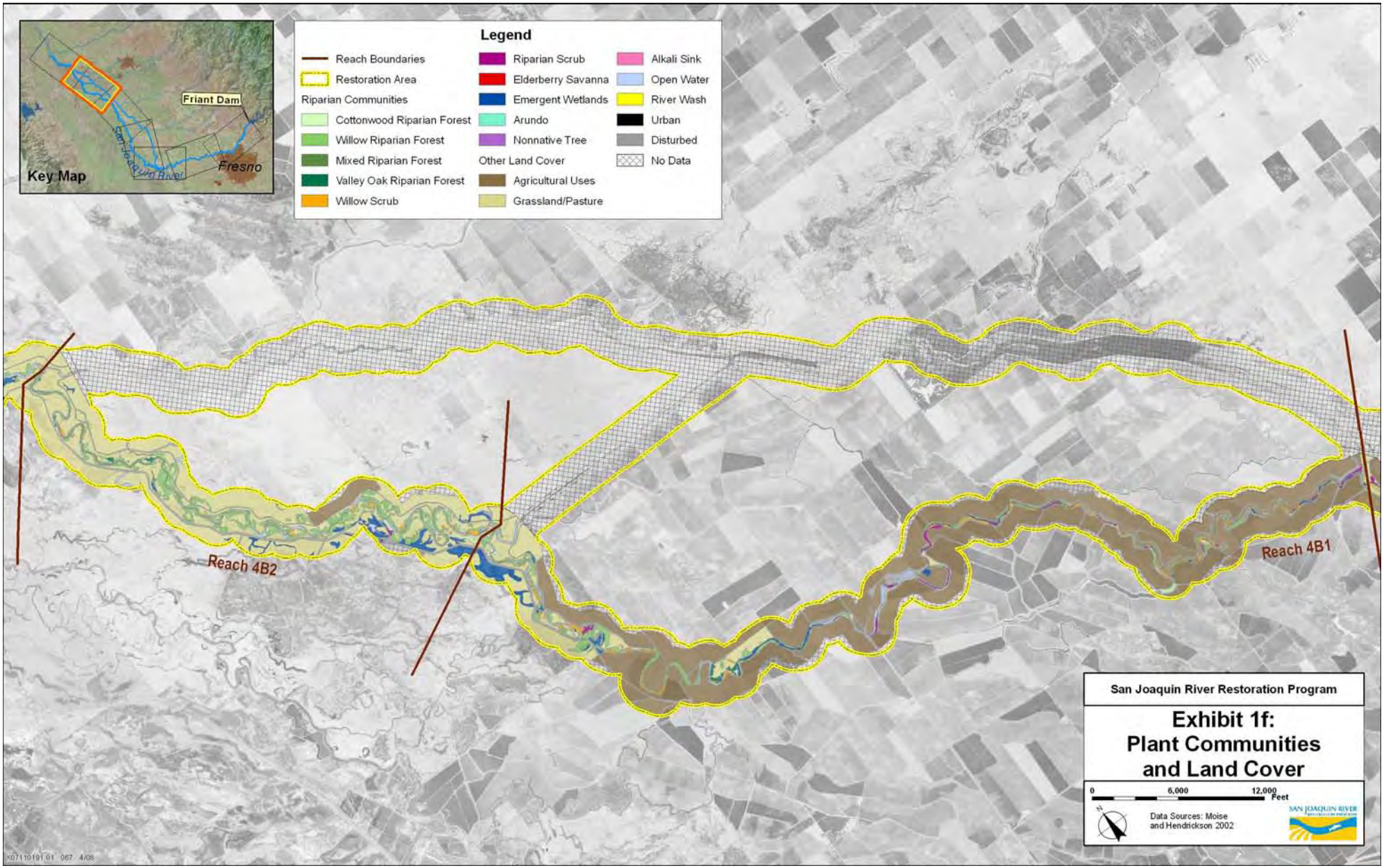
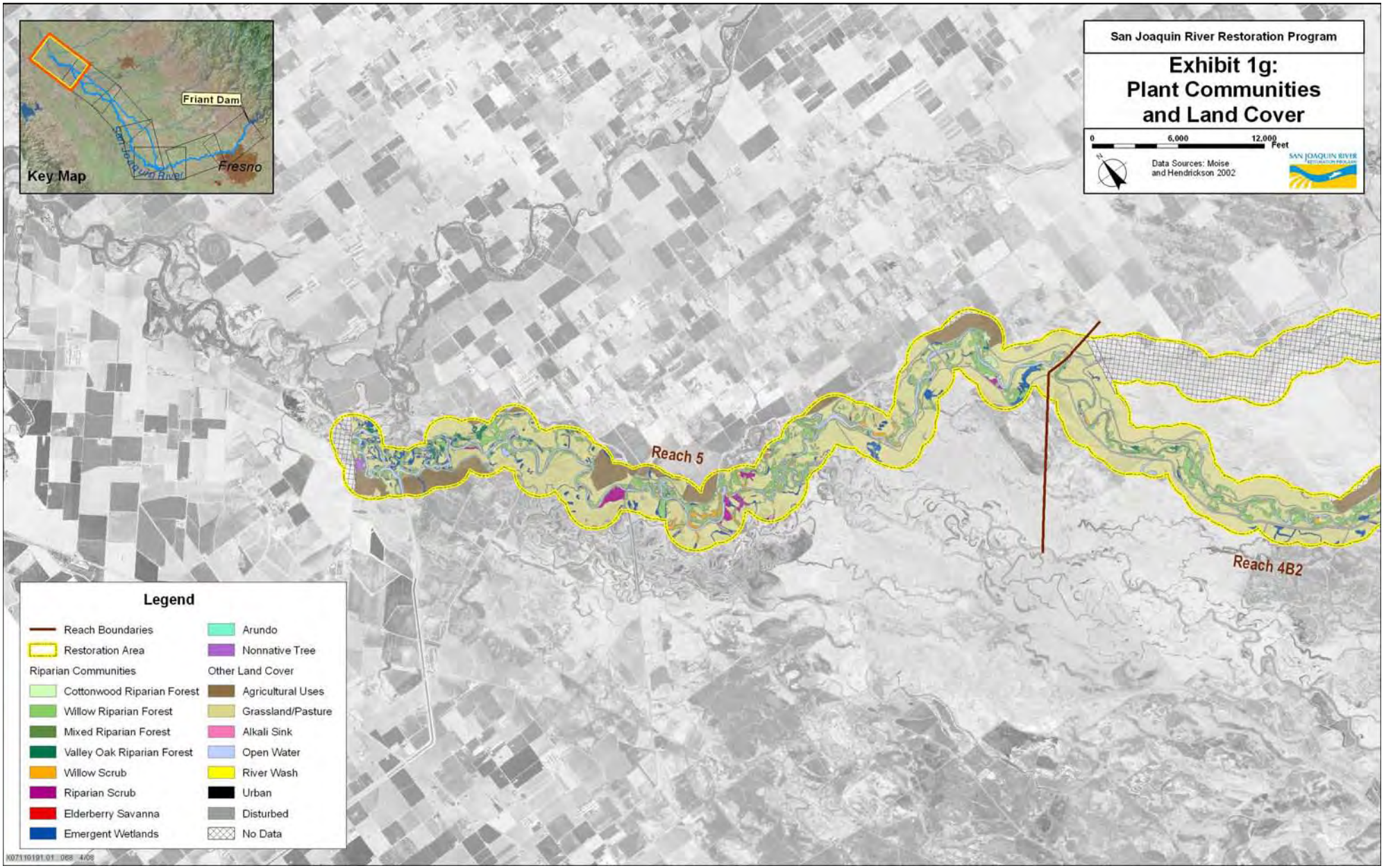
12,000
Feet
Data Sources: Moise
and Hendrickson 2002


Reach 3
Reach 2B
Reach 2A
Friant Dam
Fresno
Key Map
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data
San Joaquin River Restoration Program
Exhibit 1c:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
N
Data Sources: Moise
and Hendrickson 2002


Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data
Reach 3
Friant Dam
Fresno
Key Map
San Joaquin River Restoration Program
Exhibit 1d:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
Data Sources: Moise
and Hendrickson 2002


San Joaquin River Restoration Program
Exhibit 1e:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
Data Sources: Moise
and Hendrickson 2002
Key Map
Friant Dam
San Joaquin River
Fresno
Reach 4B1
Reach 4A
Reach 3
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data


Key Map
Friant Dam
San Joaquin River
Fresno
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data
Reach 4B2
Reach 4B1
San Joaquin River Restoration Program
Exhibit 1f:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
N
Data Sources: Moise
and Hendrickson 2002
SAN JOAQUIN RIVER


San Joaquin River Restoration Program
Exhibit 1g:
Plant Communities
and Land Cover
0
6,000
12,000
Feet
Data Sources: Moise
and Hendrickson 2002
Key Map
Friant Dam
San Joaquin River
Fresno
Reach 5
Reach 4B2
Legend
Reach Boundaries
Restoration Area
Riparian Communities
Cottonwood Riparian Forest
Willow Riparian Forest
Mixed Riparian Forest
Valley Oak Riparian Forest
Willow Scrub
Riparian Scrub
Elderberry Savanna
Emergent Wetlands
Arundo
Nonnative Tree
Other Land Cover
Agricultural Uses
Grassland/Pasture
Alkali Sink
Open Water
River Wash
Urban
Disturbed
No Data

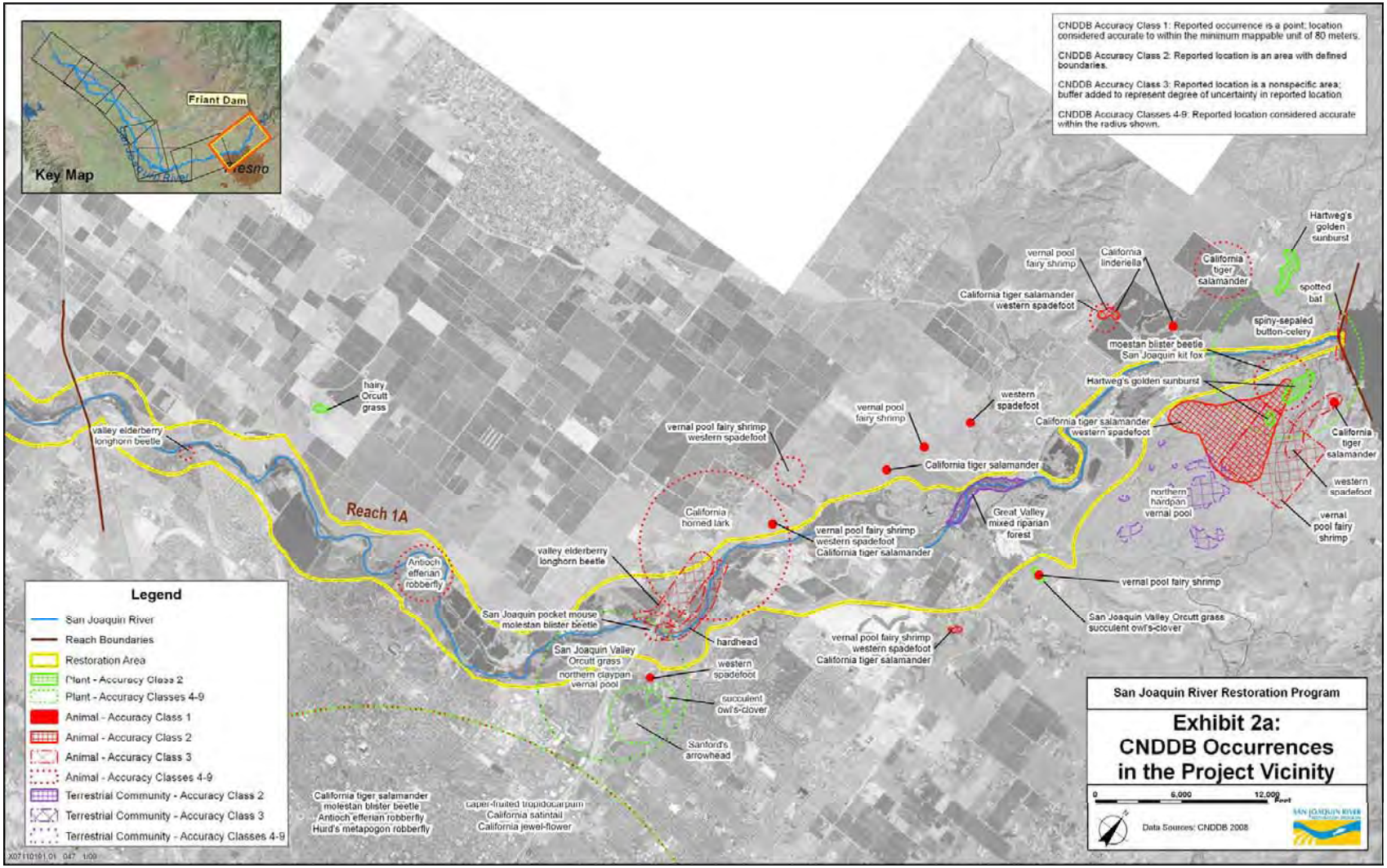
Exhibit

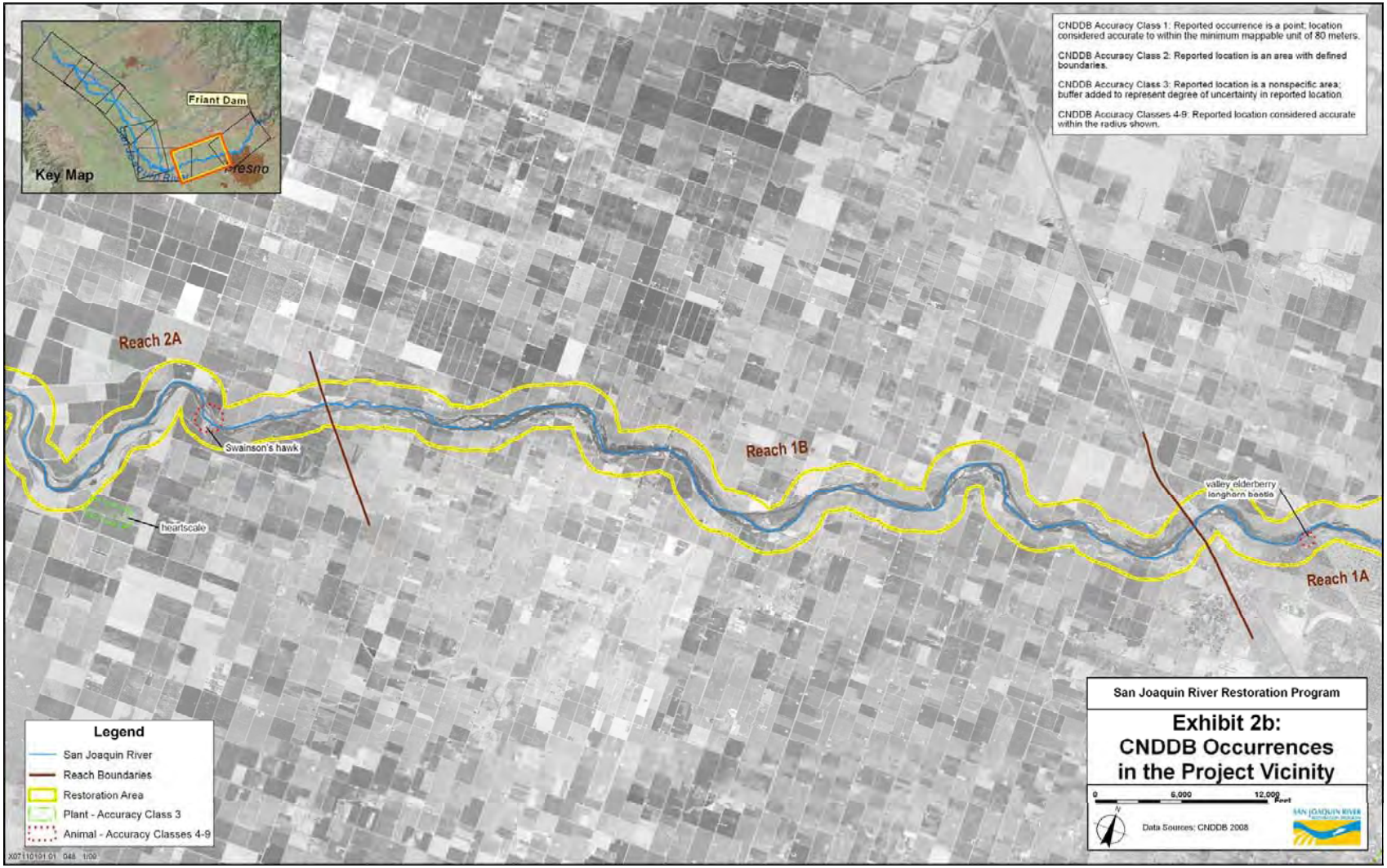
CNDDB Occurrences in the Project Vicinity

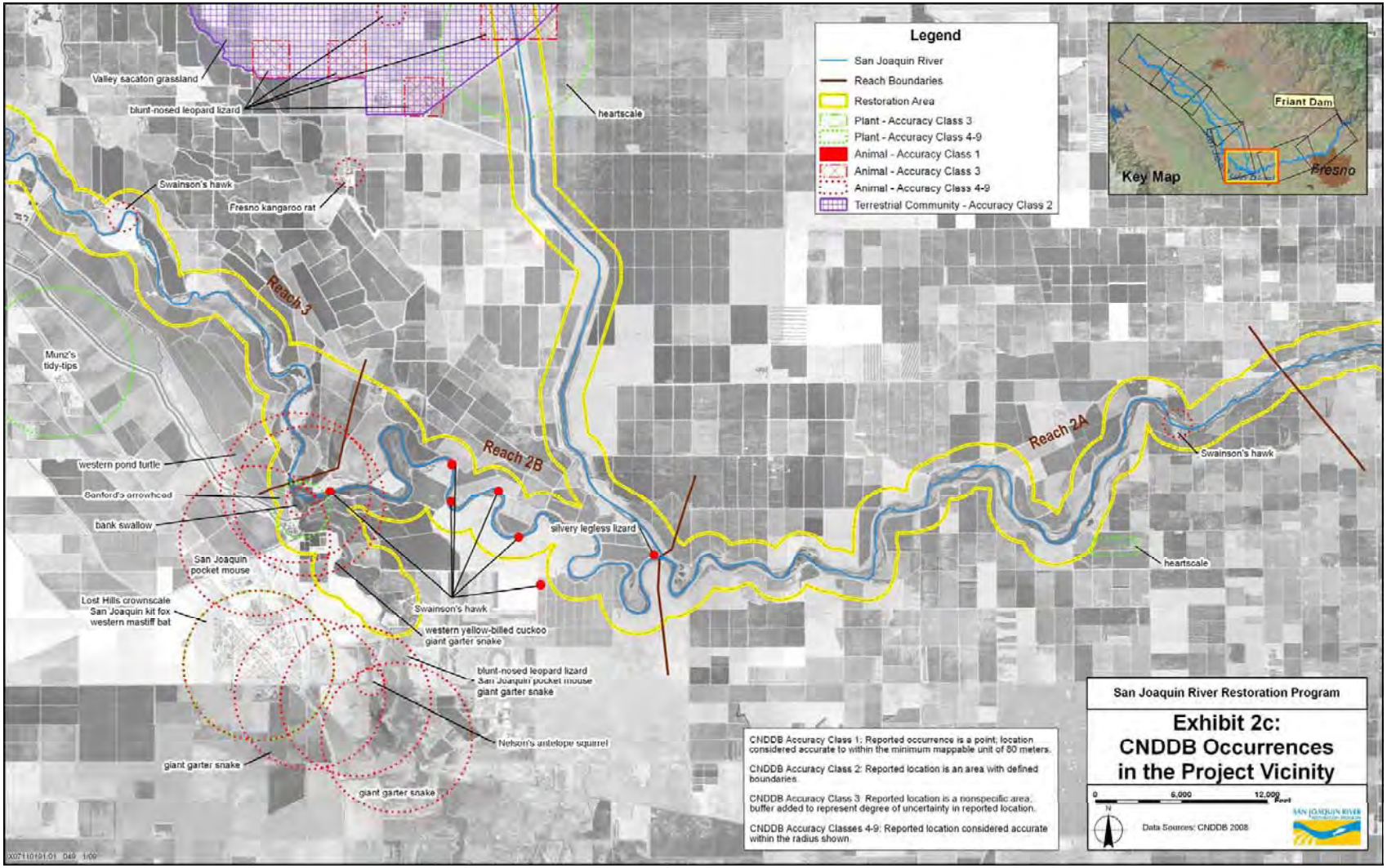
Biological Resources Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011


Key Map
Friant Dam
Fresno
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 2
Plant - Accuracy Classes 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 2
Animal - Accuracy Class 3
Animal - Accuracy Classes 4-9
Terrestrial Community - Accuracy Class 2
Terrestrial Community - Accuracy Class 3
Terrestrial Community - Accuracy Classes 4-9
Reach 1A
hairy Orcutt grass
valley elderberry longhorn beetle
Antioch efferian robberfly
San Joaquin pocket mouse
molestan blister beetle
San Joaquin Valley Orcutt grass
northern claypan vernal pool
hardhead
western spadefoot
succulent owl's-clover
Sanford's arrowhead
California tiger salamander
molestan blister beetle
Antioch efferian robberfly
Hurd's metapogon robberfly
caper-fruited tropidocarpum
California satintail
California jewel-flower
California horned lark
vernal pool fairy shrimp
western spadefoot
California tiger salamander
vernal pool fairy shrimp
Great Valley mixed riparian forest
northern hardpan vernal pool
vernal pool fairy shrimp
San Joaquin Valley Orcutt grass
succulent owl's-clover
vernal pool fairy shrimp
western spadefoot
California tiger salamander
vernal pool fairy shrimp
California linderiella
California tiger salamander
western spadefoot
Hartweg's golden sunburst
spotted bat
spiny-sepaled button-celery
molestan blister beetle
San Joaquin kit fox
Hartweg's golden sunburst
western spadefoot
California tiger salamander
western spadefoot
California tiger salamander
western spadefoot
vernal pool fairy shrimp
San Joaquin River Restoration Program
Exhibit 2a:
CNDDB Occurrences in the Project Vicinity
0
6,000
12,000
Feet
Data Sources: CNDDB 2008


Key Map
Friant Dam
Fresno
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
Reach 2A
Reach 1B
Reach 1A
Swainson's hawk
heartscale
valley elderberry longhorn beetle
Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 3
Animal - Accuracy Classes 4-9
San Joaquin River Restoration Program
Exhibit 2b:
CNDDB Occurrences
in the Project Vicinity
0
6,000
12,000
Feet
N
Data Sources: CNDDB 2008


Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 3
Plant - Accuracy Class 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 3
Animal - Accuracy Class 4-9
Terrestrial Community - Accuracy Class 2
Key Map
Friant Dam
Fresno
Valley sacaton grassland
blunt-nosed leopard lizard
heartscale
Swainson's hawk
Fresno kangaroo rat
Reach 3
Munz's tidy-tips
Reach 2B
Reach 2A
western pond turtle
Swainson's hawk
bank swallow
silvery legless lizard
heartscale
San Joaquin pocket mouse
Lost Hills crownscale
San Joaquin kit fox
western mastiff bat
Swainson's hawk
western yellow-billed cuckoo
giant garter snake
blunt-nosed leopard lizard
San Joaquin pocket mouse
giant garter snake
Nelson's antelope squirrel
giant garter snake
giant garter snake
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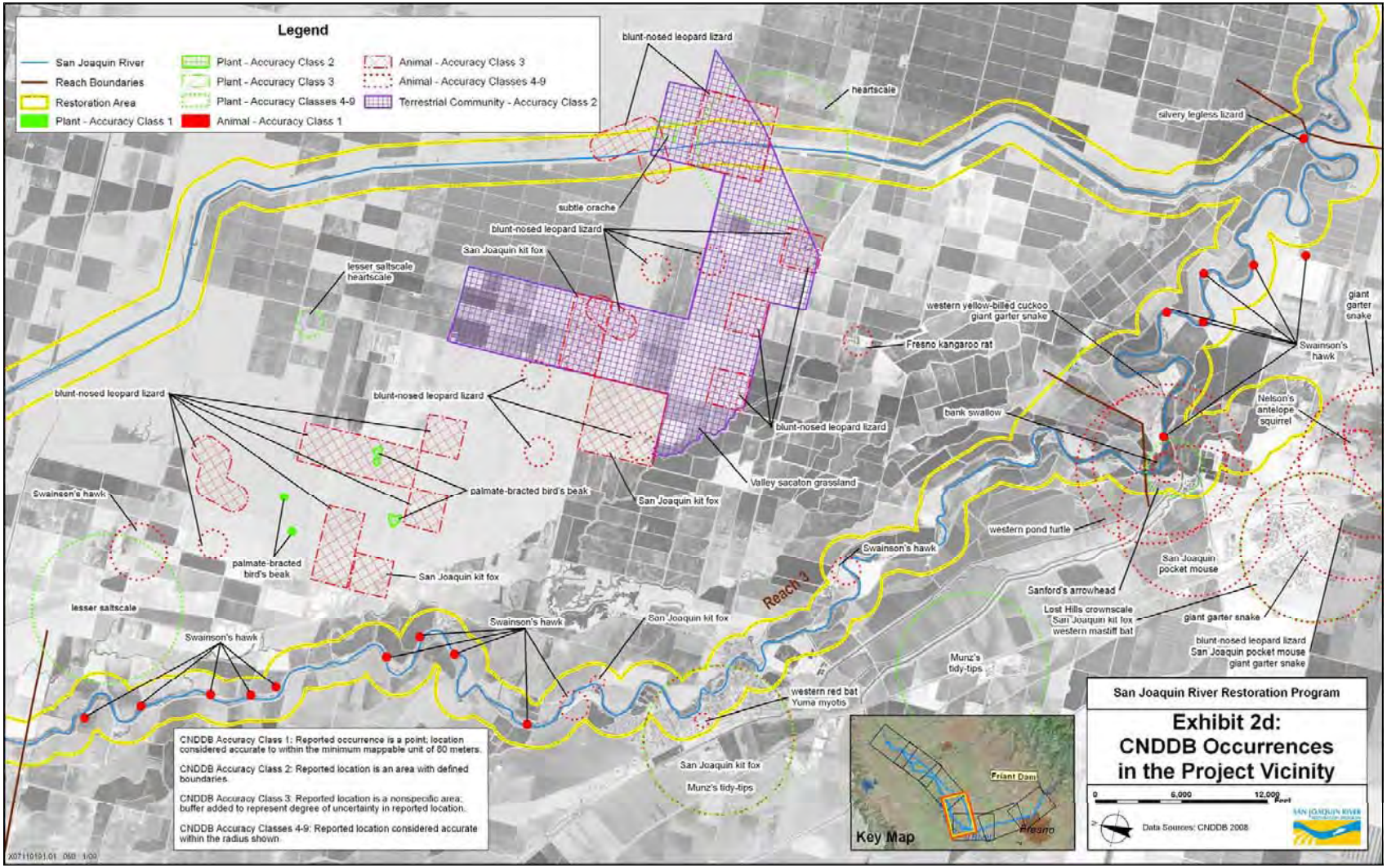
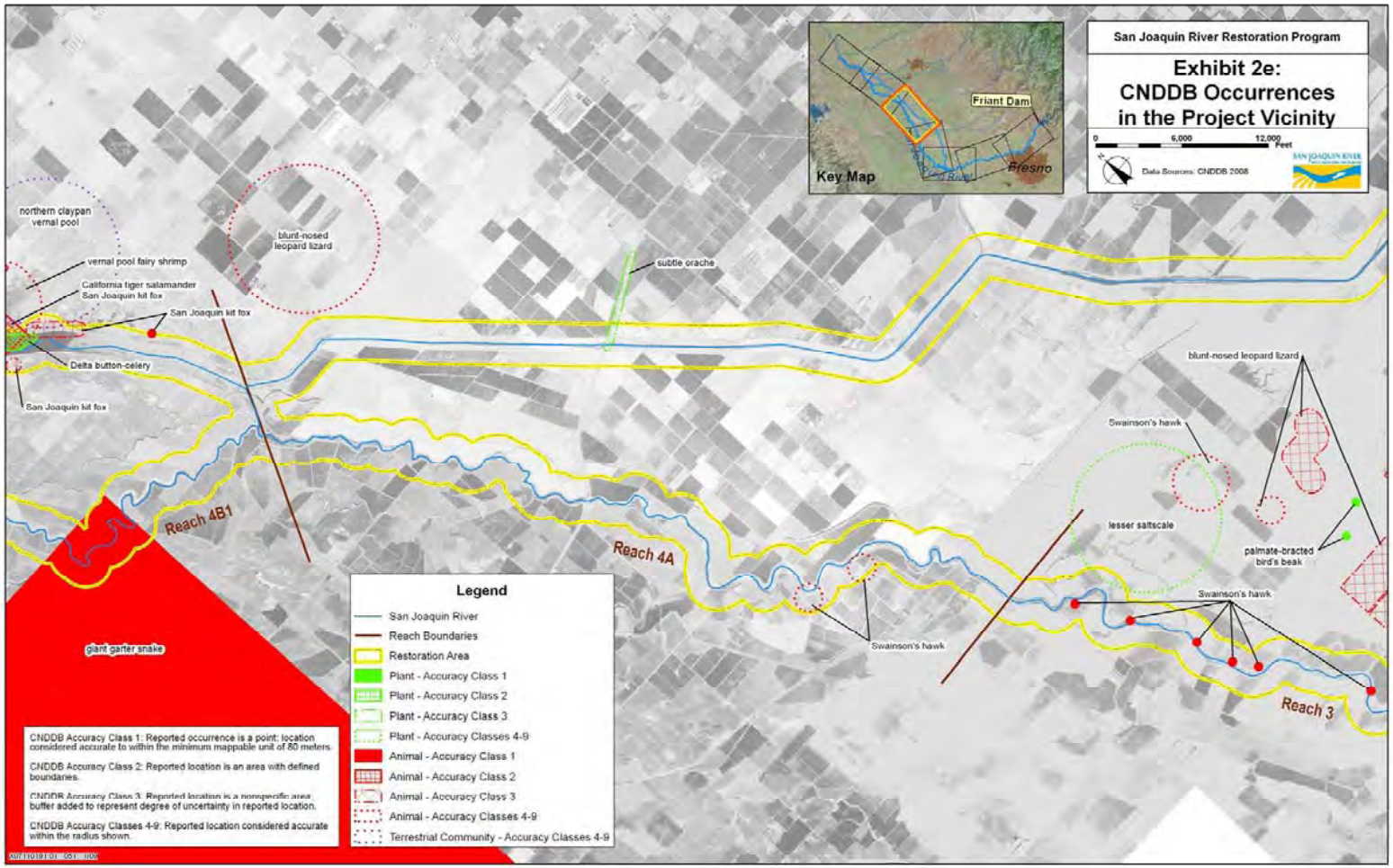
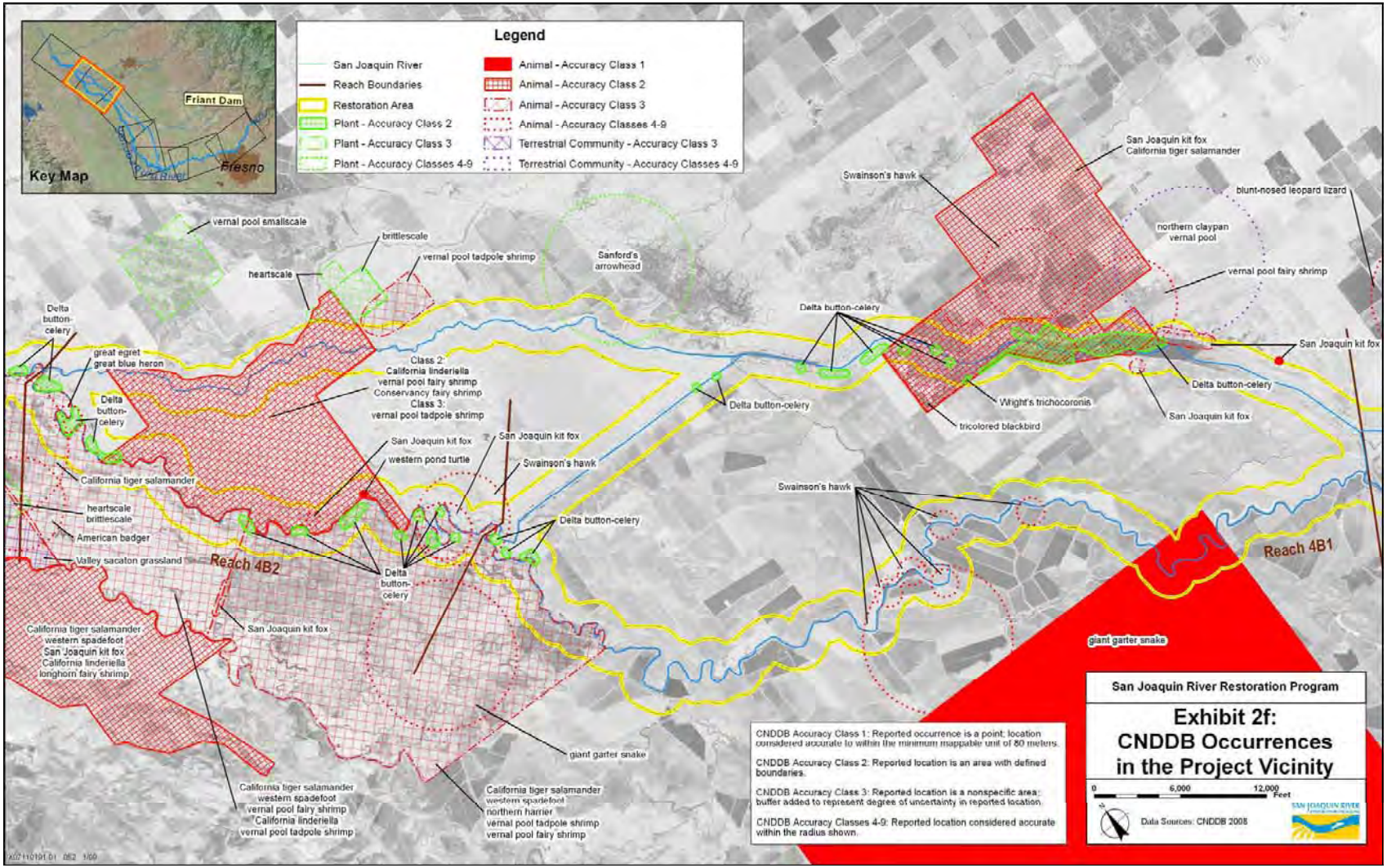
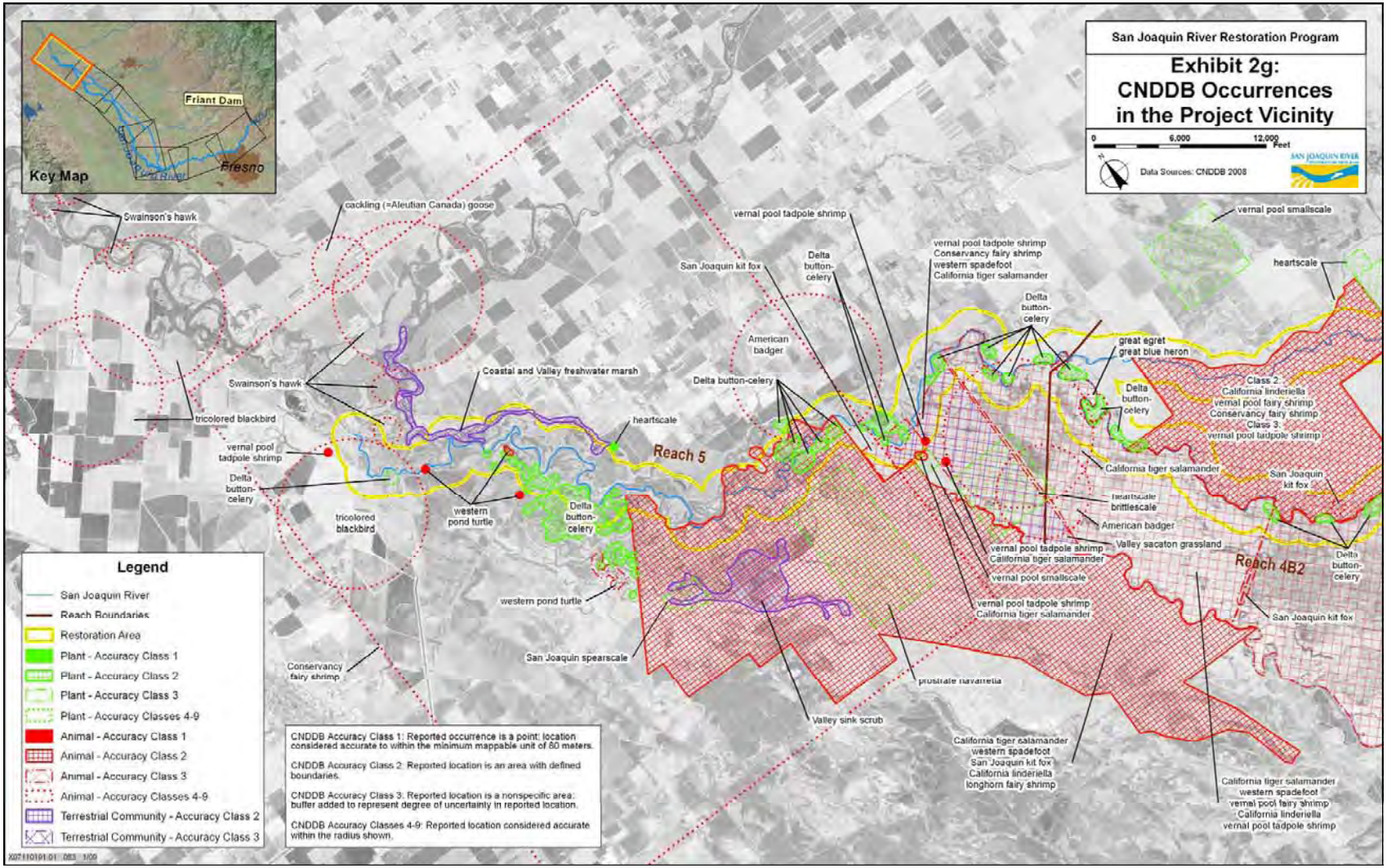
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
San Joaquin River Restoration Program
Exhibit 2c:
CNDDB Occurrences
in the Project Vicinity
0
6,000
12,000
Feet
N
Data Sources: CNDDB 2008


Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 1
Plant - Accuracy Class 2
Plant - Accuracy Class 3
Plant - Accuracy Classes 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 3
Animal - Accuracy Classes 4-9
Terrestrial Community - Accuracy Class 2
blunt-nosed leopard lizard
heartscale
silvery legless lizard
subtle orache
blunt-nosed leopard lizard
San Joaquin kit fox
lesser saltscale
heartscale
western yellow-billed cuckoo
giant garter snake
giant garter snake
Fresno kangaroo rat
Swainson's hawk
blunt-nosed leopard lizard
blunt-nosed leopard lizard
bank swallow
Nelson's antelope squirrel
blunt-nosed leopard lizard
Valley sacaton grassland
palmate-bracted bird's beak
San Joaquin kit fox
Swainson's hawk
western pond turtle
palmate-bracted bird's beak
San Joaquin kit fox
Swainson's hawk
San Joaquin pocket mouse
Reach 3
Sanford's arrowhead
lesser saltscale
Lost Hills crownscale
San Joaquin kit fox
western mastiff bat
giant garter snake
Swainson's hawk
Swainson's hawk
San Joaquin kit fox
blunt-nosed leopard lizard
San Joaquin pocket mouse
giant garter snake
Munz's tidy-tips
western red bat
Yuma myotis
San Joaquin kit fox
Munz's tidy-tips
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
Friant Dam
Fresno
Key Map
San Joaquin River Restoration Program
Exhibit 2d:
CNDDB Occurrences
in the Project Vicinity
0
6,000
12,000
Feet
Data Sources: CNDDB 2008


San Joaquin River Restoration Program
Exhibit 2e:
CNDDB Occurrences
in the Project Vicinity
0
6,000
12,000
Feet
Data Sources: CNDDB 2008
Key Map
Friant Dam
Fresno
northern claypan vernal pool
vernal pool fairy shrimp
California tiger salamander
San Joaquin kit fox
blunt-nosed leopard lizard
San Joaquin kit fox
Delta button-celery
San Joaquin kit fox
subtle orache
blunt-nosed leopard lizard
Swainson's hawk
lesser saltscale
palmate-bracted bird's beak
Swainson's hawk
Swainson's hawk
giant garter snake
Reach 4B1
Reach 4A
Reach 3
Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 1
Plant - Accuracy Class 2
Plant - Accuracy Class 3
Plant - Accuracy Classes 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 2
Animal - Accuracy Class 3
Animal - Accuracy Classes 4-9
Terrestrial Community - Accuracy Classes 4-9
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.


Key Map
Friant Dam
Fresno
Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 2
Plant - Accuracy Class 3
Plant - Accuracy Classes 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 2
Animal - Accuracy Class 3
Animal - Accuracy Classes 4-9
Terrestrial Community - Accuracy Class 3
Terrestrial Community - Accuracy Classes 4-9
vernal pool smallscale
brittlescale
vernal pool tadpole shrimp
heartscale
Sanford's arrowhead
Delta button-celery
great egret
great blue heron
Class 2:
California linderiella
vernal pool fairy shrimp
Conservancy fairy shrimp
Class 3:
vernal pool tadpole shrimp
San Joaquin kit fox
western pond turtle
Swainson's hawk
California tiger salamander
heartscale
brittlescale
American badger
Valley sacaton grassland
Reach 4B2
California tiger salamander
western spadefoot
San Joaquin kit fox
California linderiella
longhorn fairy shrimp
giant garter snake
California tiger salamander
western spadefoot
vernal pool fairy shrimp
California linderiella
vernal pool tadpole shrimp
California tiger salamander
western spadefoot
northern harrier
vernal pool tadpole shrimp
vernal pool fairy shrimp
Swainson's hawk
San Joaquin kit fox
California tiger salamander
blunt-nosed leopard lizard
northern claypan vernal pool
vernal pool fairy shrimp
Delta button-celery
San Joaquin kit fox
Delta button-celery
Wright's trichocoronis
tricolored blackbird
San Joaquin kit fox
Swainson's hawk
Reach 4B1
giant garter snake
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
San Joaquin River Restoration Program
Exhibit 2f:
CNDDB Occurrences in the Project Vicinity
0
6,000
12,000
Feet
Data Sources: CNDDB 2008
SAN JOAQUIN RIVER


San Joaquin River Restoration Program
Exhibit 2g:
CNDDB Occurrences
in the Project Vicinity
0
6,000
12,000
Feet
Data Sources: CNDDB 2008
Key Map
Friant Dam
Fresno
Legend
San Joaquin River
Reach Boundaries
Restoration Area
Plant - Accuracy Class 1
Plant - Accuracy Class 2
Plant - Accuracy Class 3
Plant - Accuracy Classes 4-9
Animal - Accuracy Class 1
Animal - Accuracy Class 2
Animal - Accuracy Class 3
Animal - Accuracy Classes 4-9
Terrestrial Community - Accuracy Class 2
Terrestrial Community - Accuracy Class 3
CNDDB Accuracy Class 1: Reported occurrence is a point; location considered accurate to within the minimum mappable unit of 80 meters.
CNDDB Accuracy Class 2: Reported location is an area with defined boundaries.
CNDDB Accuracy Class 3: Reported location is a nonspecific area; buffer added to represent degree of uncertainty in reported location.
CNDDB Accuracy Classes 4-9: Reported location considered accurate within the radius shown.
Swainson's hawk
cackling (=Aleutian Canada) goose
vernal pool tadpole shrimp
vernal pool smallscale
San Joaquin kit fox
Delta button-celery
vernal pool tadpole shrimp
Conservancy fairy shrimp
western spadefoot
California tiger salamander
heartscale
Delta button-celery
American badger
great egret
great blue heron
Coastal and Valley freshwater marsh
Swainson's hawk
Delta button-celery
Delta button-celery
Class 2:
California linderiella
vernal pool fairy shrimp
Conservancy fairy shrimp
Class 3:
vernal pool tadpole shrimp
tricolored blackbird
heartscale
Reach 5
vernal pool tadpole shrimp
Delta button-celery
California tiger salamander
San Joaquin kit fox
western pond turtle
Delta button-celery
heartscale
brittlescale
tricolored blackbird
American badger
Valley sacaton grassland
vernal pool tadpole shrimp
California tiger salamander
vernal pool smallscale
Reach 4B2
Delta button-celery
western pond turtle
vernal pool tadpole shrimp
California tiger salamander
San Joaquin kit fox
San Joaquin spearscale
Conservancy fairy shrimp
prostrate navarretia
Valley sink scrub
California tiger salamander
western spadefoot
San Joaquin kit fox
California linderiella
longhorn fairy shrimp
California tiger salamander
western spadefoot
vernal pool fairy shrimp
California linderiella
vernal pool tadpole shrimp

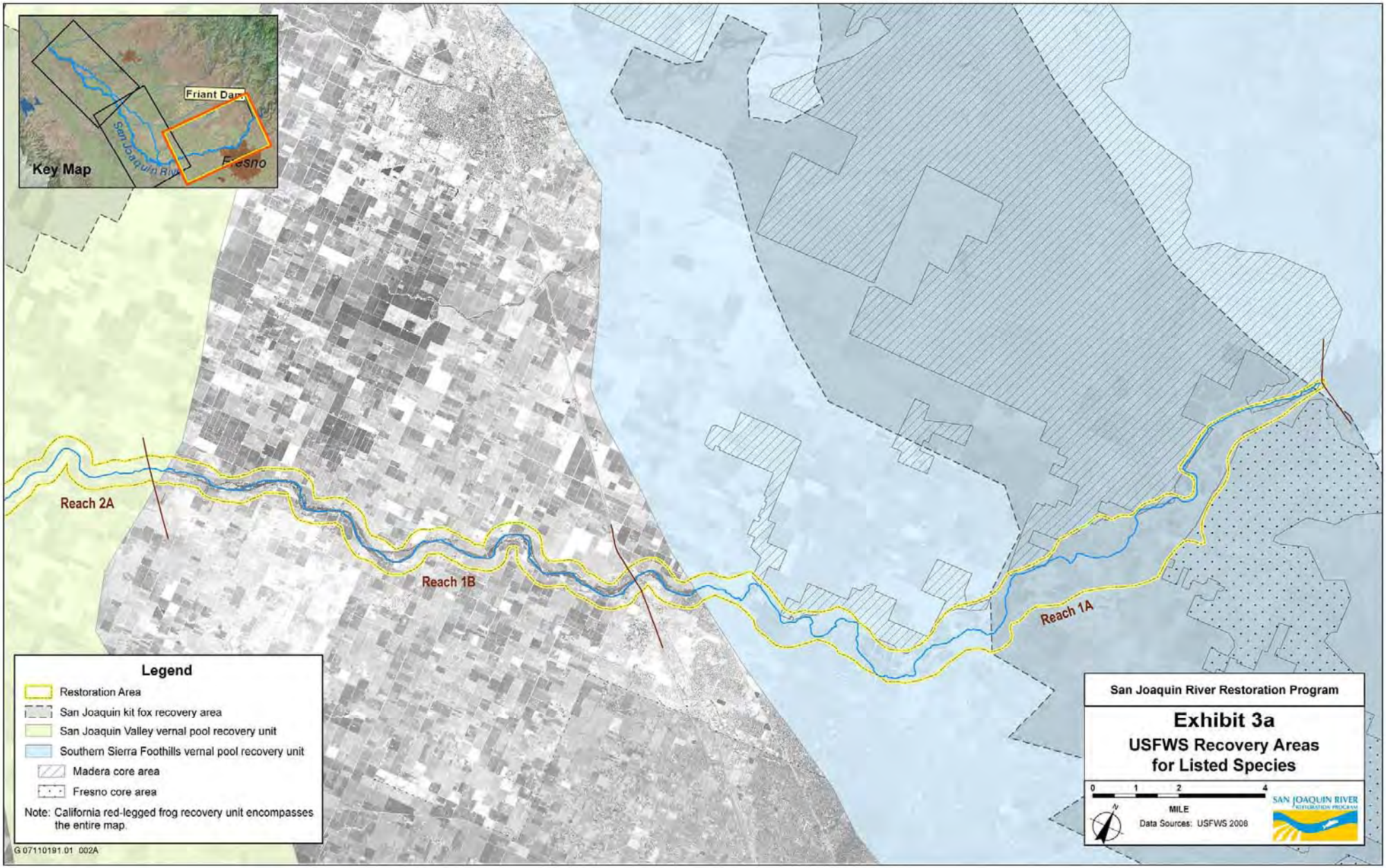
Exhibit

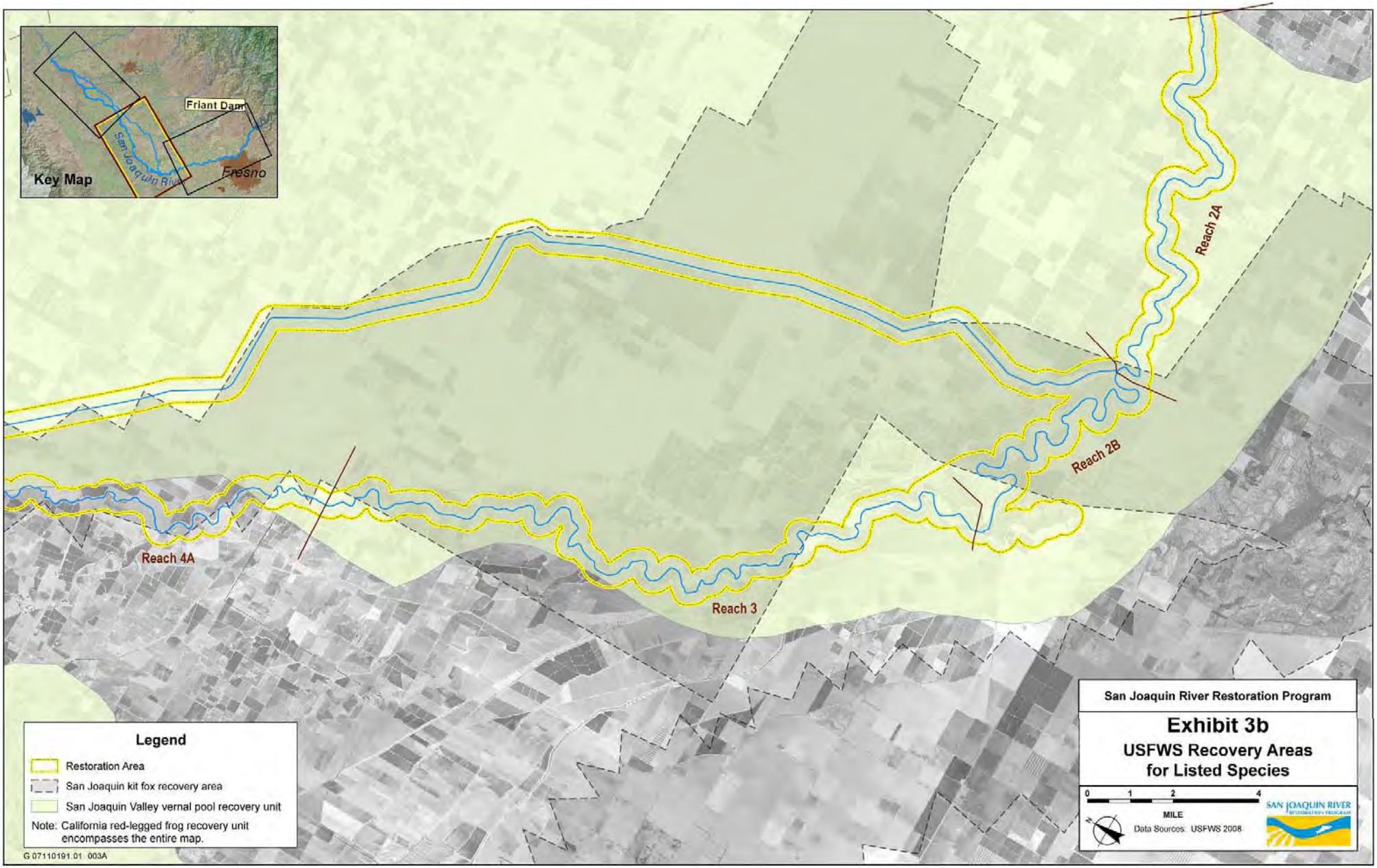
USFWS Recovery Areas for Listed Species

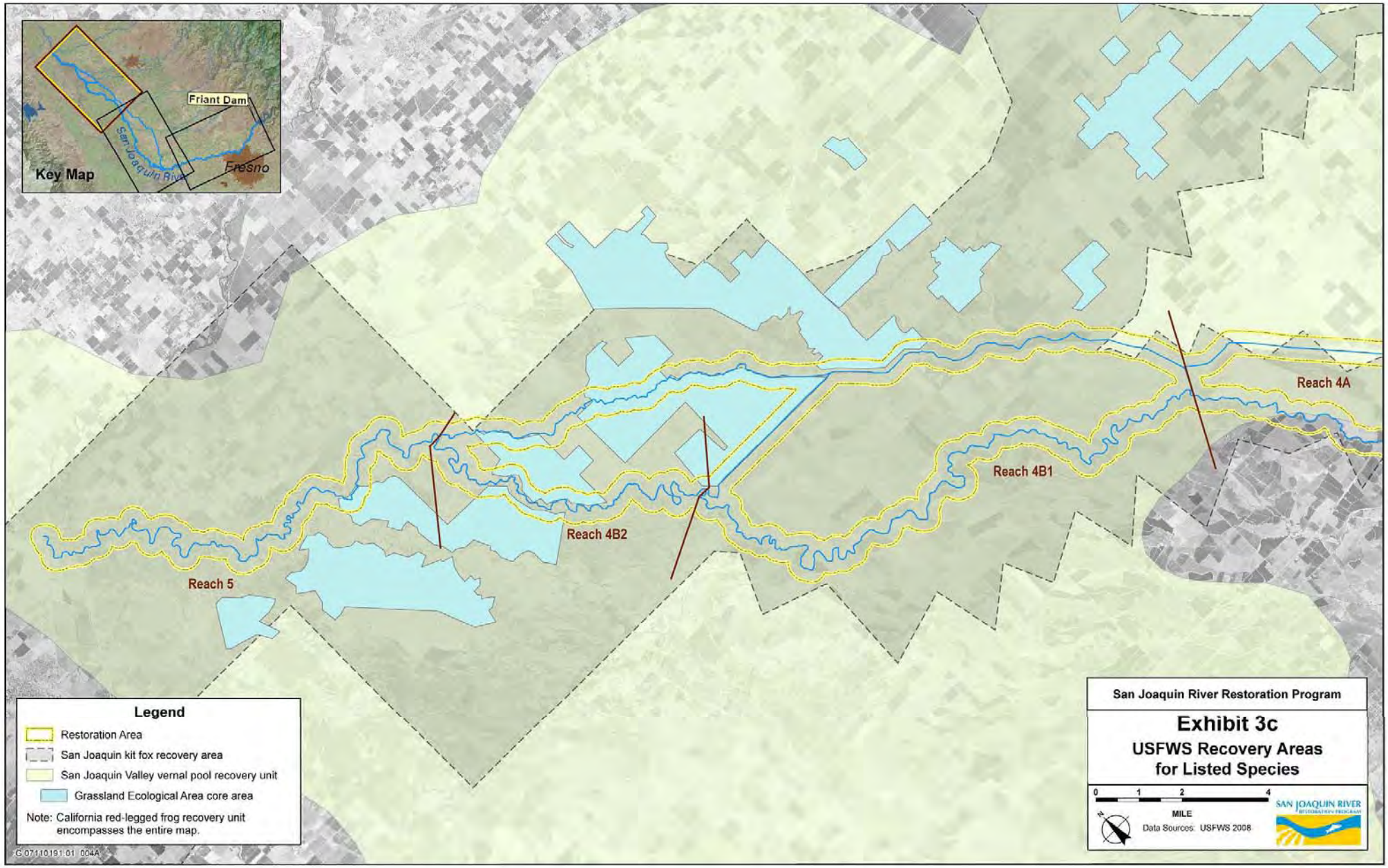
Biological Resources Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 1B
Reach 1A
Legend
Restoration Area
San Joaquin kit fox recovery area
San Joaquin Valley vernal pool recovery unit
Southern Sierra Foothills vernal pool recovery unit
Madera core area
Fresno core area
Note: California red-legged frog recovery unit encompasses the entire map.
G 07110191.01 002A
San Joaquin River Restoration Program
Exhibit 3a
USFWS Recovery Areas for Listed Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 2B
Reach 3
Reach 4A
Legend
Restoration Area
San Joaquin kit fox recovery area
San Joaquin Valley vernal pool recovery unit
Note: California red-legged frog recovery unit encompasses the entire map.
G 07110191.01 003A
San Joaquin River Restoration Program
Exhibit 3b
USFWS Recovery Areas for Listed Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 4A
Reach 4B1
Reach 4B2
Reach 5
Legend
Restoration Area
San Joaquin kit fox recovery area
San Joaquin Valley vernal pool recovery unit
Grassland Ecological Area core area
Note: California red-legged frog recovery unit encompasses the entire map.
G 07110191 01 004A
San Joaquin River Restoration Program
Exhibit 3c
USFWS Recovery Areas for Listed Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER

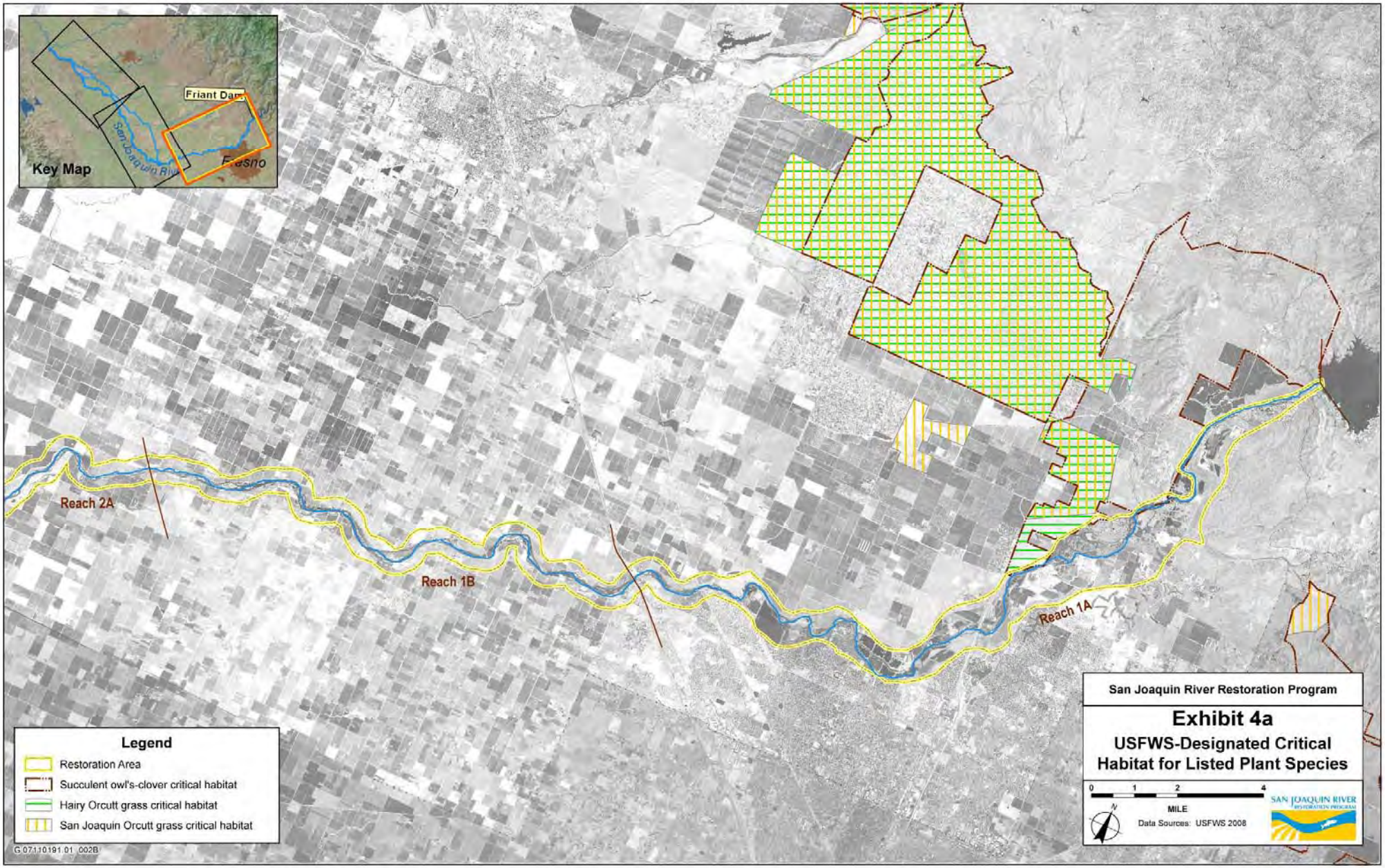
Exhibit

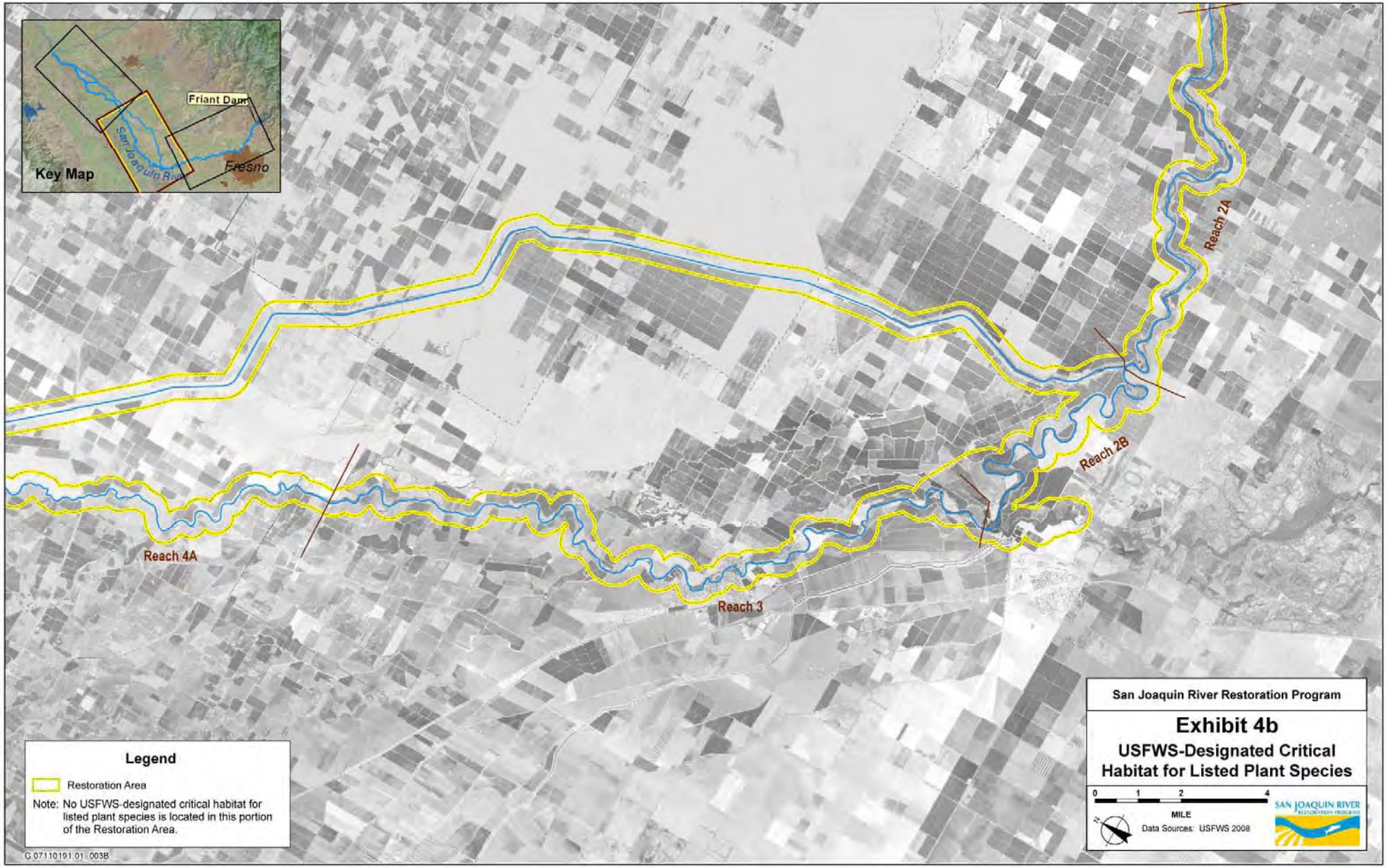
USFWS-Designated Critical Habitat for Listed Plant Species

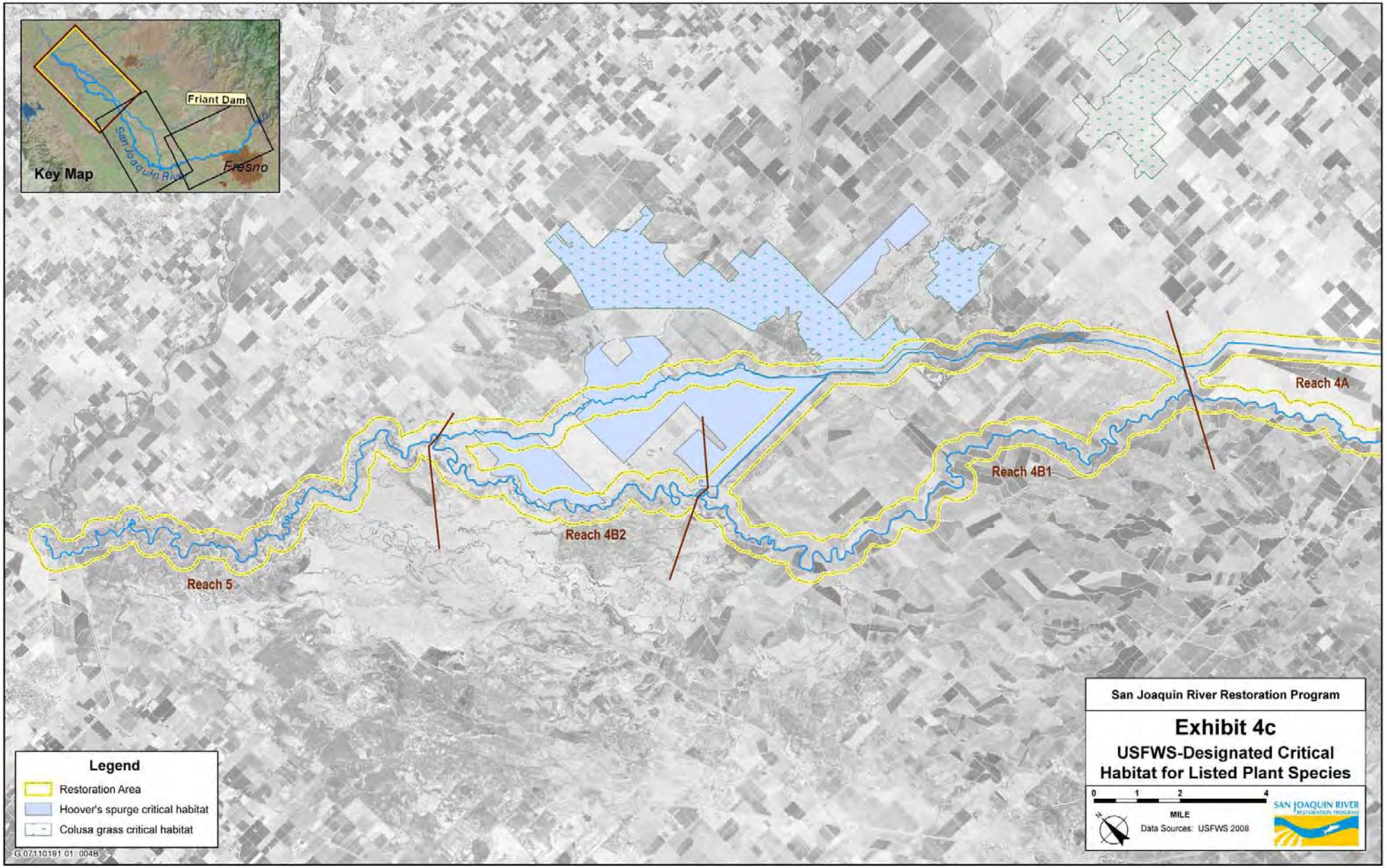
Biological Resources Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 1B
Reach 1A
Legend
Restoration Area
Succulent owl's-clover critical habitat
Hairy Orcutt grass critical habitat
San Joaquin Orcutt grass critical habitat
G 07110191.01 002B
San Joaquin River Restoration Program
Exhibit 4a
USFWS-Designated Critical Habitat for Listed Plant Species
0 1 2 4
MILE
N
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 2B
Reach 3
Reach 4A
Legend
Restoration Area
Note: No USFWS-designated critical habitat for listed plant species is located in this portion of the Restoration Area.
G 07110191.01 003B
San Joaquin River Restoration Program
Exhibit 4b
USFWS-Designated Critical Habitat for Listed Plant Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 4A
Reach 4B1
Reach 4B2
Reach 5
Legend
Restoration Area
Hoover's spurge critical habitat
Colusa grass critical habitat
G:07110191 01 004B
San Joaquin River Restoration Program
Exhibit 4c
USFWS-Designated Critical Habitat for Listed Plant Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM

Exhibit

USFWS-Designated Critical Habitat for Listed Wildlife Species

Biological Resources Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

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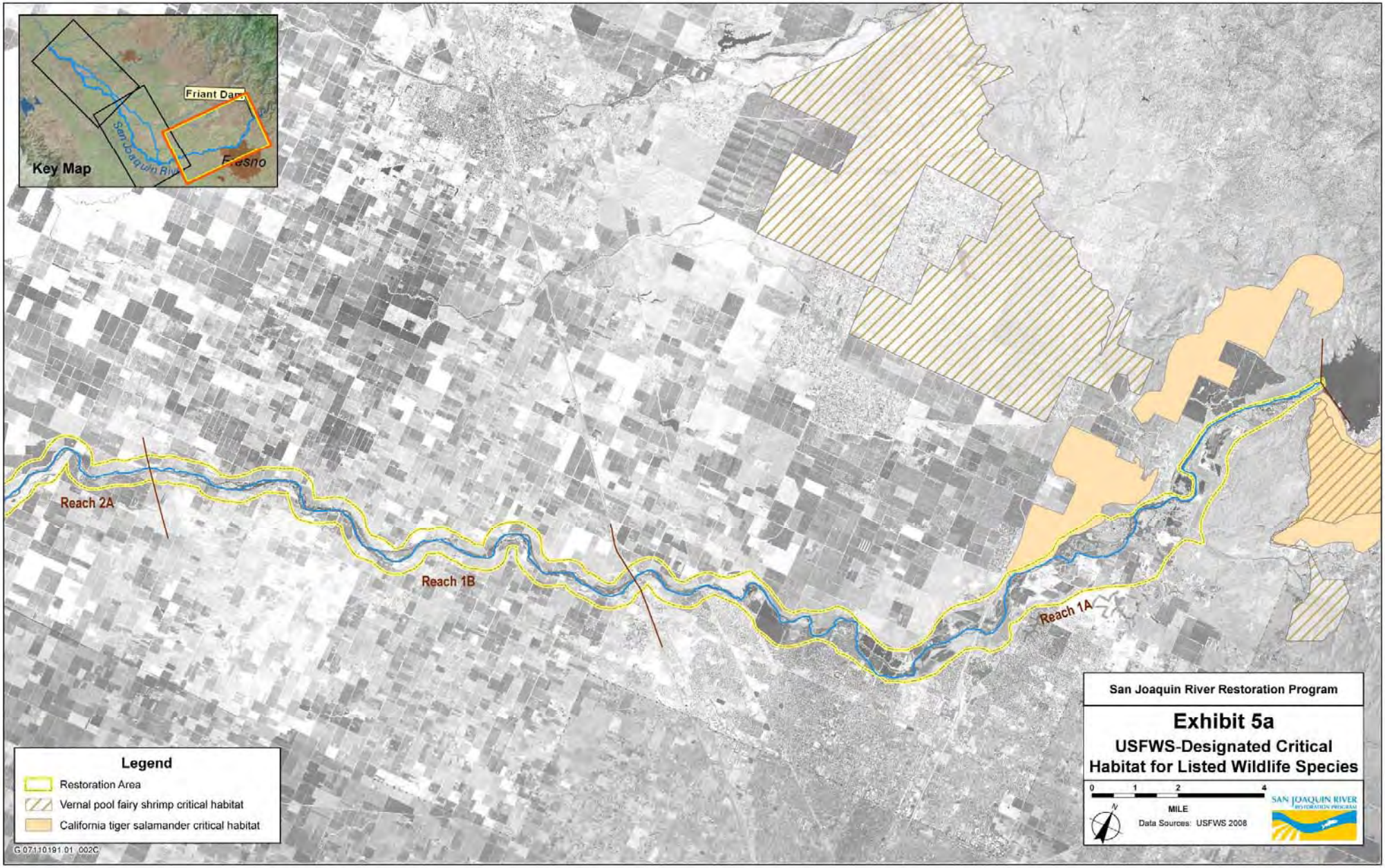
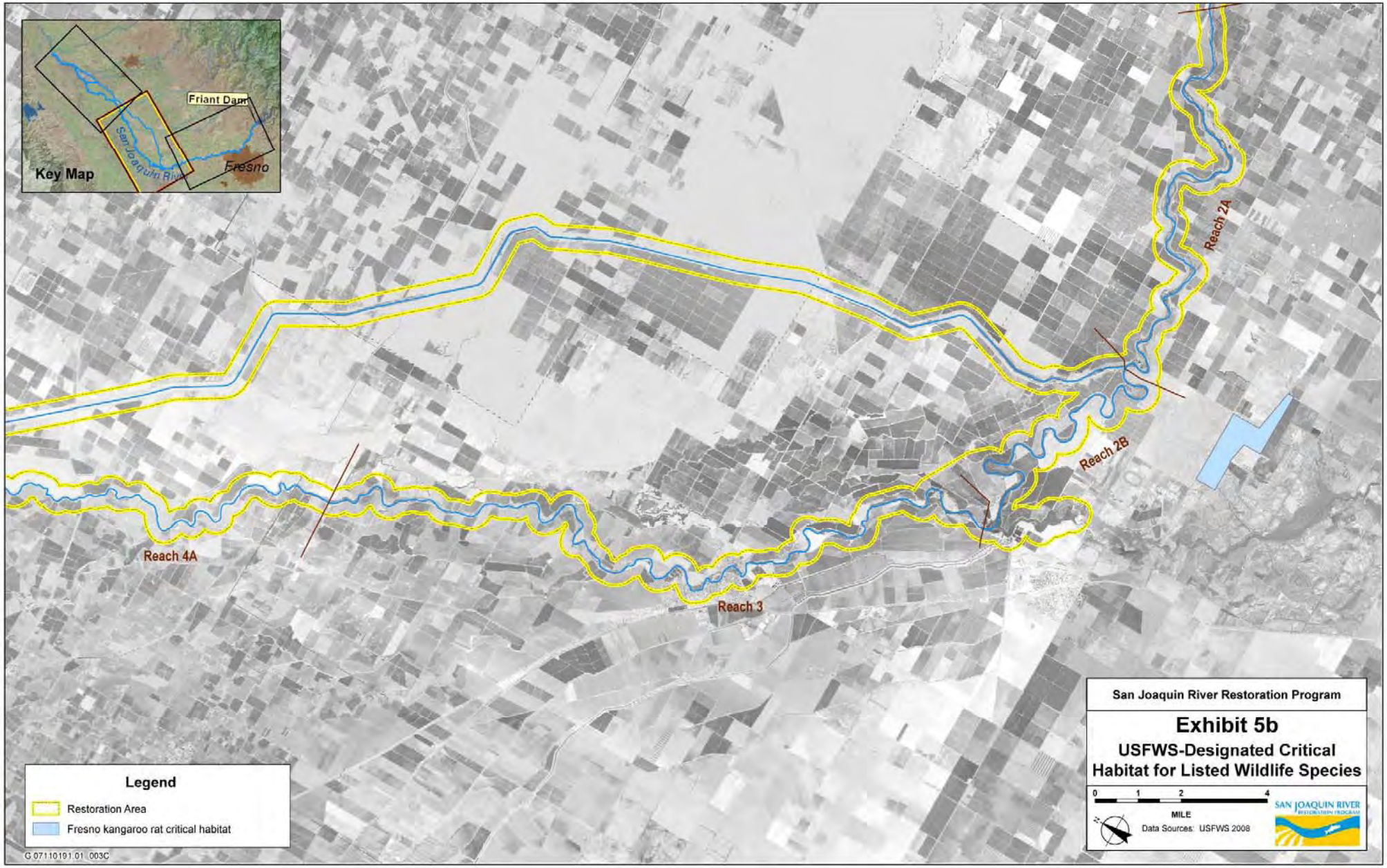
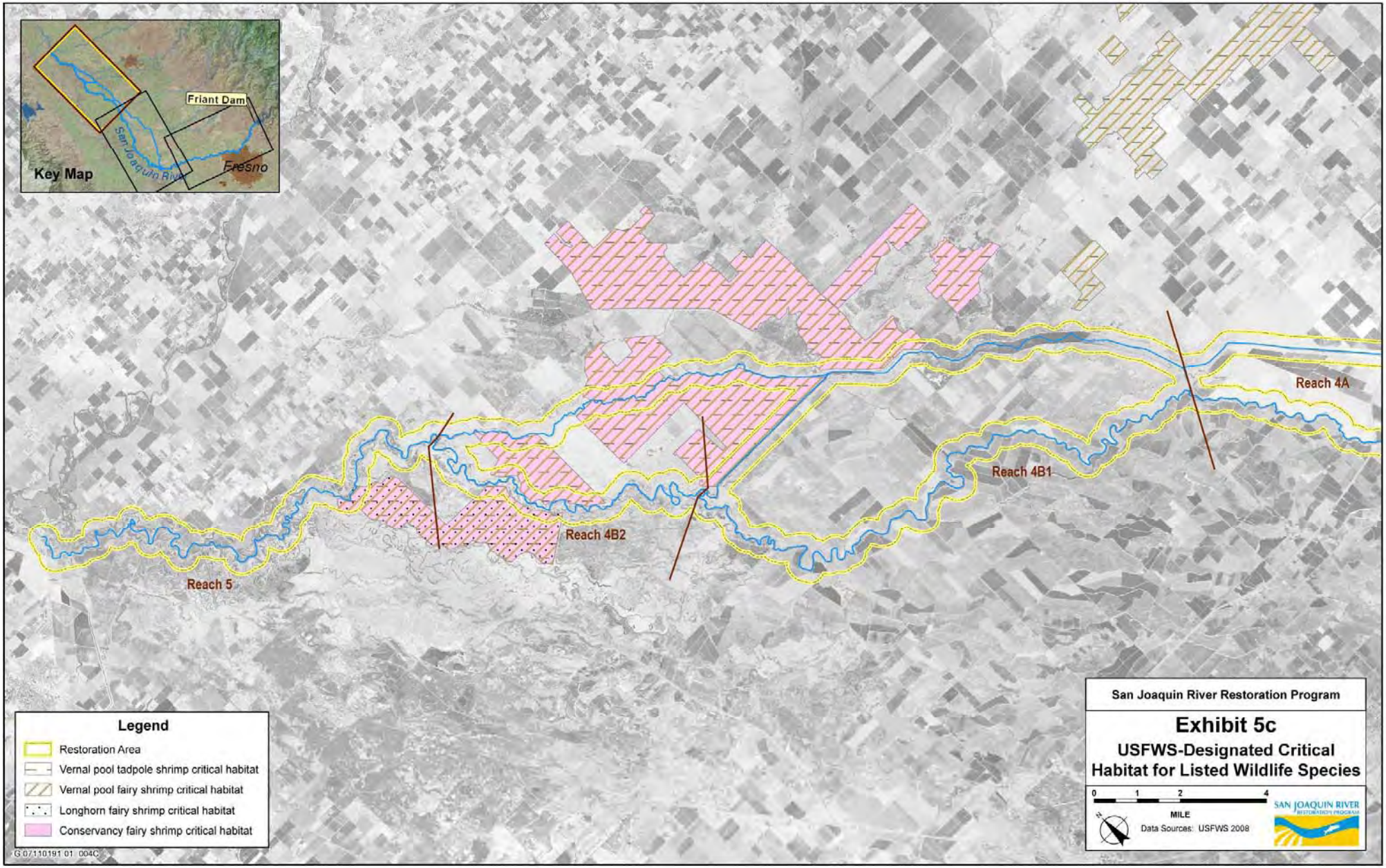

Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 1B
Reach 1A
Legend
Restoration Area
Vernal pool fairy shrimp critical habitat
California tiger salamander critical habitat
G 07110191.01 002C
San Joaquin River Restoration Program
Exhibit 5a
USFWS-Designated Critical Habitat for Listed Wildlife Species
0 1 2 4
MILE
N
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 2A
Reach 2B
Reach 3
Reach 4A
Legend
Restoration Area
Fresno kangaroo rat critical habitat
G 07110191.01 003C
San Joaquin River Restoration Program
Exhibit 5b
USFWS-Designated Critical Habitat for Listed Wildlife Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM


Key Map
Friant Dam
San Joaquin River
Fresno
Reach 4A
Reach 4B1
Reach 4B2
Reach 5
Legend
Restoration Area
Vernal pool tadpole shrimp critical habitat
Vernal pool fairy shrimp critical habitat
Longhorn fairy shrimp critical habitat
Conservancy fairy shrimp critical habitat
G:07/110191 01 004C
San Joaquin River Restoration Program
Exhibit 5c
USFWS-Designated Critical Habitat for Listed Wildlife Species
0 1 2 4
MILE
Data Sources: USFWS 2008
SAN JOAQUIN RIVER RESTORATION PROGRAM