Appendix 12C

2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report

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EIR/EIS Environmental Data Report

December 2011

Lead Agencies:

California Department of Water Resources
Bureau of Reclamation
National Marine Fisheries Service
U.S. Fish and Wildlife Service

Errata Report

Date: May 30, 2012

2009–2011 BDCP EIR/EIS Environmental Data Report, December 2011 Final Version

While reviewing the BDCP EIR/S Resource Chapters, DWR biologists found errors in the document regarding environmental surveys that came from the December 2011 Final 2009-2011 Environmental Data Report (EDR). Below is a summary of major and minor corrections needed to the EDR that may be relevant to the analyses in the BDCP EIR/S.

Overall:

- Because Table 1.4-1 on page 1-4 is a report of the 2009 environmental surveys, the columns for 2010 and 2011 should have been removed.
- Under 2009 Biological Surveys in Section 2.1 General Species List page 2-3 line 7-8, range, distribution, and habitat associations was reviewed for all species listed under both the federal and California Endangered Species Act.

Avian:

- General comment regarding avian data report: Please use 2011 EDR discussion for analysis and interpretation of Avian survey results. The 2009 and 2010 sections should be considered interim survey reports, as they did not cover all parcels surveyed in all three years, and should not be used for interpretation of final survey results. The 2011 EDR was written to incorporate analysis of all three years of surveys, and may be used for this purpose.
- The section 2.8.9.2.1 Song Sparrow, Tricolored Blackbird, and Yellow-Headed Blackbird Survey Results (Pg 2-45, line 30-32) **incorrectly states that Tricolored Blackbird observations implies there are nest sites**. After analyzing three years of survey data, the Avian survey lead concluded that these observations of Tricolored Blackbirds did not represent nesting birds, as no nesting colonies were observed.
- Throughout avian portions of the 2009, 2010, and 2011 data reports in the section heading under "results and discussion", "limitations and future surveys" should be "discussion." The title "limitations…" does not adequately describe the analysis of survey results presented in these sections. The heading "discussion" was used in an earlier version submitted and should not have been removed.
- Throughout the document, bird names should be consistent with American Ornithologists' Union standards.
- The section 2.8 Birds (pg 2-36, lines 3-4) implies Sandhill Crane is the only species that overwinters within the CPA. Sandhill Crane is not the only species that overwinters within the CPA. Several other special-status species overwinter within the CPA, including Burrowing Owl, Tricolored Blackbird, California Black Rail, etc. This statement should be corrected to state that Sandhill Crane only overwinters within the CPA, and does not breed there.
- Also in section 2.8 (line 8-9), the mention of the Sandhill Crane survey goals are out of place in this general discussion of the avian survey effort. This information is already conveyed in the Sandhill Crane section (2.8.5.1).
- The section 2.8.6.2.1 Western Yellow-Billed Cuckoo and Yellow-Breasted Chat Survey Results (Pg 2-42, line 27-2) should omit mention of potential nesting data points and nest sites, since nesting could not be confirmed. The sentences following adequately discuss the potential for the species to nest in the Delta.

Vernal Pool Invertebrates:

- The Summary Table S.1-1 incorrectly states that vernal pool invertebrate surveys were not conducted in 2011. They were conducted, just not to protocol levels. Therefore there should be an "X" in the 2011 column of the summary table for vernal pool invertebrates. The table does not state types/extent of surveys, just that the resources were surveyed for.
- In Section 6.1 Introduction to 2011 Biological Surveys, the list on lines 9-15 should include vernal pool invertebrates as surveyed for, even though it was not protocol-level.

Plants:

- The summary in section S.2 Biological Surveys incorrectly states a total of 64 plants were identified as target species. Final number of target plant species was bumped to 65 with the addition of *Atriplex coronata* var. *vallicola* in 2010.
- The text in Section S.2.1 Plants would be better represented by: "Of the 64 plant species targeted for surveys in 2009, 15 species, including one species listed as Rare under the California Endangered Species Act—Mason's Lilaeopsis—were found. In 2010, during the course of conducting field surveys, a special-status species of Atriplex (A. coronata var. vallicola) was found and added to the target species list for a total of 65 target plant species. Three additional species, Alkali Milk-vetch, Little Mousetail and Lost Hills Crownscale, were found in 2010, and two more, Brittlescale and Hogwallow Starfish- were found in 2011. Many of the plant occurrences are new records, and some extend the ranges of the species beyond what has been previously reported. Table S.2-1 provides a complete list of the twenty target plant species that were found during the three year DHCCP survey effort."
- The summary in section S.2.2 Invertebrates identifies non-listed species found during 2011 surveys in lines 15–16, which seems unnecessary without explaining that the survey timing was not ideal and presence of these non-listed species indicates higher likelihood of finding listed species if surveys were conducted according to protocol.
- In Section 2.1 on page 2–3 line 16, Lost Hills Crownscale should not be discussed along with the 2009 survey results because the addition of the species to the target list wasn't made until 2010. Likewise, Lost Hills Crownscale should not be represented in Table 2.1-1 on page 2-4 because it was not added until 2010.
- In Table 2.1-1 on page 2–4, at the time of the compilation of the target plant list, the scientific name for round-leaved filaree had already been changed from *Erodium macrophyllum* to *California macrophylla*.
- The section 4.2.1.2 Plants Survey Description (pg 4-1, line 23) needs to add that based on subsequent discussions with the species experts, the identification of the *Atriplex coronata* variety found near Clifton Court Forebay is as yet unresolved.

Amphibians and Reptiles:

- In summary section S2.3, on page S4 line 5-7 states "In 2010, four CRF were identified at two sites in Contra Costa County, but no evidence of reproduction was found at these sites. Larvae were found again at the site where they had been identified in 2009, but they were not found at four newly surveyed sites." The second sentence would be better stated as "Larvae were, however, observed again at the same site they were found in 2009."
- In summary section S2.3, on page S4 line 7-8, CRF surveys were limited in 2011 due to access restrictions to newly available properties with suitable habitat within the species' presumed range.
- In Section 2.6.1.6, line 36-37 should state "sites that dried up before April, and thus likely did not remain inundated long enough for successful reproduction, were excluded from larval surveys in 2009." Currently it says that we excluded sites with bullfrogs, crayfish, and mosquitofish as well as short pond duration, but that's not correct. DWR survey leads did sample for CTS in a pond that had crayfish and mosquitofish in 2009.
- In Section 2.6.2.2, page 2-27 line 29 states that in 2009 "surveys suggested that CTS still occur" and would be better stated as "surveys demonstrated that CTS still occur" because larvae were found in a vernal pool in March that year.
- On Figure 2.7-2 on page 2-32, the green cross-hatched polygons should say "Giant Garter Snake Survey Section." This is the verbiage used in a subsequent table. The green cross-hatched polygons represent the different areas that were delineated in an attempt to obtain adequate spatial coverage. It does not represent suitable GGS habitat, which is what is implied by the current caption.
- In section 2.7.2.2 on line 35, the word "line" is missing and should read "GGS expert Eric Hansen began independently surveying one trap location 6 weeks after the trap line had been removed…"
- In section 4.5.2.1.1 on page 4-7, line 29 and throughout the rest of the document, for clarity Sierran Treefrogs and Southern California Toads should be referred to as Pacific Chorus Frogs and Western Toads, which is what they were called at the beginning of 2009 surveys and in Appendix 2.1A-2, even though the taxonomy changed.

- In section 6.5.2.2 on page 6-6, line 31 and in the rest of the document, “American Bullfrog” was referred to earlier in the document as “Bullfrog” and in Appendix 2.1A-2.

Appendix S.1A: 2008 and 2009 Decision Matrix – Special-status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

- In Table S.1A-1, Salt Marsh Harvest Mouse and Suisun Shrew should be the same. At the time this list was created, Suisun Marsh had not been added, so this should probably say “no” to evaluated in the EIR/EIS and reason was “outside CPA” for both. With that rationale, the survey portion can be left blank.

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Acronyms and Other Abbreviations

ASTM	American Society for Testing and Materials
BDCP	Bay Delta Conservation Plan
BECT	BDCP Environmental Compliance Team
BEST	BECT Environmental Survey Team
CDBW	California Department of Boating and Waterways
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CHRIS	California Historical Resources Information System
CIR	Cortina Indian Rancheria
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CPA	Conveyance Planning Area
CRAM	California Rapid Assessment Method
CRF	California Red-legged Frog
CRHR	California Register of Historical Resources
CTS	California Tiger Salamander
CVP	Central Valley Project
dbh	diameter at breast height
Delta	Sacramento-San Joaquin Delta
DHCCP	Delta Habitat Conservation and Conveyance Program
DMP	data management plan
DWR	California Department of Water Resources
EIR/EIS	environmental impact report/environmental impact statement
EP	Environmental Professional
ESA	Federal Endangered Species Act
ESRP	Endangered Species Recovery Program
ESTL	Environmental Survey Technical Lead
EtOH	ethanol
GB	gigabyte
GIS	geographic information system
GGS	Giant Garter Snake
GPS	Global Positioning System
kHZ	kilohertz
MSCS	Multi-Species Conservation Strategy
m^2	square meter
NAHC	Native American Heritage Commission
NLIP	Natomas Levee Improvement Program
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
NWR	national wildlife refuge
PCE	Project Collaboration Environment
PIT	passive integrated transponder
PWC	personal watercraft

QA/QC	quality assurance/quality control
QC	quality control
quad	U.S. Geological Survey 7.5-minute quadrangle
REC	recognized environmental condition
Reclamation	Bureau of Reclamation
ROA	restoration opportunity area
SDF	Site Data Form
State CEQA Guidelines	California Environmental Quality Act Guidelines
SWP	State Water Project
TEP	Temporary Entry Permit
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VELB	Valley Elderberry Longhorn Beetle

SUMMARY

S.1 BACKGROUND

This report documents the methods and summarizes the results of environmental surveys conducted in 2009, 2010 and 2011 in support of the environmental impact report/environmental impact statement (EIR/EIS) for the Bay Delta Conservation Plan (BDCP). These environmental surveys were conducted to collect information about environmental resources in the area where conceptual conveyance options were proposed as part of the BDCP (i.e., the Conveyance Planning Area [CPA]). The purpose of this environmental information is to support the analysis of environmental impacts and selection of a preferred conveyance alignment in the EIR/EIS. The environmental information may also be used in the project planning process to identify avoidance and minimization measures to lessen the environmental impacts of the alignment. The data collected during the surveys provide information on biological resources (i.e., plants, invertebrates, amphibians, reptiles, birds, and mammals), cultural resources, and recreation.

The EIR/EIS is being prepared as part of the Delta Habitat Conservation and Conveyance Program (DHCCP). The environmental surveys were led by California Department of Water Resources (DWR) staff members with support from the California Department of Fish and Game (CDFG) and DHCCP. Guidance for the environmental survey program for the BDCP/DHCCP was provided by the BDCP Environmental Coordination Team (BECT), consisting of staff members from the four lead agencies (DWR, National Marine Fisheries Service, Bureau of Reclamation (Reclamation), and U.S. Fish and Wildlife Service [USFWS]), and CDFG and DHCCP. The environmental survey program was developed by the BECT Environmental Survey Team (BEST), a group of DWR, CDFG, Reclamation, and DHCCP resource specialists. Surveys for each resource area were led by a DWR survey lead (the BEST Lead).

Before surveys were initiated, a CPA was identified that had the three major conceptual conveyance alignments under consideration at the beginning of 2009: the Eastern Isolated Conveyance Facility, the Western Isolated Conveyance Facility, and the Through-Delta Conveyance Facility. Suisun Marsh and Yolo Bypass areas were not included in the conveyance planning area being considered for DHCCP EIR/EIS field surveys. In June 2008, the BEST Leads, in coordination with DWR Real Estate, developed a list of 486 parcels that appeared to provide habitat of interest for land-based field surveys. Concurrent to this process, BEST Leads created a decision matrix for special status species that would be included in the field surveys (Appendix S.1A). Temporary Entry Permit (TEP) requests were sent to landowners in an attempt to meet the seasonal survey window for each of the species included in the survey plan. An additional 312 parcels were scheduled to be surveyed by boat where no access permission from landowners was needed. In January 2009, after further lead agency review and discussions, additional species were added for surveys and appropriate adjustments were made to the species decision matrix (Appendix S.1A). A parcel review was conducted for the additional species, resulting in the need for TEP requests for an additional 42 parcels. More than 45 percent of the access requests were not granted in time for the 2009 survey season. Additional surveys were conducted in 2010 and 2011, some on new parcels that had become accessible after the 2009 surveys were initiated, and others at sites that had been surveyed in 2009 but additional information was needed to adequately assess a habitat. **Table S.1-1** below summarizes which years field surveys were conducted by each resource team. For instance, regarding botanical surveys, some areas were surveyed a second time in 2010 because spring 2010 was wetter than spring 2009 and additional annual plants were expected to emerge in seasonal wetlands and vernal pools. Bird surveys for California Black Rail were also conducted in all three survey years because surveys in 2009 started late in the season and those results were considered insufficient, plus additional parcels were accessible in the later years. Additionally, more extensive recreation surveys of boat traffic were conducted in 2010 than in 2009, and the limited Cultural Resources surveys from 2009 were supplemented by an additional effort in 2011.

Table S.1-1. Years Each Resource Team Conducted Field Surveys

Resource	2009 Survey Season	2010 Survey Seasons	2011 Survey Season
Plants	X	X	X
Valley Elderberry Longhorn Beetle	X	X	X
Vernal Pool Invertebrates	X	X	--
California Red-legged Frog	X	X	X
California Tiger Salamander	X	X	X
Giant Garter Snake	X	X	--
Birds	X	X	X
Bats	X	--	X
Riparian Mammals	X	X	X
Cultural Resources	X	--	X
Recreation	X	X	--

S.2 BIOLOGICAL SURVEYS

Special-status plant and wildlife species potentially occurring in the CPA were identified by querying CDFG's California Natural Diversity Database and the California Native Plant Society's (CNPS) Rare Plant Rank (CRPR) inventory of sensitive species, sensitive wildlife habitats, and native California plant communities for the 38 7.5-minute quadrangle maps that cover the Sacramento–San Joaquin Delta (Delta). In addition, lists of USFWS special-status species that are known to occur or that have the potential to occur in the area and species covered under the BDCP and CALFED Bay-Delta Program's Multi-Species Conservation Strategy were included. A total of 64 plant, 5 invertebrate, 2 amphibian, 1 reptile, 26 bird, and 6 mammal species were identified as target species for the surveys.

S.2.1 Plants

Of the 64 target plant species, 15 were found during the 2009 surveys. No Federally listed plant species were found. One species listed as Rare under the California Endangered Species Act – *Mason's Lilaeopsis* – was observed. In 2010, during the course of conducting field surveys, a species of *Atriplex* was identified (*A.coronata* var. *vallicola*; Lost Hills Crownscale) and added to the target species list for a total of 65 target plant species.Three additional special-status plants – Alkali Milk-Vetch, Little Mousetail, and Lost Hills Crownscale – were found in 2010, and two more – Brittlescale and Hogwallow Starfish – were identified in 2011. Many of the plant occurrences are new records, and some extend the range of the species beyond what was previously reported. **Table S.2-1** provides a complete list of the twenty species found during the three year BDCP survey effort.

Table S.2-1. Special-Status Plant Species Identified in 2009, 2010, and 2011 Field Surveys

Plant Species	CRPR	Number of 2009 Occurrences[a]	Number of 2010 Occurrences[a]	Number of 2011 Occurrences[a]
Alkali Milk-Vetch (*Astragalus tener* var. *tener*)	1B	0	6 P	25 P
Bristly Sedge (*Carex comosa*)	2	46 P	1 P	14 P
Brittlescale (*Atriplex depressa*)	1B	0	0	14 P
Delta Mudwort (*Limosella subulata*)	2	34 P	0	4 P
Delta Tule Pea (*Lathyrus jepsonii* var. *jepsonii*)	1B	26 P	1 I	4 P
Dwarf Downingia (*Downingia pusilla*)	2	1 P	8 P	0
Heartscale (*Atriplex cordulata*)	1B	2 P	0	8 P

Plant Species	CRPR	Number of 2009 Occurrences[a]	Number of 2010 Occurrences[a]	Number of 2011 Occurrences[a]
Heckard's Pepper-Grass (*Lepidium latipes* var. *heckardii*)	1B	1 P	3 P	
Hogwallow Starfish (*Hesperevax caulescens*)	4	0	0	4 P
Legenere (*Legenere limosa*)	1B	2 P	18 P	
Little Mousetail (*Myosurus minimus* spp.*apus*)	3	0	2 P	12 P
Lost Hills Crownscale (*Atriplex coronata* var. *vallicola*)[b]	1B		7 P	17 P
Marsh Skullcap (*Scutellaria galericulata*)	2	3 P	0	0
Mason's Lilaeopsis (*Lilaeopsis masonii*)	1B	333 P	19 P	26 P
Saline Clover (*Trifolium depauperatum* var. *hydrophilum*)	1B	38 P	21 P	1 P
San Joaquin Spearscale (*Atriplex joaquiniana*)	1B	2 P	0	3 P
Sanford's Arrowhead (*Sagittaria sanfordii*)	1B	64 P	7 P	10 P
Side-Flowering Skullcap (*Scutellaria lateriflora*)	2	43 P	0	0
Suisun Marsh Aster (*Symphyotrichum lentum* (*Aster lentus*))	1B	156 P	0	25 P
Woolly Rose-Mallow (*Hibiscus lasiocarpos*)	1B	341 P	12 P	41 P

[a] I=Individual plant; P=population. Estimated number of individuals in populations and associated plant species are included in corresponding sections of this report: Section 2.2, Plants (2009), Section, 4.2 Plants (2010), or Section 6.2, Plants (2011).

[b] Species not included in 2009 field surveys – added to target species list in 2010 field season.

S.2.2 Invertebrates

Elderberry shrubs, habitat for the Valley Elderberry Longhorn Beetle (VELB), which is Federally listed as Threatened, were found at 440 occurrences in the CPA during the three seasons of plant field surveys. Most of the plants were found in the northern half of the survey area, with concentrations along the Mokelumne River, Snodgrass Slough, Railroad Cut, Elk Slough, and on the San Joaquin River near the Old River confluence.

Vernal Pool Fairy Shrimp, Federally listed as Threatened, was found in three locations in the Clifton Court Forebay area and in seven vernal pools in the Stone Lakes area in 2009. During the same field season, Vernal Pool Tadpole Shrimp, Federally listed as Endangered, was found in six pools in the Stone Lakes area. Five new sites were surveyed for listed branchiopods in 2010, but no special-status invertebrates were found at these sites. Twelve new parcels that became accessible in early 2011 were visited in April and May of 2011 to determine their suitability for additional surveys. The survey locations focused on parcels north of Clifton Court Forebay. Although no listed branchiopods were found in any of the surveyed areas, several non-listed species were found including *Branchinecta mesovallensis*, *B. lindahli*, and *B. mackini*.

S.2.3 Amphibians and Reptiles

In 2009, one juvenile and two adult California Red-legged Frogs (CRF), listed as Threatened by USFWS and considered a Species of Special Concern by CDFG, were found at a location near Clifton Court Forebay. Egg masses and larvae were discovered at another location in the general vicinity of Clifton Court Forebay. In 2010, four CRF were identified at two sites in Contra Costa County, but no evidence of reproduction was found at these sites. Larvae were found again at the site where they had been identified in 2009, but they were not found at four newly surveyed sites. CRF surveys were limited in 2011, with only four new parcels identified with potential aquatic habitat available. No adult or juvenile CRF were observed or heard, and no larvae were detected during dipnetting at the surveyed locations.

Eggs of California Tiger Salamander (CTS), listed as Threatened by USFWS and CDFG, were not incidentally found during surveys of nearly 200 vernal pools conducted from January through early April 2009 in the vicinity of Clifton Court Forebay and Stone Lakes National Wildlife Refuge. Similarly, no eggs were found that same year at an additional 28 pools surveyed from late October through December in Sacramento, San Joaquin, and Contra Costa counties. In the same year, three CTS larvae were collected at one of two sites where larval surveys were conducted in Contra Costa County. In 2010, one larva was found in the same pool as in 2009, although no larvae were found in the other four sites surveyed. Due to a paucity of new parcels with suitable habitat and restrictions on timing (access not obtained until April, 2011), CTS surveys in 2011 were limited to larval dipnetting. CTS larvae were detected at two ponds, one corresponding with a 2005 CNDDB record and the other with a possible 1982 record match.

Despite an intensive survey effort, no Giant Garter Snake (GGS), listed as Threatened by USFWS and CDFG, were observed or captured in 2009. Visual encounter surveys were conducted on accessible parcels with suitable habitat in 2009 concurrently with either habitat assessment reconnaissance surveys conducted in April or with trapping surveys conducted from May through September. Trapping surveys were conducted on 97 parcels where 62 individual trap lines were set for a total of approximately 42,700 trap-days. No additional GGS trapping surveys were conducted in 2010 or 2011. However, a limited number of visual encounter surveys were conducted in spring 2010, and no GGS were encountered.

S.2.4 Birds

In the three seasons of bird surveys from 2009 through 2011, project surveyors have collected 717 nest site records for special-status bird species in the CPA, most of which were previously undocumented.

In 2009, winter surveys were conducted for Greater Sandhill Crane, State listed as Threatened and Fully Protected, and Lesser Sandhill Crane, a State Species of Special Concern. Cranes were observed in and outside of areas previously identified as important “core” areas and as suitable winter refugia habitat. No additional surveys were conducted in 2010 or 2011.

Breeding bird surveys were conducted throughout the CPA during spring and summer of all three survey years. Out of 24 special-status bird species with potential to breed in the CPA, 18 species were observed breeding (**Table S.2-2**). In addition, Western Yellow-billed Cuckoo, State listed as Endangered and a Federal Candidate, was observed in 2009 at one location in the north-central Delta, but nesting was not confirmed. This species has not been observed nesting in the Delta for approximately 100 years. Further, in 2010, although nesting could not be confirmed, Least Bittern was observed and heard in a tule marsh at Stone Lakes National Wildlife Refuge.

Table S.2-2. Nest Sites Observed During Special-Status Bird Species’ Surveys in 2009, 2010, 2011

Bird Species	2009 Occurrences[a] / Colony (C) or Nest site (N)	2010 Occurrences[a] / Colony (C) or Nest site (N)	2011 Occurrences[a] / Colony (C) or Nest site (N)
Tree-Nesting Water Birds			
Double-crested Cormorant (*Phalacrocorax auritus*)	8/C	0	1/C (75 nests)
Great Blue Heron (*Ardea herodias*)	19/C	0	0
Great Egret (*Ardea alba*)	11/C	0	0
Snowy Egret (*Egretta thula*)	4/C	0	0
Black-crowned Night-Heron (*Nycticorax nycticorax*)	4/C	0	0
Marsh-Nesting Water Birds			
Least Bittern (*Ixobrychus exilis*)	0	1[c]	0
Black Rail (*Laterallus jamaicensis*)	2/N	24/N	3/N
White-faced Ibis (*Plegadis chihi*)	0	0	0
Marsh-Associated Ground-nesting Birds			
Redhead (*Aythya americana*)	0	0	0
Northern Harrier (*Circus cyaneus*)	20/N	5/N	15/N
Short-eared Owl (*Asio flammeus*)	0	0	0

Bird Species	2009 Occurrences[a] / Colony (C) or Nest site (N)	2010 Occurrences[a] / Colony (C) or Nest site (N)	2011 Occurrences[a] / Colony (C) or Nest site (N)
Riparian Tree-nesting Raptors			
White-tailed Kite (*Elanus leucurus*)	9/N	0	1/N
Cooper's Hawk (*Accipiter cooperii*)	1/N	0	0
Swainson's Hawk (*Buteo swainsoni*)	85/N	7/N	50/N
Osprey (*Pandion haliaetus*)	3/N	0	0
Sandhill Cranes			
Greater Sandhill Crane (*Grus canadensis tabida*)	13[b]		
Lesser Sandhill Crane (*Grus canadensis canadensis*)			
Birds That Nest in Dense Riparian Vegetation			
Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)	1[c]	0	
Yellow-breasted Chat (*Icteria virens*)	13/N	9/N	29/N
Grassland Birds			
Burrowing Owl (*Athene cunicularia*)	5/N	0	18/N
Loggerhead Shrike (*Lanius ludovicianus*)	10/N	0	15/N
Grasshopper Sparrow (*Ammodramus savannarum*)	5/N	0	0
Birds That Nest in Actively Eroding Banks			
Bank Swallow (*Riparia riparia*)	0		
Water-Dependent Passerines			
Song Sparrow (Modesto race) (*Melospiza melodia*)	2,500+[d]/N		
Tricolored Blackbird (*Agelaius tricolor*)	10/N	5[c]	1[c]
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	4/N	6[c]	0

[a] Represents minimum number of nest sites or colonies. C = colony; N = nest site.
[b] Sandhill crane subspecies were not differentiated.
[c] Unconfirmed nesting occurrence; observation of single bird or flock (identification by visual or call response).
[d] Ubiquitous bird; too numerous to identify number of nests.

For a few of the target bird species, surveys were not conducted during all three survey years. These include:

- Western Yellow-billed Cuckoo surveys were conducted in 2009 and repeated in 2010, but the species was not observed in 2010 at or around the location of the 2009 finding. Therefore, it is assumed that the Delta is a migration stopover for this species and does not provide viable breeding habitat. No further surveys were conducted in 2011.
- Sandhill crane surveys were limited to the 2008/2009 winter season since sufficient data was collected to corroborate previously proposed wintering range parameters for the Delta.
- No additional Modesto Song Sparrow surveys were conducted following the 2009 survey season due to the ubiquitous nature of the Delta population.
- Bank Swallow surveys were not conducted in the 2010 or 2011 seasons, as the species' associated habitat (i.e.; cut and eroded banks) were not present in parcels surveyed during these two years.

S.2.5 Mammals

Biologists conducted approximately 5,800 hours of passive acoustic monitoring for bats at 20 parcels from March through November 2009. Nine bat species were positively identified, including the Western Red Bat, considered a Species of Special Concern by CDFG. In the same year, extensive surveys of structures and bridges were also conducted, but did not result in identification of any bat roost sites for Species of Special Concern. No bat surveys were conducted in 2010, but in 2011, with access to new parcels, additional habitat assessments were completed. All accessible buildings, barns, and sheds were surveyed for bats and bat sign on 25 additional parcels in 2011, but no evidence of bat use was detected at any of the suitable habitat features.

The two riparian mammal species surveyed for in the CPA were the Riparian Brush Rabbit, State and Federally listed as Endangered, and the Riparian Woo drat, Federally listed as Endangered and a California Species of Special Concern. Potential habitat for both species was identified in the CPA and a total of 296 parcels were surveyed over the three field seasons, but neither species was captured during three seasons of trapping. Access restrictions limited the number of sites with high-quality habitat available for survey.

S.3 OTHER ENVIRONMENTAL SURVEYS

S.3.1 Cultural Resources

A literature and records search conducted in 2009 identified approximately 300 cultural resources in all portions of the CPA. These cultural resources include early Native American burial, habitation, and mound sites; Gold Rush–era residences; an 1850s-era shipwreck; ranches; agricultural work camps and landscapes; railroads; water conveyance systems; levees; and bridges.

In the same year, a sacred lands search conducted by the Native American Heritage Commission (NAHC) failed to identify the presence of any known heritage or sacred sites. The individuals and organizations identified as knowledgeable persons by the NAHC were contacted by letter to solicit their comments and concerns regarding the project. In 2011, a second sacred lands search was conducted by the NAHC, but the results were consistent with the 2009 record search and no known heritage or sacred sites were identified in the accessible parcels.

Cursory attempts were made in 2009 to re-locate and revisit 19 previously recorded prehistoric archaeological sites and two multicomponent historic/prehistoric sites on accessible parcels in the CPA. In 2011, attempts were made to relocate and re-visit an additional seven previously recorded prehistoric sites, 22 previously recorded historic-era sites, and one multicomponent historic/prehistoric site. Further, in 2011, eight Piper Sand accumulations were surveyed. All of the previously recorded prehistoric sites were listed as burial mounds/habitation sites, except for a few identified as baked clay deposits and artifact scatters. The historic-era sites consisted mostly of agricultural work camps and water conveyance systems. The multicomponent sites included both homesteads and burial mounds/villages. Almost all site locations were difficult to identify because they were obscured by vegetation. Years of intensive agricultural use and abandonment appear to have caused previously visible cultural artifacts to be obscured. No cultural resources surveys were conducted in 2010.

In 2009, results of the surveys allowed for verification of locations for two previously recorded cultural resources based on the presence of surface artifacts, and 19 sites were located based on site records and maps, but they were not visible on the ground surface. The field crews were able to access and identify all of the 2011 attempted site verifications. No previously unrecorded resources were encountered in either survey year; however, due to either erosional processes or previous inaccurate recording, two sites re-located in 2011 were found to be larger than what was indicated on the site record.

S.3.2 Recreation

Boat traffic observations were conducted over a week-long period at the end of August and beginning of September 2009 at a total of six locations. In 2010, 8-hour boat traffic observations were conducted intermittently over a 14-week period from Memorial Day weekend through Labor Day at a total of 10

locations. On each sample day, boat traffic data were collected for a total of 8 hours during two 4-hour observation periods: 8 a.m. to 12 noon and 1 p.m. to 5 p.m.

The boat traffic observed in both survey years was dominated by two broad types of smaller boats: runabouts and small fishing boats. Together, those two types of boats made up 60–85 percent of all boat traffic observed at each site. Although there is considerable variation within these types of craft, in general, they are all open boats roughly 18–22 feet long.

Boat traffic volume during most summer weekends in 2010 was considerable at Delta Cross Channel, Snodgrass Slough, Old River, Connection Slough, north Railroad Cut, south Railroad Cut, and Victoria Canal/North Canal, with about 100–200 boats using most of these waterways during a typical survey day and as many as 50 boats per hour passing through the waterways during midday peak-use hours. Boat traffic on holiday weekends was roughly 30 percent higher on average than traffic on nonholiday weekends, with 200–250 boats using these waterways on the busiest days.

For both 2009 and 2010, boat traffic was consistently low during the first three morning hours, with as few as zero and no more than 22 boats observed per hour at any site. Boat traffic generally remained fairly high through the 4 p.m. hour, although the level of traffic tapered off at each site during that final hour of observation. The largest volume of boat traffic was observed at Old River and north Railroad Cut. Boat traffic was substantially less at Sacramento River, San Joaquin River, and Fisherman's Cut sites compared to other sites.

No additional recreation surveys were conducted in the 2011 field season.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

This report documents the methods and summarizes the results of environmental surveys conducted in 2009, 2010 and 2011 in support of the environmental impact report/environmental impact statement (EIR/EIS) for the Bay Delta Conservation Plan (BDCP). State and Federal lead agencies for the EIR/EIS are the California Department of Water Resources (DWR), U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), and National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), in cooperation with the California Department of Fish and Game (CDFG).

Environmental surveys were conducted to collect information about environmental resources in the Conveyance Planning Area (CPA). The purpose of this environmental information is to support the analysis of environmental impacts and selection of a preferred conveyance alignment in the EIR/EIS. The environmental information also may be used in the project planning process to identify avoidance and minimization measures to lessen the environmental impacts of the alignment. The data collected during the surveys provide information on biological resources (i.e., plants, invertebrates, amphibians, reptiles, birds, and mammals), cultural resources, and recreation.

The EIR/EIS is being prepared through the Delta Habitat Conservation and Conveyance Program (DHCCP).The environmental surveys in support of the EIR/EIS were led by DWR staff with support from CDFG and DHCCP. Guidance for the environmental compliance for the BDCP/DHCCP was provided by the BDCP Environmental Compliance Team (BECT), consisting of staff members from the four lead agencies, CDFG, and DHCCP. The environmental survey program was developed by the BECT Environmental Survey Team (BEST), a group of DWR, CDFG, Reclamation, and DHCCP resource specialists. Surveys for each resource area were led by a DWR survey lead (hereafter referred to as the BEST Lead).

Before surveys were initiated, a CPA was identified that had three major conceptual conveyance alignments under consideration at the beginning of 2009: the Eastern Isolated Conveyance Facility, the Western Isolated Conveyance Facility, and the Through-Delta Conveyance Facility. In fall 2009, an additional Pipeline/Tunnel Option was added to the suite of alternatives under consideration. The CPA is described in more detail in Section 1.3, Surveywide Methods.

1.2 OBJECTIVES

The objectives of this environmental data report are to document the methods of the 2009, 2010 and 2011 surveys, summarize the results of the surveys, and make general recommendations for the future survey program. The methodologies that apply to all surveys are discussed first. This discussion includes a description of the survey area (i.e., the CPA), the parcel selection methods, the methods for recording incidental observations, the database management system, and the quality assurance and quality control (QA/QC) system. After that, for each resource, methods, results, and, in some cases, survey limitations and future recommendations that apply specifically to that resource are described.

This document summarizes the results to provide the reader with the highlights of the findings for each resource. All survey data were uploaded to a web-enabled Project Collaboration Environment (PCE) and are available for analysis to support the EIR/EIS and other environmental compliance documents. Most data have a spatial component, and a geographic information system (GIS) was developed to store the spatial data. These spatial data will be used for the analyses in the EIR/EIS. The survey data will complement other available information in the EIR/EIS analyses, including information from resource databases, published studies and analyses (including previous EIRs and EISs prepared for the area), various reports, and interviews with resource experts.

The objective of the surveys was to collect environmental data that will be used to conduct impact analyses of the conveyance alignment options selected for detailed evaluation in the BDCP EIR/EIS. Survey results could also be used to identify particularly valuable resource areas that should be

considered when facilities are planned. If a conveyance alignment is selected as part of the BDCP, it is expected that a more detailed and focused survey effort and habitat analyses will be conducted prior to construction to determine and calculate appropriate avoidance, minimization, and mitigation measures.

1.3 SURVEYWIDE METHODS

The CPA (**Figure 1.3-1**) was determined based on the results of planning studies of proposed conveyance options, defined in the governor's February 28, 2008 letter addressing California water supply and the environmental crisis in the Delta. The conveyance options consisted of diversions at the north Delta on the Sacramento River, with connecting facilities to the existing State Water Project (SWP) and Central Valley Project (CVP) pumping plants. The boundaries of the CPA were developed using aerial photography with input from DHCCP Engineering, DWR Division of Environmental Services, and DWR Real Estate Branch to identify lands for subsequent technical and environmental studies. These lands were located primarily in the statutory Sacramento–San Joaquin Delta (Delta). The CPA was developed with the expectation that the boundaries of each originally proposed conveyance option could be adjusted as new engineering and/or environmental information becomes available. The initial suite of conveyance options was presented in the first series of DHCCP public meetings (August 5–14, 2008), and engineering updates were added in advance of the March 2009 EIR/EIS public scoping meetings. Additional updates are expected as the planning, environmental assessment, and engineering activities progress.

In May 2009, the BEST Leads were notified that the CPA was expanded. Most of the changes in the proposed project footprint involved adjustments to the south end of the conceptual western alignment option and the addition of possible restoration opportunity areas (ROAs). It was decided that no parcel access would be requested for conducting environmental surveys on the additional areas.

1.4 PARCEL SELECTION PROCESS

Initial discussions regarding environmental surveys by the BEST Leads began in February 2008 and focused on the level of evaluation and environmental information needed for the BDCP EIR/EIS. The BEST discussed various approaches for obtaining information to assess potential species-specific construction-level and more long-term project-level impacts of the alignment options in the CPA.

In coordination with DWR Real Estate, an ad hoc group was formed in June 2008 to identify parcels in the CPA for biological surveys. These parcels also could be used for cultural resources, recreation, and Phase I Site Assessment surveys, as well as geotechnical explorations, if needed. Through a multistep process that included species identification, consideration of survey feasibility and utility, literature and aerial photography review, and parcel selection, the BEST Leads developed a list of 486 parcels that appeared to provide habitat of interest for land-based field surveys. Temporary Entry Permit (TEP) requests were sent to landowners in an attempt to meet the seasonal survey window for each of the species included in the survey plan. An additional 312 parcels were scheduled to be surveyed by boat where no access permission from landowners was needed because observations were made from the boat or from mudflats at low tide (below the mean higher high water line).

In January 2009, after further lead agency review and discussions through the BECT, additional species were added for surveys. A parcel review was conducted for these species, resulting in an increase of 42 additional parcels for TEP request.

Table 1.4-1 shows the distribution of parcel access requests by conceptual alignment option, reflecting both the number of parcels requested and the number of parcels for which access within the 2009 survey window was granted. More than 45 percent of the access requests were not granted within the 2009 survey season (Table 1.4-1) and were submitted for review by the courts. Temporary entry permits, generally through court order, were obtained on a limited number of additional parcels, prior to initiation of the 2010 and 2011survey seasons, but most remained under court review during the 2010 and 2011 survey seasons.

Table 1.4-1. Parcel Access Requests Submitted and Granted for Surveys

Alignment Option	Parcels Requested[a]	% of Total Parcels Requested	% of Requested Parcels Accessible by TEP in 2009	% of Requested Parcels Accessible by TEP in 2010	% of Requested Parcels Accessible by TEP in 2011
East	268	37	59		
West	284	39	54		
Through Delta	174	24	41		

[a] Total of column is greater than actual total number of parcels because some parcels are common to multiple alignment options and may be included in more than one row above.
Source: Data compiled by DHCCP in 2009

1.5 INCIDENTAL OBSERVATIONS

Incidental observations (i.e., secondary observations for non-target species or resources that are collected during other resource survey efforts) were recorded during the 2009 environmental surveys. During initial survey planning, each BEST Lead identified what information would be useful to record as incidental during surveys for other resources. Incidental observations included the identification of special-status species, nest and burrow locations, and threats to natural resources and information regarding recreational activities and cultural resources. A parcel survey checklist data form (Appendix 1.5A) was developed to assist surveyors with identifying important incidental information; however, because these observations are considered to be incidental, no other survey protocols were established. The incidental observations were intended to be used by the BEST Leads to focus additional surveys but the records have not been included in the following resource-specific data summaries.

During parcel surveys, field crews were asked to either (1) record any incidental observations on the parcel survey checklist form and collect a Global Positioning System (GPS) point at the location of the observation or (2) collect a GPS point and enter comments directly into a general file in the GPS unit regarding the observation. In most instances, incidental observations were recorded as visual records; however, for certain bird species, auditory detections also were recorded. Because incidental observations were secondary to the objectives of a given survey activity, secondary observations were not recorded when they impeded the ability to effectively record primary survey results, and were therefore, sporadic in collection.

Information from completed incidental survey checklist forms and GPS units was then incorporated into an incidental observation database for 2009 that was uploaded to the PCE. For 2010 and 2011, the BEST Leads decided that no further incidental observations would be recorded because of the limited usefulness of the 2009 records.

1.6 DATABASE MANAGEMENT

1.6.1 GIS Data Management

An EIR/EIS Environmental Surveys Data Management Plan (DMP) was written and updated annually in support of the environmental surveys data collection activities associated with the EIR/EIS.

Development of the DMP involved: (1) formation of a comprehensive work plan that incorporated the data requirements of all stakeholders, provided for project-level data applications, and improved data accessibility for potential users by creating a user-friendly data storage system and clear workflows; (2) oversight and support of the field data collection process; (3) geodatabase population with field collected GPS and scanned data; and (4) quality control (QC) assistance and review of the database.

DWR, CDFG, and DHCCP biologists (Environmental Field Staff) collected data using standard ArcPad tools on handheld GPS units in the field, with custom applications developed for the EIR/EIS data collection effort. These teams also were responsible for completing any hardcopy forms and photographing site features to accompany the digital data collected. Data were uploaded or scanned and transferred to the PCE by the EFS teams. Subsequent incorporation into the multiuser geodatabase (the Enterprise Database) was completed by DHCCP data managers (Data Stewards). This structure allows for simultaneous editing by various users, management of multiple versions of data, snapshot archiving of data, and management of view and edit privileges.

Detailed information regarding the geodatabase hardware and software specifications, data processing software, data management (including metadata standards and coordinate systems), maintenance workflows, and data repository structure can be found in the DMP.

1.6.2 Quality Control

All field and administrative staff involved in the capture, transfer, and management of the BDCP/DHCCP environmental survey data were responsible for at least one stage of QC. The environmental field staff provided the first level of QC by reviewing electronic and hardcopy data collection on a daily and/or site basis. Subsequently, BDCP/DHCCP Data Stewards and the BEST Leads provided QC of BDCP/DHCCP field data to ensure that complete data were transferred from the field to the data repository and that the data collected in the field had no spelling, spatial, or biological errors. A general description of each level of QC review is shown in **Table 1.6-1**. Because of BEST Lead and Data Steward' time constraints during the peak of the survey seasons, portions of Levels 2–4 QC were completed at the end of the survey season.

Table 1.6-1. Quality Control Plan for the BDCP/DHCCP Field Surveys

QC Level	Summary of Tasks	Frequency	Responsibility
Level 1	Confirm complete and correct GPS data entry at the time of collection. Mark the QC checkbox in the GPS data form.	The final step in collection of each field feature. Frequency depends on number of sites visited in 1 day.	Environmental Field Staff
Level 2	Ensure that data have been uploaded to the PCE according to established protocols. Confirm that the GPS data uploaded to the PCE were also entered into the Enterprise Database. Review attributes and geographic locations for errors. Confirm that the photograph paths stored in the attribute table correspond to the correct picture(s).	Weekly	BEST Lead and Data Steward
Level 3	Provide a secondary check to confirm that all data uploaded to the PCE were subsequently transferred to the data repository. Confirm that all hard copy datasheets were digitized and included in final database records. Provide general review of data to identify obvious entry errors or omissions. Verify that edits were updated in central data repository.	Weekly	Data Steward
Level 4	Conduct biological QA/QC to ensure data integrity.	Monthly	Subject matter expert (generally the BEST Lead for the resource)
Source: DHCCP Team 2009			

1.6.3 References

DHCCP Team. 2009. *Environmental Surveys Data QA/QC Plan***.** June 1, 2009.

CHAPTER 2: 2009 BIOLOGICAL SURVEYS

2.1 GENERAL SPECIES LIST

The common and scientific names of the plant and wildlife species mentioned in this document are presented in Appendix 2.1A.

Special-status plant and wildlife species potentially occurring in the CPA were identified by compiling and reviewing available data sources. A preliminary special-status species list for the project was generated by using the following step-wise approach:

- Develop a map using the U.S. Geological Survey (USGS) 7.5-minute quadrangles (quads) that include the CPA and a 5-mile buffer (32 quads, shown on **Figure 2.1-1** in yellow and purple, respectively). This map was updated to include an additional 6 quads to cover the balance of the legal Delta (Figure 2.1-1, pink quads) for a total of 38 quads.
- Using the 38 identified quads, collect and review the following materials:
  - A list of special-status species that are known to occur or that have the potential to occur in the area (requested from USFWS)
  - Records of the California Natural Diversity Database (CNDDB) and California Native Plant Society's CRPR inventory for sensitive species, sensitive wildlife habitats, and native California plant communities for these areas
  - Additional species covered under the BDCP and CALFED Bay-Delta Program's Multi-Species Conservation Strategy (MSCS)

The resulting preliminary species list is provided as Appendix 2.1B. As discussed in Section 1.4, Parcel Selection Process, although this extended range was used to develop the species list, the field environmental surveys were limited to the CPA quads (shown in yellow on Figure 2.1-1).

Special-status species considered for surveys include those plant and animal species that are included in one of the following categories:

- Federally listed as Endangered or Threatened
- Proposed to be Federally listed as Endangered or Threatened
- Federally listed as a Candidate to become proposed for Federal listing
- Federally listed birds of conservation concern
- State listed as Endangered or Threatened
- State listed as a Candidate species
- State listed as a Species of Special Concern
- Fully Protected species under the California Fish and Game Code
- Plant species by CRPR (1A, 1B, 2, 3, and 4)
- Taxa (i.e., taxonomic categories or groups) that meet the criteria for listing as Rare, Endangered, or Threatened, even if they are not included on any list, as described in Section 15380 of the California Environmental Quality Act Guidelines (State CEQA Guidelines), which includes, but is not limited to, species with CNDDB Conservation Status Rank GH, G1, G2, G3, SH, S1, S2, and S3, and taxa recommended to be considered special-status species by knowledgeable scientists
- Species covered under the CALFED Program MSCS, identified for either "recovery – R," "contribute to recovery – r," or "maintenance – m"

The preliminary list of species was refined further by eliminating species that are not associated with habitats that could potentially be affected by implementation of the conveyance facilities. Species that could be affected were identified by:

- Reviewing aerial photographs and other existing resource maps and literature descriptions of the CPA (as a whole or in smaller geographic sections), including those published in previous environmental documents and technical reports
- Reviewing the range, distribution, and habitat associations for all species listed under the California Endangered Species Act (CESA)
- Evaluating the nature and extent of potential effects of the conceptual conveyance alignment on each natural community and on each special-status species that occurs in those communities

The refined species list and reasoning for the evaluation of the species in the EIR/EIS and/or consideration of the species for surveys is provided in Appendix 2.1B. The resulting list of special-status species that were included in 2009 surveys is presented in **Table 2.1-1.**

As a result of a Western Yellow-billed Cuckoo observation during an avian survey in spring 2009, the species list was modified midseason to include this species. The species originally was considered to be extirpated from the Delta. In addition, Lost Hills Crownscale was identified during 2010 field surveys and added to the plant target species list.

Table 2.1-1. Special-Status Plant and Wildlife Species That Were the Subject of Field Surveys

Common Name	Scientific Name	Legal Status[a] Federal/State/CRPR
Plants		
Alkali Milk-Vetch	*Astragalus tener* var. *tener*	--/--/1B
Antioch Dunes Evening Primrose	*Oenothera deltoides* ssp. *howellii*[b]	FE/SE/1B
Baker's Navarretia	*Navarretia leucocephala* ssp. *bakeri*	--/--/1B
Bearded Popcorn-Flower	*Plagiobothrys hystriculus*	--/--/1B
Bent Flowered Fiddleneck	*Amsinckia lunaris*	--/--/1B
Big Tarplant	*Blepharizonia plumosa*	--/--/1B
Boggs Lake Hedge-Hyssop	*Gratiola heterosepala*	--/SE/1B
Brewer's Calandrinia	*Calandrinia breweri*	--/--/4
Brewer's Western Flax	*Hesperolinon breweri*	--/--/1B
Bristly Sedge	*Carex comosa*	--/--/2
Brittlescale	*Atriplex depressa*	--/--/1B
Caper-fruited Tropidocarpum	*Tropidocarpum capparideum*	--/--/1B
Carquinez Goldenbush	*Isocoma arguta*	--/--/1B
Coast Iris	*Iris longipetala*	--/--/4
Colusa Grass	*Neostapfia colusana*[b]	FT/SE/1B
Congdon's Tarplant	*Centromadia (=Hemizonia) parryi* ssp. *congdonii*	--/--/1B
Contra Costa Goldfields	*Lasthenia conjugens*[b]	FE/--/1B
Contra Costa Wallflower	*Erysimum capitatum* ssp. *angustatum*[b]	FE/SE/1B
Cotula Navarretia	*Navarretia cotulifolia*	--/--/4
Crownscale	*Atriplex coronata* var. *coronata*	--/--/4
Delta Button-Celery	*Eryngium racemosum*	--/SE/1B
Delta Mudwort	*Limosella subulata*	--/--/2
Delta Tule Pea	*Lathyrus jepsonii* var. *jepsonii*	--/--/1B
Delta Woolly-Marbles	*Psilocarphus brevissimus* var. *multiflorus*	--/--/4
Diamond-petaled California Poppy	*Eschscholzia rhombipetala*	--/--/1B
Dwarf Downingia	*Downingia pusilla*	--/--/2
Eel-grass Pondweed	*Potamogeton zosteriformis*	--/--/2

Common Name	Scientific Name	Legal Status[a] Federal/State/CRPR
Ferris' Goldfields	*Lasthenia ferrisiae*	--/--/4
Ferris' Milk-Vetch	*Astragalus tener* var. *ferrisiae*	--/--/1B
Fox Sedge	*Carex vulpinoidea*	--/--/2
Fragrant Fritillary	*Fritillaria liliacea*	--/--/1B
Gairdner's Yampah	*Perideridia gairdneri* ssp. *gairdneri*	--/--/4
Hairless Popcorn-Flower	*Plagiobothrys glaber*	--/--/1A
Heartscale	*Atriplex cordulata*	--/--/1B
Heckard's Peppergrass	*Lepidium latipes* var. *heckardii*	--/--/1B
Hispid Bird's-Beak	*Cordylanthus mollis* ssp. *hispidus*	--/--/1B
Hogwallow Starfish	*Hesperevax caulescens*	--/--/4
Hoover's Cryptantha	*Cryptantha hooveri*	--/--/1A
Legenere	*Legenere limosa*	--/--/1B
Little Mousetail	*Myosurus minimus* ssp. *apus*	--/--/3
Lobb's Aquatic Buttercup	*Ranunculus lobbii*	--/--/4
Lost Hills Crownscale[c]	*Atriplex coronate* var. *vallicola*	--/--/1B
Marsh Skullcap	*Scutellaria galericulata*	--/--/2
Mason's Lilaeopsis	*Lilaeopsis masonii*	--/SR/1B
Mt. Diablo Fairy-Lantern	*Calochortus pulchellus*	--/--/1B
Palmate-bracted Bird's-Beak	*Cordylanthus palmatus*	FE/SE/1B
Pappose Tarplant	*Centromadia (=Hemizonia) parryi* ssp. *parryi*	--/--/1B
Parry's Red Tarplant	*Centromadia parryi* ssp. *rudis*	--/--/4
Recurved Larkspur	*Delphinium recurvatum*	--/--/1B
Round-leafed Filaree	*Erodium macrophyllum*	--/--/2
Saline Clover	*Trifolium depauperatum* var. *hydrophilum*	--/--/1B
San Joaquin Spearscale	*Atriplex joaquiniana*	--/--/1B
Sanford's Arrowhead	*Sagittaria sanfordi*	--/--/1B
Showy Madia	*Madia radiata*	--/--/1B
Side-flowering Skullcap	*Scutellaria lateriflora*	--/--/2
Slough Thistle	*Cirsium crassicaule*	--/--/1B
Small-flowered Morning-Glory	*Convolvulus simulans*	--/--/4
Small Spikerush	*Eleocharis parvula*	--/--/4
Soft Bird's-Beak	*Cordylanthus mollis* ssp. *mollis*[b]	FE/SR/1B
Solano Grass	*Tuctoria mucronata*[b]	FE/SE/1B
Stinkbells	*Fritillaria agrestis*	--/--/4
Suisun Marsh Aster	*Symphytotrichum lentum (Aster lentus)*	--/--/1B
Vernal Pool Smallscale	*Atriplex persistens*	--/--/1B
Woolly Rose-Mallow	*Hibiscus lasiocarpos*	--/--/1B
Wright's Trichocoronis	*Trichocoronis wrightii*	--/--/2
Invertebrates		
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*[b]	FT/--
Conservancy Fairy Shrimp	*Branchinecta conservatio*[b]	FE/--
Longhorn Fairy Shrimp	*Branchinecta longiantenna*[b]	FE/--
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*[b]	FT/--

Common Name	Scientific Name	Legal Status[a] Federal/State/CRPR
Vernal Pool Tadpole Shrimp	*Lepidurus packardi* [b]	FE/--
Amphibians		
California Red-legged Frog	*Rana draytonii* [b]	FT/SSC
California Tiger Salamander	*Ambystoma californiense* [b]	FT/ST[d], SSC
Reptiles		
Giant Garter Snake	*Thamnophis gigas*	FT/ST
Birds		
Bank Swallow	*Riparia riparia*	--/ST
Black-crowned Night-Heron	*Nycticorax nycticorax*	--/CDFG – Rookeries
Burrowing Owl	*Athene cunicularia*	BCC/SSC – Nesting
California Black Rail	*Laterallus jamaicensis coturniculus*	BCC/ST, FP
Cooper's Hawk	*Accipiter cooperii*	--/WL – Nesting
Double-crested Cormorant	*Phalacrocorax auritus*	--/WL – Rookeries
Grasshopper Sparrow	*Ammodramus savannarum*	--/SSC – Nesting
Great Blue Heron	*Ardea herodias*	--/CDFG – Rookeries
Great Egret	*Ardea alba*	--/CDFG – Rookeries
Greater Sandhill Crane	*Grus canadensis tabida*	--/ST, FP
Least Bittern	*Ixobrychus exilis*	--/SSC – Nesting
Lesser Sandhill Crane	*Grus canadensis canadensis*	--/SSC – Wintering
Loggerhead Shrike	*Lanius ludovicianus*	BCC/SSC – Nesting
Northern Harrier	*Circus cyaneus*	--/SSC – Nesting
Osprey	*Pandion haliaetus*	--/WL
Short-eared Owl	*Asio flammeus*	--/SSC – Nesting
Snowy Egret	*Egretta thula*	--/CDFG Rookeries
Song Sparrow "Modesto" Population	*Melospiza melodia*	--/SSC
Swainson's Hawk	*Buteo swainsoni*	BCC/ST
Tricolored Blackbird	*Agelaius tricolor*	BCC/SSC – Nesting
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	BCC/SE
White-faced Ibis	*Plegadis chihi*	--/WL – Rookeries
White-tailed Kite	*Elanus leucurus*	--/FP
Yellow-breasted Chat	*Icteria virens*	--/SSC
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	--/SSC – Nesting
Mammals		
Pallid Bat	*Antrozous pallidus*	--/SSC
Townsend's Big-eared Bat	*Corynorhinus townsendii*	--/SSC
Western Mastiff Bat	*Eumops perotis californicus*	--/SSC
Western Red Bat	*Lasiurus blossevillii*	--/SSC
Riparian Brush Rabbit	*Sylvilagus bachmani riparius*	FE/SE
Riparian Woodrat	*Neotoma fuscipes riparia*	FE/--

1

Footnotes for Table 2.1-1. Special-Status Plant and Wildlife Species That Were the Subject of 2009 Field Surveys

[a] Legal Status Definitions:

Federal (U.S. Fish and Wildlife Service)

FE	=	listed as Endangered under the Federal Endangered Species Act (ESA).
FT	=	listed as Threatened under the ESA.
BCC	=	U.S. Fish and Wildlife Service Bird of Conservation Concern.
--	=	no status.

State (California Department of Fish and Game)

SE	=	listed as Endangered under the California Endangered Species Act (CESA).
ST	=	listed as Threatened under CESA.
SR	=	listed as Rare under CESA (plants).
FP	=	Fully Protected under the California Fish and Game Code.
SSC	=	California Species of Special Concern.
WL	=	California Department of Fish and Game Watch List.
CDFG	=	rookeries protected under the California Fish and Game Code.
Nesting	=	status applies to nesting birds only.
Rookeries	=	status applies to rookeries (nesting colonies) only.
Wintering	=	status applies to wintering birds only.
--	=	no status.

CRPR (California Native Plant Society's Rare Plant Rank)

1A	=	presumed extinct in California.
1B	=	Rare or Endangered in California and elsewhere.
2	=	Rare and Endangered in California, more common elsewhere.
3	=	plants about which more information is needed.
4	=	plants of limited distribution.

[b] Critical habitat is designated for these species.

[c] Species not added to target species list until 2010 field surveys.

[d] California Tiger Salamander was listed as Threatened by the California Fish and Game Commission on March 3, 2010; during the 2009 surveys it was a Candidate species for listing under CESA.

Source: Compiled by DWR in 2009

2.2 PLANTS

2.2.1 Methods

2.2.1.1 Target Species

Sixty-four special-status plant species were identified for the 2009 plant field surveys as potentially occurring in the CPA. These species are shown in Table 2.1-1.

2.2.1.2 Survey Description

2.2.1.2.1 Surveys

The goal of botanical surveys was to identify the presence of special-status plant species in the CPA. Visual surveys for the target species followed the Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (CDFG 2000) and Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants (USFWS 1996).

Terrestrial botanical surveys were conducted to observe species by walking transects through appropriate habitat. The distance between transects was based on habitat type and commonly used botanical survey practices. Waterside surveys were conducted to observe species from a shallow-draft boat moving along or through appropriate habitat types, at a speed conducive to species identification. For intertidal species, surveys were conducted during suitable conditions (i.e., when tides were sufficiently low to expose suitable habitat) as determined using a tide prediction table for the local area. Surveys were conducted at

a time of year when target species were evident and identifiable. All surveys were floristic in nature, requiring all plants to be identified to the extent necessary to determine their rarity and listing status.

2.2.1.2.2 Documentation of Results

Survey results were documented in a handheld computer with 2- to 5-meter GPS receiver accuracy, loaded with appropriate base maps and a data dictionary, and containing the fields of the CNDDB Field Survey Form. The electronic data entry form included the following attribute fields:

- Location (latitude and longitude)
- Date
- Species name; reference used for identification (e.g., Jepson Manual)
- Number of individual specimens observed or the area (square meters) covered by clonal species
- Associated species
- Habitat attributes, including vegetation type and amount of disturbance
- Survey team member names
- Incidental observations for other environmental surveys (e.g., storage tanks, potential cultural resources, vernal pools)

Digital photographs were attributed with a GPS location in the handheld computer immediately after image acquisition. Survey data were downloaded daily and backed up on a server in the office and subsequently uploaded to the PCE. Additional data (a list of species encountered and other QA/QC information) were recorded on paper data sheets.

In this report, an "occurrence" is defined as a point, line, or polygon where a GPS point or points were recorded to identify the location of a target species. Many of the plant occurrences are new records, and some extend the range of the species beyond what was previously reported. These new occurrence records were submitted to CDFG for incorporation into the CNDDB after the data was released for that use.

2.2.1.3 Team Composition and Equipment Used

Each botany survey team was composed of two surveyors with:

- Experience in conducting floristic surveys
- Knowledge of plant taxonomy and plant community ecology
- Familiarity with plants of the Delta, including special-status species
- Familiarity with the State and Federal statutes related to plants and plant collecting

Botany survey teams attended a training session to discuss the target species, survey protocols, use of the GPS units and data dictionaries, and safety issues. They also visited known sites of the target species and herbaria to ensure that they would recognize the species during surveys. Identification tools used included a photographic atlas of the target species. Survey teams were given GPS units, cameras, field loupes, data sheets, vegetation maps, location maps, copies of temporary entry permits, and safety kits.

2.2.1.4 Survey Timing

The optimal survey period is the time when each species is most likely to be present and identifiable, usually when the plants are in flower or fruit. The target species were grouped into three optimal survey periods, and surveys were conducted throughout each of these periods in 2009:

- March through May
- May through July
- August through October

The surveys were conducted from March 4 through October 2, 2009, and covered approximately 5,500 acres of land and 700 miles of shoreline. Twenty-one botanists participated in the surveys for a total of 442 person-days.

2.2.1.5 Candidate Survey Habitat

Information on the life history and habitat of each of the target species was gathered from the CNDDB (CNDDB 2009), the Jepson Manual (Hickman 1996), and the CRPR inventory (CNPS Website 2009). The species are known to occur in the following natural communities:

- Riparian
- Grassland
- Vernal pool
- Aquatic
- Alkaline seasonal wetland
- Tidal marsh
- Nontidal marsh

2.2.1.6 Identification of Habitat Unit Survey Locations

Information about habitats, optimal survey time, and whether each species was likely to be found during waterside or terrestrial surveys was compiled into several tables. These tables were linked in databases and were used to direct the botanical surveys.

To map potential habitat for the target species, the detailed vegetation associations in CDFG's vegetation map of the Delta (CDFG 2007) were consolidated into natural community types using a GIS. The seven target natural community types were overlaid on parcels and channels where access for surveys was authorized. An Access database was used to link terrestrial survey species, habitat, parcels, acreage, an estimate of the amount of time to survey, and optimal survey period.

A second Access database was used to plan waterside surveys. Waterside survey species were linked with reaches of channels and with the date and time with optimal tide exposure to locate intertidal species.

Each week, parcels containing the habitats of species identifiable in that season were selected, appropriate notice was given to parcel landowners, and botany survey teams were scheduled. For waterside surveys, boats and boat operators were also scheduled, and launch sites were selected.

2.2.1.7 Duration of Survey Validity

CDFG and USFWS have not specified how long plant survey results are valid. Additional surveys will be necessary to confirm species presence, absence, abundance, and distribution once a project alternative is selected for construction.

2.2.2 Results and Discussion

2.2.2.1 Survey Results

Of the 64 target plant species, 15 were found during the 2009 surveys. The survey findings for each species, along with the CRPR of each species, are presented below. A list of all plants identified during the surveys is included in Appendix 2.2A.

2.2.2.1.1 Heartscale

Two occurrences of Heartscale (CRPR 1B) were found during the 2009 surveys. The two populations consisted of 15 and 150 individuals, both in alkaline seasonal wetlands which were surrounded by grazed pasture in the area southwest of Clifton Court Forebay.

2.2.2.1.2 San Joaquin Spearscale

Two occurrences of San Joaquin Spearscale (CRPR 1B) were found during the 2009 surveys. The two populations consisted of 10 and 2 individuals and were found at the edges of alkaline wetland or alkaline grassland natural communities that were surrounded by land used for grazing and agriculture in the area southwest of Clifton Court Forebay. Associated species included Salt Grass, Baltic Rush, Curly Dock, and various nonnative annual grasses.

2.2.2.1.3 Bristly Sedge

Bristly Sedge (CRPR 2) was found at 46 locations in the 2009 surveys. The number of individuals recorded at each occurrence ranged from 1 to 40. Bristly Sedge was found in riparian, tidal marsh, and nontidal marsh natural communities, where it was sometimes found growing on fallen logs or stumps. Associated species included bulrush, Fremont Cottonwood, Himalayan Blackberry, willow species, Narrow-leaf Cattail, Bugleweed, Bog Rush, Bent Grass, California Grape, and Valley Oak. In the surveyed area, bristly sedge locations ranged from along Railroad Cut near Hood to Delta Meadows.

2.2.2.1.4 Dwarf Downingia

Dwarf Downingia (CRPR 2) was found at one location during the 2009 surveys. This population, consisting of approximately 500 individuals, occurred in a heavily trampled vernal pool in a grazed pasture on property managed by Stone Lakes National Wildlife Refuge. Dwarf Downingia was found growing with Rayless Goldfields, California Goldfields, Dwarf Woolly-Heads, Blow Wives, Mediterranean Barley, and Italian Ryegrass.

2.2.2.1.5 Woolly Rose-Mallow

Three hundred and forty-one occurrences of Woolly Rose-Mallow (CRPR 1B) were located during the 2009 surveys. The number of individuals recorded at each occurrence ranged from 1 to 44 plants, although the “clumping” nature of the species sometimes made it difficult to count individuals. Woolly Rose-Mallow was found in a variety of habitats, including riprapped levee banks, edges of tule islands, and agricultural drainages. It was found in all but the west-central section of the CPA. The species was commonly found growing with bulrush, cattail species, willow, California Button Bush, Common Reed, Mason’s Lilaeopsis, Himalayan Blackberry, Spikeweed, White Sweetclover, Stinkwort, Dallis Grass, Black Willow, Arroyo Willow, Giant Reed, Johnsongrass, smartweed, Bog Rush, Northern Willow-Herb, Manyflower Marshpennywort, and Water Hyacinth.

2.2.2.1.6 Delta Tule Pea

Twenty-six occurrences of Delta Tule Pea (CRPR 1B) were located during surveys. The number of individuals recorded at each occurrence ranged from one to 50 plants, although the habit of this perennial

vine (climbing through and over other plants) sometimes made it difficult to count. Habitats described for this species included riparian forest, riparian scrub, tidal marsh, and exposed mudbanks on in-channel islands. Delta Tule Pea was commonly found growing with bulrush and other associates, including Arroyo Willow, Common Reed, American Dogwood, Hedge Bindweed, marshpennywort species, Himalayan Blackberry, California Rose, California Grape, Narrow-leaved Willow, and Narrow-leaved Cattail. In the CPA, Delta Tule Pea ranged from Elk Slough near Courtland to Middle River near Victoria Island.

2.2.2.1.7 Legenere

Two occurrences of Legenere (CRPR 1B) were documented during the 2009 surveys, both occurring on lands managed by Stone Lakes National Wildlife Refuge. The populations ranged from 20 to 50 individuals and were located in a linear depression alongside a roadway in a vernal pool grassland. Associated species included Small Stipitate Popcornflower, White Water-Buttercup, Rayless Goldfields, and Bractless Hedge-Hyssop. The nonnative competitor Waxy Manna-Grass also was found in the areas where Legenere was documented, which is considered a potential threat to the population. Additionally, the area where Legenere was found is disked annually to provide a firebreak between the roadway and grassland.

2.2.2.1.8 Heckard's Pepper-Grass

One occurrence of Heckard's Pepper-Grass (CRPR 1B) was recorded during surveys. This population contained 150 individuals and was located on a slope alongside a linear depression within a grazed grassland. This occurrence was located on lands managed by Stone Lakes National Wildlife Refuge. Associated species included Pacific Foxtail and Small Stipitate Popcornflower.

2.2.2.1.9 Mason's Lilaeopsis

Three hundred and thirty-three occurrences of Mason's Lilaeopsis (California Rare, CRPR 1B) were recorded during surveys. Population sizes ranged from small isolated patches of less than 1 square foot to a nearly 12-mile-long line along a channel. Mason's Lilaeopsis was primarily found on eroded mudbanks or mudflats and on decomposing wooden pilings or logs in tidal marshes and channels in all but the northeast section of the CPA. It was occasionally found on riprapped levee banks. Associated species include cattail species, Whorled Marshpenny, bulrush, Fiber Optic Grass, Water Pygmyweed, Common Reed, Giant Reed, Delta Mudwort, Suisun Marsh Aster, Himalayan Blackberry, Nutsedge, Woolly Rose-Mallow, and Bog Rush.

2.2.2.1.10 Delta Mudwort

Thirty-four occurrences of Delta Mudwort (CRPR 2) were recorded during the 2009 surveys. Population sizes ranged from a single 15-square-inch patch to sporadic distributions along a 25-foot line. Delta Mudwort was often found intermixed with associates such as Mason's Lilaeopsis, Whorled Marshpennywort, Water Pygmyweed, and Fiber Optic Grass. Other less common associates included Delta Tule Pea, Common Reed, Needle Spikerush, Smartweed, cattail species, American Dogwood, Himalayan Blackberry, and Nutsedge. Delta Mudwort was found growing on exposed mudflats and mudbanks in tidal marshes. In the CPA, it was found in the central Delta from Walnut Grove to Clifton Court Forebay.

2.2.2.1.11 Sanford's Arrowhead

Sanford's Arrowhead (CRPR 1B) was recorded at 64 locations during the 2009 surveys. Population sizes ranged from 2 to 320 individuals. Associated species included Water Smartweed, Nutsedge, Floating Water Primrose, Bog Rush, Iris-leaved Rush, Mason's Lilaeopsis, bulrush species, and cattail species. This species was found growing on exposed tidal mudflats and at the edges of open water in the northern half of the CPA.

2.2.2.1.12 Marsh Skullcap

Three occurrences of Marsh Skullcap (CRPR 2) were recorded during the 2009 surveys. Population sizes ranged from 1 to 10 individuals. This species was found growing on exposed fallen logs in tidal marsh habitat near Walnut Grove with associates such as Sneezeweed, Dallis Grass, Bog Rush, Purpletop Vervain, White Alder, willow-herb, and Curly Dock.

2.2.2.1.13 Side-Flowering Skullcap

There were 43 occurrences of Side-flowering Skullcap (CRPR 2). This species was found exclusively on the exposed tops of fallen logs in tidal marsh habitat east of Walnut Grove from Lost Slough to Sycamore Slough. Population sizes ranged from 1 to 40 individual plants. Associated species included Bog Rush, Salt Marsh Sandspurry, Purpletop Vervain, Bugleweed, and June Centaury.

2.2.2.1.14 Suisun Marsh Aster

Suisun Marsh Aster (CRPR 2) was recorded at 156 locations during 2009 surveys, ranging from channels near Prospect Island to near Stockton. Populations ranged from 1 to 500 individuals and were found in habitats such as levee riprap, mudbanks, and decaying pilings. Associated species include Nutsedge, Purpletop Vervain, Dallis Grass, Himalayan Blackberry, willow species, Poison-Hemlock, Giant Reed, White Alder, Mugwort, Iris-leaved Rush, Bugleweed, Woolly Rose-Mallow, and Bur Marigold.

2.2.2.1.15 Saline Clover

Thirty-eight occurrences of Saline Clover (CRPR 1B) were recorded during surveys. Population size ranged from 5 to 20,000 individuals in vernal pool and seasonally wet grassland swale habitats in the area managed by Stone Lakes National Wildlife Refuge. Associated species included popcornflower species, Rayless Goldfields, Pineapple Weed, Slender Fescue, Soft Chess, Toad Rush, Two-horned Downingia, Great Valley Button Celery, Mediterranean Barley, Italian Ryegrass, Mayweed, Alkali Sink Goldfields, Alkali Weed, and other clover species, including Dwarf Sack Clover.

2.2.2.2 Limitations and Future Surveys

Annual plant species are sensitive to rainfall and other climatic conditions; plants may not flower or set fruit, and seeds may not germinate in less than optimal conditions. Because drought conditions occurred for the third consecutive year in 2009, some of the target species may not have been present or identifiable during surveys in 2009. For this reason, parcels with habitat for target annual plant species (grassland, vernal pool, and alkaline seasonal wetlands) were surveyed again in 2010 or 2011, and may be surveyed in the future if access is authorized.

The size of the CPA has been increased to include other project features. Additional target species may need to be added to the potential special-status plant list as habitats and geographic areas are added to the CPA. If access is authorized, future surveys may include additional parcels with habitat for these and other target special-status plant species.

2.2.3 References

CDFG (California Department of Fish and Game). 2000. *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities*. Revised May 8, 2000.

CDFG (California Department of Fish and Game). 2007. *Vegetation and Land Use Classification and Map of the Sacramento-San Joaquin Delta*. Prepared by D. Hickson and T. Keeler-Wolf, Vegetation Classification and Mapping Program. February 2007.

CNDDB (California Natural Diversity Database). 2009. Results of electronic record search. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch. Sacramento, California. Accessed February 10, 2009.

CNPS (California Native Plant Society). 2009. *Inventory of Rare and Endangered Plants* (online edition, v7-09d). Sacramento, California. Site accessed February 10, 2009. URL = http://www.cnps.org/inventory.

Hickman, J. C. (ed.) 1996. *The Jepson Manual: Higher Plants of California*. University of California Press, Berkeley, California.

USFWS (U.S. Fish and Wildlife Service). 1996. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants.* September 23, 1996.

2.3 VALLEY ELDERBERRY LONGHORN BEETLE

2.3.1 Methods

2.3.1.1 Target Species

The Valley Elderberry Longhorn Beetle (VELB), Federally listed as Threatened, was identified as potentially occurring in the CPA. VELB is completely dependent on its host plant, elderberry, which is a common component of the remaining riparian forests and adjacent upland habitats of California's Central Valley.

2.3.1.2 Survey Description

2.3.1.2.1 Surveys

Visual surveys for the target shrubs were conducted during the special-status plant surveys, which followed the Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (CDFG 2000) and Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants (USFWS 1996).

The goal of these preliminary VELB surveys was to identify the location of elderberry shrubs in the CPA. The information about elderberry habitat will be used to direct more detailed protocol surveys for the beetle after an alignment option is selected.

Terrestrial surveys were conducted to observe species by walking transects through appropriate habitat. The distance between transects was based on habitat type and commonly used botanical survey practices. Waterside surveys were conducted to observe species from a shallow-draft boat moving along or through appropriate habitat types, at a speed conducive to species identification based on habitat condition and commonly used botanical survey techniques. Surveys were conducted at a time of year when target species were evident and identifiable.

2.3.1.2.2 Documentation of Results

Survey results were documented in a handheld computer with 2- to 5-meter GPS receiver accuracy, loaded with appropriate base maps and data dictionary. The data entry form had the following attribute fields:

- Location, latitude and longitude
- Species name
- Date

- Number of individual specimens observed, linear distance or area (m^2) covered
- Estimate of number of stems greater than 1 inch, in size classes
- Habitat: whether riparian, ditch, or riprap
- Survey team member names

2.3.1.3 Team Composition and Equipment Used

Each botany survey team was composed of two surveyors with:

- Experience conducting floristic surveys
- Knowledge of plant taxonomy and plant community ecology
- Familiarity with plants of the Delta, including special-status species
- Familiarity with the State and Federal statutes related to plants and plant collecting

Botanist teams attended a training session to discuss the target species, survey protocols, use of the GPS units and data dictionaries, and safety issues. Survey teams were given GPS units, cameras, field loupes, data sheets, vegetation maps, location maps, temporary entry permits, and safety kits.

2.3.1.4 Survey Timing

Elderberry shrubs are identifiable when they have leaves, from spring to fall, but the optimal survey period is from approximately March through August, when the plants are in flower or fruit. In September and October 2009 plants were still easily identifiable. The surveys were conducted from March 4 through October 2 and covered approximately 5,500 acres of land and 700 miles of shoreline. Twenty-one botanists participated in the surveys for special-status plants, including elderberry shrubs, working 442 person-days.

2.3.1.5 Candidate Survey Habitat

Elderberry shrubs are most commonly found in riparian habitats, but they also may be found in grasslands, tidal marsh, and nontidal marsh and in fence rows or adjacent to ditches in agricultural land. Because they occur in a variety of habitats, elderberry was a target species during all botanical surveys, both terrestrial and waterside.

2.3.1.6 Identification of Habitat Unit Survey Locations

Elderberry shrub surveys were conducted as incidental to the special-status plant surveys (see Section 3.2, Botany).

2.3.1.7 Duration of Survey Validity

Survey results for VELB habitat are valid for 2 years from sampling dates (USFWS 1996).

2.3.2 Results and Discussion

2.3.2.1 Survey Results

Elderberry shrubs were found at 312 occurrences in the CPA. Most of the plants were found in the northern half of the survey area, with concentrations along the Mokelumne River, Snodgrass Slough, Railroad Cut, and Elk Slough. The number of shrubs at an occurrence ranged from single plants to a line of shrubs 0.8 mile long along a levee bank. Individual plants ranged in size from a few stems to large plants with more than 20 stems.

2.3.2.2 Limitations and Future Surveys

Some potential habitat for elderberry shrubs, such as fence rows in agricultural land, was not surveyed because these areas were not considered habitat for target special-status plant species; therefore, botanical surveys were not conducted there. The accuracy of the stem count data taken during the boat surveys was limited by two issues: The shrubs were sometimes distant from the boat, and the base of the shrub was often obscured by other plants.

Since the surveys were conducted, the CPA has been increased to include additional project features. If access is authorized, future surveys may include preliminary surveys for VELB habitat on additional parcels.

2.3.3 References

CDFG (California Department of Fish and Game). 2000. *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities*. Revised May 8, 2000.

USFWS (U.S. Fish and Wildlife Service). 1996. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. September 23, 1996.

2.4 VERNAL POOL INVERTEBRATES

2.4.1 Methods

2.4.1.1 Target Species

The target species were Vernal Pool Fairy Shrimp (Federally listed as Threatened), Longhorn Fairy Shrimp (Federally listed as Endangered), Conservancy Fairy Shrimp (Federally listed as Endangered), and Vernal Pool Tadpole Shrimp (Federally listed as Endangered) (hereafter collectively referred to as "branchiopods"). Vernal pool plants are discussed in the habitat assessment part of this section only as indicators of habitat suitability for branchiopods.

2.4.1.2 Survey Description

2.4.1.2.1 Surveys

Phase 1 Branchiopod Sampling

The goal of the vernal pool branchiopod surveys was to identify suitable vernal pool habitat and identify the status and distribution of vernal pool branchiopods in the CPA. Two types of surveys were conducted: wet-season sampling of branchiopods (referred to as Phase 1) and dry-season habitat assessments (referred to as Phase 2).

USFWS has review and approval authority for branchiopod surveys and authorized the surveys by identified DWR and DHCCP staff holding Federal Endangered Species Act (ESA) Section 10(a)(1)(A) recovery permits for listed branchiopods.

Phase 1 branchiopod surveys were conducted according to the following procedure. Phase 1 methods were approved by USFWS on December 24, 2008. Once approved by USFWS, locations were surveyed according to the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods, dated April 19, 1996 (USFWS 1996).

Each approved pool in the CPA was surveyed once every 2 weeks (an event that is hereafter referred to as "survey series") until: 1) listed vernal pool branchiopods were identified , 2) the pool dried up for the season, or 3) when 120 days of pool inundation has been achieved, provided that the pool does not dry down and then refill. Before dip-netting, the surveyed features were examined visually for the presence of branchiopods. For each survey series, each vernal pool feature was sampled using a micro-mesh dip net or aquarium net appropriate for the size of the pool. Net mesh size was no larger than one-eighth inch. Representative portions of the pool bottom, edges, and vertical water column were sampled by a series of pulls through the water in a sweeping motion. Each feature was surveyed for a length of time that was commensurate to feature size and inundation depth. Contents of the net were searched for vernal pool branchiopods at least once every 5 linear meters, and sexually mature individuals were collected for identification.

No more than 20 specimens of each species from each pool, or less than 10 percent of the subpopulation present in the pool, whichever is less, were collected and preserved as voucher specimens. Voucher specimens were prepared according to California Academy of Sciences protocols and standards for the preservation and archival of vernal pool crustaceans (CAS 2007) and were added to the collection of the California Academy of Sciences in San Francisco, California. All other individuals were returned to the pool where they were found as quickly as possible. The number of branchiopod individuals was recorded based on orders of magnitude. The presence of other aquatic invertebrates and amphibians also was recorded. Vernal pool branchiopods were identified using Eriksen and Belk (1999).

Candidate survey locations that were not surveyed during Phase 1 because of access issues were included in the habitat assessment. Coordination with botany surveys revealed more locations with vernal pool branchiopod habitat, so these locations also were included in the habitat assessment.

Phase 2 Branchiopod Habitat Assessment

Phase 2 surveys were conducted according to the following procedure approved by the USFWS (Milliken and Kelly pers. comm. 2008).

The survey locations were assessed by one to two teams of vernal pool ecologists and botanists. Each survey location was assessed one time by a team made up of one vernal pool ecologist and one botanist. At least one surveyor per team had a USFWS recovery permit for listed vernal pool branchiopods. The surface area at the high-water line and the approximate depth of these ponded features were documented, and their outline was mapped using a GPS unit. The absolute and relative cover of dominant plant species (those species with the highest relative cover values that together make up at least 50 percent of the total vegetative cover, and other species with a relative cover of at least 20 percent) were recorded. For each of the dominant plant species, wetland indicator status (according to Reed 1988) was determined. A determination also was made regarding whether the species typically occurs in vernal pools (according to CDFG 1998). The number of plant zones and their degree of interspersion, based on California Rapid Assessment Method (CRAM) for Wetlands methodologies (Collins et al. 2008), was recorded. Other parameters indicative of ecological complexity were recorded, including percent cover of bare ground; presence of soil cracks, cattle prints, cobbles, plant hummocks, salt, or biotic crust; and pool shape. The land use of the identified potential habitat areas and of the surrounding area was documented, including whether the area is grazed. Presence of nearby vernal pools was documented, and evidence of altered hydrology or visible disturbances was noted.

2.4.1.2.2 Documentation of Results

The survey date and team member names were recorded for each survey series. The surface area at the high-water line of each vernal pool feature was documented, and the outline was mapped using a GPS unit. Maximum inundation depth, water temperature, and general weather conditions also were recorded for each survey series. All data were incorporated into a GIS geodatabase. Digital photographs were also taken of each sampled feature during each survey series. Results were issued to USFWS in a report within 90 days after the last field visit of the season. CNDDB documentation was submitted within 10 days after the presence of listed vernal pool branchiopods was identified.

2.4.1.3 Team Composition and Equipment Used

One to two teams consisting of DWR and DHCCP staff members (two staff members per team) conducted the surveys. At least one team member held a USFWS recovery permit for branchiopods. Other staff members also were allowed to conduct surveys if they were within 3 meters of a permitted surveyor.

Equipment and supplies used during the surveys included a Trimble Geo XH GPS unit (or similar), digital camera, aerial photographs of the survey parcel, hardcopy data sheets, dip nets, a thermometer, collection vials, nitrile gloves, a hand lens, and appropriate safety gear.

2.4.1.4 Survey Timing

Surveys were conducted in two phases:

- Phase 1: wet-season sampling of branchiopod habitat in areas where access was obtained, January through May 2009
- Phase 2: branchiopod habitat assessment concurrent with botanical surveys where access was obtained after the wet season ended, April through September 2009

2.4.1.5 Candidate Survey Habitat

Areas known to support branchiopods in the CPA include the Stone Lakes area and land around Clifton Court Forebay. Habitats likely to support listed vernal pool branchiopods are vernal pools, seasonally ponded areas in vernal swales, rock outcrop ephemeral pools, playas, and alkali seasonal wetlands.

The Clifton Court Forebay survey area is composed of 82 acres of alkali seasonal wetland dominated by annual grasses and Iodinebush. Most of the vernal pools in this area are unvegetated, large, and very shallow, within a relatively flat landscape, although there are some deeper pools, especially along roadsides and berms.

The Stone Lakes survey area comprises 1,909 acres of vernal pool grassland dominated by annual grasses. Many of the pools are large, spread-out, shallow pools with poorly defined edges, most likely the result of past grading activities. Many deeper pools are found in ditches along berms and roads.

2.4.1.6 Identification of Habitat Unit Survey Locations

Potentially suitable habitat in the CPA was defined as areas that were not developed or farmed, including areas mapped by CDFG as grassland, alkali seasonal wetland, and natural seasonal wetland on soils with an impervious clay layer (clay pan). USFWS staff members were invited to attend a reconnaissance-level survey (field visit) with DWR and DHCCP staff prior to being added to the survey candidate list. A reconnaissance-level survey of habitat suitability for target survey species was conducted in the Clifton Court Forebay survey area on December 19, 2008, by DWR and DHCCP staff members. This survey covered areas owned by DWR and areas visible from Byron Highway.

Candidate survey locations were identified and mapped, then provided to USFWS for authorization. Identifications were based on CDFG habitat maps, USGS soils maps, reconnaissance-level surveys, LIDAR, and/or aerial photograph interpretation. Locations surveyed during Phase 1 were limited to parcels that could be accessed in January 2009.

2.4.1.7 Duration of Survey Validity

USFWS has not specified how long branchiopod survey results are valid. After some currently unspecified period, new surveys would be necessary to confirm species presence, absence, abundance, and distribution.

2.4.2 Results and Discussion

2.4.2.1 Survey Results

2.4.2.1.1 Phase 1 Sampling Results

Clifton Court Forebay Survey Area

Plant species observed in the Clifton Court Forebay survey area included Soft Chess, Rattail Fescue, Mediterranean Barley, Saltgrass, Iodinebush, Bush Seepweed, Spikeweed, Alkalisink Goldfields, California Goldfields, Common Peppergrass, Common Fiddleneck, Popcornflower, Boccone's Sandspurry, and Alkali Heath. Corresponding scientific names of the species mentioned in this chapter are provided in Appendix. 2.4A. Much of the area exhibited evidence of disturbance, including ditches, berms, and roads, and many areas showed signs of past grazing, although the land appeared fallow during these surveys. At least 111 individual pools were sampled; many of these pools merged into four large, shallow features after a large rain event and were sampled together in the last survey series.

Vernal Pool Fairy Shrimp were found in three locations in the Clifton Court Forebay survey area. Two of the three occurrences were in deeper, more well-defined pools in the alkali seasonal wetland. One occurrence was found in a large inundated area with both shallow and deep pools. Other aquatic invertebrates observed were seed shrimp, water fleas, copepods, flatworms, mosquito larvae, midge larvae predaceous diving beetle larvae, water scavenger beetle larvae, water boatman, backswimmers, and other aquatic worms and beetles. In addition to Vernal Pool Fairy Shrimp, Versatile Fairy Shrimp were found in many of the features sampled. Pacific Chorus Frog eggs were observed in one pool.

Stone Lakes Survey Area

Plant species observed in the Stone Lakes survey area included Italian Ryegrass, Mediterranean Barley, Common Fiddleneck, Stipitate Popcornflower, Stork's Bill, Pale Spikerush, Curly Dock, California Goldfields, Rayless Goldfields, Common Frog-Fruit, Pacific Foxtail, Mayweed, and Summer Mustard. The vernal pool grassland in this area was actively grazed, and many areas showed evidence of historic grading, although the landscape was mostly gently undulating and in some areas exhibited natural circular mounds (mima mounds) that are typical for vernal pool terrain. A few pools among the mima mounds were more round and deeper, appearing less degraded than pools in the graded areas. Eighty-five vernal pools were sampled in the Stone Lakes survey area.

Vernal Pool Fairy Shrimp were found in seven pools, and Vernal Pool Tadpole Shrimp were found in six pools in the Stone Lakes survey area. No obvious correlation was noted among branchiopod occurrences and degradation of the pools. Branchiopods were found in ditches, graded pools, and less disturbed pools. Other aquatic invertebrates observed were seed shrimp, water fleas, copepods, amphipods, flatworms, midge larvae, predaceous diving beetle larvae, water scavenger beetle larvae, water boatman, backswimmers, and other aquatic worms, beetles, and spiders. Slug and snail eggs were commonly observed, crawdads were found in a few pools, and mosquito larvae were observed in one pool. California Fairy Shrimp and California Clam Shrimp were observed in several pools.

2.4.2.1.2 Phase 2 Branchiopod Habitat Assessment

Clifton Court Forebay Survey Area

The most common plant species observed during the habitat assessment in the Clifton Court Forebay survey area, ordered from highest total cover across all pools assessed, are presented in **Table 2.4-1**.

Of the 49 plant species observed in the Clifton Court Forebay survey area, 19 are vernal pool endemics or associates, 11 are generalists, and 19 have no designation in CDFG 1998. In general, the habitat consisted of alkali seasonal wetland and alkali playa, dominated by Iodinebush, seepweed, and exotic annual grasses.

Pools where listed branchiopods (Vernal Pool Fairy Shrimp) were found had substantially more cover of vernal pool endemic or associate plants than pools where no listed branchiopods were found (mean ± standard error = 63.0 percent ± 21.0 percent and 28.4 percent ± 24.2 percent, respectively). Pools that were assessed only during the dry season had a cover percentage of vernal pool endemic species similar to that of pools where no vernal pool branchiopods were found during the wet season (mean ± standard error = 16.0 percent ± 28.8 percent). Pools where no branchiopods were found had substantially more cover of generalist plants than pools where listed branchiopods were found (mean ± standard error = 36.8 percent ± 40.7 percent and 4.3 percent ± 8.5 percent, respectively). Pools that were assessed only during the dry season had a percent cover of generalist species similar that of pools where shrimp were found (mean ± standard error = 2.3 percent ± 3.6 percent).

Table 2.4-1. Most Common Plant Species in Clifton Court Forebay Survey Area

Species	Native Status[a]	Vernal Pool Endemic Ranking[b]	Wetland Indicator Status[c]
Spikeweed	N	gen	FAC
Bush Seepweed	N	--	FAC+
Iodinebush	N	--	FACW+
Alkali Heath	N	vpa?	FACW+
Italian Ryegrass	I	gen	FAC*
Mediterranean Barley	I	--	FAC
Stipitate Popcornflower	N	vpa	OBL
Common Peppergrass	N	vpa?	--
Saltgrass	N	vpa?	FACW
Boccone's Sandspurry	NN	gen	--

[a] Sources: Hickman 1993; Cal-IPC 2006.
Native status abbreviations: I = invasive; N = native; NN = nonnative.

[b] Source: CDFG 1998.
Ranking abbreviations: vpi = species that are restricted to vernal pools and are not known from other habitats; vpa = species that regularly occur in vernal pools but are not restricted to them, also occurring in other similar wetland habitats; gen = species that can occur in more than one habitat, either wetland or upland, or sometimes both, including vernal pools, pool margins, disturbed areas, and grasslands; vpi? = a species that is a vpi in certain region(s) only and can be a vpa or gen in other regions; vpa? = a species that is a vpa in certain region(s) and is gen in other regions; vpi/vpa = a species that is a vpi in some regions and a vpa in other regions, yet not known to be a gen; -- = no ranking.

[c] Source: Reed 1988.
Status abbreviations: OBL = occurs almost always (estimated probability 99%) under natural conditions in wetlands; FACW = usually occurs in wetlands (estimated probability 67–99%) but occasionally found in nonwetlands; FAC = equally likely to occur in wetlands or nonwetlands (estimated probability 34–66%); FACU = usually occurs in nonwetlands (estimated probability 67–99%) but occasionally found in wetlands (estimate probability 1–33%); + = more frequently found in wetlands; * = tentative assignment based on limited information; -- = no status.

Vegetation composition of pools that were sampled only during the dry season was similar to that of pools *without* listed branchiopods when considering vernal pool endemic or associate species, and similar to that of pools *with* listed branchiopods when considering generalist plant species. It should be noted that, in general, as pools dry down, generalist plant species increase in cover, so these results are affected by the timing of the assessment in late spring and summer.

Table 2.4-2 presents a summary of the habitat assessment data collected for the Clifton Court Forebay survey area. Pools in this area are mostly shallow, with a high percentage of bare ground. The high number of plant zones and high degree of plant zone interspersion indicates a complex biotic structure. Moderate physical complexity is supported by soil cracks and biotic and salt crusts. Grazing and altered hydrology have affected much of the habitat. For this reason, vernal pool habitat in the Clifton Court Forebay survey area was considered to be of moderate quality overall.

Table 2.4-2. Summary Results of Habitat Assessment Data in the Clifton Court Forebay Survey Area

	Depth (n = 93)	Number of Plant Zones (n = 101)	% Cover Bare Ground (n = 104)					
Minimum	2	0	10					
Maximum	12	5	100					
Mode	4	3	35					
Count Data								
Degree of Interspersion		**Pool Shape**						
High	49	Simple	50					
Medium	25	Complex	42					
Low	26							
Presence/Absence								
	Soil Cracks	**Cattle Prints**	**Cobbles**	**Plant Hummocks**	**Salt Crust**	**Biotic Crust**	**Grazing**	**Altered Hydrology**
Yes	103	4	0	0	21	11	59 [a]	69
No	1	100	104	104	80	90	42	22

[a] Fifty-seven pools showed signs of grazing conducted previously but not during the current year. Two pools showed signs of grazing during the current year.

Source: Compiled by DWR in 2009

Stone Lakes Survey Area

The most common plant species observed during the habitat assessment in the Stone Lakes survey area, ordered from highest total cover across all pools assessed, are presented in **Table 2.4-3**.

Of the 75 plant species observed in the Stone Lakes survey area, 23 are vernal pool endemics or associates, 23 are generalists, and 29 have no designation in CDFG 1998. In general, the habitat consisted of vernal pool grassland modified for grazing (i.e., leveled) and was dominated by exotic annual grasses.

Pools where listed branchiopods (Vernal Pool Fairy Shrimp and/or Vernal Pool Tadpole Shrimp) were found had a somewhat higher cover of vernal pool endemic plants than pools where no listed branchiopods were found (mean ± standard error = 44.7 percent ± 28.3 percent and 28.1 percent ± 34.7 percent, respectively). Pools that were assessed only during the dry season had a cover percentage of vernal pool endemic species similar to that of pools where listed branchiopods were found (mean ± standard error = 49.0 percent ± 31.4 percent). There was no clear difference in generalist plant cover between pools where listed branchiopods were found compared to pools where no listed branchiopods were found or in pools that were assessed during the dry season (mean ± standard error = 14.0 ± 7.0 percent, 16.9 ± 8.3 percent, and 19.3 ± 19.9 percent, respectively).

Table 2.4-4 presents a summary of the habitat assessment data collected for the Stone Lakes survey area. Most pools were between 4 and 8 inches deep and had a low percentage of bare ground. The low number of plant zones and moderate to low degree of plant zone interspersion indicates a moderate to poor biotic structure. Pools were mostly simple in shape but had a moderate physical complexity because of soil cracks and cattle prints. The entire survey area was grazed, and most had altered hydrology as the result of historical grading of the fields. Overall, vernal pool habitat in the Stone Lakes survey area was considered to be of low to moderate quality.

1 **Table 2.4-3. Most Common Plant Species in Stone Lakes Survey Area**

Species	Native Status[a]	Vernal Pool Endemic Ranking[b]	Wetland Indicator Status[c]
Mediterranean Barley	I	--	FAC
Stipitate Popcornflower	N	vpa	OBL
Rayless Goldfields	N	vpi?	OBL
Italian Ryegrass	I	gen	FAC*
Common Frog-fruit	NN	--	FACW
Soft Chess	I	gen	FACU-
Pale Spikerush	N	vpi?	OBL
Mayweed	NN	--	FACU
California Goldfields	N	vpa?	FACU *
Pacific Foxtail	N	vpi?	OBL

[a] Sources: Hickman 1993; Cal-IPC 2006.
Status definitions: I = invasive; N = native; N = nonnative.

[b] Source: CDFG 1998.
Ranking definitions: vpi = species that are restricted to vernal pools and are not known from other habitats; vpa = species that regularly occur in vernal pools but are not restricted to them, also occurring in other similar wetland habitats; gen = species that can occur in more than one habitat, either wetland or upland, or sometimes both, including vernal pools, pool margins, disturbed areas, and grasslands; vpi? = a species that is a vpi in certain region(s) only and can be a vpa or gen in other regions; vpa? = a species that is a vpa in certain region(s) and is gen in other regions; vpi/vpa = a species that is a vpi in some regions and a vpa in other regions, yet not known to be a gen; -- = no ranking.

[c] Source: Reed 1988.
Status definitions: OBL = occurs almost always (estimated probability 99%) under natural conditions in wetlands; FACW = usually occurs in wetlands (estimated probability 67–99%) but occasionally found in nonwetlands; FAC = equally likely to occur in wetlands or nonwetlands (estimated probability 34–66%); FACU = usually occurs in nonwetlands (estimated probability 67–99%) but occasionally found in wetlands (estimated probability 1–33%); + = more frequently found in wetlands; - = less frequently found in wetlands; * = tentative assignment based on limited information.

2 **Table 2.4-4. Summary Results of Habitat Assessment Data for the Stone Lakes Survey Area**

	Depth (n = 75)	Number of Plant Zones (n = 100)	% Cover Bare Ground (n = 84)					
Minimum	4	0	0.01					
Maximum	25	4	95					
Mode	6	2	10					
Count Data								
Degree of Interspersion		**Pool Shape**						
High	24	Simple	76					
Medium	49	Complex	25					
Low	27							
Presence/Absence								
	Soil Cracks	**Cattle Prints**	**Cobbles**	**Plant Hummocks**	**Salt Crust**	**Biotic Crust**	**Grazing**	**Altered Hydrology**
Yes	70	75	3	5	0	0	101	80
No	31	26	98	96	101	101	0	20
Source: Compiled by DWR in 2009								

2.4.2.2 Limitations and Future Surveys

USFWS noted that in November 2008, a storm resulted in ponding and the presence of branchiopods in nearby pools in Davis, California. Phase 1 surveys for the BDCP EIR/EIS effort did not begin until January 2009, which is much later than described in the USFWS protocols.

Surveys of parcels with potential branchiopod habitat for which TEPs were obtained after early January were not initiated until winter 2009–2010.

2.4.3 References

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Milliken, J. (Chief, Central Valley Branch), and D. Kelly (Fish and Wildlife Biologist, Recovery Branch), Endangered Species Program, U.S. Fish and Wildlife Service, Sacramento, California. Information provided at meeting with DWR and DHCCP biologists. November 17, 2008.

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2.5 CALIFORNIA RED-LEGGED FROG

2.5.1 Methods

2.5.1.1 Target Species

The California Red-legged Frog (CRF) is a relatively large aquatic frog that is endemic to California and Baja California, Mexico. 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, California, south to northern Baja California, Mexico, and in isolated drainages in the Sierra Nevada, northern Coast Ranges, and northern Transverse Ranges.

2.5.1.2 Survey Description

2.5.1.2.1 Surveys

CRF is listed as Threatened by USFWS and is considered a Species of Special Concern by CDFG. Agencies with review and/or approval authority for CRF include USFWS under the ESA and CDFG as a trustee agency under CEQA.

The day and night visual encounter survey methodology for CRF was derived in part from the Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog (Survey Guidance) (USFWS 2005). Although the USFWS protocol recommends two day and four night surveys during the breeding season and one day and one night survey during the nonbreeding season, the methodology used for these surveys consisted of three day and three night visual surveys between January and April. When CRF were successfully identified on a parcel, additional surveys were not conducted for this species. In addition, minor modifications to the survey protocol were necessary because of logistical constraints at the site. These included such problems as not being able to: (1) access both sides of a ditch for surveying; (2) positively identify all eyeshine; (3) measure water depth; and (4) survey in ideal weather conditions.

For CRF larval surveys, the sampling methods for California Tiger Salamander (CTS) larvae described in the Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander (USFWS 2003) were followed to the extent possible.

To prevent the spread of undesirable and/or invasive organisms, the decontamination protocols outlined in Appendix B of the Survey Guidance were followed (Appendix 2.5A).

2.5.1.2.2 Documentation of Results

Habitat characteristics of each potential breeding site were collected according to the Survey Guidance (Appendix 2.5A), including the boundaries and a description of the survey area habitat type, the aquatic and terrestrial vegetation composition and relative cover, substrate, and an estimate of water depth.

Visual encounter and larval survey data attributes were collected according to the Survey Guidance (Appendix 2.5A), including the number of individuals of each life stage of all species of amphibians observed; date, time, and weather conditions when species was observed; survey team member names; presence of other amphibians; presence of predators; and GPS point records.

To the extent possible, all data attributes described above were entered into a GPS unit at the time of the survey. Written notes were kept to supplement the electronically recorded data. Photographs were taken of the habitats and any CRF life stage observed. To the extent practicable, the data and photographs were downloaded daily to a server in the office. Any new CRF observations were reported to USFWS and CDFG's CNDDB within 3 days of the sighting.

2.5.1.3 Team Composition and Equipment Used

At least one team of two biologists surveyed each area; however, larger sites had multiple teams of up to four biologists to thoroughly cover the entire area.

Visual encounter surveyors were familiar with the distinguishing physical characteristics of all life stages of the CRF, other co-occurring California frogs and toads, and introduced, exotic species, such as Bullfrogs, before surveys were conducted. All larvae surveyors either were in possession of a Section 10(a)(1)(A) permit and given prior authorization from USFWS to conduct the surveys or were working under the direct supervision of a permitted biologist with prior authorization.

Survey equipment included a GPS unit, Rite-in-Rain notebooks, water-quality meter, thermometers, weather meters, binoculars, lights, boots and/or waders, dip nets, digital cameras, water-resistant two-way radios, buckets, scrub brushes, bleach or other equipment decontaminant, disposable vinyl gloves, and appropriate safety gear.

2.5.1.4 Survey Timing

Accessible potential CRF breeding habitat within the above-described range was surveyed in the following manner. Visual encounter surveys began on January 26 and ended on April 22. Daytime visual encounter surveys aimed at detecting CRF egg masses were conducted approximately every 3 weeks from January through March. Surveys commenced no earlier than 1 hour after sunrise and ended no later than 1 hour before sunset. Nighttime visual encounter surveys aimed at detecting juvenile and adult CRF were conducted approximately every 3 weeks from January through April. They began no earlier than 1 hour after sunset. Surveys for CRF larvae were conducted once during the day in late March. Eleven individual sites located on seven parcels, all in Contra Costa County, were visited at least once during the surveys. Totals of 13 day and 21 night visual encounter surveys were conducted.

2.5.1.5 Candidate Survey Habitat

Although CRF use both aquatic and upland habitats, the greatest probability of detecting CRF is in aquatic habitats during the breeding season. CRF breed in streams, deep pools, backwaters in streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons at least 0.7 meter (2.3 feet) deep (USFWS 2002). CRF are considered extirpated from the floor of the Central Valley (61 Federal Register 25813–25833); however, they are known to travel up to 2 miles (Bulger et al. 2003). Therefore, surveys were conducted in potential breeding habitat in the Coast Range foothills and within 2 miles of the foothills on the floor of the Central Valley in the CPA (Appendix 2.5B).

2.5.1.6 Identification of Habitat Unit Survey Locations

Survey locations were identified by first delineating a 2-mile boundary from the base of the Coast Range foothills over aerial photographs in ArcMap. In the area of overlap with the CPA, areas of potential breeding habitat were identified. On accessible parcels, a reconnaissance-level survey was conducted to determine the true suitability of the habitat to support CRF, and any water body with the potential to support breeding CRF was surveyed.

2.5.1.7 Duration of Survey Validity

Survey results are considered current and valid for 2 years after the completion of the survey season.

2.5.1.8 Methodology Approvals

The survey methodology was submitted for review to USFWS and CDFG.

2.5.2 Results and Discussion

2.5.2.1 Survey Results

2.5.2.1.1 Visual Encounter Surveys

Poor visibility in some sites related to floating aquatic vegetation, typically duckweed or algae, reduced the detectability of egg masses in some areas; however, even in areas with clear visibility, no egg masses from any species of frog were observed during these surveys. Numerous Pacific Chorus Frogs and Bullfrogs, as well as a few Western Toads, were seen and/or heard during these surveys, nearly all of them during the night surveys when frogs are more easily detected by eyeshine and are less likely to dive into the water before identification can be made.

On one parcel, a juvenile CRF was found incidentally during a reconnaissance survey for potential CTS breeding habitat on February 24. Later that day, a night visual encounter survey was conducted on the property, and two adult CRF were positively identified through call recognition and visual verification. In

addition, on March 30 on a newly accessible parcel, two CRF egg masses were incidentally discovered during a larval survey for CRF and CTS.

2.5.2.1.2 Larval Surveys

Larval surveys were conducted at two sites on March 30, and CRF larvae were captured using dip nets at the same site where the two above-mentioned developing egg masses were subsequently found. CRF larvae were also collected at this site on April 22 during a subsequent survey conducted to detect CTS larvae.

2.5.2.1.3 Habitat Evaluations

Surveys were conducted in constructed ponds, natural and artificial drainage ditches, a muted tidal slough, and a vernal pool. Only 3 of the 11 sites visited were within 1 mile of an existing CNDDB record. Most of the sites accessible for surveys were heavily manipulated waterways dominated by Bullfrogs near the valley floor and would not be considered high-quality CRF habitat. As mentioned above, some drainage ditches and ponds were covered in duckweed and algae. Where emergent aquatic vegetation was present, it was dominated by bulrushes, typically Common Tule, and uplands were dominated by Saltgrass and nonnative annual grasses. Potential predators common to most sites included Raccoons, Bullfrogs, Mosquitofish, and herons and egrets.

2.5.2.2 Limitations and Future Surveys

CRF was observed at two of the three sites surveyed that were within 1 mile of a past record of a CRF sighting. The other site was a shallow vernal pool that likely would not support successful breeding except possibly in the wettest years. All three of these sites were above sea level; the remaining eight survey sites were below sea level. USFWS recognizes that CRF has likely been extirpated from the valley floor for decades, and although they are able to disperse across seemingly unsuitable upland habitats, it does not appear that there is much suitable habitat in the lowland Delta for them to successfully reestablish a breeding population. Even at one site, a muted tidal slough, where adult frogs were calling, the potential for successful breeding was slight. The water level fluctuated such that egg masses attached to the only emergent vegetation available would become fully exposed above the waterline during low tides and possibly would become desiccated. Nevertheless, their presence at the site demonstrates that CRF will occupy seemingly unsuitable habitat, if only temporarily, so it should not be assumed that they will occur only in what would be considered typical or high-quality habitat in the CPA.

Winter 2009 was unusually dry and marked the third consecutive dry year in the State, reducing the potential for amphibians to successfully breed; however, storms in February offered late-season opportunities. The still-developing egg masses and small larvae discovered in March likely were the products of breeding attempts occurring shortly after those storms. CRF breeding activity in the nearby foothills, as evidenced by the number of new egg masses detected, typically peaks between late February and mid-March (DWR, unpublished data). To the extent practicable, future surveys will be adjusted to coincide with recent rainfall events in an attempt to maximize the likelihood of detecting breeding frogs and their egg masses. An attempt also will be made to conduct more larval surveys in the future.

2.5.3 References

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2.6 CALIFORNIA TIGER SALAMANDER

2.6.1 Methods

2.6.1.1 Target Species

The California Tiger Salamander (CTS) is a large, stocky terrestrial salamander that is endemic to California. CTS are restricted to vernal pools and seasonal ponds, including many constructed stock ponds, in grassland and oak savanna plant communities. In the coastal region, populations are scattered from Sonoma County in the northern San Francisco Bay Area to Santa Barbara County (up to elevations of 3,500 feet), and in the Central Valley and Sierra Nevada foothills from Yolo County to Kern County (up to 2,000 feet).

2.6.1.2 Survey Description

2.6.1.2.1 Surveys

The Central California Distinct Population Segment of CTS is listed as Threatened by USFWS, and the entire species is listed as a Threatened species by CDFG. Agencies with review and/or approval authority for CTS are USFWS under the ESA and CDFG under CESA (California Fish and Game Code §2805) and as a trustee agency under CEQA.

This proposed survey methodology for CTS was derived in part from the Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander (USFWS 2003); however, unlike this guidance, it did not include an upland habitat survey component. To prevent the spread of undesirable and/or invasive organisms, the decontamination protocols outlined in Appendix B of Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog (USFWS 2005) were followed (Appendix 2.5A).

There are no protocols regarding searching for CTS eggs; however, while sampling for vernal pool invertebrates, surveyors concurrently looked for amphibian eggs, including CTS eggs.

To the extent practicable, aquatic larvae sampling followed the methodology described in the Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander (USFWS 2003).

2.6.1.2.2 Documentation of Results

Data about the type and quality of each pool sampled were recorded. These data included the date and time, location, type of water body (e.g., vernal pool, seasonal wetland, artificial impoundment), dimension and depth of pond, water temperature, presence of aquatic vegetation (submergent and emergent), and dominant invertebrates and all vertebrates observed. Pools and adjacent upland areas were photographed.

Data collected during the visual encounter (incidental observations during vernal pool invertebrate surveys) and aquatic CTS larvae surveys included the number of individuals of each life stage observed;

date, time, and weather conditions when the species was observed; survey team member names; and GPS point records.

To the extent possible, all data attributes were entered into a GPS unit at the time of the survey. Notes were kept to supplement the electronically recorded data. Photographs were taken of the habitats and any CTS life stage observed. To the extent practicable, the data and photographs were downloaded daily to a server in the office. Any new CTS observations were reported to USFWS and CDFG's CNDDB within 3 days of the sighting.

2.6.1.3 Team Composition and Equipment Used

Survey efforts consisted of one to two teams of two people for egg surveys (conducted during vernal pool invertebrate surveys) and for aquatic larvae sampling. Those conducting surveys for CTS larvae either possessed a Section 10(a)(1)(A) permit from USFWS and scientific collecting permit from CDFG authorizing this activity or they obtained approval to work under someone possessing these permits.

Visual encounter surveyors were familiar with the distinguishing physical characteristics of all life stages of CTS, as well as the egg and larval stages of other co-occurring California amphibians, including introduced, exotic species such as Bullfrogs, before they conducted surveys.

Survey equipment included a GPS unit, Rite-in-Rain notebooks, thermometers, weather meters, boots and/or waders, dip nets, digital cameras, auto-inflating personal floatation devices, buckets, scrub brushes, bleach or other equipment decontaminant, disposable vinyl gloves, and appropriate safety gear.

2.6.1.4 Survey Timing

All accessible potential CTS breeding habitat in the CPA and within the above-described habitat were surveyed in the following manner. Daytime visual encounter surveys aimed at detecting CTS eggs were conducted incidentally by the vernal pool invertebrate biologists as they performed their surveys, approximately once every 2 weeks, from January (or whenever access was obtained) through early April (or whenever the pools dried out). Surveys began no earlier than 1 hour after sunrise and ended no later than 1 hour before sunset. Surveys for CTS larvae were conducted twice: once in March and once in April.

2.6.1.5 Candidate Survey Habitat

Although CTS spend most of their lives in upland habitats, the restrictions on parcel access and seasonality of aboveground activity limited the type of habitat that could be surveyed for CTS. CTS breed in vernal pools and seasonal and perennial ponds that typically contain standing water continuously for at least 10 weeks extending into April in grassland and oak savanna plant communities from sea level to 2,000 feet (USFWS 2003, 69 Federal Register 47212–47248).

2.6.1.6 Identification of Habitat Unit Survey Locations

Survey locations were identified by first overlaying aerial photographs with grassland and oak savanna communities (Hickson and Keeler-Wolf 2007) in ArcMap. In the area of overlap with the CPA, areas of potential breeding habitat were identified. Sites that dried up before April and sites containing bullfrogs, crayfish, and/or predatory fish were excluded from larval surveys in 2009.

2.6.1.7 Duration of Survey Validity

Survey results are considered current and valid for 2 years after the completion of the survey season.

2.6.1.8 Methodology Approvals

The survey methodology was submitted for review to USFWS and CDFG.

2.6.2 Results and Discussion

2.6.2.1 Survey Results

2.6.2.1.1 Visual Encounter Surveys

Nearly 200 pools were mapped and sampled for vernal pool species from January through early April 2009 in the vicinity of Clifton Court Forebay (Contra Costa County) and Stone Lakes National Wildlife Refuge (Sacramento County). No CTS eggs were observed during these surveys, and the only amphibian eggs found during these surveys were those of Pacific Chorus Frogs.

2.6.2.1.2 Larval Surveys

Larval surveys were conducted at two locations in Contra Costa County concurrently with larval surveys for CRF. Three very small CTS larvae were collected using dip nets at one site on March 30; however, the pool had nearly dried by the time it was visited a second time on April 22. The second site was also sampled on both dates, but no CTS larvae were captured either time; however, CRF egg masses and larvae were observed at this site.

2.6.2.1.3 Habitat Evaluations

The habitat type around Clifton Court Forebay is vernal alkali plains dominated by annual grasses and Iodinebush, and the habitat type around North Stone Lakes is vernal pool grassland dominated by annual grasses. The water bodies that were surveyed for CTS eggs ranged from small puddles and tire ruts to pools nearly 1 acre in area with maximum depths ranging from 1 inch to 2 feet.

Only two sites were sampled for larvae: a shallow vernal pool and a small but perennial stock pond. Both were located in annual grassland that was grazed by cattle and that supported both California Ground Squirrel and Botta's Pocket Gopher activity. Neither had Bullfrogs or predatory fish, but the deeper site, where CTS were not found but CRF were, did have crayfish and Mosquitofish.

2.6.2.2 Limitations and Future Surveys

Winter 2009 was unusually dry and marked the third consecutive dry year, reducing the potential for amphibians to successfully breed; however, storms in February offered some late-season opportunities. The discovery of small larvae in a vernal pool in late March was likely the product of breeding attempts occurring shortly after those storms. This location was the site of a nearly 30-year-old CNDDB record for CTS, so even though breeding was not successful this year because the pool very likely dried before the larvae could metamorphose, surveys suggested that CTS still occur in the area and do use this pool.

2.6.3 References

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2.7 GIANT GARTER SNAKE

2.7.1 Methods

2.7.1.1 Target Species

The Giant Garter Snake (GGS) is a summer aquatic species that is endemic to the wetlands of the floor of the Central Valley of California. Historically, GGS was found from the vicinity of Chico, in Butte County, southward to Buena Vista Lake, near Bakersfield in Kern County. This historical range coincided with the historical riverine flood basins, freshwater wetlands, and tributary streams throughout the Central Valley. Today, GGS is found in isolated populations ranging from Butte County in the Sacramento Valley to Fresno County in the San Joaquin Valley.

2.7.1.2 Survey Description

2.7.1.2.1 Surveys

GGS is listed as Threatened by USFWS and CDFG. GGS surveys were designed to detect areas being used by GGS in the CPA for use in the EIR/EIS analyses. The effort was not intended to be intensive enough to detect every GGS in the area, although attaining broad geographic coverage of the CPA was desired.

Agencies with review and/or approval authority for GGS surveys are USFWS under the ESA and CDFG under CESA because the species is listed as Threatened under both acts.

Survey efforts required between two and four teams of two to four people for visual encounter surveys and trapping. Those hand-capturing GGS during visual encounter surveys or conducting trapping surveys for GGS either possessed a Section 10(a)(1)(A) permit from USFWS and a scientific collecting permit from CDFG authorizing these activities, or obtained approval to work under someone possessing these permits.

The survey strategy used a standard number of traps (i.e.; 50 traps per trap line) and a trapping period during which time it was expected that GGS would be captured if they occurred in the area in numbers sufficient to support a subpopulation. This level of effort is used by other GGS researchers, so the results of the current surveys can be compared with those surveys to evaluate the relative size and structure of the GGS subpopulations detected (if any).

Visual encounter surveys were conducted primarily on foot between the hours of 9 a.m. and 4 p.m. by scanning the transition zone between aquatic and upland habitat features and recording all snakes encountered. These early season visual encounter surveys were conducted concurrently with reconnaissance site visits to determine the feasibility of trapping the aquatic features present at the site.

At each site chosen for trapping surveys, at least one line composed of 50 traps set approximately 10 meters (33 feet) apart and placed along the wetland vegetation/open water interface (where present) was set for 14 days. Traps were checked daily, and any captured snakes were documented. For most of the season, a total of 300 traps (six locations) were surveyed on the same day.

2.7.1.2.2 Documentation of Results

Most data were recorded using a Trimble GeoXM GPS unit loaded with base maps and data entry forms. Digital photographs were taken of survey locations. Notes to supplement the electronic data were taken in the Rite-in-Rain notebooks that were left in the survey vehicles so a daily log could be created.

Habitat characteristics were recorded at each trap line location on a score sheet so they could be compared to each other. Characteristics evaluated included persistence of water throughout the year, substrate, composition and coverage of aquatic and terrestrial vegetation, relative sun or shade coverage,

presence of predators and prey, adjacent land use, frequency of human disturbance, and proximity to a known population of GGS (**Figure 2.7-1**).

2.7.1.3 Team Composition and Equipment Used

Typically, two teams of two individuals worked simultaneously each day, sometimes at the same sites, especially during trap setting and removal, but sometimes in separate areas when the six individual trap lines were distributed relatively far apart. At least one person in the field possessed a USFWS Section 10(a)(1)(A) permit and prior authorization from USFWS and CDFG to conduct the surveys; others working in the field had obtained adequate experience under the permitted individuals' instruction to check traps independent of their immediate supervision.

Survey equipment included a Trimble GeoXM GPS unit, digital cameras, thermometers, and wind meters. For snake trapping, equipment included kayaks, modified minnow traps (Casazza et al. 2000), telescoping trap poles, and snake bags. For snake processing, equipment included tape measures, digital calipers, spring scales, electro-surgical cauterizing instrument (microbrander), surgical scissors, PIT tags and reader, and vials containing 95–100 percent ethanol (EtOH) for preserving tissue samples. Additional equipment included binoculars, Rite-in-Rain notebooks, and appropriate safety gear.

2.7.1.4 Survey Timing

Surveys were conducted in two phases:

- Phase 1: visual encounter surveys on accessible parcels throughout April 2009 (surveys were conducted on 14 separate days, concurrently with habitat assessment reconnaissance surveys, on 97 parcels, and concurrently with trapping surveys conducted from May through September)
- Phase 2: trapping surveys on accessible parcels from May through September 2009 (surveys were conducted between May 4 and September 30, and 62 individual trap lines were set for a total of approximately 42,700 trap-days [trap-days are the product of the number of traps and the number of 24-hour periods that traps were operational; all reports of trap-days throughout the document will be approximations because traps occasionally were stolen, damaged, or otherwise incapacitated by tidal fluctuations or other mechanisms])

2.7.1.5 Candidate Survey Habitat

GGS occupies remnant native marshes and sloughs; restored wetlands; low-gradient streams; agricultural wetlands, including irrigated rice fields and irrigation and drainage canals; and adjacent upland habitats. The species appears to be absent from larger rivers, especially those bordered by dense riparian vegetation.

2.7.1.6 Identification of Habitat Unit Survey Locations

In an attempt to achieve adequate coverage of the entire CPA, the area was divided into 10 survey sections (**Figure 2.7-2**). An effort was made to survey each section at least once; however, limitations on accessible parcels and the suitability of available habitat did not always afford that opportunity.

The determination of GGS habitat suitability was based on the presence, quality, and quantity of what have been described as the essential components of GGS habitat: (1) wetlands with adequate water to provide food and cover during the active season, which is from early spring through midfall; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for overwintering habitat with escape cover in the form of vegetation and burrows and underground refugia in the form of crevices and small-mammal burrows. Not all essential habitat components were required for a site to be considered suitable for trapping surveys, although one component that was constant across all sites trapped was persistent water, ensuring the opportunity for prey population establishment. Conversely, some sites with seemingly all the essential habitat components could not be trapped because of shallow water levels that precluded access to the

sites or fluctuating water levels that would have potentially stranded some traps out of the water, exposing captured animals to heat stress and desiccation.

2.7.1.7 Duration of Survey Validity

There are no approved survey protocols for GGS. If GGS are located, their presence will be considered valid until USFWS and CDFG state otherwise. If GGS are not located, lack of detection cannot be considered absence; therefore, negative survey data do not possess a "valid duration" that would trigger the need for new surveys.

2.7.1.8 Methodology Approvals

The survey methodology was submitted for review to USFWS and CDFG. USFWS provided authorization for trapping and handling of GGS, and CDFG was notified of the intent to collect GGS.

2.7.2 Results and Discussion

2.7.2.1 Survey Results

2.7.2.1.1 Visual Encounter Surveys

Air temperatures ranged from the upper 60s to mid-70s (Fahrenheit) during the surveys, which took place between the hours of 9 a.m. and 4 p.m. Nine snakes were seen but not captured, and two snakes were captured by hand during these surveys. Of the nine snakes observed, six were unidentified garter snakes, one was a Gopher Snake, one was a Yellow-bellied Western Racer, and one was a Common Kingsnake. The captured snakes were a Common Garter Snake and a Common Kingsnake. All these snakes with the exception of the Common Kingsnake, which was observed in Section 10, were found in Section 6 (Figure 2.7-2). No GGS were observed or captured during the visual encounter surveys or habitat assessments conducted in April. Incidental reptile species observed during these surveys included Western Pond Turtle, a California Species of Special Concern; Red-eared Slider; and the ubiquitous Western Fence Lizard.

2.7.2.1.2 Trapping Surveys

No GGS was observed or captured during this period; however, a total of 69 snakes of other species were observed, 40 of which were captured. Of the 40 snakes captured, 14 were caught in traps, resulting in a catch per unit effort of 0.000328, or 3,050 trap-days per snake. Twenty-six snakes were captured by hand.

The CPA was subdivided into 10 sections. The snake species and number of specimens captured or observed (but not captured) in each section are summarized in **Table 2.7-1**. A total of four snake species were captured (Common Kingsnake, Common Garter Snake, Western Terrestrial Garter Snake, and Gopher Snake), and at least one additional species (a Yellow-bellied Western Racer) was observed only.

2.7.2.1.3 Habitat Evaluations

GGS habitat quality was evaluated and scored at each trap line on a data sheet (Appendix 1.5A) so that the relative quality of each location could be compared. A perfect score of 24 was possible; however, the habitat trapped ranged between 6 and 21 with a mean of 15 and a median of 16. **Table 2.7-2** offers a comparison of habitat quality scores of trapping sites among sections with a description of the types of habitats that were sampled. As mentioned before, all sites appeared to possess perennial water at a level sufficient to support at least low densities of prey amphibians and fish and on average possessed moderate-quality habitat.

2.7.2.2 Limitations and Future Surveys

The lack of GGS observations and captures was particularly noteworthy given the amount of effort focused in areas near previous GGS sightings. Twenty-seven of the 62 trap lines (43.5 percent) were placed within 1 mile of a CNDDB record (CDFG 2009) of a GGS occurrence. GGS expert Eric Hansen began independently surveying one trap location 6 weeks after the trap had been removed and successfully captured more than one GGS with methods, equipment, and level of effort nearly identical with those used by the BEST biologists (Hansen pers. comm. 2009). These GGS captures validated the survey assumption that the level of effort expended would catch at least one GGS if the species was present in densities great enough to suggest a self-sustaining subpopulation.

Table 2.7-1. Snakes Captured or Observed during Trapping Surveys

GGS Survey Section	Number of Trap Lines, Dates	Trap-Days	Species Captured (Number of Specimens) / Capture Method (h = by Hand, t = in Trap)	Species Observed (Number of Specimens)
1	6 6/6 – 7/8	4,200	None	None
2	3 6/5 – 8/14	2,100	Common Kingsnake (1) /h	Common Garter Snake (1) Yellow-Bellied Western Racer (1) Gopher Snake (1) Unidentified Garter Snake (2)
3	15 5/18 – 8/21	9,800	Common Garter Snake (1) /t Gopher Snake (1) /h	Unidentified Garter Snake (4) Gopher Snake (1) Yellow-Bellied Western Racer (1)
4	6 6/1 – 7/15	4,200	None	Racer (1)
5	2 7/22 – 8/26	1,400	Gopher Snake (1) /h	None
6	12 5/4 – 8/21	8,400	Common Garter Snake (10) /t Gopher Snake (2) /t Common Garter Snake (1) /h Western Terrestrial Garter Snake (4) /h Gopher Snake (7) /h Common Kingsnake (10) /h	Unidentified Garter Snake (7) Common Garter Snake (2) Gopher Snake (4) Yellow-Bellied Western Racer (2)
7	16 7/8 – 9/30	11,200	Gopher Snake (1) /t	Gopher Snake (1) Unidentified Snake (1)
8	0	0	Not Surveyed	Not Surveyed
9	1 7/24 – 8/7	700	Gopher Snake (1) /h	None
10	1 8/3 – 8/17	700	None	None

Source: Data compiled by DWR in 2009

Table 2.7-2. Giant Garter Snake Habitat Quality Scores for Trapping Sites

GGS Survey Section	Range of Scores	Average Score	Median Score	Habitat Types
1	14–18	16	16	Natural and Constructed Ponds, Agricultural Drainage and Supply Ditches
2	12–18	14	12	Artificial Pond, Irrigation and Toe Ditches
3	6–21	14	16	Tidal and Nontidal Sloughs, Natural and Artificial Ponds, Drainage Ditch
4	10–16	14	14	Artificial Ponds, Agricultural Ditches
5	10	--	--	Artificial Pond
6	11–20	16	16	Artificial Ponds, Agricultural Drainage Channels
7	13–20	16	17	Agricultural Ditches and Drainage Channels
8	--	--	--	--
9	13	--	--	Agricultural Ditch
10	16	--	--	Agricultural Ditch
Source: Data compiled by DWR in 2009				

One meaningful difference between BEST and Mr. Hansen's efforts was survey timing; BEST trapped the site in mid-May, and Mr. Hansen began trapping in early July. Although the vast majority of other snake captures were in May, it is possible that GGS were not as active in that area during BEST surveys. Nearly all of BEST's captures in this area were of snakes on land, so it is possible that water temperatures were still cool enough to discourage snakes from spending prolonged periods in the water, which would directly affect the success of aquatic traps. Unfortunately, water temperature data or prey composition and abundance data were not collected to compare with the conditions during Mr. Hansen's trapping effort.

Because GGS distribution is so poorly understood in this part of its range, any opportunity to search for this species contributes greatly to efforts to conserve the species and its habitat. Identifying occupied areas and areas of high-quality habitat will continue to be the goal of future surveys.

Overall, there were few snakes of any species captured, but the vast majority of snake sightings and captures occurred in Section 6. **Table 2.7-3** offers a comparison of relative trapping survey effort per section, absolute number of days that each section was accessed for surveys, and the relative amount of snake observations in each section during the trapping period between May 4 and September 30. Nearly three-quarters of the snake observations and captures occurred in Section 6, even though less than one-fifth of the trapping effort occurred there. Although Section 3 had the next highest proportion of snake observations, the relative survey effort was greater, especially in terms of the number of days that the area was visited, than in Section 6. Both of these sections are located along the eastern edge of the Delta, which contains a higher proportion of land above sea level than other sections. All the observations and captures made during the visual encounter survey and trapping period, with the exception of two Gopher Snakes, were located either above sea level or within one-half mile of the transition zone from above to below sea level. It is possible that elevation, an element correlated with GGS sightings around the Delta (Hansen 1988), plays an important role in the distribution of snakes, even terrestrial snakes, and truly suitable habitat in the CPA.

Table 2.7-3. Relative Trapping Survey Effort per Section

GGS Survey Section	Survey Effort (% of Total Trap-Days)	Number of Days Accessed (Out of 150)	Snake Observations (% of Total)
1	9.8	31	0.0
2	4.9	32	8.7
3	23.0	94	11.6
4	9.8	41	1.4
5	3.3	30	1.4
6	19.7	58	71.0
7	26.2	62	4.3
8	0.0	0	0.0
9	1.6	15	1.4
10	1.6	15	0.0
Source: Data compiled by DWR in 2010			

2.7.3 References

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Hansen, E. C. 2009. Herpetologist. Telephone conversation with L. Patterson, Staff Environmental Scientist, California Department of Water Resources, Sacramento, California. August 2009.

2.8 BIRDS

Twenty-five special-status bird species are known to or expected to nest in the CPA. Surveys were conducted in January and February 2009 for the Sandhill Crane, which is the only special-status species that overwinters in the CPA. Additional surveys were conducted from April 1 through July 31 for the 24 other special-status bird species that are known to or are expected to nest in the CPA. In the following discussion, species are grouped by similar survey methodology, wherein species in each group were surveyed for at the same time, using similar methods, in basically the same habitat within the CPA.

The goal of the 2009 surveys was to identify and delineate all potential and occupied nest sites and nesting habitat for special-status bird species and winter-use areas for Sandhill Crane.

For each special-status species observed, data were collected with a GPS receiver noting the species observed; number observed; time; location, including the location of the observer and the distance from and direction to the subject; habitat type as a function of vegetative structure; and general activity of the subject that would indicate that it was nesting at the site. For species such as egrets, herons, and cormorants, actual nesting had to be observed; for hawks, nesting or specific nesting behavior had to be observed, such as territory defense; and for most passerines, the bird needed only to be on-site (flyovers were not accepted). Rookeries and other nesting habitat found were assumed to be extant for a minimum of 5 years.

Avian survey teams surveyed 166 parcels and approximately 500 miles of shoreline in the CPA. Teams collected more than 3,200 avian data points, many of which represent more than one bird. Most of those points represent song sparrows.

2.8.1 Double-Crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, and Black-Crowned Night-Heron

2.8.1.1 Methods

Double-crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, and Black-crowned Night-Heron are tree-nesting water birds, and all are State Species of Special Concern. The primary concern regarding these species is loss of nesting habitat. Each of these species typically uses rookeries (colonial nest sites in large trees) that often include interspecies nesting with other species in this group. Because of the colonial nature of the species, their fidelity to nest sites, and their need for large, mature riparian trees (primarily), the impacts on the species can be substantial if rookeries and other large, mature trees that have a potential to be used as rookeries are lost.

The specific goal of the 2009 surveys regarding these species was to identify all rookeries in the CPA on parcels for which the surveyors had access, as well as along all boat-accessible waterways. No formal protocols have been developed to survey for these species' rookeries. The survey methodology, summarized in the following paragraph, was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts. The 2009 surveys were completed by DWR, CDFG, and DHCCP staff members.

Teams of two or more surveyors walked transects throughout all available parcels and/or traveled by boat along all accessible waterways on a minimum of two occasions between April 1 and June 30 during daylight hours. Lands with suitable habitat characteristics were searched visually and supplemented with binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species and on trees that had multiple nest sites. Observations focused on large riparian trees, although large nonriparian trees also were scanned for both nests and target species. All trees with active nests of the target species were recorded, including type and number of species, location, and habitat type.

2.8.1.2 Results and Discussion

2.8.1.2.1 Survey Results

Available nesting habitat (large, mature trees) is highly variable throughout the CPA, depending on land use and riverbank management. Most potential nesting habitat occurs along or within (on instream islands) the Delta's rivers and sloughs. Instream islands are unleveed islands in waterways; in the Delta, they often are vegetated by emergent wetlands and/or riparian scrub.

Of the species in this group, surveyors collected 26 data points representing more than 300 Double-crested Cormorants in eight distinct rookeries (data corrected for likely double-counting) that were found throughout the Delta. All but one of the Double-crested Cormorant rookeries are located on instream islands or existing preserves. All are located in riparian trees. Six are adjacent to marsh, one is adjacent to grassland/scrub, and one is adjacent to alkali sink habitat.

Surveyors collected 73 data points representing more than 263 Great Blue Herons in 19 distinct rookeries (data corrected for double-counting) that are distributed throughout the Delta. All Great Blue Heron rookeries were found in riparian trees adjacent to rivers, sloughs, or marshes. Eleven are on instream islands, six are in or adjacent to marsh complexes, and two are adjacent to grasslands/scrub habitat. Of the eight rookeries not found on instream islands, six are on preserved lands.

The avian surveyors collected 28 Great Egret data points representing at least 271 individuals in 11 rookeries (data corrected for double-counting) that are distributed throughout the Delta. All Great Egret rookeries were found in riparian trees. Six rookeries were found in marsh complexes, three on instream

islands, one along a slough in alkali sink scrub habitat, and one in a farm complex (adjacent to an apparent marsh/slough remnant). All six rookeries adjacent to marsh are on preserved natural habitat.

Surveyors collected four data points for Snowy Egret rookeries and observed eight individuals in them. All four data points were in the north Delta. All Snowy Egrets were observed nesting in riparian trees. Unlike the species in this group, Snowy Egrets nested only on preserved lands adjacent to or in marsh complexes, and none were observed nesting on instream islands.

Surveyors observed a total of 12 Black-crowned Night-Herons in 4 rookeries. Two of the rookeries are located in riparian scrub in the south Delta near Clifton Court Forebay. One of the rookeries is located south of Walnut Grove, and one is located north of Walnut Grove; both are in riparian trees. Conditions at the four nest sites vary from well-developed riparian corridors to single trees along a heavily disturbed levee embankment.

2.8.1.2.2 Limitations and Future Surveys

Species in this group may be surveyed for in new, previously unsurveyed parcel locations that become available during future survey periods. Surveys will continue as performed in the 2009 survey season.

2.8.2 Least Bittern, Black Rail, and White-Faced Ibis

2.8.2.1 Methods

Least Bittern, Black Rail, and White-faced Ibis are marsh-nesting water birds that nest on the ground or in mats of marsh vegetation, typically using cattail and tule marsh in the CPA. The primary impact concern regarding the Least Bittern, a State Species of Special Concern, is loss of nesting habitat. The impact concerns regarding the Black Rail, State listed as Threatened, is physical loss of nesting habitat and winter refugia, increased mortality from new project structures (such as transmission lines), project-related disturbance, and project-caused changes in water elevations in their nesting habitat and winter refugia. The primary concern regarding White-faced Ibis, which was a State Species of Special Concern but has been downgraded to a listing on the CDFG Watch List, is loss of or impacts on its rookeries. Several thousand acres of potential nesting habitat for the three species, and winter and migration refugia for Black Rail, occur throughout the Delta, although most occurs in the central Delta. Nesting habitat and refugia exist in preserved and managed marshes, in tidal marshes, and on instream islands.

The specific goals of the surveys were to identify and delineate likely nesting habitat for each species, as well as Black Rail winter and migration refugia, on parcels for which the surveyors had access and along all boat-accessible waterways. No formal survey protocols have been developed for Least Bittern or White-faced Ibis. A formal protocol is available for Black Rail surveys in coastal marsh (Evens 2002), which was adapted for use in the Delta. The survey methodology was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

A habitat analysis was conducted by a GIS team consisting of DWR and DHCCP personnel who identified cattail and tule marsh patches of 8 acres or greater. Ten marsh patches on accessible parcels and islands with appropriate habitat were delineated and surveyed. Teams of two or more surveyors walked or traveled by boat along the edges of those marshes on four occasions between April 1 and June 30 during daylight hours. Black Rails were surveyed for on all four occasions, and Least Bitterns were surveyed for on two of those occasions. Surveyors stopped every 100 meters (or at longer intervals, depending on the habitat) and played calls of both species, then listened for responses from the target species. All responses from target species were recorded as assumed nesting birds. Additionally, all spontaneous calls by the target species were recorded in the same way. The White-faced Ibis was surveyed through observation only, in all shallow water wetland. The species is colonial and typically easily observed at nest sites.

2.8.2.2 Results and Discussion

2.8.2.2.1 Survey Results

No Least Bitterns were observed or heard during surveys. It is unclear whether that is the result of few or no Least Bitterns in the CPA or ineffective survey techniques.

Surveyors collected nine data points for Black Rails, which represent two nesting locations in the east-central Delta. The first location is a 56-acre tule wetland in the White Slough complex northwest of Stockton. The second is on a 25-acre instream island with tule wetland, one of a series of islands east of Stockton. Both locations are located in the eastern part of the CPA and are dominated by freshwater tidal marsh. Winter and migration refugia were identified through aerial map analysis only.

Surveyors had incidental observations of White-faced Ibis foraging in the CPA, but no nesting colonies were observed. The shallow water marsh may not be appropriately structured for nesting in the CPA, or it may be that the species has not yet returned following its extirpation there.

2.8.2.2.2 Limitations and Future Surveys

Least Bitterns and White-faced Ibis may be surveyed for in new, previously unsurveyed DHCCP locations that become available after the 2009 survey season, or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season.

Black Rails may be surveyed for in future survey seasons on newly available parcels with appropriate habitat. In addition, focused surveys will be completed in areas where the species was not found but where historic records exist. Surveys will continue in 2010.

2.8.3 Redhead, Northern Harrier, and Short-Eared Owl

2.8.3.1 Methods

Redhead, Northern Harrier, and Short-eared Owl are typically marsh-associated ground-nesting birds. The primary impact concern related to these three State Species of Special Concern is loss of nesting habitat.

The goal of the surveys was to identify and delineate likely nesting habitat of these species in the CPA. Specifically, the objective of the surveys was to identify the species' nesting habitat in the CPA on parcels for which the surveyors had access, as well as along all boat-accessible waterways. No formal protocols have been developed to survey for any of these species. The survey methodology summarized in the following paragraph was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors walked or traveled by boat throughout all available parcels and waterways on a minimum of two occasions between April 1 and June 30 during daylight hours. All appropriate habitat was searched to the greatest extent possible with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species, watching for any of them to fly from a nest site. In addition, harriers were observed for nesting behaviors, and the approximate nest location was identified. All target species with assumed active nests were recorded.

2.8.3.2 Results and Discussion

2.8.3.2.1 Survey Results

Several thousand acres of potential nesting habitat for these species are located throughout the Delta. Nesting habitat exists in preserved and managed marshes; in tidal marshes; on instream islands; and, in some cases, in seasonal wetland/grassland.

Surveyors collected 21 data points representing at least 20 northern harrier nest sites in most appropriate habitat throughout the Delta. No nesting northern harriers were observed in the northern portion of the CPA, although they were common there throughout the nesting season. Much of the marsh in that region is surrounded by riparian trees, which reduces visibility of the species, which may have resulted in missed observations, or it may be that northern harriers avoid nesting in marshes with large adjacent riparian stands.

No Redheads or Short-eared Owls were observed or heard during surveys. Redheads probably occur in the Central Valley in small numbers, and primarily as nonbreeders, because they prefer larger lakes for nesting. Although Short-eared Owls are known to nest in the CPA, they are rare and primarily are found along the western edge of the CPA. The surveys used were not optimal for finding nesting Short-eared Owls, but the surveys were deemed adequate for this effort given that the species is unlikely to nest in the CPA, the species has limited CEQA protection, and it will most likely benefit from the BDCP wetland restoration activities.

2.8.3.2.2 Limitations and Future Surveys

The species in this group may be surveyed for in new, previously unsurveyed locations that become available after the 2009 survey season or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season, with slight modifications to improve observation of Northern Harriers where wetlands are surrounded by tall riparian vegetation.

2.8.4 White-Tailed Kite, Cooper's Hawk, Swainson's Hawk, and Osprey

2.8.4.1 Methods

White-tailed Kite, Cooper's Hawk, Swainson's Hawk, and Osprey are primarily riparian tree–nesting species, although White-tailed Kites sometimes nest in large shrubs, Swainson's Hawks also use nonriparian trees, and Osprey often use human-made structures, such as transmission lines and cell towers. White-tailed Kite is State listed as Fully Protected, Swainson's Hawk is State listed as Threatened, and Cooper's Hawk and Osprey were State Species of Special Concern but have been downgraded to a listing on the CDFG Watch List. The primary impact concern regarding these species is loss of nesting structures and habitat. Additional impact concerns include direct take of White-tailed Kite and direct take of, and loss of foraging habitat for, Swainson's Hawk.

The specific goal of the 2009 surveys was to find and delineate the species' nest sites in the CPA on parcels to which the surveyors had access, as well as along all boat-accessible waterways. Of these species, a formal survey protocol has been developed for Swainson's Hawk only, and for preconstruction surveys, specifically. All survey methodologies, summarized in the following paragraph, were developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors walked or traveled by boat throughout the available parcels and waterways on a minimum of two occasions between April 1 and June 30 during daylight hours. All appropriate habitats were searched to the greatest extent possible with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species, looking for nests, paired birds, and specific behaviors that indicated nesting near the observation point. Actual or approximate nest location was identified and mapped. All target species with actual or assumed active nests were recorded.

2.8.4.2 Results and Discussion

2.8.4.2.1 Survey Results

Potential nesting habitat for these species occurs throughout the Delta, although each species has somewhat specific needs. Nesting habitat exists in riparian corridors, marshes, and tidal marshes;

on instream islands; and, in some cases, in seasonal wetland/grassland. Swainson's Hawks and Osprey nest in most land use types if appropriate trees or structures exist.

Fourteen avian data points representing at least nine White-tailed Kite nest sites were collected in the central and north Delta. No nests were observed in the south Delta. Nest sites typically were associated with dense riparian vegetation adjacent to seasonal wetland/grassland and marsh habitat. Nest sites were notably absent along navigable waterways and marsh without dense riparian trees. Almost all nest sites were located in the eastern portion of the CPA.

One data point was collected for Cooper's Hawk based on territorial behavior, and no nests were observed. This result was expected because Cooper's Hawks probably nest in the Delta in low numbers, and although they are readily observed soaring and foraging, they are relatively difficult to detect at nest sites because they nest in dense tree stands. No adjustments to survey methodology are expected for the species given the downgraded legal status from State Species of Special Concern to a listing on the CDFG Watch List.

Surveyors collected 130 Swainson's Hawk data points, which represent at least 85 individual nests. Swainson's Hawks nest throughout the Delta, in most Delta habitat types, although riparian trees are used most often. Nests were close to cultivated agricultural lands. Most of the nest sites found are along the eastern and central portion of the CPA, but that may be a function of a greater survey effort in those areas.

Five avian data points were collected for Osprey, representing three nest sites, two close to each other. Of the two nests actually observed, both were on human-made towers or poles. Because of the high rate of detection of this species, it appears that few ospreys nest in the Delta, although these data may indicate that the species is beginning to return to the Delta to nest.

2.8.4.2.2 Limitations and Future Surveys

Species in this group may be surveyed for in new, previously unsurveyed locations that become available after the 2009 survey season or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season.

2.8.5 Greater Sandhill Crane and Lesser Sandhill Crane

2.8.5.1 Methods

The Sandhill Crane is the only avian species surveyed for in 2009 that does not breed in the CPA. The Greater Sandhill Crane is State listed as Threatened and is Fully Protected; the Lesser Sandhill Crane is a State Species of Special Concern. The primary impact concern related to these species is loss of wintering habitat, both foraging habitat and roost sites. Direct mortality related to collisions with tall construction equipment and new electrical transmission facilities is a second, and potentially more important, issue. The Greater Sandhill Crane is especially vulnerable to project impacts because it has a relatively small wintering area in the Delta and does not utilize new areas readily.

The specific objective of the 2009 Sandhill Crane surveys was to identify the species' winter use areas in the CPA. Unlike the other bird surveys, these were limited to habitat that was visible from publicly accessible roads. No formal survey protocol has been developed for the Sandhill Crane, and distinguishing between the subspecies found in the Delta in winter (including the Canadian subspecies) can be difficult, especially at longer distances. The survey methodology, summarized in the following paragraph, was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Single surveyors completed driving (windshield) surveys throughout the Delta to 5 miles beyond the BDCP-delineated Greater Sandhill Crane winter use areas (adjusted using existing DWR data). All publicly accessible roads in each quadrant of the CPA outside of the previously delineated use areas were traveled at least twice between January 1 and February 28 during daylight hours. All appropriate habitat was searched to the greatest extent possible with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species, which are large and easily detected.

All observations of target species were recorded, including number of individuals observed, location, and habitat type. No attempt to distinguish subspecies was made other than noting the presence of small versus large cranes.

2.8.5.2 Results and Discussion

2.8.5.2.1 Survey Results

Both large and small sandhill cranes were observed outside the range delineated in the BDCP habitat model even after it was adjusted using DWR data. Many areas identified in that delineation as being used by Greater Sandhill Cranes were not being used during surveys, indicating that a two-tier system of use is needed to identify important core areas and lesser used areas to better assess impacts related to the alignment options. Additionally, cranes used sites that were excluded in the BDCP habitat model because of habitat type or proximity to human dwellings.

2.8.5.2.2 Limitations and Future Surveys

No additional surveys for these species are expected for the BDCP EIR/EIS, because sufficient data were collected to corroborate the wintering range in the Delta.

2.8.6 Western Yellow-Billed Cuckoo and Yellow-Breasted Chat

2.8.6.1 Methods

Western Yellow-billed Cuckoo and Yellow-breasted Chat use dense, woody riparian vegetation for nesting. Western Yellow-billed Cuckoos nest primarily in large patches of willow-dominant vegetation with large, intermittent overstory created by Fremont Cottonwoods. Yellow-breasted Chats require dense riparian scrub with or without an overstory component. The primary impact concerns related to the Western Yellow-billed Cuckoo, which is State listed as Endangered and is a Federal Candidate, is loss of nesting habitat and disturbance to nesters from project activities. The impact concern related to the Yellow-breasted Chat, a State Species of Special Concern, is loss of nesting habitat.

The goal of the 2009 surveys was to identify the species' nesting habitat in the CPA on parcels for which the surveyors had access, as well as along all boat-accessible waterways. Two sets of formal survey protocols were used for Western Yellow-billed Cuckoo. Initially, a previously released protocol (Halterman et al. 2009) was used, but beginning approximately halfway through the surveys, a newly released protocol from the Yellow-Billed Cuckoo Working Group (2009) was used. No formal survey protocol has been developed for Yellow-breasted Chat. The survey methodology was developed by the DWR avian survey lead, with input from other DWR, CDFG, USFWS, and Western Yellow-Billed Cuckoo Working Group avian experts. The 2009 surveys were completed by DWR, CDFG, and DHCCP staff, with assistance from members of the Yellow-Billed Cuckoo Working Group.

A habitat analysis was conducted for Western Yellow-billed Cuckoo by a DWR and DHCCP GIS team who identified patches of willow-dominant cottonwood riparian of 40 acres or greater. After narrow, linear patches were discarded (deemed unlikely to be nesting habitat), six patches of potential nesting habitat were identified as accessible in the CPA and were surveyed. Personnel surveyed all dense riparian scrub with little or no tree overstory for Yellow-breasted Chats. Teams of two or more surveyors walked or traveled by boat along the edges of identified Yellow-billed Cuckoo habitat on a minimum of four occasions between June 1 and July 31 during morning hours. Personnel surveyed appropriate Yellow-breasted Chat habitat on a minimum of two occasions between April 1 and June 30. Surveyors stopped every 100 meters in species-specific habitat and played calls for the appropriate target species, then listened for responses from the species. During boat surveys, calls of Yellow-breasted Chat were occasionally played (e.g., in the habitat that appeared most suitable), and much habitat was surveyed with a passive listening method. It was not feasible to play calls in all potential Yellow-breasted Chat habitat while also surveying for other bird species.

All responses from the target species were recorded as assumed nesting birds. Additionally, all spontaneous calls by the target species were recorded in the same manner.

2.8.6.2 Results and Discussion

2.8.6.2.1 Survey Results

Several hundred acres of potential Western Yellow-billed Cuckoo nesting habitat are present in the Delta. The habitat with the greatest potential for nesting use by this species, based on size and quality, is located in the northern half of the Delta. Most of that habitat is located on existing preserves, both public and private, or otherwise protected lands. Potential nesting habitat for Yellow-breasted Chat is present throughout the Delta on a variety of private and public lands.

Surveyors collected two potential nesting data points for Western Yellow-billed Cuckoos, which may represent a nest site, in the north-central Delta. Nesting could not be confirmed, but the presence of at least one cuckoo at the site indicates that the Delta may support nesting pairs now or in the near future. Because similar habitat is found elsewhere in the Delta and potential nesting habitat is being created through preservation and restoration actions, it is possible that the species will reinhabit the Delta after an estimated 100-year absence.

Surveyors collected 26 nesting data points for Yellow-breasted Chats, which represent an estimated minimum of 13 nest sites. DHCCP survey data indicate that the species nests throughout the Delta but was found at five discrete areas, indicating that it probably does not nest uniformly throughout the Delta. Appropriate nesting habitat is present throughout the Delta, so it is unclear why the species is not more widespread in the CPA and why it is not found to a greater degree on the existing preserves. Almost all chat data points were recorded between May and June, so surveyors may have missed the species on parcels that were surveyed, because of access constraints, in April only. Data from the DHCCP surveys indicate that the species is found in the Delta in much greater numbers than was previously thought.

2.8.6.2.2 Limitations and Future Surveys

Both species may be surveyed for in appropriate habitat in new, previously unsurveyed locations that become available after the 2009 survey season, or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season. Additionally, areas surveyed in 2009 that have high potential to contain nesting cuckoos may be surveyed again in the future.

2.8.7 Burrowing Owl, Loggerhead Shrike, and Grasshopper Sparrow

2.8.7.1 Methods

Burrowing Owl, Loggerhead Shrike, and Grasshopper Sparrow represent the birds dependent on grassland-type habitat, although each has species-specific habitat requirements in the grassland category. The primary concern related to these species, all of which are State Species of Special Concern, is loss of nesting habitat. Burrowing Owls typically use highly disturbed grasslands that allow good visibility from the ground and that usually are occupied by ground-burrowing mammals. Loggerhead Shrikes prefer grassland and other open, uncultivated habitats that have a few shrubs or trees for nesting. Grasshopper Sparrows typically use large patches of grassland-only habitats in a variety of conditions. All three species are susceptible to loss of grassland habitat and reduced patch size.

The goal of the 2009 surveys was to identify all nesting habitat in the CPA on parcels for which the surveyors had access, as well as along all boat-accessible waterways. A formal survey protocol has been developed for Burrowing Owls by The California Burrowing Owl Consortium (1993) and was adapted for use in the Delta. No formal survey protocols have been developed for Loggerhead Shrike or Grasshopper Sparrow. The following survey methodologies for these species were developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors walked or traveled by boat throughout all available parcels and waterways on a minimum of two occasions between April 1 and June 30 during daylight hours. All appropriate *potential* habitat was searched to the greatest extent possible with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species visually but also relied on passive call surveys, listening for target species' songs and calls. The surveyors' focus was on open grassland patches, with special attention paid to fences, shrubs, and areas with extensive squirrel activity. All target species observed with actual or assumed active nests were recorded.

2.8.7.2 Results and Discussion

2.8.7.2.1 Survey Results

Extensive grassland patches are present throughout the Delta in various forms, from nongrazed seasonal wetlands with tall vegetation structure to heavily grazed or otherwise disturbed upland grasslands with short, patchy vegetation.

Surveyors collected 13 data points for Burrowing Owls, representing approximately 5 nest sites. All nest sites were in the southwest corner of the CPA, where the habitat is alkali grassland-scrub habitat that is heavily disturbed, has extensive patches of bare ground, and has substantial squirrel activity. This finding contradicts existing range maps and models developed for the species that indicate that the species is much more widespread in the Delta. Although the species likely is present in other locations in the Delta, the results of this survey suggest that Burrowing Owl nest sites may be relatively uncommon there. The vegetation in most grassland patches in the Delta tends to be tall and dense during a substantial portion of the Burrowing Owl's nesting season and has little or no squirrel activity. Those conditions result in few available potential nest sites and greatly reduced visibility at the nest sites that are available. In this case, the defined DHCCP surveys that focused on natural habitat may not have been effective in detecting the true occurrence levels of the species in the Delta because the species may prefer Delta agricultural landscapes.

Surveyors collected 33 data points for Loggerhead Shrike, which represent an estimated 10 nest sites. This species is found in all regions of the Delta but in discrete locations defined by the occurrence of large grassland patches with a few shrubs. Narrow or small grassland patches adjacent to marshes and other permanent wetlands were used less often, if at all, by the species. The southwest corner, with its dry grassland and alkali scrub habitat, was used at a much higher rate than other grasslands and areas in the Delta. More than two-thirds of recorded occurrences were in that relatively small area, although all parcels surveyed in the Delta received a similar survey effort. The CDFG range map for Loggerhead Shrike and burrowing owl, which show the species to occur throughout the Delta, overstate their actual occurrence in the Delta.

Surveyors collected seven data points for Grasshopper Sparrows, which represent an estimated five nest sites. The species seems to be limited to two areas in the Delta: the southwest corner and northeast quadrant. The species appears to prefer the taller vegetation structure of seasonal wetlands to the short grasses of the upland grasslands. Grasshopper Sparrows are known to need large patches of grassland, of which there are few in the Delta, and surveyors had access to only a portion of those during 2009 surveys. An additional potential limiting factor for finding nesting Grasshopper Sparrows may be the short nesting period in which the species is likely to be heard (the primary mode of detection). All birds were heard and/or seen in a 3-week period, and five of the seven occurrences were noted in the first week of May. Logistically, it is impossible to survey a large portion of the Delta within that narrow window, so the species' population will likely be underestimated in the Delta.

2.8.7.2.2 Limitations and Future Surveys

Species in this group may be surveyed for in new, previously unsurveyed locations that become available after the 2009 survey season or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season.

2.8.8 Bank Swallow

2.8.8.1 Methods

The Bank Swallow, State listed as Threatened, depends on cut and actively eroding riverbanks. The primary concern related to this species is loss of nesting habitat from public and private flood control projects.

The specific objective for the 2009 surveys was to identify any active or likely active nest habitat, defined by the presence of burrows, in the CPA, primarily along boat-accessible waterways. A formal survey protocol was available from CDFG and the Bank Swallow Working Group and Technical Advisory Committee, but that methodology is designed to track population trends and colony status in known nesting areas. The following methodology for the DHCCP surveys was developed for this survey by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors traveled by boat throughout accessible waterways in the CPA on a minimum of four occasions between April 1 and June 30 during daylight hours. Lands with suitable habitat characteristics were searched to the greatest extent possible with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors searched for the target species directly and for cut riverbanks with sign of colonial swallow burrows. Target species observed with actual or assumed active nests were recorded, with notes on the size of the cut bank and the number of burrows used and potentially used by the species.

2.8.8.2 Results and Discussion

2.8.8.2.1 Survey Results

No Bank Swallow nest sites have been recorded in the legal Delta since the CNDDB was developed. The nearest known colonies are at Verona (north of Sacramento, along the Sacramento River) and on Dry Creek, Sacramento County, well east of the Project Area. Appropriate nesting habitat exists in the Delta, and bank swallows have been observed close to that habitat.

No Bank Swallow nest sites were confirmed in the CPA during surveys, although cut and eroding banks were noted.

2.8.8.2.2 Limitations and Future Surveys

No specific surveys for this species will be conducted for the BDCP EIR/EIS.

2.8.9 Song Sparrow, Tricolored Blackbird, and Yellow-Headed Blackbird

2.8.9.1 Methods

Song Sparrow, Tricolored Blackbird, and Yellow-headed Blackbird are wetland-dependent passerines. All are State Species of Special Concern, and the primary concern is loss of nesting habitat. The Modesto Song Sparrow nests in virtually all wetland vegetation types, from small trees in riparian forest to tall annual plants in seasonal wetland. Tricolored Blackbirds nest primarily in tule and/or cattail marsh, although they frequently use riparian scrub, such as California Blackberry, where vegetative overstory is absent. Yellow-headed Blackbirds nest primarily in tule and/or cattail marsh.

The specific goal of the 2009 surveys was to identify used nesting habitat in the CPA on parcels for which the surveyors had access, as well as along boat-accessible waterways. A survey protocol has been developed for Tricolored Blackbirds, but it is designed to track existing colonies and is not intended for general detection surveys. No formal survey protocols have been written for Yellow-headed Blackbirds or Song Sparrows. All three species are easily detected at nest sites. The following survey methodology was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors walked or traveled by boat throughout available parcels and waterways on a minimum of two occasions between April 1 and June 30 during daylight hours. Lands with suitable habitat characteristics were searched with the naked eye, binoculars, and/or spotting scopes, depending on need. Surveyors keyed on the target species visually but also detected them by listening for their songs or calls. Focus was on wetland habitats. Target species observed with actual or assumed active nests were recorded.

2.8.9.2 Results and Discussion

2.8.9.2.1 Survey Results

Surveyors searched several thousand acres of appropriate nesting habitat in various wetland types for these species. Habitat types used by these species are present throughout the Delta.

Surveyors collected more than 2,700 data points, which represent an extremely large and ubiquitous population of Modesto Song Sparrows. The number of detections recorded was a small fraction of those made because it was impossible to log every bird heard or seen while also making a reasonable effort to survey for other species. Modesto Song Sparrows were observed or heard on virtually every parcel and waterway surveyed, with the possible exception of the few parcels with upland grassland habitat only.

Surveyors collected 14 data points for Tricolored Blackbirds, which represent 10 likely nest sites. No large colonies were observed, and in most cases, nesting was not confirmed. The species occurred relatively uniformly throughout the CPA, in the north and central Delta, where appropriate habitat exists.

Surveyors collected four data points for Yellow-headed Blackbirds. Detections were noted on islands in the south-central Delta. In each case, one or two birds were observed, which is consistent with previous information gathered on the species in the Delta.

2.8.9.2.2 Limitations and Future Surveys

The 2009 surveys are adequate to identify the level of occurrence in the Delta by the Modesto Song Sparrow; therefore, no additional surveys for the species will be conducted for the BDCP EIR/EIS.

The use of the Delta by the Tricolored Blackbird probably was not well defined by the 2009 surveys because the species tends to use the Delta for nesting in the latter part of the nesting season, and on many parcels, the survey effort was completed by that time. Future surveys may be conducted in the optimum survey window, as determined by the 2009 surveys, and in better defined and limited areas at locations surveyed in 2009, as well as in newly available potential habitat.

The Yellow-headed Blackbird may be surveyed for in previously unsurveyed locations that become available after the 2009 survey season, or that become available before and during future survey periods. Surveys will continue as performed in the 2009 survey season.

2.8.10 References

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2.9 BATS

2.9.1 Methods

2.9.1.1 Target Species

Four bat species, all California Species of Special Concern, were identified as potentially occurring in the CPA: Western Red Bat, Pallid Bat, Western Mastiff Bat, and Townsend's Big-eared Bat.

2.9.1.2 Survey Description

2.9.1.2.1 Surveys

Three types of bat surveys were conducted to determine which bat species were present in the CPA: habitat assessments, acoustic surveys, and bridge surveys.

The goal of habitat assessments was to identify suitable habitat features for bat roosting and foraging in the CPA, and the goal of acoustic surveys was to obtain information about bat species diversity and activity level in the same area. The goal of bridge surveys was to identify accessible bridges in the CPA that are used by bats.

Habitat Assessments

Biologists identified and described potentially suitable roosting structures during habitat assessments. Potential roost structures included barns, sheds, large trees, and abandoned buildings. Structure surveys involved external and, when possible, internal visual inspection of structures for bats and bat sign (e.g., guano, staining), scent surveys for guano, and auditory surveys for bat sound (e.g., squeaking, clicking, fluttering). Biologists looked or smelled for guano and listened for bats. Using flashlights, biologists scanned the perimeter and the edges of the structure for potential entrance locations (e.g., cracks, crevices, and holes or other areas that may have gaps) and surveyed eaves, attic spaces, rafters, and other internal crevices for the presence of bats or bat sign. When no bats were detected but bat sign was found, biologists took notes on guano freshness (very fresh, moderately fresh, not fresh), approximate amount of guano (sparse amount [fewer than 50 pieces], moderate amount [50–100 pieces], large amount [greater than 100 pieces]), and took photographs and a GPS location of the roost. All photographs included an object of known size (e.g., ruler) to show the size of the object being photographed. If bats were detected, biologists used a red filter placed over the lens of the flashlight to view bats.

A single survey effort consisted of a single pedestrian habitat assessment of a single parcel and one visit to potential roost structures that were accessible, and where cracks, crevices, rafters, eaves, hollow walls, or other potential bat roost locations in the structure could be visually inspected when present.

Acoustic Surveys

Acoustic monitoring was conducted using a Binary Acoustic Technology AR 125 acoustic receiver placed on a tripod or t-post and connected to a Binary Acoustic Technology FR 125 acoustic recorder. The FR 125 recorder was secured in a weather-proof and locked McMaster box and powered by a 12-volt, deep-cycle marine battery and 40-watt solar panel. Bat echolocation calls were detected by the AR 125 receiver and transferred to the FR 125 recorder for conversion to "wav" files and storage on a 16-gigabyte (GB) USB drive inserted into the recorder. The FR 125 recorder assigned distinct file names to each wav file (bat echolocation call) collected, as well as the date and time of the call. The recorder was programmed to record calls between 10 kilohertz (kHZ) and 90 kHZ for a minimum of 1-second duration and maximum of 5-second duration. It was programmed to record during two periods: approximately 1 hour before sunset to midnight and approximately 2 hours before sunrise to sunrise.

Acoustic monitoring equipment was positioned at each survey station to maximize high-quality recording of bat calls and maximize the exposure of the solar panel to the sun. For example, the AR125 receiver was directed toward an area of potentially high bat activity (e.g., along a stream corridor) and positioned in a way that would achieve the highest quality recording (e.g., 1–2 meters above ground to avoid call distortion from ground heat, facing away from a large solid structure and the surface of water that could potentially distort bat sounds through reflection).

After setting up an acoustic station, biologists recorded the coordinates of the station with a GPS unit and took digital photographs of the acoustic station and of the habitat in the four cardinal directions (north, south, east, west) from the acoustic station. They described the relevant features of the site within 30 meters and 100 meters of an acoustic station, including percent cover of microhabitat types (e.g., agriculture, riparian streams), tree characteristics (e.g., tree species, diameter at breast height [dbh], height, canopy cover) potential foraging features (e.g., ponds, channels), and potential roosting features (e.g., trees, buildings, bridges). Biologists recorded weather conditions on each habitat unit during acoustic monitoring using a Hobo weather-recording device. The Hobo device records average ambient temperature in 15-minute increments. Following collection of the acoustic equipment after 14 days of monitoring, biologists downloaded all bat "wav" files from the USB drives and filled out a checklist on the functioning of the acoustic equipment.

On the first evening of an acoustic sampling period for each new habitat unit, biologists conducted a visual bat activity survey. Visual bat surveys were conducted for 1.5 hours (from 45 minutes before sunset to 45 minutes after sunset). During the surveys, two biologists stood back-to-back so as to cover the full range of view from the acoustic station. Biologists counted the number of bat passes and noted the bat sizes they observed in their field of view every 15 minutes during the survey period. Data were recorded on electronic datasheets in the GPS units and on paper datasheets. Biologists also collected wind speed and temperature data every 15 minutes using a handheld Kestrel weather-recording device. Bat activity surveys allowed biologists to maximize bat call detection by adjusting the location of acoustic detection equipment based on locations of observed bat activity. Subsequent bat activity surveys at the same acoustic sampling station provided limited additional information and therefore were not conducted. For those habitat units with limited hours of access (e.g., because of limited hours of ferry operation) or with potentially unsafe conditions (e.g., public areas with a history of unlawful activity), biologists did not conduct a visual bat activity survey.

Acoustical data recorded at each station were analyzed using the Sonobat® software (3 NW, prerelease version). Biologists used the automated analysis function of the software, with default settings selected, to initially identify calls to genus or species. Biologists visually compared each echolocation call to reference calls and descriptions of individual species call structure and indentified calls to genus or species based on congruence with these and with a minimum standard of 90-percent confidence. When a genus or species was impossible to identify, biologists categorized bat calls according to frequency (e.g., 50-kHZ bats, 40-kHZ bats, 30- to 20-kHZ bats). Before call analysis, biologists extracted all noise files (i.e., nonbat calls) using the batch scrubber feature of Sonobat. The batch scrubber was set to the "weak scrubber" setting, which removed only those files that did not contain strong calls and/or call patterns that may be representative of a bat. Biologists reviewed a minimum of 10 percent of the scrubbed files for 92 percent of the acoustic sessions to ensure the accuracy of the scrubbing procedure. Any potential bat calls were removed from the scrubbed batch and analyzed with the bat calls for that habitat unit and monitoring period. Overall, the scrubbing procedures had a 1.2-percent error rate of misclassification of a bat call as a nonbat call.

Bridge Surveys

Bridge surveys involved visual inspection of bridges for bats and bat sign (e.g., guano and staining), scent surveys for guano, and auditory surveys for bat sound (squeaking, clicking, fluttering).

For visual surveys, one team of two biologists inspected bridge undersurface and sides, including any cracks, crevices, and joints, for bat presence and bat sign. Biologists visually inspected the ground under each bridge for guano.

If terrain under a bridge could be traversed, biologists walked the length of the bridge and visually inspected 100 percent of the bridge underside and the ground for guano. Bridges often spanned water or

transportation corridors. When visibility and accessibility were limited, biologists visually inspected all accessible portions of the bridge underside using binoculars and flashlights. Biologists also used boats to survey bridges that crossed the San Joaquin and Sacramento rivers.

Viewing times for each bridge survey period terminated when all safely accessible portions of the bridge underside had been surveyed for bats and bat staining and all accessible terrain underneath the bridge had been surveyed for guano, or when all bat species inhabiting a bridge had been identified to species.

The following field survey protocol was followed after review and approval by CDFG:

- **Suitable habitat** – Biologists examined the area surrounding the bridge for suitable foraging habitat (e.g., riparian corridors, oak woodlands, orchards, and wetlands or other sources of insects).
- **Bat evidence (guano)** – Biologists inspected the ground around bridges and inspected bridge surfaces near cracks, crevices, joints, and joint expansions and in corners for guano and staining. Bridges over water may not have had evidence of guano, despite the presence of bats, because guano may fall into the water. For these bridges, biologists looked carefully for signs such as staining and smelled for fresh guano.
- **Bat presence** – Biologists inspected joints between structural components of bridges (especially concrete spans). They used a flashlight to assist in inspection and listened for bats. If bats were detected, biologists would use a red filter placed over the lens of the flashlight to view the bats.
- **Day/night roost** – Biologists determined whether a bridge has the potential to be used as a day or a night roost. Day roosts are found in bridges with expansion joints, crevices, and cracks where bats are protected from predators and adverse weather conditions. Biologists could find guano under day roosts and hear bats during day surveys. Night roosts may have crevices and cracks but more often have box beams or other less protected roosting spots where bats rest temporarily while feeding. Guano also may be found on the ground beneath night roosts.
- **Maternity/solitary roost** – Biologists determined whether bats present at a bridge constituted a maternity roost or a solitary individual. Presence of multiple bats of the same species or large amounts of guano would indicate a possible maternity roost. Presence of a solitary bat would indicate a solitary roost.

2.9.1.2.2 Documentation of Results

Survey documentation was conducted using electronic datasheets on the Trimble Geo XH GPS unit, paper data sheets, aerial photographs, and a digital camera. GPS coordinates were recorded at the locations where digital photographs were taken. GPS data, digital photographs, and scanned copies of paper datasheets were uploaded to the PCE and an internal server immediately following a survey effort.

Acoustic data were uploaded to the PCE and an internal server immediately following data collection and initial processing (e.g., scrubbing). All “wav” files deleted by the scrubbing process and confirmed as nonbat calls were burned to a DVD and mailed to HDR for batch upload to the PCE.

Habitat Assessments

Biologists recorded a GPS location in each assessed parcel and described habitat information in an electronic datasheet in the GPS unit and on a paper datasheet. Habitat characteristics in each parcel were described, and each parcel was assigned an overall suitability rank based on the presence of foraging and roosting features.

The following field survey data were collected:

- GPS point for each assessed parcel and any suitable habitat feature (i.e., structure)
- Description of site characteristics: habitat types, potential foraging features (e.g., pond, channel) and potential roosting features (e.g., trees, bridges, buildings), and tree characteristics (e.g., dbh, height, canopy cover)

- Overall habitat suitability ranking: 0 = no suitable bat habitat present, 1 = suitable bat foraging habitat present, 2 = suitable roost features available, and 3 = suitable bat foraging and roosting habitat present
- Digital photographs of habitat units and any potentially suitable foraging and roosting features
- Bats species identified (bat physical characteristics if unidentified)
- Presence of guano or staining
- Guano freshness and estimated amount of guano
- Potential roost type (maternity, day, night, solitary, no potential)
- Roost size (1, fewer than 50, 50–100, or more than 100 individuals)
- Presence of suitable foraging habitat surrounding a structure, including riparian, wetland, orchard, and oak woodland

Acoustic Surveys

The following acoustic station setup data were collected:

- GPS location for any new station or any station moved more than 50 feet from original location
- Description of site characteristics: habitat types, habitat characteristics (e.g., tree species, dbh, height, canopy cover, crop type) and percent cover within 100 feet of the acoustic station, potential foraging features (e.g., ponds, channels) and potential roosting features (e.g., trees, buildings, bridges) within 100 meters of the acoustic station, and digital photographs of the acoustic station and of the habitat in the four cardinal directions from the acoustic station
- Temperature data recorded every 15 minutes using a Hobo weather-recording device

The following acoustic station takedown data were collected:

- Wav files of bat echolocation calls collected every 2 weeks on a 16-GB USB drive
- Equipment functioning recorded on a checklist to confirm that all acoustic equipment was functioning properly at the time of pickup

The following acoustic nocturnal bat activity session data were collected:

- Visible bat activity level (high, medium, and low) in 15-minute increments from 45 minutes before sunset to 45 minutes following sunset
- Visible bat size categories (small, medium, and large)

Bridge Surveys

The following bridge survey data were collected:

- Bridge identification code
- Coordinates recorded with a GPS unit for each bridge surveyed
- Digital photograph of surveyed bridge
- Bat species identified (bat physical characteristics if species was unidentified)
- Presence of guano or staining
- Guano freshness and estimated amount of guano
- Potential roost type (maternity, day, night, solitary, no potential)
- Roost size (1, fewer than 50, 50–100, more than 100)
- Presence of suitable foraging habitat, including riparian, wetland, orchard, and oak woodland

2.9.1.3 Team Composition and Equipment Used

One to four teams of two biologists conducted bat habitat assessments, acoustic surveys, and bridge surveys. Each team consisted of two biologists, including at least one lead biologist proficient in bat survey methods and life-history characteristics.

Many of the non-lead biologists had previous bat experience. All biologists were trained for this effort on suitable habitat characteristics for bat roosting and bat foraging, suitable bridge and structure characteristics for bat roosting, and general life-history information for all bat species with potential to occur in the Project Area. Biologists were also trained to recognize bat guano by sight and smell.

All survey teams were supplied with a GPS unit for electronic data capture, a digital camera, binoculars, a flashlight with a red filter, a supply of paper data sheets, Delta field maps, and appropriate safety gear.

For acoustic surveys, the following specific survey equipment and supplies were added:

- Kestrel and Hobo weather-monitoring devices (one per acoustic sampling station)
- Binary Acoustic Technology AR 125 ultrasonic detector, weatherproof cover, reflector plexi-glass plate, and tripod/t-post (one per acoustic sampling station)
- Binary Acoustic Technology FR 125 ultrasonic recorder with 16-GB USB drive (one per acoustic sampling station)
- 12-volt battery in a water-tight McMaster box (one per acoustic sampling station)
- Solar panel, mounting post, wooden stake, and rebar (one per acoustic sampling station)

2.9.1.4 Survey Timing

2.9.1.4.1 Habitat Assessments

Habitat assessments were conducted between February and September 2009. Assessments occurred in phases based on when DWR received access to private lands through the TEP process.

One assessment was conducted on each parcel identified as having potentially suitable habitat and available access.

2.9.1.4.2 Acoustic Surveys

Acoustic sampling was conducted between March 23 and November 19, 2009. Twenty acoustic sampling stations (one each for 20 parcels) were surveyed, and four of these acoustic sampling stations were surveyed during each sampling period (spring, summer, and fall).

The number of acoustic sampling periods employed per sampling station depended on the timing of parcel accessibility:

- Four acoustic sampling stations were surveyed six times: twice in spring (March through May), twice in summer (June through August), and twice in fall (September through November).
- Eight acoustic sampling stations were surveyed three times: once in spring, once in summer, and once in fall.
- Eight acoustic sampling stations were surveyed two times: once in summer and once in fall.

A single acoustic sampling period consisted of 14 consecutive nights of passive echolocation call collection at the same sampling station.

Four sets of acoustic equipment allowed biologists to monitor four separate habitat units simultaneously. Eight habitat units that became accessible in summer 2009 were surveyed once in summer and once in fall only. Four habitat units were sampled twice per season in an effort to understand within-season changes that could result from bat migration.

The acoustic equipment functioned correctly during 86 percent of the surveys. To the extent feasible, an acoustic sampling station was surveyed again during the same season if acoustic equipment malfunctioned during the regularly scheduled sampling period and caused a loss of data.

2.9.1.4.3 Bridge Surveys

Bridge surveys were conducted between February and July 2009. All surveys were diurnal. Biologists revisited bridges that had potential to have a day roost, based on bridge structural features, to determine whether there was sufficient evidence of bats to require the need for a nocturnal exit survey.

Each bridge was surveyed once for evidence of bat sign, presence of bats, and potential roosting features. Bridges surveyed in February were surveyed again during summer by land and/or by boat. This additional survey was performed to ensure adequate coverage of bridges that spanned large waterways and to verify that migrating bat species had not moved into bridges that were surveyed in the early season.

A single survey effort consisted of one visit to an accessible bridge, where cracks, crevices, joints, or other potential bat roost locations could be visually inspected. The duration of visits to each bridge varied based on bridge size, bridge condition, ease of accessibility, and the presence of bats or bat sign.

2.9.1.5 Candidate Survey Habitat

2.9.1.5.1 Habitat Assessments

The types of habitat surveyed during the habitat assessments were those that contained important features for bat roosting and foraging, including riparian habitat or other intact stands of trees (Fremont Cottonwood, Western Sycamore, eucalyptus, oak, willow) close to water; orchards, agricultural lands, vineyards, and grasslands close to water and potential roost structures; water features such as wetlands, marshes, ponds, and narrow or wide-flowing channels with and without riparian vegetation close to potential roost features; and accessible structures (e.g., barns, silos, sheds) on public land or private property with TEPs in the CPA.

2.9.1.5.2 Acoustic Surveys

The types of habitat surveyed during the acoustic surveys contained important features for bat roosting and foraging. These habitats, which were selected based on the results of the habitat assessments, were grassland/disturbed, grassland with riparian scrub elements, agriculture, vineyard, eucalyptus grove, orchard, residential area, riparian forest, riparian forest with pond or slough, oak forest with slough, and wetland with riparian forest and riparian scrub elements.

2.9.1.5.3 Bridge Surveys

The types of bridges surveyed were accessible bridges on public land or private property with TEPs in the CPA.

2.9.1.6 Identification of Habitat Unit Survey Locations

2.9.1.6.1 Habitat Assessments

Potentially suitable bat habitat units in the CPA were delineated, and potentially suitable bat habitat was selected using aerial imagery, vegetation layers, and previously recorded bat locations as reported in the CNDDB.

Habitat units, regardless of the status of parcel accessibility, were assigned a level of suitability (high, moderate, and low) based on the presence of potential suitable bat roosting features (e.g., large structures, big trees, and orchards) and foraging elements (e.g., channels, ponds, marshes).

The suitability ranking assigned to the habitat units was reviewed and approved by CDFG.

All accessible habitat units were surveyed in the CPA if they had potentially suitable foraging and roosting features or were adjacent to habitat units with these features.

2.9.1.6.2 Acoustic Surveys

Potential acoustic sampling locations were identified during the habitat assessment surveys. These locations were mapped, described, and transmitted to CDFG representatives for approval. CDFG authorized the acoustic sampling locations and accompanied biologists to certain sampling locations on lands owned by public agencies.

The acoustic sampling locations were selected to represent the diverse habitat types present in the CPA with particular emphasis on the presence of habitats with elements suitable for foraging (e.g., water) and/or roosting (e.g., trees, bridges, buildings).

The number of acoustic sampling stations was broken down by habitat type as follows:

- Grassland/disturbed: 3
- Grassland/riparian scrub: 1
- Agriculture: 3
- Vineyard: 1
- Orchard (walnut): 1
- Residential: 1
- Riparian forest: 5
- Oak forest with slough: 2
- Eucalyptus grove: 1
- Wetland: 2

To the extent feasible, the habitats surveyed acoustically were stratified by conveyance option and overall project location (e.g., every attempt was made to survey a riparian forest at each conceptual alignment alternative site and in the north, central, and southern portions of the CPA).

The 20 acoustic sampling stations were distributed as follows among the proximities (within approximately 1.5 miles) of each conceptual alignment option (some stations occur in more than one conveyance option, so the number of stations identified in the following list is greater than 20):

- Eastern isolated conveyance facility option: 12
- Western isolated conveyance facility option: 7
- Through-Delta conveyance option: 6

2.9.1.6.3 Bridge Surveys

Oversized field maps were produced showing known bridges in the CPA in ArcGIS using data provided in Bridges in the Delta and Suisun Marsh, digitized based on HAZUS (HAZUS-MH dataset May 2006), with supplemental bridges provided by DWR (February 2007) and updated with 1-meter imagery (1994–2004) at scale of 1:10,000 or, in most cases, larger (more detailed).

2.9.1.7 Duration of Survey Validity

CDFG does not have criteria to determine the length of time that habitat assessments, acoustic surveys, and bridge and structure surveys for bat species are considered valid.

2.9.1.8 Methodology Approvals

CDFG has review and approval authority, and CDFG environmental scientists were directly involved in the development, review, and approval of the survey methods.

2.9.2 Results and Discussion

2.9.2.1 Survey Results

2.9.2.1.1 Habitat Assessments

Habitat assessments were conducted at 83 parcels in the CPA. Riparian habitat features, including wetlands, channels, and ponds, were present at 62 of the 83 surveyed parcels, annual grassland features at 32 parcels, agricultural fields at 22 parcels, oak forests at 13 parcels, eucalyptus at 11 parcels, urban/barren/residential land uses at 8 parcels, orchard at 1 parcel, and vineyard at 1 parcel. Multiple habitat types often were present in a single parcel so the total number of habitat features is greater than the total number of assessed parcels.

Of the 83 parcels assessed, 64 (77 percent) contained bat foraging and roosting features and were considered highly suitable parcels, 14 (17 percent) contained only foraging habitat, 3 (4 percent) contained only roosting habitat, and 2 (2 percent) contained no potential roosting or foraging habitat. More than two-thirds (N = 52, 81 percent) of the highly suitable parcels contained wetlands, channels, sloughs, ponds, or irrigation ditches associated with agricultural land uses. Nearly all (N = 61, 95 percent) of the highly suitable parcels contained large trees, and 45 of these parcels had intact stands of trees; 17 highly suitable parcels contained buildings, barns, or sheds that could support roosting bats. All accessible buildings, barns, and sheds were surveyed for bats and bat sign, but no evidence of bat use was detected at any of the suitable habitat features in the CPA in 2009. The two parcels with no potential foraging and roosting habitat were found in grasslands with no water present during surveys and no potential roost structures.

2.9.2.1.2 Acoustic Surveys

Biologists conducted approximately 5,800 hours of passive acoustic monitoring at 20 parcels from March through November 2009 (**Table 2.9-1**). Because of time constraints, biologists were unable to process acoustic data for four 2-week sampling sessions at three locations: one oak forest with slough (two sampling sessions unprocessed) and two wetland sites (one sampling session unprocessed at each site). Biologists processed acoustic calls for at least three 2-week acoustic sampling sessions at each of these sites, so they believe that the interpretation of results would not be affected by processing the aforementioned sampling sessions. Not counting the 321 hours of unprocessed sampling sessions mentioned above, biologists processed acoustic calls recorded during 5,483 hours of monitoring. Bat activity was quantified as number of passes per hour. To account for variable effort (duration of recording) among habitat types and the four unprocessed sampling sessions, data for bat activity were standardized by dividing the number of bat passes by the hours of passive acoustic monitoring processed in each habitat type during each season.

Table 2.9-1. Passive Bat Acoustic Monitoring in the Conveyance Planning Area from March through November 2009

Habitat Type	Number of Parcels	Total Effort (Hours)
Riparian Forest	5	1,247
Grassland/Disturbed	3	1,066
Oak Forest with Slough	2	780
Agriculture	3	756
Wetland	2	751
Residential	1	283
Eucalyptus	1	251
Vineyard	1	250
Orchard	1	223
Grassland/Riparian Scrub	1	197
Total	**20**	**5,804**

Source: Compiled by DWR in 2009

Of the noise files (i.e., nonbat calls) extracted during the scrubbing procedures, 98.8 percent of randomly checked noise files were confirmed to be noise, and 1.2 percent of the extracted files were bat calls (see Section 3.9.1.3, Survey Description). The bat calls extracted during scrubbing were largely in the 20–30 Kilohertz frequency range and likely that of Mexican-Free tailed Bats. Nearly all the bat calls misclassified as noise were either fragmented or had a large amount of ambient noise and/or echo that made species identity difficult to distinguish.

Acoustic monitoring was used to positively identify nine bat species found in the CPA (**Table 2.9-2**). Acoustic monitoring also detected potential calls of two species that could not be confirmed with 90-percent confidence. Because there is a large amount of overlap in the acoustic calls of bats and call quality can be compromised by ambient noise and/or echo from water surfaces or large objects, calls that closely resembled a species but lacked conclusive, distinguishing characteristics were considered "potential." Bat species did not appear to be associated with particular habitat types, and no bat species was exclusively associated with a specific habitat, possibly indicating a broad foraging distribution of these species across habitat types in the Delta.

Total bat species identified, including potential species, differed slightly by habitat type with vineyard, riparian forest, and oak forest with slough habitat types having the most species (N = 10) and grasslands having the least (N = 6) (Table 2.9-2). Most of the acoustic stations at riparian- and oak-dominated forests were positioned along sloughs or channels and surrounded by trees. Riparian forests were dominated by cottonwoods, eucalyptus, and willow trees. In most circumstances, riparian and oak trees were large and with full canopies. Although acoustic stations in grasslands were also positioned facing a slough or channel, a potential foraging feature, not as many bat species were detected in these habitat types as in the riparian and oak forests. Agricultural parcels also supported a relatively large number of bat species. Although bats are known to forage on insects associated with agricultural fields, two of the three agricultural parcels surveyed in 2009 were also adjacent to rivers and sloughs and contained large cottonwoods or willows, perhaps increasing the value of these habitat types. Nonetheless, the difference in total bat species detected among habitat types is small, and it would appear that each of these habitat types has value to resident and migratory bats.

Table 2.9-2. Bat Species Identified from Acoustic Monitoring of 20 Locations at 10 Habitat Types

Habitat Type	Number of Parcels (*N*)	Species of Special Concern		Common Species									Total Bat Species (Confirmed and Potential)
		Western Red	Pallid	Yuma Myotis	California Myotis	Canyon Bat	Western Small-Footed Myotis	Little Brown Myotis	Big Brown	Silver-Haired	Hoary	Mexican Free-Tailed	
Grassland/Disturbed	3	P[a]		X[b]				X	X		X	X	6
Grassland/ Riparian Scrub	1			X	X		X	X	X			X	6
Agriculture	3	X		X	P	P	P	X	X		X	X	9
Vineyard	1	X	P	X	X	P		X	P	P	X	X	10
Residential	1	X		X	X		X	X	X	P	P	X	9
Orchard	1	X	P	P	X	P	X		P		X	X	9
Riparian Forest	5	X		X	X	P	X	X	X	P	X	X	10
Oak Forest with Slough	2	P		X	X	P	X	X	X	P	P	X	10
Wetland	2	X		X	X		X	X	X		X	X	8
Eucalyptus	1	X	P			P		X		X	X	X	7

[a] Potential call of this species but lacks species-distinguishing characteristics.
[b] Confirmed bat species with at least 90% confidence.
Source: Compiled by DWR in 2009

Two of the detected species, Western Red and Pallid bats, are California Species of Special Concern. The Western Red Bat, a tree-roosting species, was detected in all habitat types surveyed except grassland/riparian scrub, and potential calls of red bats were detected in grassland/disturbed and oak forest with slough habitat types. Red bats were found in sites with eucalyptus trees in these surveys, as has been previously reported by others (Pierson, Rainey, and Corben 2006). In this survey, red bats were also found in residential and agricultural land use types. Red bats have been reported to forage near street lights in urban areas (WBWG 2005a) and have been observed foraging over agricultural fields in the northern Central Valley (Stephanie Coppeto, personal observation, August 2009, Sutter County).

Potential echolocation calls of Pallid Bats were detected in orchard, vineyard, and eucalyptus grove habitats. Pallid Bats previously have been detected in portions of the Central Valley (Pierson, Rainey, and Corben 2006). Throughout the range of this species, its foraging habits are closely associated with open shrub-steppe grasslands, oak savanna grasslands, open ponderosa pine forests, talus slopes, gravel roads, lava flows, fruit orchards, and vineyards (WBWG 2005b). This species has also been documented roosting in abandoned and occupied buildings, bridges, barns, and other human-made structures; in tree cavities and under sloughing bark; and in deciduous trees in riparian areas and fruit trees in orchards (WBWG 2005b).

Although the total number of bat species differed only slightly among habitat types, the level of bat activity was strongly associated with habitat. Activity, quantified as bat passes per hour of acoustic monitoring effort, was greatest in habitats with both substantial water sources and trees (**Figure 2.9-1**). Wetlands had at least two times more bat activity than any other habitat type. The wetlands surveyed in 2009 were characterized by an extensive network of large seasonal ponds but were also adjacent to permanent water sources, such as sloughs and rivers. At one wetland site, ponds were surrounded by willow trees, and at the second wetland site, large cottonwood and eucalyptus trees were present. Riparian forests and oak forests with sloughs also had a substantial amount of bat passes perhaps because of the presence of permanent water and large, decadent stands of trees. Both wetland sites and one riparian forest site had social calls of Mexican Free-tailed Bats, perhaps indicating the presence of a nearby roost. Abandoned

structures, such as buildings, and an old, very large boat were located near two of these acoustic stations, but bats were not detected in these structures during surveys.

Bat activity varied by season with the most bat passes occurring in summer from June through August (**Figure 2.9-2**). The peak in summer activity could be a result of additional foraging by newly flying young. The fewer bat passes in spring and fall could be a result of reduced temperatures, which could cause emergence from winter roosts late in the season (spring) or the early seasonal onset of torpor in fall. However, these are the periods of bat migration, so increased activity would be expected. Bat migration remains poorly understood.

2.9.2.1.3 Bridge Surveys

Biologists identified bat colonies at two of 50 bridges surveyed in the CPA. A Mexican Free-tailed Bat colony was found on May 20, 2009, in a bridge located in the western portion of West Sacramento, Yolo County. The colony was estimated to include more than 10,000 individuals, indicating a maternity roost in which females gather to give birth and rear young. The bats roost in this bridge during the day but may also gather at the bridge during nightly foraging bouts before the young are able to fly or are newly flying. Because multiple bat species may share a roost, this bridge also may be used diurnally or nocturnally by other bat species. Biologists identified a second active roost on June 16, 2009, under a metal sheath capping pylons of a bridge in eastern Solano County. Biologists were unable to view inside the pylons or under the metal cap to identify the bat species but heard the bats squeaking and clicking while the biologists conducted surveys. Based on the size of the pylons, the roost size was estimated to be fewer than 50 individuals.

Bat guano and/or staining were identified at seven bridges in the CPA (**Table 2.9-3**). All the bridges had structural features (e.g., parallel box beam design, wooden bridge spans) that could be used for night roosting. Two bridges had structural features (e.g., deep cracks, crevices, drainage holes, expansion joints) that could serve as day roosts, but no bats were observed or heard during daytime surveys. Because a bridge over Snodgrass Slough was surveyed in February and bats may not have been using the bridge this early in the season, biologists revisited the bridge on August 6, 2009, and confirmed that no bats were using the area as a roost site during the daytime. During surveys, a bridge operator informed biologists that bats have been known to use the three parallel, adjacent bridges in Walnut Grove where the Delta Cross Channel and Sacramento River meet in Sacramento County. Biologists originally surveyed one of these bridges on February 25, 2009, and returned on June 16, 2009, and again on August 10, 2009. No bats were found using this bridge.

Table 2.9-3. Seven Bridges with Evidence of Bat Use in the Conveyance Planning Area

Bat Evidence	Potential Roost Type	Location
Guano/Staining	Night	Contra Costa County
Guano/Staining	Night	Yolo County
Guano	Night	Sacramento County
Staining	Night/Day	Yolo County
Staining	Night	Sacramento County
Staining	Night/Day	Sacramento County
Staining	Night	San Joaquin County
Source: Compiled by DWR in 2009		

Of the bridges without bats or bat evidence, nine contained structural features that were considered conducive to day and/or night roosting, and 28 bridges had features conducive to night roosting only. Night roosts may have crevices and cracks but more often have box beams or other less protected roosting spots where bats rest temporarily while feeding. Day roosts are commonly found in bridges with expansion joints, crevices, or cracks where bats are protected from predators and weather. Ten bridges in the CPA had no potential for day or night roosting because they lacked surface features from which bats could hang and offered no protection from weather or predators.

2.9.2.2 Limitations and Future Surveys

Roost surveys for bats can be complicated by the difficulty of detecting bats in trees (e.g., in cavities and under foliage and sloughing bark), by roost switching, and by the time of day and season. Additionally, bridge surveys in 2009 did not document bats at some bridges with structural features that could support day and night roosts, likely because of the reduced accessibility to all or portions of the potential bridge roosts. For example, many of the bridges in the CPA span water bodies, and guano from night roosting bats may have fallen into the water and been undetected by surveys. Therefore, bats may have been roosting in trees, bridges, or other structures in the CPA but gone undetected. It is recommended that biologists conduct nocturnal emergence surveys at human-made structures, bridges, and intact stands, snags, or large, decadent trees that would be affected by project construction. Mist-netting near potential roosts, coupled with radio tracking of captured individuals, can be used to locate bat roosts.

The time constraints associated with processing a large amount of acoustic data precluded a thorough analysis of the proportion of different bat species represented at the various habitat types and the contribution of the different species to activity levels. However, the value of these habitat types to bats can be better understood by examining both the species richness and relative representation of species at each of the habitat types. Bat migration may also be better understood through an extensive seasonal evaluation of relative species representation.

Two California Species of Special Concern, Townsend's Big-eared and Western Mastiff bats, were not identified during acoustic monitoring, and Pallid Bats were not confirmed with 90-percent confidence in the CPA. Based on data available from the CNDDB, these species have been documented in the landscape surrounding the CPA, and it is possible that these species are present in the CPA, although the acoustic methods employed by this team were unable to detect them. Additionally, limited survey access in the Project Area may have caused the team to miss areas where these and other species would have been detected. Townsend's Big-eared Bats are low-intensity echolocators, producing echolocation calls often too quiet to be detected by acoustic equipment; they are best identified during internal roost surveys (WBWG Website 2007).

Western Mastiff Bats forage high above the ground, and although they descend to drink water, this species may not have been detected by acoustic stations deployed on the ground. Both passive and active acoustic monitoring are recommended methods for detecting this species (WBWG Website 2007). In addition, Pallid Bats may echolocate while flying but generally use passive acoustic cues to locate prey (WBWG 2005b), such as low-intensity calls, making this species difficult to detect acoustically. Although acoustic monitoring is a recommended method for detecting Pallid Bats, it has also been recommended that active acoustic monitoring in conjunction with visual monitoring and mist-netting be employed when searching for Pallid Bats (WBWG Website 2007). The call of the Pallid Bat also overlaps greatly with the call of the Big Brown Bat; therefore, in addition to Big Brown Bats, Pallid Bats could have been present, but not separately detected in these surveys. Mist-netting in habitat types identified to have an acoustic call or a potential call of a special-status species, and mist-netting and roost surveys in newly accessible parcels with habitat features associated with special-status bats, may assist in positively identifying these special-status species in the CPA.

2.9.3 References

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2.10 RIPARIAN MAMMALS

2.10.1 Methods

2.10.1.1 Target Species

The two riparian mammal species surveyed for in the CPA are the Riparian Brush Rabbit and Riparian Woodrat. The Riparian Brush Rabbit is State and Federally listed as Endangered. Although formerly believed to be more widespread along the San Joaquin and Stanislaus rivers, only two populations were known until 1998. A captive breeding and reintroduction program was begun in 2001 (Williams et al. 2002). The Riparian Woodrat, also known as the San Joaquin Woodrat, is Federally listed as Endangered and is a California Species of Special Concern. Historical records indicate that the Riparian Woodrat are distributed along the San Joaquin, Stanislaus, and Tuolumne rivers and at Corral Hollow, in San Joaquin, Stanislaus, and Merced counties. Nevertheless, populations today are greatly reduced, and only two are documented: at Caswell Memorial State Park and at the San Joaquin River National Wildlife Refuge (USFWS Website 2009).

2.10.1.2 Survey Description

2.10.1.2.1 Surveys

The goal of these surveys was to identify potentially suitable Riparian Brush Rabbit and Riparian Woodrat habitat and conduct protocol-level surveys in these habitats to assess species presence.

The California State University, Stanislaus, Endangered Species Recovery Program (ESRP), in collaboration with DWR and other affected agencies and stakeholders, developed survey methodologies for Riparian Brush Rabbit and Riparian Woodrat. The Riparian Brush Rabbit and Riparian Woodrat have overlapping habitat needs and were surveyed for concurrently.

After CDFG habitat maps were used to select areas with preferred habitat conditions, ground-truthing of accessible habitat was completed. In addition, comprehensive inspections for Riparian Brush Rabbit and Riparian Woodrat sign (feces, runways, vegetation clippings, and nests) were conducted by thorough searches of thickets with suitable habitat elements.

Live-trapping was conducted in habitats determined to have moderate to high suitability and where threshold criteria were met. The following threshold criteria attributes, based on Draft Habitat Assessment Guidelines and Survey Protocol for the Riparian Brush Rabbit and the Riparian Woodrat (USFWS Website 2010), were used to determine the areas for trapping:

- Presence of appropriate species of vegetation (listed in Candidate Survey Habitat section, below)
- Suitable vegetation structure (the appropriate plant species are densely concentrated over 30–100 percent of the surveyed area)

- Geographic extent and connectivity to other areas (habitat quality of each area was considered in the context of the habitat quality in adjacent areas)
- Possible sign found or visual observations made of target species (even if the structure criteria are not quite met, trapping would be conducted if sign was found or riparian brush rabbit or riparian woodrat was thought to be observed)

Initial focus for trapping was on parcels in the CPA containing potentially suitable habitat that show the potential to harbor Riparian Brush Rabbit or Riparian Woodrat. A minimum of 10 traps were used to survey each area of appropriate habitat. Terrestrial traps were placed in runways or other areas along movement paths and where sign was present. Spacing for all traps depended on the occurrence of runways or other sign and, therefore, could not be generalized.

Between March 24 and October 31, 2009, 14 survey locations were trapped for a total of 7,770 trap-nights. Traps were operated for an average of 4 consecutive nights. Trap-lines were removed earlier from areas with low suitability for target species. Photo traps and arboreal traps were not used but may be used during future trapping efforts.

2.10.1.2.2 Documentation of Results

If special-status species had been observed during survey efforts, they would have been documented by species, number, location, habitat type (including attributes and quality assessment), and activity, to the extent possible. For special-status species trapped, additional data collected would have been ear tag number, sex, weight, age, reproductive condition, right ear measurement (in millimeters), right foot measurement (in millimeters), and number of ear and hair samples taken. In addition, for all nonsensitive species trapped, data collected would have included trap number and species.

2.10.1.3 Team Composition and Equipment Used

The field teams consisted of two surveyors: a wildlife biologist and a field assistant. The wildlife biologists were fully trained to identify and handle both Riparian Brush Rabbit and Riparian Woodrat. Every wildlife biologist conducting surveys possessed a valid USFWS recovery permit, issued under Section 10(a)(1)(A) of the ESA. In addition, every wildlife biologist conducting surveys was required to possess and did possess a valid CDFG scientific collecting permit.

A Trimble Juno ST handheld GPS, Nikon Coolpix P5100 12-megapixel digital camera, and Dell Latitude field laptop (and accompanying equipment) were used to collect field attributes.

For live-trapping, 60 Tomahawk double-door, wire-mesh traps (model 203: 61 centimeters long by 15.2 centimeters high and wide) were used. To exclude predators, 0.25-inch-mesh hardware cloth was attached to the tops and sides, and plywood plates were added to both doors.

2.10.1.4 Survey Timing

GIS analysis of potential habitat and ground-truthing were initiated in December 2008 and continued through the survey period. Habitat assessment surveys were conducted in San Joaquin, Sacramento, Contra Costa, and Solano counties from January through March 31, 2009. Live-trapping began in March 2009 and continued through fall 2009.

2.10.1.5 Candidate Survey Habitat

Riparian Brush Rabbit are associated with a blend of large patches of dense shrub understory (large patches of dense brush composed of riparian vegetation [e.g., willows, blackberries, wild rose] or other dense shrub species) with edges adjacent to open areas of herbaceous plants, generally with an open overstory of trees, but tree canopy is not an essential feature. A general description of Riparian Brush Rabbit habitat can be found in USFWS's species account (USFWS Website 2007).

Riparian Woodrat are associated with dense shrub understory (large patches of dense brush composed of riparian vegetation or other dense shrub species) that generally has a tree canopy (especially oak but also black walnut, Fremont Cottonwood, and other large tree species). They inhabit riparian communities along the lower portions of the San Joaquin and Stanislaus rivers in the northern San Joaquin Valley. A general description of riparian woodrat habitat can be found in USFWS's species account (USFWS Website 2009). Although Riparian Woodrat habitat is not the same as Riparian Brush Rabbit habitat, it is assumed that RWR habitat is a subset of RBR habitat. The conditions for RWR habitat are not as well known as for RBR.

Candidate survey habitat types for these species are riparian forest, valley oak woodland, and willow scrub and the waterways and in-channel islands on Delta levee systems that support those types of natural communities or scrubby/ruderal habitat conditions. Since the purpose of the effort was to target areas for surveys, it was assumed that targeting areas for Riparian Brush Rabbit would include areas for Riparian Woodrat.

2.10.1.6 Identification of Habitat Unit Survey Locations

Specific habitat elements in the aerial photographs that were examined as part of the presurvey GIS analysis included large patches of dense brush composed of riparian vegetation or other dense shrub species.

2.10.1.7 Duration of Survey Validity

USFWS has not established a period of validity for the survey results.

2.10.1.8 Methodology Approvals

Agencies with review and/or approval authority for both species are USFWS under the ESA and CDFG under CESA (California Fish and Game Code §2805) and as a trustee agency under CEQA.

2.10.2 Results and Discussion

2.10.2.1 Survey Results

Sites were surveyed for potential habitat suitable for use by Riparian Brush Rabbits and Riparian Woodrat. Habitat conditions were determined as being suitable for both species based on: (1) presence of appropriate species of vegetation; (2) suitable vegetation structure; and (3) geographic extent and connectivity to other areas (USFWS 1998).

Vegetation species and structure suitable to support Riparian Brush Rabbit and Riparian Woodrat populations were documented at the following locations in the CPA; trapping surveys were conducted at a subset of these locations, indicated with an asterisk (*):

- Delta Meadows
- Stone Lakes National Wildlife Refuge – North Unit
- Stone Lakes National Wildlife Refuge – South Unit
- Stone Lakes National Wildlife Refuge – Sun River Unit
- Twin Cities Road *
- Twitchell Island *
- Sherman Island
- Cosumnes River Preserve West *
- Bradford Island

- Lower Roberts Island *
- White Pond at New Hope Tract *
- Ponds south of Hog Slough (White Slough Wildlife Area) *
- Ponds north of State Route 12
- Venice Island
- Clifton Court Forebay – northern, eastern, and southern perimeters *
- Eastern and western perimeter of Prospect Island *
- Hood parcels
- Stone Lake Road *
- River Road *
- Herzog Road
- Dierson Road
- Twin Cities Road northeast *
- Staten Island *
- Willow Point Road
- State Route 4
- Sun River, Lambert Road
- Bixler Road
- Delta Road
- Holland Tract
- Woodward Island

No Riparian Brush Rabbits were detected in the CPA during the habitat assessment and trapping surveys. Additionally, no Riparian Woodrats or active or historic nests were detected in the CPA during the field effort.

To date, accessible parcels have had marginal habitat conditions and/or isolation constraints or have been located in parts of the CPA that have a lower probability of harboring either species. There is a higher probability of documenting both species south of State Routes 12 and 4 (mostly in San Joaquin County) than in the central and northern parts of the CPA (see Williams 1993, Williams et al. 2005, Williams et al. 2008 for occurrence information). Just southeast of the CPA, a dispersed population of Riparian Brush Rabbit is present on and adjacent to Stewart Tract. Populations of Riparian Brush Rabbit and Riparian Woodrat also are present farther south of the CPA, at Caswell Memorial State Park and on the San Joaquin River National Wildlife Refuge, where the CSU Stanislaus (ESRP) and its Federal and State partner agencies have initiated a captive propagation and reintroduction program for Riparian Brush Rabbit using breeders from the Stewart Tract area.

2.10.2.2 Limitations and Future Surveys

Habitat assessment surveys will be continued at locations throughout Sacramento, San Joaquin, Contra Costa, Solano, and Yolo counties as parcels become available for surveys. Trapping will be conducted at all locations where suitable habitat or sign of target species is found.

The goal of these and future surveys is to document where both species or either species may have established new populations or expanded existing ones beyond the areas of known populations.

Because of access limitations in survey areas, especially in the southern end of the CPA, suitable habitat identified for Riparian Brush Rabbit and Riparian Woodrat is likely underrepresented.

2.10.3 References

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USFWS (U.S. Fish and Wildlife Service). 2007. Species Account: Riparian Brush Rabbit *Sylvilagus bachmani riparius*. Last updated November 13, 2007. Site accessed June 25, 2010. URL = http://www.fws.gov/sacramento/es/ animal_spp_acct/riparian_brush_rabbit.pdf.

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Williams, D. F., P. A. Kelly, and L. P. Hamilton. 2002. *Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)*. Endangered Species Recovery Program. California State University. Stanislaus. Turlock, California. Site accessed February 11, 2010. URL = http://www.fws.gov/sacramento/es/documents/RBR_Prop_Plan_Final.PDF.

Williams, D. F., P. A. Kelly, L. P. Hamilton, M. R. Lloyd, E. A. Williams, and J. J. Youngblom. 2008. Recovering the Endangered Riparian Brush Rabbit (*Sylvilagus bachmani riparius*): Reproduction and Growth in Confinement and Survival after Translocation. Pages 349–361 in: P. C. Alves, N. Ferrand, and K. Hacklander (eds.), *Lagomorph Biology: Evolution, Ecology, and Conservation*. Springer-Verlag, Berlin, Germany.

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CHAPTER 3: 2009 OTHER ENVIRONMENTAL SURVEYS

3.1 CULTURAL RESOURCES

3.1.1 Methods

3.1.1.1 Literature and Records Search Methods

Records of previous cultural resource study areas and previously recorded cultural resources that are maintained at the North Central Information Center, Central California Information Center, and the Northwest Information Center of the California Historical Resources Information System (CHRIS) were reviewed by the information centers for the CPA. In addition to reviewing those records, the information centers also consulted the following inventories: the National Register of Historic Places (NRHP) (2009), the California Register of Historical Resources (CRHR) (2004), the Office of Historic Preservation Historic Property Directory (2005), the California Inventory of Historic Resources (1976), the California State Historical Landmarks (1996), the California Points of Historical Interest (1992), the California Department of Transportation Bridge Inventory (1987, 2000), historic U.S. Geological Survey topographic maps, and General Land Office plats.

Records searches conducted through the CHRIS have demonstrated that a wide variety of prehistoric and historic-era sites, features, and artifacts have been documented in the CPA. For purposes of the records search, the review area was defined as the area within a distance ranging from approximately 1,000 feet to approximately 5,000 feet from the known location of facilities that may be implemented as part of the BDCP.

3.1.1.2 Native American Consultation

The Native American Heritage Commission (NAHC) was contacted on May 21, 2009, for information about the location of known heritage or sacred sites in the CPA. The California Valley Miwok Tribe, the Cortina Band of Indians, the Ione Band of Miwok Indians, the North Valley Yokuts Tribe, the Rumsey Indian Rancheria of Wintun, the Shingle Springs Band of Miwok Indians, the Ohlone Indian Tribe, the United Auburn Indian Community of the Auburn Rancheria, the Wilton Rancheria, and other knowledgeable individuals also were contacted on June 15 and 22, 2009, for any information they might have on the CPA.

3.1.1.3 Field Survey Methods

For the 2009 survey season, field investigations were limited to include condition assessments that involved ground-truthing of previously recorded or known cultural resources sites. Using cursory surveys, archaeologists attempted to verify the accuracy of site records and site locations, as well as the presence or absence of artifacts or human remains. These types of visits included, but were not limited to, single-day field inspections. Photographs and GPS location readings were taken for archaeological, architectural, and historic resources. Most known cultural resources are listed as prehistoric archaeological sites (i.e., primarily burial mounds and/or habitation sites, along with lithic scatters and baked clay deposits). Numerous historic-era resources, such as architectural and engineering features, also exist throughout the CPA.

3.1.2 Results and Discussion

3.1.2.1 Literature and Records Search Results

The literature and records search identified approximately 300 cultural resources in the CPA. These cultural resources include early Native American burial, habitation, and mound sites; Gold Rush-era residences; an 1850s-era shipwreck; ranches; agricultural work camps and landscapes; railroads; water conveyance systems; levees; and bridges.

The literature search results indicated that some of the cultural resources identified in the CPA have been evaluated for eligibility for listing in the NRHP and/or the CRHR. Several are already listed in one or both registers, but the vast majority of the cultural resources in the CPA remain unevaluated. Of those unevaluated resources, some, such as isolated artifacts or features, can be summarily dismissed from potential register eligibility because of their lack of physical integrity and status as isolated resources separated from any physical association with or documented relationship to historically important persons or events.

With few exceptions, research up until the 1970s and 1980s focused almost entirely on prehistoric sites. As a result, dozens of habitation, burial, and mound sites were identified in, and in the vicinity of, the CPA. In general, many of the sites recorded from the early 20th century to the mid-20th century have not been revisited by archaeologists since, or they were identified only after having been partially destroyed. This has been the case regarding numerous mound sites (habitation and/or burial) that were noted as having been leveled by agricultural activities when they were initially documented. Despite often considerable historic-era impacts on such sites, significant archaeological deposits and undisturbed human remains can remain in subsurface contexts. Consequently, until demonstrated otherwise, or if a preponderance of evidence indicates such locations have been completely destroyed, these resources need to be considered potentially eligible for listing in the NRHP and/or the CRHR.

It is important to note that the results of the CHRIS records searches reflect only available information on already-documented cultural resources. The vast majority of the CPA has never been subjected to intensive archaeological inventory. As a result, numerous presently unrecorded cultural resources almost certainly exist in the CPA. In addition, most archaeological surveys in California consist of surface pedestrian inventories that typically cannot provide detailed information on the potential existence of subsurface resources—even in areas where ground surface visibility is good, such as freshly plowed agricultural fields. Recent experience on the Natomas Levee Improvement Project (NLIP) immediately north of Sacramento has demonstrated that numerous important prehistoric sites exist in subsurface contexts. In most cases, these sites were identified in areas that had been subjected to conventional pedestrian survey techniques. However, systematic shovel-test surveys conducted for the NLIP demonstrated that CHRIS records searches and visual surveys provide incomplete data on the potential for projects to affect potentially significant (according to the NRHP or CRHR) prehistoric resources in particular.

3.1.2.2 Native American Consultation Results

The sacred lands search conducted by the NAHC on June 5, 2009, did not identify the presence of any known heritage or sacred sites. The individuals and organizations identified as knowledgeable persons by the NAHC were contacted by letter on June 15 and 22, 2009, to solicit their comments and concerns regarding the project. Phoebe Bender, cultural resources information specialist for the Rumsey Indian Rancheria, responded with a letter dated August 19, 2009. Ms. Bender's letter stated that, based on the information provided, the Rumsey Band of Wintun Indians of California would not be submitting comments for this particular project (Bender pers. comm. 2009). David C. Jones, Wintun Environmental Protection Agency executive director of the Cortina Indian Rancheria (CIR), responded in an e-mail dated September 4, 2009 (Jones pers. comm. 2009). Mr. Jones's e-mail stated that the Cortina Band of Indians was not aware of any cultural sites in the CPA and therefore did not have any objections or concerns about the BDCP project at this time. Mr. Jones asked that CIR be advised of any cultural material or resources found and their disposition. No additional comments have been received to date.

3.1.2.3 Field Survey Results

Cursory cultural resources surveys were conducted over 6 days (May 19–21, September 21, October 27, and December 7, 2009) by DWR archaeologists, with support from consultant staff. During the course of the fieldwork, two to four archaeologists participated in the survey efforts. Where the surface was visible, primarily at roads, shorelines, and rodent burrows, cursory surveys were completed to help identify and locate any previously recorded cultural resources. Attempts were made to re-locate and revisit 21 previously recorded prehistoric archaeological sites on accessible parcels in the CPA. All the previously recorded sites are listed as burial mounds/habitation sites, except for a few identified as baked clay deposits and artifact scatters. Two were multicomponent historic/prehistoric sites that included both homesteads and burial mounds/villages. Almost all site locations were difficult to identify because they were obscured by vegetation; others were either in active or in fallow agricultural fields. Some sites could not be re-located because of access issues or dense vegetation. Years of intensive agricultural use and abandonment appear to have caused previously visible cultural artifacts to settle below the ground surface.

Surveys of the 21 sites were conducted by accessing available land parcels. The locations of two previously recorded cultural resources were verified based on the presence of surface artifacts. An additional 19 sites were located based on site records and maps, but they were not visible on the ground surface. It is assumed that many of these 16 previously recorded archeological sites with no visible surface artifact scatters are, or may be, buried. Alternatively, the recorded locations of the sites, which were plotted before the advent of GPS, may be inaccurate. Furthermore, a reconnaissance survey was conducted by boat of three sites situated on small land-locked islands; dense shore vegetation prevented access to the islands and verification of the site locations.

If ground disturbances occur in or close to any previously recorded archaeological site, it is recommended that exploratory excavations, such as plowing, trenching, or surface scraping, be conducted. These recommendations are made to verify the location of these resources and to re-locate the resources that are believed to be buried.

3.1.2.4 Conclusions

Although the cultural resources survey did not directly reveal all previously recorded resources on accessible parcels, it did provide insight about the issues to be faced if the ground is disturbed by project construction. Cultural field surveys helped assess how to most effectively search for archaeological sites during surveys and data recovery activities. Ground-truthing of previously recorded site locations helped to determine whether sites were present in some form (e.g., a leveled mound in a cornfield or mitigation area) or whether they had likely been destroyed by construction of infrastructure or development. The potential of some sites to be buried has been noted, even though no surface evidence remained.

3.1.3 References

Bender, P. 2009. Cultural Resources Information Specialist, Rumsey Band of Wintun Indians, Brooks, California. Letter to J. Offermann, Senior Environmental Planner, California Department of Water Resources, West Sacramento, California. August 19, 2009.

Jones, D. 2009. Executive Director, Wintun Environmental Protection Agency, Williams, California. E-mail to J. Offermann, Senior Environmental Planner, California Department of Water Resources, West Sacramento, California. September 4, 2009.

3.2 RECREATION

The Delta is a popular recreational area, particularly for boating and fishing. The California Department of Boating and Waterways (CDBW) estimated that more than 2.1 million boating trips took place in the Delta in 2000 (CDBW 2003). The California Department of Parks and Recreation (CDPR) has identified portions of the north and east Delta as among the most popular areas for fishing from a boat (CDPR 1997). In addition, commercial boating facilities exist throughout the Delta. Several of the waterways are

important boating thoroughfares in the north and east Delta because they provide convenient east-west–connecting routes between the North and South Forks of the Mokelumne River and between the San Joaquin River and other nearby Delta waterways.

3.2.1 Methods

The boat traffic study was undertaken to collect boat use data in the Delta during the summer recreation season, for the purpose of establishing a baseline for determining effects on boat passage and/or boat traffic from implementation of the Bay Delta Conservation Plan.

3.2.1.1 Survey Description

Limited boat traffic data are available for the Delta, and no data are available for several waterways being considered as water conveyance components of the BDCP. Therefore, no baseline data are available to support analysis of potential impacts of proposed facilities on boating movement. A boat traffic study was identified as necessary to characterize boat traffic, including traffic volume and boat sizes/types, in the waterways.

The goal of the limited boat traffic study was to collect boat use data in the Delta to begin to establish a baseline for determining effects on boat passage and/or boat traffic for the BDCP EIR/EIS.

3.2.1.1.1 Documentation of Results

Data recorded included boat type, time of observation, direction of travel, behavior/activity, and notations regarding uncommon boat types (recorded as “other”) and other potentially useful details about boats observed and their activity. To assist in identifying the types of boats corresponding to the categories used on the data collection form (also included in Appendix 1.5A), observers were provided with a photographic guide and boat type reference photo sheets (Appendix 3.3A). Photographs representative of observed boating activity were taken at each observation location (Appendix 3.3B).

Observers also made notes of boats that had already been recorded earlier that day. Notes were recorded for each pass if the boat had left the observation area for at least half an hour, with an assumption made that those boats had probably left the specific waterway before returning and thus could be affected by a barrier both when leaving and returning to the waterway being observed. Boats that crossed back and forth in a short period were not counted after the first pass, even if they had traveled out of sight of the observer, with an assumption made that they had not left the specific waterway. Likewise, boats that anchored or beached near the observation point were recorded only once.The hourly and total counts per boat type were compiled from data collection forms for each observation and entered into spreadsheets for compilation, review, and development of descriptive statistics on boat traffic.

3.2.1.2 Team Composition

One- and two-person teams, consisting of staff members with previous experience conducting boat traffic studies, were used for surveying efforts at each of the six observation locations.

3.2.1.3 Survey Timing

Boat traffic observations were conducted between August 28, 2009, and September 7, 2009 (including the Labor Day holiday weekend), at a total of six locations by DHCCP staff members. DWR staff members assisted at two of these locations. On each sample day, boat traffic data were collected for a total of 8 hours during two 4-hour observation periods: 8 a.m. to 12 noon and 1 p.m. to 5 p.m. These observation periods allowed boat traffic to be observed during the flood and ebb tides.

On each sample day, two-person observation teams recorded boat traffic observation data on data forms (Appendix 1.5A). Data collection procedures were pretested and verified by the recreation survey field

team leader at all locations before the start of data collection. Observers used binoculars for observations when needed.

3.2.1.4 Survey Sites

As part of the Through-Delta Conveyance Option, up to five operable barriers located north of the San Joaquin River could be installed and periodically closed to control water movement and water quality. These potential barriers could be operated under a range of operational scenarios. The boat traffic studies were restricted to the locations of these select barriers because their potential effects on boat passage and/or boat traffic could vary depending on operations.

The specific barrier locations are:

- Snodgrass Slough (just south of the Delta Cross Channel, near Walnut Grove)
- North Fork Mokelumne River (just west of the confluence with South Fork Mokelumne River)
- South Fork Mokelumne River (just west of the confluence with Little Potato Slough, near Terminous)
- Potato Slough (just west of the confluence with Little Potato Slough)
- Little Connection Slough (just north of the confluence with San Joaquin River)

Observations also were made at a proposed operable barrier site on Threemile Slough, from Brannan Island State Recreation Area, to facilitate comparison to previous boat traffic studies performed there in 2008 as part of the Franks Tract Project.

3.2.1.4.1 Observation Locations

Potential boat traffic observation locations found in the vicinity of the potential operable barriers sites were assessed based on their view of the waterway and accessibility. Observation locations on levees in the vicinity of the Snodgrass Slough, South Fork Mokelumne River, and Little Connection Slough potential barriers were selected. Two of these locations were within the boundaries of commercial marinas, which granted permission for the observations to be conducted. The third location was along a public county road at an informal recreation site commonly used by shoreline anglers. Each land-based observation location enabled observation of boating activity traveling in both directions passing the site of the proposed operable barrier. No land access was available in the vicinity of the North Fork Mokelumne River and Potato Slough proposed barrier sites; therefore, the observations at those sites were conducted from a boat.

Table 3.2-1 presents a summary of observation method and location and identifies the survey date for each site.

Table 3.2-1. Labor Day Boat Traffic Study Overview

Observation Method	Waterway with a Proposed Operable Gate Location	Observation Location	Survey Date
Land Based	Threemile Slough[a]	Brannan Island State Recreation Area	August 29, 2009
	Snodgrass Slough	Walnut Grove Marina	September 5, 2009
	South Fork Mokelumne River	Terminous/Tower Marina	September 6, 2009
	Little Connection Slough	Within the County Right-of-Way in Vicinity of Proposed Gate Location	September 7, 2009
Boat Based	North Fork Mokelumne River	Vicinity of North Fork Mokelumne River on South Side of Deadhorse Island	September 6, 2009
	Potato Slough	Vicinity of Potato Slough at Junction with Little Potato Slough	September 7, 2009

[a] The Threemile Slough location was added at the request of DWR to allow comparison of boat traffic with a previous study.
Source: Data compiled by DHCCP in 2009

3.2.2 Results and Discussion

This section of the report summarizes the total amounts of boat traffic for each observation period/site and is followed by a summary of hourly count data. Boat traffic characteristics are provided, including boat types, direction of travel, and observations of the apparent influence of Tower Park Marina on boat traffic at the South Fork Mokelumne River site.

3.2.2.1 Survey Results

3.2.2.1.1 Boat Traffic Levels

The number of boats observed at each of the five sites for each respective observation day ranged from 69 to 340 boats (**Table 3.2-2**).

Table 3.2-2. Labor Day Boat Traffic Study Results Summary

Observation Date	Day of Week	Location	Observation Period[a]	Total Boat Count
August 29	Saturday	Threemile Slough[b]	9 a.m. to 5:45 p.m.	372
September 5	Saturday	Snodgrass Slough	8 a.m. to 5 p.m.	123
September 6	Sunday	North Fork Mokelumne River	10 a.m. to 5 p.m.	78
September 6	Sunday	South Fork Mokelumne River	8 a.m. to 5 p.m.	340
September 7	Monday (holiday)	Potato Slough	9:30 a.m. to 5 p.m.	69
September 7	Monday (holiday)	Little Connection Slough	8 a.m. to 5 p.m.	132

[a] Each observation day was planned to consist of 8 hours of observation, with two 4-hour observation periods (8 a.m. to 12 noon and 1 p.m. to 5 p.m.) divided by a 1-hour break period. The start of observation at the North Fork Mokelumne River and Potato Slough sites was delayed 1.5 to 2.0 hours because of rental boat logistical problems.

[b] The Threemile Slough location was added at the request of DWR to allow comparison of boat traffic with a previous study.

Source: Data compiled by DHCCP in 2009

For photographs of boat traffic and the various types of boats observed at several of the observation locations, see Appendix 3.3B.

3.2.2.1.2 Hourly Boat Traffic Patterns

Examination of boat traffic data reveals the hourly pattern of boating activity. As shown on **Figure 3.2-1**, boat traffic was consistently low during the first three morning hours, with as few as 1 and no more than 16 boats observed per hour at any site. Traffic increased considerably during the late morning and early afternoon hours, particularly at the South Fork Mokelumne River site, when from 71 to 83 boats were observed per hour. Boat traffic generally remained fairly high through the 4 p.m. hour, although the level of traffic appeared to taper off at each site during that final hour of observation.

3.2.2.1.3 Composition of Boat Traffic by Boat Type and Nonrecreational Traffic

The boat traffic observed was dominated by two broad types of smaller boats: runabouts and small fishing boats (**Table 3.2-3**). Together, those two types of boats made up 60–80 percent of all boat traffic observed at each site. (The percentage was slightly lower at Potato Slough, where cabin cruisers were more common.) Although there is considerable variation within these types of craft, in general, they are all open boats roughly 18–22 feet long.

The category of runabouts includes boats commonly referred to as ski boats, wakeboard boats, and fish-and-ski boats. Likewise, small fishing boats include boats commonly referred to as bass boats, johnboats,

and several other specialized types, all of similar size. A third type of small boat, formally known as personal watercraft (PWC), but commonly referred to as jet-skis, was the next most common type of vessel observed, accounting for 6–12 percent of traffic at all sites except North Fork Mokelumne River (where none were observed). All together, these three types of small boats made up approximately 80 percent of observed boat traffic.

Two types of larger boats, cabin cruisers and pontoon boats, made up most of the remainder of the observed traffic. There is also considerable variation within these two boat types, but in general, these are boats 25–35 feet long, with some form of enclosed cabin (cabin cruisers) or overhead cover (pontoon).

Boats categorized as "other types" included a variety of larger boats, such as sailboats, off-shore boats, and houseboats. The larger cabin cruisers, houseboats, off-shore boats, and sailboats often exceeded 35 feet in length. The "other types" category also included nonrecreational boats, which generally totaled no more than 5–10 boats during any observation day, and patrol and other boats used by resource management and law enforcement agencies. In total, the "other types" category made up less than 10 percent of the boats observed each count day. For photographs of the different types of boats observed, see Appendix 3.3B.

Table 3.2-3. Boat Types Observed

Observation Site/Dates	Total Boats Observed	Number of Boats Observed by Type (8 Hours of Observation)					
		Runabout	Fishing (Small)	PWC/ Jet Ski	Pontoon	Cabin Cruiser	Other Types[a]
Threemile Slough (August 29, 2009)	372	168	74	66	5	15	44
Snodgrass Slough (September 5, 2009)	123	75	10	7	4	10	17
North Fork Mokelumne River (September 6, 2009)	78	53	10	0	1	3	11
South Fork Mokelumne River (September 6, 2009)	340	195	32	40	9	32	32
Potato Slough (September 7, 2009)	69	25	13	7	0	16	8
Little Connection Slough (September 7, 2009)	132	43	37	13	1	20	18

[a] "Other types" primarily consisted of larger recreational boats, such as offshore powerboats, sailboats, and houseboats. The category also includes nonrecreational boats (e.g., Coast Guard and sheriff's patrol boats, State and Federal agency–owned boats).

Source: Data compiled by DHCCP in 2009

3.2.2.1.4 Boat Traffic Direction of Travel and Activity

The direction of boat traffic observed on Little Connection Slough was evenly divided between boats traveling north and boats traveling south. On Snodgrass Slough, more than 60 percent of the traffic was moving north (toward the Delta Cross Channel and Delta Meadows). On Potato Slough, approximately 75 percent of the traffic was moving north (toward popular boat gathering areas up the slough). The direction of travel of boat traffic observed at the North Fork and South Fork Mokelumne River sites was evenly divided between boats traveling east and boats traveling west. A small percentage of boats were not categorized as traveling in one direction or the other because they remained stationary in the slough, remained on shore, or repeatedly traveled back and forth in the observation area (**Table 3.2-4**).

The observations indicate that well over 90 percent of the traffic observed on this survey weekend was using the rivers and sloughs for cruising and/or as a route to some destination rather than for other types of on-site recreation in the river or slough itself (e.g., fishing, waterskiing, swimming). A small number of boats anchored or beached near the observation points and some boats, commonly originating at Tower

Park Marina (particularly PWCs), remained in the area. A small number of fishing boats were also observed trolling (pulling a fishing lure or bait at slow speeds behind a boat) in the rivers and sloughs.

Table 3.2-4. Direction of Travel of Boat Traffic

Observation Site/Date	General Orientation of Waterway	Northbound/ Eastbound (%)	Southbound/ Westbound (%)	Neither/Both[a] (%)
Threemile Slough (August 29, 2009)	North-South	49	41	10
Snodgrass Slough (September 5, 2009)	North-South	58	42	0
North Fork Mokelumne River (September 6, 2009)	East-West	54	45	1
South Fork Mokelumne River (September 6, 2009)	East-West	52	45	3
Potato Slough (September 7, 2009)	North-South	64	36	0
Little Connection Slough (September 7, 2009)	North-South	48	48	3

[a] Traffic stationary in waterway (e.g., fishing in area) or moving north-south and east-west (e.g., personal watercraft operating in area).
Source: Data compiled by DHCCP in 2009

3.2.2.1.5 Influence of Tower Park Marina Facilities on South Fork Mokelumne River Boat Traffic

The presence of Tower Park Marina, which supports several hundred long-term boat berths, a launch ramp, and boat rental and fuel services on the nearby South Fork Mokelumne River, was confirmed by the observations to have a strong influence on boater use and behavior. To the extent that it was possible to observe the origin or destination of the boats, traffic coming to or departing from the marina made up approximately 78 percent of traffic on the South Fork Mokelumne River. The other portion of traffic remained on the South Fork Mokelumne River and did not approach the marina.

It should be noted that the observation of marina-related traffic was limited primarily to boats coming to and going from the guest docks, the fuel dock, and a portion of the long-term berths located just south of the confluence of Little Potato Slough and the South Fork Mokelumne River. Because most of the long-term berths were not visible from the observation point, boats that left a berth and traveled north would have passed the observation point but may not have been recorded as having originated at the marina.

3.2.2.1.6 Summary of Boat Traffic

The following points summarize boat traffic on the five waterways observed during the Labor Day 2009 weekend:

- Traffic volume was modest, even at peak-use times, at all but the South Fork Mokelumne River site, with hourly traffic rarely exceeding 20–25 boats. In comparison, the South Fork Mokelumne River had from 70 to 83 boats per hour passing during midday peak-use hours (1–4 p.m.).
- The boat types making up the boat traffic on the waterways are diverse, but approximately 80 percent of the traffic during the observation period was composed of small boats (runabouts, ski boats, bass boats, and other small fishing boats), generally 18–22 feet long, and PWC. Most of the remainder of the watercraft was composed of a variety of larger boats, ranging from 25 to 35 feet long or larger (primarily cabin cruisers, pontoon boats, larger fishing boats, and

houseboats). Commercial boats (e.g., tour boats, guided fishing boats) and nonrecreational boats (patrol boats) made up a relatively small proportion of the boat traffic.

- Traffic movement on the waterways was roughly equal in each direction, except at Snodgrass Slough and Potato Slough, where most of the boats traveled in one direction toward nearby boater attractions.
- Nearly all the boating activity on the waterways was related to boaters passing through the slough or river rather than boaters using the slough or river for recreation. Some fishing and PWC use were focused on the sloughs and river.
- At least 78 percent of the traffic on the South Fork Mokelumne River in the vicinity of the observation area was associated with Tower Park Marina.

3.2.3 References

CDBW (California Department of Boating and Waterways). 2003. *Sacramento-San Joaquin Delta Boating Needs Assessment 2000–2020*. Sacramento, California.

CDPR (California Department of Parks and Recreation). 1997. *Sacramento-San Joaquin Delta Recreation Survey*. Sacramento, California.

CHAPTER 4: 2010 BIOLOGICAL SURVEYS

4.1 INTRODUCTION

In 2010, biological surveys were conducted in the CPA to supplement data collected in 2009. Surveys were conducted on a limited number of parcels with suitable habitat where a temporary entry permit was obtained after the 2009 surveys were initiated or where supplementary information was sought. Plant surveys in seasonal wetland habitats and vernal pools were conducted at some sites in 2010 where surveys were conducted in 2009 because rainfall occurred later in the season in 2010 than in 2009, and more occurrences of annual plants were expected. Early season bird surveys for Black Rails were conducted in 2010 because surveys in 2009 had started too late in the season and were deemed insufficient.

In this chapter, 2010 biological survey results are summarized. In general, the same survey protocols used in 2009 were used in 2010. In some cases, minor adjustments were made to the survey protocols, and only those methods are reported here.

4.2 PLANTS

4.2.1 Methods

4.2.1.1 Target Species

In the course of conducting surveys, a species of *Atriplex* was found near Clifton Court Forebay that was keyed out in the Jepson Manual to *Atriplex vallicola*. Upon consulting the Jepson Flora Project: Public Review, DWR found that the updated description places the taxon as a variety of *A. coronata*, rather than as a separate species and enlarges the range to include the entire San Joaquin Valley. Because *A. vallicola* is currently evaluated as a CRPR 1B species, it is reasonable to presume that the newly renamed *A. coronata* var. *vallicola* will have the same designation. Thus, Lost Hills Crownscale (*Atriplex coronata* var. *vallicola*) was added to the target plant list for the 2010 survey season.

4.2.1.2 Survey Description

The botanical surveys conducted in 2010 were intended to locate occurrences of special-status plants in the following areas:

- Publicly accessible waterways in areas beyond the BDCP CPA that were added because additional engineering detail for the Separate Corridors Option (i.e.; previously titled “Through Delta”) was provided. No additional parcel requests for land access were initiated as these surveys were limited to the public waterways.
- Parcels with access acquired after the conclusion of the 2009 surveys.
- Habitats that were expected to show differences in vegetation composition in response to the increased rainfall in the 2009/2010 rainy season compared to the previous year, such as grasslands and vernal pool complexes.

The rainfall for the 2008/2009 rainy season was 15.1 inches in Davis, California (a station located close to the Delta with a long period of record), which was 2.3 inches below average. The rainfall in the 2009/2010 rainy season was 16.6 inches, which was 0.8 inch below average (CIMIS 2010). This difference in precipitation was expected to result in a greater probability of emergence and survival of annual grassland and vernal pool species in 2010 than in 2009.

4.2.1.3 Survey Timing

Surveys for the 2010 season began on March 1, 2010, and ended on July 8, 2010.

4.2.2 Results and Discussion

4.2.2.1 Survey Results

Of the 65 target plant species, 12 species were found during the 2010 surveys. The survey findings for each species, along with their State status (if applicable) or CRPR status, are presented below. None of the observed species is listed by the federal government. Three target species were observed in 2010 that were not found in 2009: Alkali Milk-Vetch, Little Mousetail, and Lost Hills Crownscale. In this report, an "occurrence" is defined as a point, line, or polygon where a GPS point or points were recorded to locate a target species.

4.2.2.1.1 Alkali Milk-Vetch

Six occurrences of Alkali Milk-Vetch (CRPR 1B) were found during the 2010 surveys. Occurrences ranged from 1 to 40 individuals in alkali seasonal wetland/grassland with disturbed vernal pools west of Clifton Court Forebay. Associated species included Mediterranean Barley, Italian Ryegrass, Common Peppergrass, California Goldfields, Spikeweed, and Alkali Heath. This plant was not found during the 2009 surveys.

4.2.2.1.2 Bristly Sedge

Only one Bristly Sedge (CRPR 2) occurrence (approximately 17 plants) was found during 2010 surveys. Plants were found in nontidal freshwater marsh adjacent to agricultural fields along Snodgrass Slough north of Twin Cities Road. Associated species included Rough Cocklebur, Water Smartweed, and Bur Marigold.

4.2.2.1.3 Delta Tule Pea

One occurrence consisting of one individual Delta Tule Pea (CRPR 1B) plant was found in tidal marsh on the southwest portion of Webb Tract during 2010 surveys. Associated species included Cattail species, Common Streamside Monkeyflower, Bog Rush, Dallis Grass, Santa Barbara Sedge, and Hedge Bindweed.

4.2.2.1.4 Dwarf Downingia

Eight occurrences of Dwarf Downingia (CRPR 2) were found this year. All were located in grassland with disturbed vernal pool habitat on grazed lands managed by the Stone Lakes National Wildlife Refuge (NWR). The number of individuals recorded at each occurrence ranged from 1 to 300. The significant increase in the abundance of Dwarf Downingia in this area is likely attributable to the increased rainfall during the winter of 2009/2010. Dwarf Downingia was found growing with Small Stipitate Popcornflower, Rayless Goldfields, Legenere, Water-Starwort, Vernal Buttercup, Prickle-fruited Buttercup, Purslane Speedwell, California Goldfields, Dwarf Woolly-Heads, Curly Dock, Pale Spikerush, and Water Pygmyweed. Waxy Manna-Grass was also found at the location of one occurrence and may pose a threat to this population.

4.2.2.1.5 Heckard's Pepper-Grass

Three occurrences of Heckard's Pepper-Grass (CRPR 1B) were found during 2010 surveys. All were found in grassland with disturbed vernal pools on grazed lands managed by Stone Lakes NWR, and populations ranged from 75 to 500 individuals. Heckard's Pepper-Grass was found growing with Mouse-Ear Chickweed, Small Stipitate Popcornflower, Great Valley Gumplant, Spikeweed, Dwarf Pepper-Grass,

Annual Bluegrass, Tiny Mousetail, Redstem Filaree, Curly Dock, Pineapple Weed, Pale Spikerush, and Italian Ryegrass.

4.2.2.1.6 Legenere

Eighteen occurrences of Legenere (CRPR 1B) were found during 2010 surveys. Numbers ranged from 1 to more than 1,000 individuals at each occurrence. All were found in grassland or grassland with disturbed vernal pools on grazed lands managed by Stone Lakes NWR. The dramatic increase in the abundance of Legenere plants this year was likely attributable to the significant increase in rainfall during the winter of 2009/2010. Legenere was found with Water-Starwort, Small Stipitate Popcornflower, Rayless Goldfields, Curly Dock, Vernal Buttercup, Pale Spikerush, Pacific Foxtail, and Common Frog-Fruit.

4.2.2.1.7 Little Mousetail

Two occurrences of Little Mousetail (CRPR 3) found during 2010 surveys were confirmed to be the rare subspecies. These occurrences consisted of 200–1,000 individuals. Three other occurrences were unconfirmed because they were detected before they were fully fruiting and identification was unclear. All of these were located in the vicinity of Clifton Court Forebay in grassland with disturbed vernal pool habitat. Little Mousetail occurred in mixed populations of the target subspecies *apus* with subspecies *minimus*. Other associated species were Small Stipitate Popcornflower and Alkali Peppergrass. This plant was not found during the 2009 surveys.

4.2.2.1.8 Lost Hills Crownscale

Seven occurrences of Lost Hills Crownscale (CRPR 1B) were found during 2010 surveys. All were located in the vicinity of Clifton Court Forebay in disturbed ruderal grassland and numbers ranged from 20 to 250 plants per occurrence. Lost Hills Crownscale was found growing with Valley Saltbush, Spikeweed, Alkali Heath, Soft Chess, and a Chenopodium species. This plant was not found during the 2009 surveys.

4.2.2.1.9 Mason's Lilaeopsis

Nineteen occurrences of Mason's Lilaeopsis (California Rare, CRPR 1B) were found during 2010 surveys. Mason's Lilaeopsis was found in tidal freshwater emergent wetlands on the waterways between Webb Tract and Woodward Island, the south shore of Bacon Island, and the southeast corner of Fabian Tract on Old River. Associated species included Hardstem Bulrush, Water Iris, Marshpepper, Giant Reed, Whorled Marshpennywort, Nutsedge, Iris-leaved Rush, California Buttonbush, Red Willow, Bur Marigold, Alkali Weed, Fiber Optic Grass, Water Pygmyweed, Himalayan Blackberry, Common Reed, Sneezeweed, California Aster, Santa Barbara Sedge, Bog Rush, Common Streamside Monkeyflower, Dallis Grass, and Hedge Bindweed.

4.2.2.1.10 Saline Clover

Saline clover (CRPR 1B) was found at 21 locations during 2010 surveys. All of these occurrences were in grassland with disturbed vernal pool habitat on grazed lands managed by Stone Lakes NWR and ranged from 2 to 2,000 individuals. Associated species included Dwarf Downingia, Small Stipitate Popcornflower, Curly Dock, Pale Spikerush, Rayless Goldfields, Soft Chess, Italian Ryegrass, Vernal Buttercup, Annual Hairgrass, Whitetip Clover, Bicolored Lupine, Mediterranean Barley, Balloon Sack Clover, Dwarf Sack Clover, Truncate Sack Clover, Slender fescue, Baltic Rush, Whitestem Filaree, Clustered Field Sedge, California Goldfields, Mayweed, and Pacific Foxtail.

4.2.2.1.11 Sanford's Arrowhead

Seven occurrences of Sanford's Arrowhead (CRPR 1B) were found during the 2010 surveys. These occurrences were located on tidal freshwater emergent habitat on Georgiana Slough near Walnut Grove, east of Interstate 5 on a waterway north of New Hope Tract, and on the South Mokelumne River near

Canal Ranch. Populations ranged from 2 individual plants to 100 at each occurrence. Plants associated with Sanford's Arrowhead included Hardstem Bulrush, Eurasian Milfoil, and Floating Water Primrose.

4.2.2.1.12 Woolly Rose-Mallow

Twelve occurrences of Woolly Rose-Mallow (CRPR 1B) were found during 2010 surveys. These occurrences were found in riparian scrub and tidal emergent wetland along waterways north of New Hope Tract, on Woodward Canal south of Bacon Island, and on Middle River north of Union Island. These occurrences ranged from 1 to 5 individuals and were found with associated species such as Hardstem Bulrush, Narrow-leaf Cattail, Manyflower Marshpennywort, Water Iris, willow species, Box Elder, Floating Water Primrose, Willow-leaf Lettuce, Wild Radish, Black Mustard, Nutsedge, Himalayan Blackberry, California Bulrush, Common Streamside Monkeyflower, Twinberry, Bog Rush, Iris-leaved Rush, Hedge Bindweed, Valley Oak, and California Grape.

4.2.3 References

CIMIS (California Irrigation Management Information System). 2010. Monthly Precipitation Data for Water Year 2009 and 2010 for Davis, California. URL = http://wwwcimis.water.ca.gov/cimis/data.jsp.

4.3 VALLEY ELDERBERRY LONGHORN BEETLE

4.3.1 Methods

Visual surveys for the elderberry shrub, the host plant of the Valley Elderberry Longhorn Beetle, were conducted using the same methods as were used in the 2009 field surveys (Section 2.3.1). The elderberry shrub surveys were again conducted as incidental to the special-status plant surveys.

4.3.2 Survey Results

Twenty-four occurrences (62 individuals) of elderberry were found during 2010 surveys. Significant populations were found on the Mokelumne River north of New Hope and on the San Joaquin River near its confluence with Old River. Populations ranged from 1 to 10 shrubs per occurrence.

4.4 VERNAL POOL INVERTEBRATES

4.4.1 Methods

4.4.1.1 Survey Description

Methods for 2010 surveys were the same as those for 2009 Phase 1 Branchiopod Sampling, except that water quality sampling was added in 2010. Water quality data were collected on one or more dates in some of the survey areas. Water quality sampling was conducted opportunistically, when budget and schedule allowed. Water quality data collected included alkalinity, pH, electrical conductivity (EC), total dissolved solids (TDS), and dissolved oxygen (DO). Alkalinity was measured using a LaMotte Model WAT-DR field test kit; pH, EC, and TDS were measured using a Hanna Combo Model HI 98129 multimeter. DO was measured using a YSI Model 55 multimeter. Turbidity was also visually estimated in most survey areas on several dates.

Surveys were conducted by one to four teams at a time, consisting of DWR and DHCCP staff members (two staff members per team) from October 2009 through May 2010.

4.4.1.2 Candidate Survey Habitat

Survey locations included Clifton Court Forebay, Knightsen, Lambert, Woodbridge, and DWR Ponds. The habitat characteristics of these sites were as follows:

- The Clifton Court Forebay area supported alkali seasonal wetland, as described in the methods for 2009 surveys. Many of the pools were small, were very shallow, and had short inundation periods, although a few were deeper and larger.
- The Knightsen area supported alkali seasonal wetland similar to that in the Clifton Court Forebay area. Human-made features, including ditches and a small detention pond, were also surveyed. The alkali seasonal wetland was characterized by large, shallow pools.
- The Lambert area included annual grassland with scattered trees and a weedy area adjacent to an asphalt road. The pools were very grassy and relatively shallow.
- The Woodbridge area was characterized by annual grassland, which was adjacent to an irrigation canal that floods the site periodically via culverts in the short levee. The soil had high clay content, and inundation occurs with only little precipitation. The site was relatively flat, apparently as a result of mechanical leveling, and shallow ditches run east to west, channeling water from the culverts. Pools were relatively shallow and poorly defined, spreading across a pasture after major storm events.
- The DWR Ponds area included low marshy areas with scattered willows and relatively shallow pools with tea-colored water.

4.4.1.3 Identification of Habitat Unit Survey Locations

Survey locations included in the Phase 2 Branchiopod Habitat Assessment in 2009 and determined to be suitable branchiopod habitat were sampled in 2010, as well as locations with potentially suitable branchiopod habitat identified after 2009 surveys had ended. These locations were identified based on CDFG habitat maps, USGS soils maps, reconnaissance-level surveys, LIDAR, and/or aerial photograph interpretation. At the beginning of the 2010 surveys, these locations were surveyed at a reconnaissance level to confirm whether suitable branchiopod habitat was present, and if so, were included in 2010 branchiopod sampling.

4.4.2 Results

No Federally listed branchiopods were observed during 2010 surveys. A detailed description of the habitats at the survey locations is provided below.

4.4.2.1 Clifton Court Forebay

Plant species observed in the Clifton Court Forebay survey area included Iodinebush, Bush Seepweed, Alkali Heath, Boccone's Sandspurry, Saltgrass, Italian Ryegrass, Mediterranean Barley, Rabbitsfoot Grass, and Spikeweed. Significant algal cover was observed in the pools in the grassy areas.

Versatile Fairy Shrimp were observed in nine pools. Alkali Fairy Shrimp and California Clam Shrimp were observed in one pool. Immature (very small) *Branchinecta* sp. were observed in two pools near others where Versatile Fairy Shrimp were observed. These pools dried down too quickly for a positive identification to be made, but it is likely these were Versatile Fairy Shrimp also. California Fairy Shrimp were observed in one pool. Other aquatic invertebrates observed were biting midge larvae, nonbiting midge larvae, water fleas, copepods, water boatmen, mosquito larvae, predaceous diving beetle adults and larvae, mayfly larvae, shore fly larvae, snails, water mites, water scavenger beetle adults and larvae, flatworms, backswimmers, earthworms, seed shrimp, syrphid fly larvae, and damselfly larvae. Pacific Chorus Frog eggs, larvae, and adults were observed in several pools. California Tiger Salamander larvae were observed in one pool where a population had been previously recorded. Mosquitofish were observed in one pool. Adult Western Pond Turtles were also observed in a single pool.

Water quality measurements were taken in some pools in the Clifton Court Forebay survey area on December 23, 2009, and one pool was sampled again on April 12, 2010. Alkalinity was relatively high, ranging from 430 to 990 parts per million (ppm) calcium carbonate ($CaCO_3$). Most pools had a relatively neutral pH, ranging from 7.49 to 8.19; two pools had higher pH measurements of 9.14 and 8.88. EC and TDS were fairly high, ranging from 1,572 to 3,284 microsiemens per centimeter and from 125 to 1,118 ppm, respectively. DO ranged from 4.25 to 11.8 milligrams per liter (mg/L), a relatively average range. Turbidity varied from low to high.

4.4.2.2 Knightsen

Plant species observed in the Knightsen survey area included Saltgrass, Alkali Heath, Brass Buttons, Perennial Pepperweed, Italian Ryegrass, Ripgut Brome, Soft Chess, Foxtail Barley, Rabbitsfoot Grass, Baltic Rush, Barbgrass, Spikeweed, Willow Dock, and Common Tule.

California Clam Shrimp were observed in two pools. Other aquatic invertebrates observed were biting midge larvae, nonbiting midge larvae, water fleas, copepods, water boatmen, mosquito larvae, predaceous diving beetle adults and larvae, shore fly larvae, snails, water mites, water scavenger beetle adults and larvae, flatworms, backswimmers, earthworms, seed shrimp, and syrphid fly larvae. Pacific Chorus Frog eggs, larvae, and adults and Mosquitofish were observed in several pools.

Water quality measurements were taken at the Knightsen survey area on December 23, 2009. Alkalinity was fairly high, ranging from 400 to 500 ppm $CaCO_3$; pH was measured in only one pool, at 7.99. EC and TDS were not measured at Knightsen. DO was very high, ranging from 78.7 to 102.5 mg/L. Turbidity varied from low to high.

4.4.2.3 Lambert

Plant species observed in the Lambert survey area included Fremont Cottonwood, Valley Oak, and Arroyo Willow scattered in the annual grassland; Pale Spikerush, White Water-Buttercup, Hyssop Loosestrife, Curly Dock, Small Stipitate Popcornflower, Italian Ryegrass, Mediterranean Barley, and Mediterranean Rabbitsfoot Grass in the pools; and Black Mustard, Poison-Hemlock, Italian Thistle, Cut-Leaf Geranium, Perennial Pepperweed, Milk Thistle, Soft Chess, and Ripgut Brome in the uplands. Rayless Goldfields, Water Pygmyweed, and Owyhee Mudwort (*Limosella acaulis*) were also observed in some pools.

California Clam Shrimp were observed in three pools. Other aquatic invertebrates observed were scuds, giant water bugs, nonbiting midge larvae, water fleas, copepods, water boatmen, mosquito larvae, predaceous diving beetle adults and larvae, snails, water mites, water scavenger beetle adults and larvae, flatworms, backswimmers, and seed shrimp. Pacific Chorus Frog eggs, larvae, and adults were observed in several pools.

No water quality measurements were taken in any of the pools in the Lambert survey area.

4.4.2.4 Woodbridge

Dominant plant species observed in the Woodbridge survey area included White Clover, Baltic Rush, Spinyfruit Buttercup, Annual Bluegrass, and Curly Dock in the drier areas and Cursed Buttercup, Waxy Manna-Grass, Toad Rush, Floating Water Primrose, and Rabbitsfoot Grass in the wetter areas. Milk Thistle was a dominant and prolific weed on the site.

No large branchiopods (i.e., excluding water fleas) were observed in any pools. Aquatic invertebrates observed were biting midge larvae, nonbiting midge larvae, water fleas, copepods, water boatmen, mosquito larvae, crawdads, predaceous diving beetle adults and larvae, mayfly larvae, shore fly larvae, snails, water mites, water scavenger beetle adults and larvae, backswimmers, earthworms, and seed shrimp. Pacific Chorus Frog larvae and adults were observed in several pools.

Water quality measurements were taken at the Woodbridge survey area on November 24, 2009. Alkalinity was fairly high in the pools, ranging from 315 to 365 ppm $CaCO_3$; pH, EC, and TDS data were not collected. DO ranged from 3.30 to 7.68 mg/L.

4.4.2.5 DWR Ponds

Pools in the DWR Ponds survey area were dominated by Common Tule, Saltgrass, and Pale Spikerush. Uplands surrounding the pools were dominated by Ripgut Brome, Summer Mustard, and Wild Oat. Significant algal cover was observed in the pools throughout the season.

No large branchiopods were observed in any pools. Aquatic invertebrates observed were biting midge larvae, nonbiting midge larvae, water fleas, copepods, water boatmen, mosquito larvae, predaceous diving beetle adults and larvae, shore fly larvae, snails, water scavenger beetle adults and larvae, backswimmers, and seed shrimp. Pacific Chorus Frog larvae and adults and an unknown adult frog were observed. An unknown adult turtle was observed sliding into the water in one pool.

No water quality measurements were taken in any of the pools at the DWR Ponds survey area.

4.5 CALIFORNIA RED-LEGGED FROG

4.5.1 Methods

The number of times a site was surveyed in 2010 was commensurate with a subjective assessment of habitat suitability made by the lead investigator. Therefore, sites with higher suitability, and theoretically a greater likelihood of supporting CRF, were surveyed more often than lower quality sites. Criteria taken into consideration for habitat suitability included, but were not limited to, adequate water depth and persistence for breeding, presence and composition of emergent vegetation, and location within 1 mile of a CNDDB record. Accessible potential CRF breeding habitat that had not been surveyed the previous year was assessed for its potential to support CRF on February 1 and 4. Visual encounter surveys began on February 1 and ended on March 29. CRF larval surveys were conducted at least once, on either March 29 or April 12, at four new sites on separate parcels.

4.5.2 Results and Discussion

4.5.2.1 Survey Results

4.5.2.1.1 Visual Encounter Surveys

Sixteen sites on 11 parcels, all within Contra Costa County, were surveyed at least once (range = one to seven times per site) over the course of the season for a total of 15 day surveys and 17 night surveys. Adult males were heard calling at two sites (one male at one site on March 1 and three males at one site on March 29); however, no CRF breeding (pairs in amplexus) or egg masses were observed. Breeding Sierran Treefrogs and Southern California Toads were observed at most locations.

4.5.2.1.2 Larval Surveys

One site that possessed CRF larvae last year was revisited in an attempt to detect CTS larvae this year; CRF larvae were again captured from the site, on both April 12 and July 21, 2010. No larvae were captured at the four new survey sites.

4.5.2.2 Limitations and Future Surveys

The site that possessed the single calling male on March 1 was a seasonal wetland that appeared to possess suitable habitat for CRF to breed. Historically, CRF have been known to breed not far upstream in the same drainage. This site was surveyed seven times by the CRF team during the season and was also surveyed numerous times by the vernal pool team. It is not entirely clear why CRF did not breed here this year, although the site was slightly further down in the drainage (toward the terminal end on the valley floor) than the site that was previously known to support breeding CRF in both seasons, and it had

apparently dried earlier in the year. These factors could have resulted in the site representing only marginal habitat both in location within the species' current range as well as in quality. The site that possessed three males calling on March 29 was a constructed, rock-lined conveyance channel with nearly no water or emergent vegetation in it during previous surveys; however, on this date, it was full, and water was flowing. While no subsequent site visits were made to confirm this, it is presumed that due to the lateness in the breeding season and the site's irregular water regime, it was not likely that CRF actually bred there this year. The only site DWR surveyed this year that appeared to support CRF breeding was a stock pond where they were also found last year.

4.6 CALIFORNIA TIGER SALAMANDER

4.6.1 Methods

On March 29, April 12, or July 21, larval surveys, using dipnets, were conducted at least once at four sites on four new parcels in Contra Costa County and at one formerly accessible parcel that appeared to possess suitable CTS breeding habitat.

4.6.2 Results and Discussion

4.6.2.1 Survey Results

4.6.2.1.1 Visual Encounter Surveys

One-hundred twenty-two pools were mapped and sampled for vernal pool branchiopod species from October 16, 2009, through June 7, 2010 in Contra Costa, Sacramento, and San Joaquin counties. No CTS eggs were observed during these surveys; however, one very small CTS larva was incidentally captured during a survey for vernal pool invertebrates on March 1 in the same pool in which they were detected last year.

4.6.2.1.2 Larval Surveys

No CTS larvae were captured during the 2010 dipnet surveys for CTS.

4.6.2.2 Limitations and Future Surveys

As in 2009, the only place CTS were found was in a shallow vernal pool in the foothills of Contra Costa County. Two other sites, a stock pond and a seasonal wetland, appeared to possess suitable habitat; however, the species was not detected here by either the CTS surveys or the vernal pool biologists' surveys. Both sites were toward the terminal end of the same drainage system near the valley floor, and although one site is known to support CRF, neither seemed to support CTS for unknown reasons.

4.7 GIANT GARTER SNAKE

4.7.1 Methods

No trapping surveys for GGS were conducted in 2010; however, visual encounter surveys were conducted during the morning and early afternoon hours on April 15, April 19, or May 11 once on each of six parcels in Sacramento County and one parcel in San Joaquin County.

4.7.2 Results and Discussion

No GGS were observed; however, one Valley Garter Snake, three Mountain Garter Snakes, one Pacific Gopher Snake, and one Western Yellow-bellied Racer were captured during these surveys. Unfortunately, because the team had limited opportunity to conduct GGS surveys, the understanding of this species' distribution in the CPA was not advanced.

4.8 BIRDS

The goal of the 2010 surveys was to identify and delineate all potential and occupied nest sites and nesting habitat for special-status bird species in parcels that were not available during 2009; to conduct focused surveys to detect Black Rails and Tricolored Blackbirds which were not well represented in 2009 surveys; and to continue the Yellow-billed Cuckoo survey effort after the species was detected in 2009.

Twenty-five special-status bird species are known to or expected to nest in the CPA. Species-specific surveys were conducted in March and April for Black Rails, May and June for Tricolored Blackbirds, and June and July for Yellow-billed Cuckoos. Surveys were conducted from April 1 through July 31, 2010, at parcels that were not available in 2009 for all other special-status bird species that were known to or expected to nest in the CPA. In the following discussion, species in each group were surveyed for at the same time, using similar methods, in basically the same habitat within the CPA. Black Rails, Tricolored Blackbirds, and Yellow-billed Cuckoos were surveyed using concentrated efforts and are discussed in detail.

For species such as egrets, herons, and cormorants, actual nesting had to be observed; for hawks, nesting or specific nesting behavior had to be observed, such as territory defense; and for most passerines, the bird needed only to be on-site (flyovers were not included). Rookeries and other nesting habitat found are assumed to be extant for a minimum of 5 years.

4.8.1 California Black Rail

4.8.1.1 Methods

Black Rails are marsh-dwelling water birds that nest within the canopy of wetland vegetation and typically use cattail and tule marsh but also use instream islands with mixed tule, willow, and dogwood vegetation in the CPA. The impact concerns regarding the California Black Rail, State listed as Threatened, are physical loss of nesting habitat and winter refugia, increased mortality from new project structures (such as transmission lines), project-related disturbance, and project-caused changes in water elevations in their nesting habitat and winter refugia.

The specific goal of the 2010 survey effort was to determine whether California Black Rail were in the Delta during a time period that would indicate nesting and in areas that were not covered sufficiently during 2009. A formal protocol for California Black Rail surveys in tidal marsh (Evens 2002) was adapted for use in the Delta by the DWR avian survey lead, with input from other DWR and CDFG avian experts. The 2010 surveys were completed by DWR and CDFG avian experts.

A habitat analysis was conducted by a GIS team consisting of DWR and DHCCP personnel who identified wetland patches of 8 acres or greater. A CNDDB search was also conducted to identify historic California Black Rail locations. Five accessible parcels and 16 boat survey routes identified as containing potential California Black Rail habitat were surveyed in 2010. Teams of two or more surveyors walked or traveled by boat along the edges of those marshes on two occasions between March 1 and April 30 from sunrise to 3 hours after sunrise. Surveyors stopped every 200 meters (or at shorter intervals, depending on the habitat) and played a 7-minute series consisting of California Black Rail "ki ki do" and "grr" calls interspersed with silent periods for passive listening. All California Black Rail responses were recorded as assumed nesting birds. Additionally, all spontaneous calls were recorded in the same way.

4.8.1.2 Results and Discussion

4.8.1.2.1 Survey Results

Surveyors collected 31 California Black Rail data points in 2010 on 12 instream islands in the central Delta and one managed marsh on the eastern edge of the Delta. The instream islands consisted of mixed tule wetland and willow-dogwood scrub. The managed marsh consisted of two tule-dominated wetlands in the White Slough Wildlife Area northwest of Stockton. An estimated 24 California Black Rail nesting pairs were detected throughout the Delta during surveys.

4.8.1.2.2 Limitations and Future Surveys

Surveyors observed many more California Black Rails in 2010 in the CPA than in 2009. This is likely due to the species-specific survey effort, as well as starting surveys earlier in the season, because California Black Rails initiate nesting as early as March. The majority of California Black Rail detections were on instream islands at low elevation. It is important to note that California Black Rails were not detected on any existing marshes (nontidal) north of State Route 12 in the Delta, which should be considered in the BDCP Conservation Strategy. Additionally, most California Black Rails were found on instream islands and may have increased vulnerability to changes in Delta water levels that could result from operations of a new conveyance facility.

California Black Rails may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2010 survey season.

4.8.2 Double-Crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, and Black-Crowned Night Heron

4.8.2.1 Methods

The specific goal of the 2010 surveys regarding these species was to identify all rookeries on parcels in the CPA that were not accessible in 2009. The 2010 survey methods were the same as those used in 2009, with the exception of added attention to tule marsh for nesting Snowy Egrets.

4.8.2.2 Results and Discussion

4.8.2.2.1 Survey Results

No new Double-crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, or Black-crowned Night Heron rookeries were detected in the CPA during 2010 surveys.

4.8.2.2.2 Limitations and Future Surveys

Available nesting habitat (large, mature trees) is highly variable throughout the CPA, depending on land use and riverbank management. Most potential nesting habitat occurs along or within (on mid-channel islands) the Delta's rivers and sloughs. Mid-channel islands are unleveed islands in waterways; in the Delta, they often are vegetated by emergent wetlands and/or riparian scrub. No tule or cattail marsh-nesting colonies of Snowy Egret were observed.

Species in this group may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons.

4.8.3 Least Bittern and White-Faced Ibis

4.8.3.1 Methods

The specific goal of the 2010 surveys was to survey likely nesting habitat for each species on parcels for which the surveyors did not have access in 2009 and along the Black Rail survey routes. The 2010 survey methods were the same as those used in 2009.

Teams of two or more surveyors walked or traveled by boat along the edges of marshes on at least two occasions between April 1 and June 30 during daylight hours. Surveyors recorded Least Bittern locations when birds were heard opportunistically during Black Rail surveys and newly accessible parcel surveys.

4.8.3.2 Results and Discussion

4.8.3.2.1 Survey Results

One Least Bittern was observed and heard during surveys in a tule marsh at Stone Lakes National Wildlife Refuge in 2010. No Least Bitterns were observed during the 2009 surveys.

No White-faced Ibis were detected in the CPA in 2010. In 2009, incidental observations of White-faced Ibis were recorded, but no nesting colonies were observed.

4.8.3.2.2 Limitations and Future Surveys

The fact that only one Least Bittern was observed over two survey seasons suggests that it is rare in the Delta. While rare, the Least Bittern is a very secretive species and likely occurs with higher frequency than indicated by these survey results. White-faced Ibis may not have enough available nesting habitat with the appropriate vegetative structure within the CPA, or its numbers may not have recovered following its extirpation in the region.

Least Bitterns and White-faced Ibis may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons.

4.8.4 Redhead, Northern Harrier, and Short-Eared Owl

4.8.4.1 Methods

The goal of the 2010 surveys was to identify and delineate likely nesting habitat of these species in the CPA on parcels that were not accessible in 2009. The 2010 survey methods were the same as those used in 2009.

4.8.4.2 Results and Discussion

4.8.4.2.1 Survey Results

Surveyors collected six data points in 2010 representing at least five Northern Harrier nest sites in appropriate habitat on newly accessible parcels and along California Black Rail survey routes.

No Redheads or Short-eared Owls were observed or heard during the 2010 surveys.

4.8.4.2.2 Limitations and Future Surveys

No nesting Northern Harriers were observed in the northern portion of the CPA, although they were common there throughout the nesting season. Much of the marsh in that region is surrounded by riparian

trees, which reduces visibility of the species, which may have resulted in missed observations, or it may be that Northern Harriers avoid nesting in marshes with large adjacent riparian stands.

Redheads probably occur in the Central Valley in small numbers, and primarily as nonbreeders, because they prefer larger lakes for nesting. Although Short-eared Owls are known to nest in the CPA, they are rare and primarily found along the western edge of the CPA.

The species in this group may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons, with slight modifications to improve observation of Northern Harriers where wetlands are surrounded by tall riparian vegetation.

4.8.5 White-Tailed Kite, Cooper's Hawk, Swainson's Hawk, and Osprey

4.8.5.1 Methods

The specific goal of the 2010 surveys was to find and delineate the species' nest sites in the CPA on parcels that were not accessible in 2009, as well as along the Black Rail survey routes. The 2010 survey methods were the same as those used in 2009.

4.8.5.2 Results and Discussion

4.8.5.2.1 Survey Results

No new White-tailed Kite, Cooper's Hawk, or Osprey nest sites were observed within the CPA during 2010 surveys.

Surveyors collected seven Swainson's Hawk data points in 2010, which represented seven individual nests. All of these nests were near areas where Swainson's Hawk nests had been observed during 2009 surveys, so they may represent duplicate data points.

4.8.5.2.2 Limitations and Future Surveys

Swainson's Hawks nest throughout the Delta, in most Delta habitat types, although riparian trees are used most often. Identified nests were located close to cultivated agricultural lands. Most of the nest sites found were along the eastern and central portion of the CPA, but that may be a function of a greater survey effort in those areas.

Species in this group may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons.

4.8.6 Greater Sandhill Crane and Lesser Sandhill Crane

Sandhill Crane surveys were not conducted in 2010. No additional surveys for these species are expected for the BDCP EIR/EIS because sufficient data were collected to corroborate the wintering range in the Delta. Sandhill cranes may be surveyed for during BDCP preconstruction surveys after a project is selected and approved. Methods and results for surveys conducted in 2009 can be found in Section 2.8.5.

4.8.7 Western Yellow-Billed Cuckoo and Yellow-Breasted Chat

4.8.7.1 Methods

The goal of the 2010 surveys was to identify the species' nesting habitat in the CPA on parcels for which the surveyors had access, as well as along boat-accessible waterways. A formal survey protocol, developed by the Yellow-Billed Cuckoo Working Group (2009), was used by surveyors. No formal survey protocol has been developed for Yellow-breasted Chat. The survey methodology was developed by the DWR avian survey lead, with input from other DWR, CDFG, USFWS, and Yellow-Billed Cuckoo Working Group avian experts. The 2010 surveys were completed by DWR and CDFG staff.

Survey leads determined only one site, near Walnut Grove, had high likelihood of supporting nesting Yellow-billed Cuckoos, as the species was detected on two occasions during 2009 surveys. This site was surveyed by kayak weekly from sunrise to 12 p.m. from June 22 through July 21, following the Yellow-billed Cuckoo Working Group protocol. The other sites surveyed in 2009 were deemed unsuitable for Yellow-billed Cuckoo nesting due to lack of adequate patch size of appropriate riparian habitat.

Personnel surveyed for Yellow-breasted Chats in dense riparian scrub with little or no tree overstory on parcels not available in 2009, as well as along the Black Rail survey routes. Personnel surveyed appropriate Yellow-breasted Chat habitat on a minimum of two occasions each between April 1 and June 30 using a passive listening method. All spontaneous calls by the target species were recorded as assumed nesting birds.

4.8.7.2 Results and Discussion

4.8.7.2.1 Survey Results

The habitat with the greatest potential for Western Yellow-billed Cuckoo nesting use, based on size and quality, is located in the northern half of the Delta. Most of that habitat is located on existing preserves, both public and private, or otherwise protected lands. Potential nesting habitat for Yellow-breasted Chat is present throughout the Delta on a variety of private and public lands.

No Western Yellow-billed Cuckoos were detected during 2010 surveys.

Surveyors collected 11 data points for Yellow-breasted Chats, which represent an estimated minimum of nine nest sites.

4.8.7.2.2 Limitations and Future Surveys

Although at least one Yellow-billed Cuckoo was observed during 2009 surveys, the lack of observations in 2010 suggests that the Delta serves as a migration stopover for this species but that it may not provide viable nesting habitat. Potential nesting habitat is being created through preservation and restoration actions, so it is possible that the species will reinhabit the Delta after an estimated 100-year absence. However, the Yellow-billed Cuckoo prefers midsuccessional riparian forests on the Sacramento River; if the species has the equivalent needs in the Delta, it may not occupy the proposed restoration areas because the natural riverine processes necessary to maintain the availability of this habitat and to provide permanent nesting habitat will likely not occur in the Delta.

DHCCP survey data from both years indicate that Yellow-breasted Chats nest in many areas in the Delta, but the birds observed were found in only eight discrete areas, suggesting that it probably does not nest uniformly throughout the Delta. Appropriate nesting habitat is present throughout the Delta, so it is unclear why the species is not more widespread in the CPA or why it is not found to a greater degree on the existing preserves.

Both species may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2010 survey season.

4.8.8 Burrowing Owl, Loggerhead Shrike, and Grasshopper Sparrow

4.8.8.1 Methods

The goal of the 2010 surveys was to identify all nesting habitat in the CPA on parcels that were not accessible in 2009. The 2010 survey methods were the same as those used in 2009.

4.8.8.2 Results and Discussion

4.8.8.2.1 Survey Results

No additional Burrowing Owls, Loggerhead Shrikes, or Grasshopper Sparrows were observed during 2010 surveys.

4.8.8.2.2 Limitations and Future Surveys

Species in this group may be surveyed for in new, previously unsurveyed parcels that could become available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons.

4.8.9 Tricolored Blackbird and Yellow-Headed Blackbird

4.8.9.1 Methods

The specific goal of the 2010 surveys was to conduct focused surveys for Tricolored Blackbirds in appropriate habitat on all accessible parcels because they were not well represented in 2009 surveys. The 2010 survey methods were the same as those used in 2009. Surveys were conducted on a minimum of two occasions between May 1 and June 30 during daylight hours.

4.8.9.2 Results and Discussion

4.8.9.2.1 Survey Results

Surveyors searched several thousand acres of appropriate nesting habitat in various wetland types for these species. Habitat types used by these species are present throughout the Delta.

Surveyors collected five data points for Tricolored Blackbirds in 2010, which most likely represent foraging birds only and not nest sites. No large colonies were observed, and nesting was not confirmed.

Surveyors collected six data points for Yellow-headed Blackbirds. Detections were noted on islands in the south-central Delta. Yellow-headed Blackbirds were observed in small flocks of 2–30 individuals, most often flying overhead or foraging in pastures in mixed flocks with Red-winged Blackbirds. Breeding was not confirmed for this species.

4.8.9.2.2 Limitations and Future Surveys

Although surveys were conducted later in the 2010 season due to evidence that Tricolored Blackbirds tend to use the Delta for nesting in the latter part of the nesting season, no Tricolored Blackbird nesting colonies were detected.

Yellow-headed Blackbirds prefer dense tule-cattail vegetation surrounded by deeper water for breeding. The lack of detections of breeding birds on the parcels surveyed may be due to low availability of appropriate breeding habitat on the parcels made accessible in 2009 and 2010.Tricolored Blackbird and Yellow-headed Blackbird may be surveyed for in new, previously unsurveyed parcels that could become

available in future BDCP survey periods and/or during BDCP preconstruction surveys after a project is approved. Surveys would be conducted as performed in the 2009 and 2010 survey seasons.

4.8.10 References

Evens, J. 2002. Data Collection Protocol: Tidal Marsh Rails. Pages 21–32 in San Francisco Estuary Wetlands Regional Monitoring Program Plan 2002, Part 2: Data Collection Protocols. URL = http://www.wrmp.org/docs/protocols/Wetland%20Birds.pdf.

Yellow-Billed Cuckoo Working Group. 2009. Standard Operating Procedure (SOP) #3: Conducting Yellow-Billed Cuckoo Surveys (Draft). June 9, 2009.

4.9 BATS

No field surveys were conducted in 2010 for bat species. Results for the 2009 field season can be found in Section 2.9.

4.10 RIPARIAN MAMMALS

This section describes the results of habitat assessments, trapping surveys and habitat suitability analyses for Riparian Brush Rabbit and Riparian Woodrat conducted by biologists from the California State University, Stanislaus – Endangered Species Recovery Program (ESRP) in 2010.

4.10.1 Methods

4.10.1.1 Habitat Assessments and Trapping Surveys

Field methods for the 2010 field season for riparian mammals were consistent with the 2009 protocols. During the 2010 survey season, habitat assessments were conducted on seven parcels and live-trapping was conducted on 10 parcels for a total of 1,316 trap-nights.

4.10.1.2 Habitat Suitability Analysis – Rapid Assessment Program

Given the limited access to new survey locations with potentially suitable habitat appropriate for Riparian Brush Rabbit or Riparian Woodrat within the CPA and the Delta boundary during 2010, ESRP was authorized by DWR to conduct habitat suitability analyses using aerial imagery. A geographic information system (GIS) was used to identify potential Riparian Brush Rabbit and Riparian Woodrat use areas and to assess their potential suitability and prioritization for field surveys.

Prior to assessing new parcels, a rapid assessment program (RAP) was developed to determine key habitat parameter values for areas of known Riparian Brush Rabbit presence. Determining habitat attributes at known localities of Riparian Brush Rabbit in the Delta is vital to identifying other potential Riparian Brush Rabbit populations in and around the CPA and Delta boundary.

The RAP was used at several point locations at the Oxbow Preserve (i.e., Mossdale) and Paradise Cut, the closest known extant Riparian Brush Rabbit populations to the study area. Habitat parameters were scored in terms of their suitability for Riparian Brush Rabbit, and served as a reference in evaluating unsurveyed and/or inaccessible parcels.

With vegetation categorized to suitability, we modeled suitable and potential habitat for Riparian Brush Rabbit throughout the Delta using data from the Vegetation Classification and Mapping Program (VegCAMP) from DFG for Delta (Hickson and Keeler-Wolf, 2007) and Suisun Marsh (Boul and Keeler-Wolf 2008) sites (Appendix 4A). The data were mapped and used to quantify and designate suitable and potential habitat areas within the study area. Data and maps were then used to prioritize potential locations for field surveys (habitat assessment and trapping).

4.10.2 Results and Discussion

4.10.2.1 Trapping Results

Six mammal species were trapped during 2010 surveys (Table 4-1). The most commonly recorded species during the 2010 trapping survey were Black Rat (633 specimens), House Mouse (394 specimens), and Desert Cottontail (184 specimens). No Riparian Woodrats or Brush Rabbits were captured.

Table 4-1. Riparian Mammal Trapping Results and Sampling Effort

Common Name	Scientific Name	2009	2010
Virginia Opossum	*Didelphis virginiana*	25	3
Striped Skunk	*Mephitis mephitis*	2	0
California Vole	*Microtus californicus*	114	6
House Mouse	*Mus musculus*	338	56
Long-tailed Weasel	*Mustela frenata*	0	1
American Mink	*Neovison vison*	1	0
Dusky-footed Woodrat	*Neotoma fuscipes*	0	0
Deer Mouse	*Peromyscus maniculatus*	41	0
Black Rat	*Rattus rattus*	551	82
Western Harvest Mouse	*Reithrodontomys megalotis*	4	0
Desert Cottontail	*Sylvilagus audubonii*	170	14
Brush Rabbit	*Sylvilagus bachmani*	0	0
Sampling Effort			
Number of sites		14	3
Number of trap nights		7,770	1,316

Source: ESRP 2010

4.10.2.2 Habitat Suitability Analysis and Prioritization for Field Surveys

Habitat model results show 16,060 acres of potentially suitable habitat within the Delta boundary; 6,300 acres within the total CPA, but only 1,919 acres within accessible (signed TEP) parcels. Of the total acreage identified in the CPA, 2,626 acres were identified within Conservation Zone 7 and 238 acres within Conservation Zone 8. Less than 30% of the total area of suitable habitat in the CPA was identified by the model to be in parcels with signed TEPs.

Using the above habitat model, aerial photograph interpretation, and data collected from ground reconnaissance surveys (where accessible), ESRP biologists examined habitat suitability for the total of 537 parcels within the CPA with habitat that has the potential to be suitable (including 283 parcels with a signed TEP and 254 parcels without signed TEPs). The majority of parcels were found to have a high to medium likelihood of containing suitable habitat (71%), whereas 10.5% had a low likelihood and 18% were determined to not contain suitable habitat.

Of the parcels with high to low likelihood of containing suitable habitat, ESRP biologists measured some landscape characteristics of areas of potential habitat such as, patchy or linear, width of patches, etc. They did so to prioritize sites for field surveys (habitat assessment and trapping). Sites with habitat in wider blocks (patches) would have a relatively high priority for trapping versus sites with habitat limited to narrow strands of streamside vegetation. We grouped parcels into those with potential habitat that was linear only (63%), patchy only (2%), or both patchy and linear (35%). Of parcels containing some patchy

potential habitat, we grouped these by their width in categories of 50-100 meters (48%), 100-200 m (23%), or over 200 m (28%).

The RAP analysis was specific to Riparian Brush Rabbit habitat, as Riparian Woodrat habitat is not yet well defined. Riparian Woodrat habitat is considered to be a sub-set of Riparian Brush Rabbit habitat, so the species is likely to occur in a geographic range similar to Riparian Brush Rabbit but at fewer sites.

ESRP biologists believe that there is a higher probability of documenting both species in areas south of Highways 4 and 12 (mostly in San Joaquin County) than in central and northern parts of the CPA, but the latter should not be ruled out. From intensive field work in the Stewart Tract area (since 1998) and in other nearby areas (Caswell Memorial State Park, Buffington Tract, Faith Ranch, San Joaquin River NWR) over the past 10-30+ years, there is every reason to believe that one or both species are also present in similar habitat at the southern end of the planning area.

4.10.2.3 Limitations and Future Surveys

From intensive field work in the Stewart Tract area (since 1998) and in other nearby areas (Caswell Memorial State Park, Buffington Tract, Faith Ranch, San Joaquin River NWR) over the past 10-30+ years, there is every reason to believe that one or both species are also present in similar habitat at the southern end of the planning area. Populations of Riparian Brush Rabbit are present in these more southern areas of the CPA, where the CSU Stanislaus (ESRP) and its Federal and State partner agencies have initiated a captive propagation and reintroduction program for the species using breeders from the Stewart Tract area. In addition, since 2003, 30 woodrats have been captured at the San Joaquin River NWR and many more have been captured at Caswell Memorial State Park.

Future surveys for Riparian Brush Rabbit and Riparian Woodrat are recommended for parcels with appropriate habitat that become available as the BDCP process progresses.

4.10.3 References

Hickson and Keeler-Wolf 2007. Vegetation and Land Use Classification and Map of the Sacramento-San Joaquin River Delta. URL: http://www.dfg.ca.gov/biogeodata/vegcamp

Boul and Keeler-Wolf 2008. 2006 Vegetation Map Update for Suisun Marsh, Solano County, California: A Report to the California Department of Water Resources. URL: http://www.dfg.ca.gov/biogeodata/vegcamp

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CHAPTER 5: 2010 OTHER ENVIRONMENTAL SURVEYS

5.1 CULTURAL RESOURCES

No BDCP EIR/EIS record searches, consultations or field surveys were conducted in 2010 for Cultural Resources.

5.2 RECREATION

The boat traffic study was undertaken to collect boat use data in the Delta during the summer recreation season, for the purpose of establishing a baseline for determining effects on boat passage and/or boat traffic from implementation of the Bay Delta Conservation Plan.

In 2010, recreation surveys were conducted at 10 new observation locations to supplement data collected in 2009. New survey locations for 2010 were identified based on changes to the Separate Corridors Option (previously referred to as the "Through Delta Option"). As part of the Separate Corridors Option, two fish screens and up to 14 operable gates would be installed (as described in detail under Alternative 5 in Chapter 3, Description of Alternatives).

5.2.1 Methods

5.2.1.1 Survey Description

Surveys were conducted on land within public rights-of-way or on boats. In general, the same survey protocols used in 2009 were used in 2010.

5.2.1.1.1 Documentation of Results

Data recorded included boat type, time of observation, direction of travel, behavior/activity, and notations regarding uncommon boat types (recorded as "other") and other potentially useful details about boats observed and their activity. Categories used on the data collection form are included in Appendix 1.5A. Photographs representative of observed boating activity were taken at each observation location (Appendix 3.3B).

Observers also made notes of boats that had already been recorded earlier that day. Notes were recorded for each pass if the boat had left the observation area for at least half an hour, with an assumption made that those boats had probably left the specific waterway before returning and thus could be affected by the presence of an operable gate both when leaving and when returning to the waterway being observed. Boats that crossed back and forth in a short period were not counted after the first pass, even if they had traveled out of sight of the observer because it was assumed that they had not left the specific waterway. Likewise, boats that anchored or beached near the observation point were recorded only once.

The hourly and total counts per boat type were compiled from data collection forms for each observation and entered into spreadsheets for compilation, review, and development of descriptive statistics on boat traffic.

5.2.1.2 Team Composition

On each sample day, two-person observation teams at each respective site recorded boat traffic observation data on data forms (Appendix 1.5A). Data collection procedures were pretested and verified by the recreation survey field team leader at all locations before initiating data collection. Observers used binoculars for observations when needed.

5.2.1.3 Survey Timing

The 2010 boat traffic study was initiated on May 29, 2010 (Memorial Day weekend), and continued through September 6, 2010 (Labor Day weekend), a period of slightly more than 14 weeks. Two-person teams, consisting of DHCCP and DWR staff members with previous experience conducting boat traffic studies, were used for surveying efforts at each of the 10 observation locations.

On each sample day, boat traffic data were collected for a total of 8 hours during two 4-hour observation periods: 8 a.m. to 12 p.m. and 1 p.m. to 5 p.m. Other recent Delta boat traffic studies, including those described in Chapter 3 of this report, have indicated that boat traffic was light before 8 a.m. and generally declined after 5 p.m. (DWR 2009; DHCCP 2010).

The nonholiday weekend samples provided data representing typical summer weekend boat traffic. The weekday samples were collected to provide boat traffic data comparable to data obtained on weekends but with a lower intensity of coverage than on weekends because weekday traffic was anticipated to be substantially less than weekend traffic.

The holiday weekend samples provided data corresponding with annual peak boat traffic. Although the California Department of Boating and Waterways has identified Independence Day weekend as the single peak-use Delta boating event of the year, similar peaks in boat traffic may also occur during the Memorial Day and Labor Day holiday weekends. These May and September holidays are traditionally considered the opening and closing weekends for the peak boating season and anticipated to have the highest traffic volumes.

The number of data collection (sample) days was not intended to provide a statistically significant sample of boat traffic. However, the sample does support reasonable inferences regarding boat traffic at the observation locations during the sampling season. In particular, the high level of holiday and nonholiday weekend coverage (nearly one-third of all available days) supports a high level of confidence in the representativeness of the holiday and weekend observation results for the summer sampling season, and a commensurate understanding of peak boat traffic volumes at these respective sites.

5.2.1.4 Survey Sites and Observation Locations

Boat traffic observation locations were selected to be as near as practical to the locations where new operable gates and fish screens may be located, except for the Sacramento River site, Site 1 **(Figure 5.1-1)**. The observation location for Site 1 was centrally located in the reach of the Sacramento River where five intake locations are proposed as part of the Pipeline/Tunnel Option and the Isolated Conveyance Facility-East and -West (ICF-East and ICF-West) options (Figure 5.1-1). The remaining nine observation sites (2A through 8) are associated with the location of operable gates and fish screens being considered on several Delta waterways as part of the Separate Corridors Option (SCO). Data were not collected for several additional SCO gate sites where boat traffic data were available, where boat traffic was expected to be light, where a seasonal gate already exists, or where data were to be collected at a nearby waterway.

Boat traffic observations were made at the 10 sites (**Table 5.1-1**) by DHCCP and DWR staff.

Table 5.1-1. 2010 Boat Traffic Observation Sites

Site Number	Site Name	BDCP Option	Facility	Observation Mode	Observation Location	Direction of Travel
1	Sacramento River	PTO, ICF-East and ICF-West Options	Five Intakes for Pipeline/Tunnel/ Canal	Land	West Bank of River at Clarksburg Fishing Access	North-South
2A	Delta Cross Channel	SCO	Modified Gate and Fish Screen	Land	Confluence of Delta Cross Channel and Snodgrass Slough	East-West
2B	Snodgrass Slough	SCO	Operable Gate	Land	Confluence of Snodgrass Slough and Delta Cross Channel	North-South
3	Georgiana Slough	SCO	Operable Gate and Fish Screen	Land	West Bank of Slough at Confluence with Sacramento River	North-South
4	Fisherman's Cut	SCO	Operable Gate	Boat[a]	On Water Near Confluence with San Joaquin River	North-South
5	Old River	SCO	Operable Gate	Boat	On Water Near Confluence with San Joaquin River	East-West
6	Connection Slough	SCO	Operable Gate	Land	South Bank of Slough at Confluence with Middle River	East-West
7A	North Railroad Cut	SCO	Operable Gate	Land	East Bank of Middle River at Confluence with North Railroad Cut	East-West
7B	South Railroad Cut	SCO	Operable Gate	Land	East Bank of Middle River at Confluence with South Railroad Cut	East-West
8	Victoria Canal/ North Canal	SCO	Operable Gate	Land	North Canal Levee, about 1 Mile West of Confluence with Middle River	East-West

[a] Weekend surveys were conducted by boat because car ferry service was limited. Full-day car ferry service was available on weekdays, allowing surveyors to use an observation location on the west bank of the waterway, on Bradford Island.

Notes:
ICF = Isolated Conveyance Facility
PTO = Pipeline/Tunnel Option
SCO = Separate Corridors Option
Source: Information compiled by DHCCP in 2010

For eight of the sites, shore-based observation was employed for all surveys. Boat-based observation was employed for Site 4 on weekends, when only limited car ferry access to an observation location on Bradford Island was available, and for Site 5, where land access was not available in the vicinity of the proposed gate.

Sites 2A and 2B were surveyed using the same observation location, the confluence of the Delta Cross Channel and Snodgrass Slough, to observe traffic on each of those two waterways. The observation locations for Sites 7A and 7B were separated by the rail line that crosses Middle River at Railroad Cut and runs between the north and south sides of Railroad Cut. Separate observation locations were required because the rail bridge and other obstructions prevented the observation of boat traffic on both north and south sides of Railroad Cut from either side of the rail line.

With the exception of Sites 4 and 6, the land-based observation locations were on public lands or on the public right-of-way alongside county roads. Several of these locations are used by the general public for informal bank fishing access. At Site 4, the Port of Stockton provided permission via a temporary entry permit to conduct weekday observations from the observation location on Bradford Island. At Site 6,

permission was granted by the landowner to conduct observations from a roadside pullout on Bacon Island, with the requirement that the survey schedule and staffing information for that site be provided to the landowner's head of security before each survey.

Data were collected on at least 9 and up to 11 survey days at each of the 10 observation sites, for a total of 95 survey days, with the exception of Site 8, which was not included in the original list of sites to be surveyed and which was surveyed on only 1 day (**Table 5.1-2**). The 95 observation days equate to 760 total hours of data collection, 576 hours on weekends and 184 hours on weekdays. Nighttime observations were not conducted because of the presumed relatively low level of boat traffic on the Delta waterways at night and the difficulty of observing boat traffic in the darkness. The length of the survey days allowed boat traffic to be observed during flood and ebb tides.

Table 5.1-2. Boat Traffic Observation Days

Site Number	Site Name	Weekend	Weekday	Holiday	Total
1	Sacramento River	8	3	0	11
2A	Delta Cross Channel	5	3	3	11
2B	Snodgrass Slough	5	3	3	11
3	Georgiana Slough	6	3	1	10
4	Fisherman's Cut	6	3	1	10
5	Old River	5	2	2	9
6	Connection Slough	8	2	0	10
7A	North Railroad Cut	7	2	2	11
7B	South Railroad Cut	7	2	2	11
8	Victoria Canal/North Canal	0	0	1	1
Total		**57**	**23**	**15**	**95**

Source: Data collected by DHCCP in 2010

Data were collected on 2 or 3 weekend days and 1 weekday during June and July at nine of the observation sites. Data collection was less frequent in May, August, and September. The July weekend data collection at Sites 2A, 2B, 4, 5, 7A, and 7B included the Independence Day holiday weekend (July 3–4). Sampling during summer weekends, including holiday weekends, was emphasized because that is when Delta boating activity has been shown to be greatest (CDPR 1997; CDBW 2003).

Data were collected at three priority sites during the Memorial Day, Independence Day, and Labor Day holiday weekends. The three priority sites were Sites 2A, 2B, and 5. The sites chosen for Memorial Day holiday weekend observations, the first observation days of the study, were the sites estimated (before the boat traffic study was begun) to have the highest use levels. After the first two weekends of observations in June, it was recognized that Site 7 (Railroad Cut) was a high-use site; therefore, it was added to the schedule for July 4 observations.

5.2.2 Results and Discussion

This section of the report summarizes the total amounts of boat traffic for each observation location and sampling period. Boat traffic characteristics are provided, including boat types and direction of travel.

5.2.2.1 Survey Results

5.2.2.1.1 Boat Traffic Levels

The number of boats observed at each of the 10 sites for each respective observation day ranged from 2 to 377 boats (**Table 5.1-3**). For photographs of boat traffic and the various types of boats observed at several of the observation locations, see Appendix 3.3B.

In general, nonholiday weekend boat traffic was 3-5 times higher than weekdays for most sites. Holiday weekend traffic was generally between 1.5 and 1.9 times the average amount of traffic observed on nonholiday weekends.

The traffic volume during most summer weekends was considerable at Sites 2A, 2B, 5, 7A, 7B, and 8 (Delta Cross Channel, Snodgrass Slough, Old River, Connection Slough, north Railroad Cut, south Railroad Cut, and Victoria Canal/North Canal), with about 100-200 boats using most of these waterways during a typical survey day and as many as 35-50 boats per hour passing through the waterways during midday peak-use hours (**Figure 5.1-2**).

Table 5.1-3. Number of Boats Observed

Count Date	Site 1: Sacramento River	Site 2: Delta Cross Channel and Snodgrass Slough		Site 3: Georgiana Slough	Site 4: Fisherman's Cut	Site 5: Old River	Site 6: Connection Slough	Site 7: Railroad Cut (North and South Cuts)		Site 8: Victoria Canal/ North Canal
		Site 2A	Site 2B					Site 7A	Site 7B	
May 29		71	111							
May 30						221				
May 31				54						
June 5	42							172	93	
June 6					27		130			
June 8				13						
June 9							36			
June 12		19	54		13					
June 13	77					280				
June 16	5									
June 17								36	29	
June 19				16		121	72			
June 20					37					
June 21		24	47							
June 24					5					
June 26	54			24						
June 27		147	135				120	131	--[a]	
June 30						59				
July 3		196	184			377				
July 4					51			292	215	
July 6	25									
July 9						82				
July 10					42		101			
July 11	81			44						
July 14				8						
July 17	66			33						
July 18		117	125			200	126			
July 19								36	46	
July 22		31	42							
July 24	71				30			203	156	
July 25				52			91			
July 26					2					
July 28							20			
July 31		100	75			272		212	185	

Count Date	Site 1: Sacramento River	Site 2: Delta Cross Channel and Snodgrass Slough		Site 3: Georgiana Slough	Site 4: Fisherman's Cut	Site 5: Old River	Site 6: Connection Slough	Site 7: Railroad Cut (North and South Cuts)		Site 8: Victoria Canal/ North Canal
		Site 2A	Site 2B					Site 7A	Site 7B	
August 1				35			118			
August 3					13					
August 7							132			
August 8	62							248	150	
August 10				8						
August 12	28									
August 14						260		246	168	
August 15		147	153							
August 17		25	35							
August 28					22					
August 29	52									
September 4										328
September 5		230	231							
September 6								185	168	

[a] Data collection at Site 7B was incomplete; therefore, it is not presented.
Note: Blank fields indicate lack of surveys at that site on corresponding date. Dates in *italics* are weekdays, dates in **bold** are holiday weekend days, and all other dates are weekend days.
Source: Information compiled by DHCCP in 2010

Boat traffic was substantially less at Sites 1, 3, and 4 (Sacramento River, Georgiana Slough, and Fisherman's Cut). Boat traffic at these sites was about one-third the volume observed at other Delta waterways. This study did not determine the reason for substantially lower boat traffic at these survey sites; however, nearly all the summer boating activity on these waterways is related to boaters cruising or simply passing through the waterway on their way to some destination (**Figure 5.1-3**).

5.2.2.1.2 Hourly Boat Traffic Patterns

Examination of boat traffic data reveals the hourly pattern of boating activity. As shown in **Table 5.1-4**, boat traffic was consistently lower during the first three morning hours on weekdays, weekends, and holidays. In general, traffic increased considerably during the late morning and early afternoon hours. Boat traffic generally remained fairly high through the 4 p.m. hour, although the level of traffic tapered off at each site during that final hour of observation.

Boat traffic during midday peak-use hours was consistently highest at Sites 5 and 7A. On nonholiday weekends in 2010, peak hourly use reached 69 and 65 boats at Sites 5 and 7A, respectively. On holidays, boat traffic reached a maximum of 77 boats per hour at Site 5 and 57 boats at Site 7A. Peak hourly boat traffic at Sites 2A, 2B, and 7B ranged between 17 and 49 during midday peak-use hours on holidays. At Site 8, a peak of 74 boats was observed during the holiday survey event.

Table 5.1-4. Peak Hourly Boat Traffic Volumes Observed

Site	Peak Number of Boats Observed by Hour of Day (Weekday/Weekend/Holiday Surveys)							
	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.
Site 1: Sacramento River	0/5/--	1/6/--	6/9/--	7/13/--	7/12/--	7/22/--	4/19/--	6/18/--
Site 2A: Delta Cross Channel and Snodgrass Slough	1/2/4	1/7/14	2/12/19	4/23/17	10/37/56	4/32/49	7/34/46	12/24/39
Site 2B: Delta Cross Channel and Snodgrass Slough	1/4/3	6/6/14	6/8/12	7/16/18	5/26/30	11/21/32	13/22/34	10/20/33
Site 3: Georgiana Slough	0/1/0	1/3/1	1/5/1	9/4/6	3/9/20	1/15/14	1/15/5	2/9/7
Site 4: Fisherman's Cut	2/2/0	3/5/1	1/7/3	2/6/3	3/7/9	2/10/7	0/9/19	3/12/9
Site 5: Old River	7/22/8	6/26/18	11/41/31	12/67/45	16/45/73	14/54/65	13/46/77	12/45/62
Site 6: Connection Slough	4/15/--	3/14/--	8/17/--	6/25/--	4/27/--	5/21/--	6/41/--	2/23/--
Site 7A: North Railroad Cut	1/8/14	4/19/13	5/25/24	8/34/52	9/43/51	4/46/57	6/65[a]/50	4/35/46
Site 7B: South Railroad Cut	1/5/13	3/13/20	4/16/22	7/35/31	13/37/41	8/37/43	7/35/31	8/29/25
Site 8: Victoria Canal/North Canal	--/--/21	--/--/25	--/--/27	-/-/47	--/--/39	--/--/74	--/--/56	--/--/39

[a] This unusually high hourly count was primarily attributable to an unusually high number of personal watercraft passing through, including one group of 18.

Notes:

No holiday weekend surveys were conducted at Site 1 or 6.

No nonholiday weekend or weekday surveys were conducted at Site 8.

Hourly nonholiday weekend volumes of 20 boats or higher are shown on gray background.

Source: Data compiled by DHCCP in 2010

No more than 20 boats per hour were observed at Site 1, Site 3, and Site 4 during weekdays or weekends, with one exception at Site 1 during midday on a nonholiday weekend. Weekday peak-hour boat traffic at the remaining sites was fairly low and ranged between zero and 16 boats per hour. Nonholiday weekend peak hourly boat traffic was fewer than 40 boats at Sites 2A, 2B, and 7B. At peak midday use, boat traffic reached 41 boats at Site 6 on weekends.

5.2.2.1.3 Composition of Boat Traffic by Boat Type and Nonrecreational Traffic

The boat traffic observed was dominated by smaller boats (mostly runabouts and small fishing boats) comprising between 70 and 85 percent of all boat traffic observed at each site on weekdays, weekends, and holiday survey events (**Table 5.1-5**).

In general, the smaller boats were all open boats roughly 18–22 feet long. The category of runabouts includes boats commonly referred to as ski boats, wakeboard boats, and fish-and-ski boats. Likewise, small fishing boats included boats commonly referred to as bass boats, johnboats, and several other specialized types, all of similar size. A third type of small boat, formally known as personal watercraft (PWC) but commonly referred to as jet-skis, was the next most common type of vessel observed.

Larger fishing boats, cabin cruisers, and other boat types, made up most of the remainder of the observed traffic. There was also considerable variation within the larger fishing boat and cabin cruiser boat types, but in general, these are boats 25–35 feet long, with some form of enclosed cabin (cabin cruisers) or overhead cover (pontoon).

Boats categorized as "other types" included a variety of larger boats, such as off-shore boats, sailboats, pontoon boats and houseboats, and a few small motorized inflatable boats. The larger cabin cruisers, houseboats, off-shore boats, and sailboats often exceeded 35 feet in length. The "other types" category also included nonrecreational boats and patrol and other boats used by resource management and law enforcement agencies. Commercial boats (e.g., tour boats, guided fishing boats) and nonrecreational boats (e.g., patrol boats, other State and Federal agency boats) make up a small proportion of the boat traffic at each of the sites.

Table 5.1-5. Boat Types Observed

Observation Site	Average Number of Boats Observed by Type During 8 Hours of Observation (Weekday/Weekend/Holiday Surveys)					
	Runabout	Fishing (Small)	PWC/ Jet Ski	Fishing (Large)	Cabin Cruiser	Other Types[a]
Site 1: Sacramento River	4/31/--	4/10/--	7/9/--	2/3/--	0/5/--	1/4/--
Site 2A: Delta Cross Channel and Snodgrass Slough	10/72/102	8/13/20	5/21/21	1/12/4	1/4/4	2/6/15
Site 2B: Delta Cross Channel and Snodgrass Slough	10/59/90	19/24/36	2/5/12	3/7/4	3/10/8	5/17/25
Site 3: Georgiana Slough	4/18/15	1/4/0	0/1/2	<1/3/0	3/5/35	1/3/2
Site 4: Fisherman's Cut	2/8/18	4/14/6	0/2/19	0/2/0	0/2/5	1/1/3
Site 5: Old River	26/61/104	23/84/51	1/14/40	2/4/18	12/28/44	8/35/43
Site 6: Connection Slough	5/34/--	23/53/--	0/16/--	0/3/--	0/2/--	1/4/--
Site 7A: North Railroad Cut	23/104/153	5/28/7	5/23/35	3/1/5	0/16/28	1/12/12
Site 7B: South Railroad Cut	28/107/153	5/15/7	4/18/35	1/1/5	0/2/28	0/5/12
Site 8: Victoria Canal/ North Canal	-/-/257	--/--/48	--/--/16	--/--/0	--/--/0	--/--/7

[a] "Other types" primarily consisted of larger recreational boats, such as offshore powerboats, sailboats, and houseboats. The category also includes nonrecreational boats (e.g., Coast Guard and sheriff's patrol boats, State and Federal agency–owned boats).

Notes:

PWC = personal watercraft

No holiday weekend surveys were conducted at Site 1 or 6.

No nonholiday weekend or weekday surveys were conducted at Site 8.

Holiday results for Sites 3 and 4 and all results for Site 8 are actual numbers not averages.

Source: Data compiled by DHCCP in 2009

In total, the "other types" category ranged between 3 and 15 percent of the boats observed each count day at the 10 sites. Large boats were more common at Site 5 than at the other sites, making up as much as 30–35 percent of the average boat traffic, whereas large boats were relatively uncommon on average at Site 6, where large boats made up only 4–8 percent of boat traffic. Large boat traffic at Site 8 comprised only 2 percent of the total boat traffic during the holiday survey event. For photographs of the different types of boats observed, see Appendix 3.3B.

5.2.2.1.4 Boat Traffic Direction of Travel and Activity

Nearly all the summer boating activity on waterways at the 10 sites was observed as being related to boaters cruising or simply passing through the waterway on the way to some destination, rather than boaters using the area for other specific types of recreation. Some fishing, waterskiing, and PWC use was apparent on the waterways in the vicinity of the observation locations. Traffic flow on these waterways was roughly equal in the northbound and southbound or eastbound and westbound directions (depending on the waterway), although the balance could shift in one direction or the other on a particular day. In general, the traffic pattern on the holiday weekends was similar to that on nonholiday weekends but with more boats per hour during the afternoon hours, on average, as compared to the traffic observed on the nonholiday weekends for most sites.

5.2.2.1.5 Summary of Boat Traffic

Key observations regarding boat traffic on the Delta waterways are summarized as follows:

- The largest volume of boat traffic was observed at Sites 5 and 7A (Old River and north Railroad Cut). The traffic observed at these sites was about 30 percent greater than that observed at other sites.
- Boat traffic was substantially less at Sites 1, 3, and 4 (Sacramento River, Georgiana Slough, and Fisherman's Cut). Boat traffic at these sites was about one-third the volume observed at other Delta waterways. This study did not determine the reason for substantially lower boat traffic at

these survey sites; however, nearly all the summer boating activity on these waterways is related to boaters cruising or simply passing through the waterway on their way to some destination.

- The boat types observed at Sites 1, 3, and 4 (Sacramento River, Georgiana Slough, and Fisherman's Cut) was diverse. Approximately 70–80 percent of the traffic was small boats (e.g., runabouts, ski boats, bass boats, and other small fishing boats), generally 18–22 feet long, and PWCs. Most of the remainder was composed of a variety of larger boats, generally 25–35 feet long or larger (primarily cabin cruisers, pontoon boats, larger fishing boats, offshore boats, and a few houseboats). A higher proportion of larger boats was observed at Site 5 (Old River), where they made up about 30–35 percent of the boats observed.
- The traffic volume during most summer weekends was considerable at Sites 2A, 2B, 5, 7A, 7B, and 8 (Delta Cross Channel, Snodgrass Slough, Old River, Connection Slough, north Railroad Cut, south Railroad Cut, and Victoria Canal/North Canal), with about 100–200 boats using most of these waterways during a typical survey day and as many as 35–50 boats per hour passing through the waterways during midday peak-use hours.
- Boat traffic on holiday weekends was roughly 30 percent higher on average than traffic on nonholiday weekends, with 200–250 boats using these waterways.

5.2.3 References

CDBW (California Department of Boating and Waterways). 2003. *Sacramento-San Joaquin Delta Boating Needs Assessment 2000–2020*. Sacramento, California.

CDPR (California Department of Parks and Recreation). 1997. *Sacramento-San Joaquin Delta Recreation Survey*. Sacramento, California.

DHCCP (Delta Habitat Conservation and Conveyance Program). 2010. *Draft 2009 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*. Sacramento, California. July 2010.

DWR (California Department of Water Resources). 2009. *Final Franks Tract Project Boat Traffic Study Report*. Sacramento.

CHAPTER 6: 2011 BIOLOGICAL SURVEYS

6.1 INTRODUCTION

Biological surveys were conducted in the CPA during the 2011 season to further supplement existing 2009 and 2010 field data, particularly to access new areas with suitable habitat that were previously unavailable. Surveys were conducted on a limited number of parcels where a temporary entry permit was obtained after the 2010 field season was completed, or where additional information could add to the value of previous efforts. During the 2011 field season, the following biological teams collected data for the BDCP EIR/EIS EDR:

- Plants
- Valley Elderberry Longhorn Beetle
- California Red-legged Frog
- California Tiger Salamander
- Birds
- Bats
- Riparian Mammals

This chapter provides a summary of 2011 survey results. Unless otherwise noted, survey protocols are consistant with the most recent previously defined protocols from the chapters summarizing the 2009 and 2010 field surveys. Generally, only those methods that were updated for the 2011 surveys are provided below. Results sections for each of the resources listed above also include, if applicable, a summary of the three survey years of data collection.

6.2 PLANTS

6.2.1 Methods

6.2.1.1 Survey Description

The botanical surveys conducted in 2011 were intended to locate occurrences of special-status plants in the following areas:

- Areas newly added to the Conveyance Planning Area
- Areas that were unavailable in previous survey years which became accessible due to the court-ordered access process

The rainfall total for the 2010/2011 rainy season was 21.37 inches in Davis, California which was 2.27 inches above average (CIMIS 2011).

6.2.1.2 Survey Timing

Surveys for the 2011 season began on April 5, 2011 and ended on September 23, 2011.

6.2.2 Results and Discussion

6.2.2.1 Survey Results

Of the 65 target plant species, 15 species were found during the 2011 surveys. The survey findings for each species, along with their State Status (if applicable) or CRPR are presented below. None of the observed species is listed by the federal government. Only two species were observed in 2011 that had not been found in 2009 or 2010: Brittlescale and Hogwallow Starfish. In this report, an "occurrence" is defined as a point, line, or polygon where a GPS point or points were recorded to locate a target species.

6.2.2.1.1 Alkali Milk Vetch

Twenty five occurrences of Alkali Milk Vetch (CRPR 1B) were found during 2011 surveys. These occurrences were found in grazed grasslands containing disturbed vernal pools west of Clifton Court Forebay. Populations at each occurrence ranged from 1 to 250 individual plants. Species associated with Alkali Milk Vetch included Iodinebush, Italian Ryegrass, Mediterranean Barley, California Goldfields, Fremont's Goldfields and Yellowray Goldfields.

6.2.2.1.2 Bristly Sedge

Fourteen occurrences of Bristly Sedge (CRPR 2) were found during 2011 surveys. These occurrences were found in drainage ditches and sloughs adjacent to agriculture and grazed pasture on Woodward Island, Snodgrass Slough and near Stone Lakes NWR. Populations at each occurrence numbered from 1 to 35 individuals. Bristly Sedge was found growing in areas with dense mats of Water Hyacinth, which could pose a competitive threat to the sedge.

6.2.2.1.3 Brittlescale

Fourteen occurrences of Brittlescale (CRPR 1B) were found during 2011 surveys. These occurrences were found in scalds in grazed alkali seasonal wetlands southwest of Clifton Court Forebay. Populations at each occurrence contained between 15 and 1000+ individuals. Areas where Brittlescale was found were largely devoid of other plant species, but Brittlescale was found with a few individuals of Iodinebush and Valley Saltbush.

6.2.2.1.4 Delta Mudwort

Four occurrences of Delta Mudwort (CRPR 2) were recorded during 2011 surveys. These occurrences were found mainly on in-channel islands as well as riprapped levees on the South Mokelumne River north of Bouldin Island and the San Joaquin River near Prisoners Point on Mandeville Island. Population sizes ranged from 0.25 square feet to 20 square feet of sparse to dense coverage. Associated species included Mason's Lilaeopsis.

6.2.2.1.5 Delta Tule Pea

Four occurrences of Delta Tule Pea (CRPR 1B) were found during 2011 surveys. These occurrences were found on in-channel islands and riprapped levees on the South Mokelumne River north of Bouldin Island, Old River near Fay Island, and the San Joaquin River near Prisoner's Point on Mandeville Island. Each occurrence contained between 1 and 5 individual plants. Associated species were not recorded at these occurrences.

6.2.2.1.6 Heartscale

Eight occurrences of Heartscale (syn. *Atriplex erecticaulis*, CRPR 1B) were found during 2011 surveys. These occurrences were found in scalds in alkaline seasonal wetlands southeast of Byron Hot Springs.

Most of these sites were grazed by cattle. Populations at each occurrence contained between 10 and 30 individuals. Species associated with Heartscale included Lost Hills Crownscale and Iodinebush.

6.2.2.1.7 Hogwallow Starfish

Four occurrences of Hogwallow Starfish (CRPR 4) were found during 2011 surveys. These occurrences were found on grazed grasslands southwest of Clifton Court Forebay. Populations at each occurrence ranged from 3 to 50 individuals. Species associated with Hogwallow Starfish included Soft Chess, Italian Ryegrass, Greene's Popcornflower and Few Flowered Evax.

6.2.2.1.8 Little Mousetail

Twelve occurrences of Little Mousetail (CRPR 3) were recorded during 2011 surveys. These occurrences were found on grazed alkali seasonal wetlands and grasslands with disturbed vernal pools west of Clifton Court Forebay. Populations at each occurrence contained 1 to 200 individuals. Species associated with Little Mousetail included Fremont's Goldfields, Flatface Downingia, California Goldfields, Meadow Barley, Finebranched Popcornflower, Woolly Marbles and Tiny Mousetail.

6.2.2.1.9 Lost Hills Crownscale

Seventeen occurrences of Lost Hills Crownscale (CRPR 1B) were found during 2011 surveys. These occurrences were found in scalds in alkaline seasonal wetlands and in grassland with disturbed vernal pools west of Clifton Court Forebay. Many of these sites were grazed by cattle. Populations at each occurrence contained between 1 and 200 individuals. Species associated with Lost Hills Crownscale included Iodinebush, Mediterranean Barley, Salt Marsh Sandspurry, Berlandier's Goosefoot and Pineapple-weed.

6.2.2.1.10 Mason's Lilaeopsis

Twenty six occurrences of Mason's Lilaeopsis (State Rare and CRPR 1B) were recorded during 2011 surveys. These occurrences were found on in-channel islands, levees, and old wooden pilings along the South Mokelumne River north of Bouldin Island, San Joaquin River near Prisoner's Point on Mandeville Island and Old River near Fay Island. Population sizes ranged from 2 square inches to 20 square feet with sparse to dense cover. Species associated with Mason's Lilaeopsis included Low Clubrush, Delta Mudwort, and Whorled Pennywort.

6.2.2.1.11 Saline Clover

One occurrence of Saline Clover (CRPR 1B) was found during 2011 surveys. This occurrence was found in grazed grassland with disturbed vernal pools west of Clifton Court Forebay. This occurrence consisted of 5 individual plants. Species associated with Saline Clover included Dwarf Sack Clover, Cowbag Clover and Soft Chess.

6.2.2.1.12 San Joaquin Spearscale

Three occurrences of San Joaquin Spearscale (CRPR 1B) were found during 2011 surveys. These occurrences were found in grazed alkaline seasonal wetlands west of Clifton Court Forebay. Populations at each occurrence numbered between 4 and 100 individuals. Species associated with San Joaquin Spearscale included Lost Hills Crownscale, Mediterranean Barley, and Common Knotweed.

6.2.2.1.13 Sanford's Arrowhead

Ten occurrences of Sanford's Arrowhead (CRPR 1B) were found during 2011 surveys. These occurrences were found in agricultural ditches near Courtland and on mudflats and in-channel islands on the Mokelumne River west of Staten Island. Populations at each occurrence ranged from 10 to 700 individuals. Associated species included Floating Water Primrose, Duckweed, Cattail species, Nutsedge

and Black Mustard. Occurrences in agricultural ditches had been sprayed by land managers with herbicide in an attempt at eradication due to misidentification as Broadleaf Arrowhead. This represents an imminent threat to these occurrences.

6.2.2.1.14 Suisun Marsh Aster

Twenty five occurrences of Suisun Marsh Aster (CRPR 1B) were found during 2011 surveys. These occurrences were found on riprapped levees, in-channel islands, and old wooden pilings on the Sacramento River near Walnut Grove, South Mokelumne River north of Bouldin Island, Potato Slough and San Joaquin River near Venice Island and into Frank's Tract, and Old River near Fay Island. Populations at these occurrences ranged from 1 to 14 individuals. Species associated with Suisun Marsh Aster included Hardstem Bulrush and Woolly Rose Mallow.

6.2.2.1.15 Woolly Rose Mallow

Forty one occurrences of Woolly Rose Mallow (CRPR 1B) were found during 2011 surveys. These occurrences were found on waterways such as Snodgrass Slough, Georgiana Slough, North and South Mokelumne Rivers near Staten Island, San Joaquin River near Mandeville Island, and Old and Middle Rivers near Bacon Island. Plants were found growing on both in-channel islands and on levee banks, many of which were reinforced with riprap. Populations numbered between 1 and 80 plants at each occurrence. Associated species included Hardstem Bulrush, California Bulrush, Cattail species and Manyflower Marshpennywort.

6.2.3 References

CIMIS (California Irrigation Management Information System). 2011. Monthly Precipitation Data for Water Year 2010 and 2011 for Davis, CA. URL = http://wwwcimis.water.ca.gov/cimis/data.jsp.

6.3 VALLEY ELDERBERRY LONGHORN BEETLE

6.3.1 Methods

Visual surveys for the elderberry shrub, the host plant of the Valley Elderberry Longhorn Beetle, were conducted using the same methods as were used in the 2009 and 2010 field surveys (Sections 2.3.1 nd 4.3.1). The elderberry shrub surveys were again conducted as incidental to the special-status plant surveys.

6.3.2 Survey Results

One hundred and four occurrences (1,189 individuals) of elderberry were found during 2011 surveys. Occurrences were found in sloughs and channels off of the Sacramento River, including extensive populations in Babel Slough, Winchester Lake, Elk Slough and Snodgrass Slough. Populations ranged from 1 to 469 shrubs per occurrence.

6.4 VERNAL POOL INVERTEBRATES

6.4.1 Methods

Methods for 2011 surveys were the same as those for previous years' Branchiopod sampling; however, protocol level surveys were not completed due to access constraints. Surveys completed in 2011 were conducted in order to gather habitat suitability data. Preliminary field surveys were conducted under the authorization of the USFWS provided on April 4, 2011. These surveys were conducted by DWR biologists

pursuant to the Endangered Species Act Section 10(a)(1)(A) recovery permit for vernal pool large branchiopods, permit number TE-835365-5.1.

Surveys were conducted by one to two teams at a time, consisting of DWR staff members (two staff members per team) from April to May 2011.

6.4.1.1 Candidate Survey Habitat

The survey areas were located to the west of Clifton Court Forebay and on the east and west sides of Byron Highway in eastern Contra Costa County. The parcels are in the Clifton Court Forebay and Byron Hot Springs 7.5-minute topographic quadrangles.

The survey locations were authorized under a court ordered TEP and were not accessible to survey until April 1, 2011. DWR chose to visit parcels in this area based on soil types and aerial interpretation in order to determine their suitability for dry season and/or wet season surveys in the future. During April and May 2011, 12 parcels within the area were visited and 45 pools were mapped based on inundation and/or habitat potential. Several locations had an abundance of iodine bush (*Allenrolfea occidentalis*) in the surrounding grasslands landscape. Individual pools were often surrounded by *Downingia sp.*, goldfields (*Lasthenia spp.*), popcorn flowers (*Plagiobothrys sp.*), and *Spergularia sp*. Salt grass (*Distichlis spicata*) was abundant at several sites as well.

Field surveys were conducted in accordance with the terms and conditions outlined in the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (U.S. Fish and Wildlife Service 1996). Surveys were conducted over eight days – April 5, 6, 7, 13, 14, 18, 20, and May 10, 2011. Parcels visited are within Critical Habitat for vernal pool fairy shrimp. Surveys were conducted to assess habitat suitability and to determine the accuracy of mitigation measures proposed for the BDCP EIR/EIS. The most recent CNDDB sighting data within or near our survey locations dates from 2006. (CNDDB, June, 2011).

6.4.2 Results

Although no listed branchiopods were found in any of the survey areas, several non-listed species were identified, including *Branchinecta mesovallensis*, *B. lindahli*, and *B. mackini*.

Aquatic invertebrates observed in the survey area included biting midge larvae (Ceratopogonidae), non-biting midge larvae (Chironomidae), water fleas (Cladocera), copepods (Copepoda), water boatmen (Corixidae), mosquito larvae (Culicidae), predaceous diving beetle adults and larvae (Dytiscidae), mayfly larvae (Ephemeroptera), shore fly larvae (Ephydridae), water mites (Hydracarina), water scavenger beetle adults and larvae (Hydrophyllidae), backswimmers (Notonectidae), earthworms (oligochaeta), and seed shrimp (Ostracoda).

Midvalley fairy shrimp (*Branchinecta mesovallensis)* were observed in three surveyed pools, Versatile Fairy Shrimp (*Branchinecta lindahli*) were observed in six pools, Alkali Fairy Shrimp (*Branchinecta mackini*) were observed in two pools, and California clam shrimp (*Cyzicus californicus*) were also found in two pools.

Pacific Chorus Frog (*Pseudacris sierra*) eggs, larvae, and adults were observed in several pools. California Tiger Salamander larvae (*Ambystoma californiense*) were observed in one pool where a population had been previously (2005) recorded in CNDDB. Adult Western Pond Turtles (*Actinemys marmorata*) were observed in one pool; however, this pool did not appear to be seasonal based on the vegetation.

The landscape, abundance of vernal pool-type depressions, abundance of vernal pool plants, presence of inundation in several locations, soil composition, presence of non-listed branchiopod species, aquatic invertebrate composition, and past records have lead DWR to the opinion that these parcels warrant protocol level surveys for the BDCP, if deemed necessary.

6.4.3 References

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6.5 CALIFORNIA RED-LEGGED FROG

6.5.1 Methods

Due to a paucity of new parcels with suitable habitat and restrictions on timing and number of days that surveys were authorized on available parcels, visual and larval (dipnet) surveys for CRF were only conducted opportunistically during surveys conducted primarily for California tiger salamander on four days in April 2011.

6.5.2 Results and Discussion

6.5.2.1 Survey Results

6.5.2.1.1 Visual Encounter Surveys

Permanent and ephemeral pools, ponds, and creeks were surveyed on four properties, one per day, all within Contra Costa County. No night surveys were conducted. No CRF were observed or heard on any of the parcels; however, American Bullfrogs (including larvae), Sierran Treefrogs, and California Toads were.

6.5.2.1.2 Larval Surveys

At the same time the potential aquatic habitat was being surveyed for juvenile and adult CRF, dipnetting for larvae (of both CRF and CTS) was conducted. No CRF larvae were detected at any of the sites; however, Sierra Treefrog and California Toad larvae were captured at multiple sites.

6.5.2.2 Discussion

Most of the areas surveyed in 2011 did not possess high quality CRF habitat, even though all sites were within the historic range of the species and within one mile of an existing CNDDB record. The aquatic habitat was marginal to unsuitable for two main reasons: (1) the sites were ephemeral with little to no vegetation and likely dried prior to CRF larvae being able to metamorphose successfully or (2) the site was perennial but highly degraded and occupied by American Bullfrogs.

6.6 CALIFORNIA TIGER SALAMANDER

6.6.1 Methods

Due to a paucity of new parcels with suitable habitat and restrictions on timing and number of days that surveys were authorized on available parcels, larval (dipnet) surveys for CTS were only conducted on

four days in April 2011. By the time survey teams were able to enter properties in April 2011, it was assumed that no CTS eggs would be present at that time, only larvae, so no visual encounter surveys were conducted for CTS eggs.

6.6.2 Results and Discussion

6.6.2.1 Survey Results

Dozens of ephemeral pools and one potentially permanent pond were dipnetted for CTS larvae on four properties in Contra Costa County in April 2011. CTS larvae were detected in two of the ponds, one large, apparently ephemeral pool and one seemingly permanent pond. Sierran Treefrog and California Toad larvae were also captured during these surveys.

6.6.2.2 Discussion

The apparently ephemeral pool where a CTS larva was found is the location of a 2005 CNDDB record, so the 2011 survey confirmed that the species is still actively using the site for breeding. The seemingly permanent pool does not have a CNDDB record associated with it directly; however, it appears that it may actually be the location of a 1982 CNDDB record for the species for which the polygon has been drawn in the wrong location. That this pond continues to support CTS is interesting because it is deep (greater than 1 meter) and is located very near sites possessing American bullfrogs; however, none were observed or captured on this property.

6.7 GIANT GARTER SNAKE

6.7.1 Methods

Due to a paucity of new parcels with suitable habitat and restrictions on timing and number of days that surveys were authorized on available parcels, no surveys for GGS were conducted in 2011.

6.7.2 Discussion

Unfortunately, because the team did not conduct GGS surveys, the understanding of this species' distribution in the CPA was not advanced.

6.8 BIRDS

The goal of the 2011 surveys was to identify and delineate potential and occupied nest sites and nesting habitat for special-status bird species in parcels that were not available during 2009 and 2010, and to conduct additional focused surveys to detect Black Rails in areas not previously covered.

Twenty-five special-status bird species are known to or expected to nest in the Conveyance Planning Area CPA. Species-specific surveys were conducted in March and April for Black Rails. Surveys were conducted from April 1 through July 19, 2011 at parcels that were not available in 2009 or 2010 for all other special-status bird species that are known to or are expected to nest in the CPA, except the "modesto" song sparrow which was found to be ubiquitis in the Delta in 2009. In the following discussion, species in each group were surveyed for at the same time, using similar methods, in basically the same habitat within the CPA. Black Rails were surveyed using concentrated efforts, and will be discussed in detail.

For each special-status species observed, data were collected with a GPS receiver noting the species observed; number observed; time; location, including the location of the observer and the distance from and direction to the subject; habitat type as a function of vegetative structure; and general activity of the subject that would indicate that it was nesting at the site. For species such as egrets, herons, and cormorants, actual nesting had to be observed; for hawks, nesting or specific nesting behavior had to be

observed, such as territory defense; and for most passerines, the bird needed only to be on-site (flyovers were not accepted). Rookeries and other nesting habitat found are assumed to be extant for a minimum of 5 years.

Project surveyors, led by DWR staff, collected 226 nest site records for the 24 special-status bird species in the CPA in 2011. Project surveyors have collected 717 nest site records for special-status bird species in the CPA in the 3 seasons surveys have been conducted. Most were previously undocumented nest sites.

6.8.1 California Black Rail

6.8.1.1 Methods

The specific goal of the 2011 surveys effort was to get coverage of areas not surveyed in previous years in order to get a more complete picture of California Black Rail distribution within the CPA. A formal protocol for Black Rail surveys in tidal marsh (Evens 2002) was adapted for use in the Delta by the DWR avian survey lead, with input from other DWR avian experts. The 2011 surveys were completed by DWR avian experts.

One accessible parcel and two boat survey routes identified as containing additional potential Black Rail habitat were surveyed in 2011. Teams of two or more surveyors walked or traveled by boat along the edges of appropriate habitat within each boat route or parcel on two occasions between March 1 and April 30 from sunrise to three hours after sunrise. All Black Rail playback responses and spontaneous calls were recorded as assumed nesting birds, as the surveys took place within the known Black Rail nesting period (Eddleman et al. 1994).

6.8.1.2 Results and Discussion

6.8.1.2.1 Survey Results

Surveyors collected three Black Rail data points in 2011 on two mid-channel islands and one managed marsh in the central Delta. The mid-channel islands consisted of mixed tule wetland and willow-dogwood scrub. The managed marsh consisted of a tule-dominated wetland on Mandeville Island. An estimated three Black Rail nesting pairs were detected throughout the Delta during 2011 surveys.

6.8.1.2.2 Limitations and Future Surveys

Surveyors observed fewer Black Rails in 2011 in the CPA than in 2010. This is due in large part to a far less extensive survey effort that covered a smaller area. Detection rates were also lower in spring 2011 relative to the previous year, which may be explained by differing weather conditions. The 2010-2011 water year had higher rainfall that occurred throughout the survey period. The increased rainfall winter and spring may have delayed successful Black Rail nesting in 2011. All Black Rail observations for all years were in the and around the central Delta; none were observed in the north or south Delta.

The central and south-central Delta likely has important, albeit limited, habitat for Black Rails, both nesting and refugia. The majority of Black Rail observations in all three survey seasons were on mid-channel islands at low elevation. Other locations were within managed marshes, also at low elevation. Changes in water level due to operational changes and projected sea level rise could inundate marshes and reduce available habitat, which would in turn adversely affect Black Rail populations in the Delta. Planned habitat restoration efforts should include transitional zones with higher elevations to allow marsh vegetation to colonize as water levels rise.

Black Rails may be surveyed for in new, previously unsurveyed parcel locations that become available during future survey periods and during pre-construction surveys. Additional surveys may be conducted in order to increase understanding of how the species uses wetland habitats in the Delta. Surveys would continue as performed in the 2010 - 2011 survey seasons.

6.8.2 Double-Crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, and Black-Crowned Night Heron

6.8.2.1 Methods

Double-crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, and Black-crowned Night Heron are tree-nesting water birds, and all are State Species of Special Concern. The primary concern regarding these species is loss of nesting habitat. Each of these species typically uses rookeries (colonial nest sites in large trees) that often include interspecies nesting with other species in this group. Snowy Egrets also nest on mats of vegetation in tule-dominated wetlands.

The specific goal of the 2011 surveys regarding these species was to identify rookeries on parcels in the CPA that were not accessible in 2009 and 2010. The 2011 survey methods were the same as those used in 2010.

6.8.2.2 Results and Discussion

6.8.2.2.1 Survey Results

One Double-crested Cormorant rookery, containing 75 nests, was observed in the CPA during 2011 surveys. This rookery was found in a eucalyptus tree stand near Venice Cut in the central Delta. No new Great Blue Heron, Great Egret, Snowy Egret, or Black-crowned Night Heron rookeries were observed.

6.8.2.2.2 Limitations and Future Surveys

Available nesting habitat (large, mature trees) is highly variable throughout the CPA, depending on land use and riverbank management. Most potential nesting habitat occurs along or within (on mid-channel islands) the Delta's rivers and sloughs. Mid-channel islands are unleveed islands in waterways; in the Delta, they often are vegetated by emergent wetlands and/or riparian scrub. No tule or cattail marsh-nesting colonies of Snowy Egret were observed. Species in this group may be surveyed for in new, previously unsurveyed parcel locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009-2011 survey seasons.

6.8.3 Least Bittern and White-Faced Ibis

6.8.3.1 Methods

The specific goal of the 2011 surveys was to survey likely nesting habitat for each species on parcels for which the surveyors did not have access in 2009 and 2010, as well as along Black Rail survey routes. No formal survey protocols have been developed for Least Bittern or White-faced Ibis. The survey methodology was developed by the DWR avian survey lead, with input from other DWR and CDFG avian experts.

Teams of two or more surveyors walked or traveled by boat along the edges of marshes on at least two occasions between April 1 and June 30 during daylight hours. Surveyors recorded Least Bittern locations when birds were heard opportunistically during Black Rail surveys and parcel surveys. Surveyors recorded spontaneous calls by the Least Bitterns as assumed nesting birds. The White-faced Ibis was surveyed through observation only, in all shallow water wetland.

6.8.3.2 Results and Discussion

6.8.3.2.1 Survey Results

No Least Bitterns or White-faced Ibis were observed during 2011 surveys.

Limitations and Future Surveys

One Least Bittern was observed in 2010 surveys, but none in 2009. The fact that only one Least Bittern was observed over three survey seasons (2009-2011) suggests that it is rare in the Delta. While rare, the Least Bittern is a very secretive species, and likely occurs with higher frequency than indicated by our survey results.

No White-faced Ibis were detected in the CPA in 2010 or 2011. In 2009, incidental observations of White-faced Ibis were recorded, but no nesting colonies were observed. White-faced Ibis may not have enough available nesting habitat with the appropriate vegetative structure within the CPA, or it is possible that numbers may not have recovered following its extirpation in the region.

Least Bittern and White-faced Ibis may be surveyed for in new, previously unsurveyed DHCCP locations that become available before and during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009 - 2011 survey seasons.

6.8.4 Redhead, Northern Harrier, and Short-Eared Owl

6.8.4.1 Methods

The goal of the 2011 surveys was to identify and delineate likely nesting habitat of these species in the CPA on parcels that were not accessible in 2009 or 2010. Specifically, the objective of the surveys was to identify the species' nesting habitat in the CPA on parcels for which the surveyors had access, as well as along boat survey routes. The 2011 survey methods were the same as those used in 2009 and 2010.

6.8.4.2 Results and Discussion

6.8.4.2.1 Survey Results

Surveyors collected 15 data points in 2011 representing at least 15 Northern Harrier nest sites in appropriate habitat on newly accessible parcels and Black Rail survey routes. Thirty individuals were observed, including five juvenile birds.

No Redheads or Short-eared Owls were observed or heard during 2011 surveys.

6.8.4.2.2 Limitations and Future Surveys

Northern Harriers nest throughout the Delta in marsh, seasonal wetland, and scrub habitats. No nesting Northern Harriers were observed in the northern portion of the CPA, although they were common there throughout the nesting season. Much of the marsh in that region is surrounded by riparian trees, which reduces visibility of the species, which may have resulted in missed observations, or it may be that Northern Harriers avoid nesting in marshes with large adjacent riparian stands.

No Redheads or Short-eared Owls were observed during three years of surveys. Redheads probably occur in the Central Valley in small numbers, and primarily as nonbreeders, because they prefer larger lakes for nesting. Although Short-eared Owls are known to nest in the CPA, they are rare and primarily are found along the western edge of the CPA. The surveys used were not optimal for finding nesting Short-eared Owls, but the surveys were deemed adequate for this effort given that the species is unlikely to nest in the CPA, the species has limited CEQA protection, and it will most likely benefit from the BDCP wetland restoration activities.

The species in this group may be surveyed for in new, previously unsurveyed locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009-2011 survey seasons.

6.8.5 White-Tailed Kite, Cooper's Hawk, Swainson's Hawk, and Osprey

6.8.5.1 Methods

The specific goal of the 2011 surveys was to find and delineate the species' nest sites in the CPA on parcels that were not accessible in 2009 and 2010, as well as along boat survey routes. Of these species, a formal survey protocol has been developed for Swainson's Hawk only, and for preconstruction surveys, specifically. The 2011 survey methods were the same as those used in 2009 and 2010.

6.8.5.2 Results and Discussion

6.8.5.2.1 Survey Results

One White-tailed Kite nest sites was observed within the CPA during 2011 surveys. No Cooper's Hawk or Osprey nest sites were observed within the CPA.

In 2011, surveyors collected 54 Swainson's Hawk data points throughout the Delta, which represent a minimum of 50 individual nest sites (nesting pairs).

6.8.5.2.2 Limitations and Future Surveys

The White-tailed Kite recorded in 2011 surveys was observed on Empire Tract in the central Delta. No nest site was found, but the bird's behavior indicated there was a nest nearby. No White-tailed Kites were recorded in 2010, and all of the 2009 White-tailed Kite observations of nest sites were collected in the central and north Delta. No nests were observed in the south Delta during all three survey seasons. Observed nest sites typically were associated with dense riparian vegetation adjacent to seasonal wetland/grassland and marsh habitat. Nest sites were notably absent along navigable waterways and marsh without dense riparian trees. Almost all nest sites were located in the eastern portion of the CPA.

The one Cooper's Hawk recorded in 2009 was based on territorial behavior, and no nests were observed. This result was expected because Cooper's Hawks probably nest in the Delta in low numbers, and although they are readily observed soaring and foraging, they are relatively difficult to detect at nest sites because they nest in dense tree stands.

For all three years of surveys, surveyors collected 192 Swainson's Hawks nest data points, which represents approximately 175 nesting pairs. Many of the 2011 nests were found in areas previously not surveyed, but several nests were likely those of birds observed in previous years. The survey effort in 2011 was centered in the central Delta to address the question of nest density in that area. Although the central Delta had been characterized as a low density nesting area for Swainson's Hawks, the 2011 data indicates it is actually a high density nesting area.

The Osprey nests observed in 2009 were on human-made towers or poles. Because of the high detection probability of this species, it appears that few Ospreys nest in the Delta, although these data may indicate that the species is beginning to return to the Delta to nest.

Species in this group may be surveyed for in new, previously unsurveyed locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009-2011 survey seasons.

6.8.6 Greater Sandhill Crane and Lesser Sandhill Crane

Sandhill Crane surveys were not conducted in 2010 or 2011. Results of 2009 surveys are provided in Section 2.8.5.

6.8.6.1 Results and Discussion

No additional surveys for these species are expected for the BDCP EIR/EIS, because sufficient data were collected in 2009 to corroborate the wintering range in the Delta. Sandhill cranes may be surveyed for during pre-construction surveys.

6.8.7 Western Yellow-Billed Cuckoo and Yellow-Breasted Chat

6.8.7.1 Methods

The goal of the 2011 surveys was to identify Yellow-breasted Chat nesting habitat in the CPA on parcels for which the surveyors had access, as well as along boat-accessible waterways. The 2011 survey methods were the same as those used in 2010; surveys were completed by DWR staff. Personnel surveyed for Yellow-breasted Chats in dense riparian scrub with little or no tree overstory on parcels not available in 2009 or 2010, as well as along Black Rail survey routes.

No Western Yellow-billed Cuckoo surveys were conducted during 2011.

6.8.7.2 Results and Discussion

6.8.7.2.1 Survey Results

Surveyors collected 33 data points for Yellow-breasted Chats, which represent an estimated minimum of 29 nest sites.

6.8.7.2.2 Limitations and Future Surveys

Yellow-billed Cuckoo surveys were not conducted in 2011. Results of 2009 and 2010 surveys are provided in Section 4.7.7.

DHCCP survey data from all three years (72 records) indicate that Yellow-breasted Chats nest in discrete areas within the Delta, and primarily in the central Delta. All likely nesters were found in low to high density shrub-scrub habitat, with or without a sparse to moderate tree canopy, and associated with open water, emergent wetlands and seasonal-type wetlands, conditions that result in the growth of shrub-scrub. The species appears to be absent in most dense riparian forest habitat in the Delta. Appropriate nesting habitat is present throughout the Delta, so it is unclear why the species is not more widespread in the CPA or why it is not found to a greater degree on the existing preserves. Data from the DHCCP surveys indicate that the species is found in the Delta in much greater numbers than was previously thought.

Both species may be surveyed for in appropriate habitat in new, previously unsurveyed locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2010 survey season. Additionally, areas surveyed in 2009 and 2010 that have high potential to contain nesting cuckoos may be surveyed again in the future.

6.8.8 Burrowing Owl, Loggerhead Shrike, and Grasshopper Sparrow

6.8.8.1 Methods

The goal of the 2011 surveys was to identify all nesting habitat in the CPA on parcels which were not accessible in 2009 and 2010. The 2011 survey methods were the same as those used in 2009 and 2010.

6.8.8.2 Results and Discussion

6.8.8.2.1 Survey Results

Surveyors collected 30 Burrowing Owl data points in 2011, representing at least 18 nest sites. One juvenile bird was observed.

Eighteen Loggerhead Shrikes were observed during 2011 surveys, representing 15 nest sites. Two juvenile birds were observed.

No Grasshopper Sparrows were observed during 2011 surveys.

6.8.8.2.2 Limitations and Future Surveys

DHCCP surveys indicate that almost all Burrowing Owls that occur in the CPA nest in the southeast portion of the project area in the upland grassland habitats. No Burrowing Owls were found on Delta islands or in seasonal wetlands, and the vast majority of the CPA has no Burrowing Owls.

Loggerhead Shrikes were found primarily in the upland grasslands of the southeast corner of the CPA, with few using seasonal wetlands, and none using Delta islands. The vast majority of the CPA has no nesting Loggerhead Shrikes.

Few Grasshopper Sparrows were observed during the three survey seasons. One location was in the southern end of the CPA, but all of the others were in the northeastern end of the CPA in Stone Lakes National Wildlife Refuge.

Species in this group may be surveyed for in new, previously unsurveyed locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009-2010 survey season.

6.8.9 Tricolored Blackbird and Yellow-headed Blackbird

6.8.9.1 Methods

The goal of the 2011 surveys was to find and delineate the species' nest sites in the CPA on parcels that were not accessible in 2009 and 2010. The 2011 survey methods were the same as those used in 2009 and 2010.

6.8.9.2 Results and Discussion

6.8.9.2.1 Survey Results

Surveyors observed only one Tricolored Blackbird in 2011, foraging with a flock of Red-winged Blackbirds, and no likely nest sites. No large colonies were observed.

No Yellow-headed Blackbirds were observed in 2011.

6.8.9.2.2 Limitations and Future Surveys

Despite conducting focused surveys for the species in 2010, no Tricolored Blackbird nest colonies were detected in any of the DHCCP survey seasons. The lack of observations suggests that while there appears to be appropriate habitat available throughout the Delta, the species does not use this region for nesting. There is evidence that Tricolored Blackbirds prefer less mature freshwater marshes; active habitat management including frequent burning and/or disking, may be required to maintain the vegetation characteristics necessary for nesting to occur in the Delta over the long term.

Yellow-headed Blackbirds prefer dense tule-cattail vegetation surrounded by deeper water for breeding. The lack of detections of breeding birds on the parcels surveyed may be due to low availability of appropriate breeding habitat.

Tricolored Blackbird and Yellow-headed Blackbird may be surveyed for in previously unsurveyed locations that become available during future survey periods and during pre-construction surveys. Surveys will continue as performed in the 2009-2010 survey seasons.

6.8.10 References

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6.9 BATS

6.9.1 Methods

The specific goal of the 2011 bat surveys was to document potential habitat on new parcels made available through the TEP process that were not available in 2009. No supplemental acoustic or bridge surveys were conducted due to budgetary and staffing constraints. The methods for habitat assessments were the same as those used in 2009.

6.9.2 Results and Discussion

6.9.2.1 Survey Results

Habitat assessments were conducted at 86 additional parcels in the CPA in 2011. Riparian habitat features, including wetlands, channels, and ponds, were present at 69 of the 86 surveyed parcels; annual grassland features at 5 parcels; agricultural fields at 39 parcels; oak forests at 4 parcels; eucalyptus [stands?] at 10 parcels; urban/barren/residential land uses at 11 parcels; orchards at 5 parcels; and vineyards at 10 parcels. Multiple habitat types often were present in a single parcel so the total number of habitat features is greater than the total number of assessed parcels.

Of the 86 parcels assessed, 74 (86 percent) contained bat foraging and roosting features and were considered highly suitable parcels, none contained only foraging habitat, three (3 percent) contained only roosting habitat, and nine (10 percent) contained no potential roosting or foraging habitat. Nearly all (93 percent) of the highly suitable parcels contained wetlands, channels, sloughs, ponds, or irrigation ditches associated with agricultural land uses. Nearly ninety percent of the highly suitable parcels contained large trees, and 45 of these parcels had intact stands of trees; 25 highly suitable parcels contained buildings, barns, or sheds that could support roosting bats. All accessible buildings, barns, and sheds were surveyed for bats and bat sign, but no evidence of bat use was detected at any of the suitable habitat features in the CPA in 2011. The nine parcels with no potential foraging and roosting habitat were found in either barren fields or overgrow blackberry and willow thickets with no water present.

6.9.2.2 Limitations and Future Surveys

The scale of the bat survey effort has changed considerably over the last three years, but the method for habitat assessments has remained the same. In 2009 a large scale survey effort was performed that included habitat assessments, bridge surveys, and passive acoustic monitoring surveys. No surveys were conducted in 2010. With the availability access to new parcels from the continued BDCP TEP process, additional habitat assessments were conducted in 2011. Bat acoustic monitoring surveys were originally planned to continue as they did in 2009 through 2010 and possibly 2011; however, due to budgetary and staffing constraints, the scope of the surveys was reduced to habitat assessments on newly available parcels only. Parcels surveyed in 2011 were chosen with the same criteria used in 2009 for habitat assessment through the use of aerial photography and vegetation mapping.

Since habitat assessment surveys don't provide any detailed information on specific parcel use by bat species, just that potential habitat exists on site, more focused surveys should be conducted to determine the specific species that may be impacted within the CPA. At a minimum, additional surveys should include passive acoustic surveys comparable to those conducted in 2009, which identified bat species that were using a given location. However, passive acoustic monitoring has its own limitations, as this method has a tendency towards bias and does not always capture species with echolocation characteristics that don't lend themselves well to being recorded by acoustic monitoring equipment. For example, bats that can be potentially under-represented in acoustic monitoring survey results are those bats that are considered "quiet" echolocators, or those that forage a great distance from the ground, out of the range of the receiver.

If structures or large stands of trees that have been assessed as having potential for roosting habitat are planned for removal, active acoustic surveys should first be conducted, preferably accompanied by mist-netting. Acoustic monitoring accompanied by mist-netting is considered a highly effective survey method for specific bat species identification and should be used for structure removal surveys whenever feasible. This method is invasive and requires biologist to have special permits, which can make it a less practical survey method. For active acoustic monitoring surveys, qualified biologists conduct a visual survey of a particular structure or stand of trees for exiting bats, while simultaneously recording echolocation calls. This method removes some of the uncertainty in species identification, as combining visual inspection of bat physical characteristics with acoustic recordings allows for more accurate species identification than passive acoustic monitoring alone.

6.10 RIPARIAN MAMMALS

This section describes the results of habitat assessments and trapping surveys for Riparian Brush Rabbit and Riparian Woodrat conducted by biologists from the California State University, Stanislaus – Endangered Species Recovery Program (ESRP) in 2011.

6.10.1 Methods

6.10.1.1 Habitat Assessments and Trapping Surveys

Field methods for the 2011 field season for riparian mammals were consistent with the 2009 and 2010 protocols. Habitat assessment surveys were conducted on 23 parcels during 2011, including parcels that became available on April 1, 2011. Since the project initiated October 23, 2008, 296 parcels have been surveyed.

During 2011, live-trapping was conducted from August 8th-12th along the northern perimeter of the Middle River in San Joaquin County just east of Tracy Boulevard. For this effort, sixty live-traps were placed in six trap lines for four nights, resulting in 240 (60x4) trap-nights.

6.10.2 Results and Discussion

6.10.2.1 Trapping Results

Six mammal species were trapped during 2011 surveys – Desert Cottontail (*Sylvilagus audobonii*), Black Rat (*Rattus rattus*), Long-tailed weasel (*Mustela frenata*), Striped Skunk (*Mephitis mephitis*), and Spotted Towhee (*Pipilo maculates*). Of the 69 total captures in 2011, the most commonly recorded species during the trapping survey were Black Rat (16 specimens) and Desert Cottontail (39 specimens). No Riparian Woodrats or Brush Rabbits were captured.

6.10.2.2 Limitations and Future Surveys

Since the project's initiation date in October 2008, 296 parcels have had habitat assessment surveys and trapping has been conducted on 69 parcels for a total of 9,326 trap nights. However, most of the accessible parcels have had either marginal habitat or were located in parts of the conveyance planning areas that have a lower probability of harboring either species.

From intensive field work in the Stewart Tract area (since 1998) and in other nearby areas (Caswell Memorial State Park, Buffington Tract, Faith Ranch, San Joaquin River NWR) over the past 10-30+ years, there is every reason to believe that one or both species are also present in similar habitat at the southern end of the planning area. Populations of Riparian Brush Rabbit are present in these more southern areas of the CPA, where the CSU Stanislaus (ESRP) and its Federal and State partner agencies have initiated a captive propagation and reintroduction program for the species using breeders from the Stewart Tract area. In addition, since 2003, 30 woodrats have been captured at the San Joaquin River NWR and many more have been captured at Caswell Memorial State Park.

It is believed that there is a greater probability of documenting Riparian Brush Rabbit and perhaps Riparian Woodrat in areas south of Highways 4 and 12 (mostly in San Joaquin County) than in central and northern parts of the conveyance planning area, but the latter cannot (and have not) be ruled out.

CHAPTER 7: 2011 OTHER ENVIRONMENTAL SURVEYS

7.1 CULTURAL RESOURCES

Cultural resources surveys were conducted in 2011 to supplement data collected in 2009. The 2011 surveys were limited to parcels that DWR obtained access to in early 2011, through a court-ordered process.

7.1.1 Methods

7.1.1.1 Literature and Records Search Methods

The CHRIS record searches conducted in 2009 demonstrated that a wide variety of prehistoric and historic-era sites, features, and artifacts have been documented in the CPA. For purposes of the records search, the review area was defined as the area within a distance ranging from approximately 1,000 feet to approximately 5,000 feet from the known location of facilities that may be implemented as part of the BDCP.

The 2011 survey utilized the above-noted literature and records search conducted in 2009 to guide 2011 field efforts. A detailed description of the CHRIS records search is included in Section 3.1.1 of this document.

7.1.1.2 Native American Consultation

The Native American Heritage Commission (NAHC) was contacted on May 21, 2009, and May 5, 2011, for information about the location of known heritage or sacred sites in the CPA. The California Valley Miwok Tribe, the Cortina Band of Indians, the Ione Band of Miwok Indians, the North Valley Yokuts Tribe, the Rumsey Indian Rancheria of Wintun, the Shingle Springs Band of Miwok Indians, the Ohlone Indian Tribe, the United Auburn Indian Community of the Auburn Rancheria, the Wilton Rancheria, and other knowledgeable individuals were contacted by letter on June 15 and 22, 2009, for any information they might have on the CPA.

The parcels surveyed as part of the 2011 inventory were included in the original project area indentified in 2009, when Native American consultation was initiated by DWR under CEQA for the BDCP. Therefore, additional letters to the above-noted individuals were not sent for the 2011 survey effort.

7.1.1.3 Field Survey Methods

Field investigations for the 2011 survey were limited to condition assessments of previously recorded or known archaeological sites and conducting cursory surveys of Holocene-era Piper Sand deposits within the CPA. DWR archaeologists attempted to verify the accuracy of site records and site locations, as well as the presence or absence of artifacts or human remains within the previously recorded sites and Piper Sands. These investigations were generally limited to single-day field inspections. Photographs and GPS location readings were taken at all revisited sites. DWR archaeological staff is in the process of generating primary record updates for all revisited sites. Once the updates have been completed they will be sent to the appropriate information center.

7.1.2 Results and Discussion

7.1.2.1 Literature and Records Search Results

The literature and records search was conducted during the 2009 survey effort. Details can be found in Section 3.1.2.1.

7.1.2.2 Native American Consultation Results

The sacred lands search conducted by the NAHC on June 5, 2009, and May 5, 2011, did not identify the presence of any known heritage or sacred sites. The individuals and organizations identified as knowledgeable persons by the NAHC were contacted by letter on June 15 and 22, 2009, to solicit their comments and concerns regarding the project. Responses to letters are included in Section 3.1.2.2 of this document. No additional comments have been received to date.

7.1.2.3 Field Survey Results

Cursory cultural resources surveys for 2011 were conducted over 10 days (May 11, 12, 24, and 25, June 21 and 22, July 19 and 20, and August 10 and 11, 2011) by DWR archaeologists. The original plan was to relocate 51 previously recorded sites in the CPA, which were spread among 61 of the court-ordered parcels. Survey of 30 sites and 8 Piper Sand accumulations on 32 parcels was accomplished; surveys were halted before the remaining 21 sites could be visited.

Of the 30 sites visited, 7 were prehistoric sites, 4 of which each contained a possible human burial, 1 was a multicomponent historic/prehistoric site with a possible human burial, and 22 were historic-era sites. The field crew was able to access and identify all of the site locations; however, the site constituents were often difficult to identify due to dense vegetation, or disturbance from current and historic agricultural use.

No previously unrecorded resources were encountered; however, due either to erosional processes or previous inaccurate recording, two of the sites were larger in area than what was indicated on the site record. Further, although surface remains were not observed on the Piper Sands, these accumulations are likely to contain buried cultural deposits.

7.1.2.4 Conclusions

The cultural resources surveys conducted for BDCP in 2011 were intended to ground-truth previously recorded resources on the court-ordered parcels. This exercise provided valuable insight about the issues to be faced if the ground is disturbed by project construction in these areas. Ground-truthing of previously recorded site locations helped to determine whether sites were present in some form (e.g., a leveled mound in an agricultural field) or whether they had likely been destroyed by construction of infrastructure or development. The potential for some sites to maintain intact subsurface deposits, even though no surface evidence remains, exists. If ground disturbance occurs in, or close to, any previously recorded archaeological site, exploratory excavations shall be conducted to determine the presence and extent of any remaining site constituents.

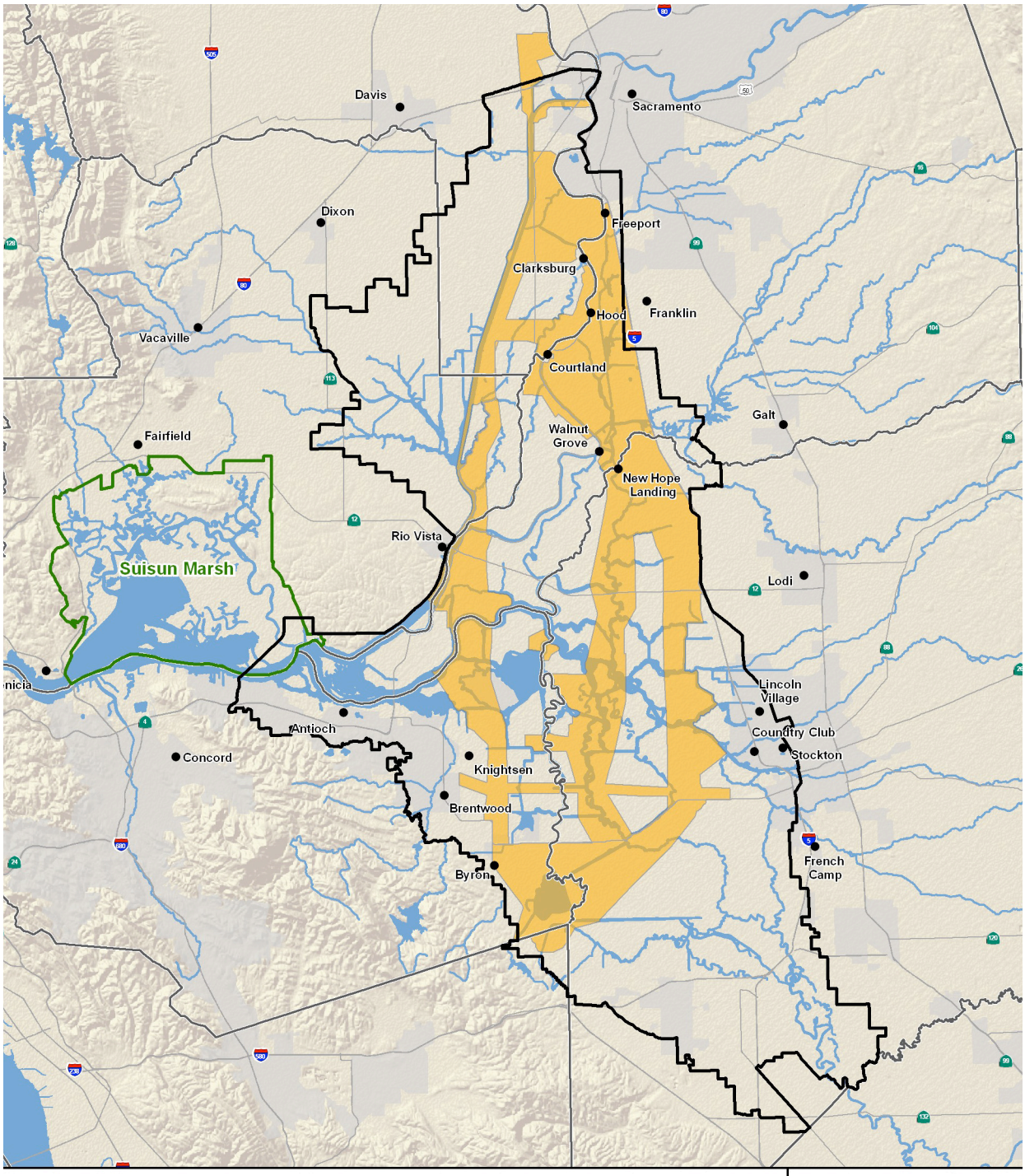
7.1.3 References

Bender, P. 2009. Cultural Resources Information Specialist, Rumsey Band of Wintun Indians, Brooks, California. Letter to J. Offermann, Senior Environmental Planner, California Department of Water Resources, West Sacramento, California. August 19, 2009.

Jones, D. 2009. Executive Director, Wintun Environmental Protection Agency, Williams, California. E-mail to J. Offermann, Senior Environmental Planner, California Department of Water Resources, West Sacramento, California. September 4, 2009.

7.2 RECREATION

No BDCP EIR/EIS recreation field surveys were conducted in 2011. Results for 2009 and 2010 are summarized in Sections 3.2 and 5.2.

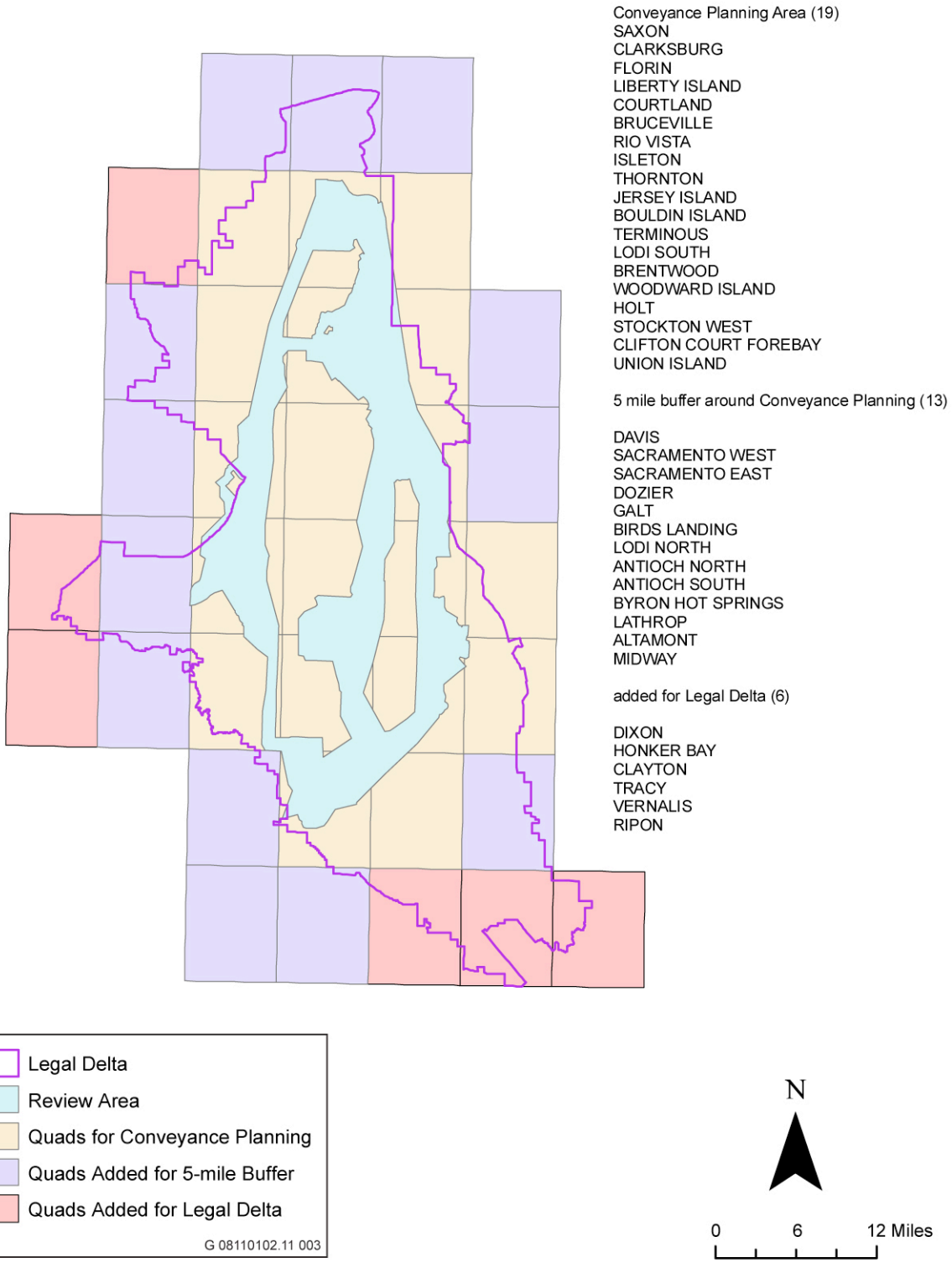


Source: Planning Area – DWR 2009

2009 Bay Delta Conservation Plan EIR/EIS Environmental Data Report
Date Created: 7/27/2010

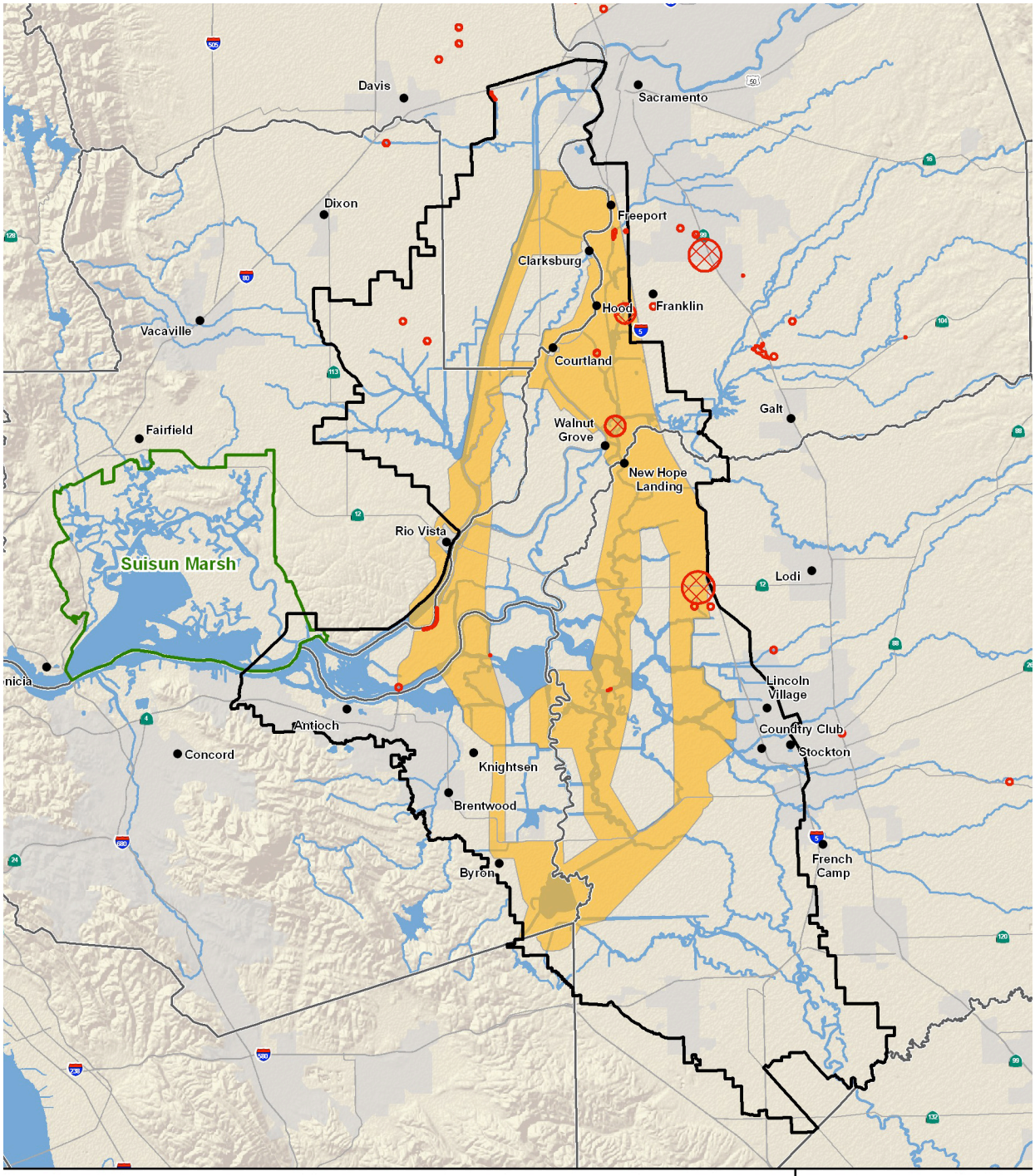
App_12C_(September 25, 2013 4:03 PM) SS

Figure 1.3-1
March 2009 Conveyance Planning Area



App_12C_(September 25,2013 4:03 PM) SS

Figure 2.1-1
USGS 7.5-Minute Quadrangles Used to Develop the List of Species Evaluated in the EIR/EIS and Considered for Surveying in the Conveyance Planning Area (as of December 2008)



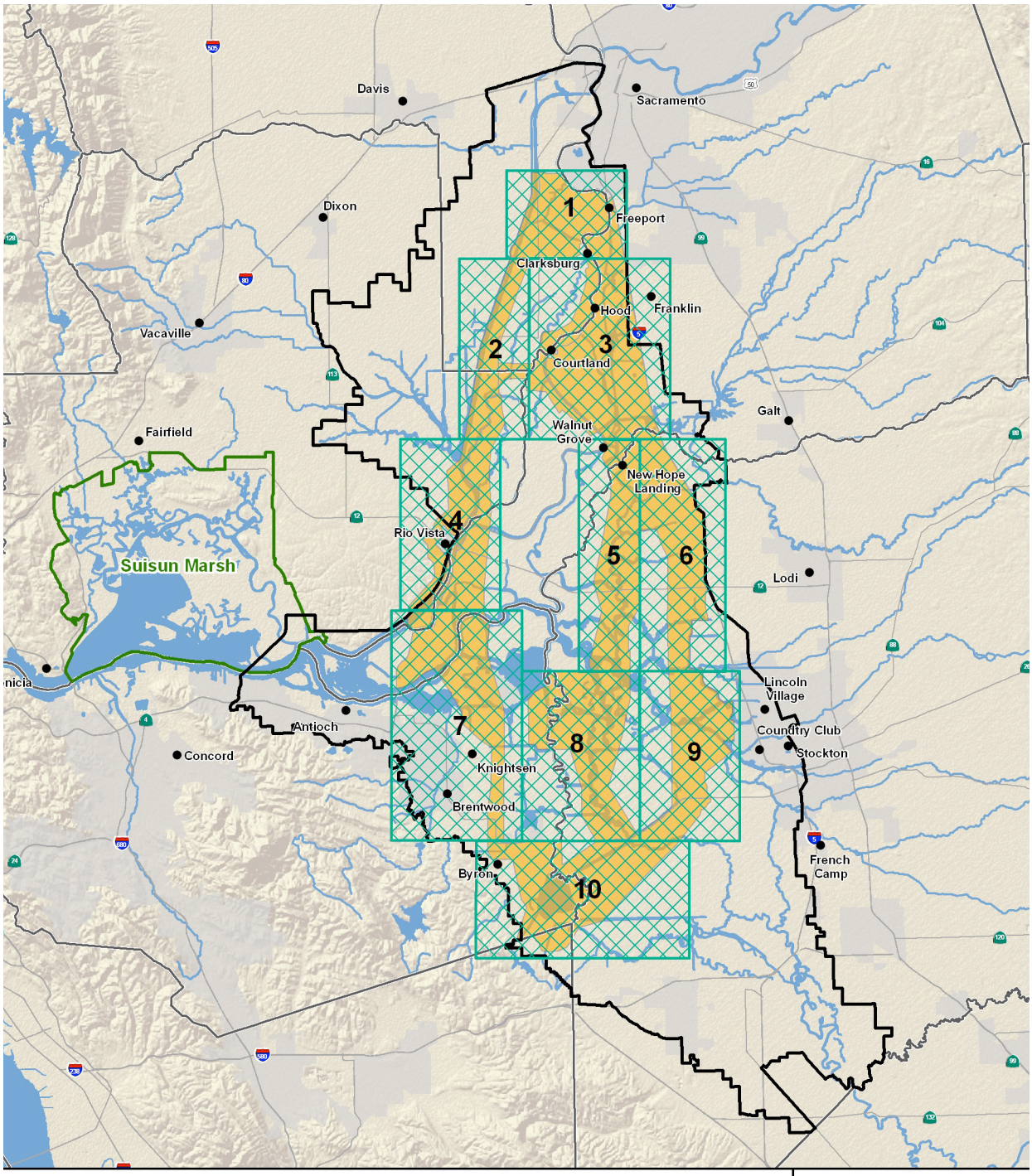
2009 Bay Delta Conservation Plan EIR/EIS Environmental Data Report

Sources: Planning Area – DWR 2010; Giant Garter Snake Occurrences – CNDDB 2008

Date Created: 7/27/2010

App_12C_(September 25, 2013 4:03 PM) SS

Figure 2.7-1
Historical Giant Garter Snake Occurrences from CNDDB



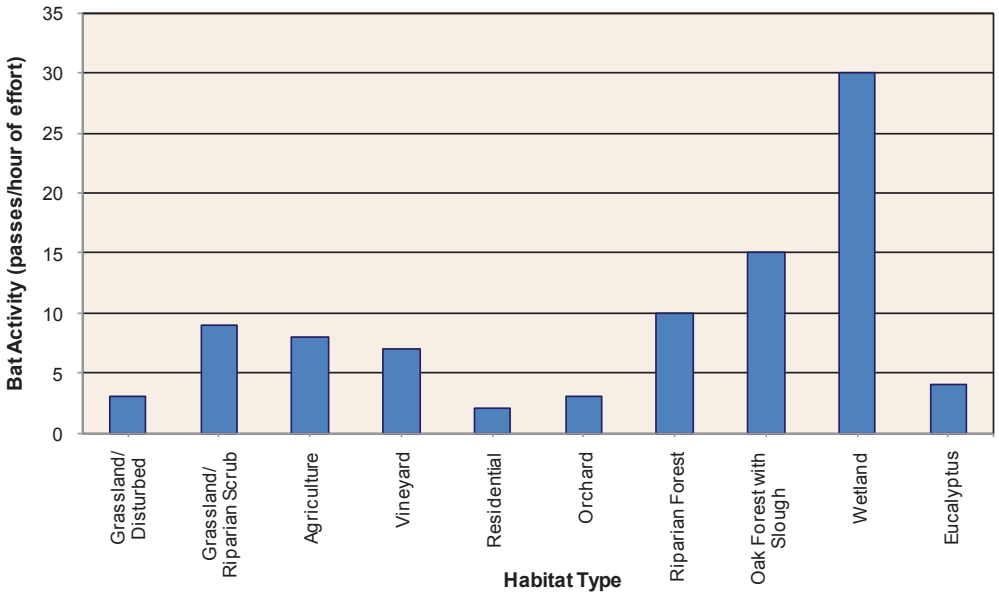
2009 Bay Delta Conservation Plan EIR/EIS Environmental Data Report

Source: Planning Area – DWR 2008; Survey Areas – DWR 2010

Date Created: 7/27/2010

App_12C_(September 25, 2013 4:03 PM) SS

Figure 2.7-2
Giant Garter Snake Survey Area

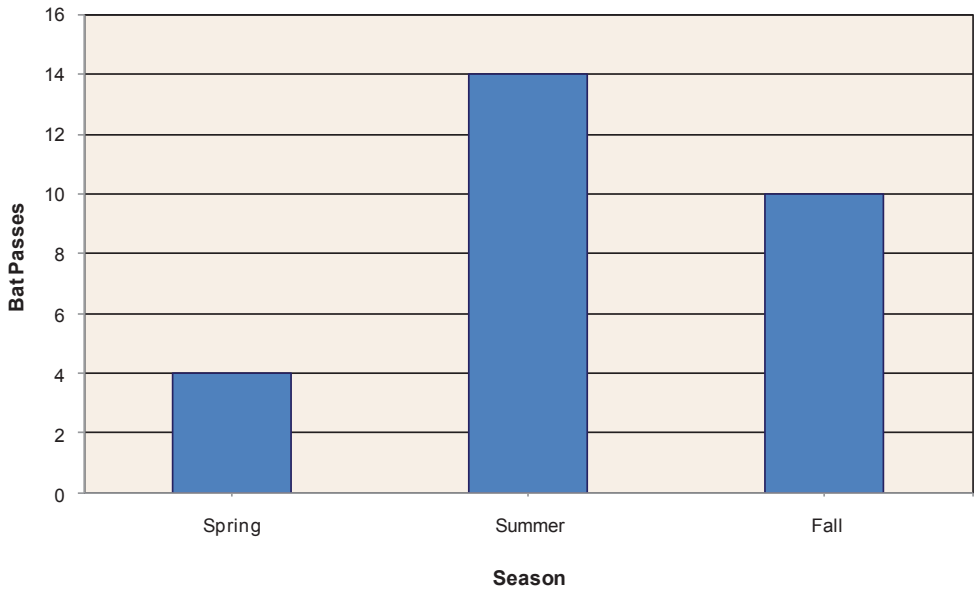


Source: Data collected by DHCCP in 2009

BDCP EIR/EIS
Unique ID: AECOM001 Date Created: 02/01/10

App_12C_ (September 25, 2013 4:03 PM) SS

Figure 2.9-1
Bat Activity at 10 Habitat Types in the Conveyance Planning Area



BDCP EIR/EIS

Source: Data collected by DHCCP in 2009

Unique ID: AECOM002 Date Created: 02/01/10

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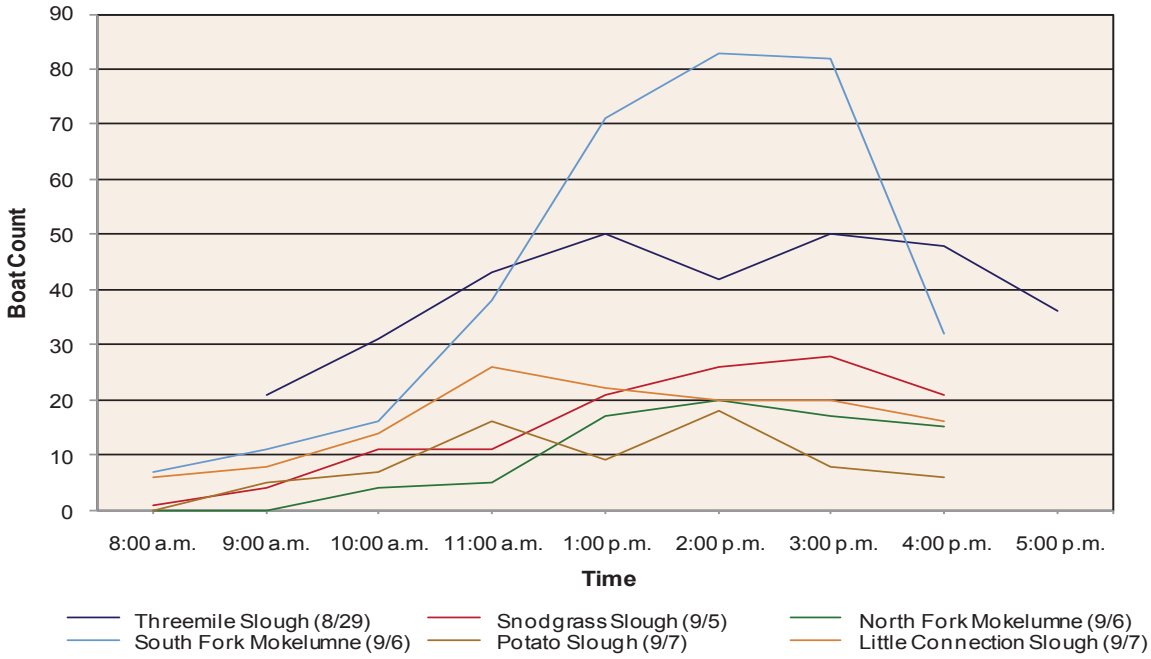
Figure 2.9-2
Bat Activity in Spring, Summer, and Fall 2009 in the Conveyance Planning Area



Source: Data collected by DHCCP in 2009

BDCP EIR/EIS
Unique ID: AECOM003 Date Created: 02/01/10

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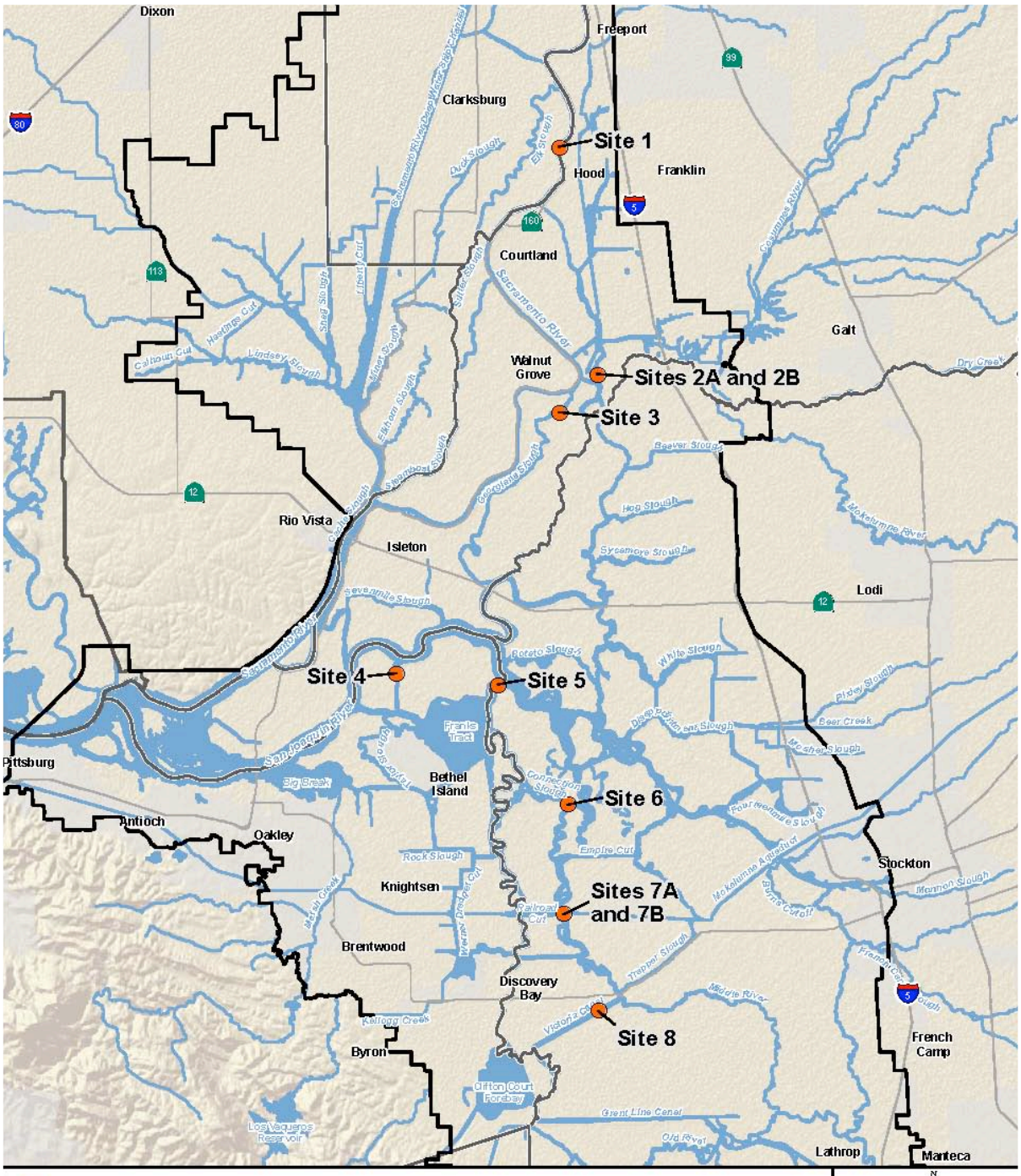
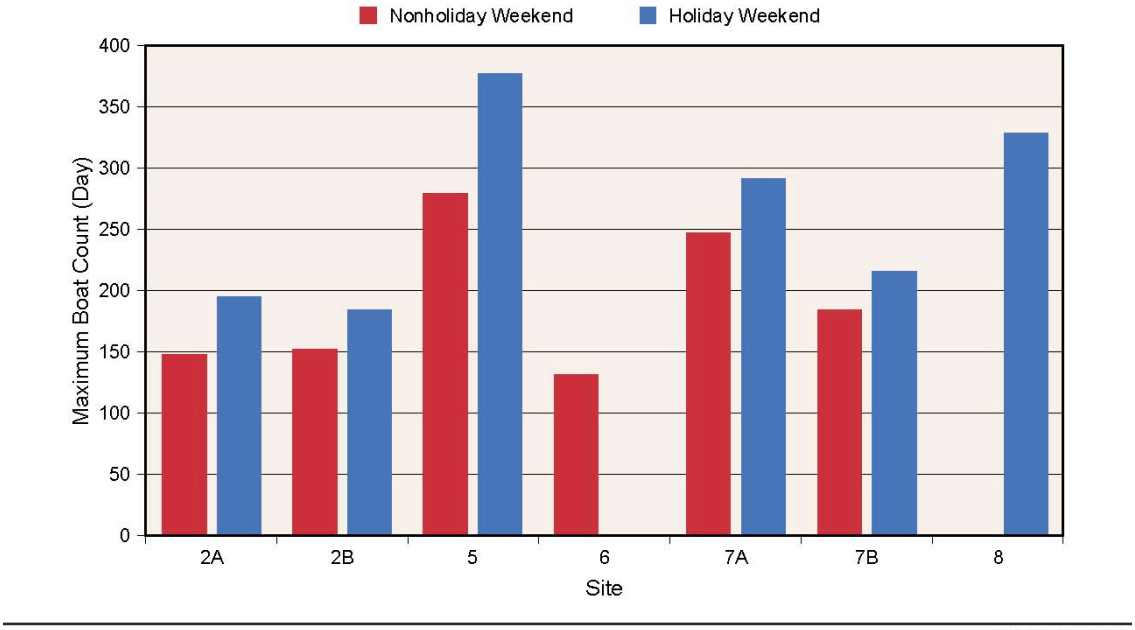
Figure 3.2-1
Hourly Boat Traffic Levels Observed



App_12C_(September 25, 2013 4:03 PM) SS

Figure 5.1-1
2010 Boat Traffic Observation Sites Map

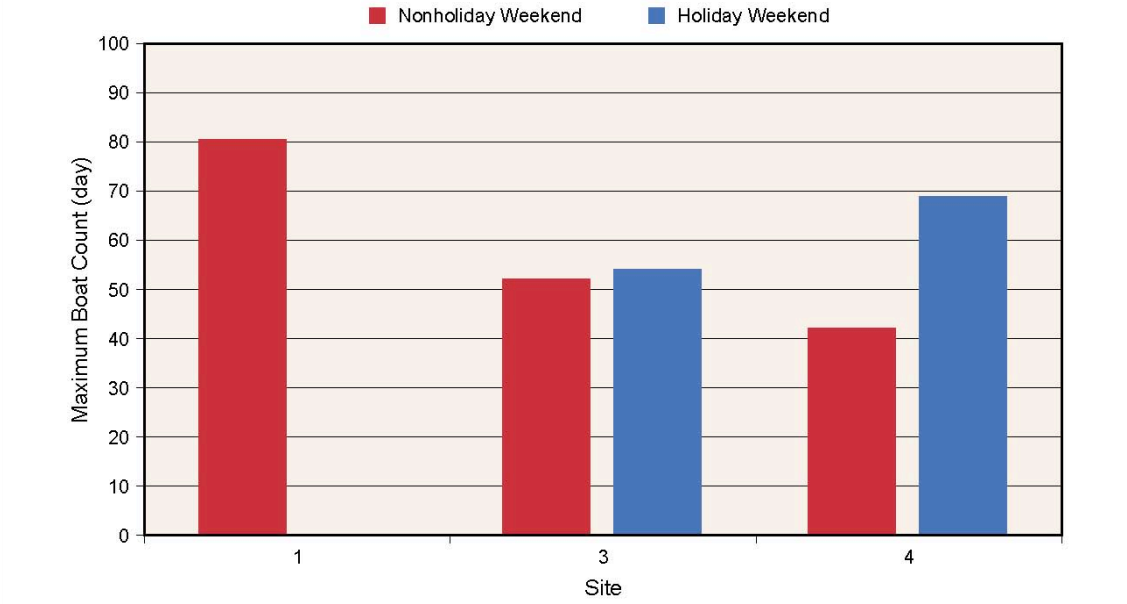


Source: Data collected by DHCCP in 2010

BDCP EIR/EIS
Unique ID: AECOM0732 Date Created: 09/28/2010

App_12C_(September 25,2013 4:03 PM) SS

Figure 5.1-2
Maximum Boat Traffic Observed
at Sites 2A, 2B, 5, 6, 7A, 7B, and 8 on Weekend



Source: Data collected by DHCCP in 2010

BDCP EIR/EIS
Unique ID: AECOM0730 Date Created: 09/28/2010

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Figure 5.1-3
Maximum Boat Traffic Observed at Sites 1, 3, and 4 on Weekend

APPENDIX 1.5A

Field Data Forms

Vernal Pool Habitat Assessment

Pool ID: Date: Assessors:

Estimated Maximum Depth (in):

Dominant Plant Species:	Relative % Cover	Wetland Indicator Status	Vernal Pool Endemic?	Invasive?
Plagiobothrys stipitatus				
Hordeum marinum				
Lasthenia glaberrima				
Glyceria declinata				
Eleocharis macrostachya				
Alopecurus saccatus				
Lolium perenne				
Lolium multiflorum				
Phyla nodiflora				
Malva neglecta				
Rumex crispus				
Trifolium depauperatum				
Anthemis cotula				
Deschampsia danthionoides				
Damasonium californicum				
Eryngium				
Trifolium hirtum				
Juncus bufonius				
Ranunculus muricatus				
Ranunculus aquatilis				
Gratiola ebracteata				

No. Plant Zones:	Degree of Zone Interspersion: High Medium Low

Physical Structure (circle if observed):

Bare Ground (% Cover:_5__) Cattle prints Plant hummocks Pool Shape : Simple

Soil cracks Cobbles Complex

Land Use (describe):

Potential Habitat: Grazed?:

Surrounding Land:

Nearby vernal pools present?:

Altered hydrology (ditches, berms)?:

Visible disturbances:

Other comments:

Vernal Pool Invertebrates - Data Sheet

Site:	Surveyors:
Date/Time:	Weather Conditions:

					Large Branchiopods[1] (estimate # individuals[2])									Other Invertebrates (indicate presence)												
																	Coleoptera		Hemiptera						
Pool #	Photo #	Max. Depth (in)	Surface Area (m)	Water Temp. (°C)	BRCO	BRLI	BRLO	BRLY	BRMA	BRME	BRSP	CYCA	LEPA	LIOC	Ostracods	Copepods	Cladocera	Dytiscidae	Hydrophilidae	Notonectidae	Corixidae	Anisoptera	Zygoptera	Belostomatidae	Amphibians (species present)	Notes

1. Large Branchiopod Acroynms:

BRCO = Branchinecta conservatio
BRLI = Branchinecta lindahli
BRLO = Branchinecta longiantenna
BRLY = Branchinecta lynchi
BRMA = Branchinecta mackini
BRME = Branchinecta mesovallensis
BRSP = Branchinecta sp
CYCA = Cyzicus californicus
LEPA = Lepidurus packardi
LIOC = Linderiella occidentalis

2. Estimate number of individuals by orders of magnitude (e.g. 10's, 100's, 1000's). Note reproductive status.

BAY DELTA CONSERVATION PLAN
BOAT TRAFFIC OBSERVATION DATA COLLECTION FORM

Date:	**Location:** (1) Snodgrass Slough (2) NF Mokelumne (3) SF Mokelumne (4) Potato Slough (5) L. Connection Slough
Time Start:	**Weather:**
Time End:	**Observer:**

	Boat Type	Time	Direction	Activity	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

KEY for symbols to use on form

Boat Type	**F1** = Fishing/small **F2** = Fishing/large **R** = Runabout **J** = Jet ski	**H** = Houseboat **C** = Cabin Cruiser **S** = Sailboat **O** = Other (add descriptive comment)
Direction of Travel	(1) Snodgrass Slough (4) Potato Slough and (5) L. Connection Slough = **North (N) or South (S)** (2) NF Mokelumne and (3) SF Mokelumne = **East (E) or West (W)**	
Activity	P = Pass through/cruising (did not stop, or stopped only briefly) F = Fishing (fished in area while stationary) T = Trolling (fishing while moving) R = Recreating (relaxing, swimming etc. while boat anchored or stationary) O = Other (add comment)	

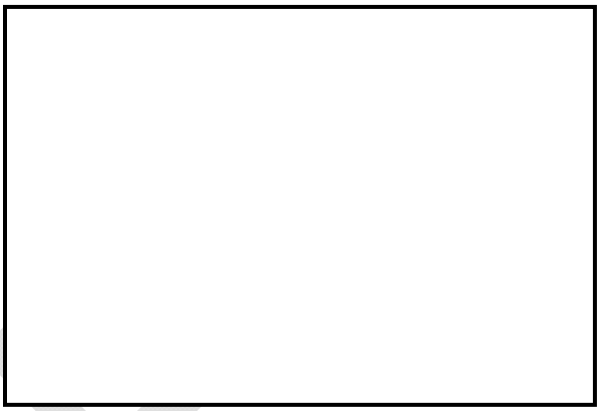
HDR SITE DATA FORM
ESA SCOPE (no interview)

_____

DATE OF RECONNAISSANCE:

SITE NAME:

ADDRESS:



EDR SITE TAG:

HDR SITE NUMBER:

VIEW TOWARD THE:

FACILITY TYPE / FEATURES:

REGULATORY LISTING AND OBSERVATIONS RELATING TO:

OTHER COMMENTS:

IMPACT PROBABILITY:

ONSITE	HIGH	☐	MEDIUM	☐	LOW	☐	INDETERMINATE ☐
OFFSITE	HIGH	☐	MEDIUM	☐	LOW	☐	INDETERMINATE ☐

DISCLAIMER: *The data provided on the Site Data Forms, including the "Impact Probability" and "Risk to the Project" sections, should not be considered as an independent summary of the entire contents of the ISA report. The Site Data Forms are intended to assist the client in making judgments about risk of contamination to the specific project, and include subjective judgments and observations specific to the site, the assessor, and the ISA process. The final judgment of risk, and appropriate action relating to the information provided in the ISA report, is solely that of the client. The information provided in the ISA is limited to observable, obtainable public information and the interpretation of that information by the assessor. Final judgments of business risk cannot be made by the assessor, only by the owner of the project*

APPENDIX 2.1A

Common and Scientific Names of Plant and Wildlife Species Mentioned in the Text

Table 2.1A-1. Plant Species Mentioned in the Text

Common Name	Scientific Name
Alkali Heath	*Frankenia salina*
Alkali Milk Vetch	*Astragalus tener* var. *tener*
Alkali Peppergrass	*Lepidium dictyotum var. dictyotum*
Alkali Sink Goldfields	*Lasthenia chrysantha*
Alkali Weed	*Cressa truxillensis*
American Dogwood	*Cornus sericea*
Annual Bluegrass	*Poa annua*
Annual Hairgrass	*Aira caryophyllea*
Arroyo Willow	*Salix lasiolepis*
Balloon Sack Clover	*Trifolium depauperatum* var. *amplectens*
Baltic Rush	*Juncus balticus*
Bent Grass	*Agrostis exarata*
Bicolored Lupine	*Lupinus bicolor*
Black Mustard	*Brassica nigra*
Black Walnut Species	*Juglans* sp.
Black Willow	*Salix gooddingii*
Blackberry Species	*Rubus sp.*
Blow Wives	*Achyrachaena mollis*
Boccone's Sandspurry	*Spergularia bocconei*
Bog Rush	*Juncus effusus*
Box Elder	*Acer negundo* var. *californicus*
Bractless Hedge-Hyssop	*Gratiola ebracteata*
Bristly Sedge	*Carex comosa*
Bugleweed	*Lycopus americanus*
Bulrush (or Tule) Species	*Schoenoplectus* spp.
Bur Marigold	*Bidens frondosa*
Bush Seepweed	*Suaeda moquinii*
California Aster	*Aster chilensis*
California Blackberry	*Rubus ursinus*
California Bulrush	*Schoenoplectus californicus*
California Buttonbush	*Cephalanthus occidentalis*
California Goldfields	*Lasthenia californica*
California Grape	*Vitis californica*
California Rose	*Rosa californica*
Cattail	*Typha* sp.
Clustered Field Sedge	*Carex praegracilis*
Common Fiddleneck	*Amsinckia menziesii*
Common Frog-Fruit	*Phyla nodiflora*
Common Peppergrass	*Lepidium nitidum*
Common Reed	*Phragmites australis*
Common Streamside Monkeyflower	*Mimulus guttatus* ssp. *guttatus*
Common Tule	*Schoenoplectus acutus*
Curly Dock	*Rumex crispus*
Dallis Grass	*Paspalum dilatatum*
Delta Mudwort	*Limosella subulata*
Delta Tule Pea	*Lathyrus jepsonii* var. *jepsonii*
Duckweed	*Lemna* sp.

Table 2.1A-1. Plant Species Mentioned in the Text

Common Name	Scientific Name
Dwarf Downingia	*Downingia pusilla*
Dwarf Peppergrass	*Lepidium latipes* var. *latipes*
Dwarf Sack Clover	*Trifolium depauperatum* var. *depauperatum*
Dwarf Woolly-Heads	*Psilocarphus brevissimus*
Eurasian Milfoil	*Myriophyllum spicatum*
Fiber Optic Grass	*Isolepis cernua* [=*Scirpus cernuus*]
Floating Water Primrose	*Ludwigia peploides*
Fremont Cottonwood	*Populus fremontii*
Giant Reed	*Arundo donax*
Great Valley Button Celery	*Eryngium castrense*
Great Valley Gumplant	*Grindelia camporum* var. *camporum*
Hardstem Bulrush	*Schoenoplectus acutus*
Heartscale	*Atriplex cordulata*
Heckard's Pepper-Grass	*Lepidium latipes* var. *heckardii*
Hedge Bindweed	*Calystegia sepium*
Himalayan Blackberry	*Rubus discolor*
Iodinebush	*Allenrolfea occidentalis*
Iris-leaved Rush	*Juncus xiphioides* var. *xiphioides*
Italian ryegrass	*Lolium multiflorum*
Johnsongrass	*Sorghum halepense*
June Centaury	*Centaurium muhlenbergii*
Legenere	*Legenere limosa*
Little Mouse Tail	*Myosurus minimus* var. *apus*
Lost Hills Crownscale	*Atriplex coronata* var. *vallicola*
Manyflower Marshpennywort	*Hydrocotyle umbellata*
Marsh Skullcap	*Scutellaria galericulata*
Marshpepper	*Polygonum hydropiper*
Mason's Lilaeopsis	*Lilaeopsis masonii*
Mayweed	*Anthemis cotula*
Mediterranean Barley	*Hordeum marinum* ssp. *gussoneanum*
Mouse-ear Chickweed	*Cerastium glomeratum*
Mugwort	*Artemisia douglasii*
Narrow-leaved Cattail	*Typha angustifolia*
Narrow-leaved Willow	*Salix exigua*
Needle Spikerush	*Eleocharis acicularis* var. *acicularis*
Northern Willow-Herb	*Epilobium ciliatum*
Nutsedge	*Cyperus eragrostis*
Oak Species	*Quercus* sp.
Pacific Foxtail	*Alopecurus saccatus*
Pale Spikerush	*Eleocharis macrostachya*
Prickle-fruited Buttercup	*Ranunculus muricatus*
Pineapple Weed	*Chamomilla suaveolens* [=*Matricaria discoidea*]
Poison-Hemlock	*Conium maculatum*
Popcornflower Species	*Plagiobothrys* spp.
Purpletop Vervain	*Verbena bonariensis*
Purslane Speedwell	*Veronica peregrina* ssp. *xalapensis*
Rattail Fescue	*Vulpia myuros*

Table 2.1A-1. Plant Species Mentioned in the Text

Common Name	Scientific Name
Rayless Goldfields	*Lasthenia glaberrima*
Redstem Filaree	*Erodium cicutarium*
Red Willow	*Salix laevigata*
Rough Cocklebur	*Xanthium strumarium*
Saline Clover	*Trifolium depauperatum* var. *hydrophilum*
Salt Grass	*Distichlis spicata*
Salt Marsh Sandspurry	*Spergularia marina*
San Joaquin Spearscale	*Atriplex joaquiniana*
Sanford's Arrowhead	*Sagittaria sanfordii*
Santa Barbara Sedge	*Carex barbarae*
Side-flowering Skullcap	*Scutellaria lateriflora*
Slender Fescue	*Vulpia bromoides*
Small Stipitate Popcornflower	*Plagiobothrys stipitatus* var. *micranthus*
Smartweed	*Polygonum* sp.
Sneezeweed	*Helenium puberulum*
Soft Chess	*Bromus hordeaceus*
Spikeweed	*Hemizonia pungens*
Stork's Bill Species	*Erodium* sp.
Suisun Marsh Aster	*Symphyotrichum lentum* [=*Aster lentus*]
Summer Mustard	*Hirschfeldia incana*
Tiny Mousetail	*Myosurus minimus* var. *minimus*
Toad Rush	*Juncus bufonius*
Truncate Sack Clover	*Trifolium depauperatum* var. *truncatum*
Twinberry	*Lonicera involucrata*
Two-horned Downingia	*Downingia bicornuta*
Valley Oak	*Quercus lobata*
Valley Saltbush	*Atriplex fruticulosa*
Vernal Buttercup	*Ranunculus bonariensis* var. *trisepalus*
Water Hyacinth	*Eichhornia crassipes*
Water Iris	*Iris pseudacorus*
Water Pygmyweed	*Crassula aquatica*
Water Smartweed	*Polygonum amphibium* var. *emersum*
Water-Starwort	*Callitriche* sp.
Waxy Manna-Grass	*Glyceria declinata*
Western Sycamore	*Platanus racemosa*
White Alder	*Alnus rhombifolia*
Whitestem Filaree	*Erodium moschatum*
White Sweetclover	*Melilotus alba*
Whitetip Clover	*Trifolium variegatum*
White Water-Buttercup	*Ranunculus aquatilus*
Whorled Marshpennywort	*Hydrocotyle verticillata*
Wild Radish	*Raphanus sativus*
Willow Species	*Salix* spp.
Willow-Herb Species	*Epilobium* sp.
Willowleaf Lettuce	*Lactuca saligna*
Woolly Rose-Mallow	*Hibiscus lasiocarpos* var. *occidentalis*

Table 2.1A-2. Wildlife Species Mentioned in the Text

Common Name	Scientific Name
Invertebrates	
Amphipods	*Amphipoda*
Aquatic Worms	*Annelida*
Backswimmers	*Notonectidae*
Beetles	*Coleoptera*
California Clam Shrimp	*Cyzicus californicus*
California Fairy Shrimp	*Linderiella occidentalis*
Copepods	*Copepoda*
Crawdads	*Decapoda*
Flatworms	*Microturbellaria*
Midges	*Chironomidae*
Mosquitoes	*Culicidae*
Predaceous Diving Beetles	*Dytiscidae*
Seed Shrimp	*Ostracoda*
Snails and slugs	*Gastropoda*
Spiders	*Araneae*
Vernal Pool Fairy Shrimp	*Branchinecta lynchii*
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*
Versatile Fairy Shrimp	*Branchinecta lindahli*
Water Boatmen	*Corixidae*
Water Fleas	*Cladocera*
Water Scavenger Beetles	*Hydrophilidae*
Fish	
Mosquitofish	*Gambusia affinis*
Amphibians and Reptiles	
Bullfrog	*Rana catesbeiana*
California Red-legged Frog	*Rana draytonii*
California Tiger Salamander	*Ambystoma californiense*
Common Garter Snake	*Thamnophis sirtalis*
Garter Snakes	*Thamnophis* sp.
Giant Garter Snake	*Thamnophis gigas*
Gopher Snake	*Pituophis catenifer*
Pacific Chorus Frog	*Pseudacris regilla*
Western Yellow-bellied Racer	*Coluber constrictor mormon*
Red-eared Slider	*Trachemys scripta elegans*
Western Fence Lizard	*Sceloporus occidentalis*
Western Pond Turtle	*Actinemys marmorata*
Western Toad	*Anaxyrus boreas*
Birds	
Bank Swallow	*Riparia riparia*
Black Rail	*Laterallus jamaicensis*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Burrowing Owl	*Athene cunicularia*
Cooper's Hawk	*Accipiter cooperii*
Double-crested Cormorant	*Phalacrocorax auritus*

Table 2.1A-2. Wildlife Species Mentioned in the Text

Common Name	Scientific Name
Egrets	*Egretta* spp.
Grasshopper Sparrow	*Ammodramus savannarum*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Greater Sandhill Crane	*Grus canadensis tabida*
Herons	*Ardea* spp.
Least Bittern	*Ixobrychus exilis*
Lesser Sandhill Crane	*Grus canadensis canadensis*
Loggerhead Shrike	*Lanius ludovicianus*
Northern Harrier	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Redhead	*Aythya americana*
Sandhill Crane	*Grus canadensis*
Short-eared Owl	*Asio flammeus*
Snowy Egret	*Egretta thula*
Song Sparrow (Modesto Race)	*Melospiza melodia*
Swainson's Hawk	*Buteo swainsoni*
Tricolored Blackbird	*Agelaius tricolor*
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*
White-faced Ibis	*Plegadis chihi*
White-tailed Kite	*Elanus leucurus*
Yellow-breasted Chat	*Icteria virens*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Mammals	
Botta's Pocket Gopher	*Thomomys bottae*
Brush Rabbit	*Sylvilagus bachmani riparius*
California Ground Squirrel	*Spermophilus beecheyi*
Pallid Bat	*Antrozous pallidus*
Raccoon	*Procyon lotor*
Red Bat	*Lasiurus blossevilli*
Riparian Brush Rabbit	*Sylvilagus bachmani riparius*
Riparian Woodrat	*Neotoma fuscipes riparia*
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Western Mastiff Bat	*Eumops perotis californicus*
Western Red Bat	*Lasiurus blossevilli*
Source: Compiled by AECOM in 2010	

APPENDIX 2.1B

Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Mammals								
Pallid Bat	*Antrozous pallidus*	– / SSC		Yes		Yes	Note Required Habitat	
Townsend's Big-eared Bat	*Corynorhinus townsendii*	– / SSC		Yes		Yes	Note Required Habitat	
Berkeley Kangaroo Rat	*Dipodomys heermanni berkeleyensis*	– / –	CNDDB–G3G4T1 S1	No	No State or Federal Status	No		
Western Mastiff Bat	*Eumops perotis californicus*	– / SSC		Yes		Yes	Note Required Habitat	
Silver-haired Bat	*Lasionycteris noctivagans*	– / –	CNDDB–G5 S3S4	No	No State or Federal Status	No		
Western Red Bat	*Lasiurus blossevillii*	– / SSC		Yes		Yes	Note Required Habitat	
Hoary Bat	*Lasiurus cinereus*	– / –	CNDDB–G5 S4?	No	No State or Federal Status	No		
Riparian Woodrat	*Neotoma fuscipes riparia*	FE / –		Yes		Yes	Habitat Evaluation, Trapping	
San Joaquin Pocket Mouse	*Perognathus inornatus inornatus*	– / –	G4T2T3 S2S3	Yes		No		Unlikely to Affect – Project will Impact Very Little Potential Habitat
Salt-marsh Harvest Mouse	*Reithrodontomys raviventris*	FE / SE		Yes		No		Does Not Occur in Conveyance Planning Area
Suisun Shrew	*Sorex ornatus sinuosus*	– / SSC		Yes		No		Does Not Occur in Conveyance Planning Area
Riparian Brush Rabbit	*Sylvilagus bachmani riparius*	FE / SE		Yes		Yes	Habitat Evaluation, Trapping	
American Badger	*Taxidea taxus*	– / SSC		Yes		No		Unlikely to Affect – Project will Impact Very Little Potential Habitat; Unlikely to Occur in Project Footprint
San Joaquin Kit Fox	*Vulpes macrotis mutica*	FE / ST		Yes		No		Unlikely to Affect – Project will Impact Very Little Potential Habitat; Unlikely to Occur in Project Footprint
Ringtail	*Bassariscus astutus*	FP		Yes		No		Unlikely to Affect – Project Area Generally Lacks the Extensive Riparian and Oak Woodlands Required by this Species; Therefore the Species is Unlikely to Occur
Birds								
Cooper's Hawk	*Accipiter cooperii*	– / WL–Nesting		Yes		Yes	Note Nest Sites	
Tricolored Blackbird	*Agelaius tricolor*	BCC / SSC–Nesting		Yes		Yes	Note Nest Sites	
Grasshopper Sparrow	*Ammodramus savannarum*	– / SSC–Nesting		Yes		Yes	Note Nest Sites	
Tule Greater White-fronted Goose	*Anser albifrons elgasi*	– / SSC – Wintering		Yes		No		Unlikely to Affect – Project Activities are Unlikely to Impact its Wintering Habitat (West Edge of Conveyance Planning Area)
Golden Eagle	*Aquila chrysaetos*	BCC / FP		Yes		No		Unlikely to Affect – Does Not Nest in the Conveyance Planning Area
Great Egret	*Ardea alba*	– / DFG–Rookeries		Yes		Yes	Note Rookeries	
Great Blue Heron	*Ardea herodias*	– / DFG–Rookeries		Yes		Yes	Note Rookeries	
Short-eared Owl	*Asio flammeus*	– / SSC–Nesting		Yes		Yes	Note Nest Sites	

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Long-eared Owl	*Asio otus*	– / SSC–Nesting	BDCP List	No	Does Not Nest in Conveyance Planning Area	No		
Burrowing Owl	*Athene cunicularia*	BCC / SSC–Nesting		Yes		Yes	Note Used Burrows	
Redhead	*Aythya americana*	– / SSC–Nesting		Yes		No		Unlikely to Affect – Project Activities are Unlikely to Impact its Wintering Habitat (Deep Water Marshes)
Cackling (Aleutian Canada) Goose	*Branta hutchinsii leucopareia*	– / –		No	Delisted March 2001	No		
Ferruginous Hawk	*Buteo regalis*	BCC / WL		Yes		No		Unlikely to Affect – Winters in Foothill Grassland, Unlikely to Affect a Significant Amount of Available Habitat
Swainson's Hawk	*Buteo swainsoni*	BCC / ST		Yes		Yes	Note Nest Sites	
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT / SSC		Yes		No		Unlikely to Affect – Does Not Nest in Conveyance Planning Area
Mountain Plover	*Charadrius montanus*	BCC / SSC–Wintering		Yes		No		Unlikely to Affect – Does Not Nest in Conveyance Planning Area, Rarely Uses Delta in Winter
Black Tern	*Chlidonias niger*	– / SSC	BDCP List	No	Does Not Nest in the Conveyance Planning Area	No		
Northern Harrier	*Circus cyaneus*	– / SSC–Nesting		Yes		Yes	Note Nest Sites	
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	FC, BCC / SE		No	Does Not Nest in Conveyance Planning Area	No		Extirpated from the Delta
Yellow Warbler	*Dendroica petechia brewsteri*	BCC / SSC–Nesting	BDCP List	No	Does Not Nest in the Conveyance Planning Area	No		
Snowy Egret	*Egretta thula*	– / DFG–Rookeries		Yes		Yes	Note Rookeries	
White-tailed Kite	*Elanus leucurus*	– / FP		Yes		Yes	Note Nests – Roosts	
California Horned Lark	*Eremophila alpestris actia*	– / WL		Yes		No		Unlikely to Affect – Grazed Annual Grassland Species, Project is Unlikely to Impact a Significant Amount of Habitat
Merlin	*Falco columbarius*	– / WL–Wintering		Yes		No		Unlikely to Affect – Will Benefit from Increased Open Water Habitat
Prairie Falcon	*Falco mexicanus*	– / WL–Nesting		Yes		No		Unlikely to Affect – Does Not Nest in Conveyance Planning Area
American Peregrine Falcon	*Falco peregrinus anatum*	BCC / SE, FP		Yes		No		Unlikely to Affect – Does Not Nest in Conveyance Planning Area, will Benefit from Increased Open Water Habitat
Saltmarsh Common Yellowthroat	*Geothlypis trichas sinuosa*	BCC / SSC		No	Does Not Nest in Conveyance Planning Area	No		Unlikely to Affect – Not in Conveyance Planning Area – this Subspecies Only Occurs West of Suisun Bay
Lesser Sandhill Crane	*Grus canadensis canadensis*	– / SSC–Wintering		Yes		Yes	Note Foraging and Roosting Areas Outside Known Occurrence	
Greater Sandhill Crane	*Grus canadensis tabida*	– / ST, FP		Yes		Yes	Note Foraging and Roosting Areas Outside Known Occurrence	
Bald Eagle	*Haliaeetus leucocephalus*	– / SE, FP		Yes		No		Unlikely to Affect – Does Not Nest in Conveyance Planning Area, will Benefit from Increased Open Water Habitat

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Yellow-breasted Chat	*Icteria virens*	– / SSC		Yes		Yes	Note Nest Sites	
Least Bittern	*Ixobrychus exilis*	– / SSC–Nesting		Yes		Yes	Note Nesting	
Loggerhead Shrike	*Lanius ludovicianus*	BCC / SSC–Nesting		Yes		Yes	Note Nest Sites	
California Gull	*Larus californicus*	– / WL–Nesting Colony		No	Does not nest in the Conveyance Planning Area	No		
California Black Rail	*Laterallus jamaicensis coturniculus*	BCC / ST, FP		Yes		Yes	Nest Survey	
Lewis's Woodpecker	*Melanerpes lewis*	BCC / –	BDCP List	No	No State or Fed Status; Does Not Nest in Conveyance Planning Area	No		
Song Sparrow "Modesto" Population	*Melospiza melodia*	– / SSC		Yes		Yes	Note Nest Sites	
Suisun Song Sparrow	*Melospiza melodia maxillaris*	BCC / SSC		Yes		No		Unlikely to Affect – Very Limited Distribution in Conveyance Planning Area, and Proposed Conveyance Facility Would Tunnel Under Known Breeding Areas
Long-billed Curlew	*Numenius americanus*	BCC / WL–Nesting	BDCP List	No	Does Not Nest in Conveyance Planning Area	No		
Black-crowned Night Heron	*Nycticorax nycticorax*	– / DFG–Rookeries		Yes		Yes	Note Rookeries	
Osprey	*Pandion haliaetus*	– / WL		Yes		Yes	Note Nest Sites	
Double-crested Cormorant	*Phalacrocorax auritus*	– / WL–Rookeries		Yes		Yes	Note Rookeries	
White-faced Ibis	*Plegadis chihi*	– / WL–Rookeries		Yes		Yes	Note Nesting	
Purple Martin	*Progne subis*	– / SSC–Nesting		Yes		No		Unlikely to Affect – Limited Breeder in the Conveyance Planning Area, Project Unlikely to Impact Nesting Structures
California Clapper Rail	*Rallus longirostris obsoletus*	FE/SE, FP		Yes		No		Unlikely to Affect – Does Not Occur in Conveyance Planning Area
Bank Swallow	*Riparia riparia*	– / ST		Yes		Yes	Nest/Habitat Survey	
California Least Tern	*Sternula antillarum browni*	FE / SE		No	Very Limited Nesting in Conveyance Planning Area	No		
Least Bell's Vireo	*Vireo belli pusillus*	FE / SE	BDCP list	No	Does Not Nest in Conveyance Planning Area	No		
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	– / SSC–Nesting		Yes		Yes	Note Nest Sites	
Reptiles								
Western Pond Turtle	*Actinemys marmorata*	– / SSC		Yes		No	Incidental Observations Only	SSC Only – Found Throughout the Review Area – Observations of Numbers and Sizes Should be Noted to Determine Relative Use of the Sites by the Species
Silvery Legless Lizard	*Anniella pulchra pulchra*	– / SSC		Yes		No?	Opportunistically When in Suitable Habitat – Lifting Cover, Sifting Through Leaf Litter or Sand	SSC Only – Review Area on Fringe of Range – Maybe We Should do some Focused Surveys in Suitable Habitat
San Joaquin Whipsnake	*Masticophis flagellum ruddocki*	– / SSC		Yes?		No?		SSC Only – Review Area on Fringe of Range – Maybe We Should do some Focused Surveys in Suitable Habitat

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Alameda Whipsnake (=Striped Racer)	*Masticophis lateralis euryxanthus*	FT / ST		No	Not Likely to Occur in Conveyance Planning Area	No		
California Horned Lizard	*Phrynosoma corantum frontale*	– / SSC		Yes		No?	Incidental Observations Only	SSC Only – Review Area on Fringe of Range – Maybe We Should do some Focused Surveys in Suitable Habitat
Giant Garter Snake	*Thamnophis gigas*	FT / ST		Yes		Yes	Following Approved Methodology – Probably Visual Encounter & Trapping	
Amphibians								
California Tiger Salamander	*Ambystoma californiense*	FT / SSC		Yes		Yes	Following Approved Methodology – Probably Egg and Larval Surveys	
Foothill Yellow-legged Frog	*Rana boylii*	– / SSC		No	Not Likely to Occur in Conveyance Planning Area	No		
California Red-legged Frog	*Rana draytonii*	FT / SSC		Yes		Yes	Following Approved Methodology – Probably Egg and Larval Surveys	
Western Spadefoot	*Spea hammondii*	– / SSC		Yes		No	Incidental Observations Only – While Conducting Vernal Pool Invert Surveys	SSC Only – Incidental During Other Surveys Should Suffice Since Breeding Habitat is Similar
Fish								
Green Sturgeon (Southern DPS)	*Acipenser medirostris*	FT / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Sacramento Perch	*Archoplites interruptus*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Delta Smelt	*Hypomesus transpacifucus*	FT, X / ST		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Central Valley Steelhead	*Oncorhynchus mykiss*	FT, X / –		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Central Valley Spring-run Chinook Salmon	*Oncorhynchus tshawytscha*	FT, X / ST		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Sacramento River Winter-run Chinook Salmon	*Oncorhynchus tshawytscha*	FE, X / SE		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Sacramento Splittail	*Pogonichthys macrolepidotus*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Central Valley Fall-/late Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*	NSC / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Hardhead	*Mylopharadon conocephalus*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
California Roach (Sacramento-San Joaquin Subspecies)	*Lavinia symmetricus* ssp. *symmetricus*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
White Sturgeon	*Acipenser transmontanus*	– / –		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
River Lamprey	*Lampetra ayresii*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Pacific Smelt	*Thaleichthys pacificus*	– / C		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Longfin Smelt	*Spirinchus thaleichthys*	– / SSC		Yes		No		Separate EIR/EIS Fish and Aquatic Resources Specific Process
Invertebrates								
Blennosperma Vernal Pool Andrenid Bee	*Andrena blennospermatis*	– / –	CNDDB–G2S2	Yes		No		No State or Federal Status
Antioch Dunes Anthicid Beetle	*Anthicus antiochensis*	– / –	CNDDB–G1S1	Yes		No		No State or Federal Status
Sacramento Anthicid Beetle	*Anthicus sacramento*	– / –	CNDDB–G1S1	Yes		No		No State or Federal Status
Lange's Metalmark Butterfly	*Apodemia mormo langei*	FE / –		No	Not Likely to Occur in Conveyance Planning Area	No	Known From Antioch Dunes Only	Not in Project Area
Conservancy Fairy Shrimp	*Branchinecta conservatio*	FE / –		Yes		Yes	Habitat Mapping and VP Crustaceans Protocol Survey	
Longhorn Fairy Shrimp	*Branchinecta longiantenna*	FE, X / –		Yes		Yes	Habitat Mapping and VP Crustaceans Protocol Survey	
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	FT, X / –		Yes		Yes	Habitat Mapping and VP Crustaceans Protocol Survey	
Midvalley Fairy Shrimp	*Branchinecta mesovallensis*	– / –	CNDDB–G2S2	Yes		No	None	No State or Federal Status
San Bruno Elfin Butterfly	*Callophrys mossii bayensis*	FE / –		No	Not Likely to Occur in Conveyance Planning Area	No	None	Not in BDCP Program Area
Sacramento Valley Tiger Beetle	*Cicindela hirticollis abrupta*	– / –	CNDDB–G5TH SH	Yes		No	None	No State or Federal Status
San Joaquin Dune Beetle	*Coelus gracilis*	– / –	CNDDB-G1S1	Yes		No	None	No State or Federal Status
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	FT, X / –		Yes		Yes	Map Shrubs, Stem Counts and Document Exit Holes	
Antioch Efferian Robberfly	*Efferia antiochi*	– / –	CNDDB-G1G3 S1S3	Yes		No		No State or Federal Status
Delta Green Ground Beetle	*Elaphrus viridis*	FT, X / –		No	Not Likely to Occur in Conveyance Planning Area	No		Known from Jepson Prairie Only
Redheaded Sphecid Wasp	*Eucerceris ruficeps*	– / –	CNDDB-G1G3 S1S2	Yes		No		No State or Federal Status
Bridges' Coast Range Shoulderband	*Helminthoglypta nickliniana bridgesi*	– / –	CNDDB-G2T1 S1	Yes		No		No State or Federal Status
Ricksecker's Water Scavenger Beetle	*Hydrochara ricksecker*i	– / –	CNDDB-G1G2 S1S2	Yes		No		No State or Federal Status
Curved-foot Hygrotus Diving Beetle	*Hygrotus curvipes*	– / –	CNDDB-G1S1	Yes		No		No State or Federal Status

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Middlekauff's Shieldback Katydid	*Idiostatus middlekauffi*	– / –	CNDDB-G1G2 S1	Yes		No		No State or Federal Status
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	FE, X / –		Yes		Yes	Habitat Mapping and VP Crustaceans Protocol Survey	
California Linderiella	*Linderiella occidentalis*	– / –	CNDDB-G3 S2S3	Yes		No		No State or Federal Status
Molestan Blister Beetle	*Lytta molesta*	– / –	CNDDB-G2 S2	Yes		No		No State or Federal Status
Hurd's Metapogon Robberfly	*Metapogon hurdi*	– / –	CNDDB-G1G3 S1S3	Yes		No		No State or Federal Status
Antioch Multilid Wasp	*Myrmosula pacifica*	– / –	CNDDB-GH SH	Yes		No		No State or Federal Status
Antioch Adrenid Bee	*Perdita scitula antiochensis*	– / –	CNDDB-G1T1 S1	Yes		No		No State or Federal Status
Antioch Specid Wasp	*Philanthus nasalis*	– / –	CNDDB-G1 S1	Yes		No		No State or Federal Status
Plants								
Santa Clara Thorn-mint	*Acanthomintha lanceolata*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Purdy's Onion	*Allium fimbriatum* var. *purdyi*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Large-flowered Fiddleneck	*Amsinckia grandiflora*	FE / SE / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Bent Flowered Fiddleneck	*Amsinckia lunaris*	– / – / 1B		Yes		Yes	Visual Surveys	
California Androsace	*Androsace elongata* ssp. *acuta*	– / – / 4		Yes		No		No Appropriate Forest Habitat in the Conveyance Planning Area
Slender Silver Moss	*Anomobryum julaceum*	– / – / 2		No	Not Likely to Occur in Conveyance Planning Area	No		
Twig-like Snapdragon	*Antirrhinum virga*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Coast Rock Cress	*Arabis blepharophylla*	– / – / 4		Yes		No		No Suitable Habitat Within Conveyance Planning Area (Coastal)
Modest Rock Cress	*Arabis modesta*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Mt. Diablo Manzanita	*Arctostaphylos auriculata*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Contra Costa Manzanita	*Arctostaphylos manzanita* ssp. *laevigata*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Serpentine Milkweed	*Asclepias solanoana*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Carlotta Hall's Lace Fern	*Aspidotis carlotta-halliae*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Brewer's Milk-vetch	*Astragalus breweri*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Cleveland's Milk-vetch	*Astragalus clevelandii*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Ocean Bluff Milk-vetch	*Astragalus nuttallii* var. *nuttallii*	– / – / 4		Yes		No		No Suitable Habitat Within Conveyance Planning Area (Coastal)
Jepson's Milk-vetch	*Astragalus rattanii* var. *jepsonianus*	– / – / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Ferris' Milk-vetch	*Astragalus tener var. ferrisiae*	– / – / 1B		Yes		Yes	Visual Surveys	
Alkali Milk-vetch	*Astragalus tener var. tener*	– / – / 1B		Yes		Yes	Visual Surveys	

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Heartscale	*Atriplex cordulata*	– / – / 1B		Yes		Yes	Visual Surveys	
Crownscale	*Atriplex coronata* var. *coronata*	– / – / 4		Yes		Yes	Visual Surveys	
Lost Hills Crownscale	*Atriplex coronata* var. *vallicola*	– / – / 1B		Yes		Yes	Visual Surveys	
Brittlescale	*Atriplex depressa*	– / – / 1B		Yes		Yes	Visual Surveys	
San Joaquin Spearscale	*Atriplex joaquiniana*	– / – / 1B		Yes		Yes	Visual Surveys	
Lesser Saltscale	*Atriplex miniscula*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Vernal Pool Smallscale	*Atriplex persistens*	– / – / 1B		Yes		Yes	Visual Surveys	
Big-scale Balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*	– / – / 1B		Yes		Yes	Visual Surveys	
Big Tarplant	*Blepharizonia plumosa*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No	Visual Surveys	
Brewer's Calandrinia	*Calandrinia breweri*	– / – / 4		Yes		Yes	Visual Surveys	
Mt. Diablo Fairy-lantern	*Calochortus pulchellus*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Oakland Star-tulip	*Calochortus umbellatus*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Butte County Morning-glory	*Calystegia atriplicifolia* ssp. *buttensis*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Chaparral Harebell	*Campanula exigua*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Bristly Sedge	*Carex comosa*	– / – / 2		Yes		Yes	Visual Surveys	
Fox Sedge	*Carex vulpinoidea*	– / – / 2		Yes		Yes	Visual Surveys	
Succulent Owl's Clover	*Castilleja campestris* ssp. *succulenta*	FT / SE / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Lemmon's Jewelflower	*Caulanthus coulteri* var. *lemmonii*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Congdon's Tarplant	*Centromadia (=Hemizonia) parryi* ssp. *congdonii*	– / – / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Pappose Tarplant	*Centromadia parryi ssp. parryi*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Parry's Red Tarplant	*Centromadia parryi* ssp. *rudis*	– / – / 4		Yes		Yes	Visual Surveys	
Slough Thistle	*Cirsium crassicaule*	– / – / 1B		Yes		Yes	Visual Surveys	
Brewer's Clarkia	*Clarkia breweri*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Santa Clara Red Ribbons	*Clarkia concinna* ssp. *automixa*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Serpentine Collomia	*Collomia diversifolia*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Small-flowered Morning-glory	*Convolvulus simulans*	– / – / 4		Yes		Yes	Visual Surveys	
Hispid Bird's-beak	*Cordylanthus mollis* ssp. *hispidus*	– / – / 1B		Yes		Yes	Visual Surveys	
Soft Bird's-beak	*Cordylanthus mollis* ssp. *mollis*	FE / SR / 1B		Yes		Yes	Visual Surveys	
Mt. Diablo Bird's-beak	*Cordylanthus nidularius*	– / SR / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Palmate-bracted Bird's-beak	*Cordylanthus palmatus*	FE / SE / 1B		Yes		Yes	Visual Surveys	
Hoover's Cryptantha	*Cryptantha hooveri*	– / – / 1A		Yes		Yes	Visual Surveys	
Livermore Tarplant	*Deinandra bacigalupi*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Hospital Canyon Larkspur	*Delphinium californica* ssp. *interius*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Gypsum-loving Larkspur	*Delphinium gypsophilum* ssp. *gypsophilum*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Recurved Larkspur	*Delphinium recurvatum*	– / – / 1B		Yes		Yes	Visual Surveys	
Norris' Beard Moss	*Didymodon norrisii*	– / – / 2		No	Not Likely to Occur in Conveyance Planning Area	No		
Dwarf Downingia	*Downingia pusilla*	– / – / 2		Yes		Yes	Visual Surveys	
Small Spikerush	*Eleocharis parvula*	– / – / 4		Yes		Yes	Visual Surveys	
Brandegee's Eriastrum	*Eriastrum brandegeeae*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Mt. Diablo Buckwheat	*Eriogonum truncatum*	– / – / 1B		Yes		No		Not Reported from Below 30 meters in Elevation
Bay Buckwheat	*Eriogonum umbellatum* var. *bahiiforme*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Jepson's Woolly Sunflower	*Eriophyllum jepsonii*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Round-leafed Filaree	*Erodium macrophyllum*	– / – / 2		Yes		Yes	Visual Surveys	
Delta Button-celery	*Eryngium racemosum*	– / SE / 1B		Yes		Yes	Visual Surveys	
Contra Costa Wallflower	*Erysimum capitatum* ssp. *angustatum* [c]	FE / SE / 1B		Yes		Yes	Visual Surveys	
Diamond-petaled California Poppy	*Eschscholzia rhombipetala*	– / – / 1B		Yes		Yes	Visual Surveys	
Stinkbells	*Fritillaria agrestis*	– / – / 4		Yes		Yes	Visual Surveys	
Fragrant Fritillary	*Fritillaria liliacea*	– / – / 1B		Yes		Yes	Visual Surveys	
Adobe-lily	*Fritillaria pluriflora*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Purdy's Fritillary	*Fritillaria purdyi*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Phlox-leaf Serpentine Bedstraw	*Galium andrewsii* ssp. *gatense*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Boggs Lake Hedge-hyssop	*Gratiola heterosepala*	– / SE / 1B		Yes		Yes	Visual Surveys	
Nodding Harmonia	*Harmonia nutans*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Diablo Helianthella	*Helianthella castanea*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Hogwallow Starfish	*Hesperevax caulescens*	– / – / 4		Yes		Yes	Visual Surveys	
Brewer's Western Flax	*Hesperolinon breweri*	– / – / 1B		Yes		Yes	Visual Surveys	
Rose-mallow	*Hibiscus lasiocarpus*	– / – / 2		Yes		Yes	Visual Surveys	
Santa Cruz Tarplant	*Holocarpha macradenia*	FE / ST / 1B		Yes		Yes	Visual Surveys	
Coast Iris	*Iris longipetala*	– / – / 4		Yes		Yes	Visual Surveys	
Carquinez Goldenbush	*Isocoma arguta*	– / – / 1B		Yes		Yes	Visual Surveys	
Northern California (Hinds) Black Walnut	*Juglans californica* var. *hindsii (Juglans hindsii)*	– / – / 1B		No	No Native Populations in Conveyance Planning Area	Yes	Visual Surveys	
Ahart's Dwarf Rush	*Juncus leiospermus* var. *ahartii*	– / – / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Contra Costa Goldfields	*Lasthenia conjugens* [c]	FE / – / 1B		Yes		Yes	Visual Surveys	
Ferris' Goldfields	*Lasthenia ferrisiae*	– / – / 4		Yes		Yes	Visual Surveys	
Delta Tule Pea	*Lathyrus jepsonii* var. *jepsonii*	– / – / 1B		Yes		Yes	Visual Surveys	
Legenere	*Legenere limosa*	– / – / 1B		Yes		Yes	Visual Surveys	

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Heckard's Peppergrass	*Lepidium latipes* var. *heckardii*	– / – / 1B		Yes		Yes	Visual Surveys	
Bristly Leptosiphon	*Leptosiphon acicularis*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Serpentine Leptosiphon	*Leptosiphon ambiguus*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Large-flowered Leptosiphon	*Leptosiphon grandiflorus*	– / – / 4		Yes		No		No Suitable Habitat Within Conveyance Planning Area (Coastal)
Spring Lessingia	*Lessingia tenuis*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Mason's Lilaeopsis	*Lilaeopsis masonii*	– / SR / 1B		Yes		Yes	Visual Surveys	
Delta Mudwort	*Limosella subulata*	– / – / 2		Yes		Yes	Visual Surveys	
Hoover's Lomatium	*Lomatium hooveri*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Napa Lomatium	*Lomatium repostum*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Showy Madia	*Madia radiata*	– / – / 1B		Yes		Yes	Visual Surveys	
Hall's Bush-mallow	*Malacothamnus hallii*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Heller's Bush-mallow	*Malacothamnus helleri*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Sylvan Microseris	*Microseris sylvatica*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Sierra Monardella	*Monardella candicans*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Green Monardella	*Monardella viridis* ssp. *viridis*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Little Mousetail	*Myosurus minimus* ssp. *apus*	– / – / 3		Yes		Yes	Visual Surveys	
Cotula Navarretia	*Navarretia cotulifolia*	– / – / 4		Yes		Yes	Visual Surveys	
Hoary Navarretia	*Navarretia eriocephala*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Jepson's Navarretia	*Navarretia jepsonii*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Baker's Navarretia	*Navarretia leucocephala* ssp. *bakeri*	– / – / 1B		Yes		Yes	Visual Surveys	
Pincushion Navarretia	*Navarretia myersii* ssp. *myersii*	– / – / 1B		Yes		Yes	Visual Surveys	
Adobe Navarretia	*Navarretia nigelliformis* ssp. *nigelliformis*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Adobe Navarretia	*Navarretia nigelliformis* ssp. *nigelliformis*	– / – / 4		Yes		No		Not Reported from Below 30 meters in Elevation
Prostrate Vernal Pool Navarretia	*Navarretia prostrata*	– / – / 1B		Yes		Yes	Visual Surveys	
Colusa Grass	*Neostapfia colusana* [c]	FT / SE / 1B		Yes		Yes	Visual Surveys	
Antioch Dunes Evening Primrose	*Oenothera deltoides* ssp. *howellii* [c]	FE / SE / 1B		Yes		Yes	Visual Surveys	
San Joaquin Valley Orcutt Grass	*Orcuttia inaequalis*	FT / SE / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Hairy Orcutt Grass	*Orcuttia pilosa*	FE / SE / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Slender Orcutt Grass	*Orcuttia tenuis*	FT / SE / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Sacramento Orcutt Grass	*Orcuttia viscida*	FE / SE / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Gairdner's Yampah	*Perideridia gairdneri* ssp. *gairdneri*	– / – / 4		Yes		Yes	Visual Surveys	
Mt. Diablo Phacelia	*Phacelia phacelioides*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Michael's Rein Orchid	*Piperia michaelii*	– / – / 4		Yes		No		No Suitable Habitat Within Conveyance Planning Area (Coastal)

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning
Hairless Popcorn-flower	*Plagiobothrys glaber*	– / – / 1A		No	Not Likely to Occur in Conveyance Planning Area	No		
Bearded Popcorn-flower	*Plagiobothrys hystriculus*	– / – / 1B		Yes		Yes	Visual Surveys	
Eel-grass Pondweed	*Potamogeton zosteriformis*	– / – / 2		Yes		Yes	Visual Surveys	
Delta Woolly-marbles	*Psilocarphus brevissimus* var. *multiflorus*	– / – / 4		Yes		Yes	Visual Surveys	
Lobb's Aquatic Buttercup	*Ranunculus lobbii*	– / – / 4		Yes		Yes	Visual Surveys	
Victor's Gooseberry	*Ribes victoris*	– / – / 4		Yes		No		Not Reported from Below 30 Meters in Elevation
Sanford's Arrowhead	*Sagittaria sanfordi*	– / – / 1B		Yes		Yes	Visual Surveys	
Rock Sanicle	*Sanicula saxatilis*	– / SR / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Marsh Skullcap	*Scutellaria galericulata*	– / – / 2		Yes		Yes	Visual Surveys	
Side-flowering Skullcap	*Scutellaria lateriflora*	– / – / 2		Yes		Yes	Visual Surveys	
Rayless Ragwort	*Senicio aphanactis*	– / – / 2		No	Not Likely to Occur in Conveyance Planning Area	No		
Most Beautiful Jewel-flower	*Streptanthus albidus* ssp. *peramoenus*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Mt. Diablo Jewel-flower	*Streptanthus hispidus*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Suisun Marsh Aster	*Symphytotrichum lentum* (*Aster lentus*)	– / – / 1B		Yes		Yes	Visual Surveys	
Wright's Trichocoronis	*Trichocoronis wrightii*	– / – / 2		Yes		Yes	Visual Surveys	
Showy Indian Clover	*Trifolium amoenum*	FE / – / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Saline Clover	*Trifolium depauperatum* var. *hydrophilum*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Coastal Triquitrella	*Triquetrella californica*	– / – / 1B		No	Not Likely to Occur in Conveyance Planning Area	No		
Dark-mouthed Triteleia	*Triteleia lugens*	– / – / 4		Yes		No		Not Reported from Below 30 Meters in Elevation
Caper-fruited Tropidocarpum	*Tropidocarpum capparideum*	– / – / 1B		Yes		Yes	Visual Surveys	
Greene's Tuctoria	*Tuctoria greenei*	FE / SR / 1B	BDCP List	No	Not Likely to Occur in Conveyance Planning Area	No		
Solano Grass	*Tuctoria mucronata*[c]	FE / SE / 1B		Yes		Yes	Visual Surveys	
Oval-leaved Viburnum	*Viburnum ellipticum*	– / – / 2		No	Not Likely to Occur in Conveyance Planning Area	No		

Table 2.1B-1. Special-Status Plant and Wildlife Species Potentially Affected by the Proposed Project/Action and Alternatives

Common Name	Scientific Name	Legal Status [a] Federal/State/ CNPS	Other Status [b]	Detailed Evaluation in EIR/EIS?	EIR/EIS Evaluation Reason	Survey Required	Type of Survey(s)	Survey Reasoning

[a] *Legal Status:*

Federal

- *FE = listed as endangered under the Federal Endangered Species Act (ESA).*
- *FT = listed as threatened under the ESA.*
- *FC = candidate for listing as threatened or endangered under the ESA.*
- *X = critical habitat.*
- *BCC = U.S. Fish and Wildlife Service bird of conservation concern.*
- *NSC = National Marine Fisheries Service species of concern.*
- *– = no status.*

State

- *SE = listed as endangered under the California Endangered Species Act (CESA).*
- *ST = listed as threatened under CESA.*
- *SR = listed as rare under CESA (plants).*
- *FP = fully protected under the California Fish and Game Code.*
- *C = candidate for listing under CESA.*
- *SSC = California species of special concern.*
- *WL = California Department of Fish and Game watch list.*
- *DFG = rookeries protected under the California Fish and Game Code.*
- *– = no status.*

California Native Plant Society (CNPS)

- *1A = presumed extinct in California.*
- *1B = rare or endangered in California and elsewhere.*
- *2 = rare and endangered in California, more common elsewhere.*
- *3 = plants about which more information is needed.*
- *4 = plants of limited distribution.*
- *– = no status.*

[b]. *Other Status:*

CNDDB Conservation Status Ranks (shown only for species without legal status)

Global Rank:

- *GH = Possibly Extinct (species)— Missing; known from only historical occurrences but still some hope of rediscovery.*
- *G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.*
- *G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.*
- *G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.*
- *G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.*
- *G5 = Secure—Common; widespread and abundant.*
- *G#G# = Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.*
- *TH = Possibly Extinct (intraspecific taxon)— Missing; known from only historical occurrences but still some hope of rediscovery.*
- *T# = Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.*

State Rank:

- *SH = Possibly Extirpated (Historical)—Species or community occurred historically in the state, and there is some possibility that it may be rediscovered.*
- *S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.*
- *S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.*
- *S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.*
- *S4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.*
- *? = Inexact or Uncertain—Denotes inexact or uncertain numeric rank. (The ? qualifies the character immediately preceding it in the S-rank).*

BDCP List Species considered for inclusion in the BDCP, or recommended for inclusion by the Independent Science Advisors, that did not meet other selection criteria.

[c] *Critical habitat for this species is present in the Conveyance Planning Area.*

Source: Compiled by DHCCP in 2008

APPENDIX 2.2A

2009 DHCCP Surveys for Special-Status Plants:
Plant Species List

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Abutilon theophrasti	Velvetleaf	Malvaceae
Acacia sp.	Wattle	Fabaceae
Acer negundo var. *californicus*	Box Elder	Aceraceae
Achillea millefolium var. *millefolium*	White Yarrow	Asteraceae
Achyrachaena mollis	Blow Wives	Asteraceae
Aegilops triuncialis	Barbed Goatgrass	Poaceae
Aesculus californica	California Buckeye	Hippocastanaceae
Agoseris heterophylla	Annual Mountain Dandelion	Asteraceae
Agrostis exarata	Spike Bent Grass	Poaceae
Agrostis sp.	Bentgrass	Poaceae
Ailanthus altissima	Tree of Heaven	Simaroubaceae
Aira caryophyllea	Silver Hairgrass	Poaceae
Albizia julibrissin	Silk Tree	Fabaceae
Alisma plantago-aquatica	Common Water Plantain	Alismataceae
Allenrolfea occidentalis	Iodine Bush	Chenopodiaceae
Allium sp.	Onion	Alliaceae
Alnus rhombifolia	White Alder	Betulaceae
Alopecurus aequalis	Short-awn Foxtail	Poaceae
Alopecurus saccatus	Pacific Foxtail	Poaceae
Amaranthus albus	Pigweed Amaranth	Amaranthaceae
Amaranthus blitoides [A. graecizans]	Prostrate Amaranth	Amaranthaceae
Amaranthus retroflexus	Red-root Amaranthus	Amaranthaceae
Ambrosia psilostachya	Western Ragweed	Asteraceae
Amorpha fruticosa	False Indigo	Fabaceae
Amsinckia menziesii var. *intermedia*	Rancher's Fire	Boraginaceae
Amsinckia menziesii var. *menziesii*	Common Fiddleneck	Boraginaceae
Anagallis arvensis	Scarlet Pimpernel	Primulaceae
Anemopsis californica	Yerba Mansa	Saururaceae
Anthemis cotula	Mayweed	Asteraceae
Anthriscus caucalis	Bur-chervil	Apiaceae
Apium graveolens	Celery	Apiaceae
Apocynum cannabinum	Indian Hemp	Apocynaceae
Arbutus unedo	Strawberry Arbutus	Ericaceae
Artemisia douglasiana	Mugwort	Asteraceae
Arundo donax	Giant Reed	Poaceae
Asclepias eriocarpa	Indian Milkweed	Asclepiadaceae
Asclepias fascicularis	Narrow-leaved Milkweed	Asclepiadaceae
Asclepias speciosa	Showy Milkweed	Asclepiadaceae
Asparagus officinalis	Asparagus	Liliaceae
Aster chilensis	California Aster	Asteraceae
Astragalus tener var. *tener*	Alkali Milk Vetch	Fabaceae
Atherium felix-femina	Lady Fern	Dryopteridaceae
Atriplex argentea	Silverscale	Chenopodiaceae
Atriplex cordulata	Heartscale	Chenopodiaceae
Atriplex coronata var. *vallicola*	Lost Hills Crownscale	Chenopodiaceae
Atriplex fruticulosa	Valley Saltbush	Chenopodiaceae
Atriplex joaquiniana	San Joaquin Saltplant	Chenopodiaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Atriplex lentiformis ssp. *lentiformis*	Big Saltbush	Chenopodiaceae
Atriplex rosea	Rose Saltbush, Tumbling Orache	Chenopodiaceae
Atriplex semibaccata	Australian Saltbush	Chenopodiaceae
Atriplex serenana var. *serenana*	Bracted Saltbush	Chenopodiaceae
Atriplex subspicata	Saline Saltbush	Chenopodiaceae
Atriplex triangularis	Spearscale	Chenopodiaceae
Avena barbata	Slender Wild Oat	Poaceae
Avena fatua	Wild Oat	Poaceae
Azolla filiculoides	Mosquito Fern	Azollaceae
Baccharis pilularis	Coyote Brush	Asteraceae
Baccharis salicifolia	Mule Fat, Seep-willow	Asteraceae
Bacopa eisenii	Gila River Waterhyssop	Scrophulariaceae
Barbarea sp.	Barbarea	Brassicaceae
Bassia hyssopifolia	Fivehook, Smotherweed	Chenopodiaceae
Bellardia trixago	Mediterranean Lineseed	Scrophulariaceae
Bidens frondosa	Sticktight	Asteraceae
Bidens laevis	Bur-marigold	Asteraceae
Blennosperma nanum var. *nanum*	Yellow Carpet, Common Stickyseed	Asteraceae
Boehmeria nivea	Ramie	Urticaceae
Brassica napus	Rapeseed	Brassicaceae
Brassica nigra	Black Mustard	Brassicaceae
Brassica rapa	Field Mustard	Brassicaceae
Briza minor	Little Quakinggrass	Poaceae
Brodiaea californica	California Brodiaea	Amaryllidaceae
Brodiaea elegans ssp. *elegans*	Elegant Harvest Brodiaea	Amaryllidaceae
Bromus catharticus	Rescue Grass	Poaceae
Bromus diandrus	Ripgut Grass	Poaceae
Bromus hordeaceus	Soft Chess	Poaceae
Bromus madritensis	Spanish Brome	Poaceae
Bromus madritensis ssp. *rubens*	Red Brome	Poaceae
Cabomba caroliniana	Carolina Fanwort	Cabombaceae
Calamagrostis sp.	Reed Grass	Poaceae
Calandrinia ciliate	Redmaids	Portulaceae
Calendula officinalis	Pot-marigold	Asteraceae
Callitriche heterophylla	Twoheaded Water-starwort	Callitrichaceae
Callitriche marginata	California Water-starwort	Callitrichaceae
Calocedrus decurrens	Incense Cedar	Cupressaceae
Calochortus sp.	Mariposa Lily	Liliaceae
Calystegia occidentalis	Western Morning Glory	Convolvulaceae
Calystegia sepium	Hedge Bindweed	Convolvulaceae
Camissonia contorta	Contorted Sun Cup	Onagraceae
Campsis radicans	Trumpet Creeper, Trumpet Vine	Bignoniaceae
Canna sp.	Canna Lily	Cannaceae
Capsella bursa-pastoris	Shepherd's Purse	Brassicaceae
Cardamine oligosperma	Few-seeded Bitter-cress	Brassicaceae
Cardaria draba	Hoary-cress	Brassicaceae
Carderia chalepensis	Lens-podded Hoary Cress	Brassicaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Carduus pycnocephalus	Italian Thistle	Asteraceae
Carex barbarae	Santa Barbara Sedge	Cyperaceae
Carex comosa	Bristly Sedge	Cyperaceae
Carex nudata	California Black-flowering Sedge	Cyperaceae
Carex praegracilis	Clustered Field Sedge	Cyperaceae
Carpobrotus chilensis	Sea-fig, Iceplant	Aizoaceae
Carya illinoinensis	Pecan	Juglandaceae
Castilleja attenuata	Valley Tassels	Scrophulariaceae
Castilleja brevistyla	Short Style Owl's Clover	Scrophulariaceae
Castilleja campestris ssp. *campestris*	Vernal Pool Indian Paintbrush	Scrophulariaceae
Castilleja exserta ssp. *exserta*	Purple Owl's-clover	Scrophulariaceae
Casuarina equisetifolia	Ironwood	Casuarinaceae
Catalpa sp.	Catawba	Bignoniaceae
Centaurea calcitrapa	Purple Star Thistle	Asteraceae
Centaurea maculosa	Spotted Knapweed	Asteraceae
Centaurea melitensis	Tocalote	Asteraceae
Centaurea solstitialis	Yellow Star-thistle	Asteraceae
Centaurium muehlenbergii	June Centaury	Gentianaceae
Cephalanthus occidentalis	California Button Bush, Buttonwillow	Rubiaceae
Cerastium glomeratum	Mouse-ear Chickweed	Caryophyllaceae
Ceratophyllum demersum	Hornwort	Ceratophyllaceae
Chaenomeles speciosa	Flowering Quince	Rosaceae
Chamaesyce maculata	Spotted Spurge	Euphorbiaceae
Chamomilla suaveolens	Pineapple Weed	Asteraceae
Chenopodium album	Pigweed, Lamb's Quarters	Chenopodiaceae
Chenopodium ambrosioides	Mexican Tea	Chenopodiaceae
Chenopodium murale	Nettle-leaved or Wall Goosefoot	Chenopodiaceae
Chlorogalum angustifolium	Narrowleaf Soap Plant	Liliaceae
Chlorogalum pomeridianum var. *pomeridianum*	Common Soap Plant	Liliaceae
Cicendia quadrangularis	Cicendia	Gentianaceae
Cichorium intybus	Chicory	Asteraceae
Ciclosperma leptophyllum	Wild Celery	Apiaceae
Cinnamomum camphora	Camphor Tree	Lauraceae
Cirsium vulgare	Bull Thistle	Asteraceae
Citrullus lanatus	Watermelon	Cucurbitaceae
Clarkia purpurea ssp. *quadrivulnera*	Four-spotted Godetia, Winecup Clarkia	Onagraceae
Claytonia parviflora	Streambank Springbeauty	Portulacaceae
Claytonia perfoliata ssp. *perfoliata*	Miner's Lettuce	Portulacaceae
Clematis sp.	Virgin's Bower	Ranunculaceae
Colocasia esculenta	Taro, Elephant Ear	Araceae
Conium maculatum	Poison-hemlock	Apiaceae
Convolvulus arvensis	Bind Weed	Convolvulaceae
Conyza bonariensis	Horseweed	Asteraceae
Conyza canadensis	Horseweed	Asteraceae
Cornus sericea ssp. *sericea*	American Dogwood	Cornaceae
Cortedaria jubata	Pampas Grass	Poaceae
Cotula coronopifolia	African Brass-buttons	Asteraceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Crassula aquatica	Water Pygmyweed	Crassulaceae
Crassula connata	Sand Pygmy-stonecrop	Crassulaceae
Crassula tillaea	Moss Pygmy-stonecrop	Crassulaceae
Crataegus suksdorfii	Hawthorn	Rosaceae
Cressa truxillensis	Alkali Weed	Convolvulaceae
Cressa truxillensis var. *vallicola*	Alkali Weed	Convolvulaceae
Crypsis schoenoides	Swamp Timothy	Poaceae
Cryptantha sp.	Cryptantha	Boraginaceae
Cupressus sempervirens	Italian Cypress	Cupressaceae
Cuscuta sp.	Dodder	Cuscutaceae
Cynara cardunculus	Cardoon, Artichoke Thistle	Asteraceae
Cynodon dactylon	Bermuda Grass	Poaceae
Cyperus eragrostis	Nutsedge	Cyperaceae
Cyperus erythrohizos	Redroot Flatsedge	Cyperaceae
Dactylis glomerata	Orchard Grass	Poaceae
Damasonium californicum	California Damasonium	Alismataceae
Datura stramonium	Jimson Weed	Solanaceae
Datura wrightii	Sacred Thorn-apple	Solanaceae
Daucus carota	Carrot, Queen Anne's Lace	Apiaceae
Deschampsia cespitosa	Tufted Hairgrass	Poaceae
Deschampsia danthanoides	Annual Hairgrass	Poaceae
Deutzia sp.	Deutzia	Hydrangeaceae
Dichelostemma capitatum ssp. *captitatum*	Blue Dicks	Amaryllidaceae
Dipsacus fullonum	Teasel	Dipsacaceae
Dipsacus sativus	Fuller's Teasel	Dipsacaceae
Distichlis spicata var. *nana*	Alkali Saltgrass	Poaceae
Dittrichia graveolens	Stinkwort	Asteraceae
Downingia bicornuta	Two-horned Downingia	Campanulaceae
Downingia insignis	Cupped Downingia	Campanulaceae
Downingia pulchella	Valley Downingia	Campanulaceae
Downingia pusilla	Dwarf Downingia	Campanulaceae
Echinochloa crus-galli	Barnyardgrass	Poaceae
Echinodorus berteroi	Burhead	Alismataceae
Echium candicans	Pride of Madeira	Boraginaceae
Egeria densa	Brazilian Waterweed	Hydrocharitaceae
Eichornia crassipes	Water Hyacinth	Pontaderiaceae
Elatine sp.	Waterwort	Elatinaceae
Eleocharis acicularis var. *acicularis*	Needle Spikerush	Cyperaceae
Eleocharis macrostachya	Pale Spikerush	Cyperaeae
Elymus glaucus ssp. *glaucus*	Blue Wildrye	Poaceae
Elymus multisetus	Big Squirreltail	Poaceae
Elymus trachycaulis	Slender Wheatgrass	Poaceae
Elytrigia elongata	Tall Wheatgrass	Poaceae
Elytrigia pontica ssp. *pontica*	Tall Wheatgrass	Poaceae
Elytrigia repens	Quackgrass	Poaceae
Epilobium brachycarpum	Panicled Willow-herb	Onagraceae
Epilobium ciliatum ssp. *ciliatum*	Northern or Hairy Willow-herb	Onagraceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Epilobium cleistogamum	Selfing Willow-herb	Onagraceae
Equisetum arvense	Common Horsetail	Equisetaceae
Equisetum hyemale	Horsetail	Equisetaceae
Eragrostis sp.	Lovegrass	Poaceae
Eremocarpus setigerus	Turkey Mullein, Dove Weed	Euphorbiaceae
Erodium botrys	Long-beaked Filaree	Geraniaceae
Erodium brachycarpum	Whitestem Filaree	Geraniaceae
Erodium cicutarium	Redstem Filaree	Geraniaceae
Erodium moschatum	Whitestem Filaree	Geraniaceae
Eryngium castrense	Great Valley Button Celery	Apiaceae
Eryngium vaseyi var. *vaseyi*	Vasey's Coyote-thistle	Apiaceae
Eschscholzia californica var. *californica*	California Poppy	Papaveraceae
Eucalyptus globulus	Tasmanian Blue Gum	Myrtaceae
Eucalyptus sp.	Gum Tree	Myrtaceae
Euthamia occidentalis	Western Goldenrod	Asteraceae
Festuca arundinacea	Tall Fescue	Poaceae
Ficus carica	Edible Fig	Moraceae
Filago gallica	Narrow-leaved Filago	Asteraceae
Foeniculum vulgare	Fennel	Apiaceae
Frankenia salina	Alkali Heath	Frankeniaceae
Fraxinus latifolia	Oregon Ash	Oleaceae
Fraxinus velutina	Modesto Ash	Oleaceae
Galium aparine	Catchweed Bedstraw	Rubiaceae
Galium parisiense	Wall Bedstraw	Rubiaceae
Gastridium ventricosum	Nitgrass	Poaceae
Geranium dissectum	Dissected Geranium	Geraniaceae
Geranium molle	Annual Cranesbill	Geraniaceae
Ginkgo biloba	Ginkgo, Maidenhair Tree	Ginkgoaceae
Glyceria declinata	Waxy Manna-grass	Poaceae
Glycyrrhiza lepidota	Wild Licorice	Fabaceae
Gnaphalium luteo-album	Everlasting Cudweed	Asteraceae
Gnaphalium palustre	Western Marsh Cudweed	Asteraceae
Gnaphalium purpureum var. *purpureum*	Purple Everlasting	Asteraceae
Gratiola ebracteata	Bractless Hedge-hyssop	Scrophulariaceae
Grindelia camporum var. *camporum*	Great Valley Gumplant	Asteraceae
Hainardia cylindrica	Thin Tail	Poaceae
Hedera helix	English Ivy	Araliaceae
Helenium puberulum	Sneezeweed	Asteraceae
Helianthus annuus	Sunflower	Asteraceae
Helianthus californicus	California Sunflower	Asteraceae
Helianthus tuberosus	Jerusalem Artichoke	Asteraceae
Heliotropium curassavicum	Alkali Heliotrope	Hydrophyllaceae
Hemizonia congesta	Hayfield Tarweed	Asteraceae
Hemizonia fitchii	Fitch's Tarplant	Asteraceae
Hemizonia pungens	Spikeweed	Asteraceae
Hesperocnide tenella	Western Nettle	Urticaceae
Heteromeles arbutifolia	Toyon, Christmas Berry	Rosaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Heterotheca grandiflora	Telegraph Weed	Asteraceae
Hibiscus lasiocarpus	Woolly Rose Mallow	Malvaceae
Hirschfeldia incana	Summer Mustard	Brassicaceae
Hoita sp.	Hoita	Fabaceae
Holocarpha virgata	Yellowflower Tarweed	Asteraceae
Hordeum brachyantherum ssp. *Brachyantherum*	Meadow Barley	Poaceae
Hordeum jubatum	Foxtail Barley	Poaceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean Barley	Poaceae
Hordeum murinum ssp. *leporinum*	Foxtail Barley	Poaceae
Hutchinsia procumbens	Prostrate Hutchinsia	Brassicaceae
Hydrocotyle ranunculoides	Floating Marshpennywort	Apiaceae
Hydrocotyle umbellata	Manyflower Marshpennywort	Apiaceae
Hydrocotyle verticillata	Whorled Marshpennywort	Apiaceae
Hypericum anagalloides	Tinker's Penny	Hypericaceae
Hypericum mutilum	Dwarf St. John's Wort	Hypericaceae
Hypericum perfoliata	Klamathweed	Hypericaceae
Hypochaeris glabra	Smooth Cat's-ear	Asteraceae
Hypochaeris radicata	Hairy Cat's-ear	Asteraceae
Ipomoea hederacea	Ivy-leaved Morning Glory	Convolvulaceae
Iris pseudacorus	Water Iris	Iridaceae
Isolepis cernua [=*Scirpus cernuus*]	Fiber Optic Grass	Cyperaceae
Juglanscalifornica var. *hindsii*	Black Walnut	Juglandaceae
Juglans regia	English Walnut	Juglandaceae
Juncus articulatus	Jointleaf Rush	Juncaceae
Juncus balticus var. *balticus*	Baltic Rush	Juncaceae
Juncus bufonius var. *bufonius*	Common Toad Rush	Juncaceae
Juncus effusus var. *pacificus*	Bog Rush	Juncaceae
Juncus mexicanus	Mexican Rush	Juncaceae
Juncus phaeocephalus	Brown Headed Creeping Rush	Juncaceae
Juncus xiphioides var. *xiphioides*	Iris-leaved Rush	Juncaceae
Juniperus sp.	Juniper	Cupressaceae
Kickxia sp.	Fluellin	Scrophulariaceae
Lactuca saligna	Willowleaf Lettuce	Asteraceae
Lactuca serriola	Prickly Wild Lettuce	Asteraceae
Lamium amplexicaule	Henbit Deadnettle	Lamiaceae
Lantana camara	Lantana	Verbenaceae
Lasthenia californica	California Goldfields	Asteraceae
Lasthenia chrysantha	Alkali Sink Goldfields	Asteraceae
Lasthenia fremontii	Fremont Goldfields	Asteraceae
Lasthenia glaberrima	Rayless Goldfields	Asteraceae
Lasthenia glabrata var. *glabrata*	Yellow-ray Goldfields	Asteraceae
Lathyrus jepsonii var. *californica*	California Tule Pea	Fabaceae
Lathyrus jepsonii var. *jepsonii*	Delta Tule Pea	Fabaceae
Layia fremontii	Fremont's Tidytips	Asteraceae
Leersia oryzoides	Rice Cutgrass	Poaceae
Legenere limosa	Legenere	Campanulaceae
Lemna sp.	Duckweed	Lemnaceae

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Scientific Name	Common Name	Family
Leontodon taraxacoides ssp. *taraxacoides*	Hairy Hawkbit	Asteraceae
Lepidium dictyotum var. *acutidens*	Alkali Pepperwort, Net Peppergrass	Brassicaceae
Lepidium dictyotum var. *dictyotum*	Alkali or Veiny Peppergrass	Brassicaceae
Lepidium latifolium	Broadleaf Peppergrass	Brassicaceae
Lepidium latipes var. *heckardii*	Heckard's Peppergrass	Brassicaceae
Lepidium latipes var. *latipes*	Dwarf Peppergrass	Brassicaceae
Lepidium nitdum var. *oreganum*	Common Peppergrass	Brassicaceae
Lepidium nitidum var. *nitidum*	Common Peppergrass	Brassicaceae
Lepidium strictum	Upright Pepperweed	Brassicaceae
Leptochloa fascicularis	Bearded Sprangletop	Poaceae
Leymus triticoides	Creeping Wildrye	Poaceae
Ligustrum lucidum	Glossy Privet	Oleaceae
Lilaea scilloides	Flowering Quillwort	Juncaginaceae
Lilaeopsis masonii	Mason's Lilaeopsis	Apiaceae
Limnanthes alba ssp. *alba*	White Meadowfoam	Limnanthaceae
Limosella acaulis	Water Mudwort	Scrophulariaceae
Limosella subulata	Delta Mudwort	Scrophulariaceae
Linanthus sp.	Linanthus	Polemoniaceae
Linum sp.	Flax	Linaceae
Liquidambar styraciflua	American Sweetgum	Altingiaceae
Lolium multiflorum	Italian Ryegrass	Poaceae
Lolium perenne	Perennial Ryegrass	Poaceae
Lomatium sp.	Lomatium	Apiaceae
Lonicera involucrata	Twinberry	Caprifoliaceae
Lonicera japonica	Japanese Honeysuckle	Caprifoliaceae
Lotus corniculatus	Bird's-foot Trefoil	Fabaceae
Lotus purshianus	Prairie Trefoil	Fabaceae
Lotus scoparius	California Broom	Fabaceae
Lotus wrangelianus	Chilean Bird's-foot Trefoil	Fabaceae
Ludwigia peploides	Floating Water Primrose	Onagraceae
Lupinus albifrons	Silverbush Lupine	Fabaceae
Lupinus arboreus	Yellow Bush Lupine	Fabaceae
Lupinus bicolor	Bicolored Lupine	Fabaceae
Lupinus microcarpus	Chick Lupine	Fabaceae
Lupinus succulentus	Arroyo Lupine	Fabaceae
Lycium barbarum	Matrimony Vine, Goji	Solanaceae
Lycopus americanus	Bugleweed	Lamiaceae
Lythrum californicum	California Loosestrife	Lythraceae
Lythrum hyssopifolium	Hyssop Loosestrife	Lythraceae
Lythrum salicaria	Purple Loosestrife	Lythraceae
Lythrum tribracteatum	Three-bracted Loosestrife	Lythraceae
Maclura pomifera	Osage Orange	Moraceae
Madia elegans	Common Madia	Asteraceae
Magnolia soulangeana	Tulip Magnolia	Magnoliaceae
Malus sp.	Apple or Pear	Rosaceae
Malva neglecta	Common Mallow, Cheeses	Malvaceae
Malva nicaeensis	Bull or High Mallow	Malvaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Malva parviflora	Cheeseweed	Malvaceae
Malva sylvestris	High Mallow	Malvaceae
Malvella leprosa	Alkali Mallow	Malvaceae
Marah fabaceus	Man-root	Cucurbitaceae
Marchantia sp.	Liverwort	Marchantia
Marrubium vulgare	White Horehound	Lamiaceae
Marsilea vestita ssp. *vestita*	Hairy Waterclover	Marsileaceae
Matricaria recutita	German Chamomile	Asteraceae
Maytenus boaria	Mayten	Celastraceae
Medicago polymorpha	Bur-clover	Fabaceae
Medicago sativa	Alfalfa	Fabaceae
Melilotus alba	White Sweetclover	Fabaceae
Melilotus indica	Sourclover	Fabaceae
Mentha arvensis	Field Mint	Lamiaceae
Mentha pulegium	Pennyroyal	Lamiaceae
Mesembryanthemum crystallinum	Crystalline Iceplant	Aizoaceae
Micropus californicus var. *californicus*	Slender Cottonseed	Asteraceae
Microseris acuminata	Sierra Foothills Microseris	Asteraceae
Microseris douglasii	Douglas' Microseris	Asteraceae
Mimulus guttatus ssp. *guttatus*	Common Streamside Monkeyflower	Scrophulariaceae
Montia fontana	Water Chickweed	Portulacaceae
Montia linearis	Narrow-leaved Montia	Portulacaceae
Morus alba	White Mulberry	Moraceae
Morus sp.	Mulberry	Moraceae
Muhlenbergia sp.	Muhly	Poaceae
Myosotis laxa	Bay Forget-me-not	Boraginaceae
Myosurus minimus var. *minimus*	Tiny Mouse Tail	Ranunculaceae
Myosurus minimus var. *apus*	Little Mousetail	Ranunculaceae
Myosurus sessilis	Vernal Pool Mousetail	Ranunculaceae
Myriophyllum aquaticum	Parrot's Feather	Haloragaceae
Myriophyllum spicatum	Eurasian Milfoil	Haloragaceae
Nandina domestica	Heavenly Bamboo	Berberidaceae
Nassella lepida	Foothill Needlegrass	Poaceae
Nassella pulchra	Purple Needlegrass	Poaceae
Navarretia intertexta	Needle-leaved Navarretia	Polemoniaceae
Navarretia leucocephala var. *leucocephala*	White-headed Navarretia	Polemoniaceae
Nerium oleander	Oleander	Apocynaceae
Nicotiana acuminata	Many Flowered Tobacco	Solanaceae
Nicotiana glauca	Tree Tobacco	Solanaceae
Nuphar lutea	Yellow Pond Lily	Nymphaeaceae
Oenanthe sarmentosa	Water Parsley	Apiaceae
Oenothera biennis	Common Evening Primrose	Onagraceae
Oenothera deltoides ssp. *deltoides*	Basket Evening Primrose	Onagraceae
Oenothera elata	Evening Primrose	Onagraceae
Olea europaea	Olive	Oleaceae
Opuntia ficus-indica	Prickly Pear Cactus	Cactaceae
Oxalis laxa	Dwarf Wood Sorrel	Oxalidaceae

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Scientific Name	Common Name	Family
Oxalis pes-caprae	Bermuda Buttercup	Oxalidaceae
Panicum sp.	Millet, Panicgrass	Poaceae
Parentucellia viscosa	Yellow Glandweed	Scrophulariaceae
Parthenocissus quinquefolia	Virginia Creeper	Vitaceae
Paspalum dilatatum	Dallis Grass	Poaceae
Paspalum distichum	Knot Grass	Poaceae
Petrorhagia dubia	Grass Pink	Caryophyllaceae
Phalaris aquatic	Harding Grass	Poaceae
Phalaris canariensis	Canary Grass	Poaceae
Phalaris minor	Littleseed Canary Grass	Poaceae
Phleum pretense	Cultivated Timothy	Poaceae
Phoenix sp.	Date Palm	Arecaceae
Phoradendron sp.	Mistletoe	Viscaceae
Phragmites australis	Common Reed	Poaceae
Phyla nodiflora	Common Frog-fruit	Verbenaceae
Phyllostachys sp.	Bamboo	Poaceae
Phytolacca americana	Pokeweed	Phytolaccaceae
Picris echioides	Bristly Ox-tongue	Asteraceae
Pilularia americana	American Pillwort	Marsileaceae
Pinus canariensis	Canary Island Pine	Pinaceae
Pinus sabiniana	Grey Pine	Pinaceae
Pinus sp.	Pine	Pinaceae
Piptatherum millaceum	Smilo Grass	Poaceae
Pistacia atlantica	Mount Atlas Pistache	Anacardiaceae
Pistacia chinensis	Chinese Pistache	Anacardiaceae
Plagiobothrys greenei	Greene's Popcornflower	Boraginaceae
Plagiobothrys leptocladus	Fine-branch Popcornflower	Boraginaceae
Plagiobothrys stipitatus var. *micranthus*	Small Stipitate Popcornflower	Boraginaceae
Plantago erecta ssp. *erecta*	California Plantain	Plantaginaceae
Plantago lanceolata	Narrowleaf Plantain	Plantaginaceae
Plantago major	Common Plantain	Plantaginaceae
Platanus racemosa	Western Sycamore	Platanaceae
Pluchea odorata	Salt Marsh Fleabane	Asteraceae
Poa annua var. *annua*	Annual Bluegrass	Poaceae
Poa bulbosa	Bulbous Bluegrass	Poaceae
Poa compressa	Canadian Bluegrass	Poaceae
Poa secunda	Sandberg Bluegrass	Poaceae
Pogogyne sp.	Serpentine Douglas' Pogogyne	Lamiaceae
Pogogyne zizyphoroides	Sacramento Mesamint	Lamiaceae
Polygonum amphibium var. *emersum*	Water Smartweed	Polygonaceae
Polygonum arenastrum	Common Knotweed, Doorweed	Polygonaceae
Polygonum hydropiper	Marshpepper, Waterpepper	Polygonaceae
Polygonum lapathifolium	Willow Weed	Polygonaceae
Polygonum persicaria	Lady's Thumb	Polygonaceae
Polygonum punctatum	Dotted Smartweed	Polygonaceae
Polypogon interruptus	Ditch Beard Grass	Poaceae
Polypogon monspeliensis	Rabbitsfoot Grass	Poaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Pontederia cordata	Pickerelweed	Pontederiaceae
Populus fremontii	Fremont Cottonwood	Salicaceae
Populus nigra 'Italica'	Lombardy Poplar	Salicaceae
Portulaca oleraceae	Purslane	Portulacaceae
Potamogeton crispus	Crispate-leaved Pondweed	Potamogetonaceae
Potamogeton diversifolius	Diverse-leaved Pondweed	Potamogetonaceae
Potamogeton foliosus	Leafy Pondweed	Potamogetonaceae
Potamogeton natans	Floating Leaved Pondweed	Potamogetonaceae
Prunus cerasifera	Cherry Plum	Rosaceae
Prunus spp.	Peach, Nectarine, Plum, Almond	Rosaceae
Psilocarphus brevissimus var. *brevissimus*	Dwarf Woolly-heads	Asteraceae
Psilocarphus tenellus	Slender Woolly-heads	Asteraceae
Pteridium aquilinum	Bracken Fern	Dennstaedtiaceae
Punica granatum	Pomegranate	Lythraceae
Pyracantha angustifolia	Firethorn	Rosaceae
Quercus agrifolia	Coast Live Oak	Fagaceae
Quercus lobata	Valley Oak	Fagaceae
Quercus wislizenii	Interior Live Oak	Fagaceae
Ranunculus aquatilis	White Water-buttercup	Ranunculaceae
Ranunculus bonarienis var. *trisepalus*	Vernal Buttercup	Ranunculaceae
Ranunculus muricatus	Prickle-fruited Buttercup	Ranunculaceae
Raphanus sativus	Wild Radish	Brassicaceae
Riccia fluitans	Crystalwort	Ricciaceae
Ricinus communis	Castor Oil Plant	Euphorbiaceae
Robinia pseudoacacia	Black Locust	Fabaceae
Rorippa curvisiliqua	Curvepod Yellowcress	Brassicaceae
Rorippa nasturtium-aquaticum	Water Cress	Brassicaceae
Rosa californica	California Rose	Rosaceae
Rubus discolor	Himalayan Blackberry	Rosaceae
Rubus laciniatus	Cutleaf Blackberry	Rosaceae
Rubus ursinus	California Blackberry	Rosaceae
Rumex crispus	Curly Dock	Polygonaceae
Rumex pulcher	Fiddle Dock	Polygonaceae
Ruppia maritima	Widgeongrass	Poaceae
Sagina decumbens ssp. *Occidentalis*	Western Pearlwort	Caryophyllaceae
Sagittaria cuneata	Arumleaf Arrowhead	Alismataceae
Sagittaria latifolia	Broadleaf Arrowhead	Alismataceae
Sagittaria montevidensis	Giant Arrowhead	Alismataceae
Sagittaria sanfordii	Sanford's Arrowhead	Alismataceae
Salicornia virginica	Pickleweed	Chenopodiaceae
Salix babylonica	Weeping Willow	Salicaceae
Salix exigua	Narrow-Leaved Willow	Salicaceae
Salix gooddingii	Black Willow	Salicaceae
Salix lasiolepis	Arroyo Willow	Salicaceae
Salix laevigata	Red Willow	Salicaceae
Salix lucida-lasiandra	Shining Willow	Salicaceae
Salsola australis	Russian Thistle	Chenopodiaceae

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Scientific Name	Common Name	Family
Salsola tragus	Tumbleweed	Chenopodiaceae
Sambucus mexicana (*Sambucus nigra* ssp. *canadensis*)	Blue Elderberry	Caprifoliaceae
Samolus parviflorus	Water-Pimpernel	Primulaceae
Sapium sebiferum	Chinese Tallow Tree	Euphorbiaceae
Schinus molle	Peruvian Pepper Tree	Anacardiaceae
Schoenoplectus acutus (*Scirpus acutus* var. *occidentalis*)	Hardstem Bulrush, Common Tule	Cyperaceae
Schoenoplectus californicus (*Scirpus californicus*)	California Bulrush	Cyperaceae
Scirpus microcarpus	Panicled Bulrush	Cyperaceae
Scrophularia californica	California Figwort	Scrophulariaceae
Scutellaria galericulata	Marsh Skullcap	Lamiaceae
Scutellaria lateriflora	Side-flowering Skullcap	Lamiaceae
Senecio vulgaris	Common Groundsel	Asteraceae
Sequoia sempervirens	Coast Redwood	Cupressaceae
Sesbania punicea	Rattlebox	Fabaceae
Sesuvium sp.	Seapurslane	Crassulaceae
Sidalcea calycosa ssp. *calycosa*	Annual Checkerbloom	Malvaceae
Sidalcea hirsuta	Hairy Checkerbloom	Malvaceae
Silene gallica	Common Catchfly	Caryophyllaceae
Silybum marianum	Milk Thistle	Asteraceae
Sisymbrium orientale	Indian Hedge Mustard	Brassicaceae
Sisymbrium sp.	Sisymbrium	Brassicaceae
Sisyrinchium bellum	Blue-eyed-grass	Iridaceae
Solanum nigrum	Black Nightshade	Solanaceae
Sonchus asper	Prickly Sow-thistle	Asteraceae
Sonchus oleraceus	Common Sow-thistle	Asteraceae
Sorghum halepense	Johnsongrass	Poaceae
Sparganium erectum ssp. *stoloniferum*	Simplestem Bur-reed	Typhaceae
Sparganium eurycarpum	Bur-reed	Typhaceae
Spergula arvensis var. *arvensis*	Corn Sandspurry	Caryophyllaceae
Spergularia bocconei	Boccon's Sandspurry	Caryophyllaceae
Spergularia macrotheca var. *macrotheca*	Beach Sandspurry	Caryophyllaceae
Spergularia marina	Salt Marsh Sandspurry	Caryophyllaceae
Spergularia rubra	Purple Sandspurry	Caryophyllaceae
Stachys albens	White Hedge Nettle	Lamiaceae
Stellaria media	Common Chickweed	Caryophyllaceae
Suaeda moquinii	Iodine Bush, Torrey's Seepweed	Chenopodiaceae
Symphyotrichum chilense (Aster chilensis)	California Aster	Asteraceae
Symphyotrichum lentum (Aster lentus)	Suisun Marsh Aster	Asteraceae
Symphyotrichum subulatum var. *ligulatum* (*Aster subulatus* var. *ligulatus*)	Annual Saltmarsh Aster	Asteraceae
Taeniatherum caput-medusae	Medusahead	Poaceae
Tamarix sp.	Tamarisk or Salt-cedar	Tamaricaceae
Taraxacum officinale	Dandelion	Asteraceae
Torilis arvensis	Field Hedge Parsley	Apiaceae
Torilis nodosa	Knotted Hedge Parsley	Apiaceae

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Scientific Name	Common Name	Family
Toxicodendron diversilobum	Poison Oak	Anacardiaceae
Tragopogon sp.	Tragopogon	Asteraceae
Tribulus terrestris	Puncture-vine	Zygophyllaceae
Trifolium albopurpureum	Indian Clover	Fabaceae
Trifolium barbigerum var. *barbigerum*	Bearded Clover	Fabaceae
Trifolium depauperatum var. *amplectens*	Balloon Sack Clover	Fabaceae
Trifolium depauperatum var. *depauperatum*	Dwarf Sack Clover	Fabaceae
Trifolium depauperatum var. *hydrophilum*	Saline Clover	Fabaceae
Trifolium depauperatum var. *truncatum*	Truncate Dwarf Sack Clover	Fabaceae
Trifolium dubium	Shamrock	Fabaceae
Trifolium fucatum	Bull Clover	Fabaceae
Trifolium gracilentum var. *gracilentum*	Pinpoint Clover	Fabaceae
Trifolium hirtum	Rose Clover	Fabaceae
Trifolium microcephalum	Maiden Clover	Fabaceae
Trifolium microdon	Thimble Clover	Fabaceae
Trifolium pratense	Red Clover	Fabaceae
Trifolium repens	White Clover	Fabaceae
Trifolium subterraneum	Subterranean Clover	Fabaceae
Trifolium tomentosum	Woolly Clover	Fabaceae
Trifolium variegatum	Whitetip Clover	Fabaceae
Trifolium wildenovii	Tomcat Clover	Fabaceae
Trifolium wormskioldii	Cows Clover	Fabaceae
Triphysaria eriantha	Butter-and-eggs, Johnny Tuck	Scrophulariaceae
Triphysaria versicolor ssp. *falcibarbata*	Yellow Owl's Clover	Scrophulariaceae
Triteleia laxa	Ithuriel's Spear	Amaryllidaceae
Triticum aestivum	Wheat	Poaceae
Tritileia hyacinthina	White Brodiaea	Amaryllidaceae
Typha angustifolia	Slender Cattail	Typhaceae
Typha dominguensis	Southern Cattail	Typhaceae
Typha latifolia	Broad-leaved Cattail	Typhaceae
Ulmus sp.	Elm	Ulmaceae
Urtica dioica	Stinging Nettle	Urticaceae
Verbascum blattaria	Moth Mullein	Scrophulariaceae
Verbascum thapsus	Woolly Mullein	Scrophulariaceae
Verbena bonariensis	Purpletop Vervain	Verbenaceae
Verbena lasiostachys	Western Vervain	Verbenaceae
Veronica peregrina ssp. *xalapensis*	Purslane Speedwell	Scrophulariaceae
Vicia americana	American Vetch	Fabaceae
Vicia faba	Broad Bean, Fava Bean	Fabaceae
Vicia sativa ssp. *sativa*	Sweet or Spring Vetch	Fabaceae
Vicia villosa ssp. *villosa*	Hairy or Winter Vetch	Fabaceae
Vinca major	Greater Periwinkle	Apocynaceae
Vitis californica	California Grape	Vitaceae
Vitis vinifera	Wine Grape	Vitaceae
Vulpia bromoides	Slender Fescue	Poaceae
Vulpia microstachys var. *microstachys*	Small Fescue	Poaceae
Vulpia myuros var. *myuros*	Rattail Fescue	Poaceae

Table 2.2A. 2009 DHCCP Surveys for Special-Status Plants: Plant Species List

Scientific Name	Common Name	Family
Washingtonia filifera	California Fan Palm	Arecaceae
Wisteria sp.	Wisteria	Fabaceaae
Wolffia sp.	Water-Meal	Lemnaceae
Woodwardia fimbriata	Giant Chain Fern	Blechnaceae
Xanthium spinosum	Spiny Cocklebur	Asteraceae
Xanthium strumarium	Rough Cocklebur	Asteraceae
Yucca sp.	Spanish Bayonet	Agavaceae
Zinnia elegans	Zinnia	Asteraceae

Species in shaded cells were first observed in 2010.
Source: Compiled by DWR in 2009

APPENDIX 2.4A

List of Taxa Found in Vernal Pools

Table 2.4A-1. List of Taxa Found in Vernal Pools

Common Name	Scientific Name
Plants	
Iodinebush	*Allenrolfea occidentalis*
Pacific Foxtail	*Alopecurus saccatus*
Common Fiddleneck	*Amsinckia meziesii*
Mayweed	*Anthemis cotula*
Soft Chess	*Bromus hordeaceous*
Saltgrass	*Distichlis spicata*
Pale Spikerush	*Eleocharis macrostachya*
Stork's Bill	*Erodium* spp.
Alkali Heath	*Frankenia salina*
Common Tarweed	*Hemizonia pungens*
Summer Mustard	*Hirschfeldia incana*
Mediterranean Barley	*Hordeum marinum* ssp. *gussoneanum*
California Goldfields	*Lasthenia californica*
Rayless Goldfields	*Lasthenia glaberrima*
Shining Pepperweed	*Lepidium nitidum*
Italian Ryegrass	*Lolium multiflorum*
Common Frog-fruit	*Phyla nodiflora*
Stipitate Popcornflower	*Plagiobothrys stipitatus*
Curly Dock	*Rumex crispus*
Boccone's Sandspurry	*Spergularia bocconii*
Bush Seepweed	*Suaeda moquinii*
Rattail Fescue	*Vulpia myuros*
Branchiopods	
Conservancy Fairy Shrimp	*Branchinecta conservatio*
Versatile Fairy Shrimp	*Branchinecta lindahli*
Longhorn Fairy Shrimp	*Branchinecta longiantenna*
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*
California Clam Shrimp	*Cyzicus californicus*
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*
California Fairy Shrimp	*Linderiella occidentalis*
Other Invertebrates	
Amphipod	*Amphipoda*
Midge	*Chironomidae*
Water Flea	*Cladocera*
Copepod	*Copepoda*
Water Boatman	*Corixidae*
Mosquito	*Culicidae*
Crawdad	*Decapoda*
Predacious Diving Beetle	*Dytiscidae*
Water Scavenger Beetle	*Hydrophilidae*
Flatworm	*Microturbellaria*
Backswimmer	*Notonectidae*
Seed Shrimp	*Ostracoda*
Amphibians	
Pacific Chorus Frog	*Pseudacris regilla*
Source: Compiled by DHCCP in 2009	

APPENDIX 2.5A

Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog

U.S. Fish and Wildlife Service

Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog

August 2005

I. Introduction

The U.S. Fish and Wildlife Service (Service) issued guidance on conducting site assessments and surveys for the California red-legged frog (*Rana aurora draytonii*) (CRF) on February 18, 1997 (1997 Guidance). Since then, the Service has reviewed numerous CRF site assessments and surveys results, accompanied wildlife biologists in the field during the preparation and performance of site assessments and CRF surveys, and consulted with species experts on the effectiveness of the 1997 Guidance. Based on our review of the information, the Service has determined that the survey portion of the 1997 Guidance is less likely to accurately detect CRF than previously thought, especially in certain portions of the species range and particularly where CRF exist in low numbers. In response to the need for new guidance, the Service has prepared this *Revised Guidance on Site Assessment and Field Surveys for the California Red-legged Frog* (Guidance).

Similar to the 1997 Guidance, two procedures are recommended in the new Guidance to accurately assess the likelihood of CRF presence in the vicinity of a project site: (1) an assessment of CRF locality records and potential CRF habitat in and around the project area and, (2) focused field surveys of breeding pools and other associated habitat to determine whether CRF are likely to be present.

Because CRF are known to use aquatic, riparian, and upland habitat, they may be present in any of these habitat types, depending on the time of year, on any given property. For sites with no suitable aquatic breeding habitat, but where suitable upland dispersal habitat exists, it is difficult to support a negative finding with the results of any survey guidance. Therefore, this Guidance focuses on site assessments and surveys conducted in and around aquatic and riparian habitat.

This Guidance was developed by the Service's Sacramento Fish and Wildlife Office in coordination with the Ventura Fish and Wildlife Office. Input by field biologists and scientists experienced in surveying for the CRF was also used in the development of this Guidance.

If the following Guidance is followed in its entirety, the results of the site assessments and surveys will be considered valid by the Service for two (2) years, unless determined otherwise on a case-by-case basis by the appropriate Service Fish and Wildlife Office. After two (2) years, new surveys conducted under the most current Service Guidance may be required, if deemed necessary by the appropriate Service Fish and Wildlife Office.

Modifications of this Guidance for specific projects or circumstances may be approved by the appropriate Fish and Wildlife Office; however, we strongly recommend that all modifications be reviewed and approved by the Service prior to implementation.

II. Permit Requirements

Unless otherwise authorized, individuals participating in site assessments and surveys for CRF may **NOT** take the California red-legged frog during the course of site assessments or survey activities. Take may only be authorized via section 7 or section 10 of the Endangered Species Act of 1973, as amended. Typically, take associated with survey activities is authorized via issuance of section 10(a)(1)(A) permits. For reference, an application for a section 10(a)(1)(A) permit is available through the appropriate Fish and Wildlife Office or online at: http://forms.fws.gov/3-200-55.pdf.

The site assessment and survey methods recommended in this Guidance do NOT require the surveyor to have a permit. As stated below, the surveyor must be otherwise qualified to conduct the surveys.

It is the responsibility of the surveyor to ensure all other applicable permits are obtained and valid (*e.g.,* state scientific collection permits), and that permission from private landowners or land managers is obtained prior to accessing a site and beginning site assessments and surveys.

III. Site Assessments

To prevent any unnecessary loss of time or use of resources, it is essential that completed site assessments be submitted to the appropriate Service Fish and Wildlife Office for review in order to obtain further guidance from the Service before conducting surveys.

Surveyors are encouraged to implement the decontamination guidelines provided in Appendix B before conducting a site assessment to prevent the spread of parasites and diseases to CRF and other amphibians.

Careful evaluation of the following information about CRF and their habitats in the vicinity of a project or other land use activities is important because this information indicates the likelihood of the presence of CRF. This information will help determine whether it is necessary to conduct field surveys.

To conduct a site assessment for CRF, complete the data sheet in Appendix D and return it with any necessary supporting documentation to the appropriate Service Fish and Wildlife Office for review prior to initiating surveys. The following information is critical to completing a proper site assessment:

1. Is the site within the current or historic range of the CRF?

Since knowledge of the distribution of the CRF is likely to change as new locality information becomes available, biologists are expected to contact the appropriate Fish and Wildlife Office (see section IV below) to determine if a project site is within the range of this species.

2. Are there known records of CRF at the site or within a 1.6-kilometer* (1-mile) radius of the site?

The biologist should consult the California Natural Diversity Data Base (CNDDB) maintained by the California Department of Fish and Game's (CDFG) Natural Heritage Division as a starting point to determine if there are reported localities of CRF within a 1.6-kilometer (1-mile) radius of the site. Information on the CNDDB is attached to the end of this document. Data entry into the CNDDB is not always current nor do all surveyors submit reports to the CNDDB, thus it is essential that other information sources on local occurrences of CRF be consulted. These sources may include, but are not limited to, biological consultants, local residents, amateur herpetologists, resource managers and biologists from municipal, State, and Federal agencies, environmental groups, and herpetologists at museums and universities. The biologist should report to the Service all known CRF records at the project site and within a 1.6-kilometer (1-mile) radius of the project boundaries. One-point-six (1.6) kilometers (1 mile) was selected as a proximity radius to a project site based on telemetry data collected by Bulger *et al.* (2003), rounded to the nearest whole mile. This distance may be subject to change when new data becomes available, or based on site-specific conditions, so it is advised that surveyors check with the appropriate Service Fish and Wildlife Office to ensure they are using the most up-to-date information.

*** IMPORTANT**: One-point-six (1.6) kilometers (1 mile) radius is a general guideline. The appropriate Service Fish and Wildlife Office will advise surveyors of the most appropriate distance for each specific project location on a case-by-case basis.

3. What are the habitats within the project site and within 1.6 kilometers* (1 mile) of the project boundary?

In order to properly characterize the habitat within 1.6 kilometers (1 mile) of the project site, individuals conducting site assessments must visit the project site and as much of the surrounding habitat within 1.6 kilometers (1 mile) of the project site as possible. Aerial photographs, maps, and other resources should be consulted as well to ensure all possible accessible habitats are considered. Based on this reconnaissance assessment, the surveyor shall describe the upland and aquatic habitats within the project site and within 1.6 kilometers (1 mile) of the project boundary. The aquatic habitats should be mapped and characterized (*e.g.*, ponds vs. creeks, pool vs. riffle, ephemeral vs. permanent (if ephemeral, give date it goes dry), vegetation (type, emergent, overhanging), water depth at the time of the site assessment, bank full depth, stream gradient (percent slope), substrate, and description of bank). The presence of

bullfrogs (*Rana catesbeiana*) and other aquatic predators such a centrarchid fishes (bass, perch, sunfish) should be documented even though their presence does not negate the presence of CRF. Upland habitats should be characterized by including a description of upland vegetation communities, land uses, and any potential barriers to CRF movement. The information provided in Appendix A serves as a guide to the features that will indicate possible CRF habitat.

4. Report the results of the site assessment

A site assessment report shall be provided to the appropriate Fish and Wildlife Office for review. Reports should include, but are not limited to, the following information:

1) Copies of the data sheet provided at Appendix D;

2) Copies of field notes and all other supporting documentation including:

   A. A list of all known CRF localities within 1.6 kilometers* (1 mile) of the project site boundaries;
   B. Photographs of the project site (photopoints shall be indicated on an accompanying map);
   C. A map of the site showing all of the habitat types and other important features as well as the location of any species detected during the site assessment within 1.6 kilometers (1 mile) of the project site boundaries. Maps shall be either copies of those portions of the U.S. Geological Service 7.5-minute quadrangle map(s) *or* geographic information system (GIS) data;
   D. A description of the project and/or land use that is being proposed at the site.

Based on the information provided in the site assessment report, the Service will provide guidance on how CRF issues should be addressed, including whether field surveys are appropriate, where the field surveys should be conducted, and whether incidental take authorization should be obtained through section 7 consultation or a section 10 permit pursuant to the Endangered Species Act.

IV. Field Surveys

Surveyors are encouraged to implement the decontamination guidelines provided in Appendix B before conducting surveys to prevent the spread of parasites and diseases to CRF and other amphibians.

To avoid and minimize the potential of harassment or harm to CRF, no additional surveys will be conducted in an area once occupancy has been established, unless the surveying effort is part of a Service-approved project to determine actual numbers of frogs at a site.

The Service should be notified in writing (*e.g.*, email) by the surveyor within three (3) working

days once a CRF is detected. The Service will provide guidance to the surveyor regarding the need to collect additional information such as population size, age class, habitat use, *etc*.

A. Qualifications of Surveyors

Surveyors must be familiar with the distinguishing physical characteristics of all life stages of the CRF, other anurans of California, and with introduced, exotic species such as the bullfrog and the African clawed frog (*Xenopus Laevis*) prior to conducting surveys according to this Guidance.

Surveyors must submit their qualifications to the Service along with their survey results.

A field guide should be consulted (*e.g.*, Wright and Wright 1949; Stebbins 2003) to confirm the identification of amphibians encountered during surveys. Surveyors also should be familiar with the vocalizations of the CRF and other amphibians found in California. Recordings of these vocalizations are available through various sources (*e.g.*, Davidson 1995). Surveyors that do not have experience with the species are required to obtain training on locating and identifying CRF adult, larval and egg stages before survey results are accepted. Training may include attendance at various workshops that have an emphasis on the biology of the California red-legged frog, accompanied by an appropriate level of field identification training; field work with individuals who possess valid 10(a)(1)(A) permits for the CRF; and experience working with ranids and similar taxa.

In some localities more intensive surveys (*e.g*., dip-netting larvae and adults) may be desirable to document the presence of CRF. In order to conduct such focused surveys a valid section 10(a)(1)(A) permit is required (refer to introduction section for information on how to apply for a section 10(a)(1)(A) permit). Applicants will be considered qualified for a section 10(a)(1)(A) permit if they meet the Service's most current qualification requirements. At a minimum, prospective applicants must:

1) Possess a Baccalaureate degree in biology, ecology, a resource management-related field, or have equivalent relevant experience;
2) Have completed course work in herpetology and study-design/survey-methodology or have equivalent relevant experience;
3) Have verifiable experience in the design and implementation of amphibian surveys or research or have equivalent relevant experience;
4) Have verifiable experience handling and identifying a minimum of 10 CRF, or similar ranid species, comprised of a minimum of 5 adults and a combination of larva and juveniles;
5) Obtain a minimum of 40 hours of field experience through assisting in surveys for the CRF during which positive identification is made;
6) Have familiarity with suitable habitats for the species and be able to identify the major vegetative components of communities in which California red-legged frog surveys or

research may be conducted.

7) Have familiarity with and be able to identify native and non-native amphibians that may co-occur with the listed species.

B. Survey Periods

Surveys may begin anytime during January and should be completed by the end of September. Multiple survey visits conducted throughout the survey-year (January through September) increases the likelihood of detecting the various life stages of the CRF. For example, adult frogs are most likely to be detected at night between January 1 and June 30, somewhere in the vicinity of a breeding location, whereas, sub-adults are most easily detected during the day from July 1 through September 30.

Due to the geographic and yearly variation in egg laying dates, it is not possible to specify a range of dates that is appropriate for egg surveys throughout the range of the CRF. The following table summarizes the best approximated times to survey for CRF egg masses.

Geographic Area	Best Survey Period*
Northern California along the coast and interior to the Coast Range (north of Santa Cruz County)	January 1 and February 28
Southern California along the coast and interior through the Coast Range (south of, and including Santa Cruz County)	February 25 and April 30
Sierra Nevada Mountains and other high-elevation locations	Should not begin before April 15

Site specific conditions may warrant modifications to the timing of survey periods, modifications must be made with the Service's approval prior to conducting the surveys.

Survey Methodology

This Guidance recommends a total of **up to** eight (8) surveys to determine the presence of CRF at or near a project site. Two (2) day surveys and four (4) night surveys are recommended during the breeding season; one (1) day and one (1) night survey is recommended during the non-breeding season. Each survey must take place at least seven (7) days apart. At least one survey must be conducted prior to August 15th. The survey period must be over a minimum period of 6 weeks (*i.e.*, the time between the first and last survey must be at least 6 weeks). Throughout the species' range, the non-breeding season is defined as between July 1 and September 30.

If CRF are identified at any time during the course of surveys, no additional surveys will be conducted in the area, unless the surveying effort is part of a Service-approved project to determine actual numbers of frogs at a site.

The following methodology shall be followed unless otherwise specified, or approved by the

appropriate Service Fish and Wildlife Office:

1) Upon arrival at the survey site, surveyors should listen for a few minutes for frogs calling, prior to disturbing the survey site by walking or looking for eye shine using bright lights. If CRF calls are identified, the surveyor should note this information on the survey data sheet and note the approximate location of the call. Once the survey begins, the surveyor should pay special attention to the area where the call originated in an attempt to visually identify the frog.

2) The most common method of surveying for CRF is the visual-encounter survey. This survey is conducted either during daylight hours or at night by walking entirely around the pond or marsh or along the entire length of a creek or stream while repeatedly scanning for frogs. This procedure allows one to scan each section of shore from at least two different angles. Surveyors should begin by first working along the entire shoreline, then by entering the water (if necessary and no egg masses would be crushed or disturbed), and visually scanning all shoreline areas and all aquatic habitats identified in the site assessment. Generally, surveyors shall focus on all open water to at least 2 meters (6.5 feet) up the bank. When wading, surveyors must take maximum care to avoid disturbing sediments, vegetation, or larvae. When walking on the bank, surveyors shall take care to not crush rootballs, overhanging banks, and stream-side vegetation that might provide shelter for frogs. Surveys must cover the entire area, otherwise the remaining survey area must be surveyed the next day/night that weather conditions allow (both visits would constitute one day/night survey).

3) Day surveys may be conducted on the same day as a night survey.

   The main purpose of day surveys during the breeding season is to look for larvae, metamorphs, and egg masses; the main purpose of day surveys during the non-breeding season is to look for metamorphosing sub-adults, and non-breeding adults. Daytime surveys shall be conducted between one hour after sunrise and one hour before sunset.

4) Night surveys

   The main purpose of night surveys is to identify and locate adult and metamorphosed frogs. Conditions and requirements for conducting night surveys are as follows:

   A. Night surveys must commence no earlier than one (1) hour after sunset.
   B. Due to diminished visibility, surveys should not be conducted during heavy rains, fog, or other conditions that impair the surveyor's ability to accurately locate and identify frogs.
   C. Nighttime surveys shall be conducted with a Service-approved light such as a Wheat Lamp, Nite Light, or sealed-beam light that produces less than 100,000 candle watt. Lights that the Service does not accept for surveys are lights that are either too dim or too bright. For example, Mag-Light-type lights and other

types of flashlights that rely on 2 or 4 AA's/AAA's, 2 C's or 2 D batteries. Lights with 100,000 candle watt or greater are too bright and also would not meet Service requirements.

D. The Service approved light must be held at the surveyor's eye level so that the frog's eye shine is visible to the surveyor.
E. The use of binoculars is a must in order to effectively see the eye shine of the frogs. Surveys conducted without the use of binoculars may call in to question the validity of the survey.

5) Weather conditions.

Weather and visibility conditions must be consistent throughout the duration of the survey; if weather conditions become unsuitable, the survey must be completed at another time when conditions are better suited to positively locating and identifying frogs. Suitable conditions are as follows:

A. Air temperature at the survey site must be at least 10 degrees Celsius (50 degrees Fahrenheit). Frogs are less likely to be active when temperatures are below 10 degrees Celsius (50 degrees Fahrenheit).
B. Wind speed must not exceed 8 kilometers/hour (5 miles/hour) at the survey site. High wind speeds affect temperatures and the surveyor's ability to hear frogs calling.
C. Surveys must be conducted under clear to partly cloudy skies (high clouds are okay) but not under dense fog or during heavy rain, as stated above. Surveys may be conducted during light rains.

Surveyors should carefully consider weather conditions prior to initiating a survey. Ask yourself, "Can I collect accurate, reliable data under the existing weather conditions" prior to proceeding with the survey. Weather conditions will be taken into account when the data is reviewed by the appropriate Service Fish and Wildlife Service Office.

6) Decontamination of equipment

In an effort to minimize the spread of terrestrial and aquatic pathogens, all aquatic survey equipment including chest waders, wet suits, float tubes, kayaks, shall be decontaminated before entering potential CRF habitat using the guidelines in Appendix B. Careful attention shall be taken to remove all dirt from boots, chest waders, wetsuits, float tubes, kayaks, and other equipment before placing equipment into the water.

7) Unidentified larvae, sub-adults, and adults

If the larval life stage is the only life stage detected and the larvae are not identified to species (or similarly, if sub-adult or adult frogs are observed but not identified to

species), the surveyor must either return to the habitat to identify the frog in another life stage or obtain the appropriate permit (*e.g.*, section 10(a)(1)(A) permit) authorization allowing the surveyor to handle CRF and larvae. In order for the Service to consider a survey to be complete, all frogs encountered must be accurately identified.

8) Reporting results of the surveys

A species survey report shall be provided to the appropriate Fish and Wildlife Office for review. Reports should include, but are not limited to, the following information:

1. Copies of the data sheets provided at Appendix E;

2. Copies of field notes and all other supporting documentation including:

    A. Photographs of all CRF observed during the survey and of the habitat where each individual was located, if possible without harming or harassing the individual;
    B. A map of the site showing the location of any species detected during the survey. Maps shall be either copies of those portions of the U.S. Geological Service 7.5-minute quadrangle map(s) *or* geographic information system (GIS) data;

Based on the information provided in the site assessment report and the survey results, the Service will provide guidance on how CRF issues should be addressed through the section 7 or section 10 processes.

All information on CRF distribution resulting from field surveys shall be sent to the California Natural Diversity Database (CNDDB). CNDDB forms shall be completed, as appropriate, for each listed species identified during the survey(s) and submitted to the California Department of Fish and Game, Wildlife Habitat Data Analysis Branch, 1807 13th Street, Suite 202, Sacramento, California 95814, with copies submitted to the appropriate Service Fish and Wildlife Office. Each form sent to the CDFG shall have an accompanying 1:24,000 scale USGS map (or an exact scale photocopy of the appropriate portion(s) of the map) -or- Global Information System (GIS) data coverage of the site. Copies of the form can be obtained from the CDFG at the above address (telephone: 916-324-3812) or online at: http://www.dfg.ca.gov/whdab/html/animals.html. Additional information about the CNDDB is available in Appendix C.

The Service may not accept the results of field surveys conducted under this Guidance for any of the following reasons:

A. if the appropriate Service Fish and Wildlife Office was not contacted to review the results of the site assessment prior to field surveys being conducted;
B. if field surveys were conducted in a manner inconsistent with this Guidance or with

survey methods not previously approved by the Service;

C. if field surveys were incomplete;
D. if surveyors were not adequately qualified to conduct the surveys;
E. if the reporting requirements, including submission of CNDDB forms, were not fulfilled.

IV. Service Contacts

There are three Service Fish and Wildlife Offices within the range of the CRF (see Map 1). The appropriate office to contact regarding site assessments or survey authorization depends on the location where the surveys are to be conducted.

For project sites and land use activities in Santa Cruz, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, portions of Los Angeles and San Bernardino Counties outside of the Los Angeles Basin, and portions of Kern, Inyo and Mono Counties east of the Sierra Crest and south of Conway Summit, contact:

Ventura Fish and Wildlife Office,
2493 Portola Road, Suite B
Ventura, California, 93003
(805/644-1766).

For project sites and land use activities in all other areas of the State south of the Transverse Ranges, contact:

Carlsbad Fish and Wildlife Office
Attn: Recovery Permit Coordinator
6010 Hidden Valley Road
Carlsbad, California, 92009
(760/431-9440).

For project sites and land use activities in all other areas of the State, contact:

Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825
(916/414-6600).
(916/414-6713, fax)

For information on section 10(a)(1)(A) recovery permits, contact:

Regional Office,
Eastside Federal Complex
911 N.E., 11th Avenue
Portland, Oregon 97232-4181
(503/231-6241)

* These are independent offices overlapping with the Sacramento Fish and Wildlife Office. Their work primarily focuses on salmonid restoration, fishery monitoring and Forest Plan Implementation.

Map 1. Map of California showing jurisdictional boundaries of Service Fish and Wildlife Offices.

References

Davidson, C. 1995. Frog and toad calls of the Pacific Coast: Vanishing Voices. Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, New York. 27 pp. +1 cassette.

Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, New York, New York. 533 pp.

Wright, A.H. and A.A. Wright. 1949. Handbook of frogs and toads of the United States and Canada. Third Edition. Comstock Publishing Company, Ithaca, New York. xii+640 pp.

Appendix A.
California red-legged frog identification and ecology.

1. Identification

The following information may aid surveyors in the identification of California red-legged frogs and similar species. However, all surveyors are expected to consult field guides (Wright and Wright 1949; Davidson 1995; Stebbins 2003) for further information.

General Description
The California red-legged frog (*Rana aurora draytonii*), is a relatively large aquatic frog ranging from 4 to 13 centimeters (1.5 to 5 inches) from the tip of the snout to the vent. From above, the California red-legged frog can appear brown, gray, olive, red or orange, often with a pattern of dark flecks or spots. The skin usually does not look rough or warty. The back of the California red-legged frog is bordered on either side by an often prominent dorsolateral fold of skin running from the eye to the hip. The hindlegs are well-developed with large webbed feet. A cream, white, or orange stripe usually extends along the upper lip from beneath the eye to the rear of the jaw. The undersides of adult California red-legged frogs are white, usually with patches of bright red or orange on the abdomen and hindlegs. The groin area can show a bold black mottling with a white or yellow background.

Adults
Positive diagnostic marks should be used to accurately distinguish California red-legged frogs from other species of frogs that may be observed. A positive diagnostic mark is an attribute of the animal that will not be found on any other animal likely to be encountered at the same locality. The following features are positive diagnostic marks that, if observed, will distinguish California red-legged frogs from foothill yellow-legged frogs (*Rana boylii)* and bullfrogs *(Rana catesbeiana)*:

a. Prominent dorsolateral folds (thick upraised fold of skin running from eye to hip) on any frog greater than 5 centimeters (2 inches) long from snout to vent. Young yellow-legged frogs can show reddish folds; these usually fade as the frogs mature.

b. Bright red dorsum.

c. Well defined stripe as described above running along upper lip.

Since California red-legged frogs are often confused with bullfrogs, surveyors should note those features that might be found on bullfrogs that will rarely be observed on California red-legged frogs. These features are:

a. Absence of the dorsolateral fold.
b. Bright yellow on throat.
c. Uniform bright green snout.
d. Tympanum (ear disc) distinct and much larger than eye.

Please note that some frogs may lack all of the above characteristics given for both California red-legged frogs and bullfrogs. Surveyors should regard such frogs as unidentified, unless it is clearly identified as another species.

California red-legged frogs are cryptic because their coloration tends to help them blend in with their surroundings, and they can remain immobile for great lengths of time. When an individual California red-legged frog is disturbed, it may jump into the water with a distinct "plop." The California red-legged frog may do this either when the surveyor is still distant or when a surveyor is very near. Bullfrogs exhibit similar behavior but will often emit a "squawk" as they dive into the water. Because a California red-legged frog is unlikely to make such a sound, a "squawk" from a fleeing frog will be considered sufficient to positively identify the frog as a bullfrog.

Larvae
Tadpoles may be trapped and handled only by those with a valid 10(a)1(A) permit. California red-legged frog larvae range from 14 to 80 millimeters (0.5 to 3.25 inches) in length. They are greenish to generally brownish color with darker marbling and lack distinct black or white spotting or speckling. Large California red-legged frog larvae often have a wash of red coloration on their undersides and a very small single row of evenly spaced whitish or gold flecks along the side where the dorsolateral fold will develop. Other features to look for to identify California red-legged frog larvae include: eyes set well in from the outline of the head (contrasts with treefrogs (*Hyla* spp.)), oral papillae on both the sides of the mouth and the bottom of the mouth (contrasts with *Bufo* spp.), well developed oral papillae on the sides of the mouth (contrasts with other subspecies of red-legged frogs (*Rana aurora* spp.) and spadefoot toads (*Scaphiopus* spp.)), generally mottled body and tail with few or no distinct black spots on tail fins (contrasts with bullfrogs), and two to three tooth rows on the top and bottom (contrasts with foothill yellow-legged frogs).

Eggs
California red-legged frogs breed during the winter and early spring from as early as late November through April and May. Adults engage in courtship behaviors that result in the female depositing from 2,000 to 6,000 eggs, each measuring between 2 and 3 millimeter (0.1 inches). California red-legged frog eggs are typically laid in a mass attached to emergent vegetation near the surface of the water, where they can be easily dislodged. However, egg masses have been detected lying on the bottom of ponds. The egg mass is well defined and

about the size of a softball. Eggs hatch within 6 to 14 days after deposition at which time the newly hatched larvae are delicate and easily injured or killed. California red-legged frog larvae transform into juvenile frogs in 3.5 to 7 months.

During the time that red-legged frog egg surveys are conducted, other amphibian eggs may be found including those of Pacific treefrogs, spadefoot toads, California tiger salamanders, and newts. Bullfrogs and foothill yellow-legged frogs lay their eggs later in the season. Field guides should be consulted for additional information on egg identification.

2. Habitat

California red-legged frogs occur in different habitats depending on their life stage, the season, and weather conditions. Rangewide, and even within local populations, there is much variation in how frogs use their environment; in some cases, they may complete their entire life cycle in a particular habitat (*i.e.,* a pond is suitable for all life stages), and in other cases, they may seek multiple habitat types (U.S. Fish and Wildlife Service 2002).

Breeding habitat
All life history stages are most likely to be encountered in and around breeding sites, which are known to include coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. California red-legged frog eggs are usually found in ponds or in backwater pools in creeks attached to emergent vegetation such as *Typha* and *Scirpus*. However, they have been found in areas completely denuded of vegetation. Creeks and ponds where California red-legged frogs are found most often have dense growths of woody riparian vegetation, especially willows (*Salix* spp.) (Hayes and Jennings 1988). The absence of *Typha, Scirpus,* and *Salix* at an aquatic site does not rule out the possibility that the site provides habitat for California red-legged frogs, for example stock ponds often are lacking emergent vegetation yet they provide suitable breeding habitat. California red-legged frog larvae remain in these habitats until metamorphosis in the summer months (Storer 1925; Wright and Wright 1949). Young California red-legged frogs can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds.

Summer habitat
California red-legged frogs often disperse from their breeding habitat to forage and seek summer habitat if water is not available. In the summer, California red-legged frogs are often found close to a pond or a deep pool in a creek where emergent vegetation, undercut banks, or semi-submerged rootballs afford shelter from predators. California red-legged frogs may also take shelter in small mammal burrows and other refugia on the banks up to 100 meters from the water any time of the year and can be encountered in smaller, even ephemeral bodies of water in a variety of upland settings (Jennings and Hayes 1994; U.S. Fish and Wildlife Service 2002).

Upland habitat
California red-legged frogs are frequently encountered in open grasslands occupying seeps and

springs. Such bodies may not be suitable for breeding but may function as foraging habitat or refugia for dispersing frogs. During periods of wet weather, starting with the first rains of fall, some individuals make overland excursions through upland habitats (U.S. Fish and Wildlife Service 2002).

3. Movement

California red-legged frogs may move up to 3 kilometers (1.88 miles) up or down drainages and are known to wander throughout riparian woodlands up to several dozen meters from the water (Rathbun *et al.* 1993). Dispersing frogs have been recorded to cover distances from 0.40 kilometer (0.25 mile) to more than 3.2 kilometers (2 miles) without apparent regard to topography, vegetation type, or riparian corridors (Bulger 1998). California red-legged frogs have been observed to make long-distance movements that are straight-line, point to point migrations rather than using corridors for moving in between habitats. Dispersal distances are considered to be dependent on habitat availability and environmental conditions. On rainy nights California red-legged frogs may roam away from aquatic sites as much as 1.6 kilometers (1 mile). California red-legged frogs will often move away from the water after the first winter rains, causing sites where California red-legged frogs were easily observed in the summer months to appear devoid of this species. Additionally, California red-legged frogs will sometimes disperse in response to receding water which often occurs during the driest time of the year.

References for Appendix A

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Storer, T.1925. A synopsis of the Amphibia of California. University of California Publications in Zoology 27:1-342.

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Wright, A.H. and A.A. Wright. 1949. Handbook of frogs and toads of the United States and Canada. Third Edition. Comstock Publishing Company, Ithaca, New York. xii+640 pp.

Appendix B.
Recommended Equipment Decontamination Procedures

In an effort to minimize the spread of pathogens that may be transferred as result of activities, surveyors should follow the guidance outlined below for disinfecting equipment and clothing after entering a pond and before entering a new pond, unless the wetlands are hydrologically connected to one another:

i. All organic matter should be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water or potentially contaminated sediments. Cleaned items should be rinsed with clean water before leaving each study site.

ii. Boots, nets, traps, hands, *etc*. should be scrubbed with either a 75% ethanol solution, a bleach solution (0.5 to 1.0 cup per 1.0 gallon of water), Quat-128™ (1:60), or a 6% sodium hypochlorite 3 solution. Equipment should be rinsed clean with water between study sites. Cleaning equipment in the immediate vicinity of a pond or wetland should be avoided (*e.g.*, clean in an area at least 100 feet from aquatic features). Care should be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

iii. Used cleaning materials (liquids, *etc.*) should be disposed of safely, and if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

iv. Additionally, the surveyors shall implement the following when working at sites with known or suspected disease problems: disposable gloves should be worn and changed between handling each animal. Gloves should be wetted with water from the site or distilled water prior to handling any amphibians. Gloves should be removed by turning inside out to minimize cross-contamination.

Appendix C.
General instructions for filling out CNDDB field survey forms

The Natural Diversity Data Base (NDDB) is the largest, most comprehensive database of its type in the world. It presently contains more than 33,000 site specific records on California's rarest plants, animals, and natural communities. The majority of the data collection effort for this has been provided by an exceptional assemblage of biologists throughout the state and the west. The backbone of this effort is the field survey form. We are enclosing copies of Natural Diversity Data Base (NDDB) field survey forms for species and natural communities. We would greatly appreciate you recording your field observations of rare, threatened, endangered, or sensitive species and natural communities
(elements) and sending them to us on these forms.

We are interested in receiving forms on elements of concern to us; refer to our free publications: *Special Plants Lis*t, *Special Animals List*, and *Natural Communities List* for lists of which elements these include. Reports on multiple visits to sites that already exist in the NDDB are as important as new site information as it helps us track trends in population/stand size and condition. Naturally, we also want information on new sites. We have enclosed an example of a field survey form that includes the information we like to see. It is especially important to include a xeroxed portion of a USGS topographic quad with the population/stand outlined or marked (see back of enclosed example).

Without the map, your information will be mapped less accurately, as written descriptions of locations are frequently hard to interpret. Do not worry about filling in every box on the form; only fill out what seems most relevant to your site visit. Remember that your name and telephone number are very important in case we have any questions about the form.

If you are concerned about the sensitivity of the site, remember that the NDDB can label your element occurrence "Sensitive" in the computer, thus restricting access to that information. The NDDB is only as good as the information in it, and we depend on people like you as the source of that information. Thank you for your help in improving the NDDB.

Copies of the NDDB form can be obtained from the CDFG at the above address (telephone: 916-324-3812) *or* online at: http://www.dfg.ca.gov/whdab/html/animals.html.

Appendix D.
California Red-legged Frog Habitat Site Assessment Data Sheet

This data sheet is to assist in the data collection of California red-legged frog habitat in the vicinity of projects or other land use activities, following the August 2005, *Revised Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (Guidance), issued by the U.S. Fish and Wildlife Service. Prior to collecting the data requested on this form, the biologist should be familiar with and understand the Guidance.

The "Site Assessments" section of the Guidance details the data needed to complete a site assessment. When submitting a complete site assessment to the Service (one that has been done following the Guidance), one data sheet should be included for each aquatic habitat identified. If multiple aquatic habitats are identified within the project site, then multiple data sheets should be completed. A narrative description of the aquatic, riparian, and upland habitats should be provided to characterize the breeding habitat within the project site and the breeding and dispersal habitat within 1.6 kilometers (1 mile) of the project site. In addition to completing this data sheet, field notes, photographs, and maps should be provided to the appropriate Fish and Wildlife Service Office, as requested in the "Site Assessments" section of the Guidance.

Appendix D.
California Red-legged Frog Habitat Site Assessment Data Sheet

Site Assessment reviewed by_____ _____ _____
(FWS Field Office) (date) (biologist)

Date of Site Assessment: _____
(mm/dd/yyyy)

Site Assessment Biologists: _____ _____
(Last name) (first name) (Last name) (first name)

_____ _____
(Last name) (first name) (Last name) (first name)

Site Location: _____
(County, General location name, UTM Coordinates or Lat./Long. or T-R-S).

****ATTACH A MAP** (include habitat types, important features, and species locations)**

Proposed project name: _____
Brief description of proposed action:

1) Is this site within the current or historic range of the CRF (circle one)? YES NO

2) Are there known records of CRF within 1.6 km (1 mi) of the site (circle one)? YES NO
If yes, attach a list of all known CRF records with a map showing all locations.

GENERAL AQUATIC HABITAT CHARACTERIZATION

(if multiple ponds or streams are within the proposed action area, fill out one data sheet for each)

POND:

Size: _____ Maximum depth: _____

Vegetation: emergent, overhanging, dominant species: _____
_____
_____

Substrate: _____
_____

Perennial or Ephemeral *(circle one).* If ephemeral, date it goes dry: _____

Appendix D.
California Red-legged Frog Habitat Site Assessment Data Sheet

STREAM:

Bank full width: _____
Depth at bank full: _____
Stream gradient: _____

Are there pools (circle one)? YES NO

If yes,

Size of stream pools: _____
Maximum depth of stream pools: _____

Characterize non-pool habitat: run, riffle, glide, other: _____
_____
_____

Vegetation: emergent, overhanging, dominant species: _____
_____
_____

Substrate: _____
_____

Bank description: _____
_____
_____

Perennial or Ephemeral *(circle one).* If ephemeral, date it goes dry: _____

Other aquatic habitat characteristics, species observations, drawings, or comments:

Necessary Attachments:

1. All field notes and other supporting documents
2. Site photographs
3. Maps with important habitat features and species location

Appendix E.
California Red-legged Frog Survey Data Sheet

This data sheet is to assist in the data collection during surveys for California red-legged frogs in areas with potential habitat. This data sheet is intended to assist in the preparation of a final report on the field surveys as detailed in the August 2005, *Revised Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (Guidance) issued by the U.S. Fish and Wildlife Service (Service). Before completing this data sheet, a site assessment should have been conducted using the Guidance and the Service should have been contacted to determine whether surveys are required. Prior to collecting the data requested on this form, the biologist should be familiar with and understand the Guidance. To avoid and minimize the potential of harassment to California red-legged frogs, all survey activities shall cease once an individual California red-legged frog has been identified in the survey area, unless prior approval has been received from the appropriate Service Fish and Wildlife Office. The Service shall be notified within three (3) working days by the surveyor once a California red-legged frog is detected, at which point the Service will provide further guidance. Surveys should take place in consecutive breeding/non-breeding seasons (*i.e.*, the entire survey period, including breeding and non-breeding surveys should not exceed 9 months). It is important that both the breeding and non-breeding survey be conducted during the time period specified in the Guidance. Site specific conditions may warrant modifications to the timing of survey periods, modifications must be made with the Service's approval. The survey consists of two (2) day and four (4) night surveys during the breeding season and one (1) day and one (1) night surveys during the non-breeding season.

All California red-legged frog life stages should be surveyed for. Surveyors may detect larvae but not be able to identify this life stage to species as handling any life stage of the California red-legged frog necessitates a valid 10(a)(1)(A) permit. If the larval life stage is the only life stage detected and the larvae are not identified to species, the surveyor must either return to the habitat to identify the frog in another life stage or have a valid 10(a)(1)(A) permit allowing the surveyor to handle California red-legged frogs and larvae. In order for the Service to consider a survey to be complete, all frogs encountered must be accurately identified.

Appendix E.
California Red-legged Frog Survey Data Sheet

Survey results reviewed by_____ _____ _____
(FWS Field Office) (date) (biologist)

Date of Survey: _____ **Survey Biologist:** _____
(mm/dd/yyyy) (Last name) (first name)

Survey Biologist: _____
(Last name) (first name)

Site Location: _____
(County, General location name, UTM Coordinates or Lat./Long. or T-R-S).

****ATTACH A MAP** (include habitat types, important features, and species locations)**

Proposed project name: _____
Brief description of proposed action:

Type of Survey (circle one): **DAY NIGHT BREEDING NON-BREEDING**

Survey number (circle one): **1 2 3 4 5 6 7 8**

Begin Time: _____ **End Time:** _____

Cloud cover: _____ **Precipitation:** _____

Air Temperature: _____ **Water Temperature:** _____

Wind Speed: _____ **Visibility Conditions:** _____

Moon phase: _____ **Humidity:** _____

Description of weather conditions: _____
_____

Brand name and model of light used to conduct surveys: _____

Were binoculars used for the surveys (circle one)**? YES NO**
Brand, model, and power of binoculars: _____

Appendix E.
California Red-legged Frog Survey Data Sheet

AMPHIBIAN OBSERVATIONS

Species	# of indiv.	Observed (O) Heard (H)	Life Stages	Size Class	Certainty of Identification

Describe potential threats to California red-legged frogs observed, including non-native and native predators such as fish, bullfrogs, and raccoons: _____

_____

_____

_____

_____

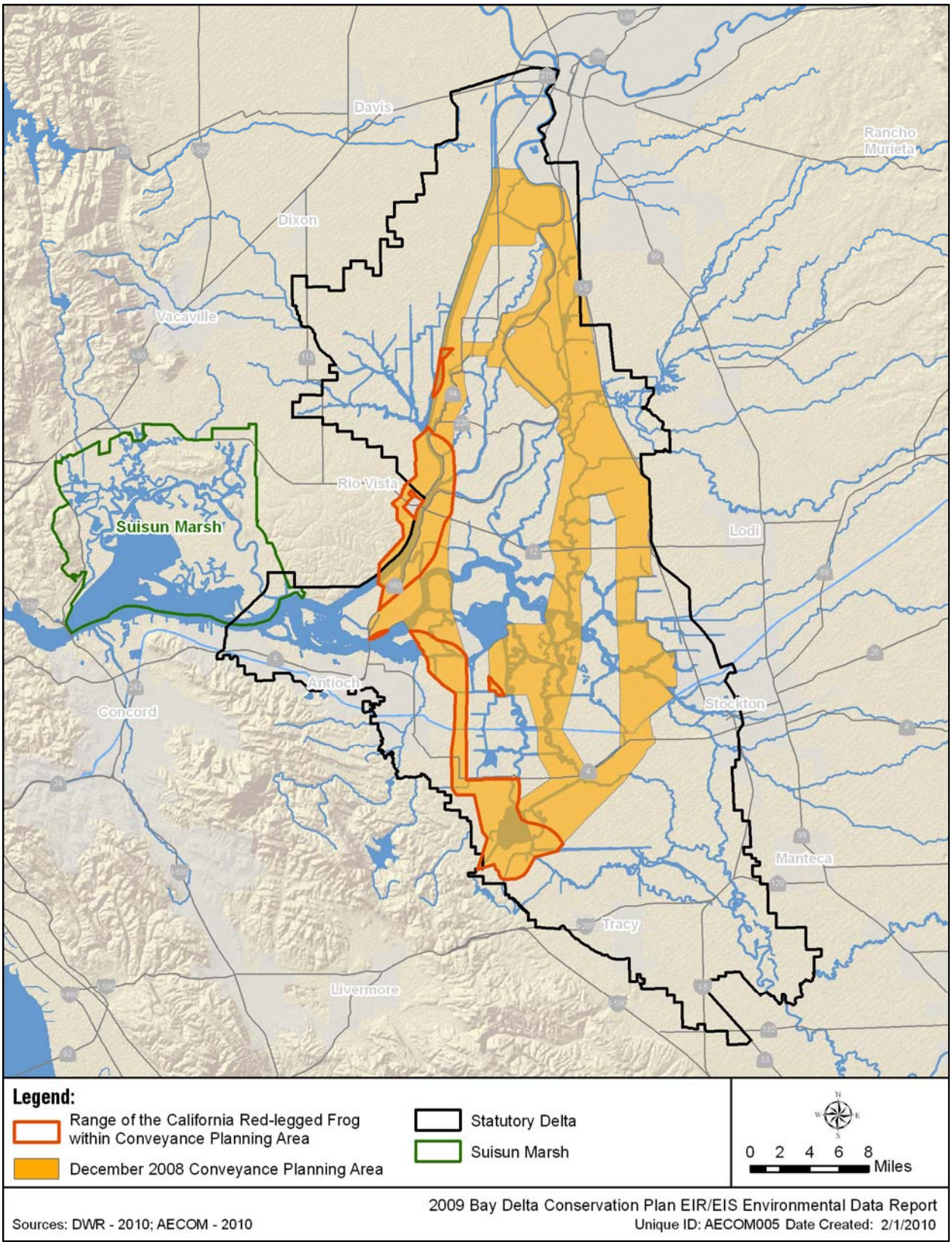
Other notes, observations, comments, *etc.*

Necessary Attachments:

4. All field notes and other supporting documents
5. Site photographs
6. Maps with important habitat features and species locations

APPENDIX 2.5B

Map of California Red-Legged Frog Range in the DHCCP Conveyance Planning Area


Davis
Rancho Murieta
Dixon
Vacaville
Rio Vista
Suisun Marsh
Lodi
Antioch
Concord
Stockton
Manteca
Tracy
Livermore
Legend:
Range of the California Red-legged Frog within Conveyance Planning Area
December 2008 Conveyance Planning Area
Statutory Delta
Suisun Marsh
0 2 4 6 8
Miles
Sources: DWR - 2010; AECOM - 2010
2009 Bay Delta Conservation Plan EIR/EIS Environmental Data Report
Unique ID: AECOM005 Date Created: 2/1/2010

APPENDIX 3.3A

Boat Type Photo Reference Sheets

TYPICAL SMALLER FISHING BOATS (F1)

- Generally 20 feet or smaller
- Commonly aluminum boats (see top two photos)
- Usually open (no cabin), may have cloth top
- Bass boats and jon boats are low profile, with high pole-mounted seats

TYPICAL LARGE FISHING BOATS (F2)

- Generally 20 feet or larger
- Commonly have center console
- Bigger boats have cabin (partially or fully enclosed)
- Look for rod holders, landing nets





TYPICAL CABIN CRUISERS (C)

- Larger boats, generally 25 to 30 feet or larger
- High-sided hull with windows on cabin visible

(these boats have larger interiors with sleeping berths and toilets)






TYPICAL RUNABOUTS (R) – includes ski boats, wake board boats

- Generally 16–20 feet in length; no larger than 25 feet
- Usually fiberglass, full windshield (often split with pass-through to front of boat)
- Most are inboards, may also be outboard
- Some may have small “cuddy cabin” with window (see top left photo)

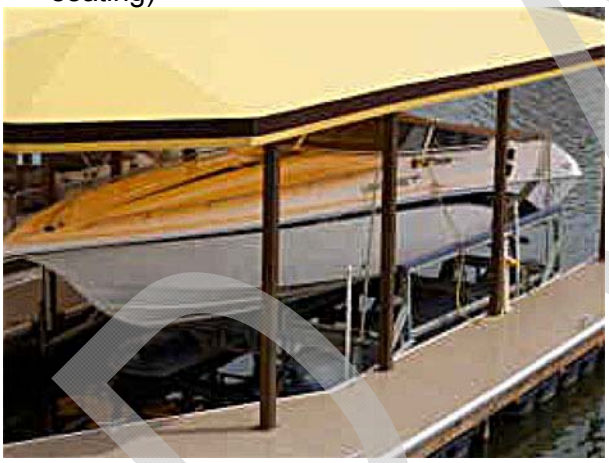
"OTHER" TYPES:

PONTOON BOAT

- Aluminum pontoons
- Usually open deck with large metal or cloth top

OFF SHORE BOAT

- Large, fast runabouts/racing boats
- Can identify by large size (25–40 feet), sleek shape with long enclosed bow (no forward seating)



Additional "Other" types of boats that may be seen in the Delta:

- Deck boats (like a pontoon on top, but with single hull rather than pontoons)
- Kayaks or other similar paddle-powered craft
- Inflatables (usually small in size, with outboard motor)
- Work boats used by DWR, or CA agencies (look for state insignia on boat)
- Coast Guard and Sheriff patrol boats

(describe any of these types or other uncommon boats observed on the form under "comments")

APPENDIX 3.3B

Photographs of Common Boat Types Observed on Rivers and Sloughs in the Vicinity of Proposed Barriers

Fishing boat (small)

Runabout and Personal Watercraft

Cabin cruiser

Sailboat

Off-shore boat

1