Appendix C: Vegetation and Wildlife, Part 1

CALIFORNIA DEPARTMENT OF FISH and WILDLIFE RareFind

Query Summary:
Quad IS (Carmichael (3812153) OR Citrus Heights (3812163) OR Clarksville (3812161) OR Folsom (3812162) OR Pilot Hill (3812171) OR Rocklin (3812172) OR Sacramento East (3812154) OR Sacramento West (3812155))

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CNDDB Element Query Results

Scientific Name	Common Name	Taxonomic Group	Element Code	Total Occs	Returned Occs	Federal Status	State Status	Global Rank	State Rank	CA Rare Plant Rank	Other Status	Habitats
Accipiter cooperii	Cooper's hawk	Birds	ABNKC12040	107	4	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Cismontane woodland, Riparian forest, Riparian woodland, Upper montane coniferous forest
Agelaius tricolor	tricolored blackbird	Birds	ABPBXB0020	859	28	None	Candidate Threatened	G2G3	S1S2	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Freshwater marsh, Marsh & swamp, Swamp, Wetland
Andrena blennospermatis	Blennosperma vernal pool andrenid bee	Insects	IIHYM35030	15	1	None	None	G2	S2	null	null	Vernal pool
Andrena subapasta	an andrenid bee	Insects	IIHYM35210	5	2	None	None	G1G2	S1S2	null	null	null
Antrozous pallidus	pallid bat	Mammals	AMACC10010	406	1	None	None	G5	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFS_S-Sensitive, WBWG_H-High Priority	Chaparral, Coastal scrub, Desert wash, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Riparian woodland, Sonoran desert scrub, Upper montane coniferous forest, Valley & foothill grassland
Aquila chrysaetos	golden eagle	Birds	ABNKC22010	312	3	None	None	G5	S3	null	BLM_S-Sensitive, CDF_S-Sensitive, CDFW_FP-Fully Protected, CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Broadleaved upland forest, Cismontane woodland, Coastal prairie, Great Basin grassland, Great Basin scrub, Lower montane coniferous forest, Pinon & juniper woodlands, Upper montane coniferous forest, Valley & foothill grassland
Archoplites interruptus	Sacramento perch	Fish	AFCQB07010	5	1	None	None	G2G3	S1	null	AFS_TH-Threatened, CDFW_SSC-Species of Special Concern	Aquatic, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters
Ardea alba	great egret	Birds	ABNGA04040	37	3	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh &

												swamp, Riparian forest, Wetland
Ardea herodias	great blue heron	Birds	ABNGA04010	137	7	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh & swamp, Riparian forest, Wetland
Astragalus tener var. ferrisiae	Ferris' milk-vetch	Dicots	PDFAB0F8R3	18	1	None	None	G2T1	S1	1B.1	BLM_S-Sensitive	Meadow & seep, Valley & foothill grassland, Wetland
Athene cunicularia	burrowing owl	Birds	ABNSB10010	1914	21	None	None	G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Coastal prairie, Coastal scrub, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran desert scrub, Valley & foothill grassland
Balsamorhiza macrolepis	big-scale balsamroot	Dicots	PDAST11061	43	1	None	None	G2	S2	1B.2	BLM_S-Sensitive, USFS_S-Sensitive	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Banksula californica	Alabaster Cave harvestman	Arachnids	ILARA14020	1	1	None	None	GH	SH	null	null	Limestone
Bombus occidentalis	western bumble bee	Insects	IIHYM24250	282	1	None	None	G2G3	S1	null	USFS_S-Sensitive, XERCES_IM-Imperiled	null
Branchinecta lynchi	vernal pool fairy shrimp	Crustaceans	ICBRA03030	751	22	Threatened	None	G3	S3	null	IUCN_VU-Vulnerable	Valley & foothill grassland, Vernal pool, Wetland
Branchinecta mesovallensis	midvalley fairy shrimp	Crustaceans	ICBRA03150	126	6	None	None	G2	S2S3	null	null	Vernal pool, Wetland
Buteo regalis	ferruginous hawk	Birds	ABNKC19120	107	1	None	None	G4	S3S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Great Basin scrub, Pinon & juniper woodlands, Valley & foothill grassland
Buteo swainsoni	Swainson's hawk	Birds	ABNKC19070	2409	65	None	Threatened	G5	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Riparian forest, Riparian woodland, Valley & foothill grassland
Calystegia stebbinsii	Stebbins' morning-glory	Dicots	PDCON040H0	13	1	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Ultramafic
Carex xerophila	chaparral sedge	Monocots	PMCYP03M60	15	1	None	None	G2G3	S2S3	1B.2	null	Chaparral, Cismontane woodland, Lower montane coniferous forest, Ultramafic
Ceanothus roderickii	Pine Hill ceanothus	Dicots	PDRHA04190	8	4	Endangered	Rare	G1	S1	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Ultramafic
Chlorogalum grandiflorum	Red Hills soaproot	Monocots	PMLIL0G020	82	3	None	None	G2	S2	1B.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Lower montane coniferous forest, Ultramafic
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle	Insects	IICOL02106	6	1	None	None	G5TH	SH	null	null	Sand shore
Clarkia biloba ssp. brandegeeae	Brandegee's clarkia	Dicots	PDONA05053	89	9	None	None	G4G5T4	S4	4.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Lower montane coniferous forest

Coccyzus americanus occidentalis	western yellow-billed cuckoo	Birds	ABNRB02022	155	1	Threatened	Endangered	G5T2T3	S1	null	BLM_S-Sensitive, NABCI_RWL-Red Watch List, USFS_S-Sensitive, USFWS_BCC-Birds of Conservation Concern	Riparian forest
Cosumnoperla hypocrena	Cosumnes stripetail	Insects	IIPLE23020	12	4	None	None	G2	S2	null	null	Aquatic
Crocanthemum suffrutescens	Bisbee Peak rush-rose	Dicots	PDCIS020F0	31	9	None	None	G2Q	S2	3.2	null	Chaparral, Ione formation, Ultramafic
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Insects	IICOL48011	271	41	Threatened	None	G3T2	S2	null	null	Riparian scrub
Downingia pusilla	dwarf downingia	Dicots	PDCAM060C0	126	1	None	None	GU	S2	2B.2	null	Valley & foothill grassland, Vernal pool, Wetland
Dumontia oregonensis	hairy water flea	Crustaceans	ICBRA23010	2	1	None	None	G1G3	S1	null	null	Vernal pool
Elanus leucurus	white-tailed kite	Birds	ABNKC06010	162	20	None	None	G5	S3S4	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_LC-Least Concern	Cismontane woodland, Marsh & swamp, Riparian woodland, Valley & foothill grassland, Wetland
Elderberry Savanna	Elderberry Savanna	Riparian	CTT63440CA	4	3	None	None	G2	S2.1	null	null	Riparian scrub
Emys marmorata	western pond turtle	Reptiles	ARAAD02030	1187	9	None	None	G3G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_VU-Vulnerable, USFS_S-Sensitive	Aquatic, Artificial flowing waters, Klamath/North coast flowing waters, Klamath/North coast standing waters, Marsh & swamp, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, South coast flowing waters, South coast standing waters, Wetland
Falco columbarius	merlin	Birds	ABNKD06030	35	1	None	None	G5	S3S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Estuary, Great Basin grassland, Valley & foothill grassland
Fremontodendron decumbens	Pine Hill flannelbush	Dicots	PDSTE03030	10	3	Endangered	Rare	G1	S1	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_UCBBG-UC Berkeley Botanical Garden	Chaparral, Cismontane woodland, Ultramafic
Fritillaria agrestis	stinkbells	Monocots	PMLIL0V010	32	2	None	None	G3	S3	4.2	null	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Galium californicum ssp. sierrae	El Dorado bedstraw	Dicots	PDRUB0N0E7	16	4	Endangered	Rare	G5T1	S1	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Lower montane coniferous forest, Ultramafic
Gratiola heterosepala	Boggs Lake hedge-hyssop	Dicots	PDSCR0R060	94	2	None	Endangered	G2	S2	1B.2	BLM_S-Sensitive	Freshwater marsh, Marsh & swamp, Vernal pool, Wetland
Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	Riparian	CTT61410CA	56	1	None	None	G2	S2.1	null	null	Riparian forest

Haliaeetus leucocephalus	bald eagle	Birds	ABNKC10010	325	4	Delisted	Endangered	G5	S3	null	BLM_S-Sensitive, CDF_S-Sensitive, CDFW_FP-Fully Protected, IUCN_LC-Least Concern, USFS_S-Sensitive, USFWS_BCC-Birds of Conservation Concern	Lower montane coniferous forest, Oldgrowth
Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	Dicots	PDMAL0H0R3	173	1	None	None	G5T2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden	Freshwater marsh, Marsh & swamp, Wetland
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	Insects	IICOL5V010	13	2	None	None	G2?	S2?	null	null	Aquatic, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters
Juncus leiospermus var. ahartii	Ahart's dwarf rush	Monocots	PMJUN011L1	13	1	None	None	G2T1	S1	1B.2	null	Valley & foothill grassland
Lasionycteris noctivagans	silver-haired bat	Mammals	AMACC02010	138	2	None	None	G5	S3S4	null	IUCN_LC-Least Concern, WBWG_M-Medium Priority	Lower montane coniferous forest, Oldgrowth, Riparian forest
Lasiurus cinereus	hoary bat	Mammals	AMACC05030	235	1	None	None	G5	S4	null	IUCN_LC-Least Concern, WBWG_M-Medium Priority	Broadleaved upland forest, Cismontane woodland, Lower montane coniferous forest, North coast coniferous forest
Laterallus jamaicensis coturniculus	California black rail	Birds	ABNME03041	244	1	None	Threatened	G3G4T1	S1	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_NT-Near Threatened, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Brackish marsh, Freshwater marsh, Marsh & swamp, Salt marsh, Wetland
Legenere limosa	legenere	Dicots	PDCAM0C010	78	6	None	None	G2	S2	1B.1	BLM_S-Sensitive	Vernal pool, Wetland
Lepidurus packardi	vernal pool tadpole shrimp	Crustaceans	ICBRA10010	320	28	Endangered	None	G4	S3S4	null	IUCN_EN-Endangered	Valley & foothill grassland, Vernal pool, Wetland
Linderiella occidentalis	California linderiella	Crustaceans	ICBRA06010	430	38	None	None	G2G3	S2S3	null	IUCN_NT-Near Threatened	Vernal pool
Melospiza melodia	song sparrow ("Modesto" population)	Birds	ABPBXA3010	92	2	None	None	G5	S3?	null	CDFW_SSC-Species of Special Concern	null
Navarretia myersii ssp. myersii	pincushion navarretia	Dicots	PDPLM0C0X1	14	1	None	None	G2T2	S2	1B.1	null	Vernal pool, Wetland
Northern Hardpan Vernal Pool	Northern Hardpan Vernal Pool	Herbaceous	CTT44110CA	126	10	None	None	G3	S3.1	null	null	Vernal pool, Wetland
Northern Volcanic Mud Flow Vernal Pool	Northern Volcanic Mud Flow Vernal Pool	Herbaceous	CTT44132CA	7	3	None	None	G1	S1.1	null	null	Vernal pool, Wetland
Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Fish	AFCHA0209K	31	4	Threatened	None	G5T2Q	S2	null	AFS_TH-Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha	chinook salmon - Central Valley spring-run ESU	Fish	AFCHA0205A	13	1	Threatened	Threatened	G5	S1	null	AFS_TH-Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha	chinook salmon - Sacramento River winter-run ESU	Fish	AFCHA0205B	2	1	Endangered	Endangered	G5	S1	null	AFS_EN-Endangered	Aquatic, Sacramento/San Joaquin flowing waters

Orcuttia viscida	Sacramento Orcutt grass	Monocots	PMPOA4G070	12	4	Endangered	Endangered	G1	S1	1B.1	null	Vernal pool, Wetland
Packera layneae	Layne's ragwort	Dicots	PDAST8H1V0	48	10	Threatened	Rare	G2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Ultramafic
Pandion haliaetus	osprey	Birds	ABNKC01010	491	1	None	None	G5	S4	null	CDF_S-Sensitive, CDFW_WL-Watch List, IUCN_LC-Least Concern	Riparian forest
Phalacrocorax auritus	double-crested cormorant	Birds	ABNFD01020	38	1	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Riparian forest, Riparian scrub, Riparian woodland
Pogonichthys macrolepidotus	Sacramento splittail	Fish	AFCJB34020	15	1	None	None	GNR	S3	null	AFS_VU-Vulnerable, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered	Aquatic, Estuary, Freshwater marsh, Sacramento/San Joaquin flowing waters
Progne subis	purple martin	Birds	ABPAU01010	68	10	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Broadleaved upland forest, Lower montane coniferous forest
Rana draytonii	California red-legged frog	Amphibians	AAABH01022	1405	1	Threatened	None	G2G3	S2S3	null	CDFW_SSC-Species of Special Concern, IUCN_VU-Vulnerable	Aquatic, Artificial flowing waters, Artificial standing waters, Freshwater marsh, Marsh & swamp, Riparian forest, Riparian scrub, Riparian woodland, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, South coast flowing waters, South coast standing waters, Wetland
Riparia riparia	bank swallow	Birds	ABPAU08010	297	4	None	Threatened	G5	S2	null	BLM_S-Sensitive, IUCN_LC-Least Concern	Riparian scrub, Riparian woodland
Sagittaria sanfordii	Sanford's arrowhead	Monocots	PMALI040Q0	93	16	None	None	G3	S3	1B.2	BLM_S-Sensitive	Marsh & swamp, Wetland
Spea hammondii	western spadefoot	Amphibians	AAABF02020	449	3	None	None	G3	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_NT-Near Threatened	Cismontane woodland, Coastal scrub, Valley & foothill grassland, Vernal pool, Wetland
Spirinchus thaleichthys	longfin smelt	Fish	AFCHB03010	45	1	Candidate	Threatened	G5	S1	null	CDFW_SSC-Species of Special Concern	Aquatic, Estuary
Symphyotrichum lentum	Suisun Marsh aster	Dicots	PDASTE8470	173	1	None	None	G2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_USDA-US Dept of Agriculture	Brackish marsh, Freshwater marsh, Marsh & swamp, Wetland
Taxidea taxus	American badger	Mammals	AMAJF04010	517	3	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Alkali marsh, Alkali playa, Alpine, Alpine dwarf scrub, Bog & fen, Brackish marsh, Broadleaved upland forest, Chaparral, Chenopod scrub, Cismontane woodland, Closed-cone coniferous forest, Coastal bluff scrub, Coastal dunes,

												Coastal prairie, Coastal scrub, Desert dunes, Desert wash, Freshwater marsh, Great Basin grassland, Great Basin scrub, Interior dunes, Ione formation, Joshua tree woodland, Limestone, Lower montane coniferous forest, Marsh & swamp, Meadow & seep, Mojavean desert scrub, Montane dwarf scrub, North coast coniferous forest, Oldgrowth, Pavement plain, Redwood, Riparian forest, Riparian scrub, Riparian woodland, Salt marsh, Sonoran desert scrub, Sonoran thorn woodland, Ultramafic, Upper montane coniferous forest, Upper Sonoran scrub, Valley & foothill grassland
Thamnophis gigas	giant gartersnake	Reptiles	ARADB36150	347	4	Threatened	Threatened	G2	S2	null	IUCN_VU-Vulnerable	Marsh & swamp, Riparian scrub, Wetland
Valley Needlegrass Grassland	Valley Needlegrass Grassland	Herbaceous	CTT42110CA	45	1	None	None	G3	S3.1	null	null	Valley & foothill grassland
Vireo bellii pusillus	least Bell's vireo	Birds	ABPBW01114	472	2	Endangered	Endangered	G5T2	S2	null	IUCN_NT-Near Threatened, NABCI_YWL-Yellow Watch List	Riparian forest, Riparian scrub, Riparian woodland
Wyethia reticulata	El Dorado County mule ears	Dicots	PDAST9X0D0	25	13	None	None	G2	S2	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Lower montane coniferous forest, Ultramafic

Appendix C: Vegetation and Wildlife, Part 2

Terrestrial Resources

1.1 Background

This section describes the existing terrestrial resources in the lower American River (LAR) and Folsom Reservoir and presents the U.S. Army Corps of Engineers' (USACE) analysis of the effects of the Folsom Dam Water Control Manual (WCM) Update alternatives on these resources. USACE's first task was to identify areas along the LAR that, as per previous observations and studies, were most susceptible to fluctuations in water flow. USACE compared various existing, with-project, and future flow scenarios and used the output to determine the effects at each of the identified susceptible focus sites.

USACE's data sources for the terrestrial assessment included previously reported field observations, analyses, and resource agency input. USACE used this information to determine the specific LAR locations (i.e., focus sites) at which to evaluate the effects of the Folsom WCM alternatives on terrestrial resources.

Figure 1 of Appendix 5B shows the seven terrestrial focus sites along the LAR that USACE selected based on the following four elements: (1) riparian locations identified by the U.S. Fish and Wildlife Service (USFWS) as potential erosion study sites (Appendix 5B, Figure 1); (2) existing mitigation and restoration sites along the LAR (Appendix 5B, Figure 4); (3) mapped locations of occurrences of California Natural Diversity Database (CNDDB) species and communities along the lower-gradient banks of the LAR (Appendix 5B, Figure 3); and (4) stands of valley elderberry longhorn beetle (VELB; *Desmocerus californicus dimorphus*) habitat (i.e., elderberry shrubs; Sambucus species) mapped by Sacramento County (Appendix 5B, Figures 1 and 2).

In addition, USACE identified an eighth focus site to evaluate effects on terrestrial species and habitat within the reservoir itself. In this case, USACE did not select a specific location for use in the evaluation; rather, the evaluation is general to the band of habitat that occurs just above the fluctuation zone of Folsom Reservoir (Appendix 5B, Figure 5). Further descriptions of the LAR focus sites and the reservoir used in this effects assessment are provided below.

1.1.1 Folsom Reservoir

Folsom Dam is a concrete gravity dam on the American River located at the juncture of the north and south forks of the American River. The dam is 340 feet high and 1,400 feet long and is flanked by earthen wing dams. Construction was completed in 1955, and the official opening occurred the following year. The dam and its reservoir, known as Folsom Reservoir or Folsom Lake, are part of the Central Valley Project (CDPR 2016). Below Folsom Reservoir, the river passes through an urbanized area but is buffered by a riparian park, the American River Parkway (Parkway). The dam was built by USACE and transferred to the U.S. Bureau of Reclamation (Reclamation) for operation at the completion of construction.

Figure 5 in Appendix 5B is a vegetation map of Folsom Reservoir. Figure 6 in Appendix 5B is a CNDDB map with elevation contours of Folsom Reservoir. The terrestrial section evaluates the effects of the

Folsom WCM alternatives on habitat types and wildlife species surrounding Folsom Reservoir. The following section briefly describes the vegetation and wildlife found around the reservoir.

1.1.1.1 Vegetation of Folsom Reservoir

Habitats associated with Folsom Reservoir include non-native grassland, blue oak woodland, and mixed oak woodland. Non-native grasslands occur around the reservoir, primarily at the southern end. Folsom Reservoir's rim is surrounded by a barren band (the fluctuation zone) as a result of historic fluctuations in water elevations. The majority of this zone is generally devoid of substantial vegetation, although arroyo willows (*Salix lasiolepis*) and narrow-leaved willows (*Salix exigua*) have established in some areas (USFWS 1991).

The only contiguous riparian vegetation occurs along Sweetwater Creek at the southern end of Folsom Reservoir (USFWS 1991). Fremont cottonwood (*Populus fremontii*) stands occur along upper reaches of creeks, farther away from the reservoir itself (LSA 2003). The three best examples occur along the south fork of the American River: at Sweetwater Creek, Hancock Creek, and Pilot Creek (LSA 2003). The understory along these disturbed creeks is choked with the non-native Himalayan blackberry (*Rubus discolor*), and California grape (*Vitus californica*) blankets the shrub layer. In several cases, these creeks appear to have once been seasonal streams that have become perennial as a result of runoff from surrounding upstream development (LSA 2003).

The Folsom Reservoir shoreline fluctuation zone occurs between the mean annual low and high water elevations (425-foot and 466-foot elevations; Reclamation 2004 and LSA 2003), which correspond with the existing minimum and maximum pool volumes for the reservoir. This zone is subject to extreme fluctuations. During high pool conditions from late winter to mid-spring, this fluctuation zone is partially or fully inundated and has water depths ranging from greater than 1 foot at its upper reaches to less than 20 feet at its lower reaches. During low pool conditions over the rest of the year, the shoreline fluctuation zone has fully desiccated soils along its upper reaches and saturated or near-saturated soil conditions along its lower reaches (LSA 2003). This zone is barren and is generally devoid of vegetation or supports less than 10 percent cover. Areas of deep sand and rock are prevalent in the fluctuation zone (Reclamation 2004). Because the fluctuation zone is virtually devoid of vegetation and the sparse willows that have established in some areas do not form a contiguous riparian community, the fluctuation zone does not have substantial habitat value for wildlife.

The blue oak woodland and mixed oak woodland habitat is located on the upland banks and slopes of the reservoir, above the fluctuation zone, and is dominated by interior live oak (*Quercus wislizenii*), blue oak (*Quercus douglasii*), and foothill pine (*Pinus sabiniana*) with several species of understory shrubs and forbs, including poison oak (*Toxicodendron diversilobum*), manzanita (*Arctostaphylos* sp.), California wild rose (Rosa californica), and lupine (Lupinus sp.). The largest unbroken stands of blue oak woodland are found on the Peninsula section of the reservoir (where the north and south forks of the American River converge; Appendix 5B, Figures 5 and 6) on well-drained, sandy or rocky soil (LSA 2003). Additional blue oak woodlands occur along the lower portion of the south fork of the American River and in scattered patches around the body of the reservoir (LSA 2003).

Non-native grassland consists of wild oats (*Avena fatua*), soft chess brome (*Bromus hordeaceus*), ryegrass (*Lolium multiflorum*), mustard (*Brassica* sp.), and foxtail (*Hordeum murinum* ssp. *leporinum*). Herbaceous forbs and wildflowers present in this vegetation include both native species such as fiddleneck (*Amsinckia* spp.), western ragweed (*Ambrosia psilostachya*), and popcorn flower (*Plagiobothrys* spp.) and non-native species such as shortpod mustard (*Hirschfeldia incana*), yellow star thistle (*Centaurea solstitialis*), and dove weed (*Eremocarpus setigerus*).

1.1.1.2 Wildlife of Folsom Reservoir

Blue oak woodlands and non-native grasslands in the Folsom Reservoir area support a variety of birds, including acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker (*Picoides nuttallii*), western wood pewee (*Contopus sordidulus*), scrub jay (*Aphelocoma californica*), Bewick's wren (*Thryomanes bewickii*), plain titmouse (*Parus inornatus*), hermit thrush (*Catharus guttatus*), loggerhead shrike (*Lanius ludovicianus*), black-headed grosbeak (*Pheucticus melanocephalus*), dark-eyed junco (*Junco hyemalis*), and Bullock's oriole (*Icterus bullockii*).

A number of raptors also use oak woodlands for nesting, foraging, and roosting. These include red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), sharp-shinned hawk (Accipiter striatus), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), great horned owl (*Bubo virginianus*), and long-eared owl (*Asio otus*).

Mammal species likely to occur in the woodland habitat include mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), black-tailed jackrabbit (*Lepus californicus*), California ground squirrel (*Spermophilois beecheyi*), and a variety of rodents.

Amphibians and reptiles that can be found in oak woodlands include California newt (*Taricha torosa*), Pacific tree frog (*Hyla regilla*), western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), common kingsnake (*Lampropeltis getulus*), and western rattlesnake (*Crotalus viridis*).

Non-native grasslands surrounding Folsom Reservoir provide habitat for a variety of rodents, which in turn serve as a prey base for carnivores such as hawks, owls, coyote, bobcat, gray fox, and some snakes. Although very few birds will nest in the grassland areas, a number of species will forage in this habitat, species including white-crowned sparrow (*Zonotrichia leucophrys*), lesser goldfinch (*Carduelis psaltria*), western meadowlark (*Sturnella neglecta*), and several raptor species. Migratory waterfowl are known to feed and rest in the grasslands associated with the north fork of the American River (USFWS 1991). Several of the reptiles and amphibians that inhabit the oak woodlands also will occur in the adjacent non-native grasslands.

1.1.2 Lower American River

Extending from Folsom Reservoir to the confluence with the Sacramento River, the LAR (also known as the south fork of the American River) has undergone tremendous change over the past 100 years (Reclamation 2004). A combination of gold mining, gravel dredging, levee building, land clearing, water diversion projects, and reservoir construction have dramatically altered the riverbed and channel as well as the river's overall flow regimes. Specifically, the construction of flood-control levees has reduced the width of the riparian corridor by isolating the floodplain from the river; these levees have also changed channel erosion patterns and reduced river migration.

In addition, the construction of Folsom and Nimbus Dams has significantly altered both the streamflow and sediment regime of the LAR. In particular, the magnitude and frequency of flood flows has been effectively moderated, causing a reduction in the frequency of overbank flows that deposit sediments conducive to seed germination on the higher terraces. Creation of the dam complex has also significantly reduced the sediment supply from the watershed that had fed the lower reaches of the river (Reclamation 2004).

The existing channel morphology of the LAR spans a continuum from a meandering belt confined within relatively resistant terraces and bluffs in the upper reaches to a low-gradient and semi-confined floodplain channel in the lower reaches (Watson 1985). Channel pattern and morphology in the upper 11 miles of the river, above the Folsom and Nimbus Dam complex, is largely controlled by resistant bedrock exposures that characterize this portion of the river. Bank erosion and sediment deposition are relatively minor, with most sediment being transported through or temporarily stored in the river channel. Point bars within this reach are forming in some areas but are typically small.

Prior to urbanization and levee construction, the American River deposited sediment in a floodplain belt that widened as it reached the confluence with the Sacramento River. Lateral migration of the river channel was slowly occurring over time. However, channel realignment and levee construction have confined the river to a substantially narrower belt. The reduced gradient and channel migration blockages have led to the formation of gravel bars and sediment deposits throughout the LAR. Terraces, once commonplace and complex as a result of extensive overbank flooding, now occur only in specific areas between the levees (Reclamation 2004).

As a result of these factors, several riparian vegetation zones exist along the banks of the LAR. The composition and vegetative structure of these zones at any particular location along the river depends on the geomorphology and other physical characteristics of the riverbank. In general, willow riparian scrub tends to occupy areas within the active channel of the LAR; these areas are repeatedly disturbed by elevated flows that occur in winter and spring. Plant species that occur in this habitat typically include various species of willow (*Salix* spp.). Cottonwood willow forests occupy the narrow belts along the active river channel where seasonal disturbance by occasional large flows influence community structure. Fremont cottonwood is the dominant tree species within the riparian forest. Other species associated with this habitat include willow, poison oak, wild grape, blackberry (*Rubus ursinus*), northern California black walnut (*Juglans californica* var. *hindsii*), and white alder (*Alnus rhombifolia*).

Valley oak woodland occurs on upper terraces composed of fine sediment where soil moisture provides a long growing season. Valley oak (*Quercus lobata*) is the dominant tree species in these areas, although some of the sites also have a cottonwood component as a result of infrequent flood inundation. Live oak woodland occurs in the more arid and gravelly terraces that are isolated from the fluvial dynamics and moisture of the river. Non-native grassland commonly occurs in areas that have been disturbed by human activity and can be found on many of the sites within the river corridor.

Backwater areas and off-river ponds that are recharged during high flows support emergent wetland vegetation. These habitat areas are located along the length of the LAR but occur more regularly downstream of the Watt Avenue bridge (river mile [RM] 9.0). Plant species that dominate this habitat type include various species of willow, sedge (*Carex* sp.), cattail (*Typha* sp.), bulrush (*Scirpus* sp.), rush (*Juncus* sp.), barnyard grass (*Echinochloa crusgalli*), slough grass (*Paspalum dilatatum*), and lycopus (*Lycopus americanus*).

1.1.3 Bureau of Reclamation Environmental Assessment

In 2004, Reclamation prepared a Finding of No Significant Impact (FONSI) and Final Environmental Assessment (EA) for the Sacramento Area Flood Control Agency (SAFCA) Long-term Reoperation of Folsom Dam and Reservoir. The FONSI and EA consisted of three independent components: (1) operation of Folsom Dam and Reservoir in accordance with the Amended 400/670 flood diagram, as part of the Long-term Agreement between SAFCA and Reclamation for the Reoperation of Folsom Dam and Reservoir; (2) temperature control shutter reconfiguration at Folsom Dam; and (3) floodplain habitat enhancement in the LAR. Each of the three components was a necessary component of the Long-term Agreement.

The impact assessments conducted for the EA used hydrologic model output to evaluate the potential for impacts due to implementing these three components and the associated results on various resources, including terrestrial resources. The EA concluded that terrestrial resources, including riparian corridor vegetation, the vegetation's associated habitat value, and special-status species that rely on the resource, along the waterways and water bodies within the project and regional study areas would not be adversely affected by changes in river flows or reservoir surface elevations resulting from implementing the three components, in relation to the No Action Alternative.

1.1.4 U.S. Fish and Wildlife Service Staff Report

In a report dated June 23, 2014, USFWS included potential study sites for erosion modeling related to riparian habitat. The report was written after USFWS staff conducted a field visit to identify sites along the LAR which had high riparian habitat value at that time and would also be expected to be the most sensitive to changes in upstream water releases (i.e., changes in flood management operations at Folsom Dam). The focus was placed on areas with a higher potential for erosional loss that would result in an anticipated corresponding loss of riparian and shaded riverine aquatic (SRA) cover value. Consideration was also given to previous geotechnical work and other materials discussed during a USFWS terrestrial resources coordination meeting that occurred on May 12, 2014. In the staff report, USFWS identified 14 potential assessment sites. These sites are presented in Appendix 5B, Figure 1. This terrestrial assessment includes 6 of the 14 potential representative sites, which are dispersed along three reaches of the LAR. The three reaches are described below.

1.1.5 River Reaches and Focus Sites Identified for the Terrestrial Assessment

For this analysis, USACE divided the LAR below Folsom Dam to the confluence with the Sacramento River into three river reaches. Within each reach, USACE identified focus sites that reflected some combination of high habitat value, high susceptibility to change, previous designation as a mitigation site with corresponding restoration actions in place, and/or other factors, such as wildlife composition, that warranted inclusion as an assessment area. Below are brief descriptions of each of the three reaches along with identification of the focus site locations.

1.1.5.1 Reach I – Confluence (River Mile 0) to H Street Bridge (River Mile 6.0)

Upstream of the confluence with the Sacramento River, from about RM 0 to RM 6, the LAR is encroached by urban infrastructure including transmission lines, pipelines, railroad tracks, bridges, and recreation areas. The river channel has a sandy bed and is predominantly flatwater, bordered on the right bank by partially vegetated, steep slopes and on the left bank by moderate- to high-quality riparian vegetation (River Corridor Management Plan 2002).

About 20 percent of the banks are armored with riprap, primarily on the left bank; the unprotected banks tend to be steep and are eroding slowly due to channel widening (River Corridor Management Plan 2002). The channel is about 500 feet wide but has a relatively wide floodplain about 2,000 to 3,000 feet between levees, primarily occurring adjacent to the right bank. The floodplain supports grasslands, cottonwood willow forest, and valley oak woodlands.

Natural features in the area of Discovery Park (RM 0 to RM 1) include high-quality cottonwood and mixed riparian forests as well as a large patch of early to mid-successional riparian scrub habitat between the Jedediah Smith Memorial Bicycle Trail and the right bank. A seasonal wetland is located at roughly RM 1, as well as areas of degraded riparian habitat along the right bank of the river. There are also several large open grassland areas dominated by non-native species. There is a concentration of elderberry shrub (clumps) located on the right bank between RM 0.3 and RM 0.5 and on the left bank between RM 0.5 and RM 1.7.

Natural features occurring near Bannon Slough (RM 1 to RM 1.8) and Urrutia Pond include mature cottonwood willow forest on the right floodplain and on the left bank at Jibboom Street East. Similar to the Discovery Park sub-reach, the river channel is flatwater bordered on the right bank by partially vegetated steep banks and on the left bank by moderate- to high-quality vegetation.

Between RM 1.8 and RM 2, a large restored seasonal wetland and riparian area is located on the right bank. Steelhead Creek (the Natomas East Main Drainage Canal) enters the LAR in this sub-reach.

In the Woodlake area, from RM 2 to RM 3.7, much of the area along the right bank was farmed during the early to mid-1900s and was planted in hay until 1998. A high berm (levee) along the right bank limits inundation of the floodplain along this sub-reach. The river channel is predominantly flatwater and is bordered by steep banks. Natural features include moderate- to high-quality cottonwood willow forest along both banks and along an urban drainage channel that runs parallel to the right-bank levee. The floodplain in this area is dominated by ruderal grasses infested by non-native vegetation and by a seasonal wetland with degraded habitat. This area also contains VELB mitigation sites and bank-protection mitigation sites with numerous elderberry shrubs along the right bank from RM 2.1 to RM 3.7.

Between RM 3.7 and RM 5.5 the primary feature is Bushy Lake, a shallow pond bordered by old-growth cottonwood willow forest and willow riparian scrub. The right bank of the river also contains high-quality early to mid-successional cottonwood willow forest habitats. Grassland with scattered elderberry shrubs occurs in open areas. The left bank was subject to major erosion from flooding in the late 1990s but has since been protected (River Corridor Management Plan 2002). Two of the seven LAR terrestrial focus sites occur in this sub-reach; Site G is on the right bank between RM 3.4 and 3.69 and Site F is on the right bank between RM 4.82 and 5.0.

The LAR between RM 5 and RM 6.0 includes a large sandy point bar deposit (Paradise Beach) along the left bank that hosts scattered pockets of willow riparian scrub and mature cottonwood forests that occur at the downstream end of the bar. Paradise Beach experiences high-velocity flows during high reservoir discharge which erodes fine-textured material and produces a naturally armored cobble surface (River Corridor Management Plan 2002). The bed of the river transitions from sand to sand and gravel bed at this location. The right bank contains moderate-quality cottonwood willow forest. A third focus site, Site E, occurs along this sub-reach on the right bank between RM 5.34 and 5.69.

1.1.5.2 Reach 2 – H Street Bridge (River Mile 6.0 to River Mile 12.0)

The LAR from RM 6.0 to RM 12.0 remains confined by Federal-State levees, with the floodplain narrowing from a width of about 2,000 feet at the downstream end to about 1,000 feet along most of the reach. The river has low flood conveyance capacity and long stretches of steep banks that are protected with rock armoring, much of it devoid of vegetation. The reach includes areas with severely eroded banks. Below Howe Avenue (RM 7.6) the entire left bank is protected by revetment, while the right bank has natural soil. Above Howe Avenue, about 60 percent of the right bank is protected by revetment, while the left bank is more natural with a small floodplain (River Corridor Management Plan 2002).

Generally, the channel and aquatic habitat diversity increase within the LAR from RM 6.0 to RM 12.0 as a result of the occurrence of several submerged and emergent sand bars, flatwater areas, glides, and pools. However, because of the narrowing of the floodplain there are fewer overbank features such as sloughs, lakes, borrow pits, canals, wetlands, and upland terraces. High-quality riparian vegetation is present, but, because of high-velocity flows and bank erosion along this reach, constraints on cottonwood growth and establishment of new seedlings limit the capacity for future riparian regeneration.

Most of the bank on the left side and some on the right side from RM 6 to RM 7.8 is armored with rock bank protection. Several bridges and the City of Sacramento’s Water Intake Structure occur in this section of the LAR. Natural features include willow riparian scrub and cottonwood willow forest along portions of the right bank. In addition, sycamore (Platanus occidentalis) trees and valley oak riparian woodland occur along either side of the LAR. In general, the near-shore habitats are degraded.

Between Howe and Watt avenues (RM 7.8 to RM 9.2), instream mining along the left bank created a series of interconnected ponds. The river here is constricted and the channel is incised, with the floodplain narrowly aligned on steep banks adjacent to the channel. Natural features include mature cottonwood willow forest and valley oak woodlands along the shoreline (floodplain) and on instream islands that continue to undergo bank erosion on both banks.

The river from RM 9.2 to RM 11 features narrow strips of floodplain along both banks with a series of gravel mine pits along the right floodplain captured by the LAR. The American River Project levees on the left bank end at RM 11. Natural features along this sub-reach include stands of willow riparian scrub and cottonwood willow forests along the LAR and at the edges of abandoned mine pits and mid-channel islands. Patches of valley oak woodland are found at slightly higher elevations on both banks. However, the upper portions of the floodplain on the right bank are infested with yellow star-thistle and support little native habitat. Between RM 9.5 and RM 9.7, naturally resistant bedrock provides a secure toe on the right bank, but the overlying emergent bank has relatively low cohesion and continues to erode. The following terrestrial assessment includes a fourth focus site along this sub-reach between RM 11.35 and RM 11.59; this focus site is identified as Site D on the right bank.

1.1.5.3 Reach 3 - River Mile 12.0 to Nimbus Dam (River Mile 23)

The LAR from RM 12 to RM 23 is primarily non-leveed, and the channel contains multiple bar complexes with associated riffles, runs, glides, and pools bordered by natural bluff formations and relatively flat, elevated terraces. Channel substrate consists mostly of gravels, cobble, and bedrock. Broad, high terraces are covered primarily by live oak and blue oak woodlands, grasslands, and active or fallow agricultural fields. The oak woodlands in this area represent the largest contiguous woodland in the American River Parkway. However, annual grasslands dominated by yellow star-thistle and dredger mine tailings fragment many of these woodland patches. The river banks are relatively unvegetated, and much of the aquatic zone in this reach provides little cover for aquatic or terrestrial species.

Bluffs largely contain the active high-gradient channel between RM 12 and RM 13.5, along with extensive dredger deposits and abandoned mine pits that create perennial and seasonal ponds off the active channel and on Arden Bar. Some pond margins support dense stands of willow riparian scrub and cottonwood and mixed riparian forests, but most of the pond's bank habitat is in a degraded state because of poor vegetative cover, cobbles, and infestations of invasive non-native weeds. Exposed bedrock formations in the channel form the Arden Rapids. The channel structure is highly modified by past mining activities, primarily along the right bank. The sub-reach between RM 13.41 and RM 14.0 is included as the fifth focus site in the following terrestrial assessment and is identified as Site C on the right bank.

Rossmoor Bar and Arden Bar are prominent features between RM 13.5 and RM 15.The upstream portion of the floodplain is leased for agricultural uses. The river channel in this sub-reach has also been highly modified by mining activities. Riffles and instream islands are present with little shoreline vegetation. This area includes the largest contiguous upper terrace of interior live oak and blue oak woodland, with patches of valley oak woodland at lower elevations. The left bank downstream of the pedestrian bridge supports a willow riparian scrub community, and USFWS has identified critical habitat for VELB in this river section.

Natural features occurring within the 300-acre Ancil Hoffman Park and 90-acre Effie Yeaw Nature Area along the right bank between RM 14.8 and RM 16.7 include live oak, blue oak, and valley oak woodlands; a large gravel bar; and Carmichael Creek, which flows through the park in a series of three ponds surrounded by bluffs. For most of the extent, both banks are dominated by cobble with sparse vegetation. The river channel contains extensive gravel deposits and periodic instream islands and riffles. The following terrestrial assessment includes the reach between RM 15.5 and RM 15.87 as the sixth LAR focus site, identified in the analysis as Site B on the left bank.

The San Juan Bluffs on the right bank and Rossmoor Bar on the left bank characterize the features between RM 16.3 and RM 18.7. Live oaks, blue oaks, and valley oaks dominate the upland areas, and pond slickens provide isolated wetland and riparian habitats. Unvegetated dredger mine tailings cover most of the interior of Rossmoor Bar. The southwestern half of this area is leased for agriculture. The river channel provides important aquatic habitat with extensive gravel and several riffles, including the San Juan Rapids. The Carmichael Water District owns land at RM 17 for its water-collection structures (instream collectors). The sub-reach between RM 18.49 and RM 18.83 was identified as the final (seventh) terrestrial focus site along the LAR and is labeled as Site A on the left bank.

On the right bank downstream from Sunrise Boulevard, Sacramento Bar, located between RM 18 and RM 20, contains natural features similar to Rossmoor Bar, with poorly vegetated dredger mine tailings covering most of the interior of the bar. The downstream part of the bar supports willow riparian scrub and cottonwood willow forest. Several seasonal and perennial ponds support a fringe of cottonwood and mixed riparian forest. The river channel in this sub-reach has riffles throughout, extensive gravels, and sparse shoreline vegetation.

Sunrise Bar on the left bank and the Sunrise Bluffs along the right bank are natural features found between RM 19 and RM 22.5. Vegetation includes willow riparian scrub on lower-elevation bars, mature cottonwood willow forests, valley oak woodlands, and live oak and blue oak woodlands at higher terraces. The Sunrise Bluffs are subject to erosion as a result of undercutting by the river, soil conditions, and the influences of the underlying strata.

The river channel contains multiple riffles, instream islands, and extensive gravels. The Nimbus Salmon and Steelhead Hatchery is located at the upstream end of this sub-reach.

Sailor Bar, located on the right bank between Hazel Avenue and the old Fair Oaks Bridge (RM 21 to RM 23), is characterized by poorly vegetated cobbles from dredger mine tailing deposits that cover most of the bar. Stands of interior live oak woodland are found in upland areas, and willow riparian scrub and cottonwood willow forests are found in the ravines between tailings. Some riparian scrub is established along the river edge, but much of the bank consists of unvegetated cobbles or ruderal vegetation. The river channel in this sub-reach has extensive riffles and small instream gravel bars.

1.1.5.4 Wildlife of the Lower American River

Previous studies have determined that the cottonwood-dominated riparian forest and areas associated with the backwater and off-river ponds have a high wildlife diversity and species richness in the region (Sands et al. 1985; USFWS 1991; Watson 1985). Along with providing food, cover, and nesting habitat for several species, the LAR functions as a wildlife corridor for the movement of animals between the valley floor and the foothills of the Sierra Nevada.

More than 220 species of birds have been recorded along the LAR, and more than 60 species are known to nest in the riparian habitats (USFWS 1991). Common species that can be found along the river include great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), red-tailed hawk, red-shouldered hawk, American kestrel, California quail (*Callipepla californica*), killdeer (*Charadrius vociferous*), belted kingfisher (*Ceryle alcyon*), western scrub jay (*Aphelocoma californica*), ash-throated flycatcher (*Myiarchus cinerascens*), tree swallow (*Tachycineta bicolor*), and American robin (*Turdus migratorius*).

Additionally, more than 30 species of mammals reside along the river, including striped skunk, Virginia opossum, brush rabbit (*Sylvilagus bachmani*), raccoon (*Procyon lotor*), western gray squirrel (*Sciurus griseus*), California ground squirrel, meadow vole (*Microtus pennsylvanicus*), muskrat (*Ondatra zibethicus*), black-tailed deer (*Odocoileus hemionus*), gray fox, and coyote.

The most common reptiles and amphibians that depend on the riparian habitats along the LAR include western toad (Bufo boreas), Pacific tree frog, bullfrog (*Rana catesbeiana*), western pond turtle (*Clemmys marmorata*), western fence lizard, common garter snake (*Thamnophis sirtalis*), and gopher snake.

Vegetation around the backwater or off-river ponds is typical of the riparian associations in the LAR area and is composed of mixed-age willow, alder, and cottonwood (see Section 5.2.2 for additional discussion). Wildlife species that have been recorded in these areas include pied-billed grebe (*Podilymbus podiceps*), American bittern (*Botaurus lentiginosus*), green heron (*Butorides striatus*), common merganser (Mergus merganser), white-tailed kite (*Elanus leucurus*), wood duck (*Aix sponsa*), yellow warbler (*Dendroica petechia*), warbling vireo (*Vireo gilvus*), duskyfooted woodrat (*Neotoma fuscipes*), western gray squirrel, Pacific tree frog, and western toad.

1.2 Terrestrial Assessment Approach

Because of the biological importance of riparian habitat and off-river (or backwater) ponds along the LAR to overall habitat diversity and species richness (as described in the previous sections), USACE's terrestrial analysis for the Folsom WCM Update focused on the effects of change in river flows to both cottonwood trees (indicative of riparian habitat) and river-associated ponds (Reclamation 2004).

The full simulation period for water storage within Folsom Reservoir is an 82-year period and flows in the LAR is a 73-year period, and the water year types used in the analysis were defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification. The modeling output provides daily average elevations and predicted variation between each alternative scenario and the base condition. The difference between the alternative scenario and the base condition indicates a benefit or a reduction of benefit to the terrestrial resource.

1.2.1 Lower American River Riparian Vegetation

The timing and duration of flooding are important factors in regulating species composition in a riparian zone, and periodic flooding by the river has historically been a fundamental characteristic of the LAR floodplain and riparian ecology pre- and post-reservoir construction. Cottonwood seed germination and tree establishment coincides with flood events. Because cottonwood seed release and establishment have adapted over time to the flow regime and fluvial process of the LAR, maintenance of this regime is vital to maintaining a viable cottonwood-dominated riparian system (Reclamation 2004).

1.2.1.1 Relationship between River Flows and Cottonwood Success

The germination, establishment, growth, and long-term survival of Fremont cottonwoods along the LAR are dependent on the dynamic flow regimes and fluvial geomorphic processes of the river. In particular, the capacity of the river to erode, transport, and deposit alluvial materials is central to the structure and maintenance of cottonwood ecosystems.

Successful regeneration of cottonwoods relies on the synchronous timing of seed dispersal and appropriate soil moisture levels to germinate and establish successfully (Stromberg 1995). Cottonwoods disperse seeds over a 2- to 6-week period, typically in the early to mid-spring months. Dispersed seeds rapidly lose the ability to germinate, so seeds must encounter suitable germination sites soon after release. Germination takes place on freshly deposited alluvial soils in areas along the river bank low enough in elevation to provide adequate moisture but high enough to avoid subsequent same-year flooding after establishment. Peak water flows of sufficient magnitude are necessary, just prior to seed dispersal, to provide these suitable germination sites.

To survive, cottonwood seedlings require a continuous source of adequate moisture (Scott et al. 1993). Consequently, river flows must decline at a rate that allows seedling roots to maintain continuous contact with saturated or sufficiently moist substrate. If river flows and the alluvial groundwater table drop too rapidly, seedling survival decreases appreciably (Scott et al. 1993). Studies have shown that first-year seedlings of Fremont cottonwood survive only where the groundwater depth is less than 1 meter, and seedlings tolerate daily declines of no more than a few centimeters per day (Segelquist et al. 1993; Stromberg 1995). Summer flows are critical to the continued survival of newly established seedlings and provide necessary moisture when evapotranspiration is highest (Scott et al. 1993).

Long-term survival of established cottonwoods is generally related to the depth to groundwater and to river flows. While cottonwoods can adapt to drought periods, overall growth and long-term maintenance of these trees depends on the ability of root systems to reach the alluvial groundwater table, the recharging of which depends on adequate river flows.

While very few studies on the long-term flow regimes necessary for continued cottonwood regeneration and growth maintenance have been conducted along the LAR, several short-term studies have provided insights into the relationship between river flows and cottonwood growth. In one study, the annual radial growth rate of young cottonwoods along a particular segment of the LAR was found to be significantly related to the groundwater depth and to river flows during the March–October growing season (Stromberg

1995). The study found that cottonwoods had little or no radial growth when average river flows during the growing season dropped below 1,765 cubic feet per second (cfs).

A second study found that cottonwood regeneration and growth are vulnerable to dewatering as a result of river damming where local precipitation is lower than potential evapotranspiration. Cottonwood decline occurs within 5 years from drought stress or when groundwater is less available due to dewatering from river damming (Rood et al. 2003). For rivers that have been dammed, water often flows from the river into the riparian groundwater, instead of the river obtaining additional groundwater flow from the adjacent alluvial and hill-slope aquifers. Therefore, cottonwoods along rivers that have been dammed are reliant for growth on the water that infiltrates from the river into the riparian groundwater (Rood et al. 2003).

1.2.1.2 Flow Thresholds for Cottonwood Success

For this analysis, USACE considered cottonwoods a key indicator species for overall health of LAR riparian vegetation; therefore, they are the focus of this evaluation of the effects of different mean monthly flow regimes on riparian vegetation. USFWS has stated that a LAR mean monthly flow of 1,765 cfs represents the minimum flow required to maintain basic or minimal radial growth of cottonwoods, while 3,000 cfs is the minimum flow to ensure optimal growth (Caicco 1996 as cited in Reclamation 2004). These flow thresholds have not been historically maintained in all years on the LAR; therefore, cottonwoods have shown that they can withstand occasional stress from inadequate flows in very dry years (Reclamation 2004). In addition, USFWS found that flows of 5,000 cfs to 13,000 cfs are required to inundate the higher terraces, which is essential for the germination of new cottonwoods (USFWS 1996).

For this analysis, a substantial effect on riparian vegetation would occur if:

1. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above the minimum flow requirements for maintenance and growth of cottonwoods (1,765 cfs for minimal growth and 3,000 cfs for optimal growth); or
2. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above minimum flow requirements for inundation of riparian terraces adjacent to and remote from the LAR for germination of new cottonwoods (5,000 cfs).

Flow projections at each of the seven sites are characterized by the average number of days per month within the 73-year period of record during which the flows are projected to remain above or below each of the thresholds (1,765 cfs, 3,000 cfs, and 5,000 cfs). The difference between each alternative scenario and the baseline condition (either the National Environmental Policy Act [NEPA] baseline or the California Environmental Quality Act [CEQA] baseline) indicates a beneficial or detrimental effect on evaluated terrestrial resources. For a definition of each baseline, see Section 5.3.

1.2.2 Lower American River Backwater Ponds

Backwater (or off-river) ponds are areas adjacent to the main stem of a river that can be connected to the river by surface water during high winter flood flows and/or by groundwater during other times of the year. Backwater pond areas along the American River Parkway generally are the result of naturally formed gravel deposits or human-created tailing deposits, although some might be remnant natural oxbow lakes, such as Bushy Lake (Sands et al. 1985). These backwater ponds are known to occur throughout the LAR system but occur predominantly at Sacramento Bar, Arden Bar, and Rossmoor Bar and between Watt Avenue and Howe Avenue (Sands et al. 1985). For more information, see Sections 5.1.5.1 through 5.1.5.3.

Studies have been conducted to determine how these backwater ponds are influenced by flows in the LAR (Sands et al. 1985). These ponds are located at varied distances from the river channel, have varied depths, and are at different elevations along the river. Ponds were studied in the spring of 1985 at flow regimes of 1,300 cfs and 2,750 cfs. In general, these studies concluded the following: (1) while the interrelationships of the ponds with the river is complex, the ponds do respond to changes in water levels in the American River; (2) the response of ponds to changes in water flows and river levels depends on the distance of the ponds from the river channel, the permeability of the soils surrounding the ponds, and the nature of intervening soils and gravels; (3) the effect of changes in pond water levels on vegetation (and secondarily, wildlife) can differ in intensity between sites depending on local soil compaction and root distribution of individual plants; (4) flows of at least 2,700 cfs are required to adequately recharge the ponds closest to the river; (5) at sustained flows of 1,300 cfs or below, many of the ponds would become more shallow and smaller, hold very little water, and become choked with willows; (6) further reductions in river flows, to levels in the 500 cfs range, would result in these ponded areas becoming completely dry, resulting in deterioration of the riparian vegetation and quality of wildlife habitats associated with the ponds; and (7) flows in the range of 2,700 cfs to 4,000 cfs are needed to provide continued recharge of more-distant off-river ponds (Sands 1986; Sands et al. 1985).

An important consideration for the maintenance of backwater pond habitats is the necessary frequency and duration of the recharge flows. Past studies have not come to definitive conclusions regarding specific frequency and/or duration requirements. Historically, however, the flows that are high enough to allow recharge of these ponds have occurred most often in either the winter or spring (Reclamation 2004). This pattern allows the backwater ponds to be recharged prior to the important spring and summer growing seasons. Therefore, it appears that regular recharge flows during most of the winter or spring are sufficient to maintain backwater pond habitats. Previous field studies conducted on the LAR indicated that mean monthly flows of 2,700 cfs and 4,000 cfs were adequate to recharge the ponds closest to the river and more-distant off-river ponds, respectively (Sands et al. 1985).

1.2.2.1 Flow Thresholds for Backwater Pond Success

For purposes of this analysis, a substantial effect on backwater ponds and off-river ponds would occur if:

1. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above the minimum flow requirements for backwater recharge of ponds closest to the river (2,700 cfs); or
2. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above minimum flow requirements for backwater recharge of off-river ponds farther from the river (4,000 cfs).

Flow projections at each of the seven sites are characterized by the average number of days per month within the 73-year period of record during which the flows are projected to remain above or below each of the thresholds (2,700 cfs and 4,000 cfs). The difference between the each alternative scenario and the baseline condition (either NEPA or CEQA) indicates a beneficial or detrimental effect on evaluated terrestrial resources. For a definition of each baseline, see Section 5.3.

1.2.2.2 Flow Thresholds for Elderberry Shrubs

USFWS has designated the American River Parkway as critical habitat for VELB, and this species has been recorded in elderberry shrubs near backwater ponds along the LAR. Elderberry is a riparian plant species that is characteristically adapted to the hydro-period of a river and relies on it for seed dispersal and predictable water table depths to establish its seedlings. The timing and duration of flooding are important factors in regulating species composition in the riparian zone. Riparian shrubs are differentially adapted to the duration of flood events, and most are able to tolerate several days of flooding (Riparian Habitat Joint Venture 2009).

For this analysis, since many of the elderberry shrubs occur near the backwater ponds, a substantial effect on elderberry shrub growth and dispersal would occur if:

1. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above the minimum flow requirements for backwater recharge of ponds closest to the river (2,700 cfs); or
2. A Folsom WCM alternative would cause a substantial decrease in the frequency of flows at or above minimum flow requirements for backwater recharge of off-river ponds farther from the river (4,000 cfs).

Flow projections at each of the seven sites are characterized by the average number of days per month within the 73-year period of record during which the flows would be projected to remain above or below each of the thresholds (2,700 cfs and 4,000 cfs). The difference between each alternative scenario and the baseline condition (either NEPA or CEQA) indicates a beneficial or detrimental effect on elderberry shrubs. For a definition of each baseline, see Section 5.3.

1.2.3 Folsom Reservoir

USACE layered an Environmental Systems Research Institute (ESRI) aerial image onto a geographic information systems (GIS) meta-database to evaluate water storage levels in Folsom Reservoir under two scenarios. USACE obtained vegetation datasets from the California Resources Agency (Cal Atlas 2012), special-status species records from the CNDDB (2015), and lake contour levels from a 2005 Reclamation sediment study (Reclamation 2005).

Historically, Folsom Reservoir has annual water levels that routinely fluctuate, and the reservoir's rim is surrounded by a barren band (the fluctuation zone) as a result of these historic fluctuations in water elevations. During normal water years, the reservoir typically reaches 466 feet above mean sea level (amsl) during the wettest months (March through August). This terrestrial assessment focuses on the potential for changes to vegetation that could occur in the band of habitat that occurs just above the fluctuation zone in Folsom Reservoir as a result of the Folsom WCM scenarios.

Specifically, for this analysis, a substantial negative effect on Folsom Reservoir vegetation, and possibly on associated wildlife, would occur if the average number of consecutive days with water elevations above the 466 foot-amsl threshold were to increase as a result of implementing a Folsom WCM alternative.

1.2.4 Summary of Impact Indicators and Threshold of Significance

Impact indicators for terrestrial resources include different environmental conditions (e.g., flows and backwater recharge) that could affect riparian vegetation. USACE developed specific significance criteria for terrestrial resources based on available guidelines and resource agency standards (Table 5-1).

Table 0-1. Terrestrial Resource Impact Indicators and Significance Criteria

Parameter	Impact Indicators	Significance Criteria
Lower American River		
Growth of cottonwoods	Daily flows (cfs) below Nimbus Dam to the confluence	An adverse effect would result from a substantial decrease in the occurrence of daily flows at or above the 1,765-cfs threshold by a frequency and duration that would impede maintenance and growth of cottonwoods, or a decrease in the number of days that meet minimal flow requirements, relative to the basis of comparison (baseline), for any given month over the simulated 73-year period of record.
		An adverse effect would result from a substantial decrease in the occurrence of daily flows at or above the 3,000-cfs threshold by a frequency and duration that would inhibit reasonable to maximal growth and maintenance of cottonwoods; or a decrease in the number of days that meet minimal flow requirements, relative to the basis of comparison (baseline), for any given month over the simulated 73-year period of record.

Parameter	Impact Indicators	Significance Criteria
		An adverse effect would result from a substantial decrease in the occurrence of spring daily flows above 5,000 cfs (estimated to represent historical peak flows of 5,000 to 13,000 cfs required for seed dispersal) by a frequency and magnitude that would hinder inundation of riparian terraces adjacent to and remote from the lower American River; or a decrease in the number of days that meet minimal flow requirements, relative to the basis of comparison (baseline), over the simulated 73-year period of record.
Backwater recharge	Daily flows (cfs) below Nimbus Dam to the confluence	An adverse effect would result from a substantial decrease in winter and spring mean monthly flows at or above 2,700 cfs by a frequency and magnitude that would adversely affect adequate recharge of backwater ponds close to the river, relative to the basis of comparison, (baseline) over the simulated 73-year period of record.
		An adverse effect would result from a substantial decrease in winter and spring mean monthly flows at or above 4,000 cfs by a frequency and magnitude that would adversely affect adequate recharge of more distant off-river ponds to the river, relative to the basis of comparison (baseline), over the simulated 73-year period of record.
	Elderberry shrubs and other associated species on open terraces and backwater areas during December through May	An adverse effect would result from a substantial change in instream flow by a frequency and magnitude that would adversely affect elderberry shrubs and their associated species, relative to the basis of comparison (baseline), over the simulated 73-year period of record.

Parameter	Impact Indicators	Significance Criteria
Folsom Reservoir		
Riparian Vegetation	Average daily reservoir water surface elevation (feet amsl)	An adverse effect on vegetation, and possibly on associated wildlife, would result from a substantial increase in the average number of consecutive days with water elevations above the 466-foot-amsl threshold within a month, given a range of water year type periods, relative to the basis of comparison (baseline) over the 73-year period of record.

1.2.5 E504 ELD Model Development

USACE used the California Department of Water Resources' (DWR) 2013 Delivery Reliability Report (DRR) CalSim II build as the base model for developing the Folsom WCM Update Existing Condition CalSim II build. E504 ELD represents a 400/600-thousand-acre-feet (TAF) variable flood storage space in Folsom Reservoir. The 2004 SAFCA/Reclamation water control diagram with upstream reservoir storage credit was used. E504 ELD does not adopt the parameters of the joint federal project operations.

See Section 5.3 for details regarding the DRR CalSim II build model, including assumptions and parameters used to simulate the E504 ELD over the 73-year and 82-year periods of record.

1.3 J602F3 ELD Model Development

USACE used the 2013 DWR DRR CalSim II build as the base model for developing the Folsom WCM Update with-project ELD CalSim II build. The with-project ELD represents a 400/670 TAF variable flood storage space in Folsom Reservoir with upstream storage crediting, and basin wetness and forecasts applied to determine flood storage requirements.

1.3.1 Comparison of E504 ELD and J602F3 ELD

1.3.1.1 Lower American River

The LAR terrestrial assessment focuses on cottonwood growth and backwater recharge. This section includes a summary of the results.

1.3.1.1.1 Cottonwood Growth

The LAR flows with J602F3 ELD could decrease 3.7 to 4.2 average days below the 1,765-cfs threshold over a 3-consecutive-month period during the cottonwood growing season relative to E504 ELD and provide a potential benefit to cottonwood radial growth. However, the overall effects on vegetation growth in the riparian corridor of the LAR under J602F3ELD would stay relatively consistent where volume flow rates would continue to be sufficient and groundwater would be available for cottonwood growth. A detailed analysis of cottonwood growth and maintenance along the LAR for this comparison is provided in Appendix 5A.

1.3.1.1.2 Backwater Recharge

Relative to E504 ELD, J602F3 ELD would result in a minimal change in the average number of days when average daily flows are below the thresholds during winter and spring. Given the minimal difference between E504 ELD and J602F3ELD, average daily flows are projected to remain essentially the same. As a result, there would be essentially no change to the magnitude and frequency of flows to substantially alter the existing backwater habitats dependent on the LAR. A detailed analysis of backwater recharge along the LAR for this comparison is provided in Appendix 5A.

1.3.1.2 Folsom Reservoir

With J602F3 ELD, the water surface elevation fluctuations at Folsom Reservoir would remain within normal operating parameters (i.e., USACE does not anticipate that water elevations would exceed the 466 foot-amsl threshold or barren band for durations that could affect existing vegetation). Folsom Reservoir has water levels that routinely fluctuate. J602F3 ELD would result in water surface elevation patterns that are the same as or slightly lower that those with E504 ELD. A detailed analysis for the Folsom Reservoir is provided in Appendix 5A.

1.3.1.3 Evaluation of Effects

Relative to E504 ELD, J602F3 ELD results indicate that the LAR average daily flows under the 1,765-cfs threshold could decrease between 3.7 to 4.2 average days per month over a 3-consecutive-month period during the cottonwood growing season, relative to E504 ELD. This decrease could provide additional flows for cottonwood radial growth and provide a potential benefit during the cottonwood growing season. However, when looking at change under the 3,000-cfs threshold comparison, cottonwood maintenance and optimal growth would stay relatively consistent during the cottonwood growing season between E504 ELD and J602F3ELD. Therefore, effects on vegetation growth in the riparian corridor of the LAR with J602F3 ELD would be less than substantial. In addition, there would be no substantial difference in the pattern of peak flows necessary to inundate terraces for cottonwood dispersal and regeneration between J602F3 ELD and E504 ELD. As discussed in Section 8 (Erosion), J602F3 ELD critical shear values for riparian study sites along the LAR would also be less than substantial, with a low probability of exceedance beyond the critical shear threshold. This results in a low probability of habitat being lost along the bank edges due to erosional effects of altered water flows.

USFWS has designated the Parkway as critical habitat for VELB, and this species has been recorded in elderberry shrubs near backwater ponds along the LAR. Sanford’s arrowhead, western pond turtle, and tri-colored blackbirds are special-status species known to occur in several backwater pond areas along the LAR. However, these flows would not be reduced by sufficient magnitude and frequency to substantially alter existing water fluctuations (pond levels) and vegetation dependent on these ponds. Because effects on backwater habitats with J602F3 ELD would be less than substantial, effects on elderberry shrubs and special-status species that depend on these habitats would also be less than substantial.

J602F3 ELD would not change the distribution of vegetation or alter riparian vegetation scattered around Folsom Reservoir. The fluctuation zone at Folsom Reservoir is essentially devoid of vegetation with typical elevations levels ranging from 384 to 465 feet amsl. USACE does not expect this duration to alter vegetation around the reservoir. Under these conditions, any elderberry shrubs that would be established at Folsom Reservoir would exist above the fluctuation zone and would not be adversely affected by the flood-control project operations.

1.4 References

Terrestrial

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Appendix C: Vegetation and Wildlife, Part 3

APPENDIX 5A

1 Terrestrial Resources – Appendix – Detailed Analysis

This appendix focuses on the presentation of the model development for a set of with-project scenarios and their comparison to a set of appropriated model baseline conditions to satisfy the project requirements for compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

1.1 J602F3 ELD Model Development

USACE used the 2013 DWR DRR CalSim II build as the base model for developing the Folsom WCM Update With-Project level of demand CalSim II build. The With-Project existing level of demand represents a 400/670-TAF variable flood storage space in Folsom Reservoir with upstream storage crediting, and basin wetness and forecasts applied to determine flood storage requirements.

1.1.1 Comparison of E504 ELD and J602F3 ELD

1.1.1.1 Lower American River

The LAR terrestrial assessment focuses on cottonwood growth and backwater recharge.

1.1.1.1.1 Cottonwood Growth

1.1.1.1.1.1 Reach 3

Simulated flows exhibited the same results at Sites A, B, and C. Table 31 summarizes simulated flows in Reach 3 (RM 12.0 to Nimbus Dam); this example is from Site A. For the first two comparisons of E504 ELD and J602F3 ELD in the table (1,765 and 3,000 cfs), preferred results would be lower numbers, as the goal is to keep flows at or above these thresholds and these modeling outputs reflect how many days that flows would fall below the desired flows. For the third comparison (5,000 cfs), preferred results would be higher numbers, showing a greater number of days when banks might flood and cottonwood seed dispersal could occur at the upper terraces (for more details, see Section 5.2.1).

Table 1. Average number of days when flows would be below or above a specified threshold for riparian vegetation in the lower American River at Site A (RM 18.49–18.83) under E504 ELD and J602F3 ELD

Month1	Average Number of Days by Month below/above Specified Thresholds (73-year Record)											
	Effects on Riparian Vegetation											
	Number of Days **below** Flow Threshold[2] (1,765 cfs)				Number of Days **below** Flow Threshold[3] (3,000 cfs)				Number of Days **above** Flow Threshold[4] (5,000 cfs)			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Jan	15.9	16.2	0.3	2%	18.8	19.2	0.4	2%	8.9	8.8	-0.1	-1%
Feb	11.7	12.9	1.2	10%	14.0	15.5	1.5	11%	10.9	9.8	-1.1	-10%
Mar	15.9	12.2	-3.7	-23%	19.2	18.8	-0.4	-2%	7.2	8.4	1.2	17%

Apr	16.4	12.2	-4.2	-26%	20.2	18.4	-1.8	-9%	6.2	7.2	1.0	16%
May	15.2	10.9	-4.3	-28%	18.9	18.5	-0.4	-2%	7.9	8.1	0.2	3%
Jun	14.1	12.4	-1.7	-12%	18.8	18.3	-0.5	-3%	7.0	7.3	0.3	4%
Jul	5.6	5.7	0.1	2%	11.8	12.3	0.5	4%	3.8	3.5	-0.3	-8%
Aug	15.3	14.6	-0.7	-5%	22.0	21.8	-0.2	-1%	0.9	0.2	-0.7	-78%
Sep	14.7	14.2	-0.5	-3%	19.8	19.1	-0.7	-4%	4.0	4.5	0.5	13%
Oct	18.6	18.2	-0.4	-2%	25.1	24.2	-0.9	-4%	0.9	0.8	-0.1	-11%
Nov	10.8	9.3	-1.5	-14%	19.1	19.3	0.2	1%	3.8	3.6	-0.2	-5%
Dec	9.2	8.0	-1.2	-13%	24.1	24.2	0.1	0%	4.6	4.8	0.2	4%

BOLD = Most Positive Output (potentially beneficial; meets threshold for maximum days); ***Italics*** = Most Negative Output (potentially adverse; meets threshold for fewest number of days)

1 The period from March through October is considered the cottonwood growing season; February through April is considered the seed dispersal season.

2 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 1,765 cfs, which is the minimum flow required to maintain cottonwood radial growth maintenance.

3 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 3,000 cfs, which is considered the threshold for optimal growth of cottonwoods.

4 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are ABOVE 5,000 cfs, which is considered to be the minimal required flows for the inundation of river bank terraces for germination of cottonwood seeds.

During the cottonwood growing season (March through October) in Reach 3, J602F3 ELD would decrease the average days (0.4 to 4.3 days) below 1,765 cfs during March, April, May, June, August, September, and October and would increase the average days (0.1 day) below 1,765 cfs during July relative to E504 ELD. October would have the greatest average number of days (during the cottonwood growing season) with 18.6 average days below 1,765 cfs in the LAR (E504 ELD). During October, J602F3 ELD would decrease the average number of days by 0.4 day to an average of 18.2 days below 1,765 cfs relative to E504 ELD. July would have the fewest average days below 1,765 cfs in the LAR with 5.6 average days below 1,765 cfs (E504 ELD). During July, J602F3 ELD would increase the average number of days by 0.1 day to an average of 5.7 days below 1,765 cfs relative to E504 ELD. The largest decrease in the number of days below threshold would occur during May, when J602F3 ELD would decrease the average number of days by 4.3 days to an average of 10.9 days below 1,765 cfs relative to the average of 15.2 days for E504 ELD. Overall, J602F3 ELD would decrease the average number of days below 1,765 cfs in the LAR, with the greatest decreases occurring during March, April, and May. A decrease of 3.7 to 4.2 average days below the threshold over a 3-consecutive-month period could provide additional flows with J602F3 ELD for cottonwood radial growth and provide a potential benefit during the cottonwood growing season.

In the second comparison, J602F3 ELD would decrease the average number of days (0.2 to 1.8 days) below 3,000 cfs during March, April, May, June, August, September, and October relative to E504 ELD. On the other hand, J602F3 ELD would increase the average number of days below the threshold by 0.5 during July. October would have the greatest average number of days (during the cottonwood growing season) below 3,000 cfs in the LAR with an average number of 25.1 days below 3,000 cfs (E504 ELD). J602F3 ELD would decrease this number of days by 0.9 day to 24.2 average days below the threshold relative to E504 ELD during October. July would have the lowest average number of days below 3,000 cfs in the LAR with an average of 11.8 days below 3,000 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 0.5 day below 3,000 cfs relative to E504 ELD during July. Overall, 7 of the 8 months would have a slight decrease in the average number of days below the threshold. However, these slight decreases over the 7 months would be negligible where volume flow rates would continue to be sufficient and groundwater would be available to support cottonwood growth; therefore, conditions would remain relatively consistent under either E504 ELD or J602F3 ELD.

Cottonwoods typically disperse seed between February and April. J602F3 ELD would result in minor changes in the average number of days (–1.1 to +1.2 days) when flows would be above the 5,000-cfs threshold relative to E504 ELD. J602F3 ELD would change the average number of days above 5,000 cfs during February (1.1-day decrease), March (1.2-day increase), and April (1.0-day increase) relative to E504 ELD. This minor difference likely falls within the range of error for the models and would not affect the overall frequency of flows above 5,000 cfs, which implies that instantaneous flows sufficient to inundate the terraces and facilitate cottonwood seed dispersal would remain largely consistent with E504 ELD over the 73-year period of record.

1.1.1.1.1.2 Reach 2

Table 32 summarizes simulated flows at Site D in Reach 2 (H Street Bridge [RM 6.0] to RM 12.0). For the first two comparisons of E504 ELD and J602F3 ELD in the table (1,765 and 3,000 cfs), preferred results would be lower numbers, as the goal is to keep flows at or above these thresholds and these modeling outputs reflect how many days that flows would fall below the desired flows. For the third comparison (5,000 cfs), preferred results would be higher numbers, showing a greater number of days when banks might flood and cottonwood seed dispersal could occur at the upper terraces (for more details, see Section 5.2.1).

Table 2. Average number of days when flows would be below or above a specified threshold for riparian vegetation in the lower American River at Site D (RM 11.35–11.59) under E504 ELD and J602F3 ELD

Month[1]	Average Number of Days by Month below/above Specified Thresholds (73-year Record)											
	Effects on Riparian Vegetation											
	Number of Days **below** Flow Threshold[2] (1,765 cfs)				Number of Days **below** Flow Threshold[3] (3,000 cfs)				Number of Days **above** Flow Threshold[4] (5,000 cfs)			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Jan	15.8	16.2	0.4	3%	18.8	19.1	0.3	2%	9.0	8.8	-0.2	-2%
Feb	11.7	12.8	1.1	9%	14.0	15.5	1.5	11%	10.8	9.9	-0.9	-8%
Mar	15.9	12.3	-3.6	-23%	19.2	18.8	-0.4	-2%	7.3	8.4	1.1	15%
Apr	16.4	12.2	-4.2	-26%	20.1	18.5	-1.6	-8%	6.1	7.1	1.0	16%
May	15.2	10.9	-4.3	-28%	18.9	18.5	-0.4	-2%	7.9	8.0	0.1	1%
Jun	14.1	12.3	-1.8	-13%	18.7	18.3	-0.4	-2%	7.1	7.3	0.2	3%
Jul	5.5	5.7	0.2	4%	11.7	12.2	0.5	4%	3.7	3.6	-0.1	-3%

Aug	15.3	14.5	-0.8	-5%	21.9	21.8	-0.1	0%	0.9	0.2	-0.7	-78%
Sep	14.6	14.2	-0.4	-3%	19.8	19.1	-0.7	-4%	4.0	4.6	0.6	15%
Oct	18.5	18.1	-0.4	-2%	25.0	24.2	-0.8	-3%	0.9	0.8	-0.1	-11%
Nov	10.8	9.3	-1.5	-14%	19.1	19.2	0.1	1%	3.8	3.6	-0.2	-5%
Dec	9.1	8.0	-1.1	-12%	24.1	24.1	0.0	0%	4.6	4.8	0.2	4%

BOLD = Most Positive Output (potentially beneficial; meets threshold for maximum days); ***Italics*** = Most Negative Output (potentially adverse; meets threshold for fewest number of days)

1 The period from March through October is considered the cottonwood growing season; February through April is considered the seed dispersal season.

2 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 1,765 cfs, which is the minimum flow required to maintain cottonwood radial growth maintenance.

3 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 3,000 cfs, which is considered the threshold for optimal growth of cottonwoods.

4 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are ABOVE 5,000 cfs, which is considered to be the minimal required flows for the inundation of river bank terraces for germination of cottonwood seeds.

During the cottonwood growing season (March through October) in Reach 2, J602F3 ELD would decrease the average number of days below 1,765 cfs during March, April, May, June, August, September, and October (decrease of 0.4 to 4.3 days) and would increase the average days below the threshold by 0.2 day during July relative to E504 ELD. October would have the greatest average number of days below threshold (during the cottonwood growing season) with 18.5 average days below 1,765 cfs in the LAR (E504 ELD). During October, J602F3 ELD would decrease the number of days by 0.4 to an average of 18.1 days below 1,765 cfs relative to E504 ELD. July would have the fewest average days below 1,765 cfs in the LAR with 5.5 average days below 1,765 cfs (E504 ELD). During July, J602F3 ELD would increase this average by 0.2 day to an average number of days below the threshold of 5.7 days relative to E504 ELD. The largest decrease would occur during May; J602F3 ELD would decrease the average number of days by 4.3 days to an average of 10.9 days below 1,765 cfs relative to the average of 15.2 days for E504 ELD. Overall, J602F3 ELD would decrease the average number of days below 1,765 cfs in the LAR, with the greatest decreases occurring during March, April, and May. Decreases of 3.6 to 4.3 days per month on average below the threshold over a 3-consecutive-month period could provide additional flows with J602F3 ELD for cottonwood radial growth and provide a potential benefit during the cottonwood growing season.

In the second comparison, J602F3 ELD would decrease the average number of days (0.1 to 1.6 days) below 3,000 cfs during March, April, May, June, August, September, and October relative to E504 ELD. On the other hand, J602F3 ELD would increase the average number of days below the threshold by 0.5 to 12.2 days during July. October would have the greatest average number of days (during the cottonwood growing season) below 3,000 cfs in the LAR with an average of 25.0 days that fall below 3,000 cfs (E504 ELD). J602F3 ELD would decrease this average number of days by 0.8 day for an estimated average of 24.2 days that fall below the threshold relative to E504 ELD during October. July would have the lowest average number of days below 3,000 cfs in the LAR with an average of 11.7 days below 3,000 cfs (E504 ELD). J602F3 ELD would increase this number of days by 0.5 day to an average of 12.4 days below 3,000 cfs relative to E504 ELD during July. Overall, 7 of the 8 months would have a slight decrease in the average number of days below the threshold. However, these slight decreases over the 7 months would be negligible, where volume flow rates would continue to be sufficient and groundwater would be available, for cottonwood growth under either E504 ELD or J602F3 ELD.

Cottonwoods typically disperse seed between February and April. J602F3 ELD would result in minor changes to the average number of days (–0.9 to +1.1 days) when flows would be above 5,000 cfs relative to E504 ELD. J602F3 ELD would increase or decrease the average number of days above 5,000 cfs during February (0.9-day decrease), March (1.1-day increase), and April (1.0-daysincrease) relative to E504 ELD. This minor difference would not affect the overall frequency of flows above 5,000 cfs, which implies that instantaneous flows sufficient to inundate the terraces and facilitate cottonwood seed dispersal would remain largely consistent with E504 ELD over the 73-year period of record.

1.1.1.1.1.3 Reach 1

Table 33 summarizes flows at Site E, Table 34 summarizes flows at Site F, and Table 35 summarizes flows at Site G, all of which are in Reach 1 (Confluence to H Street Bridge). For the first two comparisons of E504 ELD and J602F3 ELD in each table (1,765 and 3,000 cfs), preferred results would be lower numbers, as the goal is to keep flows at or above these thresholds and these modeling outputs reflect how many days that flows would fall below the desired flows. For the third comparison (5,000 cfs), preferred results would be higher numbers, showing a greater number of days when banks might flood and cottonwood seed dispersal could occur at the upper terraces (for more details, see Section 5.2.1).

Table 3. Average number of days when flows would be below or above a specified threshold for riparian vegetation in the lower American River at Site E (RM 5.34–5.69) under E504 ELD and J602F3 ELD

Month[1]	Average Number of Days by Month below/above Specified Thresholds (73-year Record)											
	Effects on Riparian Vegetation											
	Number of Days **below** Flow Threshold[2] (1,765 cfs)				Number of Days **below** Flow Threshold[3] (3,000 cfs)				Number of Days **above** Flow Threshold[4] (5,000 cfs)			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Jan	15.8	16.3	0.5	3%	18.8	19.2	0.4	2%	8.9	8.9	0.0	0%
Feb	11.6	12.7	1.1	9%	14.1	15.5	1.4	10%	10.8	9.9	-0.9	-8%
Mar	15.5	12.2	-3.3	-21%	19.1	18.9	-0.2	-1%	7.3	8.4	1.1	15%
Apr	16.3	12.0	-4.3	-26%	20.2	18.4	-1.8	-9%	6.2	7.2	1.0	16%
May	15.1	10.9	-4.2	-28%	18.9	18.4	-0.5	-3%	7.8	8.0	0.2	3%
Jun	14.0	12.2	-1.8	-13%	18.8	18.3	-0.5	-3%	7.0	7.3	0.3	4%
Jul	5.5	5.6	0.1	2%	11.9	12.4	0.5	4%	3.8	3.6	-0.2	-5%
Aug	15.2	14.5	-0.7	-5%	22.0	22.0	0.0	0%	0.9	0.2	-0.7	-78%
Sep	14.7	14.3	-0.4	-3%	19.9	19.4	-0.5	-3%	4.0	4.6	0.6	15%
Oct	18.5	18.1	-0.4	-2%	25.1	24.3	-0.8	-3%	0.9	0.8	-0.1	-11%
Nov	10.8	9.2	-1.6	-15%	19.3	19.4	0.1	1%	3.8	3.6	-0.2	-5%

Dec	9.1	8.0	-1.1	-12%	24.2	24.2	0.0	0%	4.6	4.8	0.2	4%

BOLD = Most Positive Output (potentially beneficial; meets threshold for maximum days); ***Italics*** = Most Negative Output (potentially adverse; meets threshold for fewest number of days)

1 The period from March through October is considered the cottonwood growing season; February through April is considered the seed dispersal season.

2 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 1,765 cfs, which is the minimum flow required to maintain cottonwood radial growth maintenance.

3 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 3,000 cfs, which is considered the threshold for optimal growth of cottonwoods.

4 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are ABOVE 5,000 cfs, which is considered to be the minimal required flows for the inundation of river bank terraces for germination of cottonwood seeds.

Table 4. Average number of days when flows would be below or above a specified threshold for riparian vegetation in the lower American River at Site F (RM 4.82–5) under E504 ELD and J602F3 ELD

Month[1]	Average Number of Days by Month above/below Specified Thresholds (73-year Record)											
	Effects on Riparian Vegetation											
	Number of Days **below** Flow Threshold[2] (1,765 cfs)				Number of Days **below** Flow Threshold[3] (3,000 cfs)				Number of Days **above** Flow Threshold[4] (5,000 cfs)			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Jan	15.8	16.3	0.5	3%	18.9	19.2	0.3	2%	8.9	8.9	0.0	0%
Feb	11.5	12.6	1.1	10%	14.2	15.5	1.3	9%	10.8	9.9	-0.9	-8%
Mar	15.0	12.0	-3.0	-20%	19.1	18.9	-0.2	-1%	7.3	8.4	1.1	15%
Apr	16.1	12.0	-4.1	-25%	20.2	18.4	-1.8	-9%	6.2	7.2	1.0	16%
May	15.1	11.0	-4.1	-27%	18.9	18.4	-0.5	-3%	7.8	8.0	0.2	3%
Jun	14.1	12.3	-1.8	-13%	18.8	18.3	-0.5	-3%	7.0	7.2	0.2	3%
Jul	5.5	5.6	0.1	2%	12.1	12.6	0.5	4%	3.8	3.6	-0.2	-5%
Aug	15.2	14.5	-0.7	-5%	22.1	22.0	-0.1	0%	0.9	0.2	-0.7	-78%
Sep	14.7	14.2	-0.5	-3%	20.0	19.3	-0.7	-4%	4.1	4.6	0.5	12%
Oct	18.5	18.1	-0.4	-2%	25.1	24.2	-0.9	-4%	0.9	0.8	-0.1	-11%
Nov	10.7	9.2	-1.5	-14%	19.3	19.4	0.1	1%	3.8	3.6	-0.2	-5%
Dec	9.1	8.0	-1.1	-12%	24.2	24.2	0.0	0%	4.6	4.8	0.2	4%

BOLD = Most Positive Output (potentially beneficial; meets threshold for maximum days); ***Italics*** = Most Negative Output (potentially adverse; meets threshold for fewest number of days)

1 The period from March through October is considered the cottonwood growing season; February through April is considered the seed dispersal season.

2 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 1,765 cfs, which is the minimum flow required to maintain cottonwood radial growth maintenance.

3 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 3,000 cfs, which is considered the threshold for optimal growth of cottonwoods.

4 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are ABOVE 5,000 cfs, which is considered to be the minimal required flows for the inundation of river bank terraces for germination of cottonwood seeds.

Table 5. Average number of days when flows would be below or above a specified threshold for riparian vegetation in the lower American River at Site G (RM 3.4–3.69) under E504 ELD and J602F3 ELD

Month[1]	Average Number of Days by Month below/above Specified Thresholds (73-year Record)											
	Effects on Riparian Vegetation											
	Number of Days **below** Flow Threshold[2] (1,765 cfs)				Number of Days **below** Flow Threshold[3] (3,000 cfs)				Number of Days **above** Flow Threshold[4] (5,000 cfs)			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Jan	15.6	16.1	0.5	3%	18.8	19.2	0.4	2%	8.9	8.9	0.0	0%
Feb	11.2	12.2	1.0	9%	14.1	15.5	1.4	10%	10.8	9.9	-0.9	-8%
Mar	13.9	11.6	-2.3	-17%	19.1	18.9	-0.2	-1%	7.3	8.4	1.1	15%
Apr	15.9	11.7	-4.2	-26%	20.2	18.5	-1.7	-8%	6.2	7.2	1.0	16%
May	15.0	10.9	-4.1	-27%	19.0	18.4	-0.6	-3%	7.8	8.0	0.2	3%
Jun	14.0	12.2	-1.8	-13%	18.8	18.3	-0.5	-3%	7.0	7.3	0.3	4%
Jul	5.5	5.6	0.1	2%	12.1	12.6	0.5	4%	3.8	3.6	-0.2	-5%
Aug	15.1	14.4	-0.7	-5%	22.1	22.0	-0.1	0%	0.9	0.2	-0.7	-78%
Sep	14.7	14.3	-0.4	-3%	20.1	19.3	-0.8	-4%	4.1	4.6	0.5	12%
Oct	18.5	18.1	-0.4	-2%	25.1	24.2	-0.9	-4%	0.9	0.8	-0.1	-11%
Nov	10.7	9.2	-1.5	-14%	19.3	19.4	0.1	1%	3.8	3.6	-0.2	-5%
Dec	9.0	8.0	-1.0	-11%	24.3	24.2	-0.1	0%	4.6	4.8	0.2	4%

BOLD = Most Positive Output (potentially beneficial; meets threshold for maximum days); ***Italics*** = Most Negative Output (potentially adverse; meets threshold fewest number of days)

1 The period from March through October is considered the cottonwood growing season; February through April is considered the seed dispersal season.

2 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 1,765 cfs, which is the minimum flow required to maintain cottonwood radial growth maintenance.

3 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are BELOW 3,000 cfs, which is considered the threshold for optimal growth of cottonwoods.

4 Average numbers of days in referenced month across the 73-year simulation period when the mean daily river flows below Nimbus Dam are ABOVE 5,000 cfs, which is considered to be the minimal required flows for the inundation of river bank terraces for germination of cottonwood seeds.

During the cottonwood growing season (March through October) in Reach 1, J602F3 ELD would decrease the average number of days per month by 0.4 to 4.3 days during March, April, May, June, August, September, and October and would increase the average number of days per month below 1,765 cfs during July by 0.1 average day per month relative to E504 ELD at all sites. October would have the greatest average number of days (during the cottonwood growing season) below 1,765 cfs in the LAR with 18.5 days at all sites (E504 ELD). During October, J602F3 ELD would decrease this average number of days below the threshold by 0.4 day to an average of 18.1 days at all three sites relative to E504 ELD. July would have the lowest average number of days below 1,765 cfs in the LAR with an average number of 5.5 days below 1,765 cfs at all sites (E504 ELD). During July, J602F3 ELD would increase this average by 0.1 day to an average number of days below the threshold of 5.6 days at all sites relative to E504 ELD. The largest decrease from J602F3 ELD would occur during April; J602F3 ELD would decrease the average number of days by 4.3 days at Site E, 4.1 days at Site F (which is also seen in May for Site F), and 4.2 days at Site G to an average of 12.0 days at Sites E and F, and 11.7 days at Site G, below 1,765 cfs relative to the average of 16.3 days at Site E, 16.1 days at Site F, and 15.9 days at Site G (E504 ELD). Overall, J602F3 ELD would decrease the average number of days below 1,765 cfs in the LAR, with the greatest decreases occurring during March, April, and May. A decrease of 2.3 to 4.2 average days below the threshold over a 3-consecutive-month period could provide additional flows with J602F3 ELD for cottonwood radial growth and provide a potential benefit during the cottonwood growing season.

In the next comparison, J602F3 ELD would decrease the average number of days (0.1 to 1.8 days depending on the site) below 3,000 cfs during March, April, May, June, September, and October relative to E504 ELD at all three sites. J602F3 ELD would increase the average number of days below 3,000 cfs during July (0.5 day) relative to E504 ELDs at all three sites. J602F3 ELD average number of days below 3,000 cfs would remain unchanged during August at Site E, while Sites F and G would have minimal decreases of 0.1 day during July. October would have the greatest average number of days (during the cottonwood growing season) below 3,000 cfs in the LAR with an average number of 25.1 days per month below 3,000 cfs at all three sites (E504 ELD). J602F3 ELD would decrease the average number of days per month below 3,000 cfs by 0.8 day at Site E, and 0.9 day at Sites F and G, to 24.3 average days at Site E, and 24.2 average days at Sites F and G, relative to E504 ELD during October. July would have the lowest average number of days below 3,000 cfs in the LAR with 11.9 average days at Site E and 12.1 average days at Sites F and G (E504 ELD). J602F3 ELD would increase this average number of days by 0.5 day at all sites relative to E504 ELD during July. Overall, 7 of the 8 months would have a slight decrease in the average number of days below the threshold. However, these slight decreases in monthly average days below threshold over the 7 months would be negligible, volume flow rates would continue, and cottonwood growth would remain consistent under either E504 ELD or J602F3 ELD.

Cottonwoods typically disperse seed between February and April. J602F3 ELD would result in minor changes in the average number of days (–0.9 to +1.1 days) when flows would be above 5,000 cfs relative to E504 ELD. J602F3 ELD would change the average number of days in a month above the threshold during February (0.9-day decrease), March (1.1-day increase), and April (1.0-day increase) at all three sites relative to E504 ELD. This minor difference would not affect the overall frequency of flows above 5,000 cfs, which implies that instantaneous flows sufficient to inundate the terraces and facilitate cottonwood seed dispersal would remain largely consistent with E504 ELD over the 73-year period of record.

1.1.1.1.2 Backwater Recharge

1.1.1.1.2.1 Reach 3

Simulated flows exhibited the same results at Sites A, B, and C in Reach 3. Table 36 summarizes simulated flows in Reach 3 (RM 12.0 to Nimbus Dam); this example is from Site A. For both comparisons (average days below 2,700 cfs and below 4,000 cfs), lower values are preferred, as this reflects the number of days that fall *below* the threshold that supports backwater recharge.

Table 6. Average number of days when flows would be below a specified threshold for backwater recharge in the lower American River at Site A (RM 18.49–18.83) under E504 ELD and J602F3 ELD

Month	Average Number of Days by Month Below Specified Threshold (73-year Record)							
	Average Number of Days below the 2,700-cfs Flow Threshold[1]				Average Number of Days below the 4,000-cfs Flow Threshold[2]			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Dec	23.7	23.7	0.0	0%	25.6	25.4	-0.2	-1%
Jan	18.5	18.8	0.3	2%	20.6	20.8	0.2	1%
Feb	13.5	14.8	1.3	10%	15.8	17.0	1.2	8%
Mar	18.4	18.1	-0.3	-2%	21.5	21.0	-0.5	-2%
Apr	19.5	17.7	-1.8	-9%	21.9	20.7	-1.2	-5%
May	18.4	17.5	-0.9	-5%	21.1	20.7	-0.4	-2%
Jun	18.1	17.3	-0.8	-4%	21.0	20.7	-0.3	-1%
Jul	10.0	10.0	0.0	0%	19.3	18.7	-0.6	-3%
Aug	20.3	19.5	-0.8	-4%	25.0	27.2	2.2	9%
Sep	19.0	17.9	-1.1	-6%	22.8	22.6	-0.2	-1%
Oct	23.7	23.2	-0.5	-2%	27.9	27.9	0.0	0%
Nov	18.2	18.4	0.2	1%	23.8	23.8	0.0	0%

1 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 2,700-cfs threshold for backwater pond recharge on the lower American River.

2 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 4,000-cfs threshold for off-river pond recharge on the lower American River.

The winter (December, January, and February) and spring (March, April, and May) months are when backwater ponds closest to the river are recharged by high flows. Flows of 2,700 cfs are required to recharge these ponds. Periods with average daily flows that meet this threshold for backwater recharge (2,700 cfs) are projected to continue during the 73-year hydrologic period under J602F3 ELD. Projected flows under J602F3 ELD show no effect during December, a decrease in the average number of days below 2,700 cfs during March (0.3 day), April (1.8 days), and May (0.9 day), and a slight increase in the average number of days below 2,700 cfs during January (0.3 day) and February (1.3 days) relative to E504 ELD. December is the recharge month when the average number of days below the threshold in the LAR would be the greatest, with 23.7 average days falling below the minimal threshold for backwater recharge (E504 ELD). J602F3 ELD would not affect this average number of days relative to E504 ELD. February is the recharge month when the average number of days below threshold would be the lowest in the LAR with 13.5 average days below 2,700 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 1.3 days to 14.8 average days below 2,700 cfs relative to E504 ELD. Given the minimal difference between E504 ELD and J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for backwater recharge of ponds closest to the river during the 73-year hydrologic period.

Winter and spring months are also when farther-off-river ponds are recharged by high flow, requiring a minimal threshold of 4,000 cfs. Projected flows under J602F3 ELD show a slight decrease in the average number of days below 4,000 cfs during December (0.2 day), March (0.5 day), April (1.2 days), and May (0.4 day), and a slight increase during January (0.2 day) and February (1.2 days) relative to E504 ELD. December would have the greatest number of average days during the recharge months with a 25.6 average number of days below 4,000 cfs under E504 ELD. In December, J602F3 ELD would decrease the average number of days by 0.2 day to 25.4 average days below 4,000 cfs relative to E504 ELD. February would have the lowest average number of days below the threshold during recharge months in the LAR with 15.8 days below 4,000 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 1.2 days to 17.0 average days below 4,000 cfs relative to E504 ELD. Given the minimal difference between E504 ELD and J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for recharge of farther off-river ponds during the 73-year hydrologic period.

Projected flows under J602F3 ELD at Site A would be slightly different from flows under E504 ELD, but not at a frequency or duration that would affect backwater or off-river pond recharge or vegetation associated with the ponds.

1.1.1.1.2.2 Reach 2

Table 37 summarizes flows at Site D in Reach 2 (RM 12.0 to Nimbus Dam).

Table 7. Average number of days when flows would be below a specified threshold for backwater recharge in the lower American River at Site D (RM 11.35–11.59) under E504 ELD and J602F3 ELD

Month	Average Number of Days by Month Below Specified Threshold (73-year Record)							
	Average Number of Days below the 2,700-cfs Flow Threshold[1]				Average Number of Days below the 4,000-cfs Flow Threshold[2]			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Dec	23.6	23.7	0.1	0%	25.6	25.4	-0.2	-1%
Jan	18.5	18.8	0.3	2%	20.6	20.8	0.2	1%
Feb	13.5	14.9	1.4	10%	15.8	17.0	1.2	8%
Mar	18.4	18.0	-0.4	-2%	21.4	21.0	-0.4	-2%
Apr	19.5	17.6	-1.9	-10%	21.9	20.6	-1.3	-6%
May	18.3	17.5	-0.8	-4%	21.0	20.6	-0.4	-2%
Jun	18.0	17.2	-0.8	-4%	20.9	20.7	-0.2	-1%
Jul	9.9	10.0	0.1	1%	19.2	19.0	-0.2	-1%
Aug	20.2	19.4	-0.8	-4%	25.0	27.2	2.2	9%
Sep	19.0	17.9	-1.1	-6%	22.7	22.7	0.0	0%
Oct	23.7	23.1	-0.6	-3%	27.9	27.9	0.0	0%
Nov	18.2	18.4	0.2	1%	23.7	23.8	0.1	0%

1 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 2,700-cfs threshold for backwater pond recharge on the lower American River.
2 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 4,000-cfs threshold for off-river pond recharge on the lower American River.

The winter (December, January, and February) and spring (March, April, and May) months are when backwater ponds closest to the river are recharged by high flows. Flows of 2,700 cfs are required to recharge these ponds. Periods with average daily flows that meet this threshold for backwater recharge (2,700 cfs) are projected to continue during the 73-year hydrologic period under J602F3 ELD. Projected flows under J602F3 ELD show decreases in the average number of days below 2,700 cfs during March (0.4 day), April (1.9 days), and May (0.8 day), and slight increases in the average number of days below 2,700 cfs during December (0.1 day), January (0.3 day), and February (0.7 day) relative to E504 ELD. December is the recharge month where the average number of days below the threshold in the LAR would be the highest, with 23.6 average numbers of days (E504 ELD). J602F3 ELD would increase this average number of days by 0.1 day to 23.7 average days below 2,700 cfs relative to E504 ELD. February is the recharge month when the average number of days would be the lowest in the LAR with 13.5 average days below 2,700 cfs (E504 ELD). J602F3 ELD would increase the average number of days by

1.4 days to 14.9 average days below 2,700 cfs relative to E504 ELD. Given the minimal difference between E504 ELD and J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for backwater recharge of ponds closest to the river during the 73-year hydrologic period.

Winter and spring months are also when farther-off-river ponds are recharged by high flow, requiring a minimal threshold of 4,000 cfs. Projected flows under J602F3 ELD show a slight decrease in average number of days below 4,000 cfs during December (0.2 day), March (0.4 day), April (1.3 days), and May (0.4 day), and a slight increase during January (0.2 day) and February (1.2 days) relative to E504 ELD. December would have the greatest average number of days in the recharge months with a 25.6 average number of days below 4,000 cfs under E504 ELD. In December, J602F3 ELD would decrease the average number of days by 0.2 day to 25.4 average days below 4,000 cfs relative to E504 ELD. February would have the lowest average number of days below the threshold during recharge months in the LAR with 15.8 days below 4,000 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 1.2 days to 17.0 average days below 4,000 cfs relative to E504 ELD. Given the minimal difference between E504 ELD and J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for recharge of farther-off-river ponds during the 73-year hydrologic period.

Projected flows under J602F3 ELD at Site D would be slightly different from flows under E504 ELD, but not at a frequency or duration that would affect backwater or off-river pond recharge or vegetation associated with the ponds.

1.1.1.1.2.3 Reach 1

Table 38 summarizes flows at Site E, Table 39 summarizes flows at Site F, and Table 40 summarizes flows at Site G, all of which are in Reach 1 (Confluence to H Street Bridge).

Table 8. Average number of days when flows would be below a specified threshold for backwater recharge in the lower American River at Site E (RM 5.34–5.69) under E504 ELD and J602F3 ELD

Month	Average Number of Days by Month Below Specified Threshold (73-year Record)							
	Average Number of Days below the 2,700-cfs Flow Threshold[1]				Average Number of Days below the 4,000-cfs Flow Threshold[2]			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Dec	23.7	23.7	0.0	0%	25.6	25.5	-0.1	0%
Jan	18.5	18.8	0.3	2%	20.6	20.8	0.2	1%
Feb	13.4	14.8	1.4	10%	15.9	16.9	1.0	6%
Mar	18.4	18.0	-0.4	-2%	21.3	21.0	-0.3	-1%
Apr	19.5	17.6	-1.9	-10%	21.9	20.6	-1.3	-6%
May	18.2	17.4	-0.8	-4%	21.0	20.7	-0.3	-1%
Jun	18.0	17.2	-0.8	-4%	20.9	20.6	-0.3	-1%
Jul	9.9	9.9	0.0	0%	19.1	18.9	-0.2	-1%
Aug	20.2	19.3	-0.9	-4%	24.9	27.1	2.2	9%
Sep	18.9	17.8	-1.1	-6%	22.7	22.7	0.0	0%
Oct	23.7	23.1	-0.6	-3%	27.9	27.9	0.0	0%
Nov	18.2	18.5	0.3	2%	23.8	23.9	0.1	0%

1 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 2,700-cfs threshold for backwater pond recharge on the lower American River.
2 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 4,000-cfs threshold for off-river pond recharge on the lower American River.

Table 9. Average number of days when flows would be below a specified threshold for backwater recharge in the lower American River at Site F (RM 4.82–5) under E504 ELD and J602F3 ELD

Month	Average Number of Days by Month Below Specified Threshold (73-year Record)							
	Average Number of Days below the 2,700-cfs Flow Threshold[1]				Average Number of Days below the 4,000-cfs Flow Threshold[2]			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Dec	23.7	23.7	0.0	0%	25.6	25.5	-0.1	0%
Jan	18.5	18.7	0.2	1%	20.6	20.8	0.2	1%
Feb	13.4	14.8	1.4	10%	15.9	16.9	1.0	6%
Mar	18.4	18.0	-0.4	-2%	21.3	21.0	-0.3	-1%
Apr	19.5	17.6	-1.9	-10%	21.9	20.6	-1.3	-6%
May	18.2	17.4	-0.8	-4%	21.0	20.7	-0.3	-1%
Jun	18.0	17.2	-0.8	-4%	20.9	20.6	-0.3	-1%
Jul	9.9	10.0	0.1	1%	19.1	18.9	-0.2	-1%
Aug	20.2	19.3	-0.9	-4%	24.9	27.1	2.2	9%
Sep	19.0	17.8	-1.2	-6%	22.7	22.7	0.0	0%
Oct	23.7	23.1	-0.6	-3%	27.9	27.9	0.0	0%
Nov	18.2	18.5	0.3	2%	23.8	23.9	0.1	0%

1 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 2,700-cfs threshold for backwater pond recharge on the lower American River.

2 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 4,000-cfs threshold for off-river pond recharge on the lower American River.

Table 10. Average number of days when flows would be below a specified threshold for backwater recharge in the lower American River at Site G (RM 3.4–3.69) under E504 ELD and J602F3 ELD

Month	Average Number of Days by Month Below Specified Threshold (73-year Record)							
	Average Number of Days below the 2,700-cfs Flow Threshold[1]				Average Number of Days below the 2,700-cfs Flow Threshold[1]			
	E504 ELD	J602F3 ELD	Diff	% Diff	E504 ELD	J602F3 ELD	Diff	% Diff
Dec	23.7	23.7	0.0	0%	25.6	25.5	-0.1	0%
Jan	18.5	18.7	0.2	1%	20.6	20.8	0.2	1%
Feb	13.5	14.8	1.3	10%	15.9	16.9	1.0	6%
Mar	18.4	18.0	-0.4	-2%	21.3	21.0	-0.3	-1%
Apr	19.4	17.6	-1.8	-9%	21.9	20.6	-1.3	-6%
May	18.2	17.4	-0.8	-4%	21.0	20.6	-0.4	-2%
Jun	17.9	17.2	-0.7	-4%	20.9	20.6	-0.3	-1%
Jul	9.9	10.0	0.1	1%	19.1	19.0	-0.1	-1%
Aug	20.2	19.3	-0.9	-4%	24.9	27.1	2.2	9%
Sep	19.0	17.9	-1.1	-6%	22.7	22.7	0.0	0%
Oct	23.7	23.1	-0.6	-3%	27.9	27.9	0.0	0%
Nov	18.2	18.5	0.3	2%	23.8	23.9	0.1	0%

1 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 2,700-cfs threshold for backwater pond recharge on the lower American River.
2 Number of days in referenced month during the 73-year record when the average daily river flows would be below the 4,000-cfs threshold for off-river pond recharge on the lower American River.

The winter (December, January, and February) and spring (March, April, and May) months are when backwater ponds closest to the river are recharged by high flows. Flows of 2,700 cfs are required to recharge these ponds. Periods with average daily flows that meet this threshold for backwater recharge (2,700 cfs) are projected to continue during the 73-year hydrologic period under J602F3 ELD. Projected flows under J602F3 ELD show no effect during December, a slight decrease in the average number of days below 2,700 cfs during March (0.4 day), April (1.8 to 1.9 days depending on the site), and May (0.8 day), and a slight increase in the average number of days below 2,700 cfs during January (0.2 to 0.3 day depending on the site) and February (1.3 to 1.4 days depending on the site) relative to E504 ELD. December is the recharge month when the number of average days projected to be below the threshold would be highest with 23.7 days below 2,700 cfs at all sites. J602F3 ELD would have no effect on average days below 2,700 cfs relative to E504 ELD at all sites during December. February would have the lowest average number of days below the threshold during recharge months in the LAR with 13.4 to 13.5 days (depending on the site) below 2,700 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 1.4 days (Sites E and F) and 1.3 days (Site G) to 14.8 (all sites) average days below 2,700 cfs relative to E504 ELD for February. Given the minimal difference between E504 ELD and

J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for backwater recharge of ponds closest to the river during the 73-year hydrologic period.

Winter and spring months are also when farther-off-river ponds are recharged by high flow, requiring a minimal threshold of 4,000 cfs. Projected flows under J602F3 ELD show a slight decrease in average number of days below 4,000 cfs during December (0.1 day), March (0.3 day), April (1.3 days), and May (0.4 day), and a slight increase during January (0.2 day) and February (1.0 day) relative to E504 ELD. December would have the greatest average number of days in the recharge months with a 25.6 average number of days below 4,000 cfs under E504 ELD. In December, J602F3 ELD would decrease the average number of days by 0.1 day to 25.5 average days below 4,000 cfs relative to E504 ELD. February would have the lowest average number of days below the threshold during recharge months in the LAR with 15.9 days at all sites below 4,000 cfs (E504 ELD). J602F3 ELD would increase the average number of days by 1.0 day to 16.9 average days at all sites below 4,000 cfs relative to E504 ELD for February. Given the minimal difference between E504 ELD and J602F3 ELD for this comparison, average daily flows are projected to remain essentially the same for either scenario for recharge of farther-off-river ponds during the 73-year hydrologic period.

Projected flows under J602F3 ELD at Sites E, F, and G would be slightly different from flows under E504 ELD, but not at a frequency or duration that would affect backwater or off-river pond recharge or vegetation associated with the ponds.

1.1.1.2 Folsom Reservoir

A summary table of the long-term and water year type average of Folsom Reservoir end-of-month elevations under E504 ELD and J602F3 ELD is provided in Appendix C, Table Daily-80 149 E504ELD-J602F3ELD. The highest elevations predicted for Folsom Reservoir under J602F3 ELD are 465 feet, which would occur in June for wet.

In wet and above-normal years, June would have the highest predicted water levels in Folsom Reservoir; the simulation for dry and critical years prolongs the elevated water levels to include May and June. Output from the full 82-year simulation period shows a maximum variance of 11 feet in elevation between E504 ELD and J602F3 ELD over the full 82-year simulation period (ranging from a 1-foot decrease to a 10-foot increase). For the simulations for individual water year types, the largest changes would occur in February with a 9-foot gain (2.2-percent increase) and March with a 10-foot gain (2.4-percent increase) in wet years followed by a 7-foot gain (1.9-percent increase) in February and March for above-normal years. Besides the predicted increases in February and March for both wet and above-normal years, fluctuations generally would range from a 1-foot loss to a 4-foot gain in reservoir elevation, with less than 2-percent variation between E504 ELD and J602F3 ELD across all months for all water year type simulations. In critical years, a 1-foot loss to a 1-foot gain with no change in elevation is predicted for all months. Moderate fluctuations (1-foot loss to 3-foot gain in elevation) are predicted in below-normal and dry years. Wet and above-normal years have the most predicted fluctuation (1-foot loss to 10-foot gain in elevation). More than half of the simulated years for J602F3 ELD in wet years have an increase in reservoir elevation from E504 ELD; water elevations would range from 415 to 464 feet. Above-normal years would have similar variation between conditions, with 8 months of modeled increases in reservoir elevation and water levels ranging between 407 and 463 feet. For below-normal, dry, and critical years, there would be a slight variation in elevation between conditions, with elevation levels ranging from 388 to 460 feet.

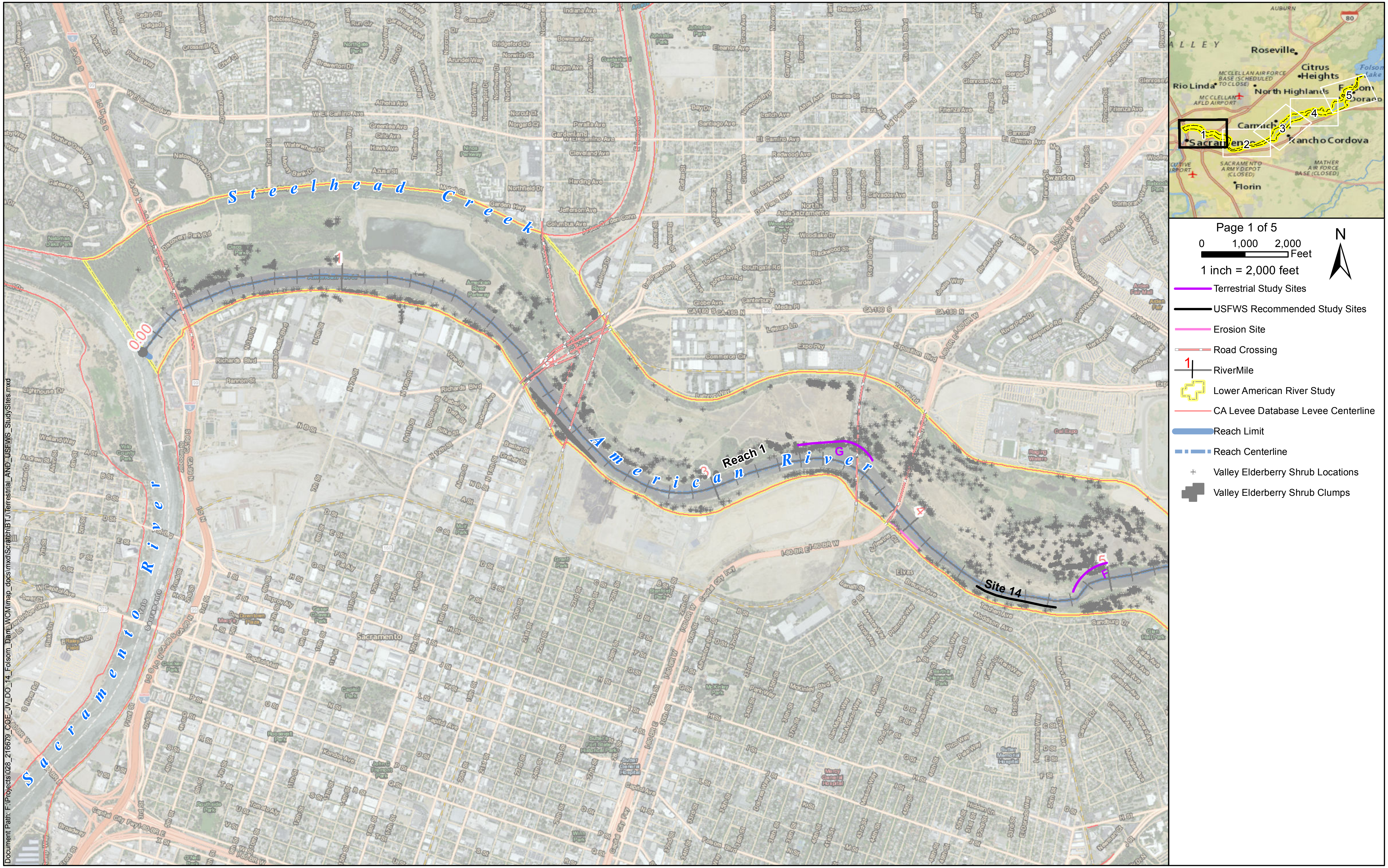
1.1.1.3 Evaluation of Effects

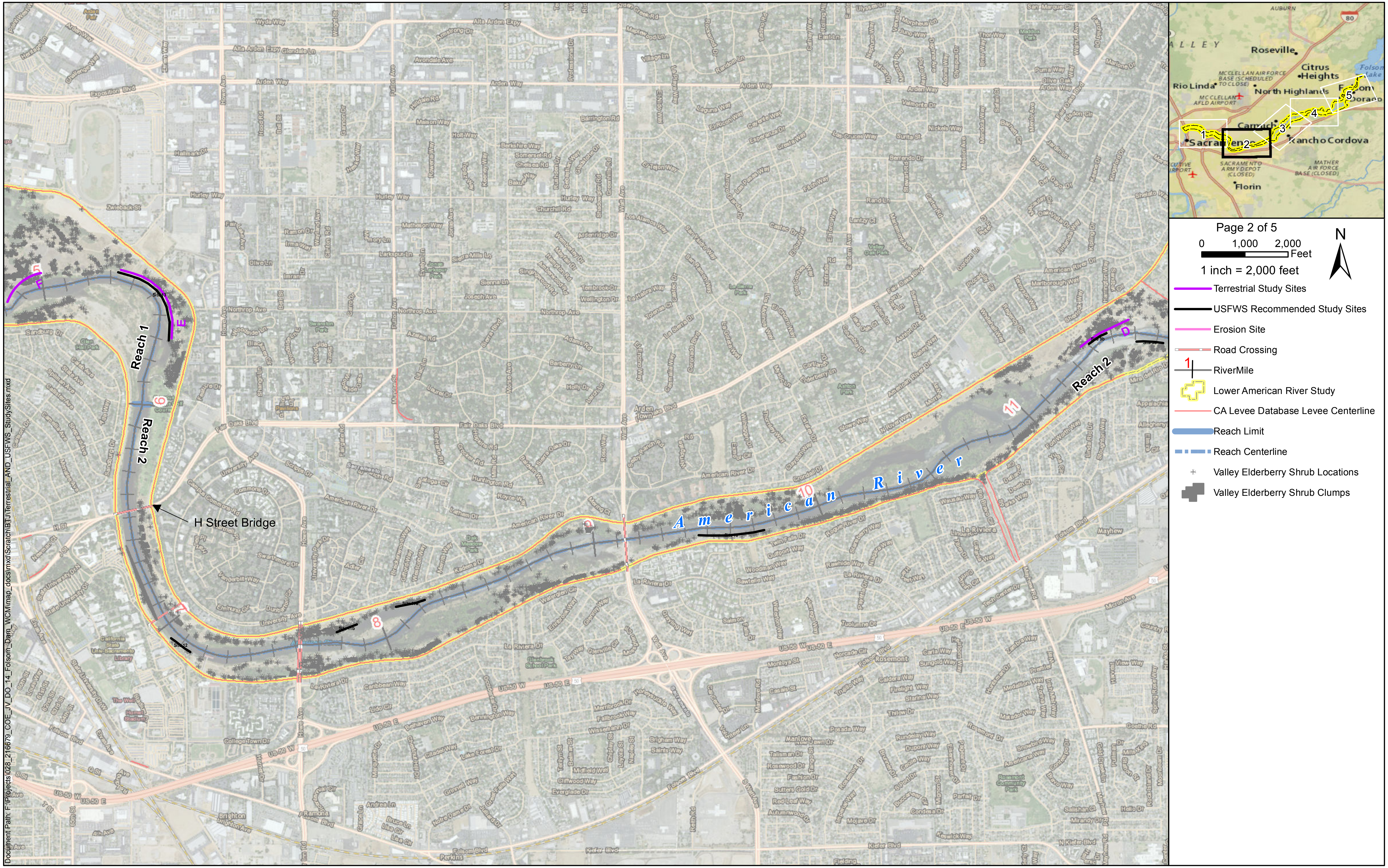
The J602F3 ELD results indicate that the LAR flows under the 1,765-cfs threshold could decrease between 3.7 to 4.2 average days over a 3-consecutive-month period during the cottonwood growing season relative to E504 ELD. A decrease of 3 to 4 average days below the threshold over a 3-consecutive-month period could provide additional flows with J602F3 ELD for cottonwood radial growth and provide a potential benefit during the cottonwood growing season. However, cottonwood maintenance and optimal growth under the 3,000-cfs threshold would stay relatively consistent during the cottonwood growing season between E504 ELD and J602F3 ELD. Therefore, effects on vegetation growth in the riparian corridor of the LAR under J602F3 ELD would be a potential benefit under the 1,765-cfs threshold and less than substantial under the 3,000-cfs threshold. In addition, there would be no substantial difference in the pattern of peak flows necessary to inundate terraces for cottonwood dispersal and regeneration between J602F3 ELD and E504 ELD. As discussed in Section 8 (Erosion), J602F3 ELD critical shear values for riparian study sites along the LAR would also be less than substantial, with a low probability of exceedance beyond the critical shear threshold.

USFWS has designated the Parkway as critical habitat for VELB, and this species has been recorded in elderberry shrubs near backwater ponds along the LAR. Sanford's arrowhead, western pond turtle, and tri-colored blackbirds are special-status species known to occur in several backwater pond areas along the LAR. Relative to E504 ELD, J602F3 ELD would result in fluctuations between 2 less to 1 more day when average daily flows are below the evaluated thresholds during winter and spring months. The difference in flows would not change by a sufficient magnitude and frequency to substantially alter existing water fluctuations (pond levels) and vegetation dependent on these ponds. Because effects on backwater habitats under J602F3 ELD would be less than substantial, effects on elderberry shrubs and special-status species that depend on these habitats also would be less than substantial.

Under J602F3 ELD, the water surface elevation fluctuations that would take place at Folsom Reservoir would remain within normal operating parameters (i.e., water elevations would not exceed the 466-foot-amsl threshold or barren band for durations that could impact existing vegetation). Folsom Reservoir has water levels that routinely fluctuate. J602F3 ELD would result in water surface elevation patterns that are the same as or slightly lower than those with E504 ELD. J602F3 ELD would not change the distribution of vegetation or alter riparian vegetation scattered around the reservoir. The fluctuation zone at Folsom Reservoir is essentially devoid of vegetation. Under these conditions, any elderberry shrubs that would be established at Folsom Reservoir would exist above the fluctuation zone and would not be adversely affected by the flood-control project operations.

Appendix 5B - Terrestrial Figures





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Terrestrial Study Sites
USFWS Recommended Study Sites
Erosion Site
Road Crossing
RiverMile
Lower American River Study
CA Levee Database Levee Centerline
Reach Limit
Reach Centerline
Valley Elderberry Shrub Locations
Valley Elderberry Shrub Clumps
Roseville
Citrus Heights
Rio Linda
North Highlands
Rancho Cordova
Florin
H Street Bridge
Reach 1
Reach 2
American River
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Reach Centerline
Valley Elderberry Shrub Locations
Valley Elderberry Shrub Clumps
American River
Reach 2
Reach 3
Site 5
Site 7
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Auburn
Roseville
Citrus Heights
Rio Linda
North Highlands
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Sacramento
Rancho Cordova
Sacramento Army Depot (Closed)
Mather Air Force Base (Closed)
Florin
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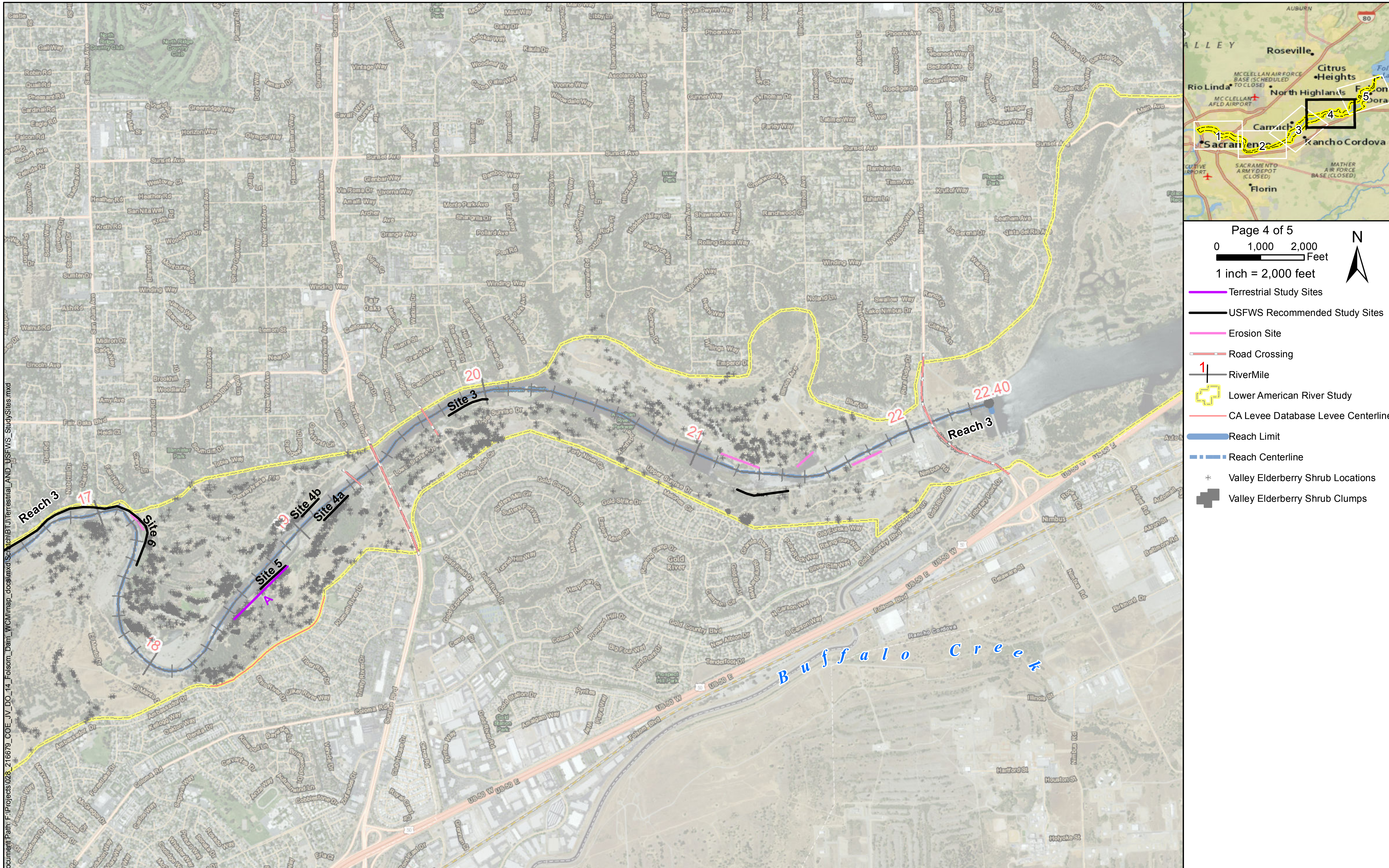
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RiverMile
Lower American River Study
CA Levee Database Levee Centerline
Reach Limit
Reach Centerline
Valley Elderberry Shrub Locations
Valley Elderberry Shrub Clumps
Reach 3
Site 3
Site 4a
Site 4b
Site 5
Site 6
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Sacramento
Florin
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American River
Willow Creek
Humbug Creek
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Rio Linda
North Highlands
Carmichael
Rancho Cordova
Florin
Sacramento
Folsom
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Terrestrial Study Sites
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Reach Centerline
Valley Elderberry Shrub Locations
Valley Elderberry Shrub Clumps
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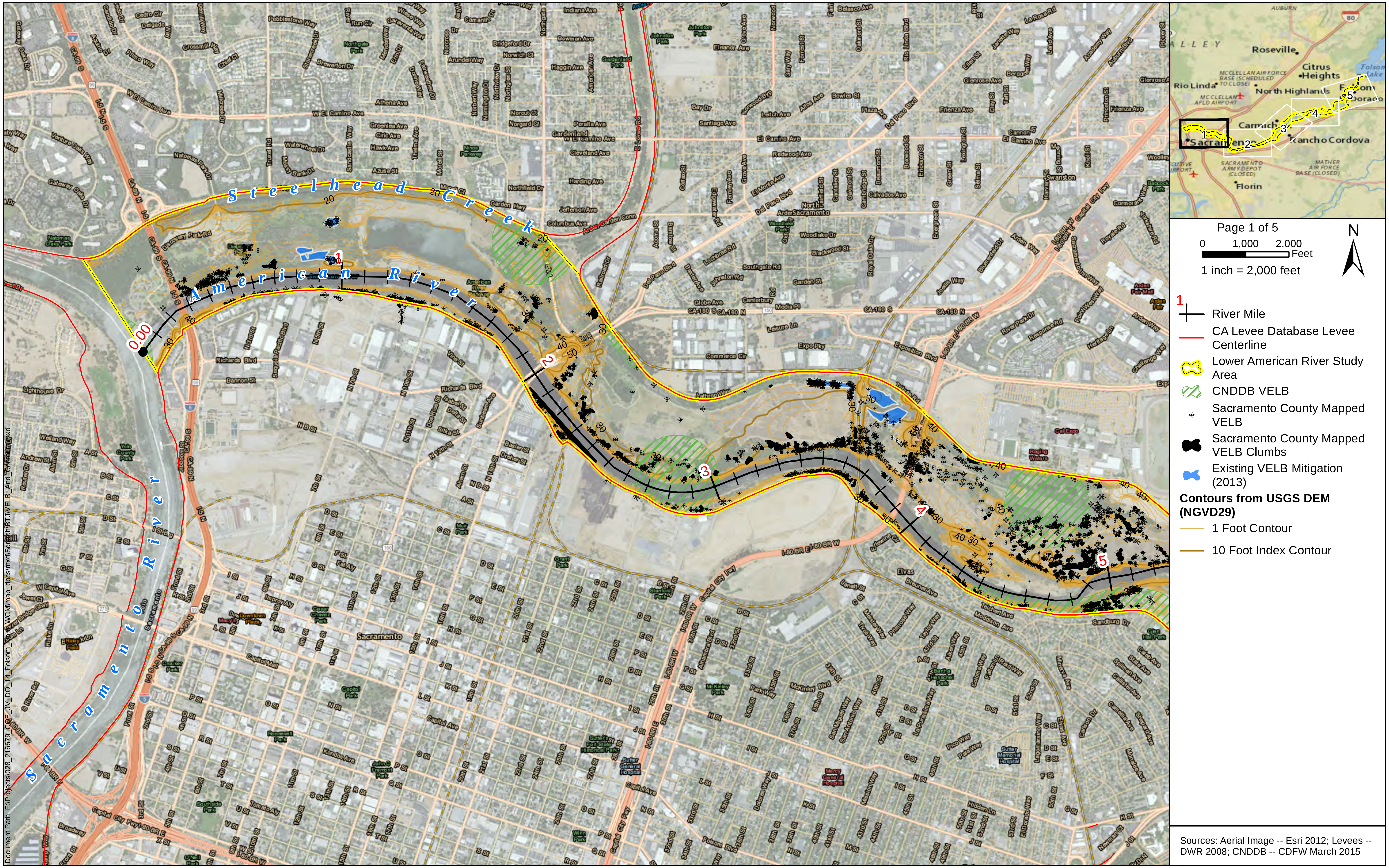

Steelhead Creek
American River
Sacramento River
Sacramento
Roseville
Citrus Heights
Rio Linda
North Highlands
Carmichael
Rancho Cordova
Florin
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1 inch = 2,000 feet
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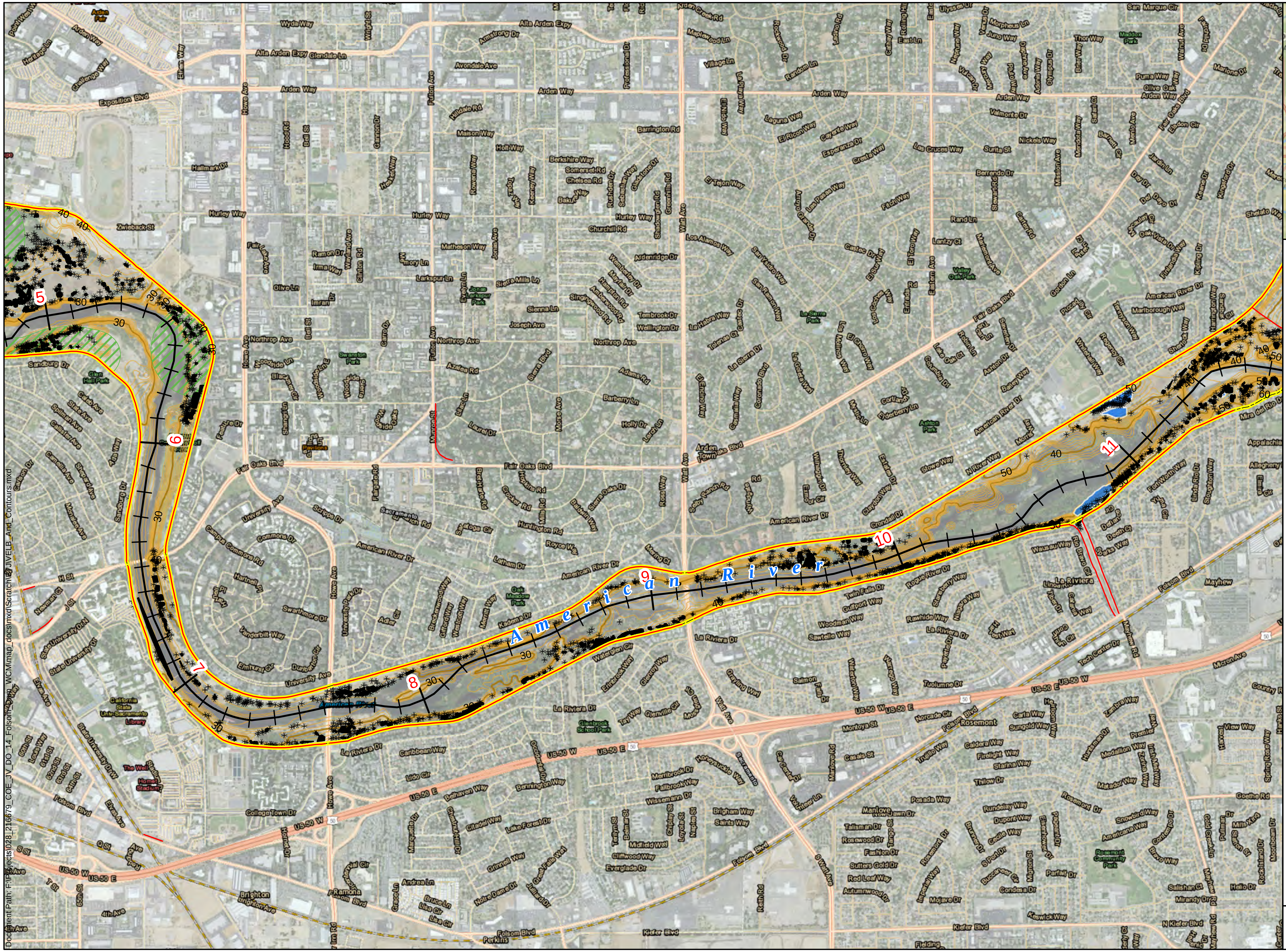
River Mile
CA Levee Database Levee Centerline
Lower American River Study Area
CNDDB VELB
Sacramento County Mapped VELB
Sacramento County Mapped VELB Clumbs
Existing VELB Mitigation (2013)
Contours from USGS DEM (NGVD29)
1 Foot Contour
10 Foot Index Contour
Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015



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- River Mile
- CA Levee Database Levee Centerline
- Lower American River Study Area
- CNDDB VELB
- Sacramento County Mapped VELB
- Sacramento County Mapped VELB Clumbs
- Existing VELB Mitigation (2013)

Contours from USGS DEM (NGVD29)

- 1 Foot Contour
- 10 Foot Index Contour

Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015

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American River
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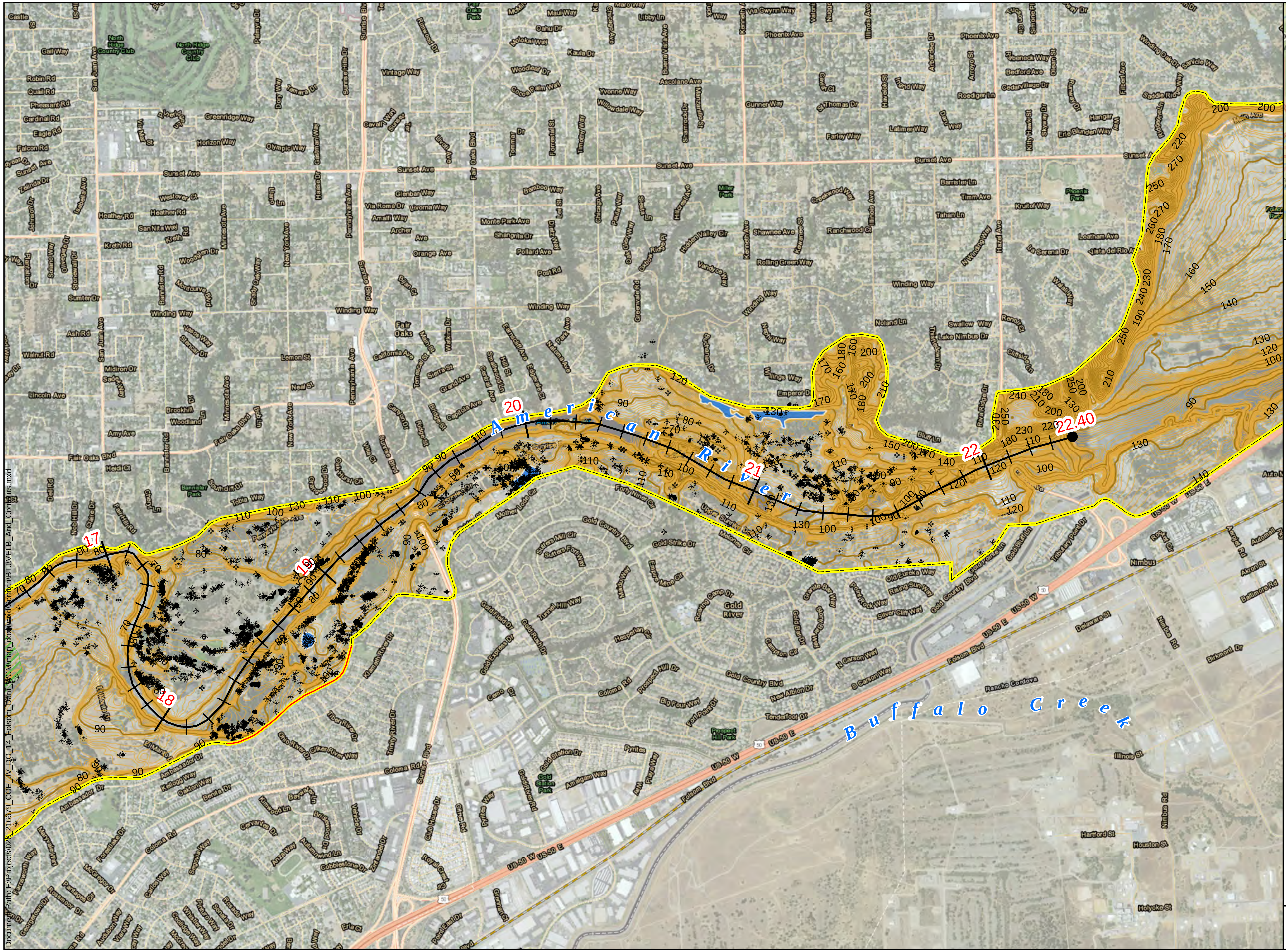
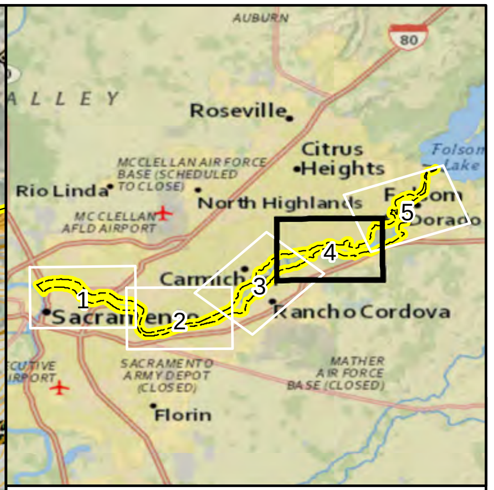
CA Levee Database Levee Centerline
Lower American River Study Area
CNDDB VELB
Sacramento County Mapped VELB
Sacramento County Mapped VELB Clumbs
Existing VELB Mitigation (2013)
Contours from USGS DEM (NGVD29)
1 Foot Contour
10 Foot Index Contour
Roseville
Citrus Heights
Rio Linda
North Highlands
Carmichael
Sacramento
Rancho Cordova
Folsom
Florin
Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015





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1 inch = 2,000 feet

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1 River Mile

CA Levee Database Levee Centerline

Lower American River Study Area

CNDDB VELB

Sacramento County Mapped VELB

Sacramento County Mapped VELB Clumbs

Existing VELB Mitigation (2013)

Contours from USGS DEM (NGVD29)

1 Foot Contour

10 Foot Index Contour

Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015


American River
Humbug Creek
Willow Creek
Folsom
Roseville
Citrus Heights
Rio Linda
North Highlands
Carmichael
Rancho Cordova
Florin
Page 5 of 5
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1 inch = 2,000 feet
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River Mile
CA Levee Database Levee Centerline
Lower American River Study Area
CNDDB VELB
Sacramento County Mapped VELB
Sacramento County Mapped VELB Clumbs
Existing VELB Mitigation (2013)
Contours from USGS DEM (NGVD29)
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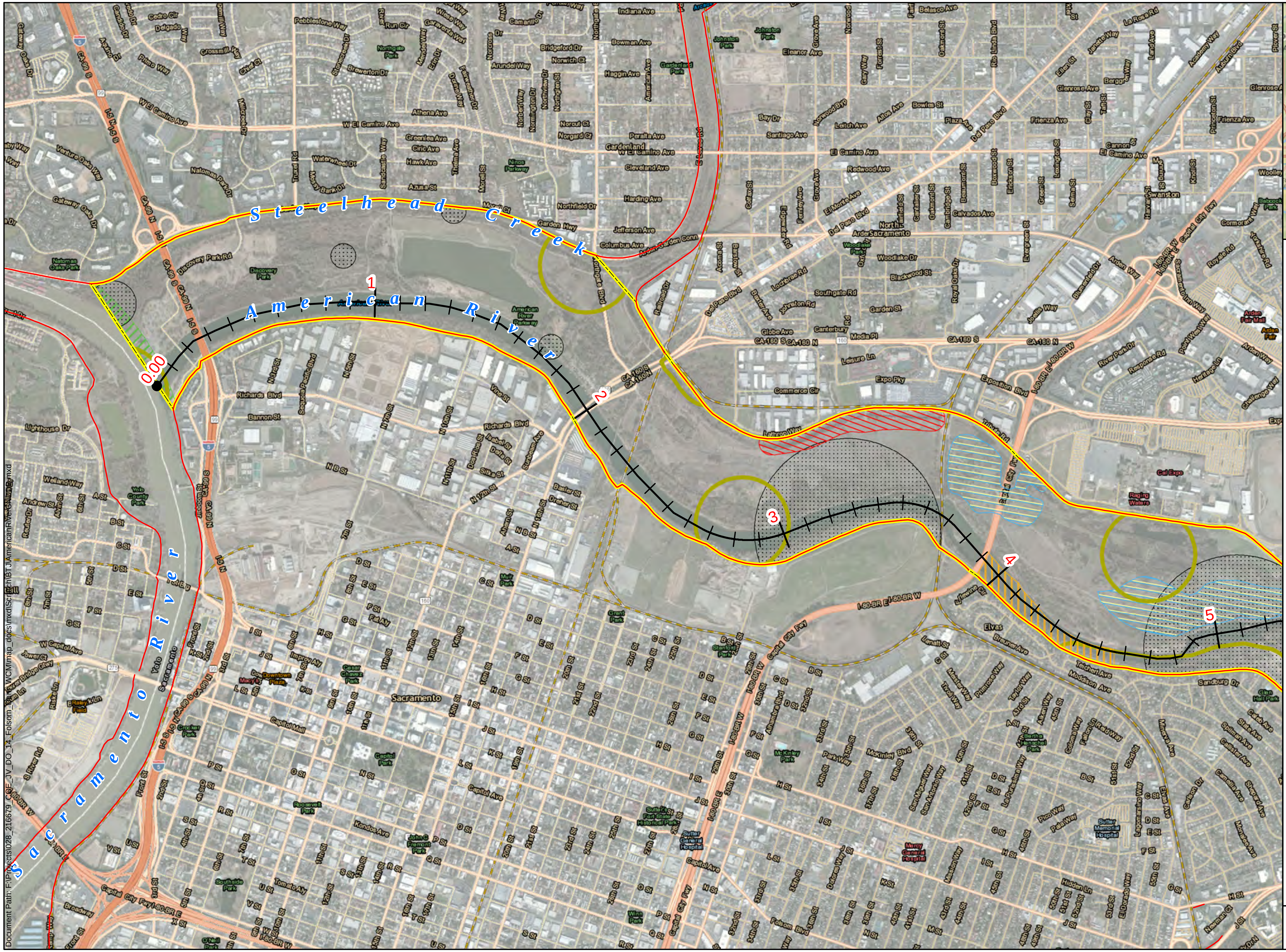

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1 inch = 2,000 feet

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River Mile

CA Levee Database Levee Centerline

Lower American River Study Area

Terrestrial Species and Sensitive Habitat from CNDDB

Elderberry Savanna

Sanford's arrowhead

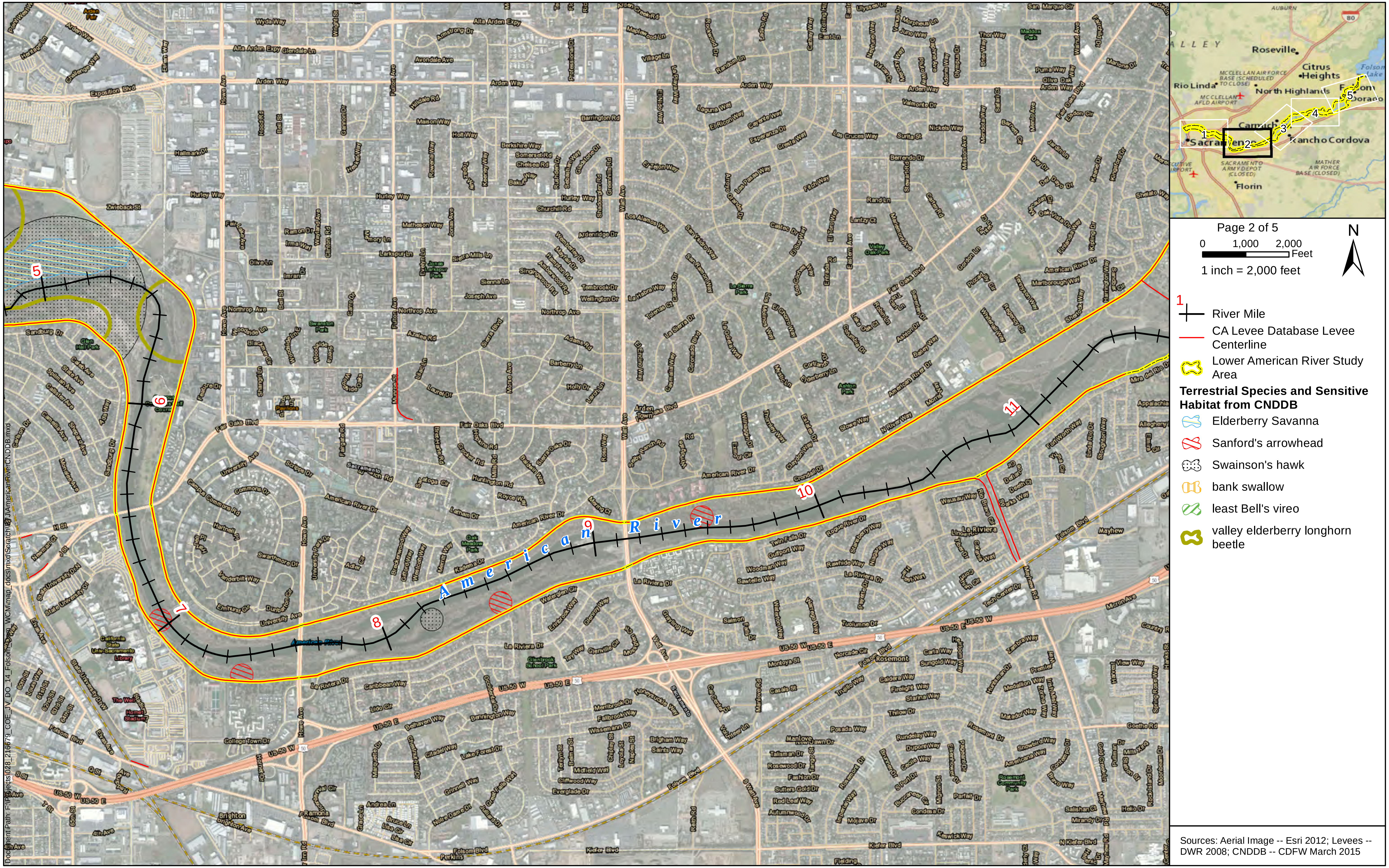
Swainson's hawk

bank swallow

least Bell's vireo

valley elderberry longhorn beetle

Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015



Page 2 of 5
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1 inch = 2,000 feet
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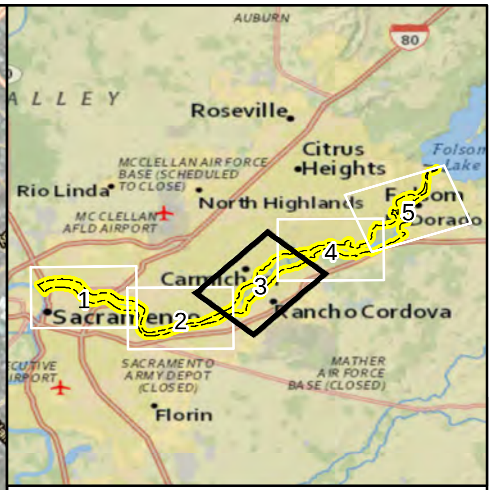
CA Levee Database Levee Centerline
Lower American River Study Area
Terrestrial Species and Sensitive Habitat from CNDDB
Elderberry Savanna
Sanford's arrowhead
Swainson's hawk
bank swallow
least Bell's vireo
valley elderberry longhorn beetle
Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015
American River
Roseville
Citrus Heights
Rio Linda
North Highlands
Rancho Cordova
Florin



Page 3 of 5

0 1,000 2,000 Feet

1 inch = 2,000 feet

1 River Mile

CA Levee Database Levee Centerline

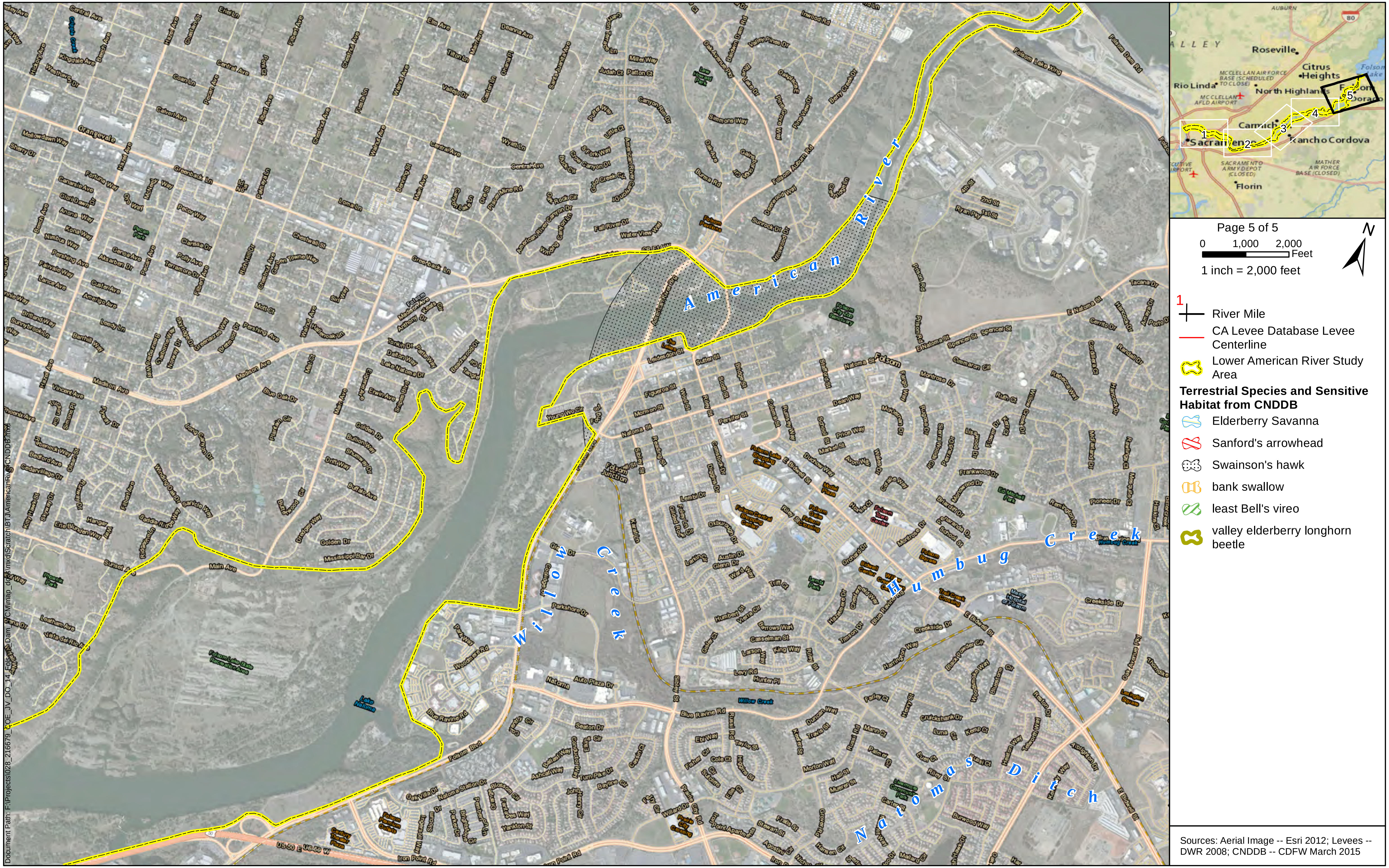
Lower American River Study Area

Terrestrial Species and Sensitive Habitat from CNDDB

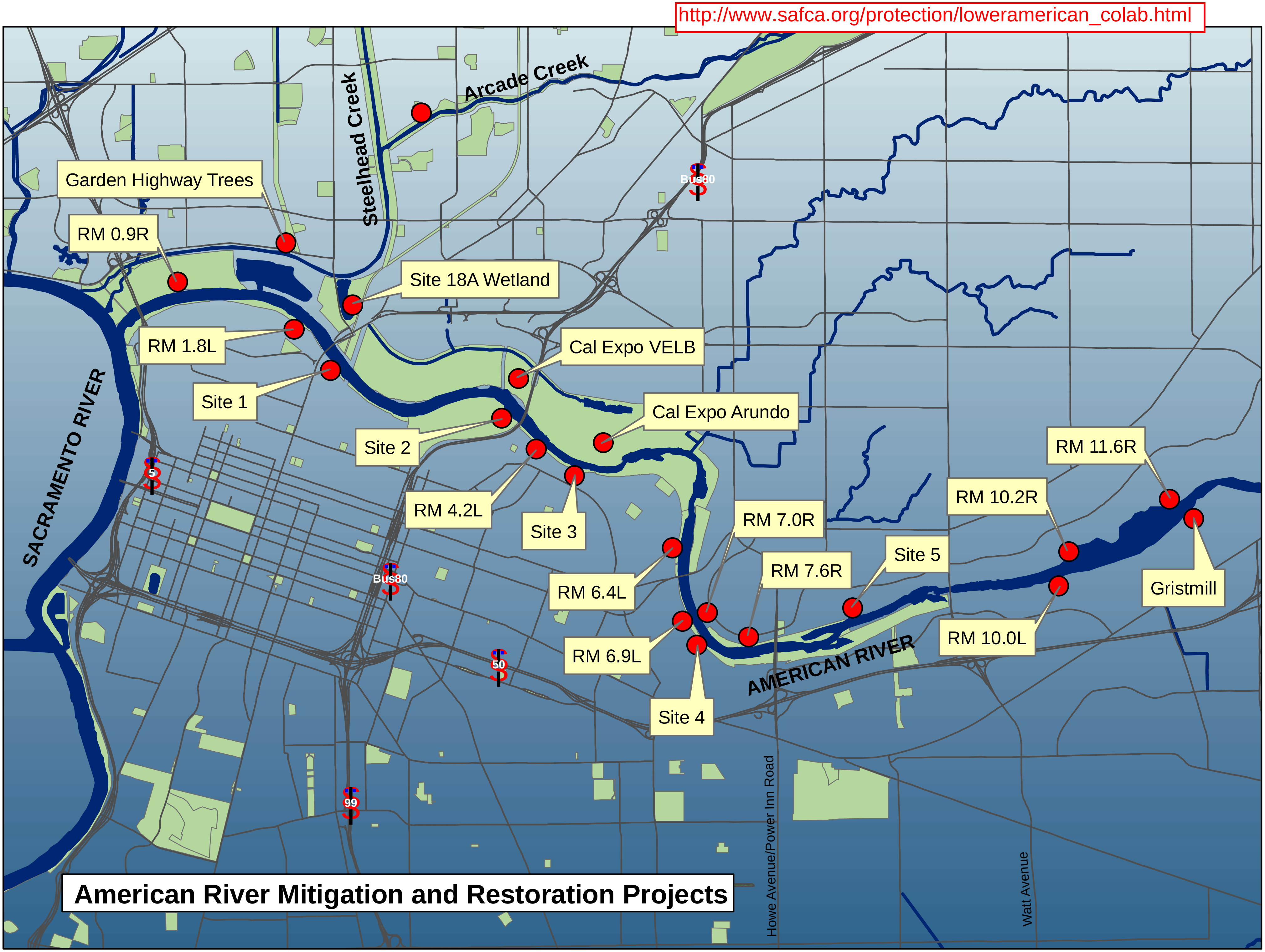
- Elderberry Savanna
- Sanford's arrowhead
- Swainson's hawk
- bank swallow
- least Bell's vireo
- valley elderberry longhorn beetle

Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015


American River
Buffalo Creek
17
18
19
20
21
22
22.40
Page 4 of 5
0 1,000 2,000
Feet
1 inch = 2,000 feet
N
River Mile
CA Levee Database Levee Centerline
Lower American River Study Area
Terrestrial Species and Sensitive Habitat from CNDDB
Elderberry Savanna
Sanford's arrowhead
Swainson's hawk
bank swallow
least Bell's vireo
valley elderberry longhorn beetle
Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015

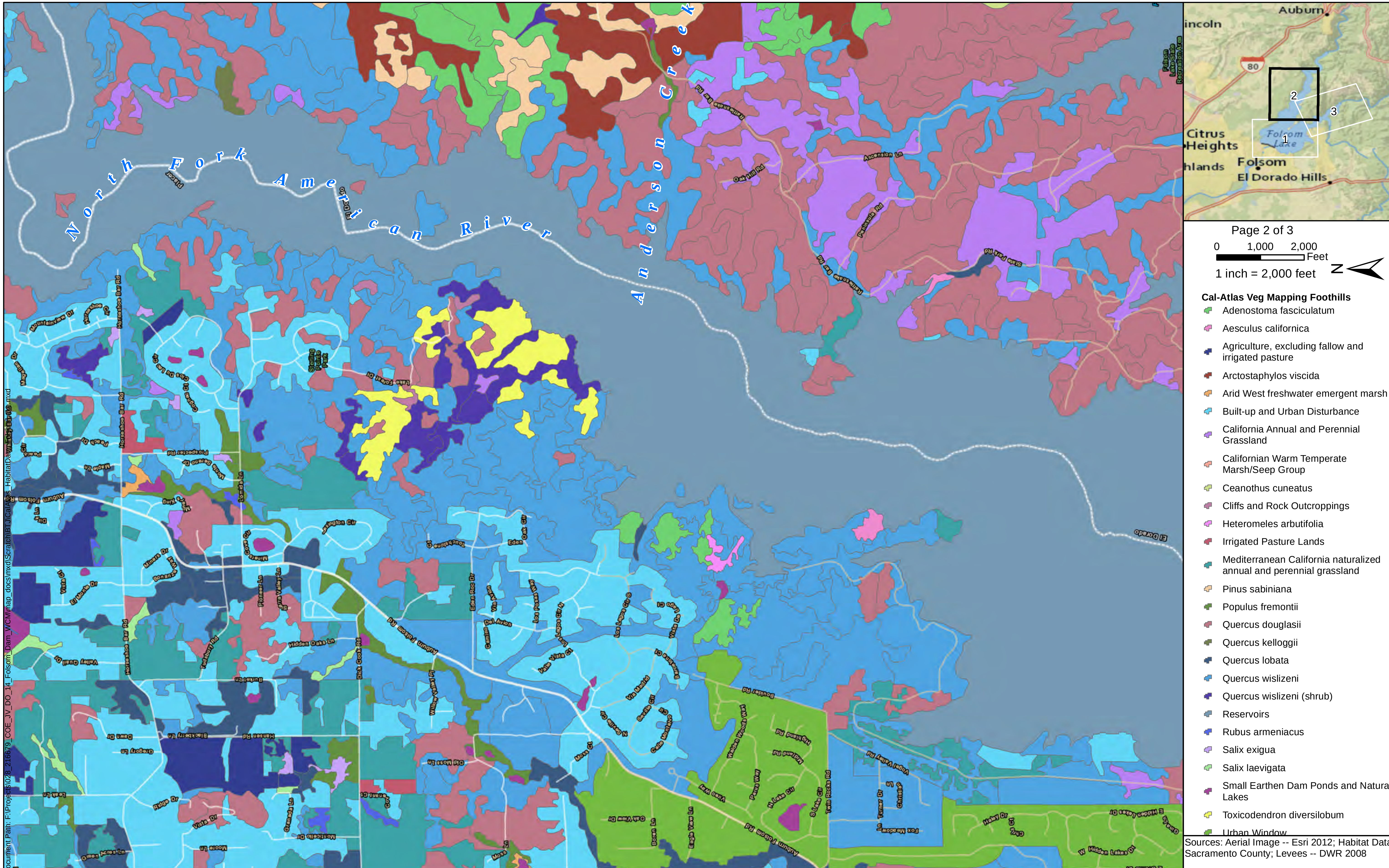


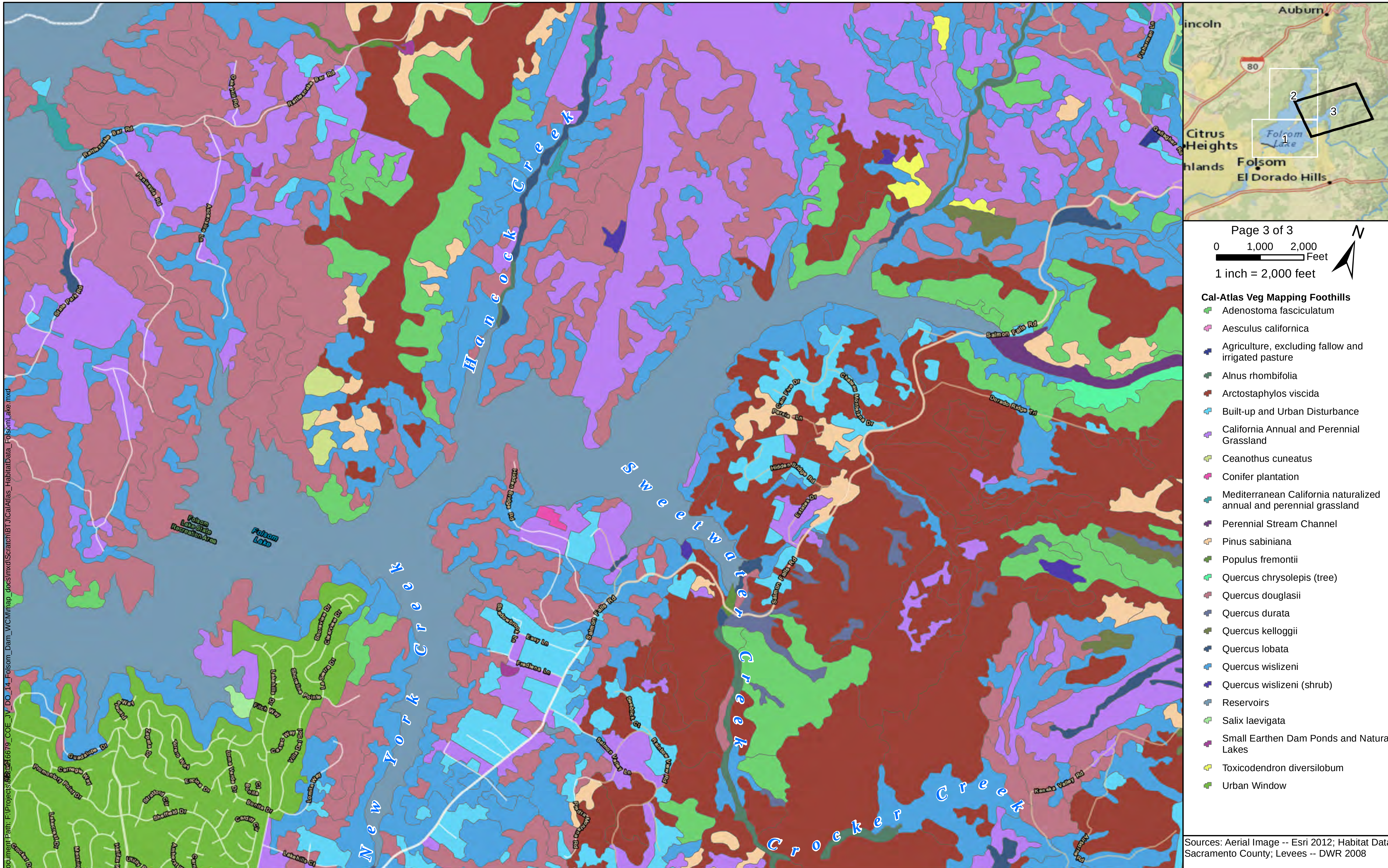
American River
Willow Creek
Humbug Creek
Natomas Ditch
Roseville
Citrus Heights
Rio Linda
North Highlands
Carmichael
Rancho Cordova
Sacramento
Florin
Page 5 of 5
0 1,000 2,000 Feet
1 inch = 2,000 feet
N
River Mile
CA Levee Database Levee Centerline
Lower American River Study Area
Terrestrial Species and Sensitive Habitat from CNDDB
Elderberry Savanna
Sanford's arrowhead
Swainson's hawk
bank swallow
least Bell's vireo
valley elderberry longhorn beetle
Sources: Aerial Image -- Esri 2012; Levees -- DWR 2008; CNDDB -- CDFW March 2015



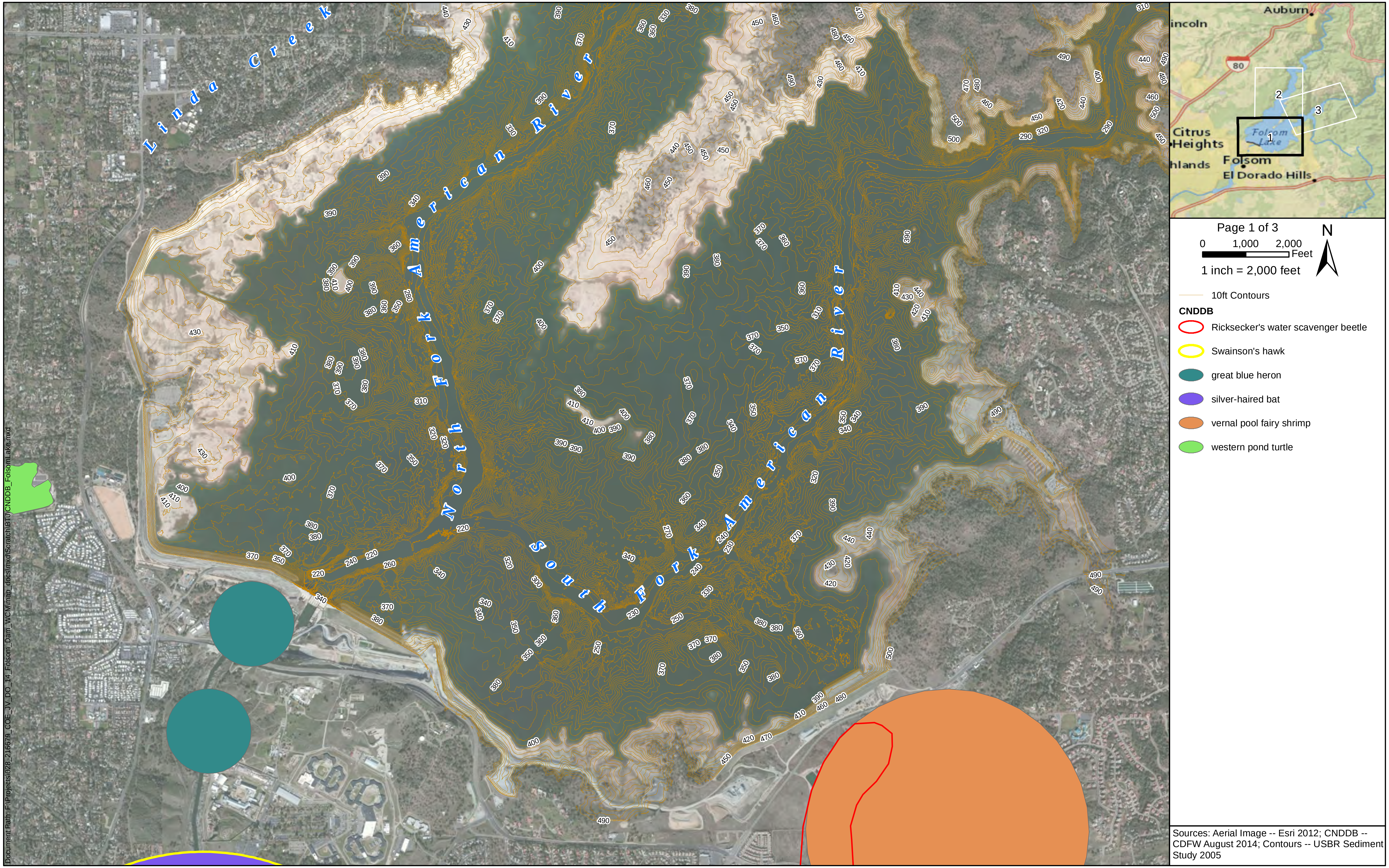
http://www.safca.org/protection/loweramerican_colab.html
Arcade Creek
Steelhead Creek
Garden Highway Trees
RM 0.9R
Site 18A Wetland
RM 1.8L
Cal Expo VELB
Site 1
Cal Expo Arundo
Site 2
RM 4.2L
Site 3
RM 11.6R
RM 10.2R
RM 7.0R
Site 5
RM 7.6R
RM 6.4L
Gristmill
RM 6.9L
RM 10.0L
Site 4
SACRAMENTO RIVER
AMERICAN RIVER
Bus80
5
50
99
Howe Avenue/Power Inn Road
Watt Avenue
American River Mitigation and Restoration Projects

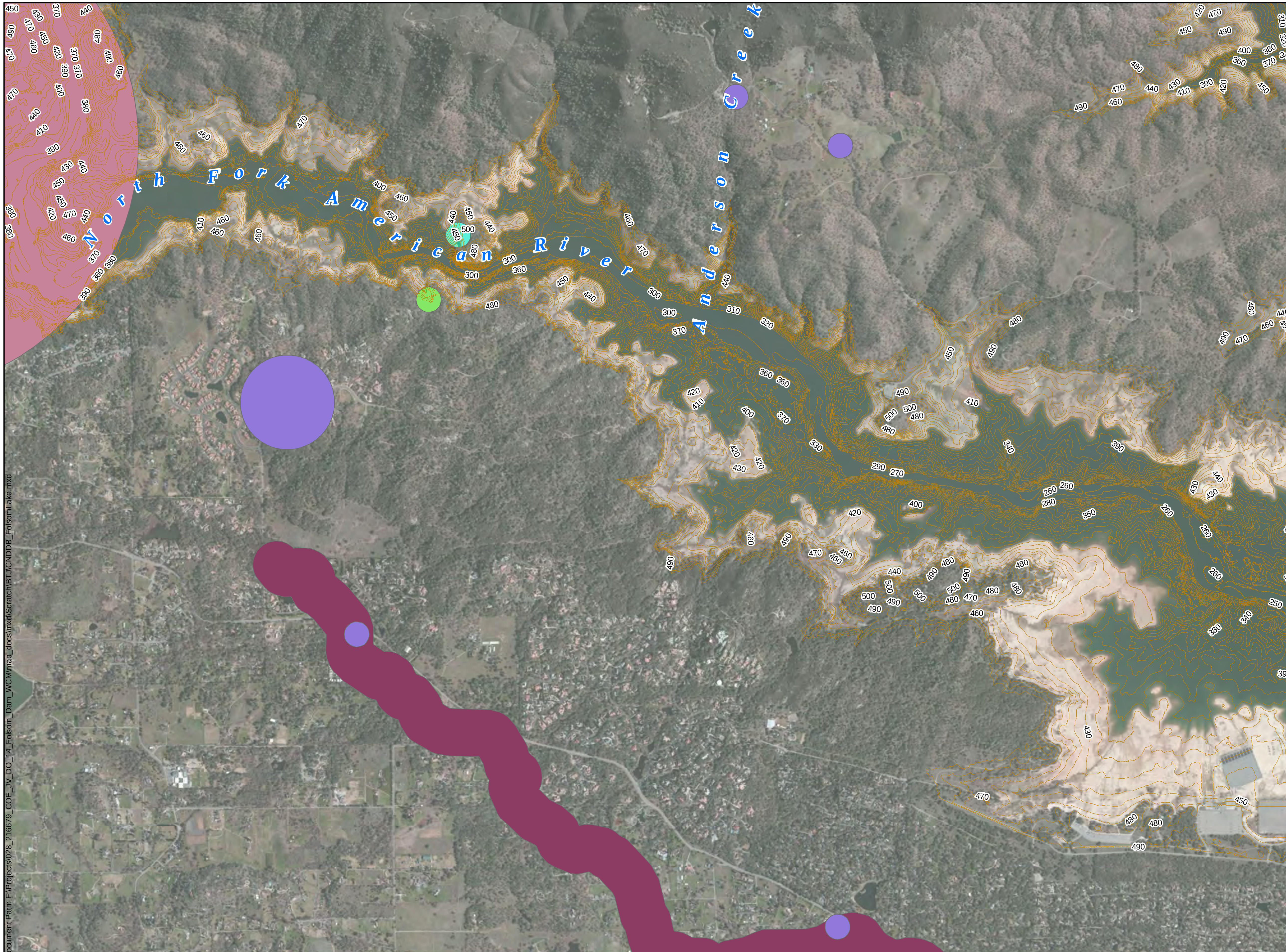

Linda Creek
North Fork American River
South Fork American River
Folsom Lake
Folsom Lake State Recreation Area
Placer
Sacramento
El Dorado
Auburn
Lincoln
Citrus Heights
Folsom
El Dorado Hills
Page 1 of 3
N
0 1,000 2,000 Feet
1 inch = 2,000 feet
Cal-Atlas Veg Mapping Foothills
Adenostoma fasciculatum
Agriculture, excluding fallow and irrigated pasture
Arctostaphylos viscida
Arid West freshwater emergent marsh
Built-up and Urban Disturbance
California Annual and Perennial Grassland
Californian Warm Temperate Marsh/Seep Group
Perennial Stream Channel
Populus fremontii
Quercus douglasii
Quercus lobata
Quercus wislizeni
Quercus wislizeni (shrub)
Reservoirs
Rubus armeniacus
Salix exigua
Salix laevigata
Small Earthen Dam Ponds and Natural Lakes
Toxicodendron diversilobum
Urban Window
Vernal Pool & Californian Annual and Perennial Grassland Matrix
Sources: Aerial Image -- Esri 2012; Habitat Data -- Sacramento County; Levees -- DWR 2008

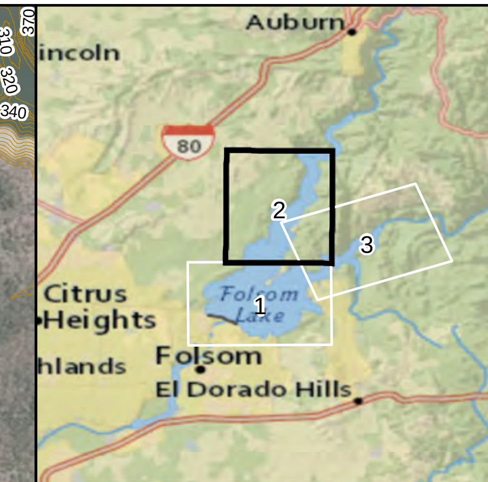

North Fork American River
Anderson Creek
Auburn
Lincoln
80
Citrus Heights
Folsom Lake
Folsom
El Dorado Hills
1
2
3
Page 2 of 3
0 1,000 2,000
Feet
1 inch = 2,000 feet
N
Cal-Atlas Veg Mapping Foothills
Adenostoma fasciculatum
Aesculus californica
Agriculture, excluding fallow and irrigated pasture
Arctostaphylos viscida
Arid West freshwater emergent marsh
Built-up and Urban Disturbance
California Annual and Perennial Grassland
Californian Warm Temperate Marsh/Seep Group
Ceanothus cuneatus
Cliffs and Rock Outcroppings
Heteromeles arbutifolia
Irrigated Pasture Lands
Mediterranean California naturalized annual and perennial grassland
Pinus sabiniana
Populus fremontii
Quercus douglasii
Quercus kelloggii
Quercus lobata
Quercus wislizeni
Quercus wislizeni (shrub)
Reservoirs
Rubus armeniacus
Salix exigua
Salix laevigata
Small Earthen Dam Ponds and Natural Lakes
Toxicodendron diversilobum
Urban Window
Sources: Aerial Image -- Esri 2012; Habitat Data -- Sacramento County; Levees -- DWR 2008



Hancock Creek
Sweetwater Creek
New York Creek
Crocker Creek
Folsom Lake
Folsom Lake State Recreation Area
Salmon Falls Rd
Dorado Ridge Trl
Rattlesnake Bar Rd
Auburn
Lincoln
80
2
3
1
Citrus Heights
Folsom Lake
Folsom
El Dorado Hills
Page 3 of 3
N
0 1,000 2,000 Feet
1 inch = 2,000 feet
Cal-Atlas Veg Mapping Foothills
Adenostoma fasciculatum
Aesculus californica
Agriculture, excluding fallow and irrigated pasture
Alnus rhombifolia
Arctostaphylos viscida
Built-up and Urban Disturbance
California Annual and Perennial Grassland
Ceanothus cuneatus
Conifer plantation
Mediterranean California naturalized annual and perennial grassland
Perennial Stream Channel
Pinus sabiniana
Populus fremontii
Quercus chrysolepis (tree)
Quercus douglasii
Quercus durata
Quercus kelloggii
Quercus lobata
Quercus wislizeni
Quercus wislizeni (shrub)
Reservoirs
Salix laevigata
Small Earthen Dam Ponds and Natural Lakes
Toxicodendron diversilobum
Urban Window
Sources: Aerial Image -- Esri 2012; Habitat Data -- Sacramento County; Levees -- DWR 2008


Linda Creek
North Fork American River
South Fork American River
Auburn
Lincoln
80
Citrus Heights
Folsom Lake
Folsom
El Dorado Hills
1
2
3
Page 1 of 3
0 1,000 2,000
Feet
1 inch = 2,000 feet
N
10ft Contours
CNDDB
Ricksecker's water scavenger beetle
Swainson's hawk
great blue heron
silver-haired bat
vernal pool fairy shrimp
western pond turtle
Sources: Aerial Image -- Esri 2012; CNDDB -- CDFW August 2014; Contours -- USBR Sediment Study 2005





Page 2 of 3

0 1,000 2,000 Feet

1 inch = 2,000 feet

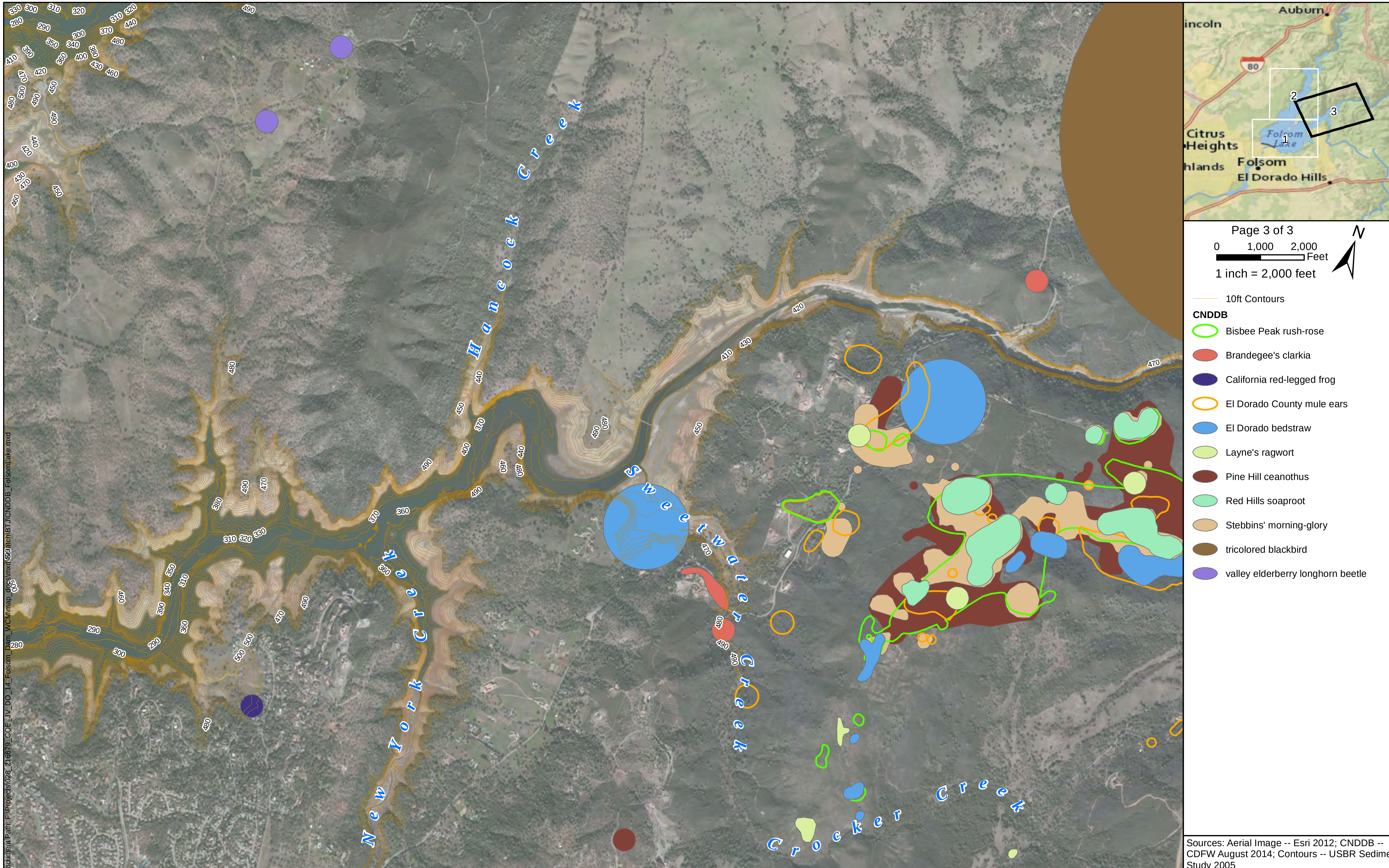
N

10ft Contours

CNDDB

- bald eagle
- big-scale balsamroot
- steelhead - Central Valley
- valley elderberry longhorn
- western pond turtle

Sources: Aerial Image -- Esri 2012; CNDDB -- CDFW August 2014; Contours -- USBR Sediment Study 2005


Hancock Creek
Sweetwater Creek
New York Creek
Crocker Creek
Auburn
Lincoln
80
Citrus Heights
Folsom Lake
Folsom
El Dorado Hills
1
2
3
Page 3 of 3
0 1,000 2,000 Feet
1 inch = 2,000 feet
N
10ft Contours
CNDDB
Bisbee Peak rush-rose
Brandegee's clarkia
California red-legged frog
El Dorado County mule ears
El Dorado bedstraw
Layne's ragwort
Pine Hill ceanothus
Red Hills soaproot
Stebbins' morning-glory
tricolored blackbird
valley elderberry longhorn beetle
Sources: Aerial Image -- Esri 2012; CNDDB -- CDFW August 2014; Contours -- USBR Sediment Study 2005