Stockton East Water District
Calaveras River Habitat Conservation Plan

Appendix A

Calaveras River Biological Resources

Calaveras River Biological Resources

The following sections describe the biological resources within the Calaveras River watershed, including vegetation, wildlife, and species of special concern. Species of special concern include those considered as Covered Species under the Calaveras River Habitat Conservation Plan, as well as those that are not included because they are not impacted by Project Operations.

1.0 Calaveras River Basin Vegetation

Plant communities in the Calaveras River Basin vary with elevation and include coniferous and deciduous forests, grassland, and chaparral. Downstream from New Hogan Dam the landscape includes large oaks, willows, and alders, with an undergrowth of herbaceous plants and scattered low shrubs such as California scrub oak, dwarf live oak, chamise digger pine, and manzanita, as well as poison oak, elderberry, California bay, and wild grape, depending on water availability (Tetra Tech 2001). Grasslands are dominated by introduced annual species, the most common being bromes and fescues (Tetra Tech 2001).

2.0 Calaveras River Basin Wildlife

The Calaveras River Basin supports a diverse array of wildlife similar to other moderately low-elevation mountain environments, foothill elevations, and the Central Valley floor. Common mammals include black-tailed deer, coyote, raccoon, golden beaver, long-tailed weasel, red and grey foxes, bobcat, Audubon cottontail, black-tailed jackrabbit, opossum, and ground squirrels (USFWS 1993). Over 150 species of birds have been reported in the basin (USFWS 1993). Amphibians and reptiles known to have occurred in the basin include newts, salamanders, bullfrog, western pond turtle, western fence lizard, skinks, gopher snake, kingsnake, and rattlesnake (USFWS 1993).

3.0 Calaveras River Basin Species of Concern

3.1 Calaveras River Basin Salmonids included as Covered Species

Historically, there was no systematic sampling for anadromous salmonids in the Calaveras River, so any information on their presence and life history characteristics must be inferred from sparse anecdotal information, occasional documented sightings beginning in 1972, fish monitoring studies within the lower Calaveras River beginning in 2001, and GIS modeling results.

Accounts of Salmonid Presence Pre-Dam

According to Yoshiyama et al. (2001),

> The Calaveras River is a relatively small, low-elevation drainage that receives runoff mainly from rainfall during November through April (Reynolds and others 1993), and its lower reaches historically were dry during part of the year (Carson 1852). This river was probably always marginal for salmon, and it lacks suitable habitat for spring-run fish (E.R. Gerstung, personal observation, see “Notes”). Chinook salmon runs reportedly occurred

> on an "irregular basis" (Reynolds and others 1993), although Clark (1929, p 235) had stated that the Calaveras River was "dry most of the summer and fall and so it has no run of salmon." Yet, the name of the river itself represents, in a way, a salmon legacy. Quoting the historian Sanchez (1932, p 291): *In his diary Moraga says that the river tribes fought against those of the Sierra for possession of the salmon in the stream, and that in one battle many were said to have been killed and left on the field. A great number of skulls, relics of this bloody conflict, were found by Moraga scattered along the creek bed, and for that reason he called it Las Calaveras [The Skulls]*. O'Brien (1951, p 33) further elaborated: *Moraga followed them…and there halted in amazement. Skulls and bones littered an acre and more. An Indian of a nearby ranchería explained that the field was an ancient battleground. A long time before, he said, invading warriors swarmed down from the Sierra to drive the tribes of the Sacramento and San Joaquin Valleys from their river fishing preserves…and these skulls and bones were the remains of those who had fallen.*

Based on the narrative accounts of Yoshiyama et al. (2001), the Central Valley Technical Recovery Team (CVTRT which consists of representatives from National Marine Fisheries Service, California Department of Fish and Wildlife, and Department of Water Resources, U.C. Davis, Bay Institute, University of Washington, and various fishery consultants) developed a GIS depiction of the historical and current distribution of salmonids in the Central Valley, which indicates that none of the salmon species (i.e., fall/late fall-run, winter-run, and spring-run) were present in the Calaveras River (Schick et al. 2005). Although Schick et al. (2005) attempted to develop a similar GIS layer for steelhead, they indicated that the derived distribution for steelhead was questionable because of limited data. Subsequently, Lindley et al. (2006) identified "stream reaches possibly suitable for steelhead spawning and rearing using a habitat model based on environmental envelopes (stream discharge, gradient, and temperature) that takes a digital elevation model and climate data as inputs" and determined that steelhead may have historically been found in several tributaries in the Calaveras River headwaters, including Woods Creek (14.5 km), Calaveras River upper mainstem (22.8 km), San Antonio and San Domingo Creeks (34.6 km), and McKinney and O'Neil Creeks (71.9 km).

Accounts of Salmonid Presence Post-Dam

According to Yoshiyama et al. (2001),

> The Calaveras River had, in recent times, an unusual "winter" salmon run which spawned during late-winter and spring, but it is unknown if the run had existed before the dams were built on the river. This run has been referred to as a "winter run," but perhaps it was more like a late-fall run, given that the spawning period was relatively early compared to the Sacramento winter run. The presence of this run was documented for six years within the period 1972–1984 and it numbered 100 to 1,000 fish annually (Reynolds and others 1993). The fish ascended to New Hogan Dam, and they held and spawned in the reach just below the dam (T. Ford, personal communication, see "Notes"). Management of streamflows by the US Army Corps of Engineers entailed high-flow releases from New Hogan Dam interspersed with periods of very low flow, which undoubtedly contributed to the apparent demise of this run since 1987 (T. Ford, personal communication, see "Notes"; USFWS 1995). Bellota Dam, 15 miles below New Hogan Dam, and at least two other diversion dams are known to have blocked upstream salmon migration during periods of low

> streamflow (Reynolds and others 1993). The run's extirpation may also have been hastened, if not guaranteed, by persistently low streamflows due to the 1987–1992 drought and to irrigation diversions. It is possible that the existence of salmon— particularly the supposed "winter run"—in this river during recent decades has been mainly the result of suitable conditions created by the dams. Historically, the natural occurrence of salmon there was most likely limited to wet years. Currently, fall-run salmon—perhaps those destined for other San Joaquin River tributaries—occasionally enter the Calaveras River when suitable fall streamflows occur. For example, several hundred fall-run fish were observed during the fall of 1995 at Bellota Dam, where they were temporarily blocked (DFG unpublished data). We have no information on the historical upstream range of salmon in the Calaveras River, so we consider the site of New Hogan Dam (the upper limit in recent times) as a minimal approximation of the historical limit.

Although Yoshiyama summarized the accounts of salmon presence between 1972 and 1984 and 1995, specific information regarding salmonid observations during these years, as well as more recent information through 2011, is summarized in Table A-1 and is further described as follows:

In March and April of 1972**,** 248 adult salmon were rescued from the Stockton Diverting Canal and released about five miles above the Bellota Weir (CDFG 1979). In late winter of 1972 and early spring 1973, no adult salmon were reported; however, one 5½ inch salmon was captured below New Hogan Dam by a California Department of Fish and Game (CDFG) employee, indicating that spawning may have been successful the previous year. The next winter and early spring season (1973-1974) were similar, whereby no adults were observed but seven yearlings (average 5.1 inches) were captured.

In 1975, CDFG conducted two SCUBA surveys below New Hogan Dam. The first survey was conducted on June 3 from New Hogan down to the mouth of Cosgrove Creek, and CDFG observed 153 live adult Chinook and 13 dead Chinook, as well as more than 500 rainbow trout. Scales were examined and all the carcasses were tentatively determined to be three-year-old fish (Sazaki 1975a). On July 8, a follow-up survey was conducted from New Hogan down to the first vehicle road bridge, and CDFG observed more than 50 rainbow trout ranging between 125 mm to 455 mm long. Three live Chinook were observed and six carcasses were recovered for examination. All of the carcasses were 100% spawned out, and five out of the six carcasses were females. The females ranged from 686 mm to 787 mm, and the single male was 787 mm (Sazaki 1975b).

On April 26, 1975, CDFG conducted their annual opening day creel census between New Hogan Dam and the first bridge downstream. Seventy-four anglers fished for 239 hours and caught 291 rainbow trout, one brown trout, and two salmon (737 mm and 838 mm). The trout captured ranged from 140 mm to 489 mm in length (Sazaki 1975c).

In 1976, 8-10 adult salmon carcasses were found in early February near one of the lowermost flashboard dams that had been recently breached by vandalism (CDFG 1979). In mid-February, two adult salmon (665 mm and 734 mm) were caught in a gill net just above the I-5 Bridge (CDFG 1979). A total of 406 salmon were rescued from the Stockton Diverting Canal (11 during February and 395 during April) and released a couple of miles above the weir (CDFG 1979).

In 1977, a total of 16 yearling Chinook were captured (13 in February and three in late April; CDFG 1979). In May, three adult salmon were observed passing above a downed grizzly barrier (blown out due to high flows and debris load) at Pacific Avenue; three salmon reported poached in vicinity of N. Wilson Way; and one dead salmon was observed about ¼ mile below McAllen Road (CDFG 1979).

In 1978, several adult salmon were observed trying to negotiate the Bellota Weir prior to, and again on, March 3. Additional surveys were made between mid-May to late June and based on these observations, Sazaki estimated the 1978 run to be less than 250 spawners (CDFG 1979).

In 1979, Charlie Young (Fisheries Habitat Supervisor at CDFG's Elk Grove Screen and Ladder Shop) observed several adult salmon on March 2 and rainbow/steelhead trout on March 5 trying to negotiate the Bellota Weir (CDFG 1979). Flows were estimated to be between 250-300 cfs on the 2nd but had dropped to about 150 cfs on the 5th. One salmon was successful while one trout almost made it over the weir.

On April 28, 1984, CDFG conducted their annual opening day creel census. Out of 80 anglers who had fished 175 hours, they caught and kept 103 rainbow trout and one 620 mm female winter-run Chinook (unmarked, unspawned; Meyer 1984). Meyer (1984) also stated that he "did not see any hatchery fish, escapees from New Hogan, whereas last year there were several with tags and a planted KS (i.e., Chinook salmon)."

Between 1986 and 1994, there were no confirmed observations of salmon in the Calaveras River; this period encompassed the 1988 to 1992 drought. Although salmon were not observed, CDFG electrofished two sections of river below New Hogan Dam, and a total of 187 rainbow trout were captured in 1988, ranging in length from 76 mm to 253 mm. Other species captured included threadfin shad, sculpin, suckers, mosquitofish and largemouth bass (Somer 1990).

According to a CDFG memo (Villa 1996), several salmon were observed trying to ascend the Bellota Weir in October 1995 (15 seen on October 1 and 6-12 seen on November 6). On October 22, several dozen live salmon and over 50 redds were observed within a five mile reach immediately below Bellota and several dozen redds were also seen above Bellota (Villa 1996). Subsequent visual surveys indicated that approximately 300 to 500 salmon had migrated into the Calaveras River, but no formal surveys were conducted (Villa 1996).

In 1996, CDFG conducted 70 individual seine hauls over an 18-week period between February and June, and captured 467 juvenile fall-run Chinook salmon between the Stockton Diversion Canal and New Hogan Dam (CDFG 1996a). About half were captured above Bellota and the other half captured below the weir (229 and 238, respectively). These juveniles were progeny of the adult salmon observed during October and November of 1995.

Table A-1. Available salmonid data for the lower Calaveras River from New Hogan Dam to the mouth. Shading and italics font indicates observations that occurred during the drought periods of 1976-1977 and 1987-1992, and 2012-2015. Codes are provided at end of table.

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1972	Mar/Apr	CHN	Adult	248 (233A;15D)	Stockton Diverting Canal	1,000	Estimate identified in Meyer 1984; no description of how estimate derived	CDFG (California Department of Fish and Game). 1979. Calaveras River anadromous fish runs from 1972, a simple chronology of events. Memo to Calaveras River File, Calaveras County. August 28, 1979. Calif. Dept. Fish and Game, Region 2. 5pp. Estimate identified in Meyer 1982
1972-1973	Late winter/ Early spring	CHN	Juvenile	1	Below NHG	-		
1973-1974	Late winter/ Early spring	CHN	Juvenile	7		-		
1973	Week of April 15	CHN	Juvenile	11	Stockton Diverting Canal	10,000-15,000	No description of how estimate derived	Gervais, B. 1973. Stranded king salmon yearlings. Memo to Mormon Slough, Stockton Diverting Canal-San Joaquin County files. July 24, 1973. Calif. Dept. Fish and Game, Region 2. 3pp.
	Nov 19	RBT/ SH	Juvenile	13	Cosgrove Creek	-		Wooster, T.W. 1973. Field Investigation of streambed alteration and water pollution of Cosgrove Creek. Memo to Cosgrove Creek, Calaveras County file. December 6, 1973. Calif. Dept. Fish and Game, Region 2. 2pp.
1975	Apr 26	CHN	Adult	2	NHG to 1st bridge	-		Sazaki, M. 1975a. Creel census below New Hogan Dam. Memo to Survey Files, Calaveras River, Calaveras County. June 11, 1975. Calif. Dept. Fish and Game, Region 2. 1pp.
		RBT/ SH	Juvenile/ Adult	291		-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
	Jun 3	CHN	Adult	166 (153A/13D)	NHG to Cosgrove Creek	1,000	Estimate identified in Meyer 1984; no description of how estimate derived	Sazaki, M. 1975b. Scuba survey below New Hogan Dam. Memo to Survey Files, Calaveras River, Calaveras County. June 11, 1975. Calif. Dept. Fish and Game, Region 2. 2pp.
		RBT/ SH	UNK	>500		-		
	Jul 8	CHN	Adult	9 (3A/6D)	NHG to 1st bridge	-		Sazaki, M. 1975c. Scuba survey below New Hogan Dam. Memo to Calaveras River file, Calaveras County. September 16, 1975. Calif. Dept. Fish and Game, Region 2.1pp.
		RBT/ SH	Juvenile/ Adult	>50		-		
1976	*Early Feb*	*CHN*	*Adult*	*8-10 (D)*	*One of lowermost flashboard dams*	-		*CDFG 1979*
	Mid Feb	*CHN*	*Adult*	*2*	*Just above I-5 bridge*	-		
	Feb	*CHN*	*Adult*	*11*	*Stockton Diverting Canal*	-		
	Apr	*CHN*	*Adult*	*395*		-		
1977	*Feb*	*CHN*	*Juvenile*	*13*	*UNK*	-		
	Apr	*CHN*	*Juvenile*	*3*		-		
	May	*CHN*	*Adult*	*7*	*3 at Pacific Ave; 3 at N. Wilson Way; 1 about 1/4 mile below McAllen Road*	-		
1978	March 3 and earlier	CHN	Adult	Several	Bellota Weir	<250 spawners	Additional surveys conducted between mid-May to late June (no numbers given); no description of how estimate derived	CDFG 1979

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1979	Mar 2	CHN	Adult	Several		-		CDFG 1979
	Mar 5	RBT/ SH	Adult	Several		-		
1982	UNK	CHN	Adult	UNK	UNK	-	According to CDFG 1996a there were "winter-run" observed in 1982.	CDFG 1996a
1982-1983	Winter	RBT/ SH	UNK	Several	Cosgrove Creek	-		Meinz, M. 1983. Rainbow trout populations in Cosgrove Creek, Calaveras County. Memo sent to file. May 3, 1983.Calif. Dept. Fish and Game, Region 2. 3pp.
1983	Apr 7	RBT/ SH	Juvenile	28		612/mile	3-pass e-fishing depletion method	
			Adult	2				
	UNK (opening day creel census)	RBT/ SH	Adult	Several	UNK	-	Tagged escapees from New Hogan	Meyer, F. 1984. Calaveras Fishery below New Hogan Dam. Memo sent to Calaveras River, San Joaquin County file. May 1, 1984. Calif. Dept. Fish and Game, Region 2. 4pp.
		CHN	Adult	1		-	Planted	
1984	Jan	CHN	Adult	Relatively large numbers (tens not hundreds)	Bellota weir	100		CDFG.1984. Chinook salmon spawning stocks in California's Central Valley, 1984. Edited by Robert Reavis, Inland Fisheries Division. Inland Fisheries Division Administrative Report No. 85.
	Apr 28	CHN	Adult	1	UNK	-		Meyer 1984
		RBT/ SH	Adult	103		-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1987	*Jun*	*CHN*	*Juvenile*	*1*	*UNK*	-		*USFWS. 1993. Stanislaus River Basin Calaveras River Conjunctive Use Water Program Study; A preliminary evaluation of fish and wildlife impacts with emphasis on water needs of the Calaveras River. Memo to David Lewis, Regional Director, San Joaquin Branch, Bureau of Reclamation. January 28, 1993. FWS, Ecological Services, Sacramento, CA. 24pp.*
1988	*Dec 15*	*RBT/ SH*	*Juvenile*	*187*	*Two sections below NHG*	-	*Mean Fulton's CF = 1.14 for both Age 0+ (mean 116 mm) and Age 1+ (mean 194 mm); CF = 1.17 for one Age 2+ (253 mm)*	*Somer. B. 1990. Calaveras River fish populations sampling. Memo to Calaveras River File, Calaveras County. March 13, 1990. Calif. Dept. Fish and Game, Region 2. 7pp.*
1995	Oct 1	CHN	Adult	Several trying to ascend weir; 15 salmon/ 10 redds below weir	Bellota Weir to county road 1/4 mile downstream	~300-500 migrated into river	No formal mark and recapture estimates were made; estimates based on visual surveys	Villa, N. 1996. Chinook salmon in the Calaveras River- Summary of events. Memo to L. Ryan Brodderick. February 22, 1996. Calif. Dept. Fish and Game, Region 2. 4pp. Koscho C. 1995 Nov 7. Calaveras River teeming with salmon. Calaveras Enterprise. Nickles J. 1995 Nov 4. Rare event for Calaveras. The Record; Sect A:1. Nickles J. 1995 Nov 7. Salmon get a little help from human friends. The Record.
	Oct 22	CHN	Adult	Several dozen (A)	Five-mile reach below Bellota			
		CHN	Redds	Over 50 redds				
		CHN	Redds	Several dozen (A)	NHG to Bellota			
	Nov 6	CHN	Adult	6-12	Bellota pool			
		RBT/ SH	Adult	1		-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1996	Feb-Jun	CHN	Juvenile	467	Stockton Diverting Canal to NHG (half above/half below Bellota)	-	Also has condition factor information; Chinook juveniles at 1.18 higher than Mokelumne at 0.89	CDFG. 1996a. Calaveras River Chinook salmon study 1996. Nickles J. 1996 March 4. Salmon call Calaveras River home again. The Record; Sect A:6.
1998	Fall	CHN	Adult	UNK	UNK	-		Nickles J. 1998 October 17. Salmon making run at Calaveras. The Record; Sect A:1. Nickles J. 1998 November 3. Go Fish! New ladder helps salmon make it. The Record.
2000	Apr 16	RBT/ SH	Juvenile	1	100 m below Bellota	-		Baxter, R. 2000. Calaveras River smolt steelhead sampling. Memo sent to Dennis McEwan. April 21, 2000. Calif. Dept. of Fish and Game, Region 2. 3 pp.
		RBT/ SH	Juvenile	3	200 m below NHG	-		
		RBT/ SH	Adult	3		-		
	March	RBT/ SH	Juvenile/ Adult	21	Pools below NHG	-		Titus, R. 2000. Adult steelhead collected in the Calaveras River below New Hogan Dam in March 2000. Calif. Dept. of Fish and Game Stream Evaluation Program report. 9 pp.
2001	UNK	RBT/ SH	Adult	UNK	UNK	-		NMFS. 2002. New Hogan Dam and Lake Project Biological Opinion. Prepared for U.S. Army Corps of Engineers by National Marine Fisheries Service Southwest Region, Long Beach, CA.
2001	Fall	CHN	Adult	11 (8A/3D)	MRS	-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2002	Jan 17 - Feb 14; Apr 5 - May 9	CHN	Juvenile	6	RST at Shelton Road	-		FFC [Fish Foundation of California] unpublished data (2001–2004). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California. SEWD [Stockton East Water District] unpublished data (2001-2004). Field notes and summary reports for data collected on behalf of SEWD by SPC (2001-2004) on file at FISHBIO office, Oakdale, CA.
		RBT/ SH	Juvenile	1,129		2,702	80% CI = 2,613-3,151	
	April	SH	Adult	1 (D)	Bellota Weir	-		
	Mar-Oct	RBT/ SH	Juvenile	UNK	Snorkel Surveys NHG to Jenny Lind	-		
		RBT/ SH	Adult	UNK		-		
	Fall	CHN	Adult	3 (D)	MRS	-		
2002-2003	Winter	CHN	Adult	15 (5A/10D)	14 MRS; 1 OCR	-		
2003	Jan 4 - Jul 17	RBT/ SH	Juvenile	1,539	RST at Shelton Road	6,918	80% CI = 6,245-13,002	
	May	RBT/ SH	Juvenile	97	Fyke nets in OCR (54) and in MRS below Bellota Weir (43)	-		
	Jul 2	RBT/ SH	Adult	1	Electro-fishing below Bellota Weir	-		
			Juvenile	40		-		
	Fall	RBT/ SH	Juvenile	24 (A)	24 MRS	-		
		RBT/ SH	Adult	3 (A)	OCR	-		
		CHN	Adult	20 (8A/12D)	MRS	-		
	11/7/03	RBT/SH	Adult	3 (A)	OCR	-	Fish rescued by SPCA	
		RBT/SH	Juvenile	1 (A)	OCR	-	Fish rescued by SPCA	

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2003-2004	Winter	RBT/ SH	Juvenile	57 (48A;9D)	32 MRS; 24 OCR; 1 UNK	-		
2003-2004	Winter	CHN	Adult	10 (4A/6D)	7 MRS; 3 OCR	-	Includes fish from 12/3/03 rescued by FFC	FFC [Fish Foundation of California] unpublished data (2003–2006). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California. SEWD [Stockton East Water District] unpublished data (2003-2006). Field notes and summary reports for data collected on behalf of SEWD by SPC and FISHBIO (2006) on file at FISHBIO office, Oakdale, CA.
	12/04/03	RBT/SH	Juvenile	24 (A)	OCR	-	Fish rescued by SPCA	
	Dec 2 - May 13	RBT/ SH	Juvenile	1,411	RST at Shelton Road	4,397	80% CI = 4,180-7,152	
2004	Spring	RBT/ SH	Juvenile	6(A)	MRS	-		
		CHN	Juvenile	1(A)	MRS	-		
	Fall	RBT/ SH	Juvenile	6 (3A/3D)	OCR	-		
		RBT/ SH	Adult	20 (15A/5D)	OCR	-		
2004-2005	Winter	CHN	Adult	17 (5A/12D)	6 MRS; 10 OCR; one UNK	-		
	Dec 10 - Apr 22	RBT/ SH	Juvenile	272	RST at Shelton Road	1,127	80% CI = 1,101-2,073	
2005	Spring	RBT/ SH	Juvenile	17 (A)	Below lowermost dam in MRS	-		
	Apr 20	RBT/ SH	Adult	1 (UNK)	MRS near Cherokee	-		
	Spring	CHN	Juvenile	17 (A)	Below lowermost dam in MRS	-		
2005	Nov 23 - Dec 26	CHN	Adult	464 (A)	MRS	-		
				221 (A)	NHG to Bellota	-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2006	Jan 19 - Mar 27; Apr 30- Jun 30	RBT/ SH	Juvenile	706	RST at Shelton Road	5,029	80% CI = 4,663-9,658	FFC [Fish Foundation of California] unpublished data (2006–2007). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California.
		CHN	Juvenile	5,943		39,123	80% CI = 16,158-57,322	
2006	Spring	CHN	Juvenile	210 (~105 D)	MRS	-		
	Nov 17 - Dec 20	CHN	Adult	71 (D)		-		
2006-2007	Winter	RBT/ SH	Juvenile	1 (A)	MRS	-		
		CHN	Juvenile	792 (A)		-		
		RBT/ SH	Juvenile	1,197		7,294	80% CI= 6,718-13,279	
	Dec 14 - Jun 29	CHN	Juvenile	2,124		13,777	80% CI= 12,914-25,986	
2007-2008	Nov 13- Jul 11	RBT/ SH	Juvenile	1,873	RST at Shelton Road	11,116	80% CI = 9,651-19,681	SEWD [Stockton East Water District] unpublished data (2006-2011). Field notes and summary reports for data collected on behalf of SEWD by FISHBIO (2006-2011) on file at FISHBIO, Oakdale, CA.
		CHN	Juvenile	1		-		
2008-2009	Nov 4- Jul 10	RBT/SH	Juvenile	1,312		7,794	80% CI = 6,722-13,467	
2009-2010	Nov 10- Jul 15	RBT/SH	Juvenile	2,769		13,670	80% CI = 13,288-28,460	
2010-2011	Nov 2- Jul 15	RBT/SH	Juvenile	742		3,706	80% CI = 3,632-8,318	
2011	Fall	CHN	Adult	186 redds	Above/below (48/138) Bellota	465	CI Not reported	
2011-2012	*Oct 27- Jul 7*	*RBT/SH*	*Juvenile*	*821*	*RST at Shelton Road*	*3,109*	*80% CI = 3,019-3,509*	SEWD. Unpublished data (2011-2015). Field notes and summary reports on file at FISHBIO, Oakdale, CA.
		CHN	*Juvenile*	*2,311*		*12,132*	*80%CI = 12,132-13,682*	
2012-2013	*Nov 5 – Jul 12*	*RBT/SH*	*Juvenile*	*336*		*2,091*	*80% CI = 2,057-4,142*	
		CHN	*Juvenile*	*449*		*4,082*	*80% CI = 3,787-7,513*	
2013-2014	*Nov 5 – Jul 11*	*RBT/SH*	*Juvenile*	*1,104*		*3,136*	*80% CI = 3,077-5,638*	
		CHN	*Juvenile*	*11*		-	-	

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2014-2015	*Nov 17 – Jul 1*	*RBT/SH*	*Juvenile*	*532*		*884*	*80% CI = 881-1,366*	
		CHN	*Juvenile*	*21*		-	-	
CHN = Chinook salmon; RBT/SH = Rainbow trout/steelhead; RST = rotary screw trap; MRS = Mormon Slough/Stockton Diverting Canal; OCR= Old Calaveras River								

On April 16, 2000, Randall Baxter accompanied three volunteer fly-fishing anglers to sample for steelhead smolts. They fished 100 m below Bellota Weir and 200 m below New Hogan Dam. They fished for one hour at Bellota and caught one trout (256 mm, smolt index 4). They fished below New Hogan for two hours and caught six trout ranging from 192 mm to 364 mm (three adults; one smolt index 5; and two smolt index 4; Baxter 2000).

In March 2000, 21 *O. mykiss* were observed stranded in pools due to a rapid ramp down in flow following a flood release. During this stranding event, three carcasses were recovered from the Calaveras River and analyses were conducted to assess basic life-history strategies of the fish. Scale analyses indicated that one male (25 inches) spent at least one year in the ocean, one female spent (15 inches) four years in freshwater, and the other male (17 inches) spent two years in freshwater and at least one year in the estuary (Titus 2000). Microchemical analysis of strontium and calcium ratios of the fish provided evidence of maternal origin of each fish. The results indicated that the two largest fish were the progeny of anadromous females and the smallest fish was a progeny of a resident female. Thus, of a limited sample of three fish, three different life-history strategies were present (residency, anadromy, and potanadromy), and although the two largest fish were the progeny of anadromous females, one of the fish had not entered the ocean. Further, all of the fish had spent a different number of years in freshwater, and both of the fish that migrated downstream did so when mature, not as young-of-year or yearlings.

In 2001, "steelhead…were observed spawning with what appeared to be smaller *O. mykiss* which may not have been to the ocean" (NOAA Fisheries 2002).

In fall of 2001, the FFC began annual fish passage surveys and observed 11 (8 live; 3 dead) adult Chinook salmon in the Mormon Slough/Stockton Diverting Canal (FFC unpublished data).
From mid-January to early May 2002, annual juvenile salmonid migration monitoring was initiated using a rotary screw trap at Shelton Road and 1,129 (2,702 estimated) juvenile *O. mykiss* and six salmon were captured (SEWD unpublished data).

In April 2002, personnel from S.P. Cramer & Associates (SPC) found one adult female *O. mykiss* carcass floating near the downstream edge of the concrete apron associated with the Bellota Weir. A preliminary scale analysis indicated that the fish was a four-year-old steelhead that spent two years in freshwater and two years in the ocean (Demko 2002).

From March to mid-October 2002, snorkel surveys were conducted by the FFC between New Hogan Dam and Jenny Lind. An unknown number of juvenile and adult *O. mykiss* and zero Chinook salmon were observed (FFC unpublished data).

Between fall 2002 and winter 2003, the FFC observed 15 adult Chinook salmon (5 live; 10 dead) in the Mormon Slough/Stockton Diverting Canal, including one dead unknown specimen (likely a salmon) in the Mormon Slough/Stockton Diverting Canal, and one dead adult salmon in the Old Calaveras River channel (FFC unpublished data).

From January through mid-July 2003, there were 1,539 juvenile *O. mykiss* (6,918 estimated) and no salmon captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

In spring/summer 2003, the FFC operated fyke nets in the Old Calaveras River channel and Mormon Slough/Stockton Diverting Canal during the first three weeks of May and conducted one electrofishing survey with CDFG below Bellota in early July. A total of 97 juvenile *O. mykiss* (<300mm) were captured in the fyke nets, with 56% (54 juveniles) captured in the Old Calaveras River channel and 44% (43 juveniles) captured in the Mormon Slough/Stockton Diverting Canal (FFC unpublished data). During electrofishing, one adult (>300 mm) and 40 juvenile (≤300 mm) *O. mykiss* were captured in the Mormon Slough/Stockton Diverting Canal in the weir pool and adjacent riffles immediately below Bellota (FFC unpublished data).

During passage surveys in fall 2003 and winter 2004, the FFC observed 23 adult salmon (12 live; 11 dead) in the Mormon Slough/Stockton Diverting Canal and three dead adult salmon in the Old Calaveras River channel (FFC unpublished data). Most were observed below Budiselich but seven (4 live; 3 dead) were found between Caprini Crossing and Bellota. Also, there were 57 juvenile *O. mykiss* (48 live; 9 dead) observed in the Mormon Slough/Stockton Diverting Canal.

Fish rescue operations associated with flashboard dam removal were conducted by SPC on November 7 and 12 and December 3 and 4, 2003, in the Old Calaveras River channel. A total of 24 juvenile and three adult *O. mykiss* were recovered alive and relocated (Demko 2003a, b).

From December 2003 through mid-May 2004, there were 1,411 juvenile *O. mykiss* (4,397 estimated) and no salmon captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

In spring 2004, the FFC observed six juvenile *O. mykiss* and one juvenile salmon in the lower reaches of Mormon Slough/Stockton Diverting Canal Bellota (FFC unpublished data).

In fall 2004, SPC conducted fish rescue operations on October 22, 25, and 27 similar to those done in 2003. A total of six juvenile (3 live; 3 dead) and 20 adult (15 live; 5 dead) *O. mykiss* were found and live fish were relocated (Simpson 2004). Measured fish had condition factors (Fulton's K factor) greater than 1.25, indicating that they were healthy (i.e., K factors of 1.25 and above found to indicate good condition for salmonid fishes [Barnham and Baxter 1998; Baxter et al. 1991]). *O. mykiss* rescued in 2004 were likely entrained during groundwater recharge operations that occurred during the first few months of the year when there was no net barrier in place, which means that they reared in the Old Calaveras River for several months prior to flashboard dam removal. Based on fish health and the probable amount of time spent rearing in the Old Calaveras River channel, it appears that conditions within the Old Calaveras River channel may be beneficial, at least in some years, for over-summer rearing.

In winter 2004-2005, the FFC observed 17 adult (5 live; 12 dead) salmon; six were found in Mormon Slough/Stockton Diverting Canal, ten in Old Calaveras River channel, and one in an unknown location Bellota (FFC unpublished data).

From mid-December 2004 through mid-April 2005**,** there were 272 juvenile *O. mykiss* (1,127 estimated) and no salmon captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data). During this season, *O. mykiss* numbers captured and abundance estimates were

relatively low compared with other years, which may be attributed to several periods of flows greater than 2,000 cfs when sampling could not occur.

In spring 2005, the FFC observed 17 live juvenile salmon and 17 live juvenile *O. mykiss* below the lowermost dam in the Mormon Slough/Stockton Diverting Canal Bellota (FFC unpublished data). On April 20, the FFC also observed one adult (species unknown) in the Mormon Slough/Stockton Diverting Canal near Cherokee Lane.

From November 23-December 26, 2005, the FFC observed 464 live adult salmon in the Mormon Slough/Stockton Diverting Canal and 221 live adult salmon between Bellota and New Hogan Bellota (FFC unpublished data).

From mid-January through June 2006, there were 706 juvenile *O. mykiss* (5,029 estimated) and 5,943 salmon (39,123 estimated) captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data). In 2006, high flows made it impossible to sample for an extended period between March 27 and April 30. It is likely that considerable fish movement occurred during these high-flow events, so numbers of fish in 2006 were likely underestimated.

In spring 2006, the FFC observed 210 (approximately half were dead) juvenile Chinook in the Mormon Slough/Stockton Diverting Canal Bellota (FFC unpublished data). About 75% were located below the lowermost dam and the remaining 25% were found near Jack Tone Road.

From November 17-December 20, 2006, the FFC observed 71 dead adult salmon in the Mormon Slough/Stockton Diverting Canal and no adult salmon above Bellota (FFC unpublished data).

In winter 2006-2007, the FFC observed 792 live juvenile salmon and one live juvenile *O. mykiss* in the Mormon Slough/Stockton Diverting Canal (FFC unpublished data).

From mid-December 2006 through June 2007, there were 1,197 juvenile *O. mykiss* (7,294 estimated) and 2,124 juvenile salmon (13,777 estimated) captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

From mid-November 2007 through mid-July 2008, there were 1,873 juvenile *O. mykiss* (11,116 estimated) and one juvenile salmon captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

From November 2008 through mid-July 2009, there were 1,312 juvenile *O. mykiss* (7,794 estimated) captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

From mid-November 2009 through mid-July 2010, there were 2,769 juvenile *O. mykiss* (13,670 estimated) captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

From November 2010 through mid-July 2011, there were 742 juvenile *O. mykiss* (3,706 estimated) captured during juvenile migration monitoring at Shelton Road (SEWD unpublished data).

From November 14-Decmber 22, 2011, the FFC observed 75 adult salmon carcasses, 8 above Bellota and 67 below Bellota (FFC unpublished data).

Additional information regarding juvenile migration timing and abundance obtained during juvenile migration monitoring at Shelton Road between 2002 and 2015 is provided in Tables A-2 through A-5.

Table A-2. Migration timing of juvenile *O. mykiss* observed at the Shelton Road (RM 28) rotary screw trap, 2002-2015. Young-of year (YOY) indicates fish ≤100 mm and Age 1+ indicates fish >100 mm (fork lengths). Dash indicates not sampled and parentheses indicate number of days sampled.

Year	Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total	Grand Total
2002	**YOY**	-	-	-	0 (9)	1 (6)	-	811 (23)	80 (6)	-	-	892	**1,129**
	Age 1+	-	-	-	159 (9)	20 (6)	-	54 (23)	4 (6)	-	-	237	
2003	**YOY**	-	-	-	7 (13)	40 (11)	126 (12)	559 (15)	453 (14)	116 (12)	14 (9)	1,315	**1,539**
	Age 1+	-	-	-	67 (13)	20 (11)	70 (12)	29 (15)	11 (14)	15 (12)	12 (9)	224	
2004	**YOY**	-	-	2 (27)	2 (15)	4 (19)	4 (9)	40 (14)	37 (6)	-	-	89	**1,411**
	Age 1+	-	-	859 (27)	197 (15)	180 (19)	54 (9)	30 (14)	5 (6)	-	-	1,325	
2005	**YOY**	-	-	0 (12)	4 (17)	1 (16)	52 (17)	39 (12)	-	-	-	96	**319**
	Age 1+	-	-	14 (12)	111 (17)	52 (16)	42 (17)	4 (12)	-	-	-	223	
2006	**YOY**	-	-	-	0 (10)	0 (15)	11 (12)	35 (1)	307 (16)	119 (18)	-	472	**706**
	Age 1+	-	-	-	47 (10)	100 (15)	45 (12)	2 (1)	17 (16)	23 (18)	-	234	
2007	**YOY**	-	-	0 (12)	0 (14)	3 (17)	70 (21)	374 (16)	403 (19)	139 (17)	-	989	**1,197**
	Age 1+	-	-	15 (12)	7 (14)	36 (17)	101 (21)	9 (16)	7 (19)	33 (17)	-	208	
2008	**YOY**	-	2 (10)	3 (16)	25 (14)	89 (14)	111 (18)	444 (18)	482 (18)	251 (16)	30 (7)	1,437	**1,873**
	Age 1+	-	27 (10)	93 (16)	95 (14)	60 (14)	27 (18)	30 (18)	79 (18)	22 (16)	3 (7)	436	
2009	**YOY**	-	2 (12)	0 (8)	6 (19)	3 (18)	77 (15)	341 (18)	394 (17)	76 (17)	19 (7)	918	**1,312**
	Age 1+	-	25 (12)	16 (8)	104 (19)	76 (18)	124 (15)	25 (18)	13 (17)	5 (17)	6 (7)	394	
2010	**YOY**	-	0 (12)	0 (18)	3 (16)	21 (17)	98 (17)	1,507 (18)	567 (16)	123 (18)	9 (8)	2,328	**2,769**
	Age 1+	-	14 (12)	132 (18)	176 (16)	61 (17)	18 (17)	28 (18)	2 (16)	7 (18)	3 (8)	441	
2011	**YOY**	-	0 (17)	0 (15)	0 (16)	0 (16)	3 (2)	76 (17)	30 (17)	43 (21)	4 (8)	156	**742**
	Age 1+	-	136 (17)	327 (15)	45 (16)	56 (16)	3 (2)	6 (17)	1 (17)	11 (21)	1 (9)	586	
2012	**YOY**	0 (5)	0 (21)	0 (24)	0 (23)	1 (17)	237 (25)	225 (28)	117 (31)	52 (30)	8 (6)	640	**821**
	Age 1+	9 (5)	10 (21)	9 (24)	36 (23)	25 (17)	48 (25)	7 (28)	5 (31)	28 (30)	4 (6)	181	
2013	**YOY**	-	0 (18)	0 (16)	0 (19)	0 (16)	44 (22)	28 (17)	58 (18)	43 (16)	2 (7)	175	**334**
	Age 1+	-	7 (18)	60 (16)	20 (19)	12 (16)	28 (22)	7 (17)	13 (18)	8 (16)	4 (7)	159	
2014	**YOY**	-	0 (16)	0 (20)	0 (20)	0 (16)	145 (22)	266 (22)	62 (17)	11 (17)	0 (7)	484	**1,104**
	Age 1+	-	26 (16)	50 (20)	34 (20)	93 (16)	351 (22)	58 (22)	5 (17)	3 (17)	0 (7)	620	
2015	**YOY**	-	0 (9)	0 (21)	0 (17)	1 (19)	5 (16)	14 (18)	7 (16)	11 (17)	0 (1)	38	**530**
	Age 1+	-	136 (9)	208 (21)	9 (17)	111 (19)	3 (16)	14 (18)	1 (16)	10 (17)	0 (1)	492	

Table A-3. Migration timing of juvenile fall-run Chinook salmon observed at the Shelton Road (RM 28) rotary screw trap, 2002-2015. Dash indicates not sampled and parentheses indicate number of days sampled.

Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
2002	-	-	0 (9)	0 (6)	-	6 (23)	0 (6)	-	-	**6**
2003	-	-	0 (13)	0 (11)	0 (12)	0 (15)	0 (14)	0 (12)	0 (9)	**0**
2004	-	0 (27)	0 (15)	0 (19)	0 (9)	0 (14)	0 (6)	-	-	**0**
2005	-	0 (12)	0 (17)	0 (16)	0 (17)	0 (12)	-	-	-	**0**
2006	-	-	4 (10)	400 (15)	2,805 (12)	105 (1)	2,069 (16)	560 (18)	-	**5,943**
2007	-	1 (12)	0 (14)	91 (17)	151 (21)	414 (16)	1,258 (19)	209 (17)	-	**2,124**
2008	0 (10)	1 (16)	0 (14)	0 (14)	0 (18)	0 (18)	0 (18)	0 (16)	0 (7)	**1**
2009	0 (12)	0 (8)	0 (19)	0 (18)	0 (15)	0 (18)	0 (17)	0 (17)	0 (7)	**0**
2010	0 (12)	0 (18)	0 (16)	0 (17)	0 (17)	0 (18)	0 (16)	0 (18)	0 (8)	**0**
2011	0 (17)	0 (15)	0 (16)	0 (16)	0 (2)	0 (17)	0 (17)	0 (21)	0 (8)	**0**
2012	0 (21)	0 (24)	0 (23)	1 (17)	241 (25)	432 (28)	1,304 (31)	331 (30)	2 (6)	**2,311**
2013	1 (18)	1 (16)	0 (19)	0 (16)	2 (22)	34 (17)	365 (18)	45 (16)	1 (7)	**449**
2014	11 (16)	0 (20)	0 (20)	0 (16)	0 (22)	0 (23)	0 (17)	0 (17)	0 (7)	**11**
2015	0 (9)	0 (21)	0 (17)	0 (19)	0 (17)	1 (18)	20 (16)	0 (17)	0 (1)	**21**

Table A-4. Estimated numbers of *O. mykiss* migrating past the Shelton Road (RM 28) rotary screw trap, 2002-2015. Young-of year (YOY) indicates fish ≤100 mm and Age 1+ indicates fish >100 mm in fork length. Dash indicates not sampled. Asterisk indicates partial month estimated due to limited sampling. Parentheses indicate 80% confidence intervals.

Year	Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total	Grand Total
2002	**YOY**	-	-	-	0*	2*	-	1,970	307*	-	-	2,279 (2,228-2,495)	**2,702**
	Age 1+	-	-	-	249*	61*	-	99	14*	-	-	423 (385-656)	
2003	**YOY**	-	-	-	42	137	456*	1,910	2,287	1,061	113	6,006 (5,390-11,006)	**6,918**
	Age 1+	-	-	-	162	79	222*	111	65	175	98	912 (855-1996)	
2004	**YOY**	-	-	3	14	21	8*	278	213*	-	-	537 (513-1,093)	**4,397**
	Age 1+	-	-	1,784	1,014	663	219*	151	29*	-	-	3,860 (3,667-6,059)	
2005	**YOY**	-	-	0*	16	9	165*	126*	-	-	-	316 (313-506)	**1,127**
	Age 1+	-	-	52*	413	181	149*	16*	-	-	-	811 (788-1,567)	
2006	**YOY**	-	-	-	0*	1	98*	72*	2,418	1,316	-	3,905 (3,577-7,656)	**5,029**
	Age 1+	-	-	-	238*	442	150*	4*	87	203	-	1,124 (1,086-2,002)	
2007	**YOY**	-	-	0*	0*	20	303	2,314	2,427	1,020	-	6,084 (5,531-10,901)	**7,294**
	Age 1+	-	-	115*	56*	261	410	88	43	237	-	1,210 (1,187-2,378)	
2008	**YOY**	-	4*	14	132	350	573	2,834	2,907	1,930	209*	8,953 (7,597-15,193)	**11,116**
	Age 1+	-	66*	267	520	306	145	263	400	175	21*	2,163 (2,054-4,488)	
2009	**YOY**	-	7*	0*	23	19	837	1,688	2,487	675	81*	5,817 (4,837-9,800)	**7,794**
	Age 1+	-	103*	80*	370	318	801	136	85	65	19*	1,977 (1,885-3,667)	
2010	**YOY**	-	0*	0*	10	74	295	7,084	3,416	780	75*	11,734 (11,408-24,456)	**13,670**
	Age 1+	-	73*	513	821	233	89	119	13	52	23*	1,936 (1,880-4,004)	
2011	**YOY**	-	0	0	0	0	36*	350*	263	188	38*	875 (870-1,635)	**3,706**
	Age 1+	-	459	1,692	350	195	23*	23*	8	72	9*	2,831 (2,762-6,683)	
2012	**YOY**	0*	0*	0	0	4	771	802	469	220	41*	2,307 (2,307-2,459)	**3,019**
	Age 1+	21*	48*	50	142	93	174	25	20	119	20*	712 (712-1,049)	
2013	**YOY**	-	0*	0	0	0	189	184	530	361	10*	1,274 (1,244-2,438)	**2,091**
	Age 1+	-	29*	252	72	55	134	41	125	82	27*	817 (813-1,704)	
2014	**YOY**	-	0*	0	0	0	463	930	448	91	0*	1,932 (1,873-3,716)	**3,136**
	Age 1+	-	100*	157	137	155	534	57	39	25	0*	1,204 (1,204-1,922)	
2015	**YOY**	-	0*	0	0	1	11	34	20	45	0*	111 (111-236)	**884**
	Age 1+	-	149*	363	22	158	4	37	4	36	0*	773 (770-1,130)	

Table A-5. Estimated numbers of juvenile fall-run Chinook salmon migrating past the Shelton Road (RM 28) rotary screw trap, 2006, 2007, 2012 and 2013. Abundance estimated based on an average trap efficiency of 26.6% in 2006 and 2007 and on percent flow sampled in 2012-2013. Dash indicates not sampled. Asterisk indicates partial month estimated due to limited sampling. Note: April 2006 substantially underestimated due to only one day of sampling. Parentheses indicate 80% confidence intervals.

Month	2006	2007	2012	2013
Oct	-	-	0*	-
Nov	-	-	0*	6*
Dec	-	10*	0*	2
Jan	15*	0*	0	0
Feb	5,435	1,018	8	0
Mar	14,017	1,255	1,257	12
Apr	395	4,766	1,317	343
May	15,582	11,488	6,452	3,297
Jun	3,679	2,264	3,021	411
Jul	-	-	77*	11*
Total	**39,123** (16,158-57-322)	**20,801** (19,507-38,821)	**12,132** (12,132-13,682)	**4,082** (3,787-7,513)

Rainbow Trout and Steelhead (*Oncorhynchus mykiss*)

General Life History and Habitat Requirements. Steelhead are the anadromous form of rainbow trout and exhibit a wide range of life-history traits depending upon their location and available habitat. Information detailing species life history, biological requirements, and population trends for this species can be found in a variety of documents (Reiser and Bjornn 1979, Bell 1991, Bovee 1978, Busby et al. 1996, Draft CALFED PEIS/EIR 1999; NOAA Fisheries 1996; McEwan and Jackson 1996, McEwan 2001).

In the Sacramento River system, steelhead adult migration occurs from July through March with peaks in September and February (Bailey 1954; Hallock et al. 1961). Spawning may begin as early as late December and can extend into April, with peaks from January through March (Hallock et al. 1961). After spending one to three years in freshwater, juvenile steelhead migrate downstream to the ocean. Most Central Valley steelhead migrate to the ocean after spending two years in freshwater (Hallock et al. 1961, Hallock 1989). Hallock et al. (1961) found that juvenile steelhead migrated downstream most months of the year in the Sacramento Basin, but the peak period of emigration occurred in the spring, with a much smaller peak occurring in the fall.

Relationship to Rainbow Trout. According to McEwan and Jackson (1996), it is not uncommon, even under unimpaired conditions, for *O. mykiss* to become isolated in perennial headwaters because of low-flow conditions occurring primarily in summer, but occasionally persisting for several consecutive years. Thus, the development of a polymorphic population structure whereby anadromous and stream-dwelling rainbow trout are able to interbreed has been theorized as a response to an environment that is frequently suboptimal and not conducive to consistent, annual recruitment of migrants to the ocean, and may be necessary for long-term persistence of a population in these types of environments (Northcote 1997; Jonsson 1985, as cited in Northcote 1997; Titus and Mosegaard 1992). The likelihood that anadromous and stream-dwelling rainbow trout can form a single interbreeding population in a particular stream such as the Calaveras River has important management implications. Management of steelhead populations must include measures to "protect and restore stream-dwelling rainbow trout and especially the ecological linkages between the different forms" (IEP 1998) and can "only be addressed through an integrated management strategy that treats all life-history forms occupying a stream as a single population" (McEwan and Jackson 1996).

Rainbow and Steelhead Trout Status in the Lower Calaveras River. Due to year-round flows provided between New Hogan Dam and Bellota and the associated suitable temperature conditions created in a majority of this reach as a result of reservoir operations, the lower Calaveras River between New Hogan Dam and Bellota has supported a prized rainbow trout fishery for decades, as evidenced by the number of large trout caught by recreational users. In addition, year-round *O. mykiss* rearing has been observed below New Hogan to at least Shelton Road (RM 28; SEWD unpublished data).

Besides resident rainbow trout, a small number of steelhead has also been observed in the lower river in recent years, including one confirmed steelhead adult out of three *O. mykiss* carcasses recovered in 2000 (Titus 2000); another confirmed steelhead adult out of three additional carcasses

(CDFG unpublished); one steelhead adult carcass collected in 2002 (Demko 2002); steelhead and offspring of steelhead identified based on otolith microchemistry (Zimmerman et al. 2009); and several hundred juvenile trout expressing an anadromous life-history (smolt indices of 4 and 5) captured in a downstream migrant trap since 2002 (SEWD unpublished data). These limited observations indicate that steelhead are able to migrate into the river as adults, and opportunistically and successfully spawn within the river when conditions are available. These data also indicate that some progeny of either resident rainbow trout or steelhead are stimulated to begin the physiological process of smoltification in preparation for an anadromous life-history. Although the number of *O. mykiss* carcasses analyzed is very limited, results demonstrate the presence of three unique life-history strategies (i.e., residency, potanadromy, and anadromy) in the river, which is a reminder of the diverse life-history strategies exhibited by *O. mykiss* populations.

Due to the lack of population estimates for the species, the overall population characteristics of *O. mykiss* (e.g., proportion of population which is anadromous versus resident) within the lower Calaveras River are unknown. However, the presence of a relatively abundant resident rainbow trout population below New Hogan Dam combined with the presence of a smaller number of steelhead indicate that current conditions within the lower river are able to support a mixed population.

Chinook Salmon

Chinook Salmon General Life History and Habitat Requirements. Information detailing general Chinook salmon life history, biological requirements, and population trends can be found in a variety of documents (Reiser and Bjornn 1979, Bell 1991, Bovee 1978, NOAA Fisheries 1998, Myers et al. 1998, Draft CALFED PEIS/EIR 1999, Brown 2001). Specific life history characteristics for each race are described below.

Fall-run Chinook Salmon. Currently, fall-run Chinook salmon are the most abundant run in the Central Valley (Reynolds et al. 1993, CDFG 1998). In general, adult fall-run migrate into the Sacramento/San Joaquin basin from July through December and spawn from early October through late December, with the peak occurring in October and November (Vogel and Marine 1991). Juvenile emigration occurs primarily from January through June; however, a small portion of the population may over-summer in the stream and migrate out the following winter or spring as yearlings (Reynolds et al. 1993). Historical spawning areas are downstream from most Central Valley dams, and as a result this run has not been as severely affected by dam construction as the spring- and winter-run Chinook, which historically spawned at higher elevations (Reynolds et al. 1993).

Late Fall-run Chinook Salmon. Adult late-fall-run Chinook salmon migrate into the Sacramento and San Joaquin rivers from mid-October through mid-April, overlapping the mid-October through December fall-run salmon spawning migration (Reynolds et al. 1993). Late-fall-run salmon spawn from January through mid-April (Reynolds et al. 1993). Incubation occurs from January through June, and rearing and emigration of fry and smolts occurs from April through mid-October (Reynolds et al. 1993). Significant emigration of naturally produced juveniles occurs through November into December and possibly January, while emigration of hatchery produced juveniles occurs well into February (CDFG 1993).

Spring-run Chinook Salmon. Spring-run Chinook were believed to be historically the second most abundant stock in the Central Valley, with fall-run being the most abundant, as it remains today (CDFG 1998). The run migrated to headwater areas upstream from the present locations of major dams. The construction of dams and subsequent loss of upstream habitat have resulted in the extirpation of spring-run Chinook in the San Joaquin Basin, and only remnant populations exist in a few Sacramento Basin tributaries (CDFG 1998).

Historically, there appeared to be two distinct spring-run populations in California, a Sacramento-San Joaquin population and a Klamath-Trinity river population (USFWS 1996). In the Sacramento-San Joaquin population the principal holding and spawning areas were the middle and headwater reaches of the San Joaquin, Feather, upper Sacramento, McCloud, and Pit rivers (USFWS 1996). The main populations were extirpated when dams were constructed that blocked access to summer holding and spawning habitat (USFWS 1996).

Spring-run currently enter their natal streams from mid-February through July (CDFG 1998). Early-arriving adults hold in cool, deep pools provided by higher elevation streams, then spawn in the fall. Spawning begins in mid-August and continues through October, with a peak usually occurring in September. Incubation occurs from mid-August through mid-March with rearing and emigration beginning in late November and continuing through April. In Deer and Mill creeks, juvenile salmon spend 9-10 months in the stream, with a significant portion of the population spending as long as 18 months in freshwater (USFWS 1996). A significant number of yearlings from the upper reaches of tributaries also occur September through December. Because spring-run spawn at the same time as fall-run Chinook, populations of spring and fall Chinook have interbred in recent years in the mainstem Sacramento and Feather rivers (CDFG 1998).

Spring-run Chinook are different than fall-run Chinook in that they require deep, cool pools to over-summer prior to spawning. Since spring-run enter the river in an immature state, gonad development occurs in the stream during the summer. These deep habitats occur naturally at higher elevations, most of which are now blocked by dams. Records indicate that spring-run Chinook in the Sacramento-San Joaquin river system spend the summer holding in large pools where summer temperatures are usually below 70-77°F (Moyle 1976). The upper limit of the optimal temperature range for adults holding while eggs are maturing is 59-60°F (Hinz 1959). Sustained water temperatures above 80.6°F are lethal to adults (Cramer and Hammack 1952). Today, spring-run continue to persist in high-elevation tributaries, such as Deer and Mill creeks, due to their naturally cold temperatures and suitable habitat conditions, and can also persist in some streams at lower elevations than they could have historically due to the supply of cold water provided by upstream storage reservoirs.

Winter-run Chinook Salmon. Winter-run Chinook salmon currently enter the Sacramento River from mid-December through July and spawn in the upper main stem portion of the river from mid-April to early August (Vogel and Marine 1991). Egg incubation occurs from mid-April through early October, with emigration of fry and smolts beginning in July and ending the following March (Vogel and Marine 1991).

According to Yoshiyama et al. (1996),

> the winter run — unique to the Central Valley (Healey 1991) — originally existed in the upper Sacramento River system (Little Sacramento, Pit, McCloud and Fall rivers) and in nearby Battle Creek (Fisher, unpubl. data); there is no evidence that winter runs naturally occurred in any of the other major drainages prior to the era of watershed development for hydroelectric and irrigation projects.

Chinook Status in Calaveras River. The historic flow regime in the Calaveras River would have provided limited upstream migration opportunities during the early portion of the fall-run spawning migration period (i.e., prior to December). In most years, significant rainfall and associated freshets large enough to provide migration opportunities did not occur until December; however, in some years, substantial rain events began as early as November. In fall 2001-2004, small numbers of adult fall-run Chinook were occasionally observed attempting to migrate upstream in the Calaveras River beginning with the first substantial freshet (flows approximately >150 cfs; FFC unpublished data). There were no juvenile migrants captured at Shelton Road (RM 28) in three of the corresponding juvenile migration seasons (i.e., 2003-2005) and only six were captured in 2002. In fall 2005, there were a total of 685 adult salmon observed in the river and 221 were found to have migrated above Bellota Weir. An unknown number of these adults spawned above Shelton Road, but a relatively high number of juvenile salmon (i.e., 5,943) were captured at the Shelton Road screw trap in 2006, and calculations indicate that juvenile salmon abundance was 39,123 (80% CI = 16,158-57,322). Later that year, a moderately high number of adult salmon (n = 77) was observed below Bellota Weir. Although no adults were recorded above Bellota, juvenile salmon migrant numbers in 2007 (i.e., 2,124 captured; 13,777 estimated with 80% CI = 12,914-25,986) indicate that a number of adult salmon must have migrated and spawned above Shelton Road (SEWD unpublished data). Based on historical and recent flow regimes, fall-run can only be expected to opportunistically use the basin during years of high rainfall and associated freshets, with migration typically not able to begin until substantial precipitation occurs in December. Although the overall contribution of fall-run in the Calaveras River to the fall-run population as a whole is unknown, it is expected to be very minimal due to limited migration opportunities and low numbers of adults and juveniles observed. Given the historic and present limitation in migration opportunities, the Calaveras River acts as a sink population of Chinook within the Central Valley, defined as one that exhibits negative intrinsic growth, relying on immigration from source populations without which it would become extinct (Schtickzelle and Quinn 2007, Johnson et al. 2012).

Both winter-run and spring-run Chinook historical distributions were limited to high-elevation headwater reaches where they depended on reliable cool temperatures and constant flows throughout the summer and fall for migration and egg incubation. The problem of naturally low elevation and flows, warm summer water temperatures, and marginal habitat would have precluded sustained viable populations of winter-run and spring-run Chinook salmon in the Calaveras River watershed. Regardless of whether these races were historically present, spring-run were believed to be extirpated from the entire San Joaquin Basin prior to the 1950s and the "winter-run" Chinook observed in the Calaveras River during the 1970s were extirpated by the mid-1980s.

San Joaquin Basin Hatchery Practices and Rainbow/Steelhead Trout Stocking

Hatchery Releases above New Hogan Reservoir. Table A-6 presents the total number of rainbow trout planted in the upper river between 1950 and 2011. San Antonio Creek was stocked annually in an unknown location from 1950 to 1969 with between 877 and 8,162 rainbow trout per year. CFG/CDFW has stocked at White Pines Lake from 1971 to the present with between 3,991 and 14,400 rainbow trout per year. Total rainbow trout stocked in San Antonio Creek between 1950 and 2005 was 281,404. O'Neil Creek only received 198 fingerling rainbow trout in 1950. From 1951 to 1953, a total of 792 catchable rainbow trout were planted in San Domingo Creek.

All of the planting in San Domingo and O'Neil creeks took place prior to the completion of New Hogan Dam in 1963, while the majority of planting in San Antonio Creek has taken place after New Hogan Dam completion in the White Pines Lake area. All rainbow trout prior to the completion of New Hogan Dam were predominantly from Murphy's Pond and Basin Creek, while those planted after the completion of the dam came from Moccasin Hatchery.

The only location within the Calaveras River drainage presently stocked is White Pines Lake near Arnold on San Antonio Creek. White Pines Dam was constructed in 1970, the year after trout planting ended in San Antonio Creek.

Hatchery Releases in New Hogan Reservoir. Between 1968 and 1984, there were 667,985 catchable sized rainbow trout planted in New Hogan Reservoir from an unknown source (Table A-6). The average number of trout planted per year was 40,000 with a minimum and maximum number of 11,557 and 101,775, respectively. To the knowledge of the American River Hatchery manager and assistant manager, rainbow trout have not been planted in the reservoir since 1984. Instead, efforts to bolster a warm-water fishery have taken priority, with species such as channel catfish and striped bass planted in the reservoir during the early 1980s.

Hatchery Releases below New Hogan Reservoir. In March and April of 1992, there were 518,800 sub-yearling steelhead planted from Nimbus Hatchery into the Calaveras River (CDFG 1991). Location of the release is unknown, but it is assumed to be below New Hogan Dam since the juveniles released were steelhead (Cramer et al. 1995).

In 1995, there were 25,024 steelhead raised at the Mokelumne River Fish Installation (hatchery of origin was Nimbus Hatchery) which were released into the Calaveras River below New Hogan Dam (CDFG 1996b).

Hatchery Releases in nearby Mokelumne River. The Mokelumne River Hatchery was built to mitigate for lost anadromous fish production due to Camanche Dam and began operation in 1963. The hatchery propagates steelhead and fall-run Chinook salmon. Due to the proximity of the mouth of the Calaveras River to the mouth of the Mokelumne (approximately 15.5 miles) River, hatchery fish released into the Mokelumne River may stray as returning adults into the Calaveras River.

Table A-6. Historical Upper Calaveras River Basin Rainbow Trout Planting Totals, 1950-2011. Source: Data from the American River Hatchery and DFG.

Year	New Hogan	O'Neil Creek	San Domingo Creek	San Antonio Creek	White Pines Lake[1]
1950	-	198	-	2,992	-
1951	-	-	165	5,707	-
1952	-	-	294	7,393	-
1953	-	-	333	8,162	-
1954	-	-	-	2,205	-
1955	-	-	-	3,085	-
1956	-	-	-	3,305	-
1957	-	-	-	3,100	-
1958	-	-	-	3,137	-
1959	-	-	-	2,595	-
1960	-	-	-	877	-
1961	-	-	-	2,953	-
1962	-	-	-	3,000	-
1963	-	-	-	2,955	-
1964	-	-	-	2,872	-
1965	-	-	-	2,995	-
1966	-	-	-	2,791	-
1967	-	-	-	3,528	-
1968	38,200	-	-	2,850	-
1969	44,630	-	-	4,502	-
1970	20,000	-	-	-	-
1971	43,930	-	-	-	3,991
1972	34,750	-	-	-	14,440
1973	62,638	-	-	-	4,631
1974	41,820	-	-	-	4,660
1975	101,775	-	-	-	3,991
1976	35,470	-	-	-	7,540
1977	46,300	-	-	-	8,050
1978	33,780	-	-	-	5,731
1979	37,120	-	-	-	4,452
1980	36,920	-	-	-	5,507
1981	29,155	-	-	-	6,252
1982	11,557	-	-	-	5,290
1983	23,690	-	-	-	5,437
1984	26,250	-	-	-	8,595
1985	-	-	-	-	5,680
1986	-	-	-	-	5,184
1987	-	-	-	-	5,115
1988	-	-	-	-	9,140
1989	-	-	-	-	10,270
1990	-	-	-	-	4,125
1991	-	-	-	-	4,543
1992	-	-	-	-	4,915
1993	-	-	-	-	7,440
1994	-	-	-	-	4,640
1995	-	-	-	-	6,078
1996	-	-	-	-	6,360

[1] White Pines Lake is located on San Antonio Creek but planting records are kept separately.

Year	New Hogan	O'Neil Creek	San Domingo Creek	San Antonio Creek	White Pines Lake[1]
1997	-	-	-	-	5,768
1998	-	-	-	-	5,890
1999	-	-	-	-	5,990
2000	-	-	-	-	4,935
2001	-	-	-	-	5,010
2002	-	-	-	-	5,065
2003	-	-	-	-	4,650
2004	-	-	-	-	5,500
2005	-	-	-	-	5,535
2006	-	-	-	-	5,365
2007	-	-	-	-	6,445
2008	-	-	-	-	4,890
2009	-	-	-	-	-
2010	-	-	-	-	9,500
2011	-	-	-	-	9,200
Total	667,985	198	792	71,004	245,800

Table A-7 presents Mokelumne Hatchery records for steelhead returns and releases from 1963-64 to 2002. Steelhead releases have ranged from 0 to 538,379 (age 0+); 0 to 206,140 (age 1+); and 20,125 to 300,320 imported fry. The number of steelhead adults returning to the hatchery has ranged from a low of 0 in the 1987-88 spawning year to a high of 215 in the 1971-72 spawning year.

Nimbus Hatchery is generally the source of steelehad eggs; however, several other sources have been used, including the Mokelumne, Feather, Mokelumne/Nimbus, Nimbus/Coleman, and Nimbus/Feather hatcheries (Table A-8). From 1971 through 1991, the Mokelumne Hatchery was essentially dependent on other hatcheries for broodstock. Since 1991, the Mokelumne River Hatchery has obtained some of its eggs from steelhead returning to the hatchery (6.1%), but is still largely dependent on transfers from the aforementioned hatcheries.

Although attempts to monitor straying of hatchery fish have been limited, hatchery records indicate that many steelhead stray. Evidence in the Sacramento Basin indicates that Chinook salmon straying increases with the distance between the hatchery and the planting location (Cramer 1989) which may be similar for steelhead. Since 1991, 37.8% of Mokelumne River hatchery produced steelhead have been planted outside of the Mokelumne River (Table A-9).

Potential Hatchery Releases in Nearby Stanislaus River. The mouth of the Calaveras River is approximately 37 miles from the mouth of the Stanislaus River. No known releases of rainbow trout have been conducted below Goodwin Dam on the Stanislaus River. However, the State Board of Commissioners Biennial Report, 1914-21, published releases of steelhead reared at Mount Shasta Hatchery to both Calaveras and Tuolumne counties in 1915 and 1916, but does not state which one of the rivers, the Stanislaus or the Calaveras, were the recipients of these fish. In 1915, there were 228,000 steelhead planted in Calaveras County and 75,000 in Tuolumne County. In 1916, there were 5,000 planted in Calaveras County and 20,000 in Tuolumne County.

San Joaquin Hatchery Practices Summary. In summary, rainbow/steelhead trout planting has occurred historically and continues to occur in the Calaveras River drainage, but the extent of planting is minimal when compared to other drainages in California. In addition, rainbow trout planting has occurred and continues to occur in the nearby Mokelumne River, which could lead to straying into the Calaveras River. The potential impacts to the lower Calaveras River *O. mykiss* population resulting from introductions or straying of hatchery fish into the river are unknown. However, NOAA Fisheries has stated that "competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly impact the production and survival of wild steelhead" (NOAA Fisheries 1996).

Table A-7. Steelhead returns and releases for the Mokelumne River 1963-2002. Source: Data from East Bay Municipal Utility District.

Spawning Year	Number of Adults*	Origin of eggs	Releases 0+	Releases 1+	Imported Fry
1963-64	15	Mokelumne/Nimbus			
1964-65	30	Nimbus	163,280	92,525	
1965-66	30	Nimbus	131,420	84,410	
1966-67	17	Nimbus	94,520	74,630	
1967-68	103	Nimbus	0	82,203	
1968-69	24	Nimbus	125,760	101,207	
1969-70	134	Nimbus	137,695	122,822	
1970-71	215	Nimbus	152,862	107,972	
1971-72	14	Nimbus	82,180	111,926	
1972-73	11	Mokelumne	38,864	154,108	
1973-74	18	Mokelumne/Nimbus	302,873	31,924	
1974-75	2	Mokelumne	46,400	77,985	
1975-76	**	Nimbus	14,600	57,202	
1976-77	**	Nimbus	0	51,752	
1977-78	**	Feather	0	8,237	20,125
1978-79	**	Nimbus	0	10,559	
1979-80	**	Nimbus	32,075	4,095	
1980-81	**	Nimbus	19,554	15,095	
1981-82	**	Nimbus	18,480	12,620	
1982-83	**	Nimbus	18,750	3,743	
1983-84	**	Nimbus	10,520	17,612	
1984-85	**	Nimbus	0	53,716	
1985-86	**	Nimbus	0	53,200	
1986-87	48	Nimbus	0	56,215	
1987-88	0	Nimbus/Feather	351,600	173,554	88,810
1988-89	7	Nimbus/Feather	0	0	300,320
1989-90	11	Nimbus/Coleman	0	195,060	
1990-91	20	Feather	0	206,140	100,000
1991-92	23	n.d.	47,338	5,600	
1992-93	108	n.d.	61,742	59,400	
1993-94	83	n.d.	538,379	600	
1994-95	19	n.d.	77,768		
1995-96	76	n.d.	156,090	79,542	
1996-97	12	n.d.		175,060	
1997-98	6	n.d.	86,650	118,610	
1998-99	12	n.d.	700	102,440	
1999-00	80	n.d.	125,581		
2000-01	48	n.d.	1,608	620	
2001-02	91	n.d.	n.d.	n.d.	

*Years 1963/64-1993/94 indicate return numbers to Mokelumne River Fish Installation while years 1994/95-2001/2002 indicate return numbers obtained from Woodbridge Dam Ladder Counts. Note: monitoring at Woodbridge prior to the 1998/99 season was focused on fall- run Chinook sampling and ended annually in December, so data is not available for the entire steelhead migration period.
**Hatchery Ladder Closed-No return data obtained.

Table A-8. Origin of Mokelumne River Hatchery broodstock, 1991-1999. Source: Data from East Bay Municipal Utility District.

Year	Mokelumne	Feather	Mad River	Nimbus
1991	47,338	5,600		
1992		65,742		55,400
1993		200,994	600	337,385
1994	22,138		55,630	
1995	43,470			192,144
1996				175,060
1997				205,260
1998		65,845		37,295
1999				125,581
TOTAL	112,946	338,181	56,230	1,128,125
Percent	6.9%	20.7%	3.4%	69.0%

Table A-9. Mokelumne River Hatchery steelhead plants by location, 1991-1999. Source: Data from East Bay Municipal Utility District.

	Mokelumne						Out of Basin
Year	Mile 19	Mile 39.7	Calaveras	Delta	Feather	Sacramento	Total
1991		47,338					0
1992	29,900	17,155				55,400	55,400
1993	119,770	21,340		41,500		337,385	378,885
1994	22,138	5,620		49,170			49,170
1995	119,610		25,024	68,640		22,340	116,004
1996	175,060						0
1997	158,360	46,900					0
1998	45,775	55,465			1,900		1,900
1999	124,117	852			612		612
TOTAL	794,730	194,670	25,024	159,310	2,512	415,125	601,971
Percent	49.9%	12.2%	1.6%	10.0%	0.2%	26.1%	37.8%

3.2. Calaveras River Other Species of Concern Considered but Not Included as Permitted Species

In addition to Chinook salmon and anadromous and resident rainbow trout, other special status species (i.e., federally or state listed threatened, endangered, or candidate species) potentially occurring within the CHCP boundaries are presented in Table A-10.

The only potential impacts associated with Project Operations to USFWS listed and candidate species include those associated with instream maintenance activities (Appendix C). The potential impacts of instream maintenance activities on USFWS listed and non-listed wildlife species have already been considered and authorized under the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP; SJCOG 2000); therefore, they are not considered further in the CHCP. Under Section 8.2.1(3) of the SJMSCP, SEWD receives coverage for Maintenance Activities undertaken on those lands within SEWD jurisdiction, as follows:

SJMSCP Permitted Activities include, but are not limited to, maintenance activities for existing and planned buildings, roads, fences, pipelines and aqueducts including valves and pipe supports, bridges, ditches, levees, parks, wasteways, hatcheries and similar facilities. SJMSCP Covered Maintenance Activities will normally be undertaken on facilities operated and/or maintained by: Caltrans, East Bay Municipal Utility District, ***Stockton East Water District***, San Joaquin Area Flood Control Agency, South San Joaquin Irrigation District, Schools, city and County public works departments and similar quasi-public agencies. Maintenance activities will normally occur within rights-of-way, easements or lands held by the identified agencies. Maintenance activities include, but are not limited to: repair and replacement of fencing, gates and cattle guards; grading (i.e., re-grading of existing roads and other existing facilities to re-establish surfaces disturbed by erosion and similar degradation); resurfacing including graveling and re-paving; ditch cleaning; culvert replacement; mowing; discing (e.g., to re-establish fire breaks along roadsides); burning; spraying (water for dust control); mechanical weeding (including weed control for fire suppression and flood control); excavating for inspection, repair and/or replacement; mechanical brush clearing (including brush clearing from wasteways); patrolling and exercising valves; scraping; maintenance of drainages along rights of ways; maintenance of river crossings for utilities such as aqueducts; reconstruction or replacement of existing facilities with negligible or no expansion; and maintenance of landscaping. Maintenance activities typically include spraying. For the purposes of the SJMSCP, pesticide use, including spraying, is not a covered activity in the Permit Area.

Table A-10. Special-status non-salmonid species potentially occurring within the CHCP boundaries. Sources: USFWS 2009, CDFG 2009.

Common Name	Scientific Name	Status Federal/State/CNPS
American peregrine falcon	*Falco peregrinus anatum*	**/E/—
Bald eagle	*Haliaeetus leucocephalus*	**/E/—
Burrowing owl	*Athene cunicularia*	—/SC/—
California black rail	*Laterallus jamaicensis coturniculus*	—/T/—
California horned lark	*Eremophila alpestris actia*	*
Ferruginous hawk	*Buteo regalis*	*
Golden eagle	*Aquila chrysaetos*	*
Great blue heron	*Ardea herodias*	—/SA/—
Great egret	*Ardea alba*	—/SA/—
Greater sandhill crane	*Grus canadensis tabida*	—/SFP/—
Loggerhead shrike	*Lanius ludovicianus*	—/SC/—
Merlin	*Falco columbarius*	*
Northern goshawk	*Accipiter gentilis*	—/SC/—
Northern harrier	*Circus cyaneus*	—/SC/—
Osprey	*Pandion haliaetus*	*
Sharp-shinned hawk	*Accipiter striatus*	*
Swainson's hawk	*Buteo swainsoni*	—/T/—
Tricolored blackbird	*Agelaius tricolor*	—/SC/—

Common Name	Scientific Name	Status Federal/State/CNPS
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	C/E/—
White-tailed kite	*Elanus leucurus*	—/SFP/—
Yellow warbler	*Dendroica petechia brewsteri*	—/SC/—
Yellow-breasted chat	*Icteria virens*	—/SC/—
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	—/SC/—
California red-legged frog	*Rana aurora draytonii*	T/SC/—
Giant garter snake	*Thamnophis gigas*	T/T/—
Western spadefoot	*Spea hammondii*	—/SC/—
Ahart's dwarf rush	*Juncus leiospermus var. ahartii*	—/—/1B
Alkali milk-vetch	*Astragalus tener var. tener*	—/—/1B
Delta button-celery	*Eryngium racemosum*	—/E/1B
Delta tule pea	*Lathyrus jepsonii var. jepsonii*	—/—/1B
Greene's tuctoria	*Tuctoria greenei*	E/R/1B
Ione manzanita	*Arctostaphlos myrtifolia*	T/—/1B
Mason's lilaeopsis	*Lilaeopsis masonii*	—/—/1B
Palmate-bracted bird's-beak	*Cordylanthus palmatus*	E/E/1B
Pincushion navarretia	*Navarretia myersii ssp. myersii*	—/—/1B
Recurved larkspur	*Delphinium recurvatum*	—/—/1B
Round-leaved filaree	*California macrophylla*	—/—/1B
San Joaquin spearscale	*Atriplex joaquiniana*	—/—/1B
Sanford's arrowhead	*Sagittaria sanfordii*	—/—/1B
Slough thistle	*Cirsium crassicaule*	—/—/1B
Suisun Marsh aster	*Symphyotrichum lentum*	—/—/1B
Wooly rose-mallow	*Hibiscus lasiocarpus*	—/—/2
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*	—/—/2
Pallid bat	*Antrozous pallidus*	—/SC/—
Riparian brush rabbit	*Sylvilagus bachmani riparius*	E/E/—
San Joaquin kit fox	*Vulpes macrotis mutica*	E /T/—
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	—/SA/—
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T/—/—
Hardhead	*Mylopharodon conocephalus*	—/SC/—
Sacramento splittail	*Pogonichthys macrolepidotus*	SC/—/—

Codes: E= Endangered; T= Threatened, C= Candidate; SC= species of concern; SFP: State fully protected; SA=Special animal; R= rare; 1B= Rare, threatened or endangered in California and elsewhere and are rare throughout their range. According to CNPS, all of the plants constituting List 1B meet the definitions of Sec. 1901; 2= Rare in California, but not elsewhere; * Watch List or Species of Local Concern; ** Delisted.

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Notes

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