4.0 AFFECTED ENVIRONMENT

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4.0 AFFECTED ENVIRONMENT

4.1. OVERVIEW OF AFFECTED ENVIRONMENT

The Affected Environment discussions provide a description of resource features of the regional and local study area that may be affected by implementation of the alternatives (i.e., proposed action and alternatives). The resource settings can be viewed as two distinct categories: those covering diversion-related resources, and those addressing service area-related resources.

The direct-effect study areas include resources in locations that could be affected by potential changes in hydrology (e.g., instream flows, reservoir storage, water surface elevations, etc.) due to the new water deliveries proposed by this action. The resources potentially affected directly are, therefore, referred to as diversion-related resources. For other projects where facility construction is proposed, the direct-effect study area typically also includes those facility footprints and associated areas where facility appurtenances are required. For this Proposed Action, however, no such new facilities or appurtenances are included.

The indirect effect study area is assumed to be those locations in the EID and GDPUD service areas where the water would be used (and, therefore, includes the service area-related or non-diversion related resources).

The conditions described for the various affected environments provide the basis for impact evaluation under both the No-Action Alternative for NEPA and the No-Project Alternative under CEQA. The information is based on the best available information and is intended to describe historical, existing, and where appropriate, likely No-Action Alternative conditions. Information was obtained through literature review, agency correspondence and consultations. The specific affected environments for each resource area are described in the separate subchapters pertaining to those individual resources.

For this EIS/EIR, resource evaluations were broken into two categories; diversion-related resources and their associated impacts, and indirect or non-diversion related service area resources and their associated impacts. The Affected Environment discussions describe those natural, social, cultural, and physical features upon which the alternatives for this action were evaluated and presented in the Executive Summary.

Diversion-related impacts could affect the following resources:

- Water Supply
- Hydropower Generation
- Flood Control
- Water Quality

- Fisheries
- Riparian Resources
- Water-related Recreation
- Water-related Cultural Resources

The Affected Environment/Setting for each of these resources is presented Subchapters 4.2 through 4.9 in this chapter.

Indirect or non-diversion related impacts could affect the following service area resources:

- Land Use/Urban Development
- Transportation and Circulation
- Air Quality
- Noise
- Geology, Soils, Mineral Resources, and Paleontological Resources
- Recreation
- Visual Resources
- Cultural Resources
- Terrestrial and Wildlife Resources

The Affected Environment/Setting for each of these resources is presented in Subchapters 4.10 through 4.18 in this chapter.

4.2. WATER SUPPLY (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing water supply conditions within the regional and local study areas, and provides the basis upon which the evaluation of potential diversion-related impacts on water supplies were made.

4.2.1. Affected Environment/Setting

A description of regional and local hydrology is presented below to provide a basis for assessing the potential impacts on water supplies that the Proposed Action and/or alternatives could have on these environments. The regional setting is the geographic area defined by the operations of the Central Valley Project (CVP) and coordinated operations with the State Water Project (SWP). The local setting includes those specific local area reservoirs and riverine reaches that could also be affected by implementation of the proposed new water service contract.

The regional setting includes:

- Trinity and Shasta Reservoirs;

- the upper Sacramento River and lower Sacramento River (that portion of the Sacramento River below the American River); and
- Sacramento-San Joaquin River Delta (Delta).

The local setting includes:

- Folsom Reservoir;
- Lower American River; and
- North Fork American immediately above Folsom Reservoir.

The Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Draft and Final EIS/EIR: U.S. Bureau of Reclamation/Sacramento County Water Agency (SCWA) (November, 1998) contains a detailed discussion of the general hydrology of these systems. Comprehensive reviews of the CVP/SWP and its hydrologic infrastructure and operations are also included in the U.S. Bureau of Reclamation, Long-Term Central Valley Project Operations Criteria and Plan (CVP-OCAP) (June 2004), CALFED Bay-Delta Program Programmatic EIR/EIS, (July 2000), and the Sacramento Area Water Forum Draft EIR for the Water Forum Proposal (January 1999). Much of the following hydrologic information describing the affected environment and settings are taken from these documents; they are, hereby, incorporated by reference.

4.2.2. Sacramento River Watershed

Upper Sacramento and Upstream Reservoirs

The Sacramento River is the largest river system in California. It originates near the slopes of Mount Shasta and flows southward to Suisun Bay in the Delta. The river drains 26,146 square miles with an average annual natural runoff of about 18 million acre-feet (MAF). Flows normally peak during the December through February period, corresponding to the annual rainy season and augmented by periodic upper watershed snowmelt events.

Sacramento River flows are largely determined by the operation of upstream or tributary reservoirs (e.g., Shasta, Oroville, and Folsom) as well as the timing and rates of diversions from the Sacramento River and tributary streams. The Trinity River Division of the CVP is a major source of water for the Sacramento River. Lewiston Dam regulates flows in the Trinity River to meet the downstream fishery and temperature requirements of the Trinity River Basin and provides a forebay for the inter-basin diversion of flows through the Clear Creek Tunnel to the Sacramento River. Upstream reservoirs in the Sacramento River basin are operated to fulfill a variety of functions within the coordinated operations of the CVP/SWP, including flood control, water supply, fisheries and wildlife benefits, and power generation, as well as to meet water quality and flow requirements in the Delta. Diversions from the Sacramento River and tributary streams also influence seasonal flow levels by reducing overall flow volumes in the river. Shasta Reservoir is the largest CVP reservoir, capable of storing up to 4.5 MAF.

The natural flow pattern of the Sacramento River has been altered over time due to construction of a variety of river flow control facilities. Flows have been reduced during the wetter months due to upstream storage and diversions, but are maintained during the drier months due to the requirements to sustain flows at levels capable of meeting water quality objectives and water delivery obligations downstream. The flow of the Sacramento River can significantly vary from year-to-year and within a year. Flow in the Sacramento River is generally controlled by operations of the CVP and SWP. At other times, such as during times of significant uncontrolled runoff during storms, flows are not controlled.

Lower Sacramento River

Sacramento River flows at the City of Sacramento are greatly influenced by the large facilities located in the upper regions of the watershed, particularly Shasta Reservoir; Keswick Reservoir; Whiskeytown Reservoir (which regulates imported water from the Trinity River system); and diversions such as the Corning, Tehama-Colusa, and Glenn-Colusa canals. The historical average annual flow for the Sacramento River at Freeport is approximately 16.7 MAF. The Feather and American rivers are the two largest tributaries of the Sacramento River. Two other inflows that contribute to the Sacramento River are the Cross Canal and the Colusa Basin Drain, which drain the agricultural land in the Glenn-Colusa Irrigation District. The lower Sacramento River begins downstream of its confluence with the lower American River.

During the flood season, Sacramento River overflows spill over the series of weirs upstream of Wilkins Slough and flow into the Butte Sink. These flows are then carried by the Sutter Bypass back into the Sacramento River at Verona. Flood flows may also bypass the Sacramento River at Verona by spilling over the Fremont Weir and into the Yolo Bypass. Overflows occur at this point when the Sacramento River flows exceed 55,000 cubic feet per second (cfs). Sacramento River overflows may also enter the Yolo Bypass just north of Sacramento by spilling over the Sacramento Weir.

4.2.3. Sacramento-San Joaquin Delta

The Sacramento-San Joaquin River Delta (or, Bay-Delta or, simply Delta) lies at the confluence of the Sacramento and San Joaquin Rivers. The Delta boundary extends north along the Sacramento River terminating just south of the American River, south along the San Joaquin River terminating just north of the Stanislaus River, east to the City of Stockton, and west to Suisun Bay.

Runoff from Central Valley streams account for approximately 95 percent of the inflows to the Delta. The Delta receives flows directly from the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers. These rivers and their tributaries drain more than 40 percent of California. Annual inflows to the Delta averaged approximately 27.8 MAF during the period from 1980 to 1991.

Hydraulic conditions in the Delta are influenced by a number of factors such as inflows (controlled and uncontrolled) from tributary streams, tidal influences from the Pacific Ocean, operation of Delta export facilities, and water diversions within the Delta. The Delta is at mean sea level, and consequently, tides significantly influence both the level and direction of flows through its many channels and sloughs. Tidal water level variations can vary from one foot on the San Joaquin River near Interstate 5 to more than five feet at the outlet of the Delta, near the City of Pittsburg. The direction of flow at these two points also changes dramatically with the tides. On the San Joaquin River at Venice Island, flows range from 47,000 cfs downstream during low tide to 58,000 cfs upstream during high tide. Near the City of Pittsburg, flows can vary from 340,000 cfs downstream to 330,000 cfs upstream.[32]

The tidal currents carry with them large volumes of seawater back and forth through the Delta with each tide cycle. The mixing zone of saltwater and freshwater can shift two to six miles depending on the tides, and may reach far into the Delta during periods of low inflow. Thus, the inflow of the tributaries into the Delta is essential in maintaining water quality in the Delta.

The average annual Delta outflow to Suisun Bay (for the period 1980-1991) is approximately 21 MAF.[33] Delta inflows rely significantly on runoff from Central Valley streams, and accordingly, also depend on the operations of water facilities on these streams. Releases from Shasta, Folsom, New Melones, and Millerton reservoirs of the CVP and Oroville Reservoir of the SWP control, to a large extent, how much and when freshwater enters the Delta.

4.2.4. Central Valley Project

The CVP is operated and maintained by the U.S. Bureau of Reclamation (Reclamation) and represents the largest surface water storage and delivery system in California, with a geographic scope covering 35 of the State's 58 counties. The CVP is composed of some 20 reservoirs with more than 11 million acre-feet (MAF) of storage capacity, 11 power plants, and over 500 miles of major canals and aqueducts.

Within the Sacramento Basin, the CVP operates Shasta and Folsom reservoirs, among others. As noted previously, water is also imported from the Trinity River into the Sacramento Basin through Clear Creek Tunnel. The Tracy Pumping Plant exports water from the Delta for storage in San Luis Reservoir and delivery to contractors in the San Joaquin Valley. The CVP also operates New Melones Reservoir on the Stanislaus River and Millerton Reservoir on the San Joaquin River, and it exports water from the San Joaquin Basin to the Tulare Basin through the Friant-Kern Canal. Overall, the project supplies water to 253 water service contractors in the Central Valley, Santa Clara Valley (San Felipe Unit), and the San Francisco Bay Area (including Sacramento River Water Settlement Contractors). Key CVP reservoirs and their storage capacities are listed in Table 4.2-1.

TABLE 4.2-1

KEY CVP RESERVOIRS

Reservoir	Reservoir Capacity (TAF)
Trinity	2,447
Shasta	4,552
Folsom	977
San Luis (CVP-share)	966
New Melones	2,420
Millerton	520

Source: U.S. Bureau of Reclamation, CVO Operations, CVP Water Supply Reports, 2007.

32 California Department of Water Resources, *Sacramento-San Joaquin Delta Atlas*, 1993.
33 California Department of Water Resources, *Sacramento-San Joaquin Delta Atlas*, 1993.

The CVP contract amounts total 6,751 thousand acre-feet (TAF) and are comprised of 3,140 TAF for the Sacramento River, 195 TAF for the American River, and 3,416 TAF for Delta exports.[34] As of 2000, the Sacramento River and Delta export contracts were considered fully subscribed with no new contracts being considered by Reclamation.

4.2.5. State Water Project

The State Water Project (SWP) is operated by the California Department of Water Resources (DWR). It consists of 32 storage facilities, 660 miles of aqueducts and pipelines, 17 pumping plants, and eight hydroelectric powerplants. Using these facilities, the SWP provides urban and agricultural water supply, flood control, recreation, fish and wildlife enhancement, power generation, and salinity-control in the Delta. The project delivers water to over two-thirds of California's population and approximately 600,000 acres of farmland through 29 urban and agricultural water districts. These agencies have long-term water supply contracts totaling 4.2 MAF per year. However, existing SWP facilities supply less than 2.4 MAF per year during drought conditions. The principal storage facility for the SWP is Oroville Reservoir. Key SWP reservoirs and their capacities are listed in Table 4.2-2.

TABLE 4.2-2

KEY SWP RESERVOIRS

Reservoir	Reservoir Capacity (thousand acre-feet)
Oroville	3,538
San Luis (SWP-share)	1,067

The North Bay Aqueduct, completed in 1988, supplies water to Napa and Solano counties from the northern Delta. Near Byron in the south Delta, the Banks Pumping Plant lifts water into Bethany Reservoir. From this reservoir, a portion of Delta water is lifted by the South Bay Pumping Plant into the South Bay Aqueduct, which serves both Alameda and Santa Clara counties.

Most of the water flows from Bethany Reservoir into the Governor Edmund G. Brown California Aqueduct, which winds along the west side of the San Joaquin Valley to the O'Neill Forebay. From there, part of the water is pumped through the William R. Gianelli Pumping-Generating Plant for storage in San Luis Reservoir until it is needed for later use. The B.F. Sisk San Luis Dam, which impounds 2,040,000 AF, is jointly owned; it was built by Reclamation and is operated by DWR. The SWP share of the storage volume of San Luis Reservoir is 1,067 TAF.

Water not retained at San Luis Reservoir continues south in the California Aqueduct, and is raised another 1,069 feet by four more pumping plants (Dos Amigos, Buena Vista, Wheeler Ridge, and Chrisman) before reaching the foot of the Tehachapi Mountains. The water is then raised 1,926 feet by the Edmonston Pumping Plant, over the Tehachapi Mountains, into a tunnel that conveys water to southern California. In the southern San Joaquin Valley, a short Coastal Branch Aqueduct serves agricultural areas west of the California Aqueduct along with Santa Barbara and San Luis Obispo counties.

34 CVPIA PEIS, 1997.

4.2.6. Factors Determining CVP/SWP Allocations

Water deliveries to CVP and SWP contractors are made continually throughout the year. The allocation of CVP and SWP water supplies for any given year is based on the following six criteria:

- Forecasted reservoir inflows and Central Valley hydrologic water supply conditions;
- Current amounts of storage in upstream reservoirs and in San Luis Reservoir;
- Projected water demands in the Sacramento Valley;
- Instream and Delta regulatory requirements;
- Demand pattern deliveries south of the Delta;
- Annual management of CVPIA 3406 (b)(2) resources (see Section 3406[b][2] under the CVPIA, below); and
- Efficient use of CVP/SWP export capacity through Joint Point of Diversion flexibility.

Beginning each year (in December for SWP contractors, and in February for CVP contractors), initial allocations of entitlement deliveries are determined based on the above criteria. Generally, allocations are updated monthly until May, although increases may occur later in the year based on changing reservoir storages.

4.2.7. CVP Water Allocations

In most years, the combination of carryover storage and current year snowmelt and runoff into CVP reservoirs are sufficient to meet the majority of CVP contractor demands. However, since about 1992 with the passage of the CVPIA, when increasing constraints placed on CVP operations removed some of the inherent flexibility required to deliver water to CVP contractors, this has become more difficult to achieve.

Generally, the water allocation process for the CVP begins in the fall when preliminary assessments are made of the upcoming year's water supply availability. Beginning on February 1, forecasts of water year runoff are prepared using precipitation to date, snow water equivalent content of the accumulated snowpack, and runoff to date. In recent years, February 15 has been the target date upon which the first announcement has been made to all CVP contractors of their forecasted water allocations for the upcoming year. NOAA Fisheries (formerly NMFS) requires Reclamation to use a conservative estimate (at least 90 percent probability of exceedance) when making such water allocation forecasts. Moreover, NOAA Fisheries reviews the operations plans prepared by Reclamation to support the initial water allocation (including any subsequent updates) to ensure that they can meet water temperature control criteria on the Sacramento River.

Forecasted runoff is updated monthly between February and May. Water allocations may or may not change as the year unfolds. Since a conservative water runoff forecast is initially prepared, it is often the case that water allocations actually can increase as the year progresses. In most years, therefore, the final water allocations are not known until April, May and even as late as June. This timing can be challenging for some agricultural contractors who, depending on agricultural crop, need to plan as early in the growing as possible.

4.2.8. CVP Water Shortage Provisions

Reclamation includes provisions in its CVP contracts specifying that a certain amount of CVP water will be made available to each CVP contractor, only to the extent that such water is available. While Reclamation uses all reasonable means to guard against shortages, delivery reductions can and do occur. Where the overall CVP water supply is not constrained by drought or other unavoidable circumstances, Reclamation is contractually committed to providing each contractor with the CVP water supply specified in the individual contracts.[35] CVP water service contracts have, over the years, had many varying water shortage provisions. In some contracts, M&I and agricultural use have shared shortages equally. In others, such as larger M&I contracts, agricultural water was shorted 25 percent before M&I water was shorted, and then both shared equally. Recognition of the increasing demands on a finite CVP water supply has, however, recently led Reclamation to consider revising its water delivery allocation guidelines. This has been ongoing since 1991, under Reclamation's M&I 2001 Water Shortage Policy.

In general, the policy provides M&I water supplies with a 75 percent water supply reliability based on a contractor's historical use. Historical use, in this context, is defined as the last 3 years of water deliveries unconstrained by the availability of CVP water. Before M&I supplies would be reduced, irrigation water supplies would be reduced below 75 percent of contract entitlement. When the irrigation allocation is reduced below 25 percent, Reclamation will reassess the availability of CVP water supplies and demand. During such water short periods, Reclamation may also reduce M&I water allocations below 75 percent of adjusted historical use. It should be noted that this policy would apply only to that portion of CVP water identified as of September 30, 1994, as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates Book, and for those contract quantities specified in P.L.101-514 (Section 206).

4.2.9. Water Allocation Priorities

Reclamation considers various categories of CVP water demands, their contractual amounts, and the deficiency criteria associated with each in their water allocation process. These various demands may be characterized as follows:

- Water Rights Settlement Agreements
- Municipal and Industrial (M&I) Water Service Contracts (e.g., P.L.101-514 contract)
- Legislative Mandates
- Agricultural Water Service Contracts
- Delivery Losses

35 U.S. Bureau of Reclamation, *Biological Assessment for U.S. Bureau of Reclamation, Central Valley* Operations, 1992.

In general, the allocation of CVP water supplies is accomplished through a two-tier hierarchy. The first tier, or Group I, includes all the categories of water demands with specifically defined minimum supplies. These include: 1) Sacramento River water rights and San Joaquin Exchange contracts, with associated minimum rate of delivery in "Critical" Shasta inflow years, 2) Refuge water supplies which must be provided at a minimum of 75 percent of supplies, 3) M&I water supplies, which are assumed to be maintained at 75 percent of maximum historical use, adjusted for growth (as per Reclamation's 2001 Draft M&I Water Shortage Policy), and 4) conveyance, evaporation, and other such water delivery losses. Group II includes all other agricultural water service contracts. Under this hierarchy, Group I water demands must be met first. Once met, the supplies available to Group II are then apportioned according to their contract entitlements that contain no delivery provisions. While there are approximately 2.0 MAF of Group II contracts for south of the Delta, due to the ongoing increases in certain Group I requirements over time (e.g., M&I and Refuge water), the potential for deficiencies to Group II users exists every year. With the potential for decreased pumping opportunities, resulting from ongoing and uncertain changes in operational criteria, these deficiencies to Group II could be exacerbated in the future.

4.2.10. American River Watershed

Surface water within the local setting originates in three primary watersheds: (1) the North and Middle Fork American River Watershed, which includes Hell Hole and French Meadows reservoirs, the Rubicon River and Stumpy Meadows Reservoir; (2) the South Fork American River Watershed, which includes the South Fork American River and its tributaries, Ice House Reservoir, Union Valley Reservoir, Slab Creek Reservoir, and Chili Bar Reservoir, and (3) the Cosumnes River Watershed, which includes Jenkinson Lake (Sly Park), Bass Lake, and the Cosumnes River and its tributaries. Each of these three watersheds flows into the Sacramento River, which ultimately flows to the Delta.[36]

The first two watersheds together comprise the upper portion of the American River Watershed and flow into Folsom Reservoir; the source of water for the proposed project diversions would be from within these two watersheds. No diversions will be made from within the Cosumnes River Watershed; thus, any hydrologic impacts on this watershed would be indirect, resulting, if at all, from water use within the Subcontractor service-areas.

The American River basin comprises a 1,875-square-mile drainage area, and is contained within Sacramento, El Dorado, Placer and a portion of Alpine counties. An average of 2.8 million acre-feet (MAF) of annual runoff drains from this basin.[37] Total reservoir storage of the American River Basin is approximately 75 percent of the mean annual runoff, or about 2.2 MAF.[38] Folsom Reservoir is the largest reservoir on the American River, and the primary flood control and water-storage reservoir, capable of storing maximum of 977 TAF. The other major reservoirs upstream of Folsom Reservoir, and their storage volumes, are: Union Valley, 277 TAF; Ice House, 459 TAF; French Meadows,

36 El Dorado County Planning Department, *El Dorado County General Plan, Volume II, Background Information*, January 23, 1996. Section V, Water: Resources, Quality, and Hazards.

37 California Department of Water Resources. May 2006. *Bulletin 120*. American River below Folsom Lake 50-year average unimpaired runoff.

38 Reclamation, SAFCA. 1994. (from Sac Fazio).

133.7 TAF; and Hell Hole, 208.4 TAF. There are also a number of smaller reservoirs in the upper watershed.

North and Middle Fork American River Upstream of Folsom Reservoir

The proposed GDPUD diversion site under a potential future exchange with PCWA s located near the old Auburn Dam construction site, at the American River Pump Station on the North Fork American River east of the town of Auburn. River flows at this location come from the Middle and North Forks of the American River, including the Rubicon River.

Flows on the Middle Fork are regulated upstream by Hell Hole and French Meadows reservoirs, and are re-regulated by the Ralston Afterbay. The Ralston Afterbay, the most downstream dam in the Middle Fork Project system, releases flows to the Middle Fork American River upstream of its confluence with the North Fork. Downstream of this confluence, Middle Fork flows are a combination of regulated and unregulated flows.[39] Stumpy Meadows Reservoir, operated by GDPUD, also regulates flows on Pilot Creek, a tributary to the Rubicon River, upstream of the confluence of the Middle Fork American and Rubicon rivers.

North Fork American River flows at the American River Pump Station have been estimated based upon upstream gage measurements. Dry-season (summer) flows at this location fluctuate daily; from 100 cfs when power is not being generated at Ralston Afterbay to about 1,100 cfs when power production peaks.[40]

Folsom Reservoir and Lake Natoma

The authorizing legislation for the construction of Folsom Dam, P.L. 81-356, directed Reclamation to operate the dam to control floods, provide for storage and delivery of water, generate power and provide salinity control in the Delta. The dam was completed in 1955. As a part of the CVP, Folsom Dam and Reservoir are operated not only for flood control and to meet CVP water delivery obligations, but also to satisfy in-stream flow needs in the lower American River and the Delta. Much of its original operational mandate was expanded with the passing of the CVPIA in 1992.

Flood-producing runoff occurs primarily during the October through April period and is usually most extreme during November through March. Snowmelt runoff by itself usually does not result in flood-producing flows, but it is usually adequate to fill the reservoir’s empty space. Approximately 40 percent of the American River flow results from snowmelt.[41]

Lake Natoma is situated downstream of Folsom Dam and forms behind Nimbus Dam. This lake is operated as a re-regulating reservoir that accommodates the diurnal flow fluctuations caused by operating the Folsom Power Plant. The capacity of Lake Natoma is approximately 9,000 AF.

39 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-35 to 3-40.
40 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-35 to 3-40.
41 Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Final Environmental Impact Report. U.S. Bureau of Reclamation. November 1998. p. 4-3.

The region's municipal, agricultural, and industrial demands are met by several water purveyors in the areas above, around, and below Folsom Reservoir. El Dorado Irrigation District, City of Roseville, San Juan Water District (SJWD) (including its member family: Citrus Heights Water District, Fair Oaks Water District, and Orange Vale Water Company), Sacramento Suburban Water District (formerly, Northridge Water District), Placer County Water Agency, California State Prison and the City of Folsom for example, are the purveyors that divert water from Folsom Reservoir.

Under the Water Forum Agreement (see Sacramento Area – Water Forum Agreement, below), base condition diversions (i.e., unadjusted for water-year type) from the American River Watershed under normal water years provide the following quantities of water to various water purveyors (see Table 4.2-3).

TABLE 4.2-3

BASE CONDITION DIVERSION UNDER THE WATER FORUM AGREEMENT IN NORMAL (AVERAGE/WET YEARS)

Upstream of Folsom Reservoir	Acre-Feet (AF)
Placer County Water Agency	35,500
GDPUD	19,700
El Dorado Irrigation District	35,430
Folsom Reservoir	
Sacramento Suburban Water District	29,000
City of Folsom	34,000
San Juan Water District	
Placer County	25,000
Sacramento County	57.200
El Dorado Irrigation District	15,050
City of Roseville	54,900
Folsom South Canal	
Southern California Water Company/ Arden Cordova Water Company	5,000
California Parks & Recreation	5,000
SMUD	15,000
South Sacramento County Agriculture	35,000
Canal Losses	1,000
Lower American River	
City of Sacramento	96,300
Arcade Water District	11,200
Carmichael Water District	12,000
Sacramento River at SWRTP or SRWRS	
Placer County Water Agency	35,000
City of Sacramento	Up to 80,600
Sacramento County Water Agency	Up to 93,000
Source: Amended from Water Forum Draft EIR, Table 4.1-2., 1999.	

There are two pumping plants located at Folsom Reservoir: the Folsom Pumping Plant, located at Folsom Dam, and the EID Pumping Plant. The Folsom Pumping Plant serves the City of Folsom, California State Prison (Folsom Prison), the City of Roseville, Sacramento Suburban Water District, and the SJWD. At times when the reservoir water level is high, gravity flow is possible and pumping is not required. The elevation at which pumping is required depends on the amount of water being pumped. Higher flow rates, typical of summer months, require greater pumping head; therefore, the lower limit of the gravity flow is higher in the summer months.[42] The EID Pumping Plant on the South Fork arm of Folsom Reservoir serves EID exclusively.

Water Temperature Control

Water temperature control operations are affected by numerous factors and operational trade-offs with downstream environmental needs. These factors include the Folsom Reservoir coldwater pool volume, Nimbus Dam release schedules, annual hydrology, season of the year (for specific life cycles of rearing or immigrating fish species), Folsom power penstock shutter management flexibility, Folsom Dam's Urban Water Supply Temperature Control Device (TCD) management, and Nimbus Fish Hatchery conditions. Folsom Dam's TCD became operational in 2003. Selective withdrawal can occur at a reservoir water surface elevation of 401 feet (msl [mean sea level]) to 301 feet (msl). The centerline for the 84-inch urban water intake on the face of the dam is at elevation 317 feet (msl).

Folsom powerplant operations, as they affect water temperature releases are described in greater detail in Subchapter 4.3, Hydropower. Additionally, Folsom operations and its effects on downstream water temperature management for fishery purposes is discussed in Subchapter 4.6, Fisheries Resources.

Lower American River

The lower American River is that portion of the American River below Nimbus Dam. This reach, owing largely to its proximity to the greater Sacramento metropolitan area, has undergone significant channel and embankment alterations since the completion of Folsom and Nimbus dams in the mid-1950s.

Rapid flow fluctuations in the lower American River historically, have primarily been in response to either flood control operations at Folsom Dam or operational changes in releases to meet SWRCB water quality standards in the Delta. The close proximity of Folsom Dam and Reservoir to the Delta (and thus the relatively short amount of time required for releases to reach the Delta), results in releases from Folsom Reservoir commonly being relied upon first to meet Delta standards, in lieu of releases from more distant CVP reservoirs when timing is critical. In the past, rapid release-flow fluctuations were common. However, Reclamation, together with the Lower American River Operations Group (AROG), presently attempts to minimize these fluctuations in both magnitude and frequency. Current proposals within the Lower American River Flow Management Standard (LAR FMS) include ramping rate and flow fluctuation criteria to minimize even further, drastic changes in flows for the benefit of specific in-river fish life cycles.

Downstream of Nimbus Dam to around River Bend Park (formerly called Goethe Park), the American River is mostly unrestricted by levees, but is bordered on both the north and south by suburban development. Natural bluffs and terraces in this reach of the river also provide natural morphological controls. From the River Bend Park area to the confluence with the Sacramento

42 Placer County Water Agency, PCWA American River Pump Station Project Final EIS/EIR, June 2002, pp.3-292 to 3-294.

River, the lower American River is less constrained by natural features, and has been confined instead by levees, resulting in a slower moving, deeper reach with less meandering.[43] Thirteen diversions originate in the lower American River reach. The diverters with the largest diversions in this reach are the City of Sacramento (50,000 AFA) and Carmichael Water District (12,000 AFA). Under the Water Forum Agreement, 2030 total water demands from the watershed will be in excess of 280,000 AFA.

4.2.11. <u>Groundwater</u>

Locally, there are no designated groundwater basins identified for El Dorado County. Groundwater within the project area is primarily from hard rock aquifers where movement, recharge, and development of the groundwater are highly variable with location due to the area's geologic faults and fractures; volumes of groundwater are not peculiar to a certain geologic formation.[44] The movement of groundwater is limited at depths of 300 feet or more, resulting in greater groundwater yields in shallower wells. The median depth of wells in El Dorado County is 160 feet; the mean depth is 184 feet.[45] Groundwater is used to supply individual properties with water within El Dorado County, but is not considered reliable enough to serve as a supply for water wholesalers or retailers within the county. Within the regional context, the Sacramento Area Water Forum identified three groundwater basins (North, Central, and South) with specific long-term sustainable yield targets as part of the Water Forum Agreement.

4.2.12. <u>Regulatory Framework</u>

Various federal, State, and local regulations, policies, and rules affect available water supply and, related drainage, flooding, and water quality. These are described below. Explanations of other general rules, regulations and executive orders pertinent to this project are presented in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

Federal and State

Within the context of hydrologic operations, numerous laws, directives, opinions, and orders affect or otherwise have influence on the management of the CVP. These include, but are not limited to the following:

Reclamation Act (1902)	Formed legal basis for subsequent authorization of the CVP.
Rivers and Harbors Act (1935)(1937)(1940)	First authorization of CVP for construction, and provision that dams and reservoirs be used first for river regulation, improvement of navigation, and flood control. Second authorization for irrigation and domestic uses. Third authorization for power.

43 U.S. Bureau of Reclamation and SAFCA. 1994. Interim Reoperation of Folsom Dam and Reservoir. Final Environmental Impact Report/Final Environmental Assessment.

44 SWRI, *Draft American River Basin Cumulative Impact Report*, August 2001, p.4-77, included as Appendix D to *PCWA American River Pump Station Project Draft EIS/EIR* (SCH #1999062089), August 2001.

45 El Dorado County Planning Department, *El Dorado County General Plan, Volume II, Background Information*, January 23, 1996. p.V.5-22. Water Forum, (2004) "Draft Policy Document" Lower American River Flow Management Standard, February 2004.

Reclamation Project Act (1939)	Provided for the repayment of the construction charges and authorized the sale of CVP water to municipalities and other public corporations and agencies.
Water Service Contracts (1944)	Provided for the delivery of specific quantities of irrigation, municipal, and industrial water to contractors.
Flood Control Act (1944)	Authorized flood control operations for Shasta, Folsom, and New Melones dams.
Water Rights Settlement Contracts (1950)	Provided diverters holding riparian and senior appropriate rights on the Sacramento and American rivers with CVP water to supplement water that historically would have been diverted from natural flows.
Trinity River Act (1955)	Provided that the operation of the Trinity River Division be integrated and coordinated with operation of other CVP features to allow for the preservation and propagation of fish and wildlife.
Fish and Wildlife Coordination Act (1958)	Provided for integration of fish and wildlife conservation programs under federal water resources developments. Authorized the Secretary of the Interior to include facilities to mitigate CVP-induced damages to fish and wildlife resources.
Reclamation Project Act (1963)	Provided a right of renewal of long-term contracts for municipal and industrial contractors.
SWRCB Decision 1379 (1971)	Established Delta water quality standards to be met by both the CVP and SWP.
Endangered Species Act (1973)	Provided protection for animal and plant species that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened).
SWRCB Decision 1485 (1978)	Ordered CVP and SWP to guarantee certain conditions for water quality protection for agricultural, municipal and industrial, and fish and wildlife use.
Secretarial Decision on Trinity River Release (1981)	Allocated CVP yield so that releases can be maintained at 340,000 AF in normal water years, 220,000 AF in dry years, and 140,000 AF in critically dry years.
Amended (1991)	Released a minimum of 340,000 AF for each dry or wetter water year. During each critically dry water year, 340,000 AF will be released if at all possible.
Corps of Engineers Flood Control	Prescribed regulations for flood control. Manuals for: Shasta (1977), Folsom (1959), New Melones (1982).
Corps of Engineers Flood Control	Outlined descriptions and data on flood potential/ratings. Diagrams for: Shasta (1977), Folsom (1986), New Melones (1982).

Long-Term Central Valley Project Operations and Criteria and Plan (CVP-OCAP)

In 1991, Reclamation requested formal consultation pursuant to Section 7 of the federal Endangered Species Act with both the U.S. Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), now NOAA Fisheries, regarding the effects of long-term CVP operations on the bald eagle in Shasta and Trinity reservoirs and on the winter-run Chinook salmon in the Sacramento River, respectively. At the time, the long-term operating criteria and procedures for the Trinity, Shasta, and Delta divisions of the CVP and the Red Bluff Diversion Dam (under the Sacramento River Division) were in question. As a result of this consultation, a development plan was prepared by Reclamation covering the long-term operation of the CVP under a range of potential hydrologic and reservoir storage conditions. Following the issuance by NMFS of a Biological Opinion (BiOp) on the 1992 operations on February 14, 1992, this development plan became known as the Long-Term Central Valley Project Operations and Criteria and Plan; CVP-OCAP (dated October 1992). For further background on the operations of the CVP, see the Long-Term Central Valley Project Operations and Criteria and Plan; CVP-OCAP (dated October 1992).

The most recent CVP-OCAP was completed in 2004. Since then, the BiOps prepared in support of the document have come under challenge from various intervenors, including, but not limited to the Natural Resources Defense Council (NRDC), Pacific Coast Federation of Fisherman's Associations/Institute for Fisheries Resources, and the Baykeeper (Delta Keeper Chapter). The challenges related to the findings of the BiOps regarding the federally threatened Delta smelt (*Hypomesus transpacificus*), various runs of Chinook salmon (*Onchorhynchus tshawytscha*), steelhead (*Onchorhynchus mykiss*), green sturgeon (*Acipenser medirostris*) and their designated critical habitats. A detailed discussion of the consultations with USFWS and NOAA Fisheries is provided in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

While these consultations are ongoing, Reclamation is continuing to operate the CVP consistent with the provisions of the 2004 CVP-OCAP as conditioned by Judge Wanger's interim rulings. At this time, with the completion of the revised final Biological Assessment in October, 2008, along with NOAA Fisheries' preliminary draft BiOp on December 11, 2008 and the USFWS BiOp on December 15, 2008, Reclamation is reviewing the USFWS BiOp and the preliminary draft BiOp from NOAA Fisheries to determine if they can be implemented in a manner that is consistent with the intended purpose of the OCAP, is within Reclamation's legal authority and jurisdiction, and is economically and technologically feasible. NOAA Fisheries' final BiOp, including its final Reasonable and Prudent Alternatives (RPAs), Incidental Take Statement, and associated terms and conditions is expected sometime in June 2009.

Central Valley Project Improvement Act (CVPIA)

The Central Valley Project Improvement Act (Public Law 102-575, Title XXXIV, 1992) (CVPIA) reauthorized the CVP for a wider range of beneficial uses and interests than originally mandated. In relevant part, the CVPIA established that fish and wildlife are to be recognized as project purposes equal to that of irrigation, power generation, and municipal and industrial use. The CVPIA was intended to authorize water transfers outside of the CVP service area; implement an anadromous fish restoration program (AFRP); create a restoration fund financed by water and power users; provide for a Shasta Temperature Control Device (TCD); implement fish passage measures at the Red Bluff Diversion Dam; plan for increased CVP yield; mandate firm water supplies for Central Valley wildlife refuges; and meet federal trust responsibilities for the protection of fishery resources (Trinity River). A significant measure of the CVPIA was the dedication of 800,000 acre-feet annually for fish, wildlife and habitat restoration (see Section 3406(b)(2) below).

Currently, the CVPIA is being implemented on a broad front. The Final Programmatic Environmental Impact Statement (PEIS) evaluates projected conditions to the year 2022 (30 years from the CVPIA's adoption in 1992). The Final PEIS was released in October 1999, and the CVPIA ROD was signed on January 9, 2001.

Section 3406 (b)(2) under the CVPIA

As noted above, under the CVPIA, significant quantities (800,000 acre-feet annually) of CVP yield are reallocated to meet other new beneficial uses. This is the major provision under CVPIA Section 3406[b][2] whose annual allocation has come to be known as "b2" water. The allocation of 800,000 AF per year for this purpose was intended to address the anticipated and recurring impacts of CVP operations on fish and wildlife resources within CVP waterways.

The CALFED Environmental Water Account (EWA)

The Environmental Water Account (EWA) under the CALFED Program is a comprehensive effort to restore the ecological health of the Delta ecosystem consistent with the Ecosystem Restoration Program (ERP). It is intended to provide environmentally beneficial changes in CVP/SWP operations at no uncompensated water cost to the water users. By acquiring alternative sources of CVP/SWP water (or "project" water) supply, called "EWA assets", streamflows and Delta outflows could be augmented, exports modified to meet fishery needs, and regular project water that was interrupted by changes to project operations could be replaced. The EWA was designed so that replacement water would be able to compensate for reductions in deliveries, relative to existing facilities, project operations, and the regulatory baseline.

Long-Term CVP Contract Renewals

Reclamation has and continues to review and evaluate each CVP water service contract (M&I and Agricultural) as part of the long-term renewal terms of each contract. CVP Agricultural contracts are typically renewed for up to 25 years while M&I contracts are typically renewed for up to 40 years. Contract renewals are negotiated under the provisions of the CVPIA. Many CVP water service contracts are currently up for renewal or will be in the immediate future. These renewals represent a comprehensive effort on the part of Reclamation which is coordinating with USFWS and NOAA Fisheries through the latter's obligations under Section 7 of the federal Endangered Species Act (ESA). Groupings of contracts and contractors by CVP division are being addressed in the negotiation process for organizational purposes. A total of 109 CVP contracts contained across 12 units of the CVP are being addressed. Currently, completed NEPA and ESA processes exist for the Cross Valley Canal Unit and the Friant Unit (not including the City of Fresno).

Coordinated Operations Agreement

Both the CVP and SWP rely on the Sacramento River and the Delta as common conveyance facilities. Reservoir releases and Delta exports must be coordinated so that both the CVP and SWP are able to retain their portion of the shared water and also jointly share in the obligations to protect beneficial uses. A Coordinated Operations Agreement (COA) between the CVP and SWP was developed and became effective in November 1986 as signed by Reclamation and the California Department of Water Resources.

The COA defines the rights and responsibilities of the CVP and SWP regarding water needs of the Sacramento River system and Delta and includes obligations for in-basin uses, accounting, and real-time coordination of water obligations of the two projects. A CVP/SWP apportionment of 75/25 is implemented to meet in-basin needs under balanced Delta conditions, and the projects are using storage withdrawals to meet the in-basin demands. When unstored flow is available to export under balanced conditions, the apportionment is a 55/45 ratio. There is no apportionment needed when the Delta is under excess flow conditions. The COA contains considerable flexibility in the manner with which Delta conditions in the form of flow standards, water quality standards, and export restrictions are met.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCB) regulate water resources in California. The SWRCB protects water quality and determines rights to surface water use. Specifically, the SWRCB appropriates surface water, oversees disputes over rights to water bodies, establishes surface and groundwater quality standards, and oversees the RWQCBs, which implement water quality standards and regulations, which are described in greater detail below.

Decision 893 and Decision 1400

Minimum fishery releases to the lower American River from Nimbus Dam are made in accordance with the SWRCB water rights Decision No. 893 (D-893). The SWRCB increased the D-893 minimum release schedule in their Decision 1400 (D-1400). This decision was applied to the water rights permit for Auburn Dam and does not apply to the operation of Folsom and Nimbus dams at this time. However, Reclamation voluntarily operates Folsom and Nimbus dams to meet a “modified D-1400” for minimum fishery flows, and more recently has been striving to meet the recommended AFRP flows for the lower American River.

In 1996, Reclamation established the Lower AROG which includes the following regular participants (Reclamation, U.S. Fish & Wildlife Service, NOAA Fisheries, California Department of Fish & Game, Sacramento Area Flood Control Agency, City of Sacramento, County of Sacramento, Western Area Power Administration, the Water Forum, and Save the American River Association). The AROG generally convenes monthly, or more frequently, with the purpose of providing input to Reclamation regarding the management of Folsom Reservoir for fish resources within the context of water availability and other beneficial uses.

Typically, the AROG plans and develops projected flow release schedules for Folsom Dam based on information received from Reclamation (e.g., flows in the river, reservoir storage, water temperatures, and projected outflows). It provides not only input for reservoir releases but also into the management of the reservoir’s coldwater pool. For example, the AROG regularly provides input regarding how best to configure the shutters on the power penstocks at Folsom Dam. It should be noted that although the AROG has been voluntarily implementing these types of adaptive management procedures since 1996, its recommendations are only advisory and the group has no authority to oversee Folsom and Nimbus dam releases. Yet, Reclamation has managed both

Folsom and Nimbus dam releases according to AROG recommendations to the fullest extent possible, given its existing other obligations.

Sacramento Area - Water Forum Agreement

In early 2000, numerous water interests in the greater Sacramento region ratified a basin-wide agreement, known as the Water Forum Agreement. This long-term agreement was based on two co-equal objectives: providing a reliable and safe water supply for the region's economic health and planned development to the year 2030; and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River. Ratified through a Memorandum of Understanding, the Water Forum Agreement has the commitment of local water purveyors, business and citizen organizations, environmental groups, and local, State, and federal governments. Of the seven elements that make up the Water Forum Agreement, acknowledged increases in future surface water diversions, commitments to reduce diversion impacts in drier years (dry-year cutbacks), water conservation (demand reduction), and the commitment to implement a new improved flow pattern for the lower American River will all have significant influence on water allocation and management of the lower American River (including Folsom Reservoir) in the future.

The reader is referred to the Sacramento City – County Office of Metropolitan Water Planning's 1995 Water Forum Proposal and its associated environmental documentation (SCH# 95082041) for a full description of the seven major elements including, the specific purveyor-specific agreements (each containing dry-year wedge restrictions on diversions from Folsom Reservoir and the lower American River). While participating in the Water Forum process, neither the El Dorado County Water Agency, nor its members (e.g., EID and GDPUD) hold purveyor-specific agreements under the Water Forum Agreement. Accordingly, they are not bound by the voluntary diversion provisions contained in those agreements that apply to other signatories. Additionally, Reclamation, while participating in the Water Forum Agreement process, is not a signatory to the agreement.

Lower American River – Flow Management Standard (FMS)

As part of the Water Forum Agreement, a new improved flow pattern for the lower American River was one of the seven key elements. The primary purpose of the proposed FMS is to maximize the annual production and survival of the anadromous fall-run Chinook salmon and steelhead in the lower American River, within water availability constraints and in consideration of Reclamation's obligation to provide for multi-purpose, beneficial uses of the project. With improved habitat conditions for salmonids, the proposed FMS is also expected to benefit other fish species within the river. A more detailed description of the various provisions of the flow standard is provided in Subchapter 4.6.4, Regulatory Framework, for Fisheries and Aquatic Resources.

While EDCWA, EID, and GDPUD support the FMS and, in the case of EDCWA, are active participants in the Water Forum Successor Effort planning process, which includes the FMS development, Reclamation has not supported the specific FMS as currently defined. Reclamation supports the benefits of an improved flow regime for the lower American River but, at this time, owing to the uncertainty associated with the CVP-OCAP, has not committed to the details of the FMS.

4.3. HYDROPOWER (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing hydropower infrastructure and operations of the CVP and includes discussion of the hydropower operations at Folsom Reservoir which, because of its uniquely based multi-purpose infrastructure, possesses important implications to hydropower generation as well as water supply and environmental considerations, namely, coldwater pool management and downstream thermal benefits. The proposed new CVP water service contract has the potential to affect CVP hydropower generation and capacity as well as pumping power at Folsom Reservoir.

4.3.1. Affected Environment/Setting

Hydropower generation in California consists of the coordinated operations of the CVP and its integration with the Northern California Power System and the operations of the Western Area Power Administration (WAPA).

4.3.2. Central Valley Project (CVP) Hydropower System

The CVP hydropower system consists of eleven power plants, 38 generators, two of which are pump-generating plants (Table 4.3-1). This system is fully integrated into the Northern California Power System and provides a significant portion of the hydropower available for use in northern and central California. The installed power capacity of the system is 2,078,750 kilowatts (kW), or approximately 7,079 megawatts (MW). By comparison, the combined capacity of the 368 operational hydropower plants in California is 12,866 MW; the Pacific Gas and Electric Company (PG&E), the area's major power supplier, has a generating capacity from all sources of over 20,000 MW. The CVP also includes approximately 860 miles of high-voltage transmission lines needed to deliver CVP power.

Once a strong influence on CVP operations, power operations are now secondary to other considerations. In part, this subordination is caused by the elevation of environmental needs to a higher standing, but changes in contractual relationships have also reduced the priority of power generation. Prior to 1977, Reclamation marketed and transmitted power from the CVP; however, under the Department of Energy Organization Act of 1977, WAPA now markets and conveys electrical power throughout the 15 western states.

Power produced by the CVP hydropower system is used first for meeting the authorized needs of the CVP including irrigation and M&I pumping (i.e., project pumping loads), fish and wildlife requirements and station service. Approximately 25 to 30 percent of the CVP total power generation is used to support these “Project Use” needs. CVP pumping facilities are listed in Table 4.3-2. Power surplus to project use is “commercial power” and is marketed by the WAPA to its “Preference Power Customers” under long-term firm contracts to municipal and government entities (preference customers) at cost-based rates. Preference Power Customers can include federal agencies, military bases, municipalities, public utilities districts, irrigation and water districts, State agencies, rural electric cooperatives, and public transportation districts (Reclamation, 2004).

TABLE 4.3-1

POWER RESOURCES OF THE CENTRAL VALLEY PROJECT

Unit	Maximum Generating Capacity (kW)
Northern California Area Office	
Carr [a]	154,000
Keswick	105,000
Lewiston	350
Shasta [b]	676,000
Spring Creek	180,000
Trinity	140,000
Subtotal	**1,255,350**
Central California Area Office	
New Melones	383,000
Folsom	207,000
Nimbus	17,000
Subtotal	607,000
Southern California Area Office	
O'Neill [c]	14,400
San Luis [c,d]	202,000
Subtotal	**216,400**
TOTAL	**2,078,750**

Notes:
a. Limited by tunnel restrictions.
b. With rewinds as of summer 2000.
c. Pump-generating plant.
d. Operated by DWR for Reclamation; eight 53,000 kW units for a total installed capacity of 424,000 kW, of which Reclamation's share is 202,000 kW.

Source: U.S. Bureau of Reclamation, Office of Public Affairs. August 2006. Central Valley Project Hydropower Production Progress Report.

TABLE 4.3-2

MAJOR PUMPING PLANTS IN THE CVP

Unit	Capacity (cfs)	Average Annual Energy Use (kWh)
American River Service Area		
Folsom Pumping Plant	350	1,041,000
Delta Export and San Joaquin Valley		
Contra Costa Canal	410	18,908,000
Dos Amigos[1]	13,200	180,146,000[2]
O'Neill	4,200	87,185,000
San Luis[1]	11,000	306,225,000 2
Tracy	4,600	620,712,000

Notes:
1. Joint State-Federal facility.
2. Federal energy use.

Source: U.S. Army Corps of Engineers, 1992.

In addition to providing peaking generation to the central and northern California power system, the CVP supplies many secondary benefits to the power system including VAR (magnetic or inductive power) support, regulation, spinning reserves, and black-start capabilities.

In an average year, 4,600 gigawatt hours (GWh) of energy and 1,700,000 kW of capacity are marketed to preference customers at rates that recover full cost of production and repayment obligations of project investment with interest.[46]

4.3.3. History of Central Valley Project Power Allocations

Power was first generated in the CVP at the Shasta Powerplant in 1944. Formal allocations of 450 MW of CVP power were first made in 1952. In 1964, with the addition of the Trinity River Division facilities, allocations to preference customers were increased to 925 MW. In 1967, under terms of Contract 2948A, power imports over the Pacific Intertie (Northwest imports) were incorporated along with provisions for load level increases up to 985 MW in 1975 and up to 1,050 MW in 1980. Later in 1980, the load level was increased by 102 MW to 1,152 MW (the required PG&E support level for capacity usage by CVP preference customer loads).

This increase in allocations was accomplished under the 1981 Power Marketing Plan (47 FR 4139) dated January 28, 1982. New customers received 26 MW of non-withdrawable power and 42 MW of withdrawable power for a total of 68 MW, with 4 MW of withdrawable power left unallocated. Also, diversity power allocations of 30 MW were made to those customers who could shed load during Sierra Nevada Region's system simultaneous peak. During the same time period, SMUD challenged WAPA's right to meld the costs of Northwest imports into CVP power rates charged to SMUD. In a 1983 settlement, it was agreed that SMUD would pay the melded CVP power rates; SMUD's electric service contract at the time due to expire in 1994, would be extended to 2004; and SMUD would have the right to purchase 100 MW of peaking capacity through 2004. Further, SMUD would have the right to purchase a portion of the power to be marketed from 2005 to 2014.

Under the 1994 Power Marketing Plan (57 FR 45782 and 58 FR 34579) dated October 5, 1992 and June 28, 1993, respectively, existing customers with contracts expiring in 1994 were allocated 501 MW, and approximately 8 MW was allocated to new customers.

In addition to the power marketed in the 1994 Power Marketing Plan, total power under existing contracts includes approximately 910 MW of long-term firm power, 100 MW of peaking capacity, and 60 MW of withdrawable power, for a total of about 1,580 MW. On November 30, 1993, the National Defense Authorization Act (NDA Act) was signed into law. This act provides that, for a 10-year period, the CVP electric power allocations to military installations in the State of California, which have been closed or approved for closure shall be reserved for sale through long-term contracts to preference entities which agree to use such power to promote economic development at the military installations closed or approved for closure. On December 1, 1994, WAPA published the final NDA Act procedures developed to fulfill the requirements of section 2929 of the NDA Act (59 FR 61604). To date, about 42 MW of long-term firm power and about 9 MW of withdrawable power under contract to military installations being closed has been converted to NDA Act power.

46 Placer County Water Agency, PCWA American River Pump Station Project Final EIS/EIR, June 2002, pp.3-292 to 3-294.

4.3.4. Folsom Dam and Reservoir

The Folsom Power Plant is located at the foot of Folsom Dam on the right abutment. Three 15-foot diameter steel penstocks are embedded in the concrete section of the dam and deliver water to the turbines. The centerline of each penstock to the turbines is at elevation 307 feet (msl) and the minimum power pool elevation is at 328.5 feet (msl). A reinforced concrete trashrack structure with steel trashracks protects each penstock intake.

The steel trashracks, located in five bays around each intake, extend the full height of the trashrack structure (between 281 and 428 feet). Forty-five 13-foot steel shutter panels (nine per bay) and operated by a gantry crane, were installed in steel guides to select the level of water withdrawal from the reservoir. The shutter panels are attached to one another in a “ganging” configuration starting with the top shutter in groups of 3-2-4.

Reclamation has the ability to preferentially access various levels of the reservoir at these three hydropower penstock intake shutters. These were originally designed in a 1-1-7 configuration; where the top shutter could be opened independent of the others, as could the second shutter, while the remaining 7 shutters could only be opened as one unit. Reconfigured in 1994 under a 3-2-4 ganging configuration, these shutters now provide greater control over the depth of intake, and thus, the temperature of the water being released from the dam. Reclamation also has the ability to “blend” water between the three hydropower penstock intakes, adding yet more operational flexibility towards optimizing coldwater pool management and resultant downstream temperatures.

The three power generating units have a total release capacity of approximately 8,600 cfs. By design, the facility is operated as a peaking facility. Peaking plants schedule the daily water release volume during the peak electrical demand hours to maximize generation at the time of greatest need. At other hours during the day there may be little or no release (and no generation) from the plant.

To avoid fluctuations in flow in the lower American River, Nimbus Dam is operated as a regulating facility. While the water surface elevation in Lake Natoma fluctuates, releases to the lower American River are kept constant. The Nimbus Power Plant consists of two generating units with a release capacity of approximately 5,100 cfs. Electric generation from this facility is continuous throughout the day.

4.3.5. Western Area Power Administration (WAPA)

WAPA is the marketing agency for power generated at Reclamation facilities in the American River Basin. As noted previously, WAPA, created in 1977 under the Department of Energy (DOE) Organization Act, markets and transmits electric power throughout 15 western states. WAPA's Sierra Nevada Customer Service Region (Sierra Nevada Region) markets approximately 1,480 MW of power from the CVP and other sources.

WAPA's mission is to sell and deliver electricity that is in excess of Project Use (power required for project operations), which, for the Sierra Nevada Region, includes CVP powerplants. WAPA's power marketing responsibility includes managing the federal transmission system and, as a federal agency, ensuring that operations of the hydropower facilities are consistent with its regulatory responsibilities. Specifically, WAPA's capacity and energy sales must be in conformance with the laws that govern its sale of electrical power. As noted previously, the hydroelectric generation facilities of the CVP are operated by Reclamation. Reclamation manages and releases water in accordance with the various acts authorizing specific projects and in accordance with other laws and enabling legislation. Hydropower operations at each facility must comply with minimum and maximum flows and other constraints set by FERC, Reclamation, USFWS, or other regulatory agencies, acting in accordance with law or policy. FERC regulations apply only to non-federal facilities and, as such do not apply to Folsom Dam and Reservoir. However, the case of *California v. FERC* in 1990 established that requirements of the Federal Energy Regulatory Commission can supersede State regulations relating to minimum stream flows. Most recently, long-term contracts for the sale of Sierra Nevada Region power resources expired December 31, 2004. WAPA developed a marketing plan that defines the products to be offered and the eligibility and allocation criteria for CVP electric power resources beyond the year 2004, and a number of long-term contracts were re-established in 2005.

4.3.6. Regulatory Framework

In 1906, Reclamation Law was amended to include power as a purpose of the projects if power was necessary for operation of the irrigation water supply facilities, or if power could be developed economically in conjunction with the water supply projects. The Act of 1906 allowed for lease of surplus power. Surplus power was described as power that exceeds the capacity and energy required to operation the Reclamation facilities (Project Use load). The Act of 1906 stipulated that surplus power would be leased with preference for municipal purposes.

Power supply was first authorized as a purpose for some CVP facilities in the Rivers and Harbors Act of 1937, which included authorization of initial CVP facilities. The Act of 1937 defined the priorities for the purposes of the CVP as: 1) navigation and flood control, 2) irrigation and M&I water supplies, and 3) power supply.

The Reclamation Act of 1939 modified Reclamation Law for all Reclamation facilities including the CVP. This Act reconfirmed the preference clause, and included the policy that the federal government would market power to serve the public interest rather than to obtain a profit. The Trinity River Act of 1955 authorized construction of the Trinity River Division (TRD) and allocated up to 25 percent of the energy resulting from the TRD to Trinity County. The Rivers and Harbors Act of 1962 authorized the New Melones Project and authorized up to 25 percent of the energy resulting from that project to Calaveras and Tuolumne counties. Customers receiving energy under these authorizations are referred to as “First Preference” customers.

As noted previously, the CVPIA in 1992 modified further the authorizations of the CVP, making fish and wildlife mitigation a higher priority than power, and power and fish and wildlife enhancement, equal priorities.

4.4. FLOOD CONTROL (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing flood control facilities and operations within the regional and local study areas, and sets the context for an analysis of the potential diversion-related effects of the new CVP water service contracts on these flood control elements.

4.4.1. Affected Environment/Setting

Flood-producing runoff in the American River basin occurs primarily during the October through April period and is usually most extreme between November and March. Snowmelt runoff by itself usually does not result in flood-producing flows, but it is usually adequate to refill the reservoirs in the basin. Approximately 40 percent of the American River flow results from snowmelt.[47] The primary flood-causing events are rain-on-snow events, where warm Pacific storms result in a large amount of precipitation in the form of rain, even in the higher elevations that generally receive snow, prompting rapid melting of the existing snowpack.

Flood control throughout the region is set out by a comprehensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels provided by the Sacramento River Flood Control Project (SRFCP) and the American River Flood Control Project (ARFCP).[48] Folsom Dam and Reservoir provide additional flood protection for the greater Sacramento metropolitan area. Each of these is discussed in more detail below.

On a regional level, flood control is a major function of the CVP. Along with the other CVP reservoirs providing flood control protection, both Shasta and Folsom reservoirs represent important elements of CVP-coordinated operations with respect to flood control. CVP operational priorities do change between seasons, and flood control is the top priority from November to April. During this period, reservoir releases are controlled by the need to create and maintain reservoir empty space for flood control storage.

4.4.2. Folsom Dam and Reservoir

On the local level, flood control is provided by Folsom Dam. Folsom Dam and Reservoir is a unit of the CVP and is the main flood control project in the American River basin. It provides critical flood protection for the approximately 350,000 residents and over $30 billion worth of damageable property currently occupying the floodplain in the Sacramento metropolitan area. Nimbus Dam and Lake Natoma lie immediately downstream of Folsom Dam, but the dam is operated to re-regulate flows released by Folsom Dam rather than for independent flood-control purposes.

Flood control requirements and regulating criteria are specified by the U.S. Army Corps of Engineers (Corps) and described in the Folsom Dam and Lake, American River, California Water Control Manual (Corps, 1987). Flood control objectives for Folsom Reservoir require that the dam and reservoir are operated to:

47 Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Final Environmental Impact Report. U.S. Bureau of Reclamation. November 1998. p. 4-3.
48 Corps et al. 1996.

- Protect the City of Sacramento and other areas within the lower American River floodplain against reasonable probable rain floods;
- Control flows in the American River downstream of Folsom Dam to existing channel capacities, insofar as practicable, and to reduce flooding along the lower Sacramento River and in the Delta in conjunction with other CVP projects;
- Provide the maximum amount of water conservation storage without impairing the flood control functions of the reservoir; and
- Provide the maximum amount of power practicable and be consistent with required flood control operations and the conservation functions of the reservoir.

From June 1 through September 30, no flood control storage restrictions exist for Folsom Reservoir. From October 1 through November 16 and from April 20 through May 31, reserving storage space for flood control is a function of the date only, with full flood reservation space required between November 17 and February 7. Beginning on February 8 and continuing through April 20, flood reservation space is a function of both date and current hydrologic year conditions (e.g., snowpack water equivalent).

If inflow into Folsom Reservoir causes the storage to encroach into the space reserved for flood control, releases from Nimbus Dam are increased. Flood control regulations prescribe the following releases when water is stored within the flood control reservation space:

- Maximum release (after the storage entered into the flood control reservation space) of as much as 115,000 cfs but not less than 20,000 cfs when inflows are increasing;
- Releases will not be increased more than 15,000 cfs or decreased more than 10,000 cfs during a 2-hour period, and
- Flood control requirements override other operational considerations in the fall and winter periods. Consequently, changes in river releases of short duration may occur.

Since 1996, Reclamation has operated according to modified flood control criteria, which reserve 400,000 to 670,000 acre-feet of flood control space in Folsom Reservoir and a combination of upstream reservoirs. The flood control plan, which provides additional protection for the lower American River, is implemented through an agreement between Reclamation and the Sacramento Air Flood Control Agency (SAFCA). The terms of the agreement allow some reservoir empty space in Hell Hole, Union Valley, and French Meadows to be treated as if it were available in Folsom Reservoir. The SAFCA release criteria are generally the same as the Corps plan, except the SAFCA diagram may prescribe flood releases earlier than the Corps plan. The SAFCA plan also relies on Folsom Dam outlet capacity to make the earlier flood releases. The outlet capacity of Folsom Dam is limited up to 32,000 cfs based on water surface elevations.

4.4.3. Upper American River Basin

Approximately 820,000 acre-feet of storage capacity exists in American River basin reservoirs upstream from Folsom Reservoir. These facilities have at times proved beneficial in attenuating inflow to Folsom Reservoir, and under current operations, the three largest upstream reservoirs (French Meadows, Hell Hole, and Union Valley) provide as much as 200,000 acre-feet of usable flood storage capacity.

As noted previously, downstream of Nimbus Dam to around River Bend Park, the American River is mostly unrestricted by levees, but is bordered on both the north and south by suburban development. Natural bluffs and terraces in this reach of the river also provide natural morphological controls. From the River Bend Park area to the confluence with the Sacramento River, the lower American River is less constrained by natural features, and has been instead confined by levees, resulting in a slower moving, deeper reach with less meandering.[49]

This reach of the river is also constrained by the American River Flood Control Project (ARFCP). The project, constructed by the Corps in 1958 and operated/maintained by the State of California, consists of a levee extending along the north side of the American River beginning near Carmichael and extending approximately seven miles downstream to a previously-existing levee near the Interstate Business 80 crossing. Two pumping plants located in low areas landside of the levee discharge storm drainage into the lower American River. The presence of this levee permits Folsom Reservoir to operate to its maximum design release of 115,000 cfs (Corps et al. 1996).

4.4.4. Recent Sacramento-Area Floodplain History

After the 1986 flood, the Corps initiated a comprehensive evaluation of the entire Sacramento River and American River flood control systems. Conclusions from the Corps' evaluation downgraded flood protection for the residents and businesses occupying low-lying areas of the Sacramento area to a 63-year level of flood protection, rather than the 120-year level levees were thought to have provided. FEMA reassessed the Sacramento area’s 100-year floodplain and issued new Flood Insurance Rate Maps (FIRMs), placing about 110,000 additional acres in the revised 100-year floodplain.[50]

In order to address the deficiencies of the flood control systems, the Corps recommended separation of the Sacramento and American river problems, clearing the way for the Sacramento Urban Levee Reconstruction Project to repair structurally deficient levees along the Sacramento River, and the American River Watershed Investigation to evaluate the alternatives available to increase the capacity of the American River flood control system and the levees around Natomas. The State of

49 Reclamation and SAFCA. 1994.

50 These revised insurance maps became effective in November 1989. U.S. Bureau of Reclamation and Sacramento Area Flood Control Agency, *Interim Reoperation of Folsom Dam and Reservoir: Volume I, Final Environmental Impact Report/Final Environmental Impact Assessment*, 1994b.

California, through DWR and the State Reclamation Board, joined these efforts as the non-federal sponsor.[51]

After the floods of 1997, the Corps once again reevaluated the flood control system on the American and Sacramento Rivers; it determined that the 100-year flood event was much larger than previously predicted. The new evaluation revealed that releases from Folsom Dam would reach 175,000 cfs, which significantly exceeds the design capacity of the American River levee system. FEMA issued revised FIRMs in 1998, which delineate the boundary of the revised 100-year floodplain. The new maps delineate areas classified Zone AR, a designation indicating "an area of special flood hazard that results from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide a 100-year or greater level of flood protection." The AR classification is temporary and will expire 10 years from the date of classification or when certification of the 100-year flood protection is obtained.

4.4.5. Folsom Dam Safety and Flood Damage Reduction Spillway Addition

In response to the new estimate of the 100-year flood event, Reclamation has proposed the alteration of Folsom Dam to include an auxiliary spillway, capable of spilling 180,000 cfs in case of a massive flood event. In December 2006, Reclamation released a Draft EIS/EIR for the Folsom Dam Safety and Flood Damage reduction project. The Final EIS/EIR was released in 2007. The proposed action is solely intended to avoid catastrophic failure of the Folsom Dam. The document was finalized and early construction work has commenced on the spillway. The revised water control manual and Folsom Reservoir Flood diagram and downstream levee improvements necessary to contain the maximum spillway flows are yet to be completed. These actions are primarily the responsibility of the Army Corps of Engineers, and their development is anticipated to commence in 2008.

4.4.6. Regulatory Framework

There are numerous agencies that regulate flood control in the greater Sacramento area. At the federal level, the Corps is involved in planning, studying, and constructing regional federally funded flood control projects. The Federal Emergency Management Agency (FEMA) is responsible for administering the National Flood Insurance Program. State agencies responsible for implementing flood control measures include the State Department of Water Resources (DWR) and the State Reclamation Board. The Corps and the State Reclamation Board are the primary agencies responsible for flood control facilities along the Sacramento River, while flood control along the American River is maintained by the State of California.

The Corps is responsible for providing the flood control regulations (operating criteria/flood control diagrams) and has ultimate authority for approval of flood control operations. Reclamation operates Folsom Dam and Reservoir for flood control within the operational parameters set by the Corps. The

51 U.S. Bureau of Reclamation and Sacramento Area Flood Control Agency, *Interim Reoperation of Folsom Dam and Reservoir: Volume I, Final Environmental Impact Report/Final Environmental Impact Assessment*, 1994b.

flood control operation principles for Folsom Dam and Reservoir, however, are mutually agreed upon by Reclamation and the Corps.

4.5. WATER QUALITY (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing water quality conditions within the regional and local study areas, and presents the context under which an analysis of potential effects on water quality due to implementation of the Proposed Action or alternatives can be made.

4.5.1. Affected Environment/Setting

The following text provides a description of regional and local water quality setting, to provide a basis for assessing the potential impacts that the Proposed Action and Alternatives could have on the environment.

4.5.2. Sacramento River

The Sacramento River system drains a 26,146 square mile basin that extends from the Southern Cascade Range, through the Sierra Nevada to the Coast Ranges. The RWQCB has defined the following existing and potential future beneficial uses for the Sacramento River:

- municipal and domestic water supply;
- industrial service and industrial process supply;
- irrigation and stock watering;
- hydropower generation;
- groundwater recharge;
- contact recreation, non-contact recreation, and canoeing/rafting;
- warm and cold freshwater habitat, warm and cold freshwater migration and spawning habitat, wildlife habitat; and
- navigation

Several of these beneficial uses (i.e., municipal, industrial and agricultural supply, recreation, groundwater recharge, and fish and wildlife habitat) depend, in part, on maintaining existing water quality. A discussion of each of these beneficial uses is provided below because of their relevance to the discussion of impacts that follow in the subsequent chapters.

Municipal, Industrial, and Agricultural Uses

Water is diverted from the Sacramento River for use in municipal systems. Industrial uses of water diverted from the river include mining, plant cooling, hydraulic conveyance, gravel washing, fire protection, and oil well re-pressurization. In addition, extensive use is made of Sacramento River waters for agricultural purposes. These uses include irrigation of crops, orchards, and pastures; stock watering; support of vegetation for range grazing; and ranching- and farming-support operations.

Recreation

Recreational uses of the Sacramento River include swimming, sport fishing, rafting, boating/canoeing and related activities that involve direct water contact and the possibility of limited water ingestion. Non-contact recreational uses include picnicking, hiking, camping, hunting, education, and various other forms of aesthetic enjoyment.

Groundwater Recharge

Sacramento River flows serve to recharge the groundwater aquifer within the broader project study area. Groundwater recharge helps to maintain soil column salt balance, to prevent salt-water intrusion into freshwater aquifers, and provides a replenishing supply for future groundwater extraction to support municipal, industrial, and agricultural uses.

In addition to natural groundwater recharge, Sacramento River water from downstream of the confluence with the American River may be used in the near future for Aquifer Storage and Recovery (ASR) projects. These artificial recharge projects can use either percolation ponds or injection wells to replenish groundwater by temporarily storing, or banking, water in the aquifer for withdrawal later. ASR projects may be used to store surface water for *in-lieu* use during dry periods, when using groundwater is preferable to diversion of surface water.

Maintenance of Fish and Wildlife Habitat

The Sacramento River provides important aquatic habitats that support a wide variety of aquatic and terrestrial wildlife populations. These habitats provide migration, spawning, and rearing areas for anadromous and other migratory fish species, as well as resident fishes. In general, the anadromous salmonid species using the river (i.e., steelhead and Chinook salmon) have the most restrictive water quality requirements. The water quality parameter most likely to adversely affect anadromous salmonids annually is water temperature.

Existing Water Quality

Sacramento River water quality monitoring studies indicate that the river's water is generally of high quality.[52] Sacramento River water quality is primarily affected by land use practices within the watershed and associated urban runoff, stormwater discharges, agricultural runoff, effluent discharge from wastewater treatment plants, and acid mine drainage. The lower Sacramento River receives urban runoff, either directly or indirectly (through tributary inflow), from the cities of Sacramento, Roseville, Folsom, and their surrounding communities.[53] The Natomas East Main Drainage Canal discharges to the Sacramento River immediately upstream of the confluence with the American River. This canal transfers both agricultural discharges and urban runoff into the Sacramento River.

52 Larry Walker Associates, 1991, 1996; Brown and Caldwell et al., 1995; Larry Walker and Associates and Brown and Caldwell, *Sacramento Coordinated Water Quality Monitoring Program 1994 Annual Report*, 1995.

53 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.

Past monitoring studies have occasionally shown certain priority pollutants (e.g., trace metals, pesticides) to be at concentrations above State water quality objectives in portions of the Sacramento River.[54] Despite the seasonal variability of many constituents, a recent study revealed that monitored water quality parameters in the vicinity of Freeport (immediately upstream of the SRWWTP's point of discharge) typically met water quality objectives specified in the former Inland Surface Waters Plan (described below), except for some metals.[55] The principal source of trace metal loading to the Sacramento River is believed to be the Iron Mountain Mine complex, which discharges to the upper Sacramento River via Spring Creek and Keswick Reservoir. The complex is thought to contribute approximately one-half of the metals loadings attributable to mine drainage.

Ongoing water quality management initiatives (e.g., Sacramento River Coordinated Monitoring Program, Sacramento River Watershed Program, Cal EPA Department of Pesticide Regulation's Rice Pesticides Program) are helping to reduce the frequency with which water quality objectives are exceeded. In terms of the river's quality as a raw municipal water source, total dissolved solids (TDS), total organic carbon (TOC), and pathogen levels are of particular concern, but are currently at acceptable regulatory levels. TDS is of concern primarily because of its effects on water treatment costs. TOC is of concern because of its role in the formation of carcinogenic disinfection by-products (e.g., trihalomethanes) during the chlorination process of treatment. Pathogens (i.e., *Cryptosporidium* and *Giardia*) also are of concern with regard to their potential to affect human health. Sacramento River water is diverted for municipal and industrial uses and its flows constitute the bulk of freshwater inflows to the Delta where municipal and industrial diversions also occur. Accordingly, additional discussion of these important water quality parameters is provided below.

Salinity, often measured in terms of TDS, is relatively low in the Sacramento River (on the order of hundreds of mg/l, whereas the TDS concentration of seawater is approximately 35,000 mg/l or 35 ppt). However, salinity does vary somewhat seasonally and among years, depending on flow levels.[56] TDS concentrations measured at the West Sacramento Intake on the Sacramento River between April 19, 1994 and May 1, 1996 revealed a mean concentration of 92 mg/l. TDS concentrations measured at Greene's Landing (located downstream of the SRWWTP) averaged 102 mg/l during the period March 13, 1986 to November 9, 1995.[57] High TDS concentrations can result in increased municipal water treatment costs. When reaching sufficiently high levels (i.e., many hundreds to thousands of mg/l), productivity of crops and habitat quality for freshwater aquatic life can be reduced.[58]

Organic carbon and bromide in waters serving municipal uses are of concern because they can react with disinfectants during the water treatment process to form trihalomethanes (THM), which pose carcinogenic risks to humans. Between December 1992 and July 1996, mean TOC concentrations at Freeport were determined to be 2.2 mg/l, with a maximum measured concentration

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54 City of Sacramento and City of West Sacramento, 1995.

55 State Water Resources Control Board, *Draft Environmental Report Appendix to Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1994.

56 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.

57 DWR data as transmitted by R. Woodard, 1996.

58 California Department of Water Resources, 1994.

of 6.8 mg/l.[59] Dissolved organic carbon (DOC) for Sacramento River at Greene's Landing for the period 1990-1993 ranged from 1.4 to 5.7 mg/l.[60] The vast majority of the organic carbon in this system tends to be in the dissolved form, and so, TOC and DOC values are generally similar.

Agricultural drainage constituents of concern include nutrients, pesticides/herbicides, suspended and dissolved solids and organic carbon.[61] In the 1980s, rice pesticides were responsible for fish kills in agricultural drains and also for taste and odor problems in the water treated at the SRWTP. The major fish kills in the Colusa Basin Drain have since been eliminated as a result of the multi-agency rice pesticide control program.[62]

The concern over *Giardia* and *Cryptosporidium* concentrations in Sacramento River water, as well as other pathogens, has increased in recent years. The most comprehensive study of these pathogens conducted to date was performed by the Metropolitan Water District of Southern California,[63] which monitored concentrations of both *Giardia* and *Cryptosporidium* at four geographic locations (Greene's Landing, Banks Pumping Plant, the Delta Mendota Canal (DMC), and the California Aqueduct Checkpoint 29) for one calendar year. Findings from this study showed that quantification of *Giardia* and *Cryptosporidium* is currently subject to poor recovery and reproducibility, resulting in highly variable detection limits for both pathogens. Therefore, the results from this study should be regarded as qualitative and should not be interpreted to represent definitive concentrations of these pathogens in the waterbodies monitored. Nevertheless, spatial differences in the relative abundance of these pathogens in the Sacramento River and Delta, as well as their prevalence, relative to other surface waters of the United States, can be approximated from this study. Concentrations of the pathogens *Giardia* and *Cryptosporidium* are measured in cysts (the dormant state) or oocysts (fertilized egg form) per 100 liters of water.

Results reported by MWD (1993) indicated that *Giardia* and *Cryptosporidium* were detected in 42 percent and 50 percent, respectively, of the Greene's Landing samples. In the positive samples, the mean concentration of *Giardia* cysts was 37 per 100 liters, with a range of 8 to 82 per 100 liters. However, it should be noted that the mean detection limit for *Giardia* was 38 cysts per 100 liters (range: 8-125). The mean concentration of *Cryptosporidium* oocysts at this Sacramento River site was 50 per 100 liters (range: 5-132), with the mean detection limit for this pathogen reported as 46 oocysts per 100 liters (range: 8-125). It should be noted that the above results do not provide information regarding the viability of these organisms or the human risk of infection associated with the observed levels.

4.5.3. Sacramento-San Joaquin Delta

Water quality in the Delta is heavily influenced by a combination of environmental and institutional variables, including upstream pollutant loading, water diversions within and upstream of the Delta,

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59 Larry Walker Associates, 1996.
60 Brown and Caldwell *et al*., 1995.
61 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.
62 City of Sacramento and City of West Sacramento, 1995.
63 MWD, 1993.

and agricultural and other land use activities throughout the watershed. Critical Delta water quality parameters (e.g., salinity and/or TDS, TOC, bromide, pathogens, temperature, nutrients, and priority pollutants) can show considerable geographic and seasonal variation. Salinity, bromide concentrations, and temperature are strongly related to changes in Delta inflows.[64]

Reduced Delta inflows can increase the amount of seawater intrusion and increase the water quality influence of organic-rich agricultural runoff in Delta channels. Delta water quality conditions that are critical for municipal drinking water quality include salinity, chloride, bromide, and TOC concentrations. Delta water quality conditions that are critical to aquatic habitat include salinity, temperature, DO, TSS and turbidity, pH, nutrients, and chlorophyll. The Delta waterways are listed as impaired for two organophosphate pesticides (chlorpyrifos, diazinon), Group A organochlorine pesticides, electrical conductivity, mercury, and unknown toxicity (SWRCB 2007).

The extent of saltwater intrusion into the Delta from the Pacific Ocean is largely controlled by freshwater inflow from the Sacramento, San Joaquin, Mokelumne, Calaveras, and Cosumnes rivers. Water diversion facilities upstream and within the Delta can reduce Delta inflows resulting in higher salinity levels at specific locations within the Delta than might otherwise occur. Conversely, water storage facilities can augment Delta inflows in certain months, resulting in salinity levels lower than would otherwise occur. By augmenting natural or historic flows via releases from upstream reservoirs, the severe salinity level intrusions that once occurred every summer—which sometimes moved upstream as far as the City of Sacramento on the Sacramento River, and as far as Stockton on the San Joaquin River, have been eliminated.

An additional source of salt or TDS to the Delta is upstream agricultural discharges to the Sacramento and San Joaquin rivers, which can sometimes create elevated salinity levels in portions of the south Delta. Runoff and treated wastewater, to a limited degree, also influence Delta TDS levels.[65] TDS concentrations at the Banks Pumping Plant for the period 1990-1993 ranged from 44 to 417 mg/l, with an annual average of approximately 300 mg/l.[66] Salinity requirements, represented in electrical conductivity (EC) units, for the Delta are defined in Table 4.5-1. These standards are intended to protect various beneficial uses of Delta waters. As noted previously, there are numerous standards for salinity and flow requirements governed by the Bay-Delta Water Quality Control Plan; Table 4.5-1 provides only a sample.

Delta waters receive organic carbon materials from a variety of sources, including agricultural drainage, surface runoff, algal productivity, in-channel soils, levee materials, riparian vegetation, and the Banks Pumping Plant during 1990-1993 ranged from 2.6 to 10.5 mg/l, approximately double that at Greene's Landing. Recent work has shown an average increase in TOC concentrations of

64 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
65 Brown and Caldwell *et al*., 1995.
66 Brown and Caldwell *et al*., 1995.

1.5 mg/l between Greene's Landing and the Banks Pumping Plant, which may be largely attributed to agricultural drainage.[67]

TABLE 4.5-1

SACRAMENTO-SAN JOAQUIN (BAY-DELTA) DELTA WATER QUALITY CONTROL PLAN STANDARDS FOR DELTA INFLOW AND OUTFLOW

Location	Parameter	Standard	Description
Contra Costa Canal at Pumping Plant #1	Chloride (Cl-)	240 days[1]	Maximum mean daily 150 mg/l Cl- for at least the number of days shown during the calendar year
Contra Costa Canal at Pumping Plant #1	Chloride (Cl-)	250 mg/1	Maximum mean daily (mg/l)
Sacramento River at Emmaton	Electrical Conductivity (EC)	0.45 EC[2]	Maximum 14-day running average of mean daily EC (mmhos/cm) Apr 1 through Aug 15
West Canal at mouth of Clifton Court Forebay and Delta Mendota Canal at Tracy Pumping Plant	Electrical Conductivity (EC)	1.00 EC	Maximum monthly average of mean daily EC (mmhos/cm)
Sacramento River at Collinsville	Electrical Conductivity (EC)	8.00 EC[3]	Maximum monthly average of both daily high tide EC values (mmhos/cm)
Sacramento River at Rio Vista	Flow Rate	4,500 cfs[4]	Minimum monthly average flow rate (cfs)
Delta Outflow	Net Delta Outflow Index	8,000 cfs[5]	Minimum Monthly average (cfs)

Notes:
1. Number of days per year is dependent on water year type. Wet Þ 240 days; Above Normal Þ 190 days; Below Normal Þ 175 days; Dry Þ 165 days; Critical Þ 155 days.
2. EC standard is relaxed before August 15 depending on water year type. Wet Þ no relaxation; Above Normal Þ on July 1 relaxed to 0.63; Below Normal Þ on June 20 relaxed to 1.14; Dry Þ on June 15 relaxed to 1.67; Critical Þ on April 1 relaxed to 2.78
3. EC standard varies by month. October Þ 19.0; November-December Þ 15.5; January Þ 12.5; February-March Þ 8.0; April-May Þ 11.0
4. Flow rate varies by month and water year type. September Þ all year types = 3,000 cfs; October Þ Wet, Above Normal, Below Normal & Dry year types = 4,000 cfs; October Þ Critical year type = 3,000 cfs; November & December Þ Wet, Above Normal, Below Normal & Dry year types = 4,500 cfs; November & December Þ Critical year type = 3,500 cfs
5. Index varies by month and water year type. January Þ all year types = 4,500 cfs or 6,000 cfs depending on Eight River Index; February through June Þ all year types = variable between 7,100 cfs and 4,000 cfs depending on Eight River Index; July Þ Wet & Above Normal year types = 8,000 cfs; July Þ Below Normal year type = 6,500 cfs; July Þ Dry year type = 5,000 cfs; July Þ Critical year type = 4,000 cfs; August Þ Wet, Above Normal & Below Normal year types = 4,000 cfs; August Þ Critical year type = 3,000 cfs; September Þ all year types = 3,000 cfs; October Þ Wet, Above Normal, Below Normal & Dry year types = 4,000 cfs; October Þ Critical year type = 3,000 cfs; November & December Þ Wet, Above Normal, Below Normal & Dry year types = 4,500 cfs; November & December Þ Critical year type = 3,500 cfs

Sources: RWQCB, 1994; SWRCB, 1995. From Tables 1, 2 and 3 (pages 16 through 19) of the 1995 Bay-Delta Water Quality Control Plan. The select location and standard listed in this Table represents only a few of the Water Quality Objectives for municipal and industrial beneficial uses, agricultural beneficial uses, and fish and wildlife beneficial uses.

Nutrients in the Delta (nitrogen, phosphate, and silicate) are derived from several sources including river inflow, ocean water, runoff (urban and agriculture), wetlands, atmospheric deposition (rain and dust), and upstream sewage effluent. Nutrient concentrations vary geographically and seasonally. In the northern reach, where river flow provides most of the nutrient load, nutrient concentrations are highest in winter and lowest in summer.[68] Nutrients at sufficient levels can lead to algal blooms that deplete oxygen in the water during decomposition.

Metals, pesticides and petroleum hydrocarbons enter the Delta from several sources and environmental pathways, including agricultural runoff, municipal and industrial wastewater discharge,

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67 Brown and Caldwell *et al*., 1995.
68 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.

urban runoff, recreational uses, river inflow, and atmospheric deposition.[69] The concentrations of these pollutants in the Delta vary both geographically and seasonally. Pesticides from agricultural runoff are of particular concern, as biologically significant concentrations have been recorded in portions of the Delta.[70] Toxic effects of priority pollutants to aquatic life can vary with flow levels, as water flowing into and through the Delta acts to dilute concentrations of priority pollutants.

Finally, levels of *Cryptosporidium, Giardia,* and other pathogens in Delta waters are becoming of increasing concern to municipal water suppliers. *Giardia* was not detected at Banks Pumping Plant or Checkpoint 29, but was found in one sample at the DMC at a concentration of 6 cysts per 100 liters. *Cryptosporidium* was detected at Banks Pumping Plant, the DMC, and Checkpoint 29 at mean concentrations of 54, 40, and 17 oocysts per 100 liter, respectively.[71]

Delta X2

A major regulatory cornerstone of the 1995 Bay-Delta Water Quality Control Plan is the development of water quality standards based on the geographical position of the 2-parts-per-thousand (ppt) isohaline (also known as X2). The geographical position of the 2-ppt isohaline is considered significant to the biologically important entrapment zone of the estuary and the resident fishery. It provides an indicator of habitat protection outflow and salinity starting conditions in the Delta.

As contained in SWRCB Decision-1641 (D-1641), various flow, operational, and water quality standards create a systematic approach to CVP/SWP operations which influence the position of the X2 location. The key to the regulatory system is the concept of an “X2 day”. An X2 day can be operationally accomplished by the CVP/SWP meeting one of three possible equivalents. These include:

- 2.64 mmhos/cm Electrical Conductive (EC) at the desired geographic compliance location for the day;
- 14-day average of 2.64 mmhos/cm EC at the desired geographic compliance location; and
- A pre-determined Delta outflow equivalent for the desired X2 compliance location for the day.

If any of these conditions are met, the day is included as a potential compliance X2 day.

The determination of the desired geographic compliance location and the required number of X2 days per month in the February through June time period that meet the above noted criteria is defined by regulatory standard tables. The various tables determine the number of required of X2 days based on the previous months inflow, noted as “8RI” since it is estimated on the full natural runoff of the largest eight streams in the Sacramento-San Joaquin River Watershed. Various geographic compliance locations have specific conditions, which are listed in the footnotes of Table 4.5-1.

69 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
70 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
71 MWD, 1993.

Folsom Reservoir

Water quality in Folsom Reservoir is generally acceptable for the beneficial uses currently defined for the facility. However, taste and odor problems have occurred in municipal water supplies diverted from Folsom Reservoir in the past, which were attributed to blue-green algal blooms that occasionally occur in the reservoir as a result of elevated water temperatures.

Folsom Reservoir has numerous beneficial uses as defined in the Central Valley Regional Water Quality Control Board's Basin Plan. The following existing and potential beneficial uses have been defined by the RWQCB:

- municipal, domestic, and industrial water supply;
- irrigation;
- power;
- water contact and non-contact recreation;
- warm and cold freshwater habitat, warm freshwater spawning habitat; and wildlife habitat.

The proposed diversion site for GDPUD is on the North Fork American River, just downstream of the confluence of the North and Middle forks of the American River. Water quality in the American River is considered to be good, although historical water quality data for the North Fork are limited. During early construction activities for the proposed Auburn Dam, Reclamation collected water samples at two locations upstream of the proposed dam site and two locations downstream. These samples were analyzed for pH and turbidity. Monitoring was conducted weekly from 1977 until 1995. The 1991-92 water-year was considered to be representative of the entire period because data for other years showed little variation. Turbidity was low at the nearest downstream and upstream monitoring locations, with annual averages just below or above 1 NTU (nephelometric turbidity unit). The pH ranged from 7.0 to 8.2 at the four monitoring locations. Information on sediment in the river was not readily available; however, the turbidity data indicate the river carries little sediment during low flows.[72]

Sources of historic wastewater flows to the North Fork American River include a sawmill located in Foresthill that discharges to a tributary to Devil's Canyon.[73]

The beneficial uses of the North Fork American River have been established by the RWQCB and are included in the Water Quality Control Plan for the Sacramento San Joaquin River Basins (1998).[74] These uses are:

- municipal and domestic supply;

72 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.
73 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.
74 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.

- agricultural supply;
- water contact and non-contact recreation;
- potential warm freshwater habitat;
- cold freshwater habitat;
- cold freshwater spawning, reproduction, and/or early development of fish; and
- wildlife habitat.

4.5.4. Lower American River

Surface water quality in Folsom Reservoir, Lake Natoma, and the lower American River depends primarily on the mass balance of various water quality constituents from groundwater inputs, tributary inflow, permitted discharges from municipal and industrial sources, indirect watershed runoff (unchannelized flow), urban runoff, and stormwater discharges. Water quality varies somewhat among years and seasonally within a year based primarily on these and related factors.

Historically, water quality parameters for the lower American River have typically been well within acceptable limits to achieve water quality objectives and beneficial uses identified for this waterbody,[75] and remain so today. Principal water quality parameters of concern for the river (e.g., pathogens, nutrients, TDS, TOC, priority pollutants, and turbidity) are primarily affected by urban land use practices and associated runoff and stormwater discharges. The stormwater discharges to the river temporarily elevate levels of turbidity and pathogens during and immediately after storm events. TOC and TDS levels in the lower American River are, however, relatively low compared to Sacramento River and Delta waters and thus are generally not of substantial concern.

Although urban land use practices, urban runoff, and stormwater discharges all contribute priority pollutants to the river, recent monitoring has not identified any priority pollutant at concentrations consistently above State water quality objectives.[76] However, water quality objectives for dissolved oxygen, temperature, and pH are not always met in the lower American River.[77] Finally, taste and odor problems occasionally arise (generally during the late summer months) in the domestic water supplies taken from the lower American River at the Fairbairn WTP.

Water released from Folsom Reservoir, through Lake Natoma, and into the lower American River can affect several water quality parameters in the river. In addition, operation of Folsom Dam and Reservoir directly affects lower American River temperatures throughout much of the year. Water temperatures in the lower American River are often unfavorably high for salmonids during the summer and fall months of the year. Elevated river temperatures can be particularly problematic to the river's salmonid resources under low-flow conditions, which occur during the drier years.

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75 SWRCB, 1992.
76 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.
77 Sacramento County, *Draft Sacramento County General Plan Update Environmental Impact Report, Volume I, Sacramento County, Department of Environmental Review and Assessment*,1992.

4.5.5. Regulatory Framework

Section 303 of the federal Clean Water Act (CWA) requires states to adopt water quality standards for all surface water of the United States. Where multiple uses exist, water quality standards must protect the most sensitive use. Water quality standards are typically numeric, although narrative criteria based upon biomonitoring methods may be employed where numerical standards cannot be established or where they are needed to supplement numerical standards.

The SWRCB and RWQCB are responsible for ensuring implementation and compliance with the provisions of the federal CWA, California's Porter-Cologne Water Quality Control Act, and related programs. Along with the SWRCB and RWQCB, water quality protection is the responsibility of numerous water supply and wastewater management agencies, as well as city and county governments, and requires the coordinated efforts of these various entities.

Water Quality Control Plan for the Sacramento San Joaquin River Basins

The Water Quality Control Plan for the Sacramento-San Joaquin River Basins (Basin Plan), adopted by the RWCQB on December 9, 1994 and reprinted (as amended in 1995 and 1996) on September 1, 1998, provides water quality objectives and standards for waters of the Sacramento River and San Joaquin River Basins. The Basin Plan contains specific numeric water quality objectives for bacteria, dissolved oxygen, pH, pesticides, EC, TDS, temperature, turbidity, and trace elements, as well as numerous narrative water quality objectives, that are applicable to certain waterbodies or portions of waterbodies. As discussed above, the Basin Plan contains specific numeric standards for Delta inflow and outflow, chloride, and electrical conductivity (EC), a measure of water's ability to conduct an electric current, which is based on the relative abundance of free ions in the water, which come from the dissociation of solid materials into the water. Thus, EC is directly related to TDS. EC standards in the Delta exist for both agricultural and fish and wildlife beneficial uses.

Bay-Delta Pollutant Policy Document and Accord

The Pollutant Policy Document (PPD) for the San Francisco/Sacramento-San Joaquin Delta Estuary was adopted by the SWRCB on June 21, 1990. The PPD sets forth basic policies for the control of toxic pollutants in the Bay-Delta Estuary. The PPD identifies seven pollutants of concern: arsenic, cadmium, copper, mercury, selenium, silver, and polynuclear aromatic hydrocarbons (PAHs). The PPD also indicates that publicly owned treatment works (POTWs) are a significant source (i.e., greater than 10 percent) of three of the seven pollutants of concern: cadmium, mercury, and silver. The RWQCB has identified the entire Delta as a waterbody of concern and designated the seven pollutants listed by the PPD as pollutants of concern. The most significant provision of the PPD for POTWs is the mass emission strategy (MES), which is designed to control the accumulation of toxic pollutants in sediments and aquatic tissue.

In June 1994, State and federal agency cooperation was formalized with the signing of a Framework Agreement. The Agreement stated that the State and federal agencies would focus on the following three areas of concern: water quality standards formulation; coordination of SWP and CVP operations with regulatory requirements; and long term solutions to problems in the Bay-Delta

Estuary.[78] On December 15, 1994, an agreement was reached regarding water quality standards and related provisions that would remain in effect for three years. This agreement included springtime export limits, regulation of the salinity gradient, specified springtime flows on the lower San Joaquin River and intermittent closure of the Delta Cross Channel gates. Many of the standards and provisions in the December 1994 agreement were incorporated into the SWRCB's "Draft Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Estuary" dated December 1994. After revisions were made that addressed comments, the final Delta Water Quality Control Plan was adopted on May 22, 1995,[79] and remains in effect today.

Anti-Degradation Policy (State Water Board Resolution 68-16)

In addition to designating beneficial uses and water quality objectives to define water quality standards, federal water quality regulations require each State to adopt an "anti-degradation" policy and to specify the minimum requirements for the policy.[80] The SWRCB has interpreted State Water Board Resolution 68-16 to incorporate the federal anti-degradation policy.

The SWRCB adopted State Water Board Resolution No. 68-16 on October 28, 1968. The goal of this policy is to maintain high quality waters where they exist in the State. Resolution No. 68-16 does not prohibit any reduction to existing water quality. Rather, the RWQCB applies Resolution No. 68-16 when considering whether to allow a certain degree of degradation to occur or remain. As stated in Resolution No. 68-16, whenever the existing quality of water is better than that defined by State water quality objectives and policies, such existing high water quality will be maintained until it has been demonstrated to the State that any change will: 1) be consistent with the maximum benefit to the people of the State; 2) not unreasonably affect present and anticipated beneficial use of such water; and 3) not result in water quality less than that prescribed in water quality control plans or policies.[81] In addition, the discharger must apply best practicable treatment or control measures to assure that: 1) a pollution or nuisance will not occur; and 2) the highest water quality, consistent with the maximum benefit to the people of the State, will be maintained.[82] Hence, for actions that produce significant changes in water quality, the State policy states that a showing must be made that such changes result in the maximum benefit to the people of the State and are necessary to the social and economic welfare of the community in order to be consistent with the anti-degradation policies.

The Porter-Cologne Water Quality Control Act states that water quality objectives are to be established that ". . . will ensure the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." The State Water Code further states that ". . . it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses." This policy statement supports the position that some level of water quality change is allowable under the anti-degradation policies.

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78 DWR, 1995.

79 State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, Environmental Report, Appendix I*, 1995.

80 40 CFR '131.12.

81 RWQCB, 1994.

82 RWQCB, 1994.

National Toxics Rule and California Toxics Rule

The U.S. EPA promulgated the National Toxics Rule (NTR) on December 22, 1992, which was amended on May 4, 1995, and November 9, 1999, to establish numeric criteria for priority toxic pollutants for California. The NTR established water quality criteria for 42 pollutants not covered, at that time, under California's state-wide water quality regulations. As a result of a court-ordered revocation of California's state-wide water quality control plan for priority pollutants in September 1994, the EPA initiated efforts to promulgate additional numeric water quality criteria for California. The EPA approved CTR promulgated numeric criteria on May 18, 2000 for priority pollutants not included in the NTR; the CTR was later amended on February 13, 2001. The CTR documentation (Federal Register, Volume 65, 31682) carried forward the previously promulgated criteria of the NTR, thereby providing a single document listing California's fully adopted and applicable water quality criteria for priority pollutants.

National Pollutant Discharge Elimination System (NPDES)

Title 40 of the Code of Federal Regulations (40 CFR) includes U.S. EPA regulations to implement the National Pollutant Discharge Elimination System (NPDES) permit system, which was established in the CWA to regulate municipal and industrial discharges to surface waters of the U.S. Each NPDES permit contains limits on allowable concentrations and mass emissions of pollutants contained in the discharge. Sections 401 and 402 of the CWA contain general requirements regarding NPDES permits. Section 307 of the CWA describes the factors that EPA must consider in setting effluent limits for priority pollutants.

Non-Point Source Discharges

Two types of non-point source discharges[83] are controlled by the NPDES program – non-point source discharges caused by general construction activities and the general quality of stormwater in municipal stormwater systems (either as part of a combined system or as a separate system in which runoff is carried through a developed conveyance system to specific discharge locations). The goal of the NPDES non-point source regulations is to improve the quality of stormwater discharged to receiving waters to the "maximum extent practicable" through the use of best management practices (BMPs). BMPs can include the development and implementation of various practices including educational measures (workshops informing public of what impacts result when household chemicals are released into storm drains), regulatory measures (local authority of drainage facility design), public policy measures (label storm drain inlets as to impacts of dumping on receiving waters) and structural measures (filter strips, grass swales and detention ponds).

The 1987 amendments to the CWA directed the federal EPA to implement the stormwater program in two phases. Phase 1 addressed discharges from large (population 250,000 or above) and medium (population 100,000 to 250,000) municipalities and certain industrial activities. Phase 2 addresses all other discharges defined by EPA that are not included in Phase 1, and construction

83 Non-point sources diffuse and originate over a wide area rather than from a definable point. Non-point pollution often enters receiving water in the form of surface runoff and is not conveyed by way of pipelines or discrete conveyances.

activities that affect one to five acres. The Phase 2 regulations were published in the Federal Register on December 8, 1999.

4.6. FISHERIES AND AQUATIC RESOURCES (DIRECT EFFECT STUDY AREA)

This subchapter describes the fisheries resources and aquatic habitats, including the regional and local area affected environments, and presents the context under which the analyses of the potential diversion-related effects on these resources resulting from implementation of the new CVP water service contracts can be made.

4.6.1. Affected Environment/Setting

The following describes the affected environment related to fisheries and aquatic biological resources in areas potentially affected by the Proposed Action and Alternatives. The discussion addresses environmental conditions that could be affected by increased depletions from the coordinated CVP/SWP system (including upper Sacramento reservoirs, the upper and lower Sacramento River, the Sacramento-San Joaquin River Delta, Folsom Reservoir, and the lower American River), including those potentially resulting from a new water exchange between the North Fork American River and Folsom Reservoir.

Fish species of primary management concern include recreationally/commercially important species, species listed under the State and/or federal Endangered Species Act (ESA), and those species being considered for State and/or federal ESA listing or other special status. Special emphasis is placed on these species since they are the focus of State and/or federal ESA initiatives, and are the primary subject of both State and federal fisheries restoration and recovery plans. Improvement of habitat conditions for these species of priority management concern will likely protect or enhance conditions for other fish resources, including native resident species.

Evaluating potential impacts on fishery resources requires an understanding of fish species' life histories and life-stage-specific environmental requirements. Therefore, this information is provided for fish species of primary management concern that occur (or potentially occur) within both the regional (Sacramento River and associated reservoirs and the Delta) and local (American River and associated reservoirs) study areas.

4.6.2. Fish Species of Primary Management Concern

The species described in this subchapter are presented in no particular order of preference.

Chinook Salmon (*Oncorhynchus tshawytscha*)

Four runs of Chinook salmon (i.e., fall-run, late-fall-run, winter-run, and spring-run) occur in the Sacramento River system, whereas only fall-run occur in the lower American River. Chinook salmon are anadromous, meaning they spend most of their lives in the ocean and return to their natal freshwater stream to spawn. A separate discussion for each of the four runs of Chinook salmon is provided below.

Winter-run Chinook Salmon

Winter-run Chinook salmon was listed as endangered under the federal ESA on January 4, 1994 and was reaffirmed this status on June 28, 2005. The Evolutionary Significant Unit (ESU) includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs: winter-run Chinook from the Livingston Stone National Fish Hatchery (NFH), and winter run Chinook in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory. A final designation of its critical habitat status was made on June 16, 1993.

Under Section 7 of the ESA, federal agencies are required to ensure that their actions are not likely to result in the destruction or adverse modification of a listed species' critical habitat. Critical habitat for the winter-run Chinook salmon is defined to occur in the Sacramento River from Keswick Dam (river mile [RM] 302) to Chipps Island (RM 0) in the Delta. Also included are waters west of the Carquinez Bridge, Suisun Bay, San Pablo Bay, and San Francisco Bay north of the Oakland Bay Bridge.[84]

Adult winter-run Chinook salmon immigration (upstream spawning migration) through the Delta and into the lower Sacramento River occurs from December through July, with peak immigration during the period January through April.[85] Winter-run Chinook salmon primarily spawn in the main-stem Sacramento River between Keswick Dam (RM 302) and Red Bluff Diversion Dam (RM 258). Winter-run Chinook salmon spawn between late-April and mid-August, with peak spawning generally occurring in June.

Winter-run Chinook salmon fry rearing in the upper Sacramento River exhibit peak abundance during September, with fry and juvenile emigration past Red Bluff Diversion Dam occurring from August through March.[86] Emigration (downstream migration) of winter-run Chinook salmon juveniles past Red Bluff Diversion Dam is believed to peak during September and October,[87] with abundance of juveniles in the Delta generally peaking during February, March, or April.[88] Additional information on the life history and habitat requirements of winter-run Chinook salmon is contained in the NOAA Fisheries Biological Opinion for this species, which was developed to specifically evaluate impacts on winter-run associated with CVP and SWP operations.[89]

Spring-run Chinook Salmon

Spring-run Chinook salmon was listed as threatened under the federal ESA on September 16, 1999 and reaffirmed as threatened on June 28, 2005. Its habitat was designated as critical habitat on September 5, 2005 with an effective date of January 2, 2006. Spring-run Chinook salmon enter the

84 National Marine Fisheries Service, *Biological Opinion on the Winter-run Chinook Salmon*, 1993.
85 U.S. Fish and Wildlife Service, *Draft Anadromous Fish Restoration Plan*, 1995.
86 U.S. Bureau of Reclamation, *Biological Assessment for U.S. Bureau of Reclamation, Central Valley Operations*, 1992.
87 R.J. Hallock and F.W. Fisher, *Status of the Winter-run Chinook Salmon (Onchorynchus tshawytscha) in the Sacramento River*, 1985.
88 D. Stevens, "When do winter-run Chinook salmon smolts migrate through the Sacramento-San Joaquin Delta?", unpublished memorandum, 1989.
89 National Marine Fisheries Service, *Biological Opinion on the Winter-run Chinook Salmon*, 1993.

Sacramento River during the period late March through September,[90] but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June.[91] Adult spring-run Chinook salmon hold in areas downstream of spawning grounds during the summer months until their eggs fully develop and become ready for spawning. This is the primary characteristic distinguishing the spring-run from the other runs of Chinook salmon. Spring-run Chinook salmon spawn primarily upstream of Red Bluff Diversion Dam, and in several upper Sacramento River tributaries (e.g., Mill and Deer creeks). Spawning has been reported to primarily occur during mid-August through early October.[92] The timing of juvenile emigration from the spawning and rearing grounds varies among the tributaries of origin, and can occur during the period November through June.

Late Fall-run Chinook Salmon

Late fall-run Chinook salmon did not warrant listing under the federal ESA on September 16, 1999, but was classified as a Species of Concern on April 15, 2005. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California.

Adult immigration of late fall-run Chinook salmon in the Sacramento River generally begins in October, peaks in December, and ends in April.[93] Primary spawning grounds for late fall-run Chinook salmon are in tributaries to the upper Sacramento River (e.g., Battle, Cottonwood, Clear, and Mill creeks), although late fall-run Chinook salmon are believed to return to the Feather and Yuba rivers as well.[94] Spawning in the main-stem Sacramento River occurs primarily from Keswick Dam (RM 302) to Red Bluff Diversion Dam (RM 258), and generally occurs from December through April.[95] Post-emergent fry and juveniles emigrate from their spawning and rearing grounds in the upper Sacramento River and its tributaries during the period May through November. Juveniles emigrate through the Delta primarily during the period October through December.[96]

Fall-run Chinook Salmon

Similar to late fall-run Chinook salmon, the fall-run also did not warrant listing under the federal ESA as of September 16, 1999, but was also classified as a Species of Concern late on April 15, 2005. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California.

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90 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
91 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.
92 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
93 U.S. Bureau of Reclamation, Appendices to *Shasta Outflow Temperature Control Planning Report/Environmental Statement, Part I – Fisheries*, 1991b.
94 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.
95 U.S. Bureau of Reclamation, Appendices to *Shasta Outflow Temperature Control Planning Report/Environmental Statement, Part I – Fisheries*, 1991b.
96 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.

The fall run of Chinook salmon is currently the largest run of Chinook salmon in the Sacramento River system, and the primary run of Chinook salmon using the lower American River. Fall-run Chinook salmon represent the greatest percentage of all four runs, and consequently, they continue to support commercial and recreational fisheries of significant economic importance.

In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from July through December, with immigration peaking from mid-October through November.[97] Fall-run Chinook salmon spawn in numerous tributaries of the Sacramento River, including the lower American River, lower Yuba River, Feather River, as well as tributaries to the upper Sacramento River. The majority of main-stem Sacramento River spawning occurs between Keswick and Red Bluff Diversion dams. A greater extent of fall-run spawning (relative to the other three runs) occurs below Red Bluff Diversion Dam, with limited spawning potentially occurring as far downstream as Princeton (RM 163).[98] Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January. Fall-run Chinook salmon emigrate as post-emergent fry, juveniles, and as smolts after rearing in their natal streams for up to six months. Consequently, fall-run emigrants may be present in the lower American and Sacramento rivers from January through June,[99,100] and remain in the Delta for variable lengths of time prior to ocean entry.

As fall-run Chinook salmon occur within the local study area and are a species of primary management concern in the lower American River, additional life history and environmental requirement information pertaining more specifically to the lower American River fall-run population is provided below.

Adult Chinook salmon begin entering the lower American River annually in August and September, with immigration continuing through December in most years and January in some years. Both historic (fish passage at Old Folsom Dam, 1944-46) and more contemporary (creel survey, 1991-94) data indicate that adult Chinook salmon arrivals in the lower American River peak in November, and that typically greater than 90 percent of the run has entered the river by the end of November.[101]

Once in the lower American River, the timing of adult Chinook salmon spawning activity is strongly influenced by water temperature. When daily average water temperatures decrease to approximately 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by the male) are eventually released. Fertilized eggs are subsequently buried with streambed gravel. Due to the timing of adult arrivals and occurrence of appropriate spawning temperatures, spawning activity in recent years (i.e., 1991-1993) has peaked during mid- to late-November.[102] These same studies indicated that approximately 98 percent of all redds

97 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*,1990.
98 Burmester, personal communication, 1996.
99 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990
100 B. Herbold, A.D. Jassby and P.B. Moyle, *Status and Trends Report on the Aquatic Resources in the San Francisco Estuary, San Francisco Estuary Project Public Report*, 1992.
101 CDFG 1992, 1993, 1994, 1995.
102 CDFG 1992, 1993a, 1995.

observed during these years were located between Watt Avenue (RM 9.5) and Nimbus Dam (RM 23).

Egg incubation survival rates are dependent on water temperature and intragravel water movement. CDFG reported egg mortalities of 80 percent and 100 percent for Chinook salmon at water temperatures of 61°F and 63°F, respectively.[103] Egg incubation survival is highest at water temperatures at or below 56°F.

Fall-run Chinook salmon emigrate from the lower American River during two distinct time periods. The primary period of emigration occurs from mid-February through early March. The remaining fry rear in the lower American River where they feed and grow for up to 6 months, prior to emigrating as juveniles or smolts through June. Emigration surveys conducted by CDFG have shown no evidence that peak emigration of Chinook salmon is related to the onset of peak spring flows.[104] Temperatures required during emigration are believed to be about the same as those required for successful rearing.

Water temperatures between 45°F and 58°F have been reported to be optimal for rearing of Chinook salmon fry and juveniles.[105,106] Raleigh et al. reviewed the available literature on Chinook salmon thermal requirements and suggested a range of approximately 53.6°F to 64.4°F as suitable rearing temperatures, and 75°F as an upper limit.[107] Lower American River water temperatures at Watt Avenue generally range from about 46°F to 60°F during the period December through April, and from 60°F to 69°F during the months of May and June. The 69-year average (1922-1990) water temperatures at Watt Avenue, as indicated by the Reclamation's Lower American River Temperature Model under existing hydrology, are 61.7°F in May and 65.9°F in June. Hence, average May and June river temperatures at Watt Avenue are currently at the upper end of the suitable range of Chinook salmon rearing temperatures, as defined above.

Central Valley Steelhead (*Oncorhynchus mykiss*)

Central Valley steelhead (hereinafter, simply referred to as steelhead) was listed as threatened under the federal ESA on March 19, 1998. Its threatened status was reaffirmed on January 5, 2005. The final designation of its critical habitat status was made on September 2, 2005 with an effective date of January 2. 2006. The Distinct Population Segment (DPS) includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman NFH, and Feather River Hatchery steelhead hatchery programs.

Steelhead are the anadromous form of rainbow trout. Adult steelhead migrate through the Sacramento River system beginning in August and continue through March. Adult steelhead return

103 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.
104 Snider et al. 1997.
105 Reiser and Bjornn 1979.
106 Rich 1987.
107 Raleigh et al. 1986.

to their spawning grounds in the upper Sacramento River and tributaries (the lower American River). Steelhead also are produced at the Coleman Fish Hatchery on Battle Creek, the Nimbus Hatchery on the American River, and the Feather River Hatchery on the Feather River.[108] Spawning generally occurs from January through April.[109] Juvenile steelhead rear in their natal streams for one to two years prior to emigrating from the river. Emigration of one- to two-year-old fish primarily occurs from April through June.[110,111]

The lower American River steelhead population is believed to be supported primarily by fish produced at the Nimbus Hatchery. Adult steelhead immigration into the lower American River typically begins in November and continues into April. The steelhead spawning immigration generally peaks during January.[112,113] Optimal immigration temperatures have been reported to range from 46°F to 52°F.[114]

Spawning usually begins during late-December and may extend through March, but can range from November through April.[115] Optimal spawning temperatures have been reported to range from 39°F to 52°F.[116] Unlike Chinook salmon, not all steelhead die after spawning. Those that do not die return to the ocean after spawning, and may return to spawn again in future years. The egg and fry incubation lifestage for steelhead in the lower American River typically extends from December through May.

Fry emergence from the gravel generally begins in March and occurs through June, with peak emergence occurring during April.[117,118,119] Optimal egg and fry incubation temperatures have been reported to range from 48°F to 52°F.[120] Optimal temperatures for fry and juvenile rearing is reported to range from 45°F to 60°F.[121] As with Chinook salmon, it is believed that temperatures up to 65°F are suitable for steelhead rearing, with each degree increase between 65°F and the upper lethal limit of 75°F[122] being increasingly less suitable and thermally more stressful.

108 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
109 McEwan, personal communication, 1997.
110 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
111 McEwan, personal communication, 1997.
112 California Department of Fish and Game, *Endangered and Threatened Animals of California*, 1986.
113 California Department of Fish and Game, unpublished data.
114 California Department of Fish and Game 1991.
115 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.
116 California Department of Fish and Game 1991.
117 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.
118 Snider and Titus 1996.
119 California Department of Fish and Game, unpublished data.
120 CDFG 1991.
121 CDFG 1991.
122 Bovee 1978.

American Shad (*Alosa sapidissima*)

American shad occur in the Sacramento River, its major tributaries (including the lower American River), and the Delta. A popular sport fishery for American shad exists annually in the Sacramento River and certain tributaries, including the lower American River.[123]

Adult American shad typically enter the lower American River from April through early July,[124] with the spawning migration peaking from mid-May through June.[125] Water temperature is an important factor influencing the timing of spawning. American shad are reported to spawn at water temperatures ranging from approximately 46°F to 79°F,[126] although optimal spawning temperatures are reported to range from about 60ºF to 70°F.[127,128,129,130,131]

Based on their 1990 field investigation, Jones and Stokes Associates (1990) reported that water velocity was the most important physical variable determining shad spawning habitat preference in the lower Yuba River, followed by depth and water temperature. In contrast to salmonids, distributions of spawning virgin shad are determined by river flow rather than homing behavior.[132] Substrate and cover played no apparent role in habitat selection. Snider and Gerstung recommended flow levels of 3,000 to 4,000 cfs in the lower American River during May and June as sufficient attraction flows to sustain the river's American shad fishery.[133] When suitable spawning conditions are found, American shad school and broadcast their eggs throughout the water column.

Based on laboratory experiments conducted on American shad incubation, Walburg and Nichols concluded that temperatures suitable for normal egg development ranged from about 54°F to 70°F.[134] These investigators further reported that eggs hatched in 3 to 5 days at 68°F to 74°F and in 4 to 6 days at temperatures of 59°F to 64.4°F. Egg incubation and hatching, therefore, are coincident with the primary spawning period (i.e., May through June). A large percentage of the eggs spawned in the lower American River probably do not hatch until they have drifted downriver and entered the Sacramento River.[135] Few juvenile American shad have been collected in the lower

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123 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.

124 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

125 California Department of Fish and Game, *Requirements of American Shad in the Sacramento-San Joaquin River System, Exhibit 23, State Water Resources Control Board 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay/Sacramento-San Joaquin Delta*, 1987.

126 U.S. Fish and Wildlife Service, *Special Scientific Report Fisheries No. 550, Biology and Management of the American Shad and Status of the Fisheries, Atlantic Coast of the U.S.*, 1967.

127 Leggett and Whitney 1972.

128 Painter et al. 1978.

129 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.

130 Bell 1986.

131 Rich 1987.

132 Painter et al. 1978.

133 W.M. Snider and E. Gerstung, *Instream Flow Requirement of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California, California Department of Fish and Game Stream Evaluation Report*, 1986.

134 Walburg and Nichols 1967.

135 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

American River.[136] Therefore, the presence of American shad in the lower American River is primarily restricted to adult immigration, spawning, and fry lifestages.

Striped Bass (*Morone saxatilis*)

Striped bass occur in the Sacramento River, its major tributaries (including the lower American River), and the Delta. Substantial striped bass spawning and rearing occurs in the Sacramento River and Delta. Year-class strength of striped bass in the Delta has been correlated with survival and growth during the first 60 days after hatching. The abundance of young striped bass, in turn, was positively correlated with freshwater outflow from the Delta, and negatively correlated with the percentage of Delta inflow diverted from Delta channels during spring and early summer by the CVP and SWP.[137]

Adult striped bass are present in the lower American River throughout the year,[138] with peak abundance occurring during the summer months.[139,140] No studies have definitively determined whether striped bass spawn in the lower American River.[141,142] However, the scarcity of sexually ripe adults among sport-caught fish indicates that minimal, if any, spawning occurs in the lower American River, and that adult fish which entered the river probably spawned elsewhere or not at all.[143] The number of striped bass entering the lower American River during the summer is believed to vary with flow levels and food production.[144] Snider and Gerstung suggested that flows of 1,500 cfs at the mouth during May and June would be sufficient to maintain the striped bass fishery in the lower American River.[145] However, these investigators reported that, in any given year, the population level of striped bass in the Delta was probably the greatest factor determining the relative number of striped bass occurring in the lower American River. Most striped bass spawning is believed to occur in the Sacramento River and Delta. The majority of Sacramento River spawning occurs in the lower Sacramento River, downstream of RM 140 (USFWS 1988).

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136 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.

137 USFWS 1988.

138 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 2*, 1977.

139 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California*, 1977, and *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 4*, 1979.

140 California Department of Fish and Game, *A Report to the State Water Resources Control Board on the Fish and Wildlife Resources of the American River to be Affected by the Auburn Dam and Reservoir and the Folsom-South Canal and Measures Proposed to Maintain These Resources*, 1971.

141 California Department of Fish and Game, *A Report to the State Water Resources Control Board on the Fish and Wildlife Resources of the American River to be Affected by the Auburn Dam and Reservoir and the Folsom-South Canal and Measures Proposed to Maintain These Resources*, 1971.

142 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

143 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California*, 1977, and *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 3*, 1978.

144 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

145 W. M. Snider and E. Gerstung, *Instream Flow Requirement of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California, California Department of Fish and Game Stream Evaluation Report*, 1986.

The lower American River apparently is a nursery area for young striped bass (CDFG 1971; 1986). Numerous schools of 5- to 8-inch-long fish have been reported in the river during the summer months (CDFG 1971). In addition, juvenile and sub-adult fish have been reported to be abundant in the lower American River during the fall (DeHaven 1977). Optimal water temperatures for juvenile striped bass rearing has been reported to range from approximately 61°F to 71°F (USFWS 1988).

Sacramento Splittail *(Pogonichthys macrolepidotus)*

Sacramento splittail were listed as threatened under the federal ESA on February 8, 1999. On September 22, 2003, USFWS delisted it. Splittail are currently listed as a State species of special concern. Splittail are members of the minnow family (*Cyprinidae*), achieving lengths of up to about 16 inches.

Adult splittail usually reach sexual maturity in their second year, and migrate upstream in the late fall to early winter prior to spawning activities. Spawning occurs from mid-winter through July in water temperatures between 9-20°C (48-68°F) (Wang 1986) at times of high winter or spring runoff (DWR 1994a). Splittail prefer to spawn over flooded streambank vegetation or beds of aquatic plants, and the timing of their upstream movements and spawning corresponds to the historically high-flow period associated with snowmelt and runoff each spring. Water temperature and photoperiod also influence the timing of spawning.

Historically, splittail could be found in the upper reaches of the Sacramento River. Today, Red Bluff Diversion Dam appears to be a complete barrier to upstream movement (CDFG 1989). The presence of splittail in the Sacramento River and its tributaries (including the lower American River) is believed to be largely restricted to their upstream and downstream movements associated with spawning. Juvenile splittail are not believed to use the Sacramento River or its tributaries for rearing to a great extent (USFWS 1994a). Downstream emigration into the Delta is believed to peak during the period April through August (Meng and Moyle 1995).

Low numbers of splittail have been collected in the lower American River. CDFG has conducted fish sampling surveys on the lower American River annually from 1991 through 1995 (Brown et al. 1992; Snider and McEwan 1993; Snider and Keenan 1994; Snider and Titus 1994; Snider and Titus 1996). The fish sampling surveys were conducted from approximately January through June, when adult and larval splittail would likely be in the river. Splittail were collected in very low numbers, primarily at the lowest sampling station located downstream of Interstate Business 80 (RM 4) (Brown et al. 1992). All splittail captured in 1991 were young-of-the-year. Only two splittail have been captured above RM 9.

Hardhead (*Mylopharodon conocephalus)*

Hardhead is a large (occasionally exceeding 600 mm standard length), native cyprinid species that generally occurs in large, undisturbed low- to mid-elevation rivers and streams of the region (Moyle 1976). They are widely distributed throughout the Sacramento-San Joaquin River system. Spawning migrations, which occur in the spring, into smaller tributary streams are common. The spawning season may extend into August in the foothill streams of the Sacramento and San Joaquin river basins. Little is known about lifestage-specific temperature requirements of hardhead;

however, temperatures ranging from approximately 65°F to 75°F are believed to be suitable (Cech et al. 1990). Hence, this species has greater thermal tolerance compared to that of the anadromous salmonids discussed above.

Delta Smelt (*Hypomesus transpacificus*)

The USFWS listed delta smelt as a threatened species under the ESA in March 1993 (CFR 58 12854), and critical habitat for delta smelt was designated on December 19, 1994. Delta smelt also is listed as threatened under the CESA.

Delta smelt is a short-lived, slender-bodied, translucent fish endemic to the Delta. Adult size is typically 60-70 mm, although some individuals as large as 120 mm standard length have been recorded (USFWS 1994a). As a euryhaline species, delta smelt can tolerate wide-ranging salinities, but rarely occur in waters with salinities greater than 10-14 ppt. Historically, they have been abundant in low (around 2 ppt) salinity habitats. Delta smelt typically live for only one year but some can live for two years. At all life stages they are found in greatest abundance in the top two meters of the water column and usually not in close association with the shoreline, inhabiting open surface water of the Delta and Suisun Bay. Critical thermal maximum for delta smelt, the temperature at which smelt can no longer survive as determined by laboratory studies, is 25.4°C (plus or minus 1.7°C).

Critical habitat for delta smelt is defined (USFWS 1994c) as:

> "Areas and all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma Sloughs; and the existing contiguous waters contained within the Delta."

When not spawning, adult delta smelt tend to concentrate just upstream from the entrapment zone (the saltwater-freshwater interface) (USFWS 1994a), the location of which varies daily, seasonally, and annually in response to tidal action and the volume of freshwater inflow to the Delta. Adults migrate from brackish water areas to freshwater areas to spawn during the winter. The adult migration may begin in October and continue through April, but movement peaks during the period December through April (USFWS 1994a). The adults and young-of-the-year remain in the spawning areas until late summer, when they begin emigrating downstream. In the Sacramento River, delta smelt have been found as far upstream as the confluence with the American River (USFWS 1994a). Delta smelt lay adhesive eggs that are believed to attach to tree limbs or small rocks. Eggs hatch after approximately 11-13 days and smelt become free-floating larvae. The larvae are difficult to detect with fish sampling gear and are not detectable in the standard fish salvage sampling at the CVP and SWP fish facilities.

In drier years, spawning is often concentrated on the Sacramento River side of the Delta, especially near the Cache Slough area. In wetter years, spawning is widespread and can occur as far west as the Napa River, as it did during 1997. A large young-of-the-year delta smelt population often results in higher "take" at the CVP and SWP pumping facilities.

Stressors for delta smelt and longfin smelt include several factors related to entrainment, species production, habitat quality/availability, as well as other factors. Entrainment concerns include those for CVP/SWP facilities, DWR-owned diversions, Reclamation owned diversions, private diversions (e.g., Contra Costa Water District), Mirant Pittsburg and Contra Costa power plants, and North Bay Aqueduct. Factors concerning species production include: insufficient food supplies/location, reduced suitable spawning habitat, reduced suitable rearing habitat, reduced seasonal availability of adult habitat, competition, water quality problems (e.g., reduced DO, seasonal salinity gradients, and TSS), and levee construction/island reclamation. Habitat quality and availability issues involve; sediment input, reclamation/land conversions, agricultural/urban development, reduced seasonal transport flows, reduced upstream attraction flows, reduced riparian vegetation, channelized riprap levees, expansion of non-native species (e.g., *Egeria*), upstream impoundment storage, flood control operations, and island subsidence. Other sources of mortality that have been noted include; CVP/SWP salvage, Clifton Court predation, exposure to toxics, predation, propeller entrainment, harvest, illegal harvest, and disease.

Continued challenges will be faced by fisheries managers as they strive to understand and better manage to increase the resilience of this species. Facing them will be several factors including; reduced genetic integrity and diversity, reduced population abundance, reduced population geographic distribution, reduction in independent populations, adaption to variability, reductions in habitat diversity, frequency of chaotic events, changes in long-term seasonal hydrology (i.e., from climate-induced changes – diminishing snowpack and shifts in precipitation events), and potential future sea level rise.

CDFG conducts four types of monitoring surveys through the year to determine distribution of juvenile, sub-adult and adult delta smelt. In two cases, abundance indices have been calculated historically. These indices provide an indication of general trends in smelt abundance over the years. The abundance indices also provide an indication of the year to year trends in smelt abundance based on the number of fish caught in each survey.

Two of these monitoring surveys, the Fall Mid-Water Trawl and the Summer Tow Net Survey, have been conducted since the 1960s. These surveys are undertaken in a consistent manner each year allowing for effective trend analysis over time. Such data, however, are not indicative of actual population estimates, which would have to make assumptions about the effectiveness of the sampling equipment, distribution of smelt, volume of water sampled by the equipment, and other factors. To date, it has been difficult to garner scientific consensus regarding these assumptions.

In addition to the surveys, the number of fish salvaged at the CVP and SWP facilities may provide an indication of the presence of delta smelt in the south Delta channels. However, the SWP has the 31,000 AF maximum capacity Clifton Court Forebay in front of its Harvey O. Banks (Banks) Pumping Plant, while the CVP William Jones (Jones) Pumping Plant and salvage facilities divert directly from the south Delta channels. Accordingly, the CVP facility is, in many ways, more reliable as a sampling “instrument” of the south Delta channels than the SWP facility, especially in June and July. Delta smelt may spawn in the Clifton Court Forebay or, juveniles may move into the Forebay earlier in the year and, therefore, the juveniles salvaged at the SWP facility in June and July may reflect those fish already in the Clifton Court Forebay and not those from the south Delta channels.

The CDFG sample adult delta smelt from mid-January into April or May as part of their Spring Kodiak Trawl survey. Sampling is conducted every other week, taking four to five days and sampling some 39 stations (from the Napa River to Stockton on the San Joaquin River, and to Walnut Grove on the Sacramento River).

The CDFG's 20 mm survey provides information of the distribution and relative abundance of post-larval and juvenile delta smelt at up to 41 locations throughout their historical range from March through June, or July. The surveys take eight to ten days and are conducted bi-weekly. The sampling equipment is designed to detect juveniles between 20 mm and 50 mm in length.

Green Sturgeon (*Acipenser medirostris)*

NOAA's Fisheries received a petition in June 2001 from several environmental organizations requesting that the agency list the north American green sturgeon (*Acipenser medirostris*) under the federal ESA. On January 29, 2003, NOAA Fisheries announced its determination that listing green sturgeon was not warranted at that time. However, due to the remaining uncertainties that existed at the time about the population structure and overall status of the species, NOAA Fisheries added two distinct population segments of green sturgeon to its list of candidate species. On April 6, 2005, the species was proposed for listing by NOAA Fisheries as threatened under the federal ESA. This included only those species south of the Eel River, California (the southern DPS). This species was listed a year later on April 7, 2006, when the southern DPS was listed as threatened under the federal ESA. On September 8, 2008, NOAA Fisheries proposed to designate critical habitat for the southern DPS; the comment period on this proposal closed on December 22, 2008.

Green sturgeon is an anadromous species, migrating from the ocean to freshwater to spawn. They exist in the Sacramento River system, as well as in the Eel, Mad, Klamath, and Smith rivers in the northwest portion of California. Adults of this species tend to be more marine than the more common white sturgeon. Nevertheless, spawning populations have been identified in the Sacramento River (Beak Consultants 1993), and most spawning is believed to occur in the upper Sacramento River. Fertilization of eggs occurs in the water column of relatively fast-flowing rivers (Emmett et al. 1991 *in* Moyle et al. 1992). In the Sacramento River, green sturgeon presumably spawn at temperatures ranging from 46°F to 57°F (Beak Consultants 1993). Small numbers of juvenile green sturgeon have been captured and identified each year from 1993 through 1996 in the Sacramento River at the Hamilton City Pumping Plant (RM 206) (Brown, pers. comm. 1996). Lower American River (Gerstung 1977), fish surveys conducted by the CDFG in recent years have not collected green sturgeon (Snider, pers. comm. 1997).

Longfin Smelt (*Spirinchus thaleichthys)*

On April 8, 2009, the USFWS announced that the Bay-Delta population of longfin smelt does not meet the legal criteria for protection as a species subpopulation under the federal ESA. The 2007 petition specifically asked to list as a DPS only the population that lives in Bay-Delta. The petition asserted that the Bay-Delta longfin smelt are physically isolated, genetically different, and live in a unique setting.

Longfin smelt is also a euryhaline species. This is particularly evident in the Delta where they are found in areas ranging from almost pure seawater upstream to areas of pure freshwater. In this system, they are most abundant in San Pablo and Suisun bays (Moyle 1976). The longfin smelt spends the early summer in San Pablo and San Francisco bays, generally moving into Suisun Bay in August. Spawning occurs in the winter months when this species congregates in upper Suisun Bay and the upper reaches of the Delta (Moyle 1976). Young longfin smelt move downstream and back into the bays in April and May (Ganssle 1966).

4.6.3. Potentially Affected Waterbodies

Shasta, Keswick, and Trinity Reservoirs

Shasta Reservoir is a deep reservoir supporting a wide variety of cold and warmwater fish species. Fish inhabiting the reservoir include several species of trout, landlocked salmon, Sacramento sucker, Sacramento squawfish, largemouth and smallmouth bass, channel catfish, white catfish, threadfin shad, and common carp. Water surface elevations in this reservoir generally fluctuate by approximately 55 feet over the course of a year. The reservoir's littoral (i.e., nearhshore shallows) habitats are often subject to physical perturbations caused by the water surface fluctuations and shoreline wave action resulting from wind and boating activities.

Keswick Reservoir, the area between Shasta and Keswick dams, serves as a regulating afterbay for Shasta Reservoir. It is characterized as a coldwater impoundment that supports a rainbow and brown trout sport fishery. Keswick Dam is a complete barrier to the upstream migration of anadromous fish in the Sacramento River. Some of the migrating anadromous fish impeded at the dam are captured in a fish trap at the dam and transported to the Coleman National Fish Hatchery located on Battle Creek (southeast of the town of Anderson).

Trinity Reservoir, an impoundment resulting from Trinity Dam, lies on the Trinity River. A portion of the water from this reservoir is directed through the Clear Creek Tunnel into Whiskeytown Reservoir and then into Keswick Reservoir. This water mixes with water from Shasta Reservoir and is released in the Sacramento River from Keswick Dam. Trinity Reservoir supports both warm- and coldwater fish species. Common species include smallmouth bass, largemouth bass, white catfish and rainbow trout.

Figure 4.6-1, Potentially Affected Reservoirs, Rivers and the Delta, shows the geographic extent of the various waterbodies and watercourses that make up, essentially, the CVP/SWP and support fisheries that could be affected by the Proposed Action and its alternatives. As noted in previous discussions regarding the hydrologic impact framework, the upper Sacramento River basin reservoirs (e.g., Shasta) are an integral component of the CVP and play an important role in coordinated CVP/SWP operations, including those as geographically distant as the Bay-Delta. Operations (i.e., coldwater pool management, flow releases, storage forecasts, etc.) in these reservoirs represent an important means of gauging downstream fisheries protection.

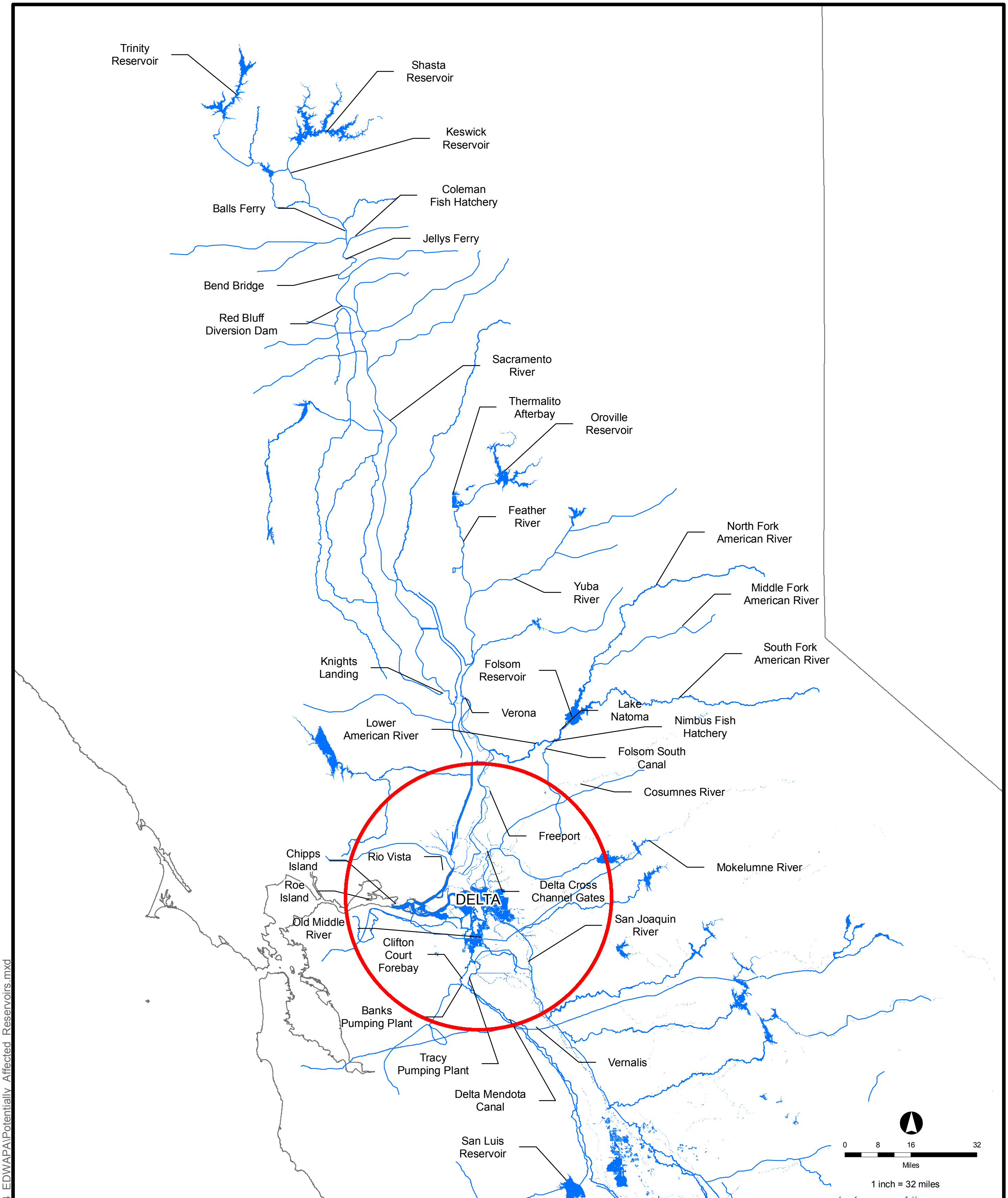

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Figure 4.6-1
Potentially Affected Reservoirs, Rivers, and the Delta

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Upper Sacramento River

The upper Sacramento River is often defined as the portion of the river from Princeton (RM 163), the downstream extent of salmonid spawning in the Sacramento River and Keswick Dam, the upstream extent of anadromous fish migration. The Sacramento River serves as an important migration corridor for anadromous fish moving between the ocean and/or Delta and their upper river/tributary spawning and rearing areas. The upper Sacramento River is differentiated from the river's "headwaters", which lie upstream of Shasta Reservoir. The upper Sacramento River provides a diversity of aquatic habitats, including fast-water riffles and shallow glides, slow-water deep glides and pools, and off-channel backwater habitats.

In excess of 30 species of fish are known to use the upper Sacramento River. Of these, a number of both native and introduced species are anadromous. Anadromous species include Chinook salmon, steelhead, green and white sturgeon, striped bass and American shad. The upper Sacramento River is of primary important to native anadromous species, and is presently utilized for spawning and early-life-stage rearing, to some degree, by all four runs of Chinook salmon (i.e., fall, late-fall, winter, and spring-runs) and steelhead. Consequently, various life stages of the four races of Chinook salmon and steelhead can be found in the upper Sacramento River throughout the year. Other Sacramento River fishes are considered resident species, which complete their life cycle entirely within freshwater, often in a localized area. Resident species include rainbow and brown trout, largemouth and smallmouth bass, channel catfish, sculpin, Sacramento squawfish, Sacramento sucker, hardhead, and common carp.

An important component of aquatic habitat throughout the Sacramento River system is referred to as Shaded Riverine Aquatic Cover (SRAC). SRAC consists of the portion of the riparian community that directly overhangs or is submerged in the river. SRAC provides high value feeding and resting areas and escape cover for juvenile anadromous and resident fishes. SRAC can also provide some degree of local temperature moderation during the summer months due to the shading it offers nearshore habitat areas. The importance of SRAC to Chinook salmon has been known for many years. In early summer, juvenile salmon have been found almost exclusively in areas of SRAC, with none observed in nearby rip-rapped areas.

Lower Sacramento River

The lower Sacramento River is generally defined as that portion of the river from Princeton to the Delta, at approximately Chipps Island (near Pittsburg). The lower Sacramento River is predominantly channelized, leveed and bordered by agricultural lands. Aquatic habitat in the lower Sacramento River is characterized primarily by slow-water glides and pools, is depositional in nature, and has reduced water clarity and habitat diversity, relative to the upper portion of the river. Much of the embankment is rip-rapped; this is where much of the current levee improvement work being undertaken by the Department of Water Resources and Corps of Engineers is focused.

Many of the fish species utilizing the upper Sacramento River also use the lower river to some degree, even if only as a migratory corridor to and from upstream spawning and rearing grounds. For example, adult Chinook salmon and steelhead primarily use the lower river as an immigration route to upstream spawning habitats and an emigration route to the Delta. The lower river is also used by other fish species (e.g., Sacramento splittail and striped bass) that make little to no use of the upper river (i.e., upstream of RM 163). Overall, fish species composition in the lower river is quite similar to that of the upper Sacramento River and includes resident and anadromous cold- and warmwater species. Many fish species that spawn in the Sacramento River and its tributaries depend on river flows to carry their larval and juvenile life stages to downstream nursery habitats. Native and introduced warmwater fish species primarily use the lower river for spawning and rearing, with juvenile anadromous fish species also using the lower river, to some degree, for rearing.

Sacramento-San Joaquin River Delta (Delta)

The Delta, along with San Francisco Bay, comprise the largest estuary on the western coast of the U.S. Its importance to fisheries resources is supported by the over 120 fish species that rely on its unique habitat characteristics for one or more of their life-stages (e.g., spawning, out-migration, immigration spawning corridor, over-summer rearing, etc.). Fish species found in the Delta include anadromous species, as well as freshwater, brackish water, and saltwater species. Delta inflow and outflow are important for species residing primarily in the Delta (e.g., delta smelt and longfin smelt) as well as juveniles of anadromous species (e.g., Chinook salmon) that rear in the Delta prior to ocean entry. Seasonal Delta inflows affect several key ecological processes, including; 1) the migration and transport of various life stages or resident and anadromous fishes using the Delta, 2) salinity levels at various locations within the Delta as measured by the location of X2 (i.e., the position in kilometers eastward from the Golden Gate Bridge of the 2 ppt near-bottom isohaline), and 3) the Delta's primary (phytoplankton) and secondary (zooplankton) production.

Middle Fork American River

The Middle Fork American River supports both warm- and coldwater fish species year-round. Operation of PCWA's MFP, constructed in 1962 (including Ralston Afterbay), results in cooler summer and fall water temperatures, thereby improving habitat suitability for rainbow trout and brown trout for a portion of the river below Ralston Afterbay.[146,147] Brown trout are resident stream fish, meaning they spend their entire lifecycle in fresh water as distinct from anadromous fish. Spawning generally occurs during November and December.[148] Brown trout fry typically hatch in seven to eight weeks, depending on water temperature, with emergence of young three to six weeks later.

Optimal riverine habitat for brown trout reportedly consists of cool to coldwater, silt-free rocky substrate, an approximate 1:1 pool-to-riffle ratio, and relatively stable water flow and temperature regimes (Raleigh et al. 1986). Moyle reported that while brown trout will survive for short periods at temperatures in excess of 80.6°F, optimum temperatures for growth range from 44.6°F to 66.2°F,

146 Corps 1994.
147 U.S. Bureau of Reclamation, 1996.
148 P.B. Moyle, *Inland Fishes of California*, 1976.

with a preference for temperatures in the upper half of this range.[149] Brown trout tend to utilize lower reaches of low to moderate gradient areas (less than one percent) in suitable, high gradient rivers.[150]

As with brown trout, rainbow trout also are resident stream fish whose optimal riverine habitat reportedly consists of coldwater, silt-free rocky substrate, a 1:1 pool-to-riffle ratio, and relatively stable water flow and temperature regimes (Raleigh and Duff 1980 *in* Raleigh et al. 1984). Moyle reported that while rainbow trout will survive temperatures up to 82.4°F, optimum temperatures for growth and completion of most lifestages reportedly range from 55.4°F to 69.8°F. Rainbow trout spawning generally occurs from February to June. Rainbow trout fry emerge from spawning nests approximately 45 to 75 days after spawning, depending on water temperatures.[151]

In addition to rainbow and brown trout, fish sampling surveys of the Middle Fork American River conducted by the USFWS in 1989 from Ralston Afterbay downstream to the confluence documented the presence of hitch (*Lavinia exilicauda)*, Sacramento sucker (*Catostomus occidentalis*), pikeminnow (*Ptychocheilus grandis*), and riffle sculpin (*Cottus gulosus*).[152] No federal- or state-listed species or species proposed for listing under the federal ESA and CESA are reported in the Middle Fork American River.

North Fork American River

Downstream of its confluence with the Middle Fork, the North Fork American River supports warmwater fish species year-round, including smallmouth bass (*Microprterus dolomieu*), pikeminnow, Sacramento sucker, riffle sculpin, brown bullhead (*Ictalurus nebulosus*), and green sunfish (*Lepomis cyanellus*). Although some rainbow and brown trout are present, summer and fall water temperatures are generally too warm for significant spawning and early-lifestage rearing of trout. The majority of trout that do occur in the North Fork American River below the Middle Fork American River are believed to be transitory downstream adult and/or sub-adult migrants that have dispersed into the area from upstream habitats (i.e., Middle Fork American River).

The PCWA American River Pump Station intakeis screened. Flat panels are recessed into the invert of the new diversion channel with wedge wire at 0.5 mm spacing.

Folsom Reservoir

In terms of aquatic habitat, the warm epilimnion of Folsom Reservoir provides habitat for warmwater fishes, whereas the reservoir's lower metalimnion and hypolimnion form a "coldwater pool" that provides habitat for coldwater fish species throughout the summer and fall portions of the year. Hence, Folsom Reservoir supports a "two-story" fishery during the stratified portion of the year (i.e., April through November), with warmwater species using the upper, warmwater layer and coldwater species using the deeper, colder portion of the reservoir.

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149 P.B. Moyle, *Inland Fishes of California*, 1976.
150 Raleigh et al. 1986.
151 Raleigh et al. 1986.
152 Corps 1991.

Black bass, sunfish, and catfish constitute the primary warmwater sport fisheries of Folsom Reservoir. The reservoir's coldwater sport species include rainbow and brown trout (*Oncorhynchus mykiss* and *Salmo trutta*, respectively), kokanee salmon (*Oncorhynchus nerka*), and Chinook salmon (stocked). The reservoir's coldwater pool is important not only to the reservoir's coldwater fish species, but is also important to lower American River steelhead and fall-run Chinook salmon. Seasonal releases from the reservoir's coldwater pool provide thermal conditions in the lower American River that support annual in-river production of these salmonid species. Reduction of the reservoir's coldwater pool may reduce the volume of coldwater that is available to be released in any given year into the lower American River to benefit the river's steelhead and fall-run Chinook salmon populations. Folsom Reservoir's annual coldwater pool volume is not sufficiently large to facilitate coldwater releases during the warmest months (i.e., July through September) to provide maximum thermal benefits to lower American River steelhead and coldwater releases during October and November that would maximally benefit fall-run Chinook salmon immigration, spawning, and incubation. Consequently, optimal management of the reservoir's coldwater pool on an annual basis is essential in order to provide the optimal thermal benefits to both steelhead and fall-run Chinook salmon, within the constraints of annual coldwater pool availability. This has been discussed previously as part of Reclamation's coordination with the AROG.

Lower American River

The lower American River provides a diversity of aquatic habitats, including shallow, fast-water riffles, glides, runs, pools, and off-channel backwater ponds and related habitats. The lower American River from Nimbus Dam (RM 23) to approximately River Bend Park (RM 14) is primarily unrestricted by levees, but is bordered by some developments on high cliff scarps. The river along this reach is hydrologically controlled by natural bluffs and terraces cut into the side of the channel. The river reach downstream of River Bend Park, and extending to its confluence with the Sacramento River (RM 0) is bordered by levees. The historic construction of levees and, their continual improvements, have changed the natural channel geomorphology and have resulted in a reduction in current velocities and meanders, and an increase in overall stream length.

The river is utilized by over 30 species of fish, including numerous resident native and introduced species, as well as several anadromous species. A number of species are of primary management concern due either to their declining status or their importance to recreational and/or commercial fisheries. These include Chinook salmon (fall-run), steelhead, Sacramento splittail, striped bass and American shad.

Historically, the majority of fall-run Chinook salmon and steelhead spawning and rearing habitat within the American River was located in the watershed above what is now Folsom Dam. The lower American River currently provides spawning and rearing habitat for fall-run Chinook salmon and steelhead below Nimbus Dam. The majority of the steelhead run is believed to be of hatchery origin. However, with the exception of an emergency release during January 1997 due to poor water quality caused by flooding, no stocking of steelhead directly into the lower American River has occurred since 1990.

Current fall-run and Chinook salmon and steelhead production within the lower American River is believed to be limited, in part, by inadequate instream flow conditions and excessively high water temperatures during portions of their freshwater residency in the river. High water temperatures during the fall can delay the onset of spawning by Chinook salmon, and river water temperatures can become unsuitably high for juvenile salmon rearing during spring and steelhead rearing during summer. Relatively low October and November flows, when they occur, tend to increase the amount of fall-run Chinook salmon redd superimposition, thereby limiting initial year-class strength.

Lake Natoma

Lake Natoma was constructed to serve as a regulating afterbay for Folsom Reservoir. Consequently, water surface elevations in Lake Natoma fluctuate three to seven feet on a daily and weekly basis. During most of the year, Lake Natoma receives controlled releases from Folsom Reservoir. Due to its small size (i.e., operating range of 2,800 AF) and rapid turnover rate, the lake has relatively little influence on water flowing through it, with the possible exception of water temperature. As residence time in the lake increases during warm summer months, warming of water released from Folsom Reservoir increases. Water released is from Lake Natoma into the lower American River at Nimbus Dam.

Lake Natoma supports many of the same fisheries found in Folsom Reservoir (e.g., rainbow trout, bass, sunfish, and catfish). Some recruitment of warmwater and coldwater fishes likely comes from Folsom Reservoir. In addition, the CDFG stocks catchable-size rainbow trout into Lake Natoma annually. Although supporting many of the same fish species found in Folsom Reservoir, Lake Natoma's limited primary and secondary production, colder epilimnotic water temperatures (relative to Folsom Reservoir), and daily elevation fluctuations are believed to reduce the size and annual production of many of its fish populations, relative to Folsom Reservoir. Lake Natoma's characteristics, coupled with limited public access, result in its lower angler use compared to Folsom Reservoir.

Nimbus Fish Hatchery

The CDFG operates the Nimbus Salmon and Steelhead Hatchery and the American River Trout Hatchery, which are both located at the same facility immediately downstream from Nimbus Dam. This hatchery facility (henceforth, referred to as the Nimbus Hatchery) receives its water supply directly from Lake Natoma.

The Nimbus Hatchery is devoted to producing anadromous fall-run Chinook salmon and steelhead. Recent production goals have been 4 million smolt-sized (60 fish/lb) fish. The hatchery fish ladder is opened to fall-run Chinook salmon annually when the average daily river temperature declines to approximately 60°F, which generally occurs in October or early November. The fall-run Chinook salmon produced are released directly into the Delta. In the event that the hatchery's inventory of Chinook salmon requires reduction prior to releasing all of the year's production, Chinook salmon fry are released into the Sacramento River at either Miller Park or Garcia Bend.

Immigrating adult steelhead typically begin arriving at the hatchery fish ladder in December. Peak steelhead egg collection generally occurs during January and February, but sometimes continues through March. Recent production goals for steelhead have been 430,000 yearling (4 fish/lb) fish, which are released into the Sacramento River at either Miller Park or Garcia Bend. Steelhead are no longer stocked directly into the lower American River on a regular annual basis. In the event that water temperatures become too high to successfully rear juvenile steelhead through the summer, these fish are generally transported to rearing facilities at the hatcheries on the Feather and Mokelumne rivers.

The Nimbus Hatchery also produces non-anadromous rainbow trout stocks. In 1997, the goal was 736,000 catchable (2 fish/lb), 280,000 sub-catchable (6-16 fish/lb) and 1.4 million fingerling rainbow trout. These trout are stocked into numerous waterbodies throughout the region.

The Nimbus Hatchery receives water for its operations from Lake Natoma via a 60-inch pipeline. Water temperatures in the hatchery are dictated by the temperature of water diverted from Lake Natoma which, in turn, is primarily dependent upon the temperature of water released from Folsom Reservoir, meteorological conditions, and retention time in Lake Natoma. The temperatures of water diverted from Lake Natoma for hatchery operations is frequently higher than that which is optimal (i.e., 55-56°F) for hatchery production of rainbow trout, steelhead, and Chinook salmon. Under such conditions, more suitable temperatures may be achieved by increasing releases at Folsom Dam and/or releasing colder water from a lower elevation within the reservoir via the release shutters at the power penstocks of Folsom Dam. However, seasonal releases from Folsom Reservoir's limited coldwater pool to benefit hatchery operations must be considered together with seasonal in-river benefits from such releases.

4.6.4. Regulatory Framework

For fisheries resources and associated aquatic habitats, the regulatory framework at the federal, State, and local levels is comprehensive. Fisheries resources remain at the forefront of water resource management mandates throughout the CVP, OCAP operations, and COA. These are reflected clearly in the ongoing and new efforts and initiatives focusing on fisheries and associated ecosystem health across California.

Management of non-anadromous fish and other aquatic biological resources (including habitats) are the responsibility of the U.S. Fish & Wildlife Service (USFWS). Management of anadromous fish is the responsibility of the National Marine Fisheries Service, NOAA (NOAA Fisheries). The California Department of Fish & Game (CDFG) serves as the State trustee for aquatic species. Sensitive aquatic resources are regulated by the federal Endangered Species Act, as well as the California Endangered Species Act. Some of the relevant statutes, regulations, and policy/programs affecting fisheries resources in California are set out below.

Central Valley Project Improvement Act (CVPIA)

Over the past two decades, no other regulatory action has had as significant an influence on California water management practices and related aquatic resources as the passing of the CVPIA in 1992. The CVPIA amended previous authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic water supply uses, and fish and wildlife enhancement having an equal priority with power generation. Accordingly, inherent in the CVPIA are several measures intended to gauge the balanced needs for fish and wildlife, recreation, water supply, and hydropower.

Significant among these measures is the broad goal identified as the Anadromous Fish Restoration Program (AFRP), under Section 3406 (b) of the CVPIA which states:

> "…develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in the Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991…".

Clearly, these goals have not been met; recent declines in anadromous fish species and in-Delta species (as previously discussed) are important indicators in the current state of fisheries health in California waterways.

Of particular relevance under the CVPIA is directed under Section 3406(b)(2) which mandates the dedication of 800,000 AF annually of CVP yield for the primary purpose of implementing the various fish, wildlife, and habitat restoration measures authorized by Title 34 (P.L.102-575). Project yield is defined as the delivery capability of the CVP during the drought period of 1928-34 as it would have been with all facilities and requirements on the date of enactment of the CVPIA (October 30, 1992) in place.

On May 9, 2003, Reclamation clarified its November 20, 1997 policy (see Department of the Interior's Final Administrative Proposal on the Management of Section 3406(b)(2) Water) with a document entitled, Department of the Interior, Decision on Implementation of Section 3046 (b)(2) of the Central Valley Project Improvement Act. This Decision provided much-needed clarification on the calculation of CVP yield and the accounting methodologies used for such purposes including upstream actions, Delta actions, and any limitations on Delta actions. The Decision further authorizes the modification of CVP operations to provide flows of necessary quantity, quality, timing, including the timing of exports, for fishery purposes. Finally, the Decision provides further explanation regarding water banking, transfers, exchanges, water to meet Water Quality Control Plan/ESA obligations and shortage criteria. Currently, Reclamation relies on the B2IT, EWA Team and the Water Operations Management Team (WOMT) to coordinate the (b)(2) fishery action.

Ecosystem Restoration Program Plan of the CALFED Bay-Delta Program

CALFED's Bay-Delta Program was originally developed as a long-term comprehensive plan for ecosystem health restoration and the improvement of water management practices within the Bay-Delta ecosystem. The program was intended to address four resource areas: ecosystem quality, water quality, system integrity, and water supply reliability. The CALFED Ecosystem Restoration Program Plan (ERPP) was designed to improve and increase aquatic and terrestrial habitats and improve ecological functions necessary to support sustainable populations of diverse and valuable plant and animal species.

Key restoration actions for Sacramento River fisheries included the following: enhancement of river flows, restoration of natural river meanders process, enhancement of riparian and riverine habitats, maintenance of suitable river water temperatures for salmonids, reduction of fish losses at water diversion intakes, improvement of anadromous fish passage at existing barriers, maintenance and improvement in water quality, improvements in hatchery and stocking programs, and improvements in the management of inland harvest salmonids.

Environmental Water Account (EWA)

The original Environmental Water Account (EWA) was established in 2000 by the CALFED ROD. The operating criteria are described in detail in the EWA Operating Principles Agreement, an attachment to the ROD. In 2004, the EWA was extended to operate through the end of 2007 and, may be reasonably expected to again be extended through 2011. Reclamation, USFWS, and NOAA Fisheries have received congressional authorization to participate in the EWA at least through September 30, 2010, as per the CALFED Bay-Delta Authorization Act (P.L. 108-361). However, for these agencies to continue to participate beyond that date, additional authorization will be required.

The EWA agencies acquire assets and determine how the assets should be used in order to best benefit the at-risk native fish species of the Bay-Delta. Operation of the EWA Program is guided by the EWA Team (EWAT), which is comprised of technical and policy representatives from each of the five EWA Agencies. The EWAT coordinates its activities with the WOMT.

The original purpose of the EWA was to enable diversions of water by the SWP and CVP from the Delta to be reduced at times when at-risk species may be harmed while, at the same time, preventing the uncompensated loss of water to both SWP and CVP contractors. Typically, the EWA replaced water loss due to curtailment of pumping by the purchase of surface and/or groundwater supplies from willing sellers and by taking advantage of regulatory flexibility and certain operational assets. Under the EWA's past operations (from 2001 through 2007), when there were pumping curtailments at Banks Pumping Plant to protect Delta fish, the EWA often owed a debt of water to the SWP.

The EWA Agencies are undertaking an environmental review to determine the future of the program. Since no decision has yet been made regarding the EWA, Reclamation analyzed the EWA as part of its project description for the OCAP Biological Assessment as having limited assets, focusing on providing assets to support Vernalis Adaptive Management Plan (VAMP) and, in some years, related actions such as the VAMP shoulders. The EWA assets will include the following:

- Implementation of the Yuba River Accord, Component 1 Water, which is an average 60,000 AF of water released annually from the Yuba River to the Delta, would be an EWA asset through 2015, with possible extension through 2025. The 60,000 AF is expected to be reduced by carriage water costs in most years, estimated at 20 percent, leaving an EWA asset of 48,000 AFA.
- Purchases of assets to the extent funds are available.
- Operational assets granted the EWA in the CALFED ROD:
    - A 50 percent share of SWP export pumping of (b)(2) water and ERP water from upstream releases;

- o A share of the use of SWP pumping capacity in excess of the SWP's needs to meet contractor requirements with the CVP on an equal basis, as needed (such use may be under the Joint Point of Diversion);
- o Any water acquired through export/inflow ratio flexibility;
- o Use of 500 cfs increase in authorized Banks Pumping plant capacity in the July through September period (from 6,680 to 7,180 cfs); and
- o Storage in project reservoirs upstream of the Delta, as well as in San Luis Reservoir, with a lower priority than project water. Such stored water will share storage priority with water acquired for Level 4 refuge needs.

For the period 2001 through 2006, these operational assets average 82,000 AF, with a range between 0 AF and 150,000 AF.

40 CFR 131.37 – Water Quality Standards (Subpart D – Federally Promulgated Water Quality Standards)

On July 1, 2005, new federal water quality standards were promulgated for California under 40 CFR 131.37. These new criteria are applicable to those waters specified in the Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, adopted originally by the State Water Resources Control Board in State Board Resolution No. 91-34 on May 1, 1991. Among others, the additional criteria include estuarine habitat criteria focusing on salinity measurements at the confluence of the Sacramento and San Joaquin rivers, Roe Island, and Chipps Island, in addition to fish migration criteria.

NOAA Fisheries – Biological Opinion for Winter-Run Chinook Salmon

On February 12, 1993, NOAA Fisheries (NMFS, at the time) issued a long-term BiOp regarding the operational impacts of the CVP on winter-run Chinook salmon. Based on Reclamation's Long-Term Central Valley Project Operations Criteria and Plan (CVP-OCAP) and the biological assessment of impacts, the BiOp concluded that the proposed long-term operations of the CVP and SWP would likely jeopardize the continued existence of winter-run Chinook salmon and identified Reasonable and Prudent Alternatives (RPAs) to avoid jeopardy.

On December 11, 2008, NOAA Fisheries released its Draft BiOp on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan. The purpose of the Draft BiOp is to determine, based on the best scientific and commercial information available, whether the Central Valley Project and State Water Project Operations Criteria and Plan, as proposed by Reclamation, is likely to jeopardize the continued existence of the following species: Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*, hereafter referred to as winter-run); Central Valley spring-run Chinook salmon (*O. tshawytscha*, hereafter referred to as spring-run); Central Valley (CV) steelhead (*O. mykiss*); Central California Coast (CCC) steelhead (*O. mykiss*); Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*, hereafter referred to as Southern DPS of green sturgeon); and Southern Resident killer whales (*Orcinus orca*, hereafter referred to as Southern Residents) or, destroy or adversely modify the designated critical habitat of the above salmon and steelhead species, or proposed critical habitat for Southern DPS of green sturgeon.

NOAA Fisheries concluded that, as proposed, the long-term continued operation of the CVP and SWP is not likely to adversely affect Central California Coast steelhead and their designated critical habitat. However, the long-term CVP and SWP OCAP is likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Southern DPS of North American green sturgeon. The long-term CVP and SWP OCAP is also likely to destroy or adversely modify critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and proposed critical habitat for the Southern DPS of green sturgeon. The consultation on the effect of that proposed action on Southern Resident killer whales is ongoing. Therefore, no conclusion was reached for that species. The final BiOp with the required Reasonable and Prudent Alternatives, Incidental Take Statements, and associated conservation recommendations were released on June 4, 2009.

USFWS Biological Opinion for Delta Smelt

With the signing of the Principles for Agreement for the Bay-Delta Plan, the USFWS agreed to initiate immediate re-consultation on the BiOp it had issued on February 4, 1994, which addressed the effects of the combined operations of the CVP and SWP on delta smelt for the period February 15, 1994, through February 15, 1995. In that opinion, the USFWS had concluded that the proposed operations of the CVP and SWP would result in jeopardy; therefore, RPAs were included in the BiOp consisting of specific operational criteria that the CVP/SWP would implement as part of their operational protocols.

On March 6, 1995, the USFWS issued a revised BiOp for delta smelt. This opinion stated that the proposed long-term combined CVP/SWP operations, as modified by the BiOp for winter-run Chinook salmon, the Principles for Agreement, and the Bay-Delta Plan, are not likely to jeopardize the continued existence of the threatened delta smelt or adversely modify its critical habitat. The opinion identifies the water quality standards along with the operational constraints that were to provide benefits to delta smelt.

The USFWS more recently, re-reviewed the listing status of the delta smelt and, on March 31, 2004, concluded that the species still faces a “high degree of threat” and should remain listed under the federal ESA. Most recently, the USFWS completed a BiOp on the long-term coordinated operations of the CVP and SWP (see below).

CVP-OCAP Biological Opinions

In February 2005, the USFWS issued a BiOp that analyzed the potential effects of the coordinated, long-term operation of the CVP and SWP, as part of Reclamation’s revised CVP-OCAP action, on delta smelt. As part of the litigation in the matter of *Natural Resources Defense Council et al., v. Dirk Kempthorne, San Luis & Delta Mendota Water Authority et al.,* (Case No. 05-CV-01207 OWW), the court held, on May 25, 2007, that the BiOp was “arbitrary and capricious” and “contrary to law”. The court maintained that an appropriate interim remedy must be implemented. The court ordered that the USFWS issue a new BiOp by September 15, 2008 (subsequently postponed to December 15, 2008). The USFWS issued its final BiOp on December 15, 2008. After reviewing the current status of the delta smelt, the effects of that proposed action and the cumulative effects, it was the USFWS's biological opinion that the coordinated operations of the CVP and SWP, as proposed, are likely to jeopardize the continued existence of the delta smelt. A full discussion of the consultation history, background, and current status of the consultation is provided in Chapter 10.0 (Consultation/ Coordination and Applicable Laws) and is not duplicated here.

SWP Pumping/CVP-OCAP

On April 28, 2007, the Alameda Superior Court made final its March 22, 2007, Proposed Order issuing a Writ of Mandate against the Department of Water Resources in a case brought by the Watershed Enforcers challenging the former's incidental take authority under the CESA for operation of the SWP pumping facilities. The Writ ordered the Department of Water Resources to cease and desist from further operation of the SWP Pumping Plant within 60 days from the date of entry of the judgment.

Bay-Delta Conservation Plan (BDCP)

State and federal agencies, along with numerous stakeholders, are developing a conservation plan for the Delta. The Bay-Delta Conservation Plan (BDCP) is intended to provide both State and federal agencies with the necessary authorization for State and federal water projects as well as their contractors. The following information is taken from the Bay-Delta Office of the DWR.

Reclamation is the Lead Agency under NEPA, and DWR is the Lead Agency under CEQA for the proposed BDCP EIS/EIR. The federal co-lead agencies under NEPA include NOAA Fisheries and the USFWS. The federal co-lead agencies have requested that both the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency participate in that EIS/EIR as cooperating agencies for the purposes of compliance with their regulatory programs such as the Clean Water Act.

Reclamation, DWR, along with the Metropolitan Water District of Southern California, Kern County Water Agency, Santa Clara Water District, Alameda County Flood Control and Water Conservation District, Zone 7, San Luis and Delta Mendota Water Authority, Westlands Water District, and Mirant Delta (known collectively as the "Potentially Regulated Entities" or PREs) are preparing the BDCP for their covered activities. It is the goal of the PREs that the BDCP follow a process that meets:

- The requirements of Section 10(a)(1)(B) of the ESA for non-federal PREs and result in the issuance of Incidental Take Permits (ITPs) from the USFWS and NOAA Fisheries;
- The requirements of an ITP under the California fish and wildlife protection laws, either pursuant to the Natural Community Conservation Planning Act, Section 2835 and/or Section 2081 of the Fish and Game Code; and
- The requirements of Section 7 of the ESA related to consultation with other federal agencies, resulting in the issuance of BiOps, including Incidental Take Statements (ITSs), from NOAA Fisheries and/or USFWS on specific activities of certain members of the PREs.

The BDCP is being developed by a Steering Committee of these State and federal water management and public trust resource agencies, water contractors, and non-governmental organizations (e.g., Nature Conservancy, Environmental Defense Fund, Defenders of Wildlife, California Farm Bureau, Natural Heritage Institute, The Bay Institute, etc.). The Friant Water Authority and the North Delta Water Agency become Steering Committee members on October 17, 2008.

The BDCP will likely consist of three primary elements: 1) actions to improve ecological productivity and sustainability in the Delta, 2) potential capital improvements to the water conveyance system, and 3) potential changes in Delta-wide operational parameters of the CVP and SWP associated with improved water conveyance facilities.

At this time, three general alternatives are being considered as they relate to the potential changes in the water conveyance system and CVP/SWP operations. These include: 1) a through Delta alternative, 2) a dual conveyance alternative, and 3) an isolated facility alternative.

When completed and approved, it will provide for conservation of the covered listed species, water supply reliability, regulatory assurances, and funding assurances for the implementation of identified conservation actions. These actions will contribute to the implementation of many parts (e.g., water quality, supply and ecosystem) of the CALFED Bay-Delta Program. While not intended to represent a comprehensive approach to ecosystem restoration of the Delta, the BDCP is focused on the conservation of species closely associated with aquatic habitats that may be affected by water conveyance actions through the Delta.

Species proposed for coverage in the BDCP are species that are currently listed as federal or State threatened or endangered or have the potential to become listed during the life of the BDCP and, additionally, have some likelihood to occur within the BDCP Planning Area. The covered species include:

- Central Valley steelhead (*Onchorhychus mykiss*)
- Central Valley Chinook salmon (*Onchorhynchus tshawytschia*) (spring-run, and fall/late-fall runs)
- Sacramento River Chinook salmon (*Onchorhynchus tshawytschia*) (winter-run)
- Delta smelt (*Hypomesus transpacificus*)
- Green sturgeon (*Acipenser medirostris*)
- White sturgeon (*Acipenser transmontanus*)
- Splittail (*Pogonichthys macrolepidotus*)
- Longfin smelt (Spirinchus thaleichthys)

Other species may be included in the BDCP include:

- Swainson's hawk (*Buteo swainsoni*)
- Bank swallow (*Riparia riparia*)
- Giant garter snake (*Thamnophis gigas*)
- Valley elderberry longhorn beetle (*Desmoceris californicus dimorphus*)

The purpose and project objectives are to achieve the following:

To be granted incidental take permits for the covered species that authorize take related to:

- The operation of existing State Water Project Delta facilities and construction and operation of facilities for the movement of water entering the Delta from the Sacramento Valley watershed to the existing State Water Project and Central Valley Project pumping plants located in the southern Delta;
- The implementation of conservation actions that have the potential to result in the take of species that are or may become listed under the ESA, pursuant to the ESA at §10(a)(1)(B) and its implementing regulations and policies; and
- The diversion and discharge of water by Mirant LLC for power generation in the western Delta.

To improve the ecosystem of the Delta by:

- Providing for the conservation and management of covered species through actions within the BDCP Planning Area that will contribute to the recovery of the species;
- Protecting, restoring, and enhancing certain aquatic, riparian, and associated terrestrial natural communities and ecosystems; and
- Reducing the adverse effects on certain listed species of diverting water by relocating the intakes of the SWP and CVP.

The completed BDCP is expected to cover a subset of species and habitats within CALFED's purview and provide a mechanism with which to address improvements. The Steering Committee anticipates that a Draft EIS/EIR will be available by the end of 2009. Environmental analysis for that EIS/EIR is fully underway; 12 scoping meetings across the BDCP Planning Area were held in March 2009. Final scoping comments on the EIS/EIR were accepted until May 14, 2009.

Sacramento Water Forum – Lower American River Flow Management Standard

As noted earlier in this document, over the past several years, the Water Forum, together with Reclamation, USFWS, NOAA Fisheries, CDFG, and various stakeholders, including the Environmental Caucus, have developed a new flow standard for the lower American River known as the Lower American River Flow Management Standard (or LAR FMS). This new proposed standard is the culmination of numerous previous efforts during the development of the Water Forum

Agreement in the mid-1990s to design a new flow regime for the river that would be “fish friendly”, maintain delivery allocations to local/regional water interests, remain consistent with ongoing changes in Folsom Dam and Reservoir flood control operations, and benefit instream habitat conditions in the lower American River.

The LAR FMS is intended to result in improved conditions for fish in the lower American River, particularly fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*). In addition, it is anticipated that the LAR FMS will comply with California Department of Fish and Game (CDFG) Code 5937, which requires that lower American River fish resources be maintained in “good condition.” The LAR FMS also is intended to be consistent with the NOAA Fisheries, Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units (2000).

The primary purpose of the proposed LAR FMS is to maximize the annual production and survival of the anadromous fall-run Chinook salmon and steelhead in the lower American River, within water availability constraints and in consideration of Reclamation's obligation to provide for multi-purpose, beneficial uses of the project. With improved habitat conditions for salmonids, the proposed LAR FMS also is expected to benefit other fish species within the lower American River. Development of an improved flow standard will:

- Improve currently required flow, water temperature, ramping rate, and flow fluctuation criteria;
- Establish a river management process for Folsom Reservoir and lower American River operations; and
- Monitor, evaluate, and report the resultant hydrologic and biologic conditions.

Each of the three primary elements of the LAR FMS is described below.

<u>Element One – Required Flows and Water Temperatures</u>

The required flow, water temperature, ramping rate, and flow fluctuation standards discussed below together comprise the first element of the LAR FMS; Required Flows and Water Temperatures. The primary objective of the Required Flows and Water Temperature element of the LAR FMS is to sustain increased habitat availability, while concurrently minimizing flow fluctuations and reductions, within the context of hydrologic uncertainty. Specifically, the required flow, water temperature, ramping rate, and flow fluctuation standards intend to:

- Provide the best possible flow and temperature based on water availability;
- Maximize the occurrence of target Chinook salmon and steelhead spawning flows;
- Stabilize flows during the Chinook salmon and steelhead egg incubation periods;
- Reduce month-to-month flow reductions to minimize juvenile salmonid stranding and isolation; and
- Manage flow releases and reservoir storage to effectively utilize coldwater pool availability.

Required Flow Standard

The required flow, as measured by the total release at Nimbus Dam, would vary throughout the year depending on the hydrology of the Sacramento and American rivers. As used in the flow standard, the term "required flow" is meant to describe the minimum required flow and does not preclude Reclamation from making higher releases at Nimbus Dam. Except for extremely dry conditions, from October through May required flows would be established between 800 cfs and 2,250 cfs. During June through September, required flows would be established between 800 cfs and 1,750 cfs. Actual required flow would be determined by specified conditions at biologically significant times of the year. For instance, during wetter years, the required flow would generally be higher, but not so high as to substantially reduce the coldwater pool volume in Folsom Reservoir by the end of summer. During drier years, the required flow would be reduced to most effectively utilize the limited availability of Folsom Reservoir storage and coldwater pool.

During the October through December period, the required flow would be based on an index of American River Basin carryover storage conditions. This index, referred to as the FRI (Four Reservoir Index), is calculated as the combined end-of-September storage in four reservoirs − French Meadows, Union Valley, Hell Hole, and Folsom. If, for example, the combined carryover storage in Folsom Reservoir and the upstream American River reservoirs was low, the required flow would be near 800 cfs; if carryover conditions were high, the required flow would be near 2,250 cfs. During October of each year, flows would be "stepped-up" until the required flow is met, at different rates depending on the magnitude of the required flow, as follows:

- Required Flows equal to 2,250 cfs
    - 250 cfs step increases from 1,500 cfs on October 1 to 2,250 cfs on November 9
        - Oct 1 to Oct 24 1,500 cfs
        - Oct 25 to Oct 31 1,750 cfs
        - Nov 1 to Nov 8 2,000 cfs
        - Nov 9 to Dec 31 2,250 cfs
- Required Flows between 2,250 cfs and 1,500 cfs
    - Incremental step increases from 1,500 cfs on October 1 to Required Flows on November 9
        - Oct 1 to Oct 15 Required Flows = 1,500 cfs
        - Oct 16 to Oct 31 Required Flows -500 cfs, or 1,500 cfs, whichever is greater
        - Nov 1 to Nov 8 Required Flows -250 cfs, or 1,500 cfs, whichever is greater
        - Nov 9 to Dec 31 Required Flows
- Required Flows less than or equal to 1,500 cfs
    - Implemented on October 1
    - Continue at same level through December 31

This "stepping-up" of flow, or increasing flow progression, was developed to maximize flow release utilization efficiency based on analysis of the last decade of fall-run Chinook salmon spawning distribution. In other words, more water is provided when more fish are expected to be spawning. In addition, the increasing flow progression is intended to minimize the incidence of redd superimposition.

During January and February, adjustments to the required flows would be based on the Sacramento River Index (SRI), an index of water year runoff for the entire Sacramento River Basin that is updated monthly. During this time, the fall-run Chinook salmon spawning period is completed, and the first part of the steelhead spawning period has begun. Based on the early January SRI, the January flow requirement may be modified from the December value. If the SRI predicts a critically dry year, then the January flow requirement would be set as 85 percent of the December requirement or 800 cfs, whichever is greater. If the SRI predicts a dry or normal year, then the January flow requirement remains the same as December. If the SRI predicts an above normal or wet year, the required flow would be set at 2,250 cfs. In February, the calculation is the same as the January routine, except the January flow is used as the basis.

Generally, by March, water supply availability and snow-pack conditions are reasonably certain for the remainder of the water year. At this time, knowledge of the actual available water supply can be used to make flow management decisions. Early in the spring, tradeoffs must be made between maintaining flows to sustain current habitat conditions versus reserving water supply for future releases to ensure that sufficient coldwater is available during both the steelhead over-summer rearing period and Chinook salmon spawning in the fall. From March through September, the required flow is based on the Impaired Nimbus Inflow Index (INI). The INI is defined as the May through September Folsom Reservoir inflow, minus May through September Folsom Reservoir diversions, minus May through September Folsom Reservoir evaporation, minus May through September Folsom South Canal diversions. Using the INI as an index, the flow requirement for the entire March through May period is established between 800 and 2,250 cfs. The same flow requirement is used for June through September, except the maximum flow requirement is capped at 1,750 cfs.

Conference Year Principles

Implementation of the required flows discussed above facilitates the release of available water for aquatic resources during all types of water years. The LAR FMS also recognizes agreements for water diversions, which are necessary because of the wide variation in runoff, ranging from over 6 MAF in one year to less than 400,000 AF in the driest water year on record. As defined in the Water Forum Agreement, "conference years" are those years when the projected March to November unimpaired inflow to Folsom Reservoir is less than 400,000 AF. It is during times of low runoff that demands on the available water supply are the greatest. Therefore, special provisions for conference years are included in the LAR FMS. A summary of these provisions is provided below. For a more detailed discussion regarding conference year principles, please refer to the Water Forum Agreement.

During conference years, water availability is insufficient to meet the lower American River instream needs, and provide the quantities of diversions specified in purveyor-specific agreements. Special provisions are necessary to deal with water management in these extremely dry years. Therefore, stakeholders agree to meet in these years to confer on how the available water supply should be managed to achieve, to the extent possible, both of the Water Forum's two co-equal objectives. The guiding principle will be for both instream and consumptive users to bear an equitable burden.

- Reclamation's water rights permit for operation of Folsom and Nimbus dams would include a minimum flow requirement of 190 cfs at the mouth of the American River. In extraordinary circumstances, the 190 cfs could be relaxed if reallocating that volume of water to another time in the year would be more beneficial for the fishery.
- In conference years, water purveyors agree to implement the highest level of conservation/rationing in their drought contingency plans.
- The River Management Group can recommend that the Water Forum Successor Effort, as defined in the Water Forum Agreement, meet and confer on operations in any year if called for by extraordinary circumstances.

These Conference Year Principles are intended to be included in the diversion agreements between Reclamation and purveyors signatory to the Water Forum Agreement that divert upstream of Nimbus Dam.

"Off-ramp" Criteria

Recent hydrologic modeling has identified some water years wherein total American River runoff is not as low as in conference years, yet the temporal distribution of runoff is such that the required flow in the lower American River below Nimbus Dam, identified in the proposed LAR FMS, could jeopardize other water right entitlements within the American River Basin. By the same token, during these years, subsequent water availability for appropriate instream flows and water temperatures could be reduced, thereby threatening adequate fish protection. To avoid: (1) infringement on other water rights; and (2) subsequent reductions of fish protection, "off-ramp" criteria were developed to allow relaxation of the required flow within the lower American River below Nimbus Dam.

The off-ramp criteria included as part of the LAR FMS allow the required flow to be less than 800 cfs (but greater than or equal to D-893 levels) if certain conditions are forecasted to occur. For the LAR FMS, Folsom Reservoir storage is used as a surrogate for other water rights. The off-ramp criteria is triggered if, at any time, Folsom Reservoir storage is forecasted to be less than 100,000 AF. Application of the off-ramp criteria is as follows:

- If, at any time between and including September 16 through December 31, Folsom Reservoir storage is forecasted to be less than 100,000 AF, then the required flow for the remainder of the period may be reduced to as low as 500 cfs, to preclude depletion of Folsom Reservoir storage; and
- If, at any time between and including January 1 through September 15, Folsom Reservoir storage is forecasted to be less than 100,000 AF, then the required flow for the remainder of the period may be reduced to as low as 250 cfs.

Water Temperature Standards

The proposed LAR FMS includes the following water temperature standards:

- Reclamation shall operate Folsom Dam and Reservoir and Nimbus Dam to meet daily average water temperatures of 60ºF or less, striving to achieve 56°F or less as early in the season as possible, in the lower American River at Watt Avenue from October 16 through December 31 for fall-run Chinook salmon spawning and egg incubation; and
- Reclamation shall operate Folsom Dam and Reservoir and Nimbus Dam to maintain daily average water temperatures that do not exceed 65°F in the lower American River at Watt Avenue from June 1 through October 15 for juvenile steelhead over-summer rearing.

Although the standards specify Watt Avenue as the location where water temperature compliance must be met, the proposed LAR FMS allows for alternative upstream compliance locations (up to Nimbus Dam) on occasions when the coldwater pool at Folsom Reservoir is insufficient to provide target water temperatures for fish. On these occasions, achieving the water temperature standard could jeopardize fish survival by causing a further depletion of the coldwater pool. Therefore, during these occasions, alternative locations can be designated by Reclamation after consultation and concurrence with the River Management Group.

There may be some instances in which factors beyond Reclamation's reasonable control may preclude the ability to meet the specified water temperatures during the indicated time periods, even at an alternative upstream location. Factors considered beyond the reasonable control of Reclamation include the amount of water in storage at Folsom Reservoir, the volume of the coldwater pool, ambient air temperatures, tributary inflow, and natural events such as prolonged droughts. On these occasions, the starting date of the specified water temperatures may need to be delayed. Reclamation shall immediately report instances when it is necessary to meet the daily water temperature requirements at alternative locations or time periods to the Chief of the Water Rights Division of the SWRCB (Chief of Division), and shall file an operation plan showing Reclamation’s strategy to meet the water temperature requirements.

This element of the proposed LAR FMS would work in conjunction with other projects designed to improve water temperatures in the lower American River that have been completed, are in progress, or are planned for completion. One such project is the installation of a water temperature control device for municipal and industrial water at Folsom Dam, completed by Reclamation in 2003. Additionally, the El Dorado Irrigation District plans to install a water temperature control device at its pumping plant on the South Fork American River arm of Folsom Reservoir. These devices will allow operators to draw water from various elevations in Folsom Reservoir, thereby most effectively conserving the coldwater pool. Also, the Sacramento Area Flood Control Agency is in the implementation phase of a project that will upgrade the shutter configuration serving the power penstocks at Folsom Dam to allow for increased operational flexibility.

Ramping Rate Standard

A ramping rate is the rate at which flows, released from a dam, are increased or decreased in a river. Since the majority of medium and low gradient gravel bars in the lower American River are inundated at about 4,000 cfs, the greatest threat of beach stranding occurs at flows less than or equal to 4,000 cfs. Decreases from relatively high flows that result in flows remaining above 4,000 cfs would be less likely to result in salmonid beach stranding.

The proposed LAR FMS includes the following ramping rate standards:

- Decreases in flow shall not exceed 100 cfs per hour when flows are less than or equal to 4,000 cfs during December through June to prevent possible stranding of fry-sized fall-run Chinook salmon and steelhead in the lower American River.

This ramping rate standard is directed toward preventing salmonid fry from stranding due to changes in water surface elevation (river stage). Information on the rate of water surface elevation change relative to flow provided by CDFG indicates that stage can decrease more than one inch per 100 cfs change in flow, when flows are less than or equal to 4,000 cfs. The gradual reduction of flows is intended to minimize "beach stranding" and provide conditions that are more conducive to the survival of fry-sized fall-run Chinook salmon and steelhead.

Flow Fluctuation Objectives

The release of relatively stable flows into the lower American River will help provide conditions that are more conducive to the protection of fall-run Chinook salmon and steelhead. Thus, the LAR FMS includes the flow fluctuation objectives described below. The flow fluctuation objectives would apply to the extent that lower American River flow fluctuations are controllable. Depending upon the amount of water in storage at Folsom Reservoir, tributary inflow, and other factors (e.g., flood events), flow fluctuations are not always controllable.

- Avoid flow increases to 4,000 cfs or more, year-round, to avoid significant losses of juvenile Chinook salmon and steelhead due to isolation.

Juvenile Chinook salmon and steelhead can become stranded, or isolated from the main channel of the river, when flows increase to levels that inundate side-channel or off-channel depressions and subsequently recede, trapping the fish in unconnected pockets of water. The actual effect of an isolation event appears to be directly related to the relative abundance of juvenile salmonids in the river, and the timing and duration of a potential isolation flow. According to CDFG, flow increases above 4,000 cfs, with subsequent decreases in flow to less than 4,000 cfs, have resulted in large numbers of juvenile salmonids stranded in isolated areas. Accomplishing the flow fluctuation objective is intended to minimize the loss of juvenile anadromous salmonids due to potential isolation events.

- Minimize flow reductions during the spawning and incubation periods of late October through May to prevent possible dewatering of fall-run Chinook salmon and steelhead redds in the lower American River.

The greatest potential for fall-run Chinook salmon and steelhead redd dewatering exists at the lower flow levels, due to stage-discharge relationships in the lower American River. In other words, for a given increment of flow reduction, water surface elevation decreases more at lower flow levels. Operations which minimize flow reductions, after spawning nests have been constructed and eggs are incubating, will minimize the potential for Chinook salmon and steelhead egg mortality in the lower American River.

Element Two – River Management

The River Management element of the proposed LAR FMS is a systematic process of continually improving management policies and practices by learning from the outcomes of prior operational actions. The formal incorporation of river management into Reclamation's SWRCB water right permit will facilitate beneficial management of the lower American River on a continuing basis.

Implementation of the proposed LAR FMS will require management of the lower American River based on operational decisions that must take into account multiple factors and objectives. In operating Folsom Dam and Reservoir, Reclamation must meet:

- Flood control, water, and energy supply obligations;
- Requirements of the CVPIA, the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 Bay-Delta Plan), the federal ESA, and California Fish and Game Code Section 5937 (which requires Reclamation to operate Folsom Dam and Reservoir to maintain lower American River fish resources in "good condition"); and
- Terms and conditions of its water right permits.

Real-time operations to meet these regulatory objectives must be based on consideration of many factors, including current and anticipated hydrological conditions, water supply forecasts, demand for water and electricity, the location, movement, and condition of fish, water temperature, coldwater pool availability, and water quality conditions in the Delta.

Reclamation's implementation of the proposed LAR FMS will be guided by an annual operations plan prescribing operations affecting the lower American River. The operations plan will include a description of the decision-making considerations, parameters, and actions necessary to implement the LAR FMS, including average monthly flows in the lower American River, end-of-month storage in Folsom Reservoir (specifically including end-of-month storage for September), and water temperature in the lower American River from Nimbus Dam to Watt Avenue, consistent with the temperature requirements of the Flow Management Standard. The operations plan will include a range of operating flexibility consistent with Reclamation's ability to meet the requirements of the LAR FMS. The initial operations plan prepared by Reclamation will be based on its April 15 delivery forecast and will describe projected operations for the 12-month period beginning May 1. The operations plan will be reviewed and updated each month to describe operations for the following 12-month period, to incorporate any changes needed to address new information or changed conditions.

Element Three – Monitoring and Evaluation

The third element of the proposed LAR FMS, Monitoring and Evaluation, includes preparation of a monitoring and evaluation plan. The purpose of the monitoring and evaluation plan is to provide information that can be used by the RMG for real-time operational decisions, as well as in the on-going evaluation of whether the long-term goals and objectives of the LAR FMS are being met. The monitoring and evaluation plan will allow the RMG to learn from previous management actions and decisions, build on successes, and adjust operations simultaneously with changes in fishery resources and associated habitats. In addition, monitoring the outcomes of previous management decisions provides early warning of potential problems, allowing corrective actions to be taken before adverse impacts on lower American River fishery resources occur.

4.7. RIPARIAN RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter describes existing riparian resources, i.e., riparian and wetland vegetation and associated species that use it for habitat. The regional setting for these resources includes the lower American and Sacramento rivers and reservoirs that may be influenced by the new CVP water service contracts. It also includes that portion of the North Fork American River between the American River Pump Station and Folsom Reservoir. The discussion provides the context for various species and critical habitat. Special-status species include those that are listed as threatened or endangered by the CDFG or the USFWS, species proposed for State or federal listing, species designated as "species of concern" by USFWS or "special concern species" by CDFG, and species tracked by the CNDDB or California Native Plant Society (CNPS).

4.7.1. Affected Environmental/Setting

The regional setting includes riparian/terrestrial resources that may be directly affected by implementation of the new CVP water service contract where changes to CVP system operations including its numerous reservoirs and rivers may occur. Certain CVP facilities and associated waterways are included in the regional study area. These facilities include: Trinity and Shasta reservoirs, the upper and lower Sacramento River, and the Delta. Detailed descriptions of the terrestrial resources associated with these facilities are provided below.

4.7.2. Shasta and Trinity Reservoirs

Vegetation Surrounding Reservoirs

Habitats associated with these reservoirs include ponderosa pine forest, non-native grassland, oak-pine woodlands, and chaparral. Much of the vegetation surrounding the reservoirs consists of forested habitats, with small enclaves of oak woodland, grassland, and chaparral. Pine forest habitats are located on the upland banks, and slopes of the reservoirs are dominated by ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), Douglas fir (*Pseudotsuga menziesii*), madrone (*Arbutus menziesii*), and incense cedar (*Calocedrus decurrens*). Chaparral occurs in openings in the forest, and is characterized by several native shrubs such as manzanita (*Arctostaphylos* sp.) and various species of ceanothus (*Ceanothus* sp.). Non-native grasslands and oak-pine woodlands are similar to habitats described for Folsom Reservoir (see local project area description). Similar to Folsom Reservoir, the drawdown zone of these reservoirs is expected to be devoid of substantial vegetation, and contiguous riparian communities are not present in these areas due to constantly changing water levels and hence, water availability; therefore, the drawdown zones do not provide or promote the establishment of high-value plant communities or wildlife habitat.

Wildlife of Reservoirs

Ponderosa pine forest and chaparral habitats associated with the reservoirs support a variety of birds, including western tanager (*Piranga ludoviciana*) and white-breasted nuthatch (*Sitta carolinensis*). Raptors that use these habitats near water include osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*). Mammal species likely to occur in these habitats include mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), black bear (*Ursus americanus*), and beaver (*Castor canadensis*).

4.7.3. Upper and Lower Sacramento River

Vegetation of the Sacramento River

Much of the Sacramento River is confined by levees that reduce the natural diversity of riparian vegetation. Agricultural land (rice, dry grains, pastures, orchards, vineyards, and row and truck crops) is common along the lower reaches of the Sacramento River, but is less common in the upper portions. The bands of riparian vegetation that occur along the Sacramento River are similar to those found along the lower American River, but are generally somewhat narrower and not as botanically diverse. The riparian communities consist of Valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), wild grape (*Vitis californica*), box elder (*Acer negundo*), elderberry (*Sambucus mexicanus*), and willow (*Salix* sp.). Freshwater, emergent wetlands occur in the slow moving backwaters and are primarily dominated by tules (*Scirpus acutus* var. *occidentalis*), cattails (*Typha* sp.), rushes (*Juncus* sp.), and sedges (*Carex* sp.) (SAFCA and USBR, 1994). Although such riparian vegetation occurs along the Sacramento River, it is confined to narrow bands between the river and the river side of the levee.

Wildlife of the Sacramento River

The wildlife species inhabiting the riparian habitats along the lower Sacramento River are essentially the same as those found along the lower American River. These include, but are not limited to, wood duck (*Aix sponsa*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), green heron (*Butorides virescens*), black phoebe (*Sayornis nigricans*), ash-throated flycatcher (*Myiarchus cinerascens*), sora (*Porzana carolina*), great horned owl (*Bubo virginianus*), Swainson's hawk (*Buteo swainsoni*), California ground squirrel (*Spermophilois beecheyi*), and coyote (*Canis latrans*). The freshwater/emergent wetlands represent habitat for many wildlife species, including reptiles and amphibians such as the western pond turtle (*Clemmys marmorata*), bullfrog (*Rana catesbeiana*), and Pacific tree frog (*Hyla regilla*). Agricultural areas adjacent to the river also represent foraging habitat for many raptor species.

4.7.4. Sacramento-San Joaquin Delta

Vegetation of the Delta

Most of the vegetation in the Delta consists of irrigated agricultural fields and associated ruderal (disturbance-adapted or weedy), non-native vegetation fringes that border cultivated fields. Throughout much of the Delta, these areas border the levees of various sloughs, channels, and other waterways within the historic floodplain. Native habitats include remnant riparian vegetation that persists in some areas, with brackish and freshwater marshes also being present. Saline wetlands consist of pickleweed (*Salicornia virginica*), cord grass (*Spartina* sp.), glasswort (*Salicornia* sp.), saltgrass (*Distichlis spicata*), sea lavender (*Limonium californicum*), arrow grass (*Triglochin* spp.), and shoregrass (*Monanthochloe littoralis*). These wetlands are very sensitive to fluctuations in water salinity, which are determined by water flows into the Delta (San Francisco Estuary Project, 1993).

Wildlife of the Delta

The wetlands of the Delta represent habitat for a number of shorebirds and waterfowl species including killdeer (*Charadrius vociferous*), California black rail (*Laterallus jamaicensis coturniculus*), western sandpiper (*Calidris mauri*), long-billed curlew (*Numenius americanus*), greater yellow-legs (*Tringa melanoleuca*), American coot (*Fulica americana*), American wigeon (*Anas americana*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), canvasback (*Aythya valisineria*), and common moorhen (*Gallinula chloropus*). These areas also support a number of mammals such as coyote, gray fox (*Urocyon cereoargenteus*), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), and beaver. Several species of reptiles and amphibians also occur in this region.

4.7.5. Folsom Reservoir

Vegetation of Folsom Reservoir

Habitats associated with Folsom Reservoir include non-native grassland, blue oak-pine woodland, and mixed oak woodland. Non-native grassland occurs around the reservoir, primarily at the southern end. The reservoir rim is surrounded by a barren band (the drawdown 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, 1991a). The only contiguous riparian vegetation occurs along Sweetwater Creek at the southern end of the reservoir (USFWS, 1991a). The drawdown zone is virtually devoid of vegetation and the sparse willows that have established in some areas do not form a contiguous riparian community. Consequently, the drawdown zone does not possess consistent or substantial habitat value.

Non-native grassland consists of wild oat (*Avena fatua*), soft chess brome (*Bromus hordeaceus*), ryegrass (*Lolium multiflorum*), mustard (*Brassica* sp.), and foxtail (*Hordeum murinum* ssp. *leporinum*). The oak woodland habitat located on the upland banks and slopes of the reservoir 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.).

Wildlife of Folsom Reservoir

Oak-pine woodlands and non-native grasslands in the 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 will 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, and long-eared owl (*Asio otus*). Mammal species likely to occur in the woodland habitat include mule deer, coyote, bobcat, gray fox, Virginia opossum (*Didelphis virginiana*), raccoon, striped skunk, black-tailed jackrabbit (*Lepus californicus*), California ground squirrel, and a variety of rodents. Amphibians and reptiles that may 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*).

The non-native grassland surrounding Folsom Reservoir represents habitat for a variety of rodents, which, in turn. serve as a prey base for carnivores such as hawks and 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, 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 Folsom Reservoir (USFWS, 1991a). Several of the reptiles and amphibians that inhabit the oak woodlands will also occur in the adjacent non-native grasslands.

4.7.6. <u>Lower American River</u>

Vegetation of the Lower American River

The lower American River provides a diverse assemblage of vegetation communities, including freshwater marsh and emergent wetland, riparian scrub, riparian forest, and in the upper, drier areas further away from the river, oak woodland and non-native grassland. The current distribution and structure of riparian communities along the river has been determined by human-induced changes such as gravel extraction, dam construction and operations, and levee construction and maintenance, as well as by both historic and on-going streamflow and sediment regimes and channel dynamics (Sands, et al., 1985; Watson, 1985).

As a result of these factors, several riparian vegetation zones exist along the banks of the lower American River. 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 river bank.

In general, willow scrub and alders tend to occupy areas within the active channel of the river, which are repeatedly disturbed by elevated winter and spring river flows. Plant species in this zone typically include various species of willow. Cottonwood-willow thickets and cottonwood forests occupy the narrow belts along the active river channel where seasonal disturbance by occasional large flows influence community structure. Fremont cottonwood dominates these riparian forest zones. 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*). Alder-cottonwood forest is typical of the steep, but moist banks along much of the river corridor. Valley Oak Woodland occurs on upper terraces composed of fine sediment where prolonged availability of soil moisture provides a long growing season. Valley oak 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 throughout the length of the river, but occur more regularly downstream of the Watt Avenue bridge. Plant species that dominate this habitat type include various species of willow, sedge, cattail, bulrush (*Scirpus* sp.), rush, barnyard grass (*Echinochloa crusgalli*), slough grass (*Paspalum dilatatum*), and lycopus (*Lycopus americanus*).

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 are highest in wildlife diversity and species richness relative to other river corridor habitats (Sands, et al., 1985; Watson, 1985; USFWS, 1991). More than 220 species of birds have been recorded along the lower American River and more than 60 bird species are known to nest in the riparian habitats (USFWS 1991). Common species that can be found along the river include great blue heron, mallard, red-tailed hawk, red-shouldered hawk, American kestrel, California quail (*Callipepla californica*), killdeer, belted kingfisher (*Ceryle alcyon*), western scrub jay, ash-throated flycatcher, tree swallow (*Tachycineta bicolor*), and American robin (*Turdus migratorius*). Additionally, more than 30 species of mammals reside along the river, including beaver, striped skunk, Virginia opossum, brush rabbit (*Sylvilagus bachmani*), raccoon, western gray squirrel (*Sciurus griseus*), California ground squirrel, meadow vole (*Microtus pennsylvanicus*), muskrat, black-tailed deer, gray fox, coyote, and infrequently, mountain lion.

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

Along with providing food, cover, and nesting habitat for several species, the lower American River functions as a wildlife corridor for the movement of animals between the valley floor and the foothills of the Sierra Nevada.

River Channel Hydrology and Riparian Vegetation Relationships along the Lower American River

The type and distribution of riparian vegetation along a river is generally a function of the complex hydrologic and geomorphic conditions of the river (Watson, 1985). In particular, water availability and magnitude (i.e., flow regimes), floodplain geology, and channel morphology are the driving forces behind the ability of various riparian plants to germinate, establish, and grow. Flood flows mobilize bank and riverbed sediments that result in the deposition of nutrient-rich sediments on the floodplain that, when timed with the release of seeds in the spring, provides suitable areas for seed germination. High water (flushing) flows, usually occurring in late winter and early spring, are necessary to clear the river channel of debris, control the encroachment of vegetation, and unclog sediments. Water availability during the summer and early fall months can determine growth rates and plant types. The structure and composition of the channel bed and banks affects the rate of channel migration, the elevation of the water surface during low-flow periods, the lateral movement of groundwater into the banks, the transport and deposition of sediments, and how often certain areas are inundated by flood flows. These, in turn, affect overall plant diversity, growth, and generation.

History of Events Affecting the Riparian Corridor

From Folsom Reservoir to the confluence with the Sacramento River, the lower American River has undergone tremendous change over the past 100 years. The 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 overall flow regimes. Specifically, the construction of flood control levees reduced the width of the riparian corridor by isolating the floodplain from the river; these levees also changed channel erosion patterns and reduced migration. In addition, the construction of the Folsom and Nimbus Dams has significantly altered both the streamflow and sediment regime of the lower American River. In particular, the magnitude and frequency of flood flows has been effectively reduced, causing a reduction in the frequency of overbank flows that deposit sediments, conducive to seed germination, on the higher terraces. The dam complex also significantly reduced the amount of sediment supplied to the lower reaches of the river from its watershed.

The existing channel morphology of the lower American River 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, to the Folsom and Nimbus dam complex, is largely controlled by resistant bedrock exposures that characterize this portion of the river. Bank erosion and deposition of sediments is 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 widens toward 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 low gradient and blockage of channel migration has allowed for the formation of gravel bars and sediment deposits throughout this portion of the river. Terraces, once commonplace and complex as a result of extensive overbank flooding, now only occur in specific areas between the levees.

The current composition of the riparian plant communities along the lower American River is a function of the resulting set of hydrologic, geomorphic, and substrate conditions that have occurred there over time; it is also a result of the adaptations of the riparian system to these conditions. In the upper reaches of the river near Nimbus Dam, steep banks of resistant soils and bedrock allow only a very slow rate of erosion and sediment deposition. In these areas, alder-dominated vegetation occurs as stringers along portions of the channel, particularly along the base of bluffs and steep banks. Further down the river where gravel bars and point bars occur as a result of sediment transport and storage along the channel bed, regeneration of willows occurs on scoured gravel bar sites. Cottonwoods also form small stringers on freshly deposited sediment on point bars as well as on less steep terraces with suitable seed beds, where even-aged stands of older cottonwoods occur.

Most of the riparian forest habitat immediately adjacent to the lower American River is dominated by cottonwood intermixed with willows. In addition, several backwater and off-river ponds occur at some of the bars along the river. Riparian zones support a greater abundance and diversity of wildlife than any other terrestrial habitat in California (Sands, et al., 1985). In addition, previous studies have determined that the riparian vegetation surrounding the backwater channels and off-river ponds ranked very high in overall wildlife diversity and species richness (Sands, et al., 1985). The following discussion focuses on the relationship of changes in river flows to both cottonwood trees and river-associated ponds, because of the biological importance of these areas.

Cottonwood Growth Along the Lower American River

The germination, establishment, growth, and long-term survival of Fremont cottonwoods along the lower American River is dependent upon 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. Cottonwood seed release and establishment has adapted over time to the flow regime and fluvial process of the lower American River, and consequently, maintenance of this regime is vital to maintain a viable cottonwood riparian system.

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., 1996). 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 one meter, and tolerate daily declines of no more than a few centimeters per day (Stromberg, et al., 1991; Segelquist, et al., 1993). Sufficient 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 of 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 groundwater table, which is recharged by adequate river flows.

While few studies have been conducted on the long-term flow regimes necessary for continued cottonwood regeneration and growth maintenance along the lower American River, several relatively 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 lower American River was found to be significantly related to the groundwater depth and to river flows during the March through 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 cfs. Monthly mean flows of 1,765 cfs are recommended by Stromberg (1995) as necessary for maintenance of radial growth. In order to assure some growth of cottonwoods, the USFWS recommends that an average minimum streamflow of 2,000 cfs occur during the March through October growing season.

A USFWS study concluded that an average flow of 3,000 cfs is required to provide "reasonable" growth and maintenance conditions for riparian vegetation (USFWS 1996). The USFWS (1997) correlated monthly mean flows of 3,000 cfs from April though June to peak inundation flows of 5,000 to 13,000 cfs, levels deemed critical to establishment of seedlings on riverine terraces.

Backwater Ponds of the Lower American River

Backwater ponds are areas adjacent to the mainstem of a river that may be connected to the river by surface water during high winter flood flows and by groundwater during other times of the year. Backwater pond areas along the American River Parkway are generally the result of naturally formed gravel deposits and man-induced dredging, although some are likely to be remnant oxbow lakes, such as Bushy Lake (Sands, et al., 1985). These backwater ponds and lagoons are known to occur throughout the lower American River system, but occur predominantly at Sacramento Bar, Arden Bar, Rossmoor Bar, and between Watt Avenue and Howe Avenue (Sands, et al., 1985).

Vegetation around these ponds is typical of the riparian associations in the area and is composed of mixed-age willow, alder, and cottonwood. Water is slower moving in backwater ponds, and these areas are isolated from human disturbances; consequently, backwater ponds tend to be of higher value to wildlife (Sands, et al., 1985). Wildlife species that have been recorded in these areas include: pied-billed grebe (*Podilymbus podiceps*), American bittern (*Botaurus lentiginosus*), green heron, common merganser (*Mergus merganser*), white-tailed kite (*Elanus leucurus*), wood duck, yellow warbler (*Dendroica petechia*), warbling vireo (*Vireo gilvus*), dusky-footed woodrat (*Neotoma fuscipes*), western gray squirrel, Pacific tree frog, and western toad.

Studies have been conducted to determine how these backwater ponds are influenced by flows in the lower American River (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 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 is dependent upon 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 impact of changes in pond water levels on vegetation and wildlife may 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 wildlife habitats associated with the ponds; and 7) to provide continued recharge of off-river ponds, flows in the range of 2,750 to 4,000 cfs are needed (Sands et al., 1985; Sands 1986).

An important consideration for the maintenance of backwater pond habitats is the frequency and duration of the necessary recharge flows. Past studies have not come to definitive conclusions about specific frequency and duration needs. Historically, however, the flows high enough to allow recharge have occurred most often either in the winter or spring. 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 months are sufficient to maintain backwater pond habitats.

4.7.7. Special-Status Species

The following is a discussion of plant and wildlife species that have been afforded special recognition by federal, State, or local resource agencies and organizations. This discussion focuses on, and summarizes, species addressed in previous biological studies of the study area, and those species that have been added to State and federal special-status species lists since the time those studies were conducted. Special-status biological resources also include unique habitats or plant communities that are of relatively limited distribution, or are of particular value to wildlife. Sources for determination of the status of these biological resources are: Plants – CDFG (1996a), CNPS (1994), and Hickman (1993); and Wildlife – CDFG (1996b), CNDDB (1994), and Williams (1986).

A number of special-status plant and wildlife species are known to occur within the study area (USFWS, 1991a; USFWS, 1996). The following discussion focuses only on those species occurring or potentially occurring within the study area that could potentially be affected by the increases in diversions. A brief summary of the life history requirements of each species, and their occurrence within the study area, is included below.

Special-Status Plants

<u>Sanford's Arrowhead (*Sagittaria sanfordi*)</u>

This plant is a CNPS List 1B species, it has no federal or State status. Sanford's arrowhead (also known as Valley sagittaria) is a perennial herb that blooms from May to August and grows in shallow, slow-moving or standing water in ponds and ditches. This species is found in two locations along the American River, near Watt Avenue and Rio Americano High School (SAFCA and Reclamation 1994).

Special-Status Invertebrates

<u>Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)</u>

VELB was listed as Federally Threatened in 1980. It has no State status. Adult beetles feed and lay eggs on elderberry shrubs, where the larvae remain within the elderberry stems until they emerge as adults through newly formed exit holes. USFWS has designated the American River Parkway as critical habitat for this beetle (USFWS 1996). This species has been recorded in elderberry shrubs near backwater ponds along the lower American River.

Special-Status Amphibians

<u>Foothill Yellow-legged Frog (*Rana boylii*)</u>

Federal Species of Concern and California Species of Special Concern. This frog occurs in relatively fast moving shallow rocky streams. It is typically absent from areas where bullfrogs have been introduced. Potential habitat may occur along portions of the American River upstream of Folsom Reservoir, particularly in smaller tributaries off of the main channel. This species has occurred historically throughout the Sierra Nevada foothills. Although Sierra Nevada populations have greatly declined, this species may still be present in portions of the service area.

<u>California Red-legged Frog (*Rana aurora draytonii*)</u>

Federally Listed as Threatened and California Species of Special Concern. This frog typically occurs in deeper, slow moving portions of streams and in ponds and marshes. It is typically absent from areas where non-native fish (i.e., catfish, bass, sunfish) and bullfrogs are present.

Special-Status Reptiles

<u>Western Pond Turtle (*Clemmys marmorata*)</u>

California Species of Special Concern. This aquatic turtle generally occurs in still waters of ponds, freshwater marshes, and lakes, and in slow moving streams with sand bars or in stream emergent woody debris for basking sites. The western pond turtle is known to occur along the American and Sacramento rivers (Jennings and Hayes 1994).

Special-Status Birds

<u>Bald Eagle (*Haliaeetus leucocephalus*)</u>

De-listed. Even though they are de-listed, bald eagles are still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Their long-time listing status makes them worth noting here. Bald eagles winter throughout California, excluding the southern desert areas, and generally breed in the northern portion of the State. While most of the bald eagles in California are residents, many bald eagles migrate to the State for the winter. This species prefers mature wooded areas adjacent to or near large bodies of water or flowing rivers. Bald eagles feed primarily on fish, but will also eat birds, mammals, and carrion. Bald eagles are a common winter visitor to Folsom Reservoir and have been observed foraging along the lower American River (SAFCA and Reclamation 1994). Historically, bald eagles nested along the lower American River; however, there are no recent nest records for this species within the study area (USFWS 1991a).

Swainson's Hawk (*Buteo swainsoni*)

State Threatened. Swainson's hawk is a migratory raptor that breeds in western North America and winters primarily in South America. This species is associated with riparian corridors adjacent to agricultural fields and grasslands in the Central Valley. They nest in trees, forage over pastures and agricultural fields, and prey largely on small mammals and insects. Both foraging and nesting habitat for Swainson's hawk exist throughout the study area (USFWS 1991a). There are no recent records of nesting Swainson's hawks along the lower American River, most likely because of the predominance of developed urban areas and general lack of large grassland and agricultural areas along the river. However, a number of active nests occur along the Sacramento River, including some nest sites near the confluence of these two rivers (CNDDB 1994). Mature cottonwood, walnut, and willow trees along the Sacramento River, adjacent to agricultural areas, provide optimal nesting habitat for this species.

Bank Swallow (*Riparia riparia*)

California Threatened. Bank swallows winter in northern and central South America and migrate to the United States and Canada to breed. Nesting colonies are present in the Sacramento Valley along the Sacramento and Feather rivers. This species occurs almost exclusively along watercourses that have steep, vertical banks and bluffs for nesting. Preferred nesting sites are sandy-loam soils or compatible gravels. Bank swallows have occasionally nested along the lower American River. In 1985, nesting colonies were reported along the river north of Rancho Cordova and, in 1986, a colony was observed on the south side of the American River near Cal Expo (SAFCA and Reclamation 1994). As a result of major physical changes in the hydrology and stream channel conditions of the lower American River, limited steep cut-bank habitat is present (USFWS 1991a). The most suitable habitat for bank swallows now occurs along the river’s edge near Discovery Park (USFWS 1991a).

Tricolored Blackbird (*Agelaius tricolor*)

California Species of Special Concern. A resident species in California, the tricolored blackbird is common locally throughout the Central Valley and in coastal districts south from Sonoma County. Preferred nesting habitat is dense cattails or tules associated with marsh and pond habitats. However, thickets of willows, blackberry, and wild rose may also be suitable (Zeiner 1990). Tricolored blackbirds are known to occur in the riparian habitats along the lower American River (SAFCA 1994). Most reported nesting occurrences have been in canals, ponds, and marshes located adjacent to the river channel (SAFCA 1994).

Yellow-breasted Chat (*Icteria virens*) and Yellow Warbler (*Dendroica petechia*)

Both California Species of Special Concern. These migratory species are summer visitors to riparian habitats. Both of these species are known to occur in the riparian habitats along the lower American River.

Other Raptors

Raptors are considered sensitive by the CDFG. Removal or destruction of active raptor nests is considered a violation of the California Fish and Game Code (Section 3503.5). In addition to the above-mentioned bald eagle and Swainson's hawk, raptors that are known to nest, or could potentially nest, in the study area include red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), white-tailed kite, American kestrel (*Falco sparverius*), and great horned owl (*Bubo virginianus*).

Special-Status Mammals

River Otter (Lontra canadensis)

California Species of Special Concern. River otters are an uncommon, yearlong resident of rivers, large streams, lakes, wetlands, estuaries, and coastal areas. Optimal habitat consists of riparian and other wetland vegetation associated with a large, permanent water source (Zeiner, et al. 1990). They feed primarily on fish, crayfish, and other crustaceans, but also eat amphibians, some mammals, and aquatic invertebrates. River otters are known to occur along both the Sacramento and American rivers (CNDDB 1994).

4.8. WATER-RELATED RECREATIONAL RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter addresses existing recreational uses within the regional and local study areas that could be directly affected by the Proposed Action and its Alternatives. It provides the context upon which the analysis of potential diversion-related effects on water-related recreational resources can be made.

4.8.1. Affected Environment/Setting

The following describes the environmental setting related to recreation resources in areas potentially affected by the Proposed Action and alternatives. This subchapter addresses local environmental conditions that could be affected by diversions from the North Fork American River and Folsom Reservoir. Recreational and riverine parkway resources that could be affected by the diversions contemplated under the P.L.101-514 contract also include the upper and lower Sacramento River, lower American River and Sacramento-San Joaquin Delta.

4.8.2. Shasta/Trinity Reservoirs

Shasta, Keswick, Whiskeytown, and Trinity reservoirs are part of the Whiskeytown-Shasta-Trinity National Recreation Area administered by the U.S. Forest Service and National Park Service. Whiskeytown and Keswick reservoirs are regulating reservoirs for Shasta Reservoir and Trinity and

Lewiston Reservoirs, respectively, providing a relatively stable shoreline that is minimally affected by changes in upstream diversion and storage.

At full pool, Shasta Reservoir has 370 miles of shoreline. Recreational uses at Shasta Reservoir averages about 2.4 million visitor days per year, with an estimated 75 percent of the uses taking place between May and September. Recreation facilities include seven public boat ramps, 22 developed campsites, picnic areas, and numerous private marina resorts. Trinity Reservoir has many public and private recreation facilities including campgrounds, picnic areas, resorts, and marinas. Facilities at Trinity, Whiskeytown, and Keswick Reservoirs include boat ramps, campgrounds, picnic areas, and resorts.[153]

4.8.3. Upper and Lower Sacramento River

On the upper Sacramento River, water-dependent activities (swimming, boating, and fishing) account for approximately 52 percent of the recreation uses. While fishing is a year-round activity, boating, rafting, and swimming uses take place in summer months when temperatures are high. Between Colusa and Sacramento, major recreation facilities are located at Colusa-Sacramento River Recreation Area, Colusa Wier access, Tisdale Wier access, River Bend access, Knights Landing, Sacramento Bypass, and Elkhorn Boating Facility.

Recreational uses in the lower Sacramento River, between the American River confluence and the Delta, are closely associated with recreational use of Delta waterways. This reach of the river, which is influenced by tidal action similar to the Delta, is an important boating and fishing area with several private marinas.[154]

4.8.4. Sacramento-San Joaquin River Delta

As a complex of waterways affected by both fresh water inflows and tidal action, the Delta is an important recreation resource that provides a variety of water-dependent and water-enhanced recreation opportunities. The Delta supports about 12 million user days of recreation per year. Parks along the mainstem of the Sacramento River and Delta sloughs provided access for water-oriented recreation as well as picnic sites and camping areas. Brannan Island State Park and Delta Meadows River Park are major water-oriented recreational areas. Peak usage in the parks is typically in July.

Boating is the most popular activity in the Delta region, accounting for approximately 17 percent of the visits, with other popular uses including fishing, relaxing, sightseeing, and camping. Boating and related facilities are located throughout the Delta and include launch ramps, marinas, boat rentals, swimming areas, camping sites, dining and lodging facilities, and marine supply stores. [155]

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153 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-161, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

154 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-162, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

155 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-162, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

4.8.5. Folsom Reservoir

The California Department of Parks and Recreation (CDPR) manage the Folsom Lake State Recreation Area (SRA) and surrounding facilities. The area's primary recreational uses are boating and fishing. In addition, the reservoir features approximately 75 miles of shoreline and 80 miles of trails that provide opportunities for hiking, horseback riding, nature studies, camping, and picnicking.

The water surface elevation of the reservoir can vary considerably, from 466 feet when its gross pool is full, to less than 375 feet during multiple dry years occur in a row. Reclamation attempts to maintain storage in Folsom Reservoir throughout the summer at sufficient levels to accommodate marina and boat access as much as possible. When full, Folsom Reservoir extends nearly 15 miles up the North Fork American River and 10.5 miles up the South Fork American River. Folsom Reservoir has 75 miles of undeveloped shoreline.

The primary commercial recreation facility on Folsom Reservoir is the Folsom Reservoir Marina on Brown's Ravine on the east side of the reservoir. Other major use areas are located at Granite Bay, Beals Point, Folsom Point, Peninsula, and Rattlesnake Bar. The predominant recreational activities at Folsom Reservoir are water-dependent uses, such as boating, water-skiing, personal watercraft use, swimming and fishing. The upper (easternmost) arms of the reservoir are designated as slow zones for quiet cruising, fishing, and nature appreciation.

The Folsom Lake (Reservoir) SRA is one of the most heavily used recreational facilities in the State Park system, with two to three million visitor days per year. The Folsom Reservoir SRA is an important regional resource because of its proximity to a heavily populated metropolitan area, the area's summer climate, the surrounding population's high interest in outdoor recreation, and the decrease in open space and recreational resources in neighboring areas.[156]

Water-enhanced activities (picnicking, relaxing, camping, and trail use) account for approximately 15 percent of the total recreational demand at the reservoir while water-related activities (boating, windsurfing, swimming, wading, rafting, boat camping, fishing) account for the remaining 85 percent. Of these recreational uses, boating (trailer and non-trailer launched) is the most popular and accounts for nearly 30 percent of the total recreational demand at Folsom Reservoir.

Lake Natoma is the downstream end of the Folsom Reservoir SRA and serves as a regulating reservoir for the releases from Folsom Reservoir. Recreation facilities and activities at Lake Natoma are operated by CDPR and include the California State University Sacramento Aquatic Center, day use areas, a campground, boat ramp, and an 8.4-mile segment of the American River Bicycle Trail.

The predominant recreational activity at Lake Natoma is trail use (e.g., jogging, bicycling, hiking and horseback riding). Due to the lake's stable water surface conditions, it is a popular destination for boating, rowing, canoeing, and wind surfing activities. Summer water temperatures are generally lower than Folsom Reservoir since water released into Lake Natoma generally comes from the

156 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.3-156 to 3-160, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

deeper portions of Folsom Reservoir; therefore, it is typically less intensely used for swimming and wading. The beaches at Negro Bar and Nimbus Flat are the primary swimming areas of the lake.

4.8.6. Lower American River

The lower American River begins below Nimbus Dam and flows along the valley floor until it reaches the Sacramento River at the City of Sacramento. The flow regime in the lower American River has been significantly altered since the completion of Folsom and Nimbus dams. The American River Parkway extends from Folsom Reservoir to Discovery Park in Sacramento. The Parkway consists of 14 interconnected parks, a continuous trail system, and approximately 5,000 acres of total land. Owned and managed by the County of Sacramento, the Parkway is linked to additional park lands, from Nimbus Dam to Folsom Reservoir which is managed by CDPR. Over five million visitors each year are estimated to use the parkway.[157]

Considered one of the nation's premiere urban parkways, the American River Parkway consists of 32 miles of paved bicycle and pedestrian trail along the American River from Discovery Park to Folsom Reservoir, known as the Jedediah Smith Memorial Bicycle Trail. Additional recreational facilities, including pedestrian and equestrian trails and picnic areas are located throughout the Parkway. No commercial recreational facilities are located within the Parkway, although raft rental outfitters are located near the Parkway at Sunrise Boulevard.

Water-enhanced (picnicking, camping, equestrian staging, and bicycle and pedestrian trails) and water-dependent (boat launching) facilities are provided throughout the Parkway, from Discovery Park upstream to Sailor Bar. The Parkway accommodates over 6 million visitors each year with visits projected to increase to almost 10 million by the year 2020. Peak use is typically from May through September with public use and visitations influenced by not only season, but also by air temperatures and river flow conditions. Water-enhanced activities account for about 70 percent of all recreation activities, with the remaining 30 percent geared towards water-dependent activities. The most popular activity of the Parkway is the category represented by nature study and site seeing, accounting for approximately 30 percent of the total recreational use. Within the Parkway, trail use (e.g., jogging, bicycling, hiking, and equestrian) accounts for approximately 27 percent of the remaining recreational use, with picnicking at 12 percent, boating at 11 percent, and swimming and fishing at 10 percent.

Rafting on lower American River is supported by commercial outfitters who provide services such as daily tours, shuttle buses, instructional services, and rental equipment for rafting, boating, and fishing activities. Two major outfitters, both located near Sunrise Boulevard, put-in rafts just downstream of Sunrise Boulevard and use either River Bend Park and/or the Harrington Drive access as the primary take-out points. The boating and rafting season is generally between April and October, with peak raft rentals occurring during the June through August period.

157 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

4.8.7. Middle and North Forks American River

Whitewater recreation in the Auburn State Recreation Area (SRA) is very popular on both forks of the river, with Class II, III and IV runs. Over 30 private outfitters are licensed to offer whitewater trips in Auburn SRA.[158]

Recreational use on the North Fork American River is concentrated upstream of the confluence of the North Fork and South Fork American River, outside of the Folsom Lake State Recreation Area. The North Fork supports commercial whitewater rafting upstream of Lake Clementine. On the Middle Fork, commercial rafting occurs upstream of the North Fork/Middle Fork confluence. Boating is prohibited downstream of the Middle/Fork North Fork confluence to the Folsom Reservoir high water line. Other recreation opportunities along the North Fork American River include hiking, mountain bicycling, and horseback riding on the Auburn-to-Cool Trail and Western States Trail.

4.8.8. Regulatory Framework

National Wild and Scenic Rivers Act

The National Wild and Scenic Rivers System was established in 1968 with the enactment of P.L. 90-542 (16 USC 1271 et seq.). The congressional declaration of policy stated the following:

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The North Fork American River from below Lake Clementine to the former location of the old Auburn Dam bypass tunnel is eligible for listing for its recreational values. The lower American River from Nimbus Dam to its confluence with the Sacramento River was added to the National Wild and Scenic Rivers System based on the State's petition in 1981 and is designated a "recreational river." Recreational rivers are ones "that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past" (16 USC 1273[6][3]).

As a result of its designation under the act, federally assisted projects affecting the lower American River are subject to the Secretary of the Interior's determination that the project "will not invade the area or unreasonably diminish" the river's recreational value (16 USC 1278[a]; see also Swanson Mining Corporation v. VERC, 1790 F.2d 96 [D.C. Cir. 1986]; and the American River Parkway Plan). When seeking authorization or appropriations for a project that affects the protected values of the lower American River, the relevant federal agency must notify the Secretary of the Interior of its intent, and report to Congress on the project's conformity with the act and its effect on the protected values of the river (16 USC 1278[a].

158 www.cal-parks.ca.gov.

State Wild and Scenic Rivers Act

The State Wild and Scenic Rivers Act was passed by the California Legislature in 1972 (Public Resources Code (PRC) Section 5093.50 et seq.). The Legislature declared that it was the State's intent that "*certain rivers which possess extraordinary scenic, recreation, fishery, or wildlife values shall be preserved in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state*." The Act restricts the construction of dams, reservoirs, diversions, and other water impoundments. A diversion facility may be authorized if the Secretary of the Resources Agency determines that (a) it is needed to supply domestic water to the residents of the county through which the river flows, and (b) it will not adversely affect the natural character of the river (PRC Section 5093.33[a]; DWR 1994).

The North Fork American River from below Lake Clementine to location of the former the old Auburn Dam bypass tunnel is eligible for listing for its recreational values. The Middle Fork American River from Oxbow Dam to the confluence with the North Fork American River is eligible for listing for its scenic values (City of Sacramento 1993). The lower American River was included in the State Wild and Scenic River System and was given the classification of "recreational river" (PRC Sections 5093.54[e], 5093.545[h]). The State defines a recreational river as a river "readily accessible by road or railroad, that may have some development along [its] shorelines, and that may have undergone some impoundment or diversion in the past" (PRC Section 5093.53[c]).

Auburn State Recreation Area Interim Resource Management Plan

The CDPR, through a management agreement with Reclamation, manages the public use of the Reclamation lands in the Auburn SRA. The area supports and offers the potential for unique and diverse recreational opportunities. The Auburn Interim Resource Management Plan provides planning goals and objectives to address agency and public concerns of protection and enhancement of recreation and natural resources of the area. These efforts will include re-assessment of existing resources, public interests, and possible improvements to accommodate recreation while protecting the natural resources and primitive setting of the upper American River reaches.

American River Parkway Plan

The American River Parkway Plan was adopted by the County of Sacramento in 1985 (Sacramento County 1985). The plan is an element of the Sacramento County General Plan. It establishes goals and policies for the parkway, presents a description of parkway resources, and provides area plans to guide resource protection and development. Policy 3.1 of the plan discusses flow issues, as follows:

> Water flow in the lower American River should be maintained at adequate levels to permanently sustain the integrity of the water quality, fisheries, waterway recreation, aesthetics, riparian vegetation, wildlife, and other river-dependent features and activities of the Parkway. The required flow levels of the lower American River should be established at higher levels than those required under D-1400 of the SWRCB. State and federal policy should provide for the maintenance of flows in the optimum range in the lower American River.

The Plan explains that D-1400 flows (e.g. 1,500 cfs for recreation) are inadequate and that the decision has no legal effect without the completion of the Auburn Dam. It acknowledges that research is ongoing to establish adequate flows for the lower American River, including recreation flows. When required flows are determined, the plan states that "those flows will be incorporated into the policies of this Plan."

4.9. WATER-RELATED CULTURAL RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter addresses existing cultural resources within the regional and local study areas and presents the affected environment context upon which an analysis of potential diversion-related effects of the proposed new CVP water service contract on water-related cultural resources can be made.

A Class I survey of the area of potential effects was conducted in 2008. This survey consisted of a literature review and records search; no field reconnaissance was conducted for the action described in this EIS/EIR. This Class I survey does not qualify as full compliance with the National Historic Preservation Act (NHPA) process for identifying cultural resources 36 CFR Part 800), but serves to aid in the initial stages of identification of cultural resources. As per NHPA provisions, no site locations are provided in the public version of this EIS/EIR; however, the document has been prepared for and reviewed by Reclamation's cultural resources staff.

4.9.1. Affected Environment/Setting

The following describes the affected environment/setting related to cultural resources in areas potentially affected by the proposed project and alternatives. This discussion addresses local environmental conditions that could be affected by a new diversion of water from the North Fork American River and Folsom Reservoir, as well as regional conditions that could be affected by way of hydrological changes that occur as a result of coordinated CVP/SWP operations.

4.9.2. Local Setting

Folsom Reservoir

Many studies have been carried out in and adjacent to the Folsom Reservoir basin, beginning with the Smithsonian Institution River Basin Surveys[159] and continuing into the 1990s.[160] These studies, and the sites recorded for them, are summarized in Scott, 1995, and Waechter and Mikesell, 1994. The consensus among these researchers was that the nature and extent of the effects on cultural resources from reservoir operation depended on several factors, most notably the location of a cultural property within the reservoir basin. Sites within the zone of seasonal fluctuation or drawdown suffered the greatest impacts, primarily in the form of erosion/scouring, deflation, hydrologic sorting, and artifact displacement, caused by waves and currents. Sites located lower in the reservoir, within the deep pool (including those adjacent to old river floodplains), were more likely to be covered with silt, which sometimes formed a protective cap. Sites at or near the high water

159 Drucker, 1948.
160 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992 and 1993.

line, and sites exposed during drawdown, suffered both erosion and vandalism. The various reservoir studies also indicated, however, that even sites that have been inundated for a few decades may still contain viable research data.[161]

There have nearly 200 sites recorded at the reservoir, and many more undoubtedly lie beneath the waterline. Among these are 126 prehistoric sites or components, some with remnant patches of midden.[162] Human burials are noted on a few of the early (1940s and 1950s) site records, but the present status of these burials is unknown. The 59 historic-period sites recorded at the reservoir are mostly related to Gold Rush-era mining, settlement, and transportation. Many of the sites show signs of adverse effects from wave action, inundation, and/or recreation use at the reservoir.[163] Any changes in water levels caused by increased or decreased diversions from the reservoir, or from points upstream, have the potential to impact many important or unevaluated cultural resources within the reservoir basin. It is also the case, however, that many of the cultural deposits in the upper part of the reservoir, where water-level fluctuation is greatest, have been scoured down to bare granitic sand. Conversely, sites below this zone have suffered much less from seasonal water-level fluctuations.

There are two kinds of potentially significant impacts/adverse effects on cultural resources from changes in water levels in Folsom Reservoir: *increased cycles of inundation and drawdown*, resulting in more erosion and scouring of sites, and more rapid breakdown of organic materials through more frequent wetting and drying; and *exposure of previously inundated resources*, subjecting these resources to increased weathering, vandalism, and other factors.[164] Under current operating conditions, the zone of greatest seasonal water-level fluctuation, and thus of greatest impact on cultural sites, is approximately 395-466 feet, where fluctuation events often exceed one per year. What this means, among other things, is that cultural sites at or above 395 feet already have suffered serious impacts that have greatly compromised their integrity and destroyed much of their data potential. Large-scale surveys by Far Western[165] observed that many, though not all, of the cultural deposits within this zone have been scoured down to bare granitic sand.

Lower American River

A 1999 records search revealed 36 recorded sites (22 prehistoric, 13 historic, 1 multi-component) on the American River between Folsom Dam and the Sacramento River. Of the 22 prehistoric sites, 4 have been determined eligible for the National Register of Historic Places (NRHP), 3 are ineligible, and 15 are unevaluated. These sites include village mounds and village middens, small camps, bedrock mortar stations, and flaked stone scatters. Several ethnographic Maidu settlements were

161 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.

162 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.

163 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992 and 1993; Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.

164 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.

165 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992, and 1993.

located along the river, especially on the north bank;[166] at least some of the recorded villages undoubtedly represent these settlements.

> Historic sites recorded on the American River consist of dredge tailings, segments of the Western and Transcontinental railroads, bridge abutments, a pump house, features associated with the Folsom hydroelectric power system (CA-SAC-429H), stone foundations, a cemetery (CA-SAC-192/H), and segments of the historic levee system (LAR-16, LAR-18). Segment LAR-16 has been recommended as eligible to the NRHP; segment LAR-18 remains unevaluated (Nilsson, et al., 1995). In general, the lower American River is considered highly sensitive for archaeological and historical resources, especially historic mining remains.

4.9.3. Regional Setting

Shasta Reservoir

Archaeological records indicate that Native Americans used the forests and waters in the Shasta area for at least 7,000 years prior to European occupation. The Pit River and Wintu Indians were the predominant groups inhabiting the area around Shasta and Keswick reservoirs. Numerous prehistoric sites are known within the drawdown zone of Shasta Reservoir. Small camps in particular are known to exist within this zone, and with fluctuating water levels and the lack of vegetation, they are periodically exposed to wave and wind action that deteriorates the sites. Looting of exposed sites is also a problem in this area.[167]

In 1991, Reclamation consulted with the State Historic Preservation Officer regarding historical archaeological sites potentially affected by the Shasta Outflow Temperature Control Project.[168] It was determined that the dam itself, constructed in 1938, is eligible for inclusion in the National Register of Historic Places because of its historical and engineering significance.

Trinity Reservoir

Prior to the construction of Trinity Dam, the valley below Trinity Reservoir was inhabited by the Upper Trinity Wintu Indians. Prehistoric evidence dates back 2,000 to 3,000 years, although the area was probably inhabited even before that. Archaeological surveys during the 1950s documented very large village sites that are believed to have been inhabited year-round. These sites were destroyed when the valley was flooded after construction of the dam. As at Shasta Reservoir, many known prehistoric sites at Trinity Reservoir are subject to ongoing damage as a result of fluctuating water levels, which exposes them to wind and wave action, and consequently, looting.[169]

Extensive gold mining and logging took place in the Trinity Reservoir area during the historic period. The valley inundated by the construction of Lewiston Dam contains several large homestead areas and two, or possibly three, historic communities (M. Arnold, U.S. Forest Service, pers. comm. 1994).

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166 Wilson, N. and A. Towne, "Nisenan," in *Handbook of North American Indians, Volume 8: California*, edited by R.F. Heizer, 1978, p. 387-397.
167 M. Arnold, U.S. Forest Service, personal communication, 1994.
168 U.S. Bureau of Reclamation 1991.
169 M. Arnold, U.S. Forest Service, personal communication, 1994.

Sacramento River

The Sacramento River region is rich in historic and prehistoric resources. Considerable archaeological research has been conducted in the area, including early work that defined central California's prehistory. Of particular importance are the region's large, deep midden sites, which provide information on prehistoric culture extending over thousands of years. Historic archaeological sites and architectural resources are plentiful because this area was settled early in California's history. As in other parts of the Central Valley, resources related to agricultural development are prevalent.

Lower Sacramento River

At least 31 cultural resources studies have been conducted for the lower segment of the Sacramento River, and a minimum of 27 sites and 42 historic structures have been recorded. Three of the prehistoric sites, all burial mounds, are considered eligible for the National Register of Historic Places (NRHP): CA-SAC-16, CA-SAC-43, and CA-SAC-164. Burials were noted at two other prehistoric mound sites, but their status is unknown at this time. A 1990 survey of prehistoric site CA-SAC-268, originally recorded by Riddell in 1960, revealed no cultural material, and no further work was recommended.[170] The remaining 17 prehistoric sites, recorded in the 1930s and 1950s, were not relocated during more recent surveys/augering, and are believed to have been destroyed during levee construction.

The Natomas Main Drainage Canal (CA-SAC-430H) meets the Sacramento River on its northern bank, roughly 3/4 mile west of its confluence with the American River. This historic feature has not been evaluated. Two segments of the levee system at the confluence have been recorded as historical features (LAR-16 and LAR-18); the first has been determined eligible and the other is unevaluated.[171] In addition to these features, the tiny river town of Freeport, founded in the 1860s as an early tidewater railroad terminal,[172] has the potential to be determined an important historical resource.

Other eligible or potentially eligible historic resources along the lower Sacramento include a rural historic landscape district,[173] Washington Water Company Water Tower, Sacramento Weir and Yolo Bypass, St. Josephs Church and Rectory, Leonidis Taylor Monument, and 37 houses built between 1855 and 1900. Fifteen of these houses are part of the historic Lisbon District (YOL-HRI-9/287-301), a community settled by Portuguese immigrants during the 1850s. This district, which is characterized by early pioneer-style houses, became the largest Portuguese community in the area by 1900.[174] Of the 37 houses along this stretch of the river that are listed in the Historic Property Data File for Yolo County,[175] only one (John White House) was not recommended for the National Register; the other 36 are listed as "appears eligible" or "may become eligible," either as separate

170 Bouey, P.D., *Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*, 1990.
171 Nilsson et al., 1995.
172 Thompson, J., *The Settlement Geography of the Sacramento-San Joaquin Delta, California*, 1957.
173 Reclamation District-1000.
174 K. Les, 1986.
175 State Historic Preservation Officer [SHPO].

properties or as contributors to a National Register district. All of these properties are on South River Road, adjacent to the river, but the distance of each from the riverbank cannot be determined at this time. It is safe to assume that they are located outside the river levees. The banks of the lower Sacramento River are considered highly sensitive for archaeological and historical resources.

4.9.4. Regulatory Framework

Cultural resources, also termed "historical resources" or "historic properties," consist of remains and sites associated with past human activities. These include prehistoric and protohistoric Native American archaeological sites, historic archaeological sites, and historic sites, buildings, structures, or objects. Another category of cultural resources includes traditional cultural properties. These are areas that have been, and often continue to be, of economic and/or religious significance to peoples today. Traditional cultural properties may include Native American sacred areas where religious ceremonies are practiced, or landscapes, which are central to their origins or history as a people. Some historical resource sites may also be of cultural significance to contemporary Native Americans or other ethnic groups because they contain objects or elements important to their cultural heritage.

Significant historical resources and traditional cultural properties are afforded protection under existing federal, State and local laws. These laws and regulations were designed to protect significant cultural resources that may be affected by actions that they undertake or regulate. The National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA) are the basic federal and State laws governing preservation of historic and archaeological resources of national, regional, State and local significance.

Federal Laws

Federal laws for cultural resources are governed primarily by Section 106 of the NHPA of 1966 (amended 2006). The Code of Federal Regulations (CFR) includes specific information on the protection of historic resources. A historic property is defined to mean any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria. The term eligible for inclusion in the National Register includes both properties formally determined as such in accordance with regulations of the Secretary of the Interior and all other properties that meet the National Register criteria (36 CFR 800.16).

Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and affords the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The Council's implementing regulations, "Protection of Historic Properties" are contained in 36 CFR Part 800. The goal of the Section 106 review process is to offer a measure of protection to sites which are determined eligible for listing on the National Register of Historic Places. National Register criteria define an important cultural resource as one that is associated with important persons or events, or that embodies high artistic or architectural values, or that has scientific value (36 CFR 60.4). Amendments to the Act (1986 and 1992) and subsequent revisions to the implementing regulations have, among other things, strengthened the provisions for Native American consultation and participation in the Section 106 review process. For the proposed new CVP water service contracts, compliance with the NHPA will occur through Reclamation's coordination with the Advisory Council on Historic Preservation. Additonal information is presented in Subchapter 10.5.6.

State Regulations

Historical Resources

State historic preservation regulations affecting this project include the statutes and guidelines contained in the California Environmental Quality Act (CEQA; Public Resources Code Sections 21083.2 and 21084.1 and Section 15064.5 of the CEQA guidelines). CEQA requires lead agencies to carefully consider the potential effects of a project on historical resources.

The CEQA Guidelines (Section 15064.5[a] of the Title 14 of the CCR) identifies the following four categories of historical resources that lead agencies must consider in determining the significance of impacts on historical and unique archaeological resources:

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historic Places.
2. A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Places, including the following:
    - A. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
    - B. Is associated with the lives of persons important in our past.
    - C. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
    - D. Has yielded, or may be likely to yield, information important in prehistory or history (PRC section 5024.1; 36 CFR 60.4).

> 4. The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to Section 5020.1(k) of the Public Resources Code, or identified in an historical resources survey (meeting the criteria in Section 5024.1(g) of the Public Resources Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resources Code Section 5020.1(j) or 5024.1.

Lead agencies must treat historical resources within the first three categories as protected by statute on either an unqualified or a presumptive basis. The first category is considered mandatory under statute. For the second category, this definition indicates that although any resource included in, or eligible for inclusion in, the State register must be treated as an historical resource. A resource included in a local register, but not in the State register, is only presumed to be an historical resource. Under the third category, the resources are presumed to be historically or culturally significant. The fourth category extends only to those resources that an agency chooses to consider "historical."

Archaeological Resources

The California Public Resources Code Section 21083.2 defines a "unique archaeological resource" as follows:

> An archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets the following criteria:
>
> 1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
> 2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
> 3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

A "non-unique archaeological resource" is one that does not meet the criteria for being "unique" (Public Resources Code 21083.2[h]). Public Resources Code 21083.2 provides that CEQA generally gives protection only to those "archaeological resources" that are "unique." An EIR is not required to address the issue of non-unique archaeological resources.

However, although an archaeological resource may not be "unique" for purposes of Section 21083.2, it may nevertheless qualify as an "historical resource" under Section 21084.1. That is, some resources are "historical resources" because they are "archaeologically significant." Section 15064.5(e) of the Title 14 CCR requires that the lead agency must first determine whether the archaeological site is an historical resource.

Native American Burials

California law protects Native American burials, skeletal remains and associated grave goods regardless of their antiquity and provides for the sensitive treatment and disposition of those remains

(California Health and Safety Code Section 7050.5, California Public Resources Code Sections 5097.94 *et seq*.). Section 7050.5(b) of the California Health and Safety code specifies protocol when human remains are discovered. The code states:

> In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.

4.10. LAND USE (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context under which potential indirect, service area-related impacts on the existing land uses could result from the implementation of the new CVP water service contracts authorized under P.L. 101-514. The context of the affected environment description provides the background upon which subsequent analysis at a general, programmatic level were evaluated.

4.10.1. Affected Environment/Setting

El Dorado County is home to 173,407 people (DOF 2005). The primary communities are South Lake Tahoe, El Dorado Hills, Cameron Park, and Placerville, which together account for approximately 64 percent of the County population (DOF 2000). Two of the most rapidly growing areas are El Dorado Hills and Cameron Park, along the western slopes of the county. With its proximity to Folsom Reservoir (a CVP facility), EID's intended use of this new water will likely occur in the El Dorado Hills and Bass Lake Tank's service area (in the western portion Cameron Park). Similarly, for GDPUD, its allocation will be used within the western portion of its service area in the vicinity of Cool, Pilot Hill, Auburn Lakes Trail, and Greenwood. See Subchapter 3.5, under the "Subcontractor Service Areas" heading, for a complete discussion and description of these service areas.

The following describes the affected environment related to existing and planned land use in those Subcontractor service areas where this new water allocation will be used.

General Land Use Designations

Historically, growth in El Dorado County resulted in compact development patterns. Communities such as Cool, Georgetown, Mt. Aukum, and Placerville were small, mixed-use communities where residents lived, worked, and shopped. Recently, urban-like development has continued in the foothills; large lot, low-density residential development, while urban in character, has maintained the feeling of a rural lifestyle throughout the County and has slowly transformed traditional rural areas into areas characterized with dispersed residential uses.

In general, the land use pattern in El Dorado County concentrates urban uses in the vicinity of U.S. Highway 50 in the portion of the county west of the City of Placerville. Rural residential and agricultural uses are located throughout the non-urbanized western portion of the County.

Since the Proposed Action consists of an M&I contract, which cannot be served to agricultural land, only areas with a designation consistent with those that can receive M&I water are included in the proposed Subcontractor service areas. The only land use designations within the proposed Subcontractor service areas are low-, medium- and high-density residential,[176] commercial, industrial, and public services (e.g., firehouses, schools).

Future facilities, however, may necessitate the construction of transmission facilities between the Subcontractor service areas and either Folsom Reservoir for EID, or the North Fork American River for GDPUD. These facilities would likely pass through areas with a land use designation of open space, either along the shore of Folsom Reservoir, or in what would have been the inundation area of Auburn Reservoir, had Auburn Dam been constructed. The Government Code defines open space as any parcel or area of land or water that is essentially unimproved and designated for natural resource protection, managed production of natural resources, provision of outdoor recreation, or assurance of public health and safety.[177]

Lands considered suitable for agricultural production are found predominantly in the western half of the county, and comprise approximately 11 percent of the County's total acreage. Despite the relatively small percentage of land, agriculture is considered a valuable resource of the western slope.

Specific Approved/Planned Land Uses in EID Proposed Subcontractor Service Areas

El Dorado County has approved and construction has begun on six specific plans that establish significant amounts of the future land use within El Dorado Hills in the EID Subcontractor service areas, as summarized below.

- The Serrano El Dorado Hills community covers approximately 3,380 square acres and consists of 13 distinct residential villages, golf course, open space, and some commercial uses. Current development plans call for construction of homes on approximately 1,900 acres to accommodate approximately 4,500 residential units.
- The Promontory Specific Plan allows for mixed-use development on approximately 1,000 acres, which includes 115 acres of parks and open space and 1,100 residential units, and began construction in mid-January 2000.

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176 It should be noted that El Dorado County has different definitions for the low-, medium- and high-density residential land use designations than those used in most areas. According to the El Dorado County 2004 General Plan, high-density residential areas are suitable for one to five dwelling units per acre, the medium-density residential designation permits one dwelling unit per 1- to 5-acre parcel, and low-density residential designation allows one dwelling unit per 5- to 10-acre parcel. The rural residential designation allows a density of one dwelling unit per 10 to 160 acres.

177 Government Code Section 65560(b).

- The Carson Creek Specific Plan provides 713 acres of mixed-use development, including 37 acres of park development and about 200 acres of open space. The Specific Plan was modified in 1999 to require a senior housing development, which would accommodate 1,700 dwelling units. The Carson Creek development is planned to include about 100 acres of industrial/R&D within its 713-acre site.
- The approximately 2,000-acre Valley View Specific Plan will ultimately contain 2,840 residential units and some non-residential development in a commercial town center; non-residential development is planned to include approximately 2.5 million square feet of retail and service-oriented development.[178]
- The Bass Lake Hills project is a 1,410-acre development consisting primarily of residential development, with portions in both the El Dorado Hills and Shingle Springs Market Areas. The plan includes 19 acres of parks and 151 acres of open space.
- The Northwest El Dorado Hills Specific Plan is a 915-acre residential development that was substantially completed in 1999, prior to the passage of Measure Y.[179]

Additionally, there are approximately 1,500 single-family lots in the Cameron Park/Shingle Springs area that are expected to be built out during the 2000 to 2010 timeframe, and a planned 80-unit multi-family apartment complex (Cameron Park Village).

4.11. TRANSPORTATION AND CIRCULATION (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context upon which potential indirect, service area-related impacts on the existing traffic and circulation conditions that could result from the implementation of the P.L. 101-514 water service contract, and those that could occur under the various alternatives were analyzed.

4.11.1. Affected Environment/Setting

The following describes the affected environment to traffic and transportation within the EID and GDPUD Subcontractor service areas, potentially affected by the Proposed Action and Alternatives.

Regional Road and Highway System

The primary roadways serving the EID and GDPUD service areas are U.S. Highway 50, State Route 49, and State Route 193. U.S. Highway 50 serves east-west traffic through El Dorado County and is the main east-west transportation facility in the county. U.S. Highway 50 is a four-lane freeway west of the City of Placerville, and a four-lane highway east of that point. State Route 49 runs north-south through El Dorado County at the northern boundary of the county, near Auburn, to the southern boundary of the county, north of Plymouth. State Route 193 runs from Placerville to Cool, via Georgetown. Regional roadways in the service areas (U.S. Highway 50, State Route 193, State Route 49) are maintained by the California Department of Transportation (Caltrans).

178 Economic & Planning Systems, *El Dorado County "No Project" Land Use Scenario Final Report,* April 2001.
179 Economic & Planning Systems, *El Dorado County "No Project" Land Use Scenario Final Report,* April 2001.

Major arterials and connectors in the Subcontractor service areas include El Dorado Hills Boulevard, Cameron Park Drive, Salmon Falls Road, Deer Valley Road, Green Valley Road, Bass Lake Road, Country Club Drive, and, State Route 193 and 49, along with Garden Valley Road and Wentworth Springs Road. These roadways serve development in the El Dorado Hills, Bass Lake and Cameron Park areas. The El Dorado County Department of Transportation manages local transportation routes and enforces roadway standards for the unincorporated areas of the county.

There are existing LOS deficiencies on U.S. 50, El Dorado Hills Boulevard, and Green Valley Road, which comprise major roadways in the El Dorado Hills area, where the most growth is anticipated to occur. The deficiencies are caused largely by commuter traffic to and from Sacramento County. Roadway improvements across the county line in Sacramento County have not kept pace with the development in El Dorado County, creating LOS F conditions on these roadways near the county line.

Roadway Capacity and Level of Service

Level of Service (LOS) is a general measure of traffic operating conditions whereby a letter grade, from A (the best) to F (the worst), is assigned. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving. The LOS grades are generally defined as follows:

- LOS A represents free-flow travel with an excellent level of comfort and convenience and the freedom to maneuver.
- LOS B has stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.
- LOS C has stable operating conditions, but the operation of individual users is significantly affected by the interaction with others in the traffic stream.
- LOS D represents high-density, but stable flow. Users experience severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
- LOS E represents operating conditions at or near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions.
- LOS F is used to define forced or breakdown conditions. This condition exists wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.

These definitions are contained in the *Highway Capacity Manual* (HCM) (Transportation Research Board 2000). The HCM methodology is the prevailing measurement standard used throughout the United States.

Caltrans has completed transportation or route concept reports for a number of State highways in El Dorado County. These reports identify long-range improvements for specific State highway corridors and establish the "concept," or desired, LOS for specific corridor segments. The reports also identify long-range improvements needed to bring an existing facility up to expected standards needed to adequately serve 20-year traffic forecasts. Additionally, the reports identify the ultimate design concept for conditions beyond the immediate 20-year design period. El Dorado County highways that have concept reports are U.S. Highway 50, State Route 49, State Route 193, and State Route 153.

The *State Route 50 Transportation Concept Report* (Caltrans 1998) identifies the 20-year concept (through 2018) for the corridor as a six-lane freeway with two general-purpose lanes and one HOV lane in each direction from the county line to the future Silva Valley interchange. The ultimate facility concept (beyond 2018) for the corridor is an eight-lane freeway with three general-purpose lanes and one HOV lane in each direction from the county line to west of Placerville.

County Roadway-Related Initiatives and Programs

In November 1998, an initiative measure was approved by voters that modified the 1996 General Plan Policies relating to transportation. Measure Y prohibits discretionary approvals of residential development with five or more units that would result in LOS F conditions during weekday, peak-hour periods on any highway, roadway, interchange, or intersection, or further deteriorate operation where operation is already at LOS F. When the 1996 General Plan was set aside, the County continued to implement the Circulation Element as amended by Measure Y, as directed by the Court.[180] When the 2004 General Plan was developed, the Transportation and Circulation element was written so as to incorporate and build upon "the key principles of the measure and the County's experiences in its implementation", due to the public support for Measure Y.

Traffic Impact Fee Programs

The County has adopted four developer-funded traffic impact fee programs:

- The El Dorado Hills/Salmon Falls Area Road Impact Fees (RIF), Resolution 175-96, was adopted by the Board of Supervisors in July 1996 with major revisions adopted in December 2000.
- The West Slope Area of Benefit Traffic Impact Mitigation (TIM) Fees, Resolution No. 201-96, was adopted by the Board of Supervisors in August 1996.
- The Transportation Impact Fee for the State System's Capacity & Interchanges (State TIM), Resolution No. 202-96, was adopted by the Board of Supervisors in August 1996.
- The Interim Transportation Impact Fee for Highway 50 Corridor Improvements (Interim 50 TIM), Resolution 247-2002, was adopted by the Board of Supervisors in October 2002.[181]

Funds from these programs will pay a portion of the cost of transportation improvements in the County. However, complete funding has not yet been identified to cover the gap caused by the

180 El Dorado County Planning Department, *El Dorado County General Plan*. July 2004, p. 51.
181 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-16.

Measure Y restriction of the use of tax revenues to pay for traffic and road improvements to serve new development.

Other Transport Systems

Public transportation in western El Dorado County consists of the El Dorado County Transit Authority (EDCTA), commercial bus services, taxi service, vanpools and carpools, and park-and-ride facilities.[182] The County also contains a number of regional bikeways and trails, although these are used primarily for recreation, rather than for commuting.

There are four general-aviation airports within the County, two of which are in the vicinity of the Subcontractor service areas. The Georgetown Airport is owned and operated by the County; the Cameron Airpark Airport is operated by a special, non-County district. The airports are used by local residents and visitors for recreational purposes, and for training, rescue, and fire-suppression activities by government agencies and military personnel.[183]

4.12. AIR QUALITY (INDIRECT EFFECTS STUDY AREA)

This subchapter discussed the context upon which the potential indirect service area-related impacts on the existing air quality conditions that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.12.1. Affected Environment/Setting

The following describes the affected environment related to air quality in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Sensitive Receptors

With respect to air quality, sensitive receptors represent portions of the population who are particularly susceptible to poor air quality. The term is also used to indicate land uses where people would be likely to remain for extended periods of time. Such uses include residential areas, schools, playgrounds, parks and recreational areas, hospitals and convalescent homes.

Sensitive receptors are present throughout the County and Subcontractor service areas. The Subcontractor service areas include a mixture of primarily residential land uses of varying density, and commercial, industrial, research and development, and public services land use designations. In addition to residential development, sensitive receptors present in the Subcontractor service areas include schools, playgrounds, parks, and long-term care facilities associated with mixed development.

182 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-8 to 5.4-10.

183 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-11.

Regional Overview

Climate and Meteorology

Western El Dorado County is located in a transition zone between the climate of the Central Valley and that of the Sierra Nevada. The western portion of the County is generally warmer year-round than the eastern portion and often experiences summer temperatures greater than 100 degrees Fahrenheit. Wind currents in this area are primarily from the west and southwest. Winds from the west facilitate local mixing but also bring air pollutants from urbanized areas to the west and southwest. In the winter, winds are typically from the east and southeast. The area experiences inversions that contribute to degraded air quality during the summer.[184]

Meteorology is often an important mediator of air pollutant impact severity. Atmospheric stability, wind speed, wind direction and the influence of local terrain control the speed with which pollutants disperse as one moves away from a pollutant release point towards a receptor. Episodes of high atmospheric stability (also known as temperature inversions) severely limit the ability of the atmosphere to disperse pollutants vertically, while low wind speeds and confining terrain have a similar effect attenuating the horizontal dispersion of airborne pollutants.

Air Quality

Monitoring data are used to designate areas according to their attainment status for criteria air pollutants. The purpose of the designations is to identify those areas with air quality problems and, thereby, initiate planning efforts for improvement. The three basic designation categories are: non-attainment, attainment, and unclassified. Unclassified is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California (State) designations include a subcategory of the non-attainment designation, called non-attainment-transitional. The non-attainment-transitional designation is given to non-attainment areas that are progressing and nearing attainment.

Western El Dorado County is located at the western edge of the Mountain Counties Air Basin (MCAB), and is under the jurisdiction of the El Dorado County Air Pollution Control District (APCD). The County is currently designated as a non-attainment area with respect to the State 1-hour ozone and PM_{10} standards, and is either in attainment or unclassified for the remaining State standards. With respect to the national standards, the County is designated as a severe non-attainment area for the 1-hour ozone standard and non-attainment for the 8-hour ozone standard. The County is either in attainment, unclassified, or unclassified/attainment for the remaining national standards. Based on current attainment status, lead, sulfates, hydrogen sulfide, and visibility-reducing particulate matter are not a primary concern in El Dorado County in comparison to ozone, PM_{10}, CO, and NO_2. Concentrations of sulfates, lead, and hydrogen sulfide are, consequently, not monitored by the ambient air quality monitoring stations in El Dorado County. The California Air Resources Board (CARB) does not yet have a measuring method with enough accuracy or precision to designate areas in the State as either “attainment” or “non-attainment.” The entire State is considered “unclassified” for visibility-reducing particulate matter. El Dorado County is in unclassified or

184 El Dorado County Planning Department, El Dorado County General Plan Environmental Impact Report, May 2003, p. 5.11-1.

unclassified/attainment for the State and national CO standards on a regional level. However, localized exceedances or CO "hot spots" can occur. Localized CO concentrations that exceed the applicable ambient air quality standards likely exist today because of the unacceptable level of service related to traffic, at which intersections currently operate in the county.[185]

Asbestos-Containing Rocks and Soils

Asbestos is a term used for several types of naturally occurring fibrous minerals. Chrysotile asbestos is the most common form, but tremolite asbestos is frequently present. Both types are associated with serpentine rock, but tremolite can also occur in certain other common rocks, especially near faults. Undisturbed, serpentine rock and soils derived from it do not present a substantial health risk, unless fibers from weathered or eroded material are transported by air currents and deposited elsewhere. Fibers may become airborne when the ground dries. When disturbed by human activity, however, asbestos can also be released into the air and become a health hazard. Dust from unpaved roads and construction activities that result in crushing or grading of serpentine rock or soils represent a typical source; and once airborne, asbestos fibers may be present in ambient air for long periods of time.

Asbestos poses a health risk as airborne fibers may become lodged in the respiratory or digestive tract and cause health problems. Breathing high levels of asbestos fibers can lead to an increase of: lung cancer; mesothelioma, a rare cancer of the lining of the chest and the abdominal cavity; and asbestosis, in which the lungs become scarred with fibrous tissue. Asbestos-related diseases may take decades to appear. Although there has been some scientific disagreement on the specific degree of hazard associated with each type of asbestos, all types of asbestos are considered hazardous by State and federal health professionals. There is not sufficient scientific information to support the identification of an exposure level that would be considered "safe." The most important way to reduce asbestos risk is to reduce exposure to airborne fibers.

Monitoring data gathered by the CARB as part of a study conducted in 1998 indicated that there is not widespread exposure to elevated levels of asbestos in ambient air. The general population does not appear to be exposed to significant risks from naturally-occurring asbestos. The report noted that increased health risk may occur near certain sources such as unpaved roads and quarries, and that construction activities in areas of serpentine or ultramafic rocks are a potential source of short-term, elevated asbestos exposures. The County has adopted an ordinance that regulates construction activities where asbestos-containing rock may be present.

Service Area-Related Air Quality Impact Sources

<u>Fixed Sources</u>

There are numerous stationary operations that can be sources of regulated emissions and particulates that may affect air quality (e.g., quarry operations, lumber mills, industrial facilities, rail yards, wood-burning stoves) dispersed throughout the county. Some, such as wood-burning stoves, are often located in urban settings and others, such as quarry operations, are sited in more rural

185 El Dorado County Planning Department, *El Dorado County General Plan Environmental Impact Report,* May 2003, p. 5.11-14.

locations. Some sensitive receptors, including schools, playgrounds, parks, may be located in the vicinity of these stationary sources that may affect air quality.

Non-stationary Sources

The primary non-stationary source of impacts on air quality in El Dorado County is vehicular traffic. Common commuter vehicles are emitters of carbon monoxide, NO_x (and thus ground-level ozone), and potentially particulate emissions. While zero-emission vehicles and partial zero-emission vehicles (PZEV) are becoming more common, it is not assumed that these and other low- or ultra-low emission vehicles will be enough to cause a significant reduction in vehicular emissions overall. Industrial traffic is also present in the County, and includes large delivery trucks and construction equipment, both of which generally run on diesel fuel. Emissions of concern from these vehicles include sulfur dioxide and particulates.

Temporary Sources

Construction-related activities are a notable temporary source of air quality impacts. Heavy machinery, pile driving, blasting, excavation activities, material transport, traffic related to additional worker trips, and constant delivery traffic all make construction a common producer of dust and diesel particulate-emissions in many locales. In rapidly growing areas, such as the western slopes of El Dorado County, it can be a prolonged source of emissions and particulates, as construction continually moves from one area to the next. Commercial/industrial, public utility, retail, roadway, or residential construction can be temporary sources of air quality problems.

4.13. NOISE (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context upon which the potential indirect service area-related impacts on the existing noise environment that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.13.1. Affected Environment/Setting

The following describes the affected environment relative to noise conditions and sensitive receptors in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Noise-Sensitive Receptors

Land-use types for which low ambient noise levels are integral to the use or value of the land are considered noise-sensitive receptors. These receptors typically include residences, hospitals, convalescent homes, schools, guest lodgings, libraries, and parks. The largest majority of noise-sensitive land uses located within the county is residential dwellings. Sensitive receptors, as identified, exist throughout the EID and GDPUD service areas.

Noise Sources

Several sources of noise that could affect local communities occur within El Dorado County. These sources include noise generated from stationary activities (e.g., commercial and industrial uses), aircraft operations, as well as traffic on major roadways and highways. In general, areas within EID and GDPUD that contain noise-sensitive land uses are relatively quiet except in the vicinity of traffic on major roadways and highways, near aircraft operations, or where stationary activities that generate noise (e.g., commercial and industrial uses) are present.

Traffic Noise

Ambient noise levels in many portions of the county are defined primarily by traffic on major roadways, including but not limited to U.S. Highway 50 (U.S. 50) and State Routes (SRs) 49, 193, and 89.[186] The 60-dBA CNEL/L_{dn} contour is typically considered the maximum "normally acceptable" noise level for the largest majority of noise-sensitive land uses located within the county (i.e., residential dwellings). Other noise-sensitive land uses, such as schools, hotels, convalescent care facilities, and hospitals, are typically considered "normally acceptable" at levels below 65 to 70 dBA CNEL/L_{dn}, depending on land-use designation.[187]

Fixed Noise Sources

There are numerous stationary noise sources (e.g., quarry operations, lumber mills, industrial facilities, rail yards) dispersed throughout the county. Some are located in urban settings and others, such as quarry operations, are sited in more rural locations. Noise-sensitive receptors located in the vicinity of these stationary sources consist primarily of residential properties and dwellings.

Other examples of stationary sources of noise include the Material Recovery Facility/Transfer Station (Diamond Springs), El Dorado Rod and Gun Club (El Dorado), and Pacific Western Pipe Extrusion (Shingle Springs). Major noise sources associated with the transfer station result from onsite heavy-duty mobile equipment.

Temporary Noise Sources

A significant temporary noise source is construction-related activities. The use of heavy machinery, pile driving, blasting, excavation activities, material transport, the intensity of on-site workers activities, and constant delivery traffic make construction the most widespread noise source in many locales. In rapidly growing areas such as the western slopes of El Dorado County, it can be a prolonged noise source, as construction continually moves from one area to the next. Whether commercial/industrial, public utility, retail, roadway, or residential, construction noise represents a significant concern.

4.14. Geology, Soils, Mineral Resources, and Paleontological Resources (Indirect Effects Study Area)

This subchapter discusses the context upon which the potential indirect, service area-related impacts on the existing geologic, seismic, mineral and paleontological resources, and soils

186 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p.5.10-12.

187 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p.5.10-12.

conditions that could result from the implementation of the P.L. 101-514 water service contract were analyzed.

4.14.1. Affected Environment/Setting

The following describes the affected environment relative to geology, soils, and mineral resources in areas potentially affected by the Proposed Action and alternatives.

Regional Geologic Setting

El Dorado County is located in the Sierra Nevada geomorphic province. Certain distinctive rock assemblages in the western Sierra Nevada can be interpreted as remnants of ancient volcanic areas, subduction zone complexes, and sequences of oceanic crust and upper mantle. The stratigraphic and structural data of the area suggest that the rock assemblages record the deposition of marine sediments and submarine volcanic rocks from the Paleozoic Era. The Mesozoic-Era collision with an oceanic island arc subsequently altered the marine sediments and volcanic rocks into metasedimentary and metavolcanic rocks that comprise the Calaveras Group. Marine sediments deposited near the end of the Mesozoic Era comprise the Mariposa Formation. Massive intrusions of igneous rocks (granitic materials of the Sierra Nevada batholith) subsequently folded and faulted the metasedimentary and metavolcanic rocks, at which time gold-bearing quartz veins and other precious metals were formed in the foothills. Volcanic activity in the Cenozoic Period on the east side of the Sierra Nevada deposited rocks, volcanic debris, and ash over the Sierra Nevada and foothills in El Dorado County. Approximately three million years ago, fault-generated uplift of the Sierra Nevada created west-flowing streams and deep canyons through the uplifted areas, removing much of the volcanic cover and exposing the metasedimentary and metavolcanic rocks.

The southwestern foothills, with elevations of less than 1,000 feet, are generally composed of rocks of the Mariposa Formation. The major groups of the Mariposa Formation in these areas are amphibolite, serpentine, and pyroxenite. The northwest parts of El Dorado County are underlain by an abundance of metamorphic rocks of the Calaveras Formation, including chert, slate, quartzite, and mica schist. Some amount of serpentine formations and asbestos soils are also found in this area. Naturally-occurring asbestos-related impacts pertaining to human health have been discussed previously. At the higher peaks, the surface geology in the county consists primarily of igneous and metamorphic rocks; and intruded into these rock masses is granite, which comprises much of the soil parent material at the higher elevations.[188] The western part of the EID service area is comprised of Copper Hill volcanics, the Pine Hill intrusive complex, and other metavolcanic and metasedimentary rocks associated with foothills development.[189]

Faults and Seismicity

The distribution of known faults is concentrated in the western portion of the county, with several isolated faults in the central county area and the Lake Tahoe Basin. Fault systems mapped in

188 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-110, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

189 California Department of Conservation, Division of Mines and Geology, Geologic Map of the Sacramento Quadrangle, California, 1:250,000, DMG Regional Geologic Map Series, 1981, Sheet 1.

western El Dorado County include the West Bear Mountains Fault; the East Bear Mountains Fault; the Maidu Fault Zone; the El Dorado Fault; the Melones Fault Zone of the Clark, Gillis Hill Fault; and the Calaveras–Shoo Fly Thrust. There are no active fault-rupture hazard zones within the proposed GDPUD and EID Subcontractor service areas.

According to the most recent estimates published by the California Geological Survey (CGS, formerly Division of Mines and Geology), El Dorado County has a low to moderate potential for strong seismic groundshaking. Potential sources include earthquakes occurring in the Sierra Nevada, as well as seismic activity associated with earthquake faults in the San Francisco Bay Area and Coast Ranges to the west. No portion of El Dorado County is located in a Seismic Hazard Zone (regulatory zones that encompass areas prone to liquefaction and earthquake-induced landslides) based on the Seismic Hazards Mapping Program administered by CGS.[190] However, wet meadows on the western slope are areas where liquefaction could occur, but there are no specific assessments of these hazards.[191]

Mineral Resources

Metallic mineral deposits – and gold deposits in particular – are considered the most significant extractive mineral resource in El Dorado County. Other metallic minerals found include silver, copper, nickel, chromite, zinc, tungsten, mercury, titanium, platinum, and iron. Non-metallic mineral resources include building stone, limestone, slate, clay, marble, soapstone, sand, and gravel.[192]

One of the most historically productive gold-producing areas is located near Latrobe in southwestern El Dorado County. Chromite was historically mined in the Flagstaff District in northern El Dorado County east of Folsom Reservoir, and approximately three square miles is classified as MRZ-2b, highly likely to have economic concentrations of mineral deposits. There is a large active limestone quarry near Cool, along State Route 49, and another near Pilot Hill. Both are classified as MRZ-2a, areas of prime mineral importance with known economic mineral deposits.[193,194] An area surrounding a former quarry lake in the proposed Marble Valley Rezone and Subdivision Project a few miles east of El Dorado Hills and south of U.S. Highway 50 was classified by CGS as MRZ-2a for limestone in 1983-84, and actively mined until 1989.[195]

190 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-6.

191 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-110, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

192 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-23.

193 California Department of Conservation, Division of Mines and Geology, Mineral Land Classification of the Auburn 15' Quadrangle, El Dorado and Placer Counties, DMG Open-File Report 83-37, 1984, p.19.

194 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, p. 7-7.

195 El Dorado County Planning Department, Revised Marble Valley Rezone and Subdivision Project Draft Environmental Impact Report, June 1997, pp. 4.9-14 and 4.9-29/30.

Gold and other metallic resources are not considered to be exhausted in El Dorado County. Some mining operations are still active or may be active near Sly Park, Georgetown, Pilot Hill, Fairplay, and other locations in southwestern El Dorado County.[196]

Subsidence, Volcanic, Landslide, and Avalanche Hazards

Surface subsidence is generally caused by groundwater withdrawal, gas withdrawal, hydrocompaction, or peat oxidation. None of these types of subsidence are evident within El Dorado County,[197] and therefore subsidence would not be expected to affect locations in the proposed Subcontractor service areas that would be served by the water deliveries resulting from the Proposed Action.

Volcanic hazard potential exists in the Tahoe-Truckee area, but none has been identified in the western portions of El Dorado County.

Regarding landslide hazard, there are no current maps identifying landslide hazards in El Dorado County, as these mapping programs were discontinued in the mid-1990s.[198] Previous mapping efforts, however, have shown the areas with potential for landslides to be along the Foothills Fault Zone, and on the eastern slope of the Sierra Nevada.[199] Historically, landslides have occurred as recently as 1997 along U.S. Highway 50 in the American River Canyon[200] east of Placerville, but have primarily been associated with significant amounts of rainfall, rather than with seismic activity. Since this landslide, USGS, in cooperation with the El Dorado National Forest, has actively monitored landslide activity along this stretch of U.S. Highway 50.

Snow avalanches are not expected to occur in the proposed Subcontractor service areas because elevations in these parts of the EID and GDPUD service areas are under 2,500 feet – considerably lower than potential avalanche areas that normally receive significant snowfall (5,000 feet and above).

Soils and Erosion

A detailed survey of soil types in western El Dorado County and their suitability for agricultural production and other land uses was published in 1974. Focusing on agricultural uses, soil classifications range from Class I to Class VIII with soils being progressively less suited for agricultural uses the higher the classification number. Class I soils are best-suited to the widest range of production and cultivation. There are no Class I soils in El Dorado County. In general, the western slope has agricultural limitations that result primarily from steep slopes, shallow depth to

196 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, p. 7-6.

197 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-110 to 4-111, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

198 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-10.

199 California Department of Conservation, Division of Mines and Geology (CDMG). 1973. Generalized Map Showing Relative Amounts of Landslides in California. Sacramento, CA.

200 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-10.

bedrock, coarse fragments in the soil profile, low available water holding capacity, and rock outcrops.[201]

Soils in the EID and GDPUD service areas (private land below 5,000 feet) consist of well-drained silt and sandy and gravelly loams divided into two physiographic regions; the Lower and Middle Foothills and the Mountainous Uplands. In the Lower and Middle Foothills, there are five soil associations: Auburn-Argonaut, Boomer-Auburn, Rescue, Serpentine Rock Land-Delpiedra, and Auberry-Ahwanee-Sierra. Mountainous Upland soil associations are Mariposa-Josephine-Site, Holland-Musick-Chaix, and Cohasset-Aiken-McCarthy.

Except for the Musick soils, the soil associations have low to moderate shrink-swell (expansion) potential.[202] The Musick soils are not present in the proposed Subcontractor service areas.

El Dorado County soils are subject to erosion near road cuts and stream banks. The NRCS rates the erosion potential in the western county as low to moderate on most of the land with slopes less than 15 percent. Slopes in the El Dorado Hills, Shingle Springs/Cameron Park, and Diamond Springs/El Dorado areas range from 0 to 25 percent. Steeper slopes in excess of 25 percent are located along the river and stream canyons in the Coloma/Gold Hill, Cool/Pilot Hill, and Georgetown/Garden Valley, Pollock Pines, Camino, Pleasant Valley, Latrobe, and Somerset/Fairplay areas. The following areas in the EID and GDPUD service areas are characterized by predominantly steep slopes: Pollock Pines, Pleasant Valley, Georgetown/Garden Valley, American River, and Mosquito.[203] Of these steeper areas, only a small portion of the Georgetown/Garden Valley area lies within the Subcontractor service areas of this Proposed Action.

Paleontological Resources

Paleontology is the study of the remains, typically fossilized, of various plant or animal species such as dinosaurs and early mammals. While it is frequently associated with cultural sites and artifacts, paleontology does not encompass the study of traces of human cultural activity or human remains themselves. Paleontological remains may be found in numerous types of rock formations. However, vertebrate fossils are most commonly recovered from sedimentary and some volcanic rock formations, and can also be found in re-deposited stream and river gravels. Although no comprehensive paleontological studies have been conducted within the county, the paleontological sensitivity of rock units can be generally assessed based on the density of fossil remains previously documented within the rock unit and based on known unique, scientifically mportant fossils produced from that rock unit.

El Dorado County geology is fairly complex, with documented formations ranging from the Paleozoic era, dating to as early as 350 million years ago (Ma), to stream and gravel deposits still being

201 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, pp. 7-1 to 7-2.

202 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-111, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

203 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-19.

deposited in recent times. Paleontological finds within most of these formations have been limited, with the exception of certain limestone cave deposits. Seven such localities have been discovered and recorded, mostly during the early 20th century, and consist of Pleistocene-age (1.8 Ma to 10 thousand years ago) vertebrates from caves near the town of Cool and along the Cosumnes River in the southern portion of the County. Other geological contexts from which a few vertebrate fossils have been discovered in the County include the Mehrten formation and Pleistocene channel deposits. The Mehrten is exposed in areas immediately surrounding Placerville to the north, south, and east. Pleistocene channel deposits occur in river tributaries in El Dorado County, and may appear underlying deposits mapped as Quaternary alluvium at shallow depth. While Quaternary alluvium is not prevalent in El Dorado County, primarily because of the topography, localized deposits are found within the County in stream and river channels, on the surface of valleys, and as alluvial fans.[204]

4.15. Recreation (Indirect Effects Study Area)

This subchapter discusses the context upon which the potential indirect service area-related impacts on existing recreational uses in the project vicinity that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.15.1. Affected Environment/Setting

The following describes the affected environment related to recreation and recreational resources in areas within the EID and GDPUD Subcontractor service areas, which could be potentially affected by the Proposed Action and Alternatives.

In-County Recreational Areas

The diverse natural characteristics of El Dorado County provide a wide range of recreational opportunities to residents and visitors alike. Many of the recreational resources located in the County have been developed by State and federal public agencies on public lands that are not directly subject to the County's General Plan. El Dorado County also owns and operates a number of regional recreation areas and is also involved in trail designation and construction as well as planning and administering the use of rivers flowing through the County for recreation activities.[205]

El Dorado County has a combined total of 106 existing and proposed parks and recreation areas encompassing more than 65,800 acres. The largest recreation areas include the approximately 17,718-acre Folsom Lake State Recreation Area (SRA), along the shores of Folsom Reservoir, and the 42,000-acre Auburn SRA in the North and Middle Fork American River Canyon. Of the 106 existing and proposed recreation areas, 38 are under the jurisdiction of El Dorado County, Cameron Park Community Services District, El Dorado Hills Community Services District, and Georgetown

204 El Dorado County Planning Department, *El Dorado County General Plan Final Environmental Impact Report* (SCH #2001082030), January 2004, p. 2-69.
205 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.7-63.

Divide Recreation District and lie within or adjacent to the service areas.[206] There are four County service area recreation zones of benefit on the western slope: Ponderosa, Gold Trail, Mother Lode, and Camino/Pollock Pines Recreation Districts. The County Parks and Recreation Division is responsible for the facilities located within the recreation service areas. There is a County-wide deficiency in required park acreage in all areas, and a high level of use for all existing park and recreation facilities within the service areas.[207]

Recreational use of open space lands within the County is managed under plans developed by the U.S. Forest Service (El Dorado National Forest), Bureau of Land Management (along the American River), or the California Department of Parks and Recreation (CDPR, Auburn SRA, Folsom Lake SRA).[208]

Sly Park, located at Jenkinson Lake, is the only recreational area in the County operated by EID, but lies outside the proposed Subcontractor service area. Another parcel of undeveloped land owned by EID that may be developed in the future is adjacent to Bass Lake in the El Dorado Hills area, and is within the Subcontractor service area.[209]

American River

Recreational use on the North Fork American River is concentrated upstream of the confluence of the North Fork and South Fork American River, outside of the Folsom Lake SRA. The North Fork supports commercial whitewater rafting upstream of Lake Clementine. On the Middle Fork, commercial rafting occurs upstream of the North Fork/Middle Fork confluence. Boating is prohibited downstream of the Middle/Fork North Fork confluence to the Folsom Reservoir high water line. Other recreation opportunities along the North Fork American River include hiking, mountain bicycling, and horseback riding on the Auburn-to-Cool Trail and Western States Trail.

4.16. VISUAL RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter discusses the context upon which the potential indirect service area-related impacts on existing visual and aesthetic resources within the project vicinity that could result from the implementation of the P.L.101-514 water service contract were assessed.

206 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

207 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

208 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

209 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.7-68/69.

4.16.1. Affected Environment/Setting

The following describes the affected environment related to visual resources in the two Subcontractor service areas that could be potentially affected by the Proposed Action and Alternatives.

Regional Visual Setting

Undeveloped lands characterize much of El Dorado County included within the EID and GDPUD service areas. A variety of native environments exist, each represented by a distinct vegetative communities, geologic features, and landforms. These features contribute some of the most distinct visual resources in the County, providing numerous and varied short-range, mid-range, and long-range views. Gently rolling grassy foothills containing oak woodlands, orchards, and vineyards dominate views in the County's western and southern areas. Progressing east towards Lake Tahoe, north towards the American River, or south towards the Cosumnes River, the terrain and elevation changes dramatically. Views of the gently rolling foothills progressively change into landscapes consisting of steep, scenic river and stream corridors with dense woodlands, rugged valleys, and mid-range views of peaks along the crest of the Sierra Nevada. Traditions and styles linked to the Gold Rush are an integral part of the visual character of lands in the two service areas. Historic buildings, trails, and remnants of the early mining history of the County contribute significantly to the visual environment. Agricultural activities including ranching, orchards, vineyards and wineries, and grazing lands provide visual elements as well. The visual and aesthetic qualities of the County, including views of the Sierra Nevada, panoramas of agricultural land, forests, steep canyons, and woodlands are unique and integral components of the tourism industry.

The existing urban environment is as varied as the native environment. The U.S. Highway 50 corridor is characterized by newer high-density residential development, retail centers of varying size, commercial and business park development, and ranches. The largest portion of the proposed place of use for the P.L. 101-514 water lies within the more heavily-developed western portion of the county along Highway 50, including El Dorado Hills, Bass Lake, and Cameron Park. Areas along State Route 49 are characterized by rural communities with commercial cores with architectural styles reflecting Old West, Victorian, and contemporary design. This character, however, is more common in the GDPUD proposed Subcontractor service area than in the EID area.

Several highways in El Dorado County have been designated by Caltrans as scenic highways or are eligible for such designation. The following State scenic highways have been designated in the county:

- U.S. Highway 50 from the eastern limits of the Government Center interchange (Placerville Drive/Forni Road) in Placerville to South Lake Tahoe;
- all of SR 89 within the county; and
- those portions of SR 88 along the southern border of the county. SR 88 has also been designated under the USFS program as a national scenic byway.

Studies are pending for a similar designation under a Federal Highway Administration program. One of these portions of highway, however, are within or adjacent to the proposed Subcontractor service area for the Proposed Action.

American River and Folsom Reservoir

Folsom Reservoir is located within a landscape of rolling wooded foothills and provides a generally pleasing visual setting for numerous recreational uses, as viewed above the dam. The reservoir represents a significant visual component that contrasts sharply with the nearby foothill landscape, creating a vivid landscape feature. Folsom Reservoir levels are generally drawn down as summer progresses, creating exposed soil along the reservoir's shores, and affecting the overall visual quality; this effect is accentuated in dry years.

Upstream from Folsom Reservoir, many of the tributary streams flow into the forks of the American River in very steep terrain, creating cascades and waterfalls. These features provide notable scenic value to the area. Vegetation in the area is composed of oak woodland, chaparral, and ponderosa pine forest.

In September 1992, the Bureau of Land Management completed a study of the North and Middle forks of the American River and determined three segments of the river in this area to have significant scenic quality and, therefore, eligible for designation as National Wild and Scenic Rivers under Section 5(d) of the National Wild and Scenic Rivers Act. However, none of these Wild and Scenic River lie within the proposed Subcontractor service areas.

4.17. CULTURAL RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter discusses the affected environment context upon which the potential indirect service area-related impacts on existing cultural resources that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.17.1. Affected Environment/Setting

The following describes the affected environment related to cultural resources in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Service Area-Related Cultural Resources

The Water Agency's planning area covers approximately 18,270 acres. According to the files at the North Central Information Center of the California Historical Resources Information System, housed at CSU Sacramento, roughly 4,252 acres, or about 23 percent of the area, had been subject to previous cultural resources studies as of 2006. These are of various ages and levels of completeness, and many of them may not be up to current standards. They are listed in the Class I Overview prepared for Reclamation (Waechter 2008). A review of the Information Center's files, published references, and historic-period maps has identified 325 recorded or potential cultural resources, of which 146 appear to lie within the planning area boundaries.

Prehistoric/Native American Resources

The most common element of prehistoric/Native American resources, which include ethnographic-period sites, are milling features: mortars and grinding slicks made on boulders or bedrock outcrops. These occur as isolated features and also in association with artifacts and midden. Complex occupation or "village" sites—usually including milling features—also are fairly frequent, no doubt because the project lies in the lower foothills, below the snow line, where people lived all-year-round. Lithic scatters are very common, since most prehistoric sites contain flaked stone tools and debitage. According to the records search results, none of the known prehistoric sites or components within the Plan Area has been formally evaluated for eligibility to the National Register of Historic Places or the California Register of Historical Resources.

Historic-Era (Non-Native) Resources

Historic-period resources make up two-thirds of the total, and these are dominated by mining remains, ditches/canals (which may also be related to mining), refuse deposits, and roads/trails. The high percentage of mining sites is not surprising, given the project's location in the foothills of the Mother Lode. Adits, shafts, tailings, and prospect pits (also called "glory holes" or "coyotes") cover much of El Dorado County, as well as adjacent Placer, Nevada, and Amador counties. Roads and trails were constructed to access mining sites and connect settlements, and these travel corridors join to form webs across the landscape, along which people built houses, farms, and commercial businesses. Refuse deposits, like prehistoric lithic scatters, are common elements of many sites. Few, if any, of these resources have been formally evaluated for eligibility to the National Register of Historic Places or the California Register of Historical Resources.

4.18. TERRESTRIAL AND WILDLIFE RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter describes the terrestrial resources and habitats within the Subcontractor service areas and presents the context under which the analyses of the potential indirect or secondary effects on these resources resulting from implementation of the new CVP water service contracts can be made. The information contained herein is taken from the El Dorado County General Plan EIR dated 2003, as amended (2004), and supplemented with updated information where relevant.

4.18.1. Affected Environment/Setting

The following describes the affected environment related to terrestrial resources and related habitats in areas potentially affected by the Proposed Action and Alternatives. El Dorado County possesses a diverse mix of native flora and fauna. This diversity can be attributed to a combination of unique physical characteristics that have resulted in a wide assortment of habitats. These unique physical features include a wide range of elevations and varied terrain, diverse substrate material, large tracts of contiguous natural habitat, and a broad range of climatic conditions. Habitats are generally distributed in an integrated mosaic pattern across the county. Coniferous forest is dominant at higher elevations in the eastern half; oak and hardwood habitats are found mostly in the central region; and annual grassland, chaparral, agriculture, and urban development is found primarily in the western third of the county.

Within the western foothill region (western slope) of the county, threats to biological diversity and sensitive biological resources are considered most serious. The impacts on biological resources are primarily the result of urbanization of the area, habitat fragmentation, water pollution, and conversion of natural land to agricultural uses. This area includes the proposed Subcontractor service areas.

Major Habitat Types

The following descriptions of major habitat types are summaries of detailed accounts presented in *A Guide to Wildlife Habitats in California* (Mayer and Laudenslayer 1988). For the General Plan EIR, the distribution of habitats in El Dorado County was defined using land-cover data developed as part of a cooperative effort between the California Department of Forestry and Fire Protection (CDF) Fire and Resource Assessment Program (FRAP) and USFS (CDF-FRAP El Dorado County General Plan EIR, May 2003). Habitat types were quantified using the GIS land-cover data developed by FRAP. The major habitats in El Dorado County have been grouped into five categories: coniferous forest habitats, woodland habitats, shrub-dominated habitats, herbaceous-dominated habitats, and other habitats.

Coniferous Forest Habitats

Coniferous forest habitats are the dominant vegetation type above 2,500 feet elevation. Coniferous forest habitats cover 613,200 acres, or more than half of the 1,145,400 acres in the county. The eight major coniferous forest habitats in El Dorado County are Douglas-fir, Jeffrey pine, lodgepole pine, ponderosa pine, red fir, Sierran mixed conifer, subalpine conifer, and white fir. Within the Subcontractor service areas, Sierran mixed confer is dominant of the coniferous forest habitats.

Sierran mixed conifer covers 304,100 acres and is the most common habitat type in El Dorado County. Generally occurring between 2,500 and 6,000 feet elevation, this habitat is comprises both hardwood and conifer species. Trees commonly occurring in Sierran mixed conifer include Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, and black oak. Historically, burning and logging have caused wide variability in stand structure, resulting in both even-aged and uneven-aged stands. Forested stands form closed, multilayered canopies with nearly 100 percent overlapping cover. Virgin old-growth stands where fire has been excluded are often two-storied, with the overstory composed of mixed conifer and the understory white fir and incense cedar. Shrubs are common below openings in the canopy. Common shrub species are deer brush, manzanita, bush chinquapin, squawcarpet, mountain whitethorn, gooseberry, and mountain misery.

Woodland Habitats

Woodland habitats are located primarily at middle and lower elevations in the western half of El Dorado County. The four major woodland habitats are montane hardwood-conifer, montane hardwood, blue oak-foothill pine, and blue oak woodland. These habitats combined cover 252,400 acres in El Dorado County. Woodland habitats range in structure from open savannah to dense forest. Sensitive woodland habitats in the county include montane riparian, valley-foothill riparian, aspen, and valley oak woodland.

Montane hardwood-conifer, which covers 49,100 acres, includes vegetation associated with both coniferous and hardwood habitats and is a transitional habitat between the montane hardwood, mixed chaparral, and woodlands of low elevations and the coniferous forests of high elevations. Habitat composition is generally defined as including a minimum of one-third coniferous trees and one-third broad-leaved trees. Typically, conifers dominate the upper canopy, ranging up to 200 feet in height, and broad-leaved trees form a sub-canopy at 30–100 feet elevation. Common tree species associated within this habitat type include black oak, ponderosa pine, Douglas-fir, white fir, and incense cedar. In the northern Sierra Nevada, montane hardwood-conifer is found between 1,000 and 4,000 feet elevation.

Montane hardwood covers 155,900 acres. This habitat usually occurs at lower elevations than montane hardwood-conifer and is often associated with major river canyons. Montane hardwood is composed of a mixture of trees that occur on rocky, poorly developed and well drained soils. The structure ranges from dense to open tree cover with a poorly developed shrub understory. At low elevations, common species include canyon live oak, foothill pine, madrone, and California bay. Black oak and Douglas-fir may occur at higher elevations. Common shrubs in montane hardwood habitat include wood rose, snowberry, manzanita, and poison-oak.

Blue oak-foothill pine covers 4,200 acres and is characterized by a mixture of hardwoods, conifers, and shrubs. This habitat is found generally in the foothills where it intergrades with blue oak woodland and annual grassland at lower elevations, extending up to about 3,000 feet elevation, where it frequently intergrades with mixed chaparral. The understory is commonly characterized by clusters of mixed shrubs with interspersed openings dominated by annual grasses. Blue oaks are dominant at lower elevations but are usually outnumbered by foothill pines at higher elevations. Associated tree species include interior live oak, canyon live oak, and California buckeye. Interior live oaks are present on alluvial soils associated with river floodplains, low foothills, and upland slopes. Canyon live oaks are present on low foothills, mountain canyons, upland slopes, and exposed ridges.

Blue oak woodland covers 43,200 acres and is found mostly below 3,000 feet elevation on shallow, rocky, and infertile soils. Blue oak woodland includes an understory of annual grasses or a poorly developed shrubby understory featuring species such as poison-oak, California coffeeberry, and buckbrush. Interior live oaks and canyon live oaks are often found in blue oak woodland. These species can also be the dominant tree species where they may be considered as distinct habitats. Interior live oaks are often associated with river floodplains, low foothills, and upland slopes. In low-elevation foothill woodlands, interior live oaks occur as widely spaced trees or clumps that may be concentrated around rock outcrops. Interior live oak becomes a more significant part of the blue oak woodland canopy with increasing elevation, particularly on north-facing slopes. Canyon live oaks are found on low foothills, mountain canyons, upland slopes, and exposed ridges.

Shrub-Dominated Habitats

Shrub-dominated habitats exist at scattered locations throughout the county and include sagebrush, alpine dwarf-shrub, montane chaparral, chamise chaparral, and mixed chaparral. These five habitats cover a total of 84,100 acres. Although none of these habitats are considered sensitive, they are known to provide habitat for a number of special-status plant and wildlife species.

Alpine dwarf-shrub covers 1,200 acres above 8,500 feet elevation. The prostrate plants within this habitat are adapted to the thin, rocky soil, heavy snowpack, and short growing season. Common plants include pussy paws, Sierra primrose, Davidson's penstemon, and Indian paintbrush.

Chamise chaparral covers 3,700 acres and is usually found below 4,000 feet elevation often consists of nearly pure stands of chamise. The purest stands of chamise occur on xeric (dry), south-facing slopes. Toyon, sugar sumac, poison-oak, and California buckthorn are commonly found with chamise in drainages and on other relatively moist sites.

Herbaceous-Dominated Habitats

Annual grassland, which covers 81,100 acres, is the only major herbaceous-dominated habitat in El Dorado County. Annual grassland is fairly common at low elevations (i.e., below 2,500 feet elevation) in the western region of the county. This habitat comprises mostly non-native annuals, primarily of Mediterranean origin, but can also include a variety of native herbaceous species. Non-native grasslands have replaced most native perennial grasslands in El Dorado County and throughout most of California.

Wildlife

The complex array of habitats in El Dorado County supports abundant and diverse fauna because large tracts of land are covered by habitats known to have outstanding value for wildlife, such as mixed coniferous and hardwood forests. Sierran mixed conifer habitat alone, the most common habitat in the county, supports 355 species of animals (Verner and Boss 1980). Oak woodlands provide habitat for more than 100 species of birds, 60 species of mammals, 80 species of amphibians and reptiles, and 5,000 species of insects (Verner and Boss 1980, Pavlik et al. 1991). Blue oak-foothill pine, another major habitat type in El Dorado County, provides suitable breeding habitat for 29 species of amphibians and reptiles, 79 species of birds, and 22 species of mammals (Verner and Boss 1980).

Important wildlife habitat is found throughout the county. Large contiguous blocks containing multiple habitat types have the potential to support the highest wildlife diversity and abundance. Special-status wildlife occur in both large and small blocks of habitat, while some large mammals and other species that have large home ranges are generally found only on large undisturbed parcels. Generally, the lowest diversity of native wildlife species can be expected in densely urbanized areas as in much of the EID Subcontractor service area.

Wildlife diversity is generally high in the lower montane coniferous forest types. Amphibians and reptiles found in lower montane forest and woodlands include Pacific treefrog and rubber boa. Common resident birds in these forests include Stellar's jay and hairy woodpecker. Migratory species that use these forests for breeding during summer months include western tanager, Nashville warbler, and black-headed grosbeak. Common mammals in lower montane coniferous forests include mule deer and Douglas' squirrel.

Oak and other hardwood habitats at mid-elevations are important for a large percentage of the wildlife species found in El Dorado County. Reptiles and amphibians found in oak woodlands include California slender salamander, western fence lizard, and California kingsnake. Common birds in oak woodland include acorn woodpecker, western scrub-jay, and oak titmouse. Mammals that characterize oak woodland habitat include mule deer, western gray squirrel, gray fox, and bobcat.

Chaparral generally has lower wildlife diversity than most forest and woodland habitats. However, chaparral does provide habitat for many wildlife species, including some that are considered rare elsewhere. Reptiles found in chaparral include western rattlesnake, western fence lizard, and western whiptail. Common birds in chaparral at low elevations include wrentit, Bewick's wren, California towhee, and California quail. At higher elevations chaparral can provide habitat for mountain quail, fox sparrow, and green-tailed towhee. Mammals commonly associated with chaparral include and gray fox and mule deer.

Annual grasslands generally support lower wildlife diversity than woodland and shrub-dominated habitats but are invaluable to the grassland-dependent species found in El Dorado County. A great diversity and abundance of insects rely on grasslands. Reptiles found in annual grasslands include western fence lizard and gopher snake. Birds that are common in this habitat include western meadowlark, Say's phoebe, and savanna sparrow. Mammals known to use this habitat include California ground squirrel, black-tailed jackrabbit, pocket gopher, and coyote.

Agricultural land and lands dominated by urban development support many wildlife species, most of which are highly adapted to these disturbed environments. Agricultural land is not generally considered important wildlife habitat but is used by many species, particularly as foraging habitat. Wildlife found in agricultural areas varies by crop type and time of year. Common wildlife expected in most agricultural regions of El Dorado County include Brewers blackbird, American crow, red-tailed hawk, house finch, raccoon, striped skunk, and opossum.

Wildlife found in urban areas is often dependent upon surrounding land uses and the presence or absence of nearby natural vegetation. In densely urbanized areas such as El Dorado Hills, Cameron Park, and Shingle Springs, a large percentage of the wildlife can be made up of exotic species such as rock dove, European starling, house sparrow, house mouse, and brown rat. Urban areas provide habitat for species also found in agricultural areas, such as mourning dove, American robin, and western gray squirrel.

Sensitive Habitats

Sensitive habitats for El Dorado County and, specifically, in those areas delineated by the proposed Subcontractor service areas have been identified and described in detail in other documents. Most notably, the Draft Biological Assessment for listed terrestrial species associated with the ongoing informal consultation between Reclamation and USFWS for this action provides a thorough discussion of these habitats and potentially affected listed species (see Appendix G in this Draft EIS/EIR). A brief summary of some of the sensitive habitats includes those for montane and valley-foothill riparian habitat, valley oak woodland, and vernal pools.

Montane riparian habitat, which covers 700 acres, is associated with montane lakes, ponds, seeps, bogs, and meadows, as well as rivers and streams. This habitat is usually present below 8,000 feet elevation. Montane riparian vegetation is quite variable and often structurally diverse. Usually, the montane riparian zone occurs as narrow, often dense grove of broadleaved, deciduous trees. In the Sierra Nevada, characteristic species include thinleaf alder, aspen, black cottonwood, dogwood, wild azalea, willow, and white alder. Like all riparian habitats, montane riparian habitat supports rich fauna that include a high diversity of amphibians, reptiles, birds and mammals. Montane and other riparian habitats also provide important migration and dispersal corridors for wildlife (Mayer and Laudenslayer 1988). A few of the many common wildlife species associated with montane riparian habitat in El Dorado County include western aquatic garter snake, Pacific treefrog, Wilson's warbler, and mink. Several special-status wildlife species depend on montane riparian including willow flycatcher and yellow-legged frog.

Valley-foothill riparian habitat is typically found at lower elevations (i.e., below 3,000 feet elevation) in western El Dorado County. It is found along many of the rivers and streams that flow through the valleys and rolling foothills in this region. Plant diversity within valleyfoothill riparian varies considerably depending upon hydrological factors, soils, and other environmental conditions. Dominant tree species may include Fremont cottonwood, willow, and valley oak. The understory typically consists of a shrub and herbaceous layer. Common shrubs and vines include wild rose, blackberry, blue elderberry, poison-oak, wild grape, California coffeeberry, and willows. Common wildlife associated with valley-foothill riparian habitat include black-headed grosbeak, bushtit, striped skunk, raccoon, and gray fox. Special status wildlife species that depend on valley-foothill riparian habitat include the northwestern pond turtle, Cooper's hawk, and foothill yellow-legged frog.

Valley oak woodland covers 3,300 acres at lower elevations in El Dorado County. This habitat, which is dominated by valley oaks, varies from savanna-like to forest-like stands with partially closed canopies. Valley oak woodland is composed mostly of winter-deciduous, broad-leaved species. Denser stands typically grow in valley soils along natural drainages. In the foothills, valley oak woodland often intergrades with blue oak woodland or blue oak-foothill pine habitats. Trees frequently associated with this habitat include western sycamore, box elder, Northern California black walnut, blue oak, and interior live oak. Valley oak woodland, like most oak woodland habitats, supports numerous wildlife species. It is particularly important for species that feed on acorns, are cavity-nesters, or otherwise dependent on valley oaks for food and/or breeding habitat. Wildlife found commonly in valley oak woodland includes gopher snake, acorn woodpecker, oak titmouse, white-breasted nuthatch, California quail, and western gray squirrel. Valley oak woodland is classified by both the CNDDB and CWHR, and is listed as a high-priority community for inventory by the CNDDB.

Vernal pools are associated with annual grassland habitat in the westernmost region of the county. These ephemeral pools support many endemic species, including special-status plants, invertebrates, and amphibians. Suitable topographic and soil conditions are prerequisites for the occurrence of vernal pools. The topography requirement is a series of microdepressions that collect water from precipitation and runoff from the surrounding higher landforms during the rainy season. The important soil requirement is a subsoil hardpan or claypan, which prevents the draining of water from these pools by downward percolation, resulting in a perched water table. Vernal pools are typically characterized by a high percentage of native annuals such as goldfields, downingia, and meadowfoam.

Regulatory Framework

The regulatory setting for the preservation, protection, and long-term management of terrestrial wildlife and associated habitats is provided at the federal, State and local county levels. Where special status species and/or their habitats are listed under either the federal or State Endangered Species Acts, the provisions for protection and conservation are explicit (see Draft Biological Assessment for listed terrestrial species for this action under Appendix G). A review of the federal consultation requirements under Section 7(a) of the federal Endangered Species Act is not restated here.

Locally, El Dorado County has long considered the conservation of biological resources (e.g., wildlife and vegetation) an important part its resource management responsibilities. As part of its Conservation and Open Space Element of the General Plan, various Goals, Objectives, and Policies exist that address these resource protection issues. They are identified below:

GOAL 7.4: WILDLIFE AND VEGETATION RESOURCES

Identify, conserve, and manage wildlife, wildlife habitat, fisheries, and vegetation resources of significant biological, ecological, and recreational value.

OBJECTIVE 7.4.1: RARE, THREATENED, AND ENDANGERED SPECIES

The County shall protect State and Federally recognized rare, threatened, or endangered species and their habitats consistent with Federal and State laws.

<u>Policies</u>

7.4.1.1 The County shall continue to provide for the permanent protection of the eight sensitive plant species known as the Pine Hill endemics and their habitat through the establishment and management of ecological preserves consistent with County Code Chapter 17.71 and the USFWS' Gabbro Soil Plants for the Central Sierra Nevada Foothills Recovery Plan (USFWS 2002).

7.4.1.2 Private land for preserve sites will be purchased only from willing sellers.

7.4.1.3 Limit land uses within established preserve areas to activities deemed compatible. Such uses may include passive recreation, research and scientific study, and education. In conjunction with use as passive recreational areas, develop a rare plant educational and interpretive program.

7.4.1.4 Proposed rare, threatened, or endangered species preserves, as approved by the County Board of Supervisors, shall be designated Ecological Preserve (-EP) overlay on the General Plan land use map.

7.4.1.5 Species, habitat, and natural community preservation/conservation strategies shall be prepared to protect special status plant and animal species and natural communities and habitats when discretionary development is proposed on lands with such resources unless it is determined that those resources exist, and either are or can be protected, on public lands or private Natural Resource lands.

7.4.1.6 All development projects involving discretionary review shall be designed to avoid disturbance or fragmentation of important habitats to the extent reasonably feasible. Where avoidance is not possible, the development shall be required to fully mitigate the effects of important habitat loss and fragmentation. Mitigation shall be defined in the Integrated Natural Resources Management Plan (INRMP) (see Policy 7.4.2.8 and Implementation Measure CO-M).

The County Agricultural Commission, Plant and Wildlife Technical Advisory Committee, representatives of the agricultural community, academia, and other stakeholders shall be involved and consulted in defining the important habitats of the County and in the creation and implementation of the INRMP.

7.4.1.7 The County shall continue to support the Noxious Weed Management Group in its efforts to reduce and eliminate noxious weed infestations to protect native habitats and to reduce fire hazards.

OBJECTIVE 7.4.2: IDENTIFY AND PROTECT RESOURCES

Identification and protection, where feasible, of critical fish and wildlife habitat including deer winter, summer, and fawning ranges; deer migration routes; stream and river riparian habitat; lake shore habitat; fish spawning areas; wetlands; wildlife corridors; and diverse wildlife habitat.

Policies

7.4.2.1 To the extent feasible in light of other General Plan policies and to the extent permitted by State law, the County of El Dorado will protect identified critical fish and wildlife habitat, as identified on the Important Biological Resources Map maintained at the Planning Department, through any of the following techniques: utilization of open space, Natural Resource land use designation, clustering, large lot design, setbacks, etc.

7.4.2.2 Where critical wildlife areas and migration corridors are identified during review of projects, the County shall protect the resources from degradation by requiring all portions of the project site that contain or influence said areas to be retained as non-disturbed natural areas through mandatory clustered development on suitable portions of the project site or other means such as density transfers if clustering cannot be achieved. The setback distance for designated or protected migration corridors shall be determined as part of the project's environmental analysis. The intent and emphasis of the Open Space land use designation and of the non-disturbance policy is to ensure continued viability of contiguous or interdependent habitat areas and the preservation of all movement corridors between related habitats. The intent of mandatory clustering is to provide a mechanism for natural resource protection while allowing appropriate development of private property. Horticultural and grazing projects on agriculturally designated lands are exempt from the restrictions placed on disturbance of natural areas when utilizing "Best Management Practices" (BMPs) recommended by the County Agricultural Commission and adopted by the Board of Supervisors when not subject to Policy 7.1.2.7.

7.4.2.3 Consistent with Policy 9.1.3.1 of the Parks and Recreation Element, low impact uses such as trails and linear parks may be provided within river and stream buffers if all applicable mitigation measures are incorporated into the design.

7.4.2.4 Establish and manage wildlife habitat corridors within public parks and natural resource protection areas to allow for wildlife use. Recreational uses within these areas shall be limited to those activities that do not require grading or vegetation removal.

7.4.2.5 Setbacks from all rivers, streams, and lakes shall be included in the Zoning Ordinance for all ministerial and discretionary development projects.

7.4.2.6 El Dorado County Biological Community Conservation Plans shall be required to protect, to the extent feasible, rare, threatened, and endangered plant species only when existing Federal or State plans for non-jurisdictional areas do not provide adequate protection.

7.4.2.7 The County shall form a Plant and Wildlife Technical Advisory Committee to advise the Planning Commission and Board of Supervisors on plant and wildlife issues, and the committee should be formed of local experts, including agricultural, fire protection, and forestry representatives, who will consult with other experts with special expertise on various plant and wildlife issues, including representatives of regulatory agencies. The Committee shall formulate objectives which will be reviewed by the Planning Commission and Board of Supervisors.

7.4.2.8 Develop within five years and implement an Integrated Natural Resources Management Plan (INRMP) that identifies important habitat in the County and establishes a program for effective habitat preservation and management. The INRMP shall include the following components:

A. Habitat Inventory. This part of the INRMP shall inventory and map the following important habitats in El Dorado County:

1. Habitats that support special status species;
2. Aquatic environments including streams, rivers, and lakes;
3. Wetland and riparian habitat;
4. Important habitat for migratory deer herds; and
5. Large expanses of native vegetation.

The County should update the inventory every three years to identify the amount of important habitat protected, by habitat type, through County programs and the amount of important habitat removed because of new development during that period. The inventory and mapping effort shall be developed with the assistance of the Plant and Wildlife Technical Advisory Committee, CDFG, and USFWS. The inventory shall be maintained and updated by the County Planning Department and shall be publicly accessible.

B. Habitat Protection Strategy. This component shall describe a strategy for protecting important habitats based on coordinated land acquisitions (see item D below) and management of acquired land. The goal of the strategy shall be to conserve and restore contiguous blocks of important habitat to offset the effects of increased habitat loss and fragmentation elsewhere in the county. The Habitat Protection Strategy should be updated at least once every five years based on the results of the habitat monitoring program (item F below). Consideration of wildlife movement will be given by the County on all future 4- and 6-lane roadway construction projects. When feasible, natural under-crossings along proposed roadway alignments that could be utilized by terrestrial wildlife for movement will be preserved and enhanced.

C. Mitigation Assistance. This part of the INRMP shall establish a program to facilitate mitigation of impacts on biological resources resulting from projects approved by the County that are unable to avoid impacts on important habitats. The program may include development of mitigation banks, maintenance of lists of potential mitigation options, and incentives for developers and landowner participation in the habitat acquisition and management components of the INRMP.

D. Habitat Acquisition. Based on the Habitat Protection Strategy and in coordination with the Mitigation Assistance program, the INRMP shall include a program for identifying habitat acquisition opportunities involving willing sellers. Acquisition may be by state or federal land management agencies, private land trusts or mitigation banks, the County, or other public or private organizations. Lands may be acquired in fee or protected through acquisition of a conservation easement designed to protect the core habitat values of the land while allowing other uses by the fee owner. The program should identify opportunities for partnerships between the County and other organizations for habitat acquisition and management. In evaluating proposed acquisitions, consideration will be given to site specific features (e.g., condition and threats to habitat, presence of special status species), transaction related features (e.g., level of protection gained, time frame for purchase completion, relative costs), and regional considerations (e.g., connectivity with adjacent protected lands and important habitat, achieves multiple agency and community benefits). Parcels that include important habitat and are located generally to the west of the Eldorado National Forest should be given priority for acquisition. Priority will also be given to parcels that would preserve natural wildlife movement corridors such as crossing under major roadways (e.g., U.S. Highway 50 and across canyons). All land acquired shall be added to the Ecological Preserve overlay area.

E. Habitat Management. Each property or easement acquired through the INRMP should be evaluated to determine whether the biological resources would benefit from restoration or management actions.

Examples of the many types of restoration or management actions that could be undertaken to improve current habitat conditions include: removal of non native plant species, planting native species, repair and rehabilitation of severely grazed riparian and upland habitats, removal of culverts and other structures that impede movement by native fishes, construction of roadway under and over-crossing that would facilitate movement by terrestrial wildlife, and installation of erosion control measures on land adjacent to sensitive wetland and riparian habitat.

F. Monitoring. The INRMP shall include a habitat monitoring program that covers all areas under the Ecological Preserve overlay together with all lands acquired as part of the INRMP. Monitoring results shall be incorporated into future County planning efforts so as to more effectively conserve and restore important habitats. The results of all special status species monitoring shall be reported to the CNDDB. Monitoring results shall be compiled into an annual report to be presented to the Board of Supervisors.

G. Public Participation. The INRMP shall be developed with and include provisions for public participation and informal consultation with local, state, and federal agencies having jurisdiction over natural resources within the county.

H. Funding. The County shall develop a conservation fund to ensure adequate funding of the INRMP, including habitat maintenance and restoration. Funding may be provided from grants, mitigation fees, and the County general fund. The INRMP annual report described under item F above shall include information on current funding levels and shall project anticipated funding needs and anticipated and potential funding sources for the following five years.

7.4.2.9 The Important Biological Corridor (-IBC) overlay shall apply to lands identified as having high wildlife habitat values because of extent, habitat function, connectivity, and other factors. Lands located within the overlay district shall be subject to the following provisions except that where the overlay is applied to lands that are also subject to the Agricultural District (-A) overlay or that are within the Agricultural Lands (AL) designation, the land use restrictions associated with the -IBC policies will not apply to the extent that the agricultural practices do not interfere with the purposes of the -IBC overlay.

- Increased minimum parcel size;
- Higher canopy-retention standards and/or different mitigation standards/thresholds for oak woodlands;
- Lower thresholds for grading permits;
- Higher wetlands/riparian retention standards and/or more stringent mitigation requirements for wetland/riparian habitat loss;
- Increased riparian corridor and wetland setbacks;
- Greater protection for rare plants (e.g., no disturbance at all or disturbance only as recommended by U.S. Fish and Wildlife Service/California Department of Fish and Game);
- Standards for retention of contiguous areas/large expanses of other (non-oak or non-sensitive) plant communities;
- Building permits discretionary or some other type of “site review” to ensure that canopy is retained;
- More stringent standards for lot coverage, floor area ratio (FAR), and building height; and
- No hindrances to wildlife movement (e.g., no fences that would restrict wildlife movement).

The standards listed above shall be included in the Zoning Ordinance.

Wildland Fire Safe measures are exempt from this policy, except that Fire Safe measures will be designed insofar as possible to be consistent with the objectives of the Important Biological Corridor

OBJECTIVE 7.4.3: COORDINATION WITH APPROPRIATE AGENCIES

Coordination of wildlife and vegetation protection programs with appropriate Federal and State agencies.

OBJECTIVE 7.4.4: FOREST AND OAK WOODLAND RESOURCES

Protect and conserve forest and woodland resources for their wildlife habitat, recreation, water production, domestic livestock grazing, production of a sustainable flow of wood products, and aesthetic values.

Policies

7.4.4.1 The Natural Resource land use designation shall be used to protect important forest resources from uses incompatible with timber harvesting.

7.4.4.2 Through the review of discretionary projects, the County, consistent with any limitations imposed by State law, shall encourage the protection, planting, restoration, and regeneration of native trees in new developments and within existing communities.

7.4.4.3 Utilize the clustering of development to retain the largest contiguous areas possible in wildland (undeveloped) status.

7.4.4.4 For all new development projects (not including agricultural cultivation and actions pursuant to an approved Fire Safe Plan necessary to protect existing structures, both of which are exempt from this policy) that would result in soil disturbance on parcels that (1) are over an acre and have at least 1 percent total canopy cover or (2) are less than an acre and have at least 10 percent total canopy cover by woodlands habitats as defined in this General Plan and determined from base line aerial photography or by site survey performed by a qualified biologist or licensed arborist, the County shall require one of two mitigation options: (1) the project applicant shall adhere to the tree canopy retention and replacement standards described below; or (2) the project applicant shall contribute to the County's Integrated Natural Resources Management Plan (INRMP) conservation fund described in Policy 7.4.2.8.

Option A. The County shall apply the following tree canopy retention standards:

Percent Existing Canopy Cover	Canopy Cover to be Retained
80–100	60% of existing canopy
60–79	70% of existing canopy
40–59	80% of existing canopy
20–39	85% of existing canopy
10-19	90% of existing canopy
1-9 for parcels > 1 acre	90% of existing canopy

Under Option A, the project applicant shall also replace woodland habitat removed at 1:1 ratio. Impacts on woodland habitat and mitigation requirements shall be addressed in a Biological Resources Study and Important Habitat Mitigation Plan as described in Policy 7.4.2.8. Woodland replacement shall be based on a formula, developed by the County, that accounts for the number of trees and acreage affected.

Option B. The project applicant shall provide sufficient funding to the County's INRMP conservation fund, described in Policy 7.4.2.8, to fully compensate for the impact to oak woodland habitat. To compensate for fragmentation as well as habitat loss, the preservation mitigation ratio shall be 2:1 and based on the total woodland acreage onsite directly impacted by habitat loss and indirectly impacted by habitat fragmentation. The costs associated with acquisition, restoration, and management of the habitat protected shall be included in the mitigation fee. Impacts on woodland habitat and mitigation requirements shall be addressed in a Biological Resources Study and Important Habitat Mitigation Plan as described in Policy 7.4.2.8.

7.4.4.5 Where existing individual or a group of oak trees are lost within a stand, a corridor of oak trees shall be retained that maintains continuity between all portions of the stand. The retained corridor shall have a tree density that is equal to the density of the stand.

OBJECTIVE 7.4.5: NATIVE VEGETATION AND LANDMARK TREES

Protect and maintain native trees including oaks and landmark and heritage trees.

Policies

7.4.5.1 A tree survey, preservation, and replacement plan shall be required to be filed with the County prior to issuance of a grading permit for discretionary permits on all high-density residential, multifamily residential, commercial, and industrial projects. To ensure that proposed replacement trees survive, a mitigation monitoring plan should be incorporated into discretionary projects when applicable and shall include provisions for necessary replacement of trees.

7.4.5.2 It shall be the policy of the County to preserve native oaks wherever feasible, through the review of all proposed development activities where such trees are present on either public or private property, while at the same time recognizing individual rights to develop private property in a reasonable manner. To ensure that oak tree loss is reduced to reasonable acceptable levels, the County shall develop and implement an Oak Tree Preservation Ordinance that includes the following components:

A. Oak Tree Removal Permit Process. Except under special exemptions, a tree removal permit shall be required by the County for removal of any native oak tree with a single main trunk of at least 6 inches diameter at breast height (dbh), or a multiple trunk with an aggregate of at least 10 inches dbh. Special exemptions when a tree removal permit is not needed shall include removal of trees less than 36 inches dbh on 1) lands in Williamson Act Contracts, Farmland Security Zone Programs, Timber Production Zones, Agricultural Districts, designated Agricultural Land (AL), and actions pursuant to a Fire Safe plan; 2) all single family residential lots of one acre or less that cannot be further subdivided; 3) when a native oak tree is cut down on the owner’s property for the owner’s personal use; and 4) when written approval has been received from the County Planning Department. In passing judgment upon tree removal permit applications, the County may impose such reasonable conditions of approval as are necessary to protect the health of existing oak trees, the public and the surrounding property, or sensitive habitats. The County Planning Department may condition any removal of native oaks upon the replacement of trees in kind. The replacement requirement shall be calculated based upon an inch for inch replacement of removed oaks. The total of replacement trees shall have a combined diameter of the tree(s) removed. Replacement trees may be planted onsite or in other areas to the satisfaction of the County Planning Department. The County may also condition any tree removal permit that would affect sensitive habitat (e.g., valley oak woodland), on preparation of a Biological Resources Study and an Important Habitat Mitigation Program as described in Policy 7.4.1.6. If an application is denied, the County shall provide written notification, including the reasons for denial, to the applicant.

B. Tree Removal Associated with Discretionary Project. Any person desiring to remove a native oak shall provide the County with the following as part of the project application:

- A written statement by the applicant or an arborist stating the justification for the development activity, identifying how trees in the vicinity of the project or construction site will be protected and stating that all construction activity will follow approved preservation methods;
- A site map plan that identifies all native oaks on the project site; and
- A report by a certified arborist that provides specific information for all native oak trees on the project site.

On May 6, 2008 the Board of Supervisors adopted the Oak Woodland Management Plan (OWMP) and its implementing ordinance, to be codified as Chapter 17.73 of the County Code (Ord. 4771. May 6, 2008). The primary purpose of this plan is to implement the Option B provisions of Policy 7.4.4.4 and Measure CO-P. These provisions establish an Oak Conservation In-Lieu Fee for the purchase of conservation easements for oak woodland in areas identified as Priority Conservation Areas.