# Chapter 12
# Cultural Resources

## 12.1 Introduction

This chapter describes the environmental setting of cultural resources, including paleontological resources (described in Section 12.2, *Environmental Setting*) and the regulatory background associated with these resources. This chapter evaluates environmental impacts on cultural resources that could result from the Lower San Joaquin River (LSJR) alternatives and, if applicable, it also offers mitigation measures that would reduce significant impacts.

The potential of cultural resources to exist within the plan area is used to determine if flow and reservoir conditions under the LSJR alternatives, when compared to baseline, would impact cultural resources, including paleontological resources. The area of potential effects evaluated in this chapter is primarily the area of fluctuation around the three reservoirs and the channels of the three eastside tributaries[1] and the LSJR within the plan area as, described in Chapter 1, *Introduction*. A broad cultural context for potential impacts in the plan area is provided in this chapter and in Appendix I, *Cultural Resources Overview*.

The extended plan area, also described in Chapter 1, *Introduction*, generally includes the area upstream of the rim dams.[2] The area of potential effects for the extended plan area is similar to that of the plan area and includes the zone of fluctuation around the numerous reservoirs that store water on the Stanislaus and Tuolumne Rivers. (Merced does not have substantial upstream reservoirs that would be affected.) It also includes the upper reaches of the Stanislaus, Tuolumne, and Merced Rivers. Unless otherwise noted, all discussion in this chapter refers to the plan area. Where appropriate, the extended plan area is specifically identified.

In Appendix B, *State Water Board's Environmental Checklist*, the State Water Resources Control Board (State Water Board) determined whether the plan amendments[3] would cause any adverse impact on resources in each of the listed environmental categories and provided a brief explanation for its determination. Impacts in the checklist that are identified as "Potentially Significant Impacts" are discussed in the resource chapters. Appendix B identified the LSJR alternatives as having a potentially significant impact on cultural resources because the project could potentially degrade or destroy existing cultural resources within the plan area. Accordingly, this chapter evaluates the potential of the LSJR alternatives to impact cultural resources by determining whether the alternatives would: (1) cause a substantial adverse change in the significance of a historical or archaeological resource, (2) disturb any human remains, including those interred outside formal cemeteries, or (3) directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

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[1] In this document, the term *three eastside tributaries* refers to the Stanislaus, Tuolumne, and Merced Rivers.

[2] In this document, the term *rim dams* is used when referencing the three major dams and reservoirs on each of the eastside tributaries: New Melones Dam and Reservoir on the Stanislaus River; New Don Pedro Dam and Reservoir on the Tuolumne River; and New Exchequer Dam and Lake McClure on the Merced River.

[3] These plan amendments are the *project* as defined in State CEQA Guidelines, Section 15378.

Potential cultural resource impacts were generally evaluated using changes in river flows and changes in reservoir water surface elevations that are expected to result from the implementation of each of the LSJR alternatives. For this evaluation, the potential for known and unknown significant cultural resources to exist at the three reservoirs and along the rivers was determined. Following this determination, a qualitative analysis of the effects of altering reservoir elevations or modifying flows using the results of the State Water Board's Water Supply Effects (WSE) model was performed. Results indicated that LSJR alternatives 2–4 would change the rates of flow of the three eastside tributaries and the LSJR within the plan area, the maximum and minimum surface elevations of the three reservoirs, and the timing that these fluctuations in surface water elevations occur. For the three large reservoirs, the WSE model results were summarized in two ways to characterize the effect of the LSJR alternatives on both high and low reservoir elevations in order to assess changes in reservoir elevation that may: (1) increase inundation of cultural resources that are typically out of the water, or (2) increase exposure of cultural resources that are typically below the water surface. These two assessments also capture the change in the range of reservoir elevations. For the three eastside tributaries and the LSJR, the modeled changes in flow are the primary mechanism for impacts on cultural resources. The comparison of monthly cumulative distributions of flows, in conjunction with the individual monthly average changes in flow, provides an appropriate measure of hydrologic changes resulting from the LSJR alternatives.

A summary of the potential impacts of the LSJR alternatives on cultural resources is provided in Table 12-1. As described in Chapter 3, *Alternatives Description*, LSJR Alternatives 2, 3 and 4 each include four methods of adaptive implementation. This recirculated substitute environmental document (SED) provides an analysis with and without adaptive implementation because the frequency, duration, and extent to which each adaptive implementation method would be used, if at all, within a year or between years under each LSJR alternative is unknown. The analysis, therefore, discloses the full range of impacts that could occur under an LSJR alternative, from no adaptive implementation to full adaptive implementation. As such, Table 12-1 includes impact determinations with and without adaptive implementation.

Any change in salinity in the southern Delta as a result of southern Delta water quality (SDWQ) Alternatives 2 or 3 is expected to be similar to that of the historic range of salinity because Vernalis water quality would be maintained under the SDWQ alternatives through the program of implementation. Since the chemical properties of the baseline water quality conditions would not change, there would be no potential to substantially adversely impact significant cultural resources. Therefore, the SDWQ alternatives are not discussed in this chapter. To comply with specific water quality objectives or the program of implementation under SDWQ Alternatives 2 or 3, construction and operation of different facilities in the southern Delta could occur, which could involve impacts on cultural resources. These impacts are evaluated in Chapter 16, *Evaluation of Other Indirect and Additional Actions.*

Impacts related to the No Project Alternative (LSJR/SDWQ Alternative 1) are presented in Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* and the supporting technical analysis is presented in Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1).* Chapter 16, *Evaluation of Other Indirect and Additional Actions,* includes discussion of impacts related to actions and methods of compliance.

## Table 12-1. Summary of Cultural Resource Impact Determinations

| Alternative | Summary of Impact(s) | Impact Determination without Adaptive Implementation | Impact Determination with Adaptive Implementation[a] |
|---|---|---|---|
| **Impact CUL-1 Cause a substantial adverse change in the significance of a historical or archaeological resource** | | | |
| No Project Alternative (LSJR/SDWQ Alternative 1) | See note.[b] | Significant | NA |
| LSJR Alternatives 2, 3, and 4 | The expected changes in reservoir elevations are within historical fluctuations, and known or unknown significant cultural resources are expected to continue to be inundated or exposed as usual under current operations. Additionally, historic property management plans at the reservoirs would continue to be implemented<br>Changes in river flows are not expected to alter the low potential for significant cultural resources to remain along rivers due to previous natural and anthropogenic disturbances. | Less than significant | Less than significant |
| **Impact CUL-2 Disturb any human remains, including those interred outside formal cemeteries** | | | |
| No Project Alternative (LSJR/SDWQ Alternative 1) | See note. [b] | Less than significant | NA |
| LSJR Alternatives 2, 3, and 4 | The expected changes in reservoir elevations are within historical fluctuations and are not expected to affect human remains due to low potential for human remains to exist within the fluctuation zone of the reservoirs. Additionally, historic property management plans at the reservoirs would continue to be implemented Additionally, any human remains would be treated in accordance with existing state and federal regulations. Changes in river flows are not expected to alter the low potential for undocumented human remains to exist along rivers due to previous natural and anthropogenic disturbances. | Less than significant | Less than significant |
| **Impact CUL-3 Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature** | | | |
| No Project Alternative (LSJR/SDWQ Alternative 1) | See note.[b] | Significant | NA |
| LSJR Alternatives 2, 3, and 4 | The expected changes in reservoir elevations are within historical fluctuations, and unique paleontological or geologic resources, specifically caves, would continue to be inundated and exposed as usual under current | Less than significant | Less than significant |

| Alternative | Summary of Impact(s) | Impact Determination without Adaptive Implementation | Impact Determination with Adaptive Implementation[a] |
|---|---|---|---|
| | operations. Additionally, the documented caves are managed and protected under a cave management plan.<br>Changes in river flows are not expected to alter the low potential for paleontological resources to exist along rivers due to depth of occurrence of rock units with high paleontological potential. | | |

[a] Four adaptive implementation methods could occur under the LSJR alternatives, as described in Chapter 3, *Alternatives Description*, and summarized in Section 12.4.2, *Methods and Approach*, of this chapter.

[b] The No Project Alternative (LSJR/SDWQ Alternative 1) would result in the continued implementation of flow objectives and salinity objectives established in the 2006 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan). See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

# 12.2 Environmental Setting

The environmental setting for cultural resources in the plan area is described below according to cultural resources that are historic or archaeological (including sites with human remains), and paleontological in origin. The geographic scope of the plan area potentially affected by cultural resources impacts is defined by the cultural setting and ethnographic territory of the prehistoric, ethnohistoric, and historic peoples who have occupied the northern San Joaquin Valley and adjacent Sierra Nevada foothills region of inland California, as well as by accessible, near-surface areas in this region exhibiting a high paleontological potential (e.g., Calaveras Formation caves). The LSJR alternatives would apply to the LSJR up to its confluence with the Merced River and to the lower portions of the three eastside tributaries to the LSJR (Stanislaus, Tuolumne, and Merced Rivers) upstream to, and including, the reservoirs (New Melones Reservoir, New Don Pedro Reservoir, and Lake McClure), impounded by the three rim dams (New Melones, New Don Pedro, and New Exchequer Dams).

Cultural resources include archaeological sites of prehistoric or historic origin, built or architectural resources older than 50 years (e.g., historical resources), traditional or ethnographic resources, and paleontological resources (e.g., fossil deposits of paleontological importance). A prehistoric or historic archaeological site, district, built environment resource, or traditional cultural resource that is recognized as historically or culturally significant may be determined to be a *historical resource* as defined by state law. (California Public Resources Code [Pub. Resources Code], § 21084.1; California Code of Regulations [Cal. Code Regs.], tit. 14, § 15064.5, subd. (a).)

Archaeological resources include both prehistoric and historic remains of human activity. Built environment resources include an array of historic resources such as buildings, structures, and objects serving as a physical connection to California's past. Traditional or ethnographic cultural resources may include Native American sacred sites (traditional cultural properties), traditional cultural places, and traditional resources of any ethnic community that are important for maintaining the cultural traditions of any group.

Prehistoric site locations are often predicted using environmental variables, particularly the availability of water and food, because site occupation and exploitation of natural resources were primarily based on subsistence essentials. For historic-era sites, historical settlement in this region was influenced primarily by the growth of mining in the foothills, agriculture in the valley, and the development of a transportation network of rivers, roads, and railroads connecting the valley and foothills. Many archaeological sites in the region, particularly along the river drainages, have been destroyed by mining practices and developments in agriculture and irrigation, or previously have been affected by the construction of dams and reservoirs or other development. Although remnants of sites have been discovered within the region, many have been highly disturbed.

Paleontological resources, including mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains, are more than 5,000 years old and occur mainly in Pleistocene or older sedimentary rock units.

The following sections describe the environmental setting for cultural resources in the reservoirs, and rivers in the plan area: Section 12.2.1, *Reservoir Historic or Archaeological and Paleontological Resources,* describes the environmental setting for New Melones, New Don Pedro, and Lake McClure; and Section 12.2.2, *River Historic or Archaeological and Paleontological Resources*, describes the environmental setting for the three eastside tributaries and the LSJR. For additional information see Appendix I, *Cultural Resources Overview,* provides an overview of the prehistoric, historic, and paleontological setting of the northern portion of the San Joaquin Valley and the adjacent foothills.

## 12.2.1 Reservoir Historic or Archaeological and Paleontological Resources

### New Melones Reservoir

#### Prehistoric and Historic Resources

The U.S. Army Corps of Engineers (USACE) began construction of the New Melones Dam and reservoir, spillway, and powerhouse on the Stanislaus River in 1966 and completed it in 1979. Management of the project was transferred to U.S. Bureau of Reclamation (USBR) in 1979, and the reservoir is now part of the Central Valley Project (CVP). Archaeological survey, excavation, and analysis were conducted for the project between 1968 and 1981, documenting nearly 700 prehistoric and historic-era sites (Moratto 1984:312). The New Melones Archaeological District, comprised of more than 500 archaeological sites, bedrock mortars, and historic-era homestead sites, is eligible for National Register of Historic Places (NRHP) inclusion (USBR 2010:5.90–5.91).
In addition to prehistoric habitation, rock art, and resource processing sites, mortuary chambers used between circa 1000 B.C. and A.D. 700 were identified in numerous caves in the plan area (Moratto 2002:40). The reservoir inundated the Gold Rush era mining towns of Bostwick Bar, Pine Log, and Robinson's Ferry (later renamed Melones, and now State Historical Landmark #276) (USBR 2007:3.14). Completed in 1988, the 10-volume cultural report on the New Melones project presented the evidence for a local archaeological sequence, with occupation of the area beginning as early as 10,000 years ago (USBR 2010:5.84).

A study completed in 2008 for the *New Melones Lake Area Resource Management Plan and Environmental Impact Statement* (RMP/EIS) identified 643 prehistoric, ethnohistoric, and historic-era cultural resources within the New Melones Lake Area, which includes a total of

23,265 acres administered by USBR and the U.S. Bureau of Land Management (BLM) (USBR 2010:5.82). Prehistoric site types, some of which include lithic scatters, human remains, house depressions and/or shell scatters, bedrock mortar, midden, cave, and rock art. Historic site types are mining, homestead/ranching, water/power systems, transportation, cemetery, and historic feature.

Of the archaeological sites identified within the New Melones Lake Area, 122 sites are located in the permanent pool zone lower than 808 feet (ft) above mean sea level (MSL), 33 sites in the permanent pool/fluctuation pool zone 808–1,088 ft above MSL, 232 sites in the fluctuating pool zone, 24 sites in the fluctuating pool zone/above-pool area, 203 sites above the flood pool zone, and 5 sites that include portions in all zones (USBR 2007:3.1-3.3, Table R-9). The elevation of the remaining sites is uncertain. Of the archaeological resources located in the permanent pool zone, 66 sites are prehistoric and 75 sites are historic sites or features (USBR 2007:3.11–3.12, 3.14–3.15). Ninety-six prehistoric and 226 historic sites or features are located entirely or partially within the fluctuating pool zone; these have been subject to wave action, as well as erosion from cyclical inundation and exposure, and are considered by USBR to be most susceptible to damage from lakeside recreational use and vandalism. Known cultural resources above the flood zone include 69 prehistoric and 147 historic sites or features.

No historic-era built environment resources are referenced in the New Melones Lake Area Final RMP/EIS (USBR 2010:5.82–5.83).

Of the 6,735 total acres of the New Melones Lake Area that has not yet been surveyed for the presence or absence of cultural resources, 2,063 acres are below the maximum pool zone (USBR 2010:5.82–5.83, Table 5-14). The potential for a surface survey to yield newly identified cultural resources varies from low to very high depending on the management area and the density of previously recorded resources within each area. In management areas (USBR 2010: Figure 2-2) that have been completely inventoried (Bowie Flat, Dam and Spillway, Mark Twain) or in those under the maximum pool zone (Middle Bay, North Bay, and South Bay), the discovery of previously unidentified cultural resources is considered unlikely. The potential for surface discovery in nine management areas located under or partially under reservoir waters is considered low to moderate in one (Greenhorn Creek), moderate in two (Bear Creek, Carson), moderate to high in two (Camp Nine, French Flat), high in two (Coyote Creek, Westside), and very high in two (Parrotts Ferry, Stanislaus River Canyon). Four of the designated management areas are outside the reservoir boundary (Bowie Flat, Dam and Spillway, Peoria Wildlife Area, Tuttletown).

No TCPs or sacred lands have been identified as of February, 2010 within the New Melones Lake Area (USBR 2010:5.91). If identified after this date, TCPs are subject to the same impacts as archaeological sites.

All documented or currently undocumented historic properties[4] at New Melones Lake Area would be protected and managed by the *Resource Protection Plan* administered by the USBR at the New Melones Lake Area (USBR 2010:1.5, 5.81) (Section 12.3.1*, Federal [Regulatory Background]*).

[4] *Historic property* is a term with defined statutory meaning at 36 CFR Section 800.16, subd. (l)(1), and refers to any cultural resource (i.e., prehistoric or historic district, site, building, structure, or object) included in, or eligible for inclusion in, the NRHP. The term includes properties of traditional religious or cultural importance to an Indian tribe that meet the NRHP criteria listed at 36 CFR Section 60.4.

### Paleontological Resources

Geologic formations around the reservoir are pre-Tertiary metamorphic or igneous rocks with low paleontological potential; however, there are Calaveras Formation deposits in proximity to New Melones Reservoir (USBR 2010:5.5-5.8). Caves formed in the Calaveras Formation limestone deposits are unique geologic features, and the formation is also considered to have high paleontological potential because fossilized vertebrate remains have been recovered from its caves (UCMP 2012). Paleontological specimens have been discovered in the New Melones region inside the limestone caves. The caves are managed and protected in accordance with the directives of the *New Melones Lake Revised Cave Management Plan* administered by USBR (Section 12.3.1*, Federal [Regulatory Background]*).

Fossilized remains of Rancholabrean (younger Pleistocene and Holocene fauna) vertebrates recovered from more than a dozen Calaveras Formation caves include ground sloth, horse, deer, rabbit, squirrel, and mole, among others (UCMP 2012). In 1978, before the reservoir was filled, the BLM identified 87 caves within the New Melones Lake Area (USBR 2010:5.10–5.12). The specific location of caves ranked by the BLM as paleontologically significant is confidential, so the following discussion references all 87 caves. Of these, 30 of the 44 caves within the Stanislaus River Canyon are inundated or subject to inundation by the impounded waters. Of the 19 caves in the Coyote Creek Canyon, all but Lower Natural Bridges Cave are above the New Melones Dam spillway elevation of 1,088 ft above MSL. Coyote Creek flows through two caves, Upper and Lower Natural Bridges. In the Skunk Gulch and Grapevine Gulch areas, all 24 caves identified there are above spillway elevation. Five of the caves, including Upper and Lower Natural Bridges, are protected under the Federal Caves Protection Act of 1988. Of these, Lower Natural Bridges (Cave 85) and two others (Caves 25 and 54) are below the 1,088-foot MSL spillway level of New Melones Dam.

## New Don Pedro Reservoir

The New Don Pedro Dam and reservoir on the Tuolumne River were completed in 1971. Archaeological investigations were conducted in the late 1960s but were fairly limited and not initiated before many of the archaeological sites already had been inundated or damaged (TID and MID 2011a:5.246). During 1970 and 1971, salvage archaeology in the reservoir basin recorded the remnants of 41 prehistoric sites (Moratto 1984:311). A July 2010 records search identified 61 prehistoric and historic archaeological sites within the boundary for the Federal Energy Regulatory Commission (FERC) New Don Pedro relicensing application (FERC Project No. 2299) (TID and MID 2011a: 5.255, 5.260–5.263). These include 32 prehistoric, 21 historic, and 2 multi-component sites; 6 sites with missing records are of unknown type. Prehistoric site types found at New Don Pedro Reservoir are bedrock mortar, kiln, lithic scatter, midden, and village; a few of these include human remains, shell scatters, house pits, or evidence for cave dwelling. Historic site types found at New Don Pedro Reservoir are foundations, rock walls, mining features, a gravestone, water conveyance systems, rock dam, roadbeds, debris scatters, and the former location of a mining town called Jacksonville. Of the 61 resources that are currently documented, four prehistoric sites have been determined eligible for inclusion in the NRHP and two prehistoric bedrock milling stations, as well as the former location of Jacksonville, which is now a State Historical Landmark (#419), are under the waters of New Don Pedro Reservoir (TID and MID 2011a:5.260–5.263, 2011b:4-5). An inventory and evaluation for NRHP eligibility of historic-era built environment resources is also in progress for the Don Pedro FERC relicensing application (TID and MID 2011b:8). A review of historic maps identified more than 50 locations where unrecorded historic-era sites or features may be present, such as roads, trails, buildings, mines, ditches, and the Hetch Hetchy railroad and aqueduct.

No TCPs or sacred lands have been identified as of November 2011 within the FERC relicensing boundary (TID and MID 2011c:3.5). A TCP study and consultation with local Native American groups or tribes is in the New Don Pedro FERC relicensing application. If identified, TCPs are subject to the same impacts as archaeological sites.

Geologic formations around the reservoir are pre-Tertiary metamorphic or igneous rocks (TID and MID 2011a:5.3) with low paleontological potential. No paleontological resources have been reported at New Don Pedro Reservoir (TID and MID 2011a).

All documented or undocumented cultural resources at New Don Pedro Reservoir would be protected and managed under a Historic Properties Management Plan (HPMP) (Section 12.3.3, *Regional or Local [Regulatory Background]*).

## Lake McClure

Construction of the New Exchequer Dam and Lake McClure Reservoir on the Merced River was completed in 1967, prior to the 1972 enactment of the California Environmental Quality Act (CEQA). No cultural resources investigations were conducted in the plan area prior to 1977 (Merced Irrigation District [Merced ID] 2008: 7.12/4-5). Cultural resources surveys of approximately 6,200 acres were conducted for the Merced River Hydroelectric Project (FERC Project No. 2179) July 2008–July 2010 when lands usually inundated by Lake McClure were exposed and accessible due to lower than normal water levels (Merced ID 2012a: Exhibit E, 411-415). Merced ID has identified a total of 203 archaeological sites: 38 prehistoric, 149 historic-era, and 16 with prehistoric and historic-era components (Merced ID 2012b:27). Prehistoric site types that were identified include base and temporary camps, sparse lithic scatter, and milling station; site constituents at the camps include bedrock mortars, rock art, midden, and/or artifact scatters (Merced ID 2012b:28). Historic site types found include mining and mining related, road and trail, railroad element, farming and ranching habitation, industrial foundation, rock walls, water control element, refuse deposit, land survey marker, hydroelectric element, transmission line, and Bagby townsite (Merced ID 2012b:31). Multi-component sites include constituents of both prehistoric and historic period use (e.g., bedrock mortars and lithic scatters with cabin foundations, rock walls, or prospect pits) (Merced ID 2012b:30-31). No evidence of burials was observed at the location of a possible cemetery noted on a U.S. Geological Survey (USGS) quadrangle map, and no human remains were found during the survey (Merced ID 2012b:27, 48).

The 203 documented archaeological sites remain unevaluated for potential listing on the NRHP; all prior eligibility assessments are now considered premature (Merced ID 2012a: Exhibit E, 413–414).[5] Of the 203 sites, more than 45 prehistoric and historic-era sites are at or below the high water level (Merced ID 2011: Exhibit E, 334–335). Siltation was noted at 16 of the 45 sites and was considered a positive effect because it provides site protection. Among the Gold Rush-era mining communities now under the waters of Lake McClure are the town of Benton Mills (later renamed Bagby), the Exchequer mining camp, and the Horseshoe Bend camp (Merced ID 2008: 7.12/12).

[5] It is anticipated that concurrence by the State Historic Preservation Officer (SHPO) on NRHP recommendations will be received by the end of 2012.

The archaeological site on the north and south banks of the Merced River comprising the townsite of Bagby/Benton Mills includes artifacts and 31 features (e.g., foundations, structure pads, pits, cisterns, retaining walls) (Merced ID 2012b:30–32). Although normally submerged, portions of the townsite were exposed during low water levels in 2009 (Merced ID 2010b:48). Remnants of Yosemite Valley Railroad elements were exposed during the low water levels in 2008 (Merced ID 2010b:34–38). During the survey within the two drought years (2008–2010), portions of a prehistoric base camp were also noted to extend underwater into the Merced River (Merced ID 2010b:28).

In 2011, Merced ID completed its study of the built environment for the Merced River Hydroelectric Project (FERC Project No. 2179) and determined the New Exchequer and McSwain Dams, powerhouses, and other project features, most of which were constructed in the late 1960s, are not currently eligible for inclusion on the NRHP but will be reevaluated once individual facilities become 50 years old (Merced ID 2012a: Exhibit E, 412–414). Seventeen buildings and structures more than 50 years old, including the original Exchequer Dam and a gauging station, were determined not eligible for NRHP listing. The original Exchequer Dam is normally submerged but was exposed in 2008 during the low water levels (below 720-ft elevation) (Merced ID 2010b:38).

No TCPs or sacred lands have been identified prior to submission of the final license application for the Merced River Hydroelectric Project in February 2012 (Merced ID 2012a: Exhibit E, 412). Ethnographic interviews with the Southern Sierra Miwok Nation (also known as the American Indian Council of Mariposa County, Inc.) may be conducted during the term of the new license and may identify potential TCPs. If identified, TCPs are subject to the same impacts as archaeological sites.

Geologic formations around the reservoir are pre-Tertiary metamorphic or igneous rocks (Merced ID 2012a, b: E3.47, Figure 3.3.1-1) with low paleontological potential. No paleontological resources have been reported within the boundaries of the Merced River Hydroelectric Project (FERC Project No. 2179) (Merced ID 2008, 2012b).

All documented or undocumented cultural resources at Lake McClure would be protected and managed under an HPMP (Section 12.3.3*, Regional or Local [Regulatory Background]*).

## 12.2.2 River Historic or Archaeological and Paleontological Resources

The potential presence or absence of cultural resources along the LSJR and the Merced, Tuolumne, and Stanislaus Rivers below the major rim dams and reservoirs has been presented in numerous documents. It was most recently summarized in the environmental impact statement/ environmental impact report (EIS/EIR) prepared to meet the flow objectives for the San Joaquin River Agreement (SJRA) (EA Engineering 1999). Due to the extensive reach of the LSJR and its three eastside tributaries, the summary of prehistoric and historic resources was presented in two tables tabulated by the total number of sites recorded in each county (EA Engineering 1999: Tables 3.7-2 and 3.7-3). Because little change is likely in the number of recorded cultural resources between the time that document was prepared and now, the same information is presented in Table 12-2 and Table 12-3 for the six counties traversed by the LSJR and the Stanislaus, Tuolumne, and Merced Rivers. Following Table 12-2 and Table 12-3 is a discussion of anthropogenic practices that have disturbed or destroyed archaeological sites during the historic period.

Geologic formations along the LSJR and the Stanislaus, Tuolumne, and Merced Rivers downstream of the rim dams include eight Pleistocene or older sedimentary rock units that have a high paleontological potential and are mapped at the surface or beneath Holocene-age alluvium. As detailed below, these units are the Ione, Laguna, Mehrten, Modesto, Moreno, Riverbank, Turlock Lake, and Valley Springs Formations, each of which has yielded the fossilized remains of plants, invertebrates, or vertebrates.

## Prehistoric Resources

A summary of prehistoric resources by county is provided in Table 12-2. Together, these counties have more than 2,600 recorded prehistoric sites and range from 2 to 15 percent surveyed for cultural resources. Although people were present in the northern San Joaquin Valley and Sierra Nevada foothills as early as 12,000 years ago (Rondeau et al. 2007:65; Rosenthal et al. 2007:151), the majority of prehistoric sites documented in this region are less than 500 years old (EA Engineering 1999:3.106–3.109). Prehistoric sites recorded in the region include villages, seasonal occupation areas, burials, bedrock mortars, and lithic scatters, among other site types.

**Table 12-2. Documented Prehistoric Sites by County**

| County | Total Number of Recorded Sites | Number of Prehistoric Sites | Percentage of County Land Surveyed | Areas with High Density of Sites | Overall Amount of Significant Disturbance in the County |
|---|---|---|---|---|---|
| Calaveras | 1,527 | 929 | 10–15 | Stanislaus, N. Fork Stanislaus, and Mokelumne Rivers; creeks, ridge flats | Low |
| Mariposa | 1,264 | 856 | 5 | Merced River; along creeks; in Yosemite National Park | Low |
| Merced | 341 | 316 | 2 | Unknown | Low |
| San Joaquin | 249 | 189 | 5 | San Joaquin and Mokelumne Rivers | Low to moderate |
| Stanislaus | 350 | 280 | 3 | Stanislaus, Tuolumne, and San Joaquin Rivers; along smaller creeks | Low |
| Tuolumne | 3,540 | Unknown | 10 | Stanislaus and Tuolumne Rivers; along creeks, ridge flats | Low |
| Totals | 7,271 | >2,570 | | | |

Source: EA Engineering 1999: Table 3.7-2.

**Table 12-3. Documented Historic Resources by County in the Northern San Joaquin Valley**

| County | Number of Historic Sites[a] | Number of Properties in the NRHP | Number of California Historical Landmarks | Number of Evaluated Sites in California Historical Resources Inventory | Number of California Points of Historical Interest |
|---|---|---|---|---|---|
| Calaveras | 598 | 13 | 42 | 56 | 4 |
| Mariposa | 408 | 29 | 8 | 15 | 0 |
| Merced | 25 | 12 | 5 | 13 | 7 |
| San Joaquin | 60 | 31 | 23 | 28 | 8 |
| Stanislaus | 70 | 17 | 5 | 12 | 7 |
| Tuolumne | Unknown | 19 | 20 | 79 | 4 |
| Totals | >1,161 | 121 | 103 | 203 | 30 |

Source: EA Engineering 1999: Tables 3.7-2 and 3.7-3.
NRHP = National Register of Historic Places
[a] Calculated by subtracting the number of prehistoric sites from the recorded sites total provided in Table 12-2.

The areas in the six counties with the highest density of documented prehistoric sites are along the rivers (Table 12-2). The natural channels and meanders of these rivers have changed during the historic period by agriculture, irrigation, and mining practices, eliminating much of the natural floodplains and terraces, creating large in-channel and off-channel pits, and resulting in relatively static channels with narrow floodways confined by dikes or levees and agricultural fields. Other activities, such as hydraulic mining practiced in the New Melones Lake Area, have also disturbed much of the river areas (USBR 2010:5–9). Historical dredge tailings remain visible, flanking the Merced River between Lake McSwain and the community of Hopeton, and locally along parts of the Tuolumne River between the community of La Grange and the city of Waterford, indicating past areas of substantial disturbance (Merced ID 2010a:2.5–2.6; TID and MID 2011a:5.8). Large-scale aggregate mining along the Lower Merced and Tuolumne Rivers began in the early 1900s, and gold mining continued on the Lower Tuolumne River near Waterford into the mid-1900s, which also disturbed large areas of the rivers (Merced ID 2008:7.1/3–7.1/4; TID and MID 2011a:5.8).

The prehistoric site data reflect the preference of indigenous Californians for occupation along major watercourses, as well as the location of cultural resource management projects during the last three to four decades. Although a high number of prehistoric archaeological sites have been recorded along the rivers, sites have been destroyed by agriculture and irrigation practices, mining activities, or development. Furthermore, although Table 12-2 indicates the overall amount of significant disturbance in the six counties is relatively low, many of the known sites along the rivers have been highly disturbed by these types of activities (EA Engineering 1999:3.106).

## Historic Resources

A summary by county of historic-era resources listed in the NRHP and the California Historical Resources Inventory is provided in Table 12-3. Together, these six counties have more than 1,000 recorded historic sites, of which more than 200 have been evaluated for listing in the NRHP, California Register of Historical Resources (CRHR), or local registers. The counties also include a number of historic properties listed in the NRHP, as well as California Historical Landmarks and Points of Historical Interest.

The historic period in the northern San Joaquin Valley is characterized by agricultural settlement, while mining activities influenced the east side of the valley and the Sierra Nevada foothills. The availability of water, as well as soil and landform type, was an important factor in early agricultural settlement and the interrelated locations of settlements and towns (Caltrans 2006:16–17, 34–35; Caltrans 2007:31–35).

Many of the documented historic-era resources in the six counties shown in Table 12-3 represent early settlement along the rivers during the Gold Rush era. Historic-era resources recorded along the rivers include buildings, structures or features of farming and ranching homesteads and rural communities, cemeteries, ferry landings, bridges, boat ramps and anchors, irrigation ditches or canals, early trails and roadways, rock walls, and assorted historic features and debris. In the Sierra Nevada foothills, resources related to the establishment and growth of mining, most of which are located along the rivers and smaller waterways, are represented by the buildings or remnants of camps and towns, refuse deposits, ditches, earthen dams, flumes, prospect pits, rock walls, and remains of stamp mills and other mining structures. Recorded resources also include transportation features, such as abandoned railroad grades, bridges, and roadways that connected the mines, ferry crossings, and settlements in the foothills to the San Joaquin Valley.

The natural channels and meanders of the LSJR and the Lower Stanislaus, Tuolumne, and Merced Rivers have been extremely modified by anthropogenic processes during the historic period, particularly by agriculture, irrigation, and mining practices, as discussed above. Although a high number of historic period archaeological sites or built resources have been recorded along the rivers, many have been highly disturbed or destroyed. Due to these disruptive practices and considering the young age of the alluvial landforms, the potential for buried historic-era archaeological sites along the four rivers is considered low (Rosenthal and Meyer 2004:106–107, Table 18).

In addition to agriculture, irrigation practices, and aggregate mining, commercial and residential development continues to affect riverside cultural resources. For example, the riverside town of Burneyville, dating from the 1870s, has been absorbed by the expanding City of Riverbank on the Stanislaus River (Hoover et al. 2002:521). The City of Modesto, initially established in 1870 as a railroad town, prospered in the early 1900s following the establishment of the Modesto Irrigation District (MID) and modern irrigation practices, and has now absorbed lands along both sides of the Tuolumne River, an area sensitive for the presence of historic-era sites related to ranching, agriculture, and early transportation practices (ICF Jones & Stokes 2008:V/8.3–5). Similarly, the City of Livingston's proposal to expand its sphere of influence within the agricultural lands along the southern side of the Merced River could affect historic-era resources (PMC 2008:1.0/5–6, Figure 2-1).

## Paleontological Resources

The Holocene riverine floodplain deposits along the LSJR and the lower portions of the three eastside tributaries are surrounded mainly by a mixture of continental rocks and deposits that include younger Holocene and older Pleistocene alluvium, three Pleistocene formations (Modesto, Riverbank, and Turlock Lake), and the Pliocene Laguna Formation (Page 1986: Plate 2). There is a large area with Holocene-age sand dunes mapped on the stretch of the Merced River between the communities of Irwin and Cressey. A few small sand dune patches are also mapped on the Stanislaus River west of the city of Riverbank. The sand dunes vary in thickness, reaching up to approximately 140 ft (Page 1986:19). At the confluence of the three eastside tributaries with the LSJR are Holocene flood basin deposits, some of which may be Pleistocene Modesto Formation (Page 1986:18–19). The thickness of the flood basin deposits in the San Joaquin Valley is estimated to be as much as 100 ft. The geologic formations (e.g., Miocene and Pliocene-age Mehrten Formation deposits) in the area have a high paleontological potential and have produced fossils as described in Table 12-4.

As discussed previously, the natural channels and meanders of the LSJR and the Merced, Tuolumne, and Stanislaus Rivers have been extremely modified by anthropogenic processes, particularly agriculture, irrigation, and mining practices. The natural floodplains and terraces have been mostly eliminated and the rivers confined by dikes, levees, and agricultural fields to relatively static channels with narrow floodways. During the historic era, native soils and sediments along the waterways draining westward from the foothills were displaced or buried by hydraulic mining and dredging, two particularly destructive mining methods that have been followed by modern large-scale aggregate mining (USBR 2010:5–9; Merced ID 2008:7.1/3–7.1/4; Merced ID 2010a:2.5–2.6; TID and MID 2011a:5.8). Although a number of fossil localities have been recorded along the rivers in the northern San Joaquin Valley, these are typically identified at depths below surficial Holocene-age deposits, including those native sediments rearranged by the anthropogenic practices that have recontoured and continue to recontour the riverine landscapes.

**Table 12-4. Summary of Formations with High Paleontological Potential along the LSJR and Three Eastside Tributaries**

| Formation | Characteristics | Documented Fossil Presence |
|---|---|---|
| Ione | This middle Eocene rock unit extends more than 200 miles along the western edge of the Sierra Nevada (Creely and Force 2007:10). The marine sandstone and kaolinitic clay deposits have produced few marine body fossils, but trace burrows are abundant in many places. | Plant fossils have been recovered from deposits in Calaveras County near Comanche Reservoir, and invertebrate fossils in Mariposa, Stanislaus and Tuolumne Counties (UCMP 2012). Near the alternatives, the Ione Formation contains fossils of an Eocene fossil index bivalve at the Planicosta Buttes just south of the bridge at Merced Falls (Arkley 1962:5). |
| Laguna | This Pliocene rock unit consists of moderately consolidated, interbedded, arkosic alluvial gravel, sand, and silt (Helley and Harwood 1985:17). The gravel beds are predominantly comprised of quartz and metamorphic rock fragments. | Land vertebrate fossils have been found in fine-grained deposits of the Laguna Formation, mainly along the Sierra Nevada foothills. |
| Mehrten | This rock unit is composed of a sequence of dark sandstone, conglomerate, and claystone beds of late Miocene and Pliocene age (Arkley 1962:6-7) that unconformably overlie the Valley Springs Formation and consist of fluvial material reworked from volcanic deposits. In the Modesto area, the Mehrten attains a maximum thickness of about 1,200 feet where it lies at a depth of about 1,100 feet (Page 1986:11). | Microfossils and fossilized plant specimens have been identified in the Mehrten in Tuolumne County. Vertebrate fossils, including horse, pronghorn, and peccary, have been found at Goodwin Dam in Calaveras County, near Columbia and Two Mile Bar in Tuolumne County, and at Oakdale and Turlock Lake State Recreation Area in Stanislaus County (UCMP 2012). |
| Modesto | This Pleistocene rock unit was deposited by rivers still existing today and forms alluvial terraces and fans of major rivers along the axis of the Central Valley, including the San Joaquin and Sacramento Rivers, and is widely distributed along the rivers in the Sacramento and San Joaquin Valleys (Helley and Harwood 1985:10). The upper and lower members are dated 9,000–73,000 years ago. | The type section for this unit is along the south bluff of the Tuolumne River south of Modesto. Vertebrate fossils have been recovered from sediments in Merced, San Joaquin and Stanislaus Counties, and from nearly every major community in the San Joaquin Valley, including Fresno, Lathrop, Lodi, Manteca, Merced, Modesto, Stockton, and Tracy (UCMP 2012). |
| Moreno | Late Cretaceous in age, the Moreno Formation is the most important fossil locality of Cretaceous-aged marine vertebrates in the western United States. | Fossilized bony fish and plesiosaur and mosasaur remains have been found in Merced County near Laguna Seca and Rattlesnake Creeks (UCMP 2012). Moreno Formation deposits in Merced and Stanislaus Counties have produced invertebrate fossils. Microfossils have been found in Merced and San Joaquin Counties. Fossilized plant remains have been identified near Del Puerto and Little Salado Creeks in Stanislaus County. |

| Formation | Characteristics | Documented Fossil Presence |
|---|---|---|
| Riverbank | Formed during the Pleistocene age, 2.6 million to 11,700 years ago, this formation forms arkosic alluvial terraces and fans consisting of weathered, reddish gravel, sand and silt with some mafic igneous rock fragments. In the San Joaquin Valley, the Riverbank is broken into informal upper and middle members (Helley and Harwood 1985:11). | Fossils have mainly been recovered from fine-grained deposits, typically at a depth of 12 feet or more below the surface. Vertebrate fossils have been identified at various locations in Merced, San Joaquin, and Stanislaus Counties. |
| Turlock Lake | The alluvial sediments of this Pleistocene rock unit originated from the Sierra Nevada, and the formation is more widespread in the San Joaquin Valley than the Sacramento Valley (Helley and Harwood 1985:11-12). The age of the lower and upper members is estimated to at least 730,000 years and 600,000 years ago, respectively. | A series of exposures in Turlock Lake State Recreation Area in Stanislaus County are the type site for this formation. The most well-known locality is the Fairmead Landfill near Chowchilla in Madera County that has produced more than 3,000 fossil specimens from 35 different species (Dundas et al. 1996). |
| Valley Springs | This formation is generally considered to be late Miocene age (Arkley 1962:5; Page 1986:10). It consists of a fluvial sequence of rhyolitic ash, sandy clay, and siliceous gravel, and in most areas lies unconformably over the Ione Formation. | Fossilized plant specimens have been found near the community of Burson in Calaveras County (UCMP 2012). |

### 12.2.3 Extended Plan Area

In general, the rocks along the rivers or reservoirs in the extended plan area are pre-Tertiary metamorphic or igneous rocks with a low potential for paleontological resources. Additionally, Calaveras Formation limestone does not occur in the vicinity of the extended plan area reservoirs on the Stanislaus and Tuolumne Rivers so no cave-associated paleontological resources are expected at those locations. Reservoirs in the extended plan area were created in the location of former lakes or along the rivers (Carpenter and Kirn 1988); both of these site types have extensive historical or archaeological use. Consequently, historical and archaeological sites may be associated with them (Carpenter and Kirn 1988; Anderson and Moratto 1996). Some of the historical sites are related to dam construction or to the dams themselves (Carpenter and Kirn 1988). Most of these sites are inundated by their associated reservoirs (Carpenter and Kirn 1988). Tuolumne and Mariposa counties are in the heart of California's historic "Mother Lode," and contain many historically significant Gold Rush era towns, and both historic and prehistoric heritage sites (USFS n.d.).

### 12.2.4 Southern Delta Historic or Archaeological, and Paleontological Resources

The setting and summary of cultural and paleontological resources for the southern Delta are not presented in this section because the water quality of the southern Delta is expected to remain within historical conditions under SDWQ Alternatives 2 or 3 (refer to Section 12.4.2, *Methods and Approach [SDWQ Alternatives]* for details).

## 12.3 Regulatory Background

### 12.3.1 Federal

Relevant federal programs, policies, plans, or regulations related to cultural resources are described below.

#### National Historic Preservation Act of 1966

The National Historic Preservation Act of 1966 (NHPA) (54 United States Code [U.S.C.], § 300101 et seq.), as amended, is the primary federal law governing the preservation of cultural and historic resources in the United States. The NHPA establishes the federal government policy on historic preservation and the programs through which this policy is implemented. The NHPA requires federal agencies to take into account the effects of their undertakings on any historic property.

#### Archeological Resources Protection Act of 1979

The Archeological Resources Protection Act of 1979 (ARPA) (16 U.S.C., § 470aa) was enacted to protect archeological resources and site that are located on public lands and Indian lands. The ARPA governs the excavation and removal of archaeological resources and provides for enforcement to protect such sites.

### American Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act (AIRFA) of 1978 (42 U.S.C., § 1996) established federal policy to protect and preserve rights involving traditional religions of Native Americans, including access to sacred sites.

### Native American Graves Protection and Repatriation Act of 1990

For activities on federal lands, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 U.S.C., § 3001 et seq.) provides for the repatriation of Native American cultural items and establishes procedures for the inadvertent discovery of Native American cultural items on federal or tribal lands.

### Federal Cave Resources Protection Act of 1988

The Federal Cave Resources Protection Act of 1988 (16 U.S.C., § 4301et seq.) provides for the protection and preservation of significant caves on federal lands. It requires inventory of significant caves on federal lands, implementation of management measures, and provides certain protections of cave resources. It provides for the issuance of permits for collection or removal of cave resources and identifies criminal and civil penalties for prohibited acts.

## 12.3.2 State

Relevant state programs, policies, plans, or regulations related to cultural resources are described below.

### California Environmental Quality Act of 1972

As discussed below in the impact analysis, CEQA (Pub. Resources Code, § 21000, et seq.) requires an evaluation of a project's impacts on historical and archeological resources in California. Public Resources Code section 21083.2 specifically addresses unique archeological. Archeological resources that are not unique do not need to be considered. (Pub. Resources Code, § 21083.2, subds. (a), (h).) State CEQA Guidelines (Cal. Code Regs., tit. 14, § 15064.5), "Determining the Significance of Impacts to Archaeological and Historical Resources," provides further direction regarding cultural resources. Subsection (a) defines the term "historical resources." Subsection (b) explains when a project may be deemed to have a significant effect on historical resources and defines terms used in describing those situations. Subsection (c) describes CEQA's applicability to archaeological sites and provides a method for analyzing archeological sites that are historical resources and those that are not.

### California Public Resources Code

The California Public Resources Code contains various provisions protecting historic, archeological, and paleontological sites. For example, Section 5024.1 establishes the CRHR, which is to be used by state and local agencies to identify the state's historical resources and to indicate what properties are to be protect, to the extent prudent and feasible, from substantial adverse change. Other provisions of the Public Resources Code protect resources on public lands. (See, e.g., Pub. Resources Code, §§ 5097–5097.7 [providing for protection of resources on state and public lands].)

## 12.3.3 Regional or Local

Relevant regional or local programs, policies, or regulations related to cultural resource are described below.

### New Melones Resource Management Plan

The purpose of the New Melones Resource Management Plan (RMP) is to develop a framework for management guidance on recreational, natural, and cultural resource management. The RMP document reflects contemporary resource needs for the New Melones Lake Area, while ensuring the Eastside Division of the CVP continues to meet its authorized purposes of flood control, water supply, power, recreation, water quality, and fish and wildlife enhancement. The RMP serves as the basis for future resource management decision-making that, when implemented, may result in the desired future condition for the management area.

All documented or currently undocumented historic properties at New Melones would be protected and managed by the Resource Protection Plan administered by USBR at New Melones Lake Area (USBR 2010:1.5, 5.81). Projects undertaken by USBR follow the directives and guidelines found in a series of Policy and Directives and Standards in the USBR manual that establish policies for cultural resource identification, evaluation, and management. The policies include standard unanticipated discovery and treatment measures should any previously unknown cultural resources, including human remains, be discovered during continued operation of the dam. In addition, USBR park rangers currently patrol recreational facilities and check on the condition of cultural resources in the New Melones Lake Area (USBR 2010:5.73).

### New Melones Lake Revised Cave Management Plan

The caves at New Melones are managed and protected in accordance with the directives of the *New Melones Lake Revised Cave Management Plan* administered by USBR (USBR 2007:3.5; USBR 2010:1.16). The plan was prepared in 1996 and updated the information presented in the Draft Cave Management Plan of 1978. The current plan includes guidance to minimize publicity and access to sensitive cave locations, to avoid constructing trails, and to install gates where necessary for conservation purposes.

### Historic Properties Management Plans

All documented or currently undocumented cultural resources at New Don Pedro Reservoir or Lake McClure/Lake McSwain are being protected and managed under HPMPs. These plans were completed or are being prepared following the Historic Properties Study Plan as part of the FERC hydropower water quality certification for the Don Pedro Dam (FERC Project No. 2299) and the Merced River Hydroelectric Project (FERC Project No. 2179) (TID and MID 2011b and Merced ID 2012a: Exhibit E, 413–415). Requirements to protect cultural resources at New Don Pedro Reservoir and Lake McClure/Lake McSwain include site management measures, training for all operations and maintenance staff, and routine monitoring of known cultural resources. HPMPs also include standard unanticipated discovery and treatment measures should any previously unknown cultural resources, including human remains, be discovered during continued operation of the dams.

# 12.4 Impact Analysis

This section identifies the thresholds or significance criteria used to evaluate the potential impacts on cultural resources. It further describes the methods of analysis used to determine significance.

## 12.4.1 Thresholds of Significance

The thresholds for determining the significance of impacts for this analysis are based on the State Water Board's Environmental Checklist in Appendix A of the State Water Board's CEQA regulations. (Cal. Code Regs, tit. 23, §§ 3720–3781.) The thresholds derived from the checklist have been modified, as appropriate, to meet the circumstances of the alternatives. (Cal. Code Regs., tit. 23, § 3777, subd. (a)(2).) Cultural resource impacts were determined to be potentially significant in the State Water Board's Environmental Checklist (see Appendix B, *State Water Board's Environmental Checklist*, in this SED) and therefore, are evaluated in this analysis as to whether the alternatives could result in the following.

- Cause a substantial adverse change in the significance of a historical resource or archaeological resource as defined in the State CEQA Guidelines Section 15064.5. (Cal. Code Regs., tit. 14, § 15064.5.)
- Disturb any human remains, including those interred outside of formal cemeteries.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Where appropriate, specific quantitative or qualitative criteria are described in Section 12.4.2, *Methods and Approach,* for evaluating these thresholds. However, State CEQA Guidelines Section 15064.5 provides that, in general, a resource not listed on state or local registers of historical resources shall be considered by the lead agency to be historically significant if the resource meets the criteria for listing on the CRHR. Section 15064.5 also provides standards for determining what constitutes a "substantial adverse change" that must be considered a significant impact on archaeological or historical resources. For example, a "substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired." (State CEQA Guidelines, Cal. Code Regs., tit. 14, § 15064.5, subd. (b)(1).)

Section 15064.5 of the State CEQA Guidelines pertains to the determination of the significance of impacts on archaeological and historical resources. Direct and indirect impacts may occur by any of the following means.

- Physically damaging, destroying, or altering all or part of the resource.
- Altering characteristics of the surrounding environment that contribute to the resource's significance.
- Neglecting the resource to the extent that it deteriorates or is destroyed.
- The accidental discovery of cultural resources during construction.

These could be facilitated through changes in reservoir water surface elevations and river flows that are expected to result from the implementation of each of the LSJR alternatives (discussed in more detail below).

## 12.4.2 Methods and Approach

### LSJR Alternatives

This chapter evaluates the potential cultural resource impacts associated with the LSJR alternatives. Each LSJR alternative includes a February–June unimpaired flow[6] requirement (i.e., 20, 40, or 60 percent) and methods for adaptive implementation to reasonably protect fish and wildlife beneficial uses, as described in Chapter 3, *Alternatives Description*. In addition, a minimum base flow is required at Vernalis at all times during this period. The base flow may be adaptively implemented as described below and in Chapter 3. State Water Board approval is required before any method can be implemented, as described in Appendix K, *Revised Water Quality Control Plan*. All methods may be implemented individually or in combination with other methods, may be applied differently to each tributary, and could be in effect for varying lengths of time, so long as the flows are coordinated to achieve beneficial results in the LSJR related to the protection of fish and wildlife beneficial uses.

The Stanislaus, Tuolumne, and Merced Working Group (STM Working Group) will assist with implementation, monitoring, and assessment activities for the flow objectives and with developing biological goals to help evaluate the effectiveness of the flow requirements and adaptive implementation actions. Further details describing the methods, the STM Working Group, and the approval process are included in Chapter 3 and Appendix K. Without adaptive implementation, flow must be managed such that it tracks the daily unimpaired flow percentage based on a running average of no more than 7 days. The four methods of adaptive implementation are described briefly below.

1. Based on best available scientific information indicating that more flow is needed or less flow is adequate to reasonably protect fish and wildlife beneficial uses, the specified annual February–June minimum unimpaired flow requirement may be increased or decreased to a percentage within the ranges listed below. For LSJR Alternative 2 (20 percent unimpaired flow), the percent of unimpaired flow may be increased to a maximum of 30 percent. For LSJR Alternative 3 (40 percent unimpaired flow), the percent of unimpaired flow may be decreased to a minimum of 30 percent or increased to a maximum of 50 percent. For LSJR Alternative 4 (60 percent unimpaired flow), the percent of unimpaired flow may be decreased to a minimum of 50 percent.
2. Based on best available scientific information indicating a flow pattern different from that which would occur by tracking the unimpaired flow percentage would better protect fish and wildlife beneficial uses, water may be released at varying rates during February–June. The total volume of water released under this adaptive method must be at least equal to the volume of water that would be released by tracking the unimpaired flow percentage from February–June.
3. Based on best available scientific information, release of a portion of the February–June unimpaired flow may be delayed until after June to prevent adverse effects on fisheries, including temperature that would otherwise result from implementation of the February–June flow requirements. The ability to delay release of flow until after June is only allowed when the

[6] *Unimpaired flow* represents the water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds. It differs from natural flow because unimpaired flow is the flow that occurs at a specific location under the current configuration of channels, levees, floodplain, wetlands, deforestation and urbanization.

unimpaired flow requirement is greater than 30 percent. If the requirement is greater than 30 percent but less than 40 percent, the amount of flow that may be released after June is limited to the portion of the unimpaired flow requirement over 30 percent. For example, if the flow requirement is 35 percent, 5 percent may be released after June. If the requirement is 40 percent or greater, then 25 percent of the total volume of the flow requirement may be released after June. As an example, if the requirement is 50 percent, at least 37.5 percent unimpaired flow must be released in February–June and up to 12.5 percent unimpaired flow may be released after June. ~~If after June the STM Working Group determines that conditions have changed such that water held for release after June should not be released by the fall of that year, the water may be held until the following year.~~ See Chapter 3 and Appendix K for further details.

4. Based on best available scientific information indicating that more flow is needed or less flow is adequate to reasonably protect fish and wildlife beneficial uses, the February–June Vernalis base flow requirement of 1,000 cubic feet per second (cfs) may be modified to a rate between 800 and 1,200 cfs.

The operational changes made using the adaptive implementation methods above may be approved if the best available scientific information indicates that the changes will be sufficient to support and maintain the natural production of viable native SJR Watershed fish populations migrating through the Delta and meet any biological goals. The changes may take place on either a short-term (e.g., monthly or annually) or longer-term basis. Adaptive implementation is intended to foster coordinated and adaptive management of flows based on best available scientific information in order to protect fish and wildlife beneficial uses. Adaptive implementation could also optimize flows to achieve the objective, while allowing for consideration of other beneficial uses, provided that these other considerations do not reduce intended benefits to fish and wildlife.

Cultural resources for this analysis of the LSJR alternatives were identified through a review of the location, environmental setting, and available documentation, as described in Section 12.2, *Environmental Setting*, for the reservoirs and the rivers. No fieldwork was used to confirm the presence or absence of archaeological, architectural, or paleontological resources, and no evaluation of known resources was done to assess their significance. Unless determined previously, the significance evaluation of documented resources will be completed as part of the HPMPs under way for the FERC hydropower water quality certifications for the Don Pedro Project (FERC Project No. 2299) on the Tuolumne River and the Merced River Hydroelectric Project (FERC Project No. 2179), including Lake McClure, or for the RMP administered by USBR at New Melones Lake Area (USBR 2010:5.81; Merced ID 2011: Exhibit E, 334–335; TID and MID 2011b:2-3).

Potential direct and indirect impact mechanisms for disturbing, materially altering, or demolishing cultural resources, including buried human remains and paleontological resources, as a result of the LSJR alternatives were considered. Providing people access to known or currently unknown cultural resources is the primary direct mechanism to disturb, alter, or demolish cultural resources (e.g., vandalism, authorized collection of artifacts, use of off-highway vehicles). Additionally, cultural resources could be indirectly disturbed, altered, or demolished by activities that would substantially increase natural processes (e.g., weathering or erosion). Soil disturbance or grading is not considered a direct impact mechanism because soil disturbance or grading would not occur under the LSJR alternatives. The LSJR alternatives were evaluated by first determining the potential for known and unknown significant cultural resources to exist at the three reservoirs and along the rivers. The results of the State Water Board's Water Supply Effects (WSE) model were then used to qualitatively analyze the effects of altering reservoir elevations or modifying flows.

This chapter presents the quantitative results of the WSE modeling for the specified unimpaired flow requirement of each LSJR alternative (i.e., 20, 40, or 60 percent). This chapter also incorporates a qualitative discussion of adaptive implementation under each of the LSJR alternatives, including the potential environmental effects associated with adaptive implementation. To inform the qualitative discussion and account for the variability allowed by adaptive implementation, modeling was performed to predict conditions at 30 percent and 50 percent of unimpaired flow (as reported in Appendix F.1, *Hydrologic and Water Quality Modeling*). The modeling also allows some inflows to be retained in the reservoirs until after June, as could occur under method 3, to prevent adverse temperature effects. This variety of modeling scenarios provides information to support the analysis and evaluation of the effects of the alternatives and adaptive implementation. This chapter incorporates a qualitative discussion of the potential cultural resource impacts of adaptive implementation under each of the LSJR alternatives. For more information regarding the modeling methodology and quantitative flow and temperature modeling results, see Appendix F.1.

## Reservoir Evaluation

The prevalence of cultural resources, within and adjacent to the reservoirs, determines the potential for direct and indirect impacts on cultural resources. There are documented significant cultural resources located at the reservoirs (see Section 12.2.1, *Reservoir Historic or Archaeological and Paleontological Resources*); however, the locations of many significant or potentially significant cultural resources remain unknown because survey of the reservoirs remains incomplete and there is a potential for buried resources. The LSJR alternatives could reduce reservoir elevations, which could potentially affect cultural resources by: (1) exposing known or currently unknown significant cultural resources now underwater, and (2) providing people access to these resources. Additionally, the LSJR alternatives could substantially increase natural processes (e.g., weathering or erosion) by inundating known or currently unknown significant cultural resources.

WSE model results were summarized in two ways to characterize the effect of the LSJR alternatives on both high and low reservoir elevations in order to assess changes in reservoir elevation that may: (1) increase inundation of cultural resources that are typically out of the water, or (2) increase exposure of cultural resources that are typically below the water surface. These two assessments also capture the change in the range of reservoir elevations. An increase in the range of elevations could result in more resources being within the zones that are repeatedly exposed or inundated.

For the first assessment, the highest elevations under LSJR Alternatives 2, 3, and 4 were identified at the 70, 80, and 90 percent cumulative distribution during June for each alternative, and the difference relative to baseline was calculated (the WSE model results for reservoir storage are end-of-month values). June was selected because during wet years, June is the month with the highest reservoir elevations. Reporting the results of the cumulative distribution accounts for the interannual variability over the 82-year modeled period. The change in high elevations is presented using the 70, 80, and 90 percent cumulative distribution because it is expected that at these elevation levels, cultural resources that typically remain dry would potentially be inundated. Table 12-5 summarizes the results of the 70, 80, and 90 percent cumulative distribution assessment for each reservoir.

**Table 12-5. Reservoir Elevations (feet) and Expected Changes (feet) for June at the 70, 80, or 90 Percent Cumulative Distribution for New Melones, New Don Pedro, and Lake McClure**

| Cumulative Distribution | Baseline Elevations | LSJR Alternative 2 Minus Baseline | LSJR Alternative 3 Minus Baseline | LSJR Alternative 4 Minus Baseline |
|---|---|---|---|---|
| New Melones | Jun | Jun | Jun | Jun |
| 70% | 1,027 | 8 | -6 | -38 |
| 80% | 1,039 | 5 | -9 | -33 |
| 90% | 1,061 | 4 | -11 | -28 |
| New Don Pedro | | | | |
| 70% | 827 | -5 | -23 | -40 |
| 80% | 832 | -3 | -13 | -35 |
| 90% | 833 | 0 | -3 | -21 |
| Lake McClure | | | | |
| 70% | 861 | -3 | -23 | -42 |
| 80% | 867 | 0 | -6 | -30 |
| 90% | 867 | 0 | 0 | -9 |

Note: Negative numbers indicate a decrease in reservoir elevations; positive numbers indicate an increase in reservoir elevations. The absolute maximum value was not used because it only occurred a few years over the 82-year period, and therefore is not representative of typical conditions.

For the second assessment, the lowest elevations under LSJR Alternatives 2, 3, and 4 were identified at the 10, 20, and 30 percent cumulative distribution for June and September for each alternative, and the difference relative to baseline was calculated. June was selected because the reservoirs typically experience the heaviest use due to recreationists during that time of year, and the LSJR alternatives are most likely to affect reservoir elevations in June. September was selected because it represents the carryover storage at the end of the water year when reservoir levels are often at their lowest level. Reporting the results of the cumulative distribution accounts for the interannual variability over the 82-year modeled period. The change in elevation is presented using the 10, 20, and 30 percent cumulative distribution because it is expected that at these lowest elevation levels, there would be the potential to expose more cultural resources located in the reservoirs. Table 12-6 summarizes the results for each reservoir for the 10, 20, and 30 percent cumulative distribution.

**Table 12-6. Reservoir Elevations (feet) and Expected Changes (feet) for June and September at the 10, 20, or 30 Percent Cumulative Distribution for New Melones, New Don Pedro, and Lake McClure**

| Cumulative Distribution | Baseline Elevations | | LSJR Alternative 2 Minus Baseline | | LSJR Alternative 3 Minus Baseline | | LSJR Alternative 4 Minus Baseline | |
|---|---|---|---|---|---|---|---|---|
| New Melones | Jun | Sep | Jun | Sep | Jun | Sep | Jun | Sep |
| 10% | 870 | 837 | 46 | 57 | 47 | 68 | 44 | 72 |
| 20% | 910 | 874 | 31 | 35 | 27 | 45 | 16 | 45 |
| 30% | 941 | 913 | 27 | 25 | 11 | 17 | 2 | 19 |
| New Don Pedro | | | | | | | | |
| 10% | 748 | 706 | -1 | 2 | -14 | 3 | -20 | 13 |
| 20% | 767 | 727 | 1 | 2 | -16 | -1 | -25 | -1 |
| 30% | 787 | 744 | -3 | -2 | -26 | -10 | -33 | -8 |
| Lake McClure | | | | | | | | |
| 10% | 692 | 636 | 56 | 73 | 37 | 72 | 17 | 69 |
| 20% | 746 | 669 | 23 | 48 | 12 | 50 | -2 | 48 |
| 30% | 775 | 701 | 14 | 40 | 2 | 29 | -9 | 41 |

Note: Negative numbers indicate a decrease in reservoir elevations; positive numbers indicate an increase in reservoir elevations. The absolute minimum value was not used because it only occurred 1 year over the 82-year period, and therefore is not representative of typical conditions.

### River Evaluation

The prevalence of cultural resources within and adjacent to the three eastside tributaries and the LSJR (see Section 12.2.2, *River Historic or Archaeological and Paleontological Resources*) determines the potential for direct and indirect impacts on cultural resources in and adjacent to the rivers. The potential for currently unknown cultural resources to exist is low and many of the known cultural resources have likely been modified, altered, damaged, or destroyed. The expected changes (see below) in flow from the LSJR alternatives would not provide new or expanded access to known or unknown cultural resources. People currently using the rivers would continue to do so and would continue to experience the periodic fluctuations and changes in flow. Therefore, general trends for the LSJR alternatives were identified from the WSE model and used to analyze impacts on cultural resources along the rivers. These trends are summarized below.

- For LSJR Alternative 2, modeled monthly flows on the Stanislaus River were generally similar to baseline flows, although with some small shifting of flows from March to June. Flows for the Tuolumne and Merced Rivers and the LSJR were generally similar to or greater than baseline flows, depending on the month (Tables 5-16 and 5-17a, 5-17b, 5-17c, and 5-17d).
- For LSJR Alternatives 3 and 4, modeled monthly flows would generally increase relative to baseline flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR (Table 5-16 and 5-17a, 5-17b, 5-17c, and 5-17d). In most cases, these rivers would experience substantial increases in median flows from February–June relative to baseline.
- For LSJR Alternatives 3 and 4, modeled results indicated occasional reductions in the highest flows caused by a reduced need for flood control releases when compared to baseline conditions. Flood control releases were most likely to occur when the reservoirs were filling

with storm flows or when the reservoirs had to be emptied in the fall in preparation for storms in winter and spring. Flood control releases occurred more often in wet years and were more common at New Don Pedro Reservoir and Lake McClure (i.e., the two smaller reservoirs). During wet years, reservoir releases were greater under LSJR Alternatives 3 and 4, so reservoir storage would reach the maximum allowed limit less often, and flood control releases would not be needed as much.

- The largest changes in flow associated with the LSJR alternatives occurred from February–June, but there were some smaller effects outside of this period. Changes from July–January were primarily related to changes in flood control releases, retention of unimpaired flow for later release in the fall as part of adaptive implementation described under the LSJR alternatives in Section 12.4.3, *Impacts and Mitigation Measures*, during wet conditions, and retention of water in the reservoirs to maintain carryover storage (by reducing diversions in dry years).

As described in Chapter 3, *Alternatives Description*, the percent of unimpaired flow, as specified by the LSJR alternatives, would not apply when such flows would cause flooding or other related public safety concerns.

## Extended Plan Area

The analysis of the extended plan area generally identifies how the impacts may be similar to or different from the impacts in the plan area (i.e., downstream of the rim dams) depending on the similarity of the impact mechanism (e.g., changes in reservoir levels, reduced water diversions, and additional flow in the rivers) or location of potential impacts in the extended plan area. Where appropriate, the program of implementation is discussed to help contextualize the potential impacts in the extended plan area.

## SDWQ Alternatives

As discussed in Chapter 5, *Surface Hydrology and Water Quality*, and Appendix B, *State Water Board's Environmental Checklist*, the baseline water quality in the southern Delta generally ranges from 0.2 deciSiemens per meter (dS/m)[7] and 1.2 dS/m during all months of the year. Under SDWQ Alternatives 2 or 3, salinity levels in the southern Delta are expected to remain within their historical range (i.e., 0.2 dS/m–1.2 dS/m) because the salinity in the southern Delta has a strong relationship with the salinity at Vernalis, and the program of implementation for SDWQ Alternatives 2 or 3 would still include requirements for USBR to maintain salinity at Vernalis in accordance with its water rights. Therefore, the chemical properties of the baseline water quality conditions in the southern Delta (identified in Chapter 5, *Surface Hydrology and Water Quality*) would not change, and would have no potential to cause a substantial adverse change in the significance of historical or archaeological resources, to disturb human remains, including those interred outside formal cemeteries, or to directly or indirectly destroy a unique paleontological resource, site or unique geologic feature. Therefore, impacts on historical resources, archaeological resources, human remains, or unique paleontological resources under the SDWQ alternatives are not further discussed

[7] In the 2006 Bay-Delta Plan, a salinity value—or electrical conductivity (EC) value—of 2.64 millimhos/centimeter (mmhos/cm) is used to represent the X2 location. X2 is the location of the 2 parts per thousand salinity contour (isohaline), 1 meter off the bottom of the estuary measured in kilometers upstream from the Golden Gate Bridge. Note, in this SED, EC is generally expressed in deciSiemens per meter (dS/m). The conversion is 1 mmhos/cm = 1 dS/cm.

in this chapter. To comply with specific water quality objectives or the program of implementation under SDWQ Alternatives 2 or 3, construction and operation of different facilities in the southern Delta could occur, which could involve impacts on cultural resources. These impacts are evaluated in Chapter 16, *Evaluation of Other Indirect and Additional Actions.*

## 12.4.3 Impacts and Mitigation Measures

**Impact CUL-1: Cause a substantial adverse change in the significance of a historical or archaeological resource**

### No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 *Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan). See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

### LSJR Alternatives

There is generally a high potential for currently known and unknown significant cultural resources to exist at the three reservoirs because some resources have already been documented at each of the reservoirs. As described in Section 12.2, *Environmental Setting*, two-thirds of the documented cultural resources at New Melones Reservoir are currently located in the permanent pool zone and/or the fluctuation pool zone. Few cultural resources have been documented below the average water level at New Don Pedro Reservoir. Documented archaeological sites and one built resource at Lake McClure are at or below the high water levels and currently experience inundation by water or exposure by receding water. Significant historical and archaeological resources (historic properties) are protected and managed under the HPMPs as part of the FERC hydropower water quality certifications for the Don Pedro Project (FERC Project No. 2299) on the Tuolumne River and the Merced River Hydroelectric Project (FERC Project No. 2179), including Lake McClure, and by the RMP administered by USBR at New Melones Reservoir.

There is a low potential for unknown significant cultural resources to exist on the three eastside tributaries and the LSJR because of prior disturbance by agriculture, irrigation practices, mining activities, or development within the riverine floodplains. Since the rivers have experienced extensive disturbances since the start of the historic period approximately 150 years ago, there is a low potential for unknown significant cultural resources to exist within the displaced or reworked soils or sediments in the confined river channels. Furthermore, although a high number of historic period archaeological sites or built resources have been recorded along the rivers, many have been highly disturbed or destroyed by these processes as the natural floodplains and terraces were modified and confined by levees or agricultural fields, or as early settlements or mining prospects were later displaced or buried by hydraulic mining and dredging, which continued into the mid-1900s in some places, such as the Lower Tuolumne River near Waterford, and then by modern large-scale aggregate mining (see Section 12.2.2, *River Historic or Archaeological and Paleontological Resources*).

## LSJR Alternative 2 (Less than significant/Less than significant with adaptive implementation)

### Reservoirs

LSJR Alternative 2 would change reservoir elevations in New Melones Reservoir, New Don Pedro Reservoir, and Lake McClure. Table 12-5 and Table 12-6 summarize the expected changes. In general, under LSJR Alternative 2 there would be little change in the highest reservoir elevations in June (Table 12-5); there would be slight increases in New Melones Reservoir (less than 10 ft), and slight decreases in New Don Pedro Reservoir and Lake McClure (5 ft or less). Under LSJR Alternative 2, the lower reservoir elevations in September (Table 12-6) are expected to increase significantly at New Melones Reservoir (25–57 ft) and would be similar to baseline at New Don Pedro Reservoir. At Lake McClure, the very lowest reservoir elevations (10 percent cumulative distribution) would increase by 73 ft under LSJR Alternative 2 as a result of the LSJR alternative carryover storage requirements; moderately low elevations (30 percent cumulative distribution) would increase under LSJR Alternative 2 by 40 ft in September (Table 12-6).

Depending on the location at New Melones Reservoir, cultural resources could experience slight increases in inundation at high reservoir elevations under LSJR Alternative 2. However, while inundation might increase, higher water surface elevations would be expected to prevent human disturbance, and siltation could provide protection to existing cultural resources from human disturbance and other physical forces. Furthermore, under LSJR Alternative 2, the lowest elevations at the reservoirs are expected to be either similar to baseline or be above baseline elevations. The carryover storage requirement means that in some cases, cultural resources that occasionally were exposed during droughts under baseline conditions might no longer be exposed.

The existing archaeological and historic-era built environment resources currently experience, and would continue to experience, fluctuations in water levels at the reservoirs. Furthermore, the management plans for historic properties at the reservoirs would include standard unanticipated discovery and treatment measures should any previously unknown significant cultural resources be discovered during continued operation of the dams. Therefore, while cultural resources might experience variation in their physical environment due to changes in water level or siltation, these variations have an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of the resources. As such, under LSJR Alternative 2, impacts on historical or archaeological resources at the reservoirs would be less than significant.

### Rivers

The potential for vandalism, unauthorized collection, and other anthropogenic disturbances is considered low along the LSJR and the three eastside tributaries because of the prior anthropogenic and natural disturbance of the rivers and adjacent areas. It is expected that each of the rivers would continue to experience episodic high flows during significant storm events as the flood capacities of the rivers are controlled and managed by USACE. LSJR Alternative 2 would not exceed flood control or management requirements. Furthermore, average and seasonal flows are expected to remain within the existing channels that have been previously disturbed by natural flows and anthropogenic activities. The potential for bank erosion on all four rivers under this alternative is expected to be similar to baseline conditions, including the occasional years with major flood events. Given the low potential for significant cultural resources to be located within and adjacent to the rivers, and because the expected change in flows has an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of any resources that may be present, impacts on historical or archaeological resources located within or adjacent to the rivers under LSJR Alternative 2 would be less than significant.

### Adaptive Implementation

Based on best available scientific information indicating that a change in the percent of unimpaired flow is needed to reasonably protect fish and wildlife, adaptive implementation method 1 would allow an increase of up to 10 percent over the 20-percent February–June unimpaired flow requirement (to a maximum of 30 percent of unimpaired flow). A change to the percent of unimpaired flow would take place based on required evaluation of current scientific information and would need to be approved as described in Appendix K, *Revised Water Quality Control Plan*. Accordingly, the frequency and duration of any use of this adaptive implementation method cannot be determined at this time. However, an increase of up to 30 percent of unimpaired flow would potentially result in different effects as compared to 20-percent unimpaired flow, depending upon flow conditions and frequency of the adjustment.

Based on best available scientific information indicating that a change in the timing or rate of unimpaired flow is needed to reasonably protect fish and wildlife, adaptive implementation method 2 would allow changing the timing of the release of the volume of water within the February–June timeframe. While the total volume of water released February–June would be the same as LSJR Alternative 2 without adaptive implementation, the rate could vary from the actual (7-day running average) unimpaired flow rate. Method 2 would not authorize a reduction in flows required by other agencies or through other processes, which are incorporated in the modeling of baseline conditions. Method 3 would not be authorized under LSJR Alternative 2 since the unimpaired flow percentage would not exceed 30 percent.

Adaptive implementation method 4 would allow an adjustment of the Vernalis February–June flow requirement. WSE model results show that under LSJR Alternative 2 the 1,200-cfs February–June base flow requirement at Vernalis would require a flow augmentation in the three eastside tributaries and the LSJR only 2.7 percent of the time in the 82-year record analyzed. Similarly, flow augmentation would be required 0.7 percent of the time to meet a 1,000-cfs requirement and 0.5 percent of the time for an 800-cfs Vernalis base flow requirement. These results indicate that changes due to method 4 under this alternative would rarely alter the flows in the three eastside tributaries or the LSJR.

Impacts associated with adaptive implementation method 1 may be slightly different from those associated with methods 2 and 3. With method 1, if the specified percent of unimpaired flow were changed from 20 percent to 30 percent on a long-term basis, the conditions and impacts could become more similar to those described under LSJR Alternative 3 (e.g., 30 percent unimpaired flow). It is anticipated that over time the unimpaired flow requirement could increase or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions. If method 2 is implemented, the total annual volume of water associated with LSJR Alternative 2 (i.e., 20 percent of the February–June unimpaired flow) would not change. As a result, the total volume of water that would remain in the river would not change with adaptive implementation method 2. However, given that this method would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, and given the prior anthropogenic and natural disturbance of the rivers and adjacent areas have resulted in a low potential for significant historical or archaeological resources to exist, impacts would be similar to those described above under LSJR Alternative 2. Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and the LSJR because it would rarely cause a change in flow and the volume of water involved would be relatively small. Consequently the impact determination of LSJR Alternative 2 with adaptive implementation for historical or archaeological resources would be the same as described above under LSJR Alternative 2 without adaptive implementation. Impacts would be less than significant.

## LSJR Alternative 3 (Less than significant/Less than significant with adaptive implementation)

### Reservoirs

LSJR Alternative 3 would change reservoir elevations in New Melones Reservoir, New Don Pedro Reservoir, and Lake McClure. Table 12-5 and Table 12-6 summarize the expected changes. In general, under LSJR Alternative 3, there would be slight decreases in the highest reservoir elevations, with the largest decrease (23 ft) occurring at the 70 percent cumulative distribution level at New Don Pedro Reservoir and Lake McClure (Table 12-5). Under LSJR Alternative 3, the lower reservoir elevations in September (Table 12-6) are expected to increase significantly at New Melones Reservoir (31–83 ft) and would be similar to baseline at New Don Pedro Reservoir. At Lake McClure, the very lowest reservoir elevations in September would increase under LSJR Alternative 3 (by 72 ft) as a result of carryover storage requirements that are part of LSJR Alternative 3, and the moderately low elevations (30 percent cumulative distribution) would increase by 29 ft. Similarly, at New Melones Reservoir, the very lowest reservoir elevations in September would increase under LSJR Alternative 3 (by 68 ft) as a result of carryover storage requirements that are part of LSJR Alternative 3, and the moderately low elevations (30 percent cumulative distribution) would increase by 17 ft. For instances in which LSJR Alternative 3 may reduce already low reservoir elevations, the reduction relative to baseline is greater in June than it is in September (Table 12-6). These reductions in elevation during a period of high recreational use (June) could expose cultural resources to more human-caused damage. However, actual elevations in June are significantly higher than in September. Exposure of some resources in June under LSJR Alternative 3 would not be consequential, given that the resources would ultimately be exposed by September under baseline conditions.

Under LSJR Alternative 3, resources high in the fluctuation pool zone may experience slightly less inundation. Furthermore, under LSJR Alternative 3, the lowest elevations at the reservoirs are expected to be either similar to baseline or be above baseline elevations. The carryover storage requirement for LSJR Alternative 3 means that in some cases, cultural resources that occasionally were exposed during droughts under baseline conditions might no longer be exposed. Cultural resources would continue to experience inundation and receding reservoir water levels.
As described under LSJR Alternative 2, any documented or currently unknown significant cultural resource would be managed by the various plans of the reservoirs (e.g., the New Melones Lake RMP and Resource Protection Plan, and the HPMPs for New Don Pedro and Lake McClure). Although cultural resources might experience variation in their physical environment due to changes in water level or siltation, these variations have an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of the resources. Therefore, under LSJR Alternative 3, impacts on historical or archaeological resources at the reservoirs would be less than significant.

### Rivers

As discussed under LSJR Alternative 2, there is a low potential for unknown significant cultural resources to be located within and adjacent to the rivers due to past anthropogenic and natural modifications within river channels and adjacent to river channels. Under LSJR Alternative 3, average and seasonal flows are expected to remain within the existing channels, which have been previously disturbed by natural flows and anthropogenic activities. Furthermore, there is only a low potential for significant cultural resources to be located within or adjacent to the rivers, and the expected change in flows has an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of any resources that may be present. Therefore, impacts on historical or archaeological resources located within or adjacent to the rivers under LSJR Alternative 3 would be less than significant.

### Adaptive Implementation

Under LSJR Alternative 3, impacts associated with adaptive implementation method 1 may be slightly different from those associated with adaptive implementation methods 2 and 3.

Implementing method 1 would allow an increase or decrease of up to 10 percent in the February–June, 40 percent unimpaired flow requirement (with a minimum of 30 percent and maximum of 50 percent) to optimize implementation measures to meet the narrative objective, while considering other beneficial uses, provided that these other considerations do not reduce intended benefits to fish and wildlife. Adaptive implementation must be approved using the process described in Appendix K, *Revised Water Quality Control Plan*. Accordingly, the frequency and duration of any use of this adaptive implementation method cannot be determined at this time. Adaptive implementation method 1 could affect the volume of water and level of flow in the LSJR and its tributaries. However, the frequency and duration of such a change is unknown. If the specified percent of unimpaired flow were changed from 40 percent to 30 percent, or 40 percent to 50 percent on a long-term basis, the conditions and impacts could become more similar to LSJR Alternatives 2 or 4, respectively. It is anticipated that over time the unimpaired flow requirement could increase, decrease, or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions.

Under adaptive implementation methods 2 or 3, the overall volume of water from the February–June time period or after June would be the same as LSJR Alternative 3 without adaptive implementation, but the volume within each month could vary. Adaptive implementation method 3 is incorporated into the modeling; thus, the range of historical or archaeological effects is reflected in the results presented above under LSJR Alternative 3. Furthermore, given that these two methods would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, and given that prior anthropogenic and natural disturbance of the rivers and adjacent areas have resulted in a low potential for significant historical or archaeological resources to exist, impacts would be similar to those described above under LSJR Alternative 3.

Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and the LSJR. WSE model results show that under LSJR Alternative 3 the 1,200-cfs February–June base flow requirement at Vernalis would require a flow augmentation in the three eastside tributaries and the LSJR only 1.2 percent of the time in the 82-year record analyzed. Similarly, flow augmentation would be required only 0.2 percent of the time to meet either a 1,000-cfs or 800-cfs Vernalis base flow requirement. These results indicate that adaptive implementation method 4 would rarely alter the flows in the three eastside tributaries or the LSJR under this alternative.

Consequently, the impact determination of LSJR Alternative 3 with adaptive implementation would be the same as described above under LSJR Alternative 3 without adaptive implementation, for historical or archaeological resources. Impacts would be less than significant.

## LSJR Alternative 4 (Less than significant/Less than significant with adaptive implementation)

### Reservoirs

LSJR Alternative 4 would change reservoir elevations in New Melones Reservoir, New Don Pedro Reservoir, and Lake McClure. Table 12-5 and Table 12-6 summarize the expected changes. In general, under LSJR Alternative 4, there would be decreases in the highest reservoir elevations, with all three reservoirs experiencing a roughly 40 foot decrease in carryover elevations at the 70 percent cumulative distribution level (Table 12-5). Under LSJR Alternative 4, the lower reservoir elevations (in September), are expected to increase significantly at New Melones Reservoir (19–72 ft) and at Lake McClure (41–69 ft) (Table 12-6). At New Don Pedro Reservoir, elevations in September would be similar to baseline with changes in elevation ranging from a decrease of 8 ft (30 percent cumulative distribution) to an increase of 13 ft (10 percent cumulative distribution) (Table 12-6). LSJR Alternative 4 is more likely to cause low elevations relative to baseline in June than in September (Table 12-6). These reductions in elevation during a period of high recreational use (June) could expose cultural resources to more human-related damage. However, actual elevations in June are significantly higher than in September. Exposure of some cultural resources in June under LSJR Alternative 4 would not be consequential, given that the resources would ultimately be exposed by September under baseline conditions.

Under LSJR Alternative 4, resources high in the fluctuation pool zone may experience less inundation. Furthermore, under LSJR Alternative 4, the lowest elevations at the reservoirs are expected to be either similar to baseline or be above baseline elevations. The carryover storage requirement for LSJR Alternative 4 means that in some cases, cultural resources that occasionally were exposed during droughts under baseline conditions might no longer be exposed. Cultural resources would continue to experience inundation and receding reservoir waters. As discussed under LSJR Alternative 2, cultural resources would be managed by the various plans of the reservoirs (e.g., the New Melones Lake RMP and Resource Protection Plan, and the HPMPs for New Don Pedro and Lake McClure). Although cultural resources might experience variation in their physical environment due to changes in water level or siltation, these variations have an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of the resources. Therefore, under LSJR Alternative 4, impacts on historical or archaeological resources at the reservoirs would be less than significant.

### Rivers

There is a low potential for unknown significant cultural resources to be located within and adjacent to the rivers due to past anthropogenic and natural modifications within river channels and adjacent to river channels. As discussed under LSJR Alternative 2, any modification of flows has an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of documented or currently undocumented historical or archaeological resources located within or adjacent to the rivers. Therefore, impacts on historical or archaeological resources within or adjacent to the rivers under LSJR Alternative 4 would be less than significant.

### Adaptive Implementation

Under LSJR Alternative 4, impacts associated with adaptive implementation method 1 may be slightly different from those associated with methods 2 and 3.

Implementing method 1 would allow a decrease of up to 10 percent in the annual February–June 60 percent unimpaired flow (to a minimum of 50 percent) to optimize implementation measures to meet the narrative objective, while considering other beneficial uses, provided that these other considerations do not reduce intended benefits to fish and wildlife. Adaptive implementation must be approved using the process described in Appendix K, *Revised Water Quality Control Plan*. Accordingly, the frequency and duration of any use of this adaptive implementation method cannot be determined at this time. If the specified percent unimpaired flow were changed from 60 percent to 50 percent on a long-term basis, the conditions and impacts could become more similar to LSJR Alternative 3. It is anticipated that over time the unimpaired flow requirement could decrease or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions.

Under adaptive implementation methods 2 or 3, the overall volume of water from the February–June time frame or after June would be the same as under LSJR Alternative 4 without adaptive implementation, but the volume within each month could vary. Adaptive implementation method 3 is incorporated into the modeling; thus, the range of historical or archaeological effects is reflected in the results presented above under LSJR Alternative 4. Furthermore, given that these two methods would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, and given the prior anthropogenic and natural disturbance of the rivers and adjacent areas have resulted in a low potential for significant historical or archaeological resources to exist, impacts would be similar to those described above under LSJR Alternative 4.

Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and the LSJR. WSE model results show that under LSJR Alternative 4 the 1,200-cfs February–June base flow requirement at Vernalis would require a flow augmentation in the three eastside tributaries and the LSJR only 0.7 percent of the time in the 82-year record analyzed. Similarly, flow augmentation would be required only 0.2 percent of the time to meet a 1,000-cfs requirement and is not affected at all for an 800-cfs requirement. These results indicate that adaptive implementation method 4 would rarely alter the flows in the three eastside tributaries or the LSJR under this alternative.

Consequently, the impact determination of LSJR Alternative 4 with adaptive implementation would be the same as described above under LSJR Alternative 4 without adaptive implementation, for historical or archaeological resources. Impacts would be less than significant.

**Impact CUL-2: Disturb any human remains, including those interred outside formal cemeteries**

## No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the*

*No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)*, for the No Project Alternative technical analysis.

## LSJR Alternatives

As described in Section 12.2, *Environmental Setting*, human remains interred outside of formal cemeteries have been documented at relatively few archaeological sites at New Melones Reservoir and New Don Pedro Reservoir. No human remains have been documented to date at Lake McClure. Cemeteries have been documented at New Melones Reservoir; however, "cemetery" is not listed as a historic site type at New Don Pedro Reservoir or Lake McClure. Furthermore, no evidence of burials was found at a possible cemetery at Lake McClure. In compliance with procedures for the treatment of human remains discovered on state, private, or federal lands, documented human remains would have been left in place, reinterred under the maximum pool or elsewhere, or excavated, curated, and/or repatriated at each of the reservoirs if they had been discovered previously. In addition, documented or currently undocumented sites with human remains would be protected under federal and state laws and under the HPMPs for the New Don Pedro on the Tuolumne River and Lake McClure, and by the RMP administered by USBR at New Melones Reservoir. The potential for the presence of human remains in proximity to the reservoir fluctuation zones is considered low.

The potential for the presence of undocumented human remains within and adjacent to the LSJR and the three eastside tributaries is considered low due to prior disturbance of the riparian corridors by natural and historic-era anthropogenic processes. Any human remains discovered within and adjacent to the LSJR and the three eastside tributaries outside of formal cemeteries would also have been treated in accordance with state or federal regulations.

### LSJR Alternative 2 (Less than significant/Less than significant with adaptive implementation)

#### Reservoirs and Rivers

Since the potential for human remains to exist within the fluctuation zone of the reservoirs is low, the change in reservoir elevation described above in Impact CUL-1 would have a low potential to disturb documented or undocumented human remains. Considering the prior disturbance by agriculture, irrigation practices, mining activities, and development within the riverine floodplains, the change in flows under LSJR Alternative 2 would have an extremely low potential to disturb documented or undocumented human remains, including those interred outside formal cemeteries. The natural processes of localized soil erosion and siltation could also be beneficial by reducing the potential for access and unauthorized artifact collection or vandalism. Therefore, under LSJR Alternative 2, impacts on human remains, including those interred outside formal cemeteries, would be less than significant.

#### Adaptive Implementation

It is anticipated that adaptive implementation would not substantially change the less than significant determination for impacts on human remains. As discussed under Impact CUL-1, it is anticipated that over time the unimpaired flow requirement could increase or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions under adaptive implementation method 1. If method 2 is implemented, the total annual volume of water associated with LJSR Alternative 2 (i.e., 20 percent of the February–June unimpaired flow) would not change. As a result, the total volume of water that would remain in the river would not change with adaptive implementation method 2; therefore, impacts associated with total volume of water would not change. Given that this method would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, impacts would be similar to those described under LSJR Alternative 2 without adaptive implementation. Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and the LSJR because it rarely would cause a change in flow and the volume of water involved would be relatively small. Consequently, the impact determination of LSJR Alternative 2 with adaptive implementation would be the same as described above under LSJR Alternative 2 without adaptive implementation, for human remains. Impacts would be less than significant.

### LSJR Alternatives 3 and 4 (Less than significant/Less than significant with adaptive implementation)

For LSJR Alternatives 3 and 4, the impacts on human remains, including those interred outside formal cemeteries, would not differ from those described under LSJR Alternative 2, with and without adaptive implementation methods 1, 2, and 4. Under adaptive implementation method 3, the overall volume of water from the February–June time period or after June would be the same as LSJR Alternative 3 without adaptive implementation, but the volume within each month could vary. However, adaptive implementation method 3 is incorporated into the modeling; thus, the range of impacts on human remains is reflected in the results described above under LSJR Alternatives 3 and 4 under Impact CUL-1. In addition, given that these methods would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, impacts would be similar to those described for LSJR Alternative 3 and 4. Therefore, impacts on human remains under LSJR Alternatives 3 and 4 with and without adaptive implementation would be less than significant.

**Impact CUL-3: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature**

## No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

## LSJR Alternatives

As described in Section 12.2, *Environmental Setting*, the rock units in proximity to the reservoirs have a low potential to contain paleontological resources. No paleontological resources have been documented at New Don Pedro Reservoir or Lake McClure. At New Melones Reservoir, fossils were recovered from more than 12 caves. More than 50 caves at New Melones Reservoir are inundated or subject to inundation. Three of the caves subject to inundation are considered significant paleontological resources. The documented caves are protected and managed under the Cave Management Plan administered by USBR at New Melones Reservoir.

As also described in Section 12.2, *Environmental Setting*, the potential for paleontological resources within and adjacent to the LSJR and the three eastside tributaries is considered low due to the depth of occurrence of rock units with high paleontological potential below reworked surficial sediments and Holocene-age floodplain and channel deposits. In other words, buried paleontological resources would be found at soil and rock depth too deep for the rivers to modify or change. The potential is also low due to disturbance or destruction of near-surface paleontological resources by historic-era anthropogenic practices or natural processes.

## LSJR Alternative 2 (Less than significant/Less than significant with adaptive implementation)

### Reservoirs

As described above under Impact CUL-1, reservoir elevations currently experience, and would continue to experience, fluctuations in water levels at the reservoirs (Table 12-5 and 12-6). No paleontological resources have been documented at New Don Pedro Reservoir or Lake McClure. The low potential for rock units within proximity of these two reservoirs indicates that the change in elevation under LSJR Alternative 2 would have a low potential to affect any unknown paleontological resources. New Melones Reservoir may experience an increase in reservoir elevations. Many of the caves adjacent to the reservoir are currently above the spillway elevation, and of those that are below the spillway elevation, the increase in reservoir elevations could prevent human disturbance of the caves. The documented caves would continue to be protected and managed under the Cave Management Plan, which is administered by USBR at New Melones Reservoir. Therefore, under LSJR Alternative 2, impacts on paleontological resources or sites or unique geologic features associated with the reservoirs would be less than significant.

### Rivers

The expected change in flows in the LSJR and the three eastside tributaries would have an extremely low potential to disturb paleontological resources. This is because these resources are typically identified at depths below the surficial sediments reworked by historic-era anthropogenic practices and the Holocene-age floodplain and channel deposits along the riparian corridors. In addition, it is likely that near-surface paleontological resources have been previously disturbed or destroyed by agriculture, irrigation practices, mining activities, or other development. Therefore, impacts on paleontological resources or sites or unique geologic features under LSJR Alternative 2 associated with the rivers would be less than significant.

### Adaptive Implementation

It is anticipated that adaptive implementation would not substantially change the less than significant determination for impacts on paleontological or geologic features. As discussed under Impact CUL-1, it is anticipated that over time the unimpaired flow requirement could increase or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions, under method 1. If method 2 is implemented, the total annual volume of water associated with LJSR Alternative 2 (i.e., 20 percent of the February–June unimpaired flow) would not change. As a result, the total volume of water that would remain in the river would not change with adaptive implementation method 2. Given that this method would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, impacts would be similar to those described under LSJR Alternative 2. Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and the LSJR because it rarely would cause a change in flow and the volume of water involved would be relatively small. Consequently the impact determination of LSJR Alternative 2 with adaptive implementation would be the same as described above under LSJR Alternative 2 without adaptive implementation, for paleontological or geologic features. Impacts would be less than significant.

## LSJR Alternative 3 (Less than significant/Less than significant with adaptive implementation)

### Reservoirs

Impacts for LSJR Alternative 3 would be the same as described above under LSJR Alternative 2 for New Don Pedro Reservoir and Lake McClure. At New Melones Reservoir, the highest reservoir elevations may decrease (Table 12-5) and the lowest reservoir elevations may increase (Table 12-6). This reduction in the range of elevations could reduce the potential to adversely affect the caves by natural processes such as erosion and weathering and/or could reduce access to the caves and the risk of vandalism or unauthorized collection of undocumented, newly eroded fossils. The documented caves would continue to be protected and managed under the Cave Management Plan, administered by USBR at New Melones Reservoir. Therefore, under LSJR Alternative 3, impacts on paleontological resources or sites or unique geologic features would be less than significant.

### Rivers

Impacts for LSJR Alternative 3 would be the same as described above under LSJR Alternative 2 for the three eastside tributaries and the LSJR. Therefore, impacts on paleontological resources or sites or unique geologic features would be less than significant.

### Adaptive Implementation

It is anticipated that adaptive implementation would not substantially change the less than significant determination for impacts on paleontological or geologic features. Adaptive implementation method 1 could affect the volume of water and level of flow in the LSJR and its tributaries. However, the frequency and duration of such a change is unknown. If the specified percent of unimpaired flow were changed from 40 percent to 30 percent or 40 percent to 50 percent on a long-term basis, the conditions and impacts could become more similar to LSJR Alternatives 2 or 4, respectively. It is anticipated that over time the unimpaired flow requirement could increase, decrease, or not change at all within a year or between years, depending on hydrology, and fish and wildlife conditions.

Under adaptive implementation methods 2 or 3, the overall volume of water from the February–June time frame or after June would be the same as LSJR Alternative 3 without adaptive implementation, but the volume within each month could vary. However, given that these two methods would not allow flows to go below what is required by existing requirements on the three eastside tributaries and the SJR, impacts would be similar to those described above under LSJR Alternative 3. Implementing method 4 is expected to have little effect on conditions in the three eastside tributaries and WSE model results indicate that method 4 would rarely alter the flows in the three eastside tributaries or the LSJR under this alternative. Consequently, the impact determination of LSJR Alternative 3 with adaptive implementation would be the same as described above under LSJR Alternative 3 without adaptive implementation, for paleontological or geologic features. Impacts would be less than significant.

### LSJR Alternative 4 (Less than significant/Less than significant with adaptive implementation)

Impacts for LSJR Alternative 4 would be the same as described above under LSJR Alternative 2 for New Don Pedro Reservoir and Lake McClure. Impacts would be the same as described above under LSJR Alternative 3 for New Melones Reservoir. Impacts would be the same as described above under LSJR Alternative 2 for the three eastside tributaries and the LSJR. Therefore, under LSJR Alternative 4 with and without adaptive implementation, impacts on paleontological resources or sites or unique geologic features would be less than significant.

## 12.4.4 Impacts and Mitigation Measures: Extended Plan Area

Cultural resources in the extended plan area could be affected by the bypassing of flow, as described in Chapter 5, *Surface Hydrology and Water Quality*. Bypassing flows could produce increased stream flows downstream of the reservoirs during the bypass period, or lower flows after the bypass period, and could produce lower reservoir levels. Effects on significant cultural resources could occur if existing significant cultural resource sites at these locations were exposed to increased erosion or other physical conditions resulting in deterioration. Additionally, sites exposed by lower reservoir levels could be vulnerable to discovery, disturbance, and artifact removal. However, both the river flow and reservoir level reductions would be similar to reductions under baseline conditions, although they could occur more frequency. Furthermore, because these reductions have occurred under baseline conditions, existing significant cultural resources have already been affected. Lastly, under the LSJR alternatives with or without adaptive implementation, erosion or exposure of existing significant cultural resources is not expected to be substantially different than under baseline conditions. Consequently, impacts on significant cultural resources under the LSJR alternatives with or without adaptive implementation would be less than significant in the extended plan area.

# 12.5 Cumulative Impacts

For the cumulative impact analysis, refer to Chapter 17, *Cumulative Impacts, Growth-Inducing Effects, and Irreversible Commitment of Resources.*

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