

## 2. Physical Resources

### 2.1 Overview

#### 2.1.1 Introduction

Physical resources including climate, topography, air resources, noise, geologic resources (excluding caves), caves, and hydrologic resources form the basis for the combination of resources found in New Melones Lake Area. This section describes these resources and gives an overview of the issues associated with them that Reclamation may address in the RMP/EIS, as well as strategies that Reclamation currently uses to manage those resources.

This section is organized into the following subsections:

- **Climate:** Climatic variables include precipitation and temperature. Precipitation influences management actions by affecting lake levels, and in turn, access to certain resources. Temperature is one of the main influences on season of use.
- **Topography:** Topography includes all features that contribute to diverse surface assemblage. Topographic features including steepness and aspect affect access to resources and influence such factors as location of vegetative communities and fire management.
- **Air Resources:** The air resources section focuses primarily on factors that influence air quality. Although management of the New Melones Lake Area has little effect on air quality in the overall region, localized effects may occur at particular times of the year, or in particular locations at the lake.
- **Noise:** Noise includes all sources of sound generated at or near the lake area which affect humans or visitors. Noise may be from natural sources, such as wind, or it may be generated by human sources, such as boats or cars.
- **Geologic Resources (excluding caves):** Geologic resources include subsurface features, soils, and rock formations. The geologic resources section describes these features and relates them to current management.
- **Caves:** The New Melones Lake area contains an extensive cave network. Although the caves are themselves a significant resource, many of them also contain sensitive cultural and biological resources.
- **Hydrologic Resources:** Hydrologic resources include groundwater, water quality, all streams that feed the lake, and the lake itself. Hydrologic resources are the basis for the existence of the lake, and management of all other resources relates to this feature.
- **Visual Resources:** Visual resources give the area many of its aesthetic qualities, and include topographical, aquatic, and biological features.

### **2.1.2 Specific Mandates and Authority**

Physical resources in the New Melones Lake Area are managed under several local, state, and Federal regulations, including the following:

**Air Quality:** The primary Federal law that regulates air quality is the Clean Air Act, which was last amended in 1990. The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment (EPA 2006). The six criteria pollutants established by this regulation are particulate matter (PM), carbon monoxide, nitrogen oxides, sulfur dioxide, ozone, and lead. Nitrogen oxides are composed primarily of nitric oxide and nitrogen dioxide. PM is regulated as PM10 and PM2.5.

Formal air quality management responsibilities rest primarily with the Calaveras County Air Pollution Control District (APCD), the Tuolumne County APCD, California Air Resources Board (CARB), and EPA. CARB and EPA have primary responsibility for setting emission standards for motor vehicles and off-highway equipment (such as construction equipment and watercraft). The county APCDs have primary responsibility for regulating non-transportation sources of air pollution.

**Noise:** 43 Code of Federal Regulations (CFR) 423.39 puts forth standards on vessels on Reclamation waters, including requirements for safety equipment, effective exhaust mufflers, and maintenance of vessels.

**Geological Resources:** The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults.

**Caves:** The Federal Cave Resources Protection Act of 1988 (16 US Code [USC] 4301 – 4309) requires inventory of significant caves on Federal lands, implementation of management measures, and provides certain protections of cave resources. It requires that significant caves are considered in the preparation of resource management plans and that the public be invited to participate in planning. It provides for the issuance of permits for collection or removal of cave resources and identifies criminal and civil penalties for prohibited acts.

The California Cave Protection Act (Section 594-625c of the California Penal Code) makes it a misdemeanor to perform certain acts that damage cave features or resources.

#### **Water Resources:**

##### ***Federal Laws and Statutes***

- **The Clean Water Act of 1987, as amended (33 USC 1251)**, establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water;
- **The Federal Water Pollution Control Act (33 USC 1323)** requires the Federal land manager to comply with all Federal, state, and local requirements, administrative authority,

processes, and sanctions regarding the control and abatement of water pollution in the same manner and to the same extent as any nongovernmental entity;

- **The Safe Drinking Water Act (42 USC 201)** is designed to make the nation's waters drinkable and swimmable. Amendments in 1996 establish a direct connection between safe drinking water and watershed protection and management;
- **The Flood Control Act of 1944 (16 USC 460(d) et seq.; 33 USC 701 et seq.)** authorizes the US Army Corps of Engineers (USACE) to construct, maintain and operate public park and recreational facilities at water resources development projects. While planning such projects, the USACE is required by this act to consult with the Secretary of the Interior on certain projects, and reports for such projects were to contain the opinions of governors of affected states as well as the Secretary of the Interior.
- **The Appropriations Act of 1952, McCarran Amendment**, allows the US to be joined as a defendant in any suit for the general adjudication of water rights;
- **The Watershed Protection and Flood Control Act of 1954**, as amended, directs the Federal government to cooperate with states and their political subdivisions, soil or water conservation districts, flood prevention or control districts, and other local public agencies to prevent erosion or flood water and sediment damage;
- **The Water Resources Research Act of 1954**, as amended, permits the Secretary of the Interior to give grants to, and cooperate with, Federal, state, and local agencies to undertake research into any water problems related to the mission of the department;
- **The Water Resources Planning Act of 1965**, as amended, establishes the Water Resources Council, which is directed to maintain studies of water supplies and water programs. The chairman of any river basin commission can request from an agency, and that agency is authorized to furnish, such information as is necessary to carry out its functions;
- **The Water Resources Development Act of 1974** directs agencies to consider the full range of potentially useful measures in all projects involving reduction of flood losses;
- **Executive Order 11288** requires heads of agencies to provide leadership in the field of water quality management and requires Federal facilities to develop pollution abatement plans;
- **Executive Order 11507** directs the Federal government in the design, operation, and maintenance of its facilities to provide leadership in the nationwide effort to protect and enhance the quality of air and water resources. It provides for action necessary to correct air and water pollution at existing facilities to be completed or underway by December 31, 1972, and requires surveillance to ensure that water quality standards are met;
- **Executive Order 11514, as amended by Executive Order 11991**, directs Federal agencies to provide leadership in protecting and enhancing the quality of the nation's environment to

sustain and enrich human life. It provides for continued monitoring, evaluation, and control of the activities of each Federal agency, as well as development of programs and measures to protect and enhance environmental quality and to exchange data and research results and cooperate with other agencies to accomplish the goals of NEPA;

- **Executive Order 11738** directs each Federal agency to enforce the Clean Air Act and the Clean Water Act in the procurement of goods, materials, and services;
- **Executive Order 11752** mandates that Federal agencies provide national leadership to protect and enhance the quality of air, water, and land resources by complying with applicable Federal, state, interstate, and local pollution standards. This order mentions the Clean Air Act, Federal Water Pollution Control Act, Solid Waste Act, Noise Control Act, insecticide and pesticide acts, and NEPA;
- **President's Letter of May 26, 1974**, creates the Interagency Committee on Water Resources and establishes interagency participation in river basin planning. The Federal agencies concerned executed a memorandum of agreement that assigns interagency cooperation to coordinate water and related land resource activities;
- **Executive Order 11988, Floodplain Management, as amended by EO 12148**, directs each Federal agency to take action to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Agencies are further required to avoid direct or indirect support of floodplain development whenever there is a practicable alternative;
- **Executive Order 11990, Protection of Wetlands**, directs Federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial value of wetlands in carrying out programs affecting land use;
- **Executive Order 12088, Federal Compliance with Pollution Control Standards**, requires all Federal agencies to comply with local standards and limitations relating to water quality. As a wastewater management agency, each Federal agency is bound to recognize and adopt the policies, goals, and standards of approved Section 208 area-wide water quality management plans in regard to those Federal lands under its jurisdiction. Each agency also must implement plan standards to the maximum extent feasible in its own planning process and management activities;
- **Executive Order 12322** requires that any report, proposal, or plan relating to a Federal or Federally assisted water and related land resources project or program must be submitted to the Director, Office of Management and Budget, before submission to Congress;
- **Reclamation Manual Policy CMP P01: Floodplain Management-** To (1) reduce the vulnerability of the nation to loss of life and property and the disruption of societal and economic pursuits caused by flooding or facility operations; and (2) sustain, restore, or enhance the natural resources, ecosystems, and other functions of the floodplain; and

- **Reclamation Manual Standard/Directive CMP 01-01: Floodplain Management**  
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### **2.1.3 Other Plans That Will Be Considered**

***Calaveras County General Plan.*** The Calaveras County General Plan contains at least two elements that pertain to management of resources at New Melones. The Noise Element identifies the dominant noise sources in the county as highway traffic, flight operations at the county airport (Tuolumne County 2003a), and various industrial operations. The Open Space Element addresses areas of outstanding scenic value (Calaveras County 1996b). The Open Space Element states there are significant topographic variations and several resources which contribute to scenic quality. The primary attributes include the lakes, rivers and streams, rolling hills with oak habitat, ridgelines, and the forests.

***Tuolumne County General Plan.*** At least two elements of the Tuolumne County General Plan pertain to management of resources at New Melones. The goal of the Tuolumne County General Plan Conservation and Open Space Element is to conserve the scenic environment and rural character of the county (Tuolumne County 1996b). The policies for preserving scenic resources address the history of agricultural and timberlands, the natural scenic quality and rural character along designated transportation routes, conserving the natural scenic quality of hillsides and hilltops, and voluntary efforts to protect clusters of native trees and conserve the county's scenic resources.

The noise element of the Tuolumne County general plan sets general outdoor noise level land use compatibility standards in terms of the 24-hour weighted community noise exposure level (CNEL) (Tuolumne County 1996d). The CNEL standard for noise-sensitive land uses (residential, transient lodging, and health care) is 60 dBA.

***Tuolumne County Airport Land Use Compatibility Plan.*** The Tuolumne County Airport Land Use Compatibility Plan establishes land use restrictions in the immediate vicinity of the Columbia Airport and Pine Mountain Lake Airport. Most affected lands are outside the area of Reclamation jurisdiction, but flight paths from Columbia Airport pass directly over New Melones Lake. The FAA has contacted Reclamation with concerns such as low hanging utility lines and recreation activities such as paragliding impacting flight paths.

***US Forest Service (USFS) Stanislaus National Forest Plan.*** Lands in the upper watershed are managed primarily by USFS as part of the Stanislaus National Forest. Several aspects of this plan pertain to management of physical resources at New Melones. Water quality management is described in the Stanislaus National Forest Plan Update (USFS 2005) and includes nearly 100 Best Management Practices (BMPs) designed to minimize water quality impacts throughout the portions of the watersheds that it manages. Although Reclamation has not formally adopted these BMPs, many are standard land use and land management practices that are used widely by Reclamation and other agencies.

The Forest Plan Direction for the Stanislaus National Forest identifies proposed Wild and Scenic Rivers (USFS 2005). Proposed Wild and Scenic Rivers, along with immediate environments, will be managed to preserve their free flowing condition and protect their outstandingly remarkable values. Opportunities for public recreation and other resource uses are based on the classification of each identified river segment. For the Stanislaus River, there is a 1.5 mile eligible segment from the North/Middle Fork confluence to Clark Flat. It also includes all lands within one quarter mile of the segment. The river is located near the western boundary of the forest. Wild classification is recommended for this proposed Wild and Scenic River.

Clark Flat is at the farthest northern boundary of the upper reach of the lake and straddles Reclamation and USFS jurisdictional boundaries (Reclamation 1995). If designated as part of a Wild and Scenic river area, Clark Flat would be afforded a high level of protection by law, thereby allowing for the retention of the area's present scenic qualities. The area's scenic values include a broad, deep and rugged, V-shaped, river-cut canyon through granitics with some meta-sedimentary rocks exposed, a variety of water forms including rapids, cascades and pools, and vegetation patterns that include scattered ponderosa pine and oak woodland.

The Land and Natural Resources Management Plan also calls for retention and partial retention of the scenic values on portions of the South Fork of the Stanislaus River that abut Reclamation's jurisdictional boundary (Reclamation 1995). The area south of the river channel is designated for retention and the area immediately to the north is classified for partial retention. This location has not been proposed for inclusion in the Wild and Scenic River system.

### ***Bureau of Land Management***

Lands in lower watersheds draining to New Melones Lake are managed primarily by the Bureau of Land Management (BLM) and Reclamation. As the BLM is currently revising the RMP for lands that they manage in proximity to New Melones, an opportunity exists to coordinate management of watersheds and other hydrological features. One such area is the Red Hills AOCC, which is an area with extensive serpentine outcroppings that have been severely affected by inappropriate use of off road vehicle (ORVs). Management of this area and adjacent areas offers an opportunity for collaborative management of ORVs and serpentine soils between Reclamation and BLM.

### ***California Department of Transportation***

A highway may be designated scenic depending upon how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent of development. The California Department of Transportation (Caltrans) has designated SR 49, which crosses New Melones Lake at the Stevenot Stanislaus River Bridge, as eligible for state scenic highway status (Caltrans 2006).

## 2.1.4 Trends

### ***Climate***

**Global warming.** New Melones Lake resource managers manage natural, cultural, and recreational resources in response to changes in water operations. Reclamation's water operation is determined by the complicated obligations of the Central Valley Project and the system-wide management of California's water infrastructure. Although there is little consensus on predicted effects of global warming on local climate, the trend will likely be for more precipitation to fall as rain and less as snow. Such an effect would require changes in water resource management on the part of Reclamation, as a greater percentage of water would enter New Melones Lake in the winter and early spring and less would enter the lake in the late spring and summer. Ultimately, this effect could significantly alter recreational opportunities at the lake if water levels during the summer were so low as to diminish the value of the lake as a recreational resource.

### ***Topography***

No trends have been identified for topography in the New Melones Lake Area.

### ***Air Resources***

Air pollutant emission sources associated with New Melones Lake Area include car and truck traffic, boat and personal watercraft engine emissions, and generators, camp stoves, and campfires at campground facilities. Localized air quality can be lowered at boat ramps where cars, boats, and personal watercraft may idle while launching. Wildfires and prescribed burns occurring on lands surrounding New Melones Lake Area, as well as seaplanes, are an additional but infrequent source of air pollutant emissions. Facility construction activities would be an additional temporary and localized source of fugitive dust and vehicle emissions.

Ozone monitoring data from Sonora and San Andreas (CARB 2007) show that the state and Federal ozone standards typically are exceeded several times each year, with considerable year-to-year variation. Ozone monitoring data from Sonora and San Andreas show no clear trend in either the frequency of violations or the maximum measured ozone levels. PM10 monitoring data from San Andreas in Calaveras County (CARB 2007) do not show any clear trends in annual average PM10 levels.

### ***Noise***

No information is available on trends in noise levels, but overall noise levels in the New Melones Lake Area are correlated with the intensity of visitor use.

### ***Geologic Resources***

**Geologic Formations.** The steep cliffs formed on the Table Mountain latite are increasingly a destination for visitors, including hikers and climbers.

**Mineral Resources.** There has been a decreasing trend in mineral development in the region, including decreased gold exploration and extraction, fewer limestone and marble quarries, and discontinuation of asbestos mining. Gold mining activity is sensitive to price and could increase in the future, but the costs of extraction, including environmental compliance, are high enough to

act as a strong impediment to new mineral extraction. Continuing and possibly increasing demand for building materials may lead to increased production from the remaining major active limestone quarry in the project area, but the current negligible level of other mineral extraction activity within the study area is not expected to change.

**Soils.** Since the 1976 Master Plan, overgrazing, overuse of underdesigned roads, and uncontrolled use of fragile lands in the Peoria Wildlife Management Area, including adjacent private lands, have resulted in loss of vegetation and in compaction and erosion of soils in that area (Reclamation 2007c). However, Shell-Peoria Road, which is within the Peoria Wildlife Management Area, has been closed for several years and there are currently no grazing leases at New Melones Lake, so this trend is decreasing. Similar, and potentially worse, impacts on soils are occurring at Bear Creek and French Flat, caused by illegal OHV use and grazing, as well as vandalism, shooting, and other unauthorized activities. Additional impacts may have occurred within the rest of the adjacent Peoria Wildlife Area, though the effects have been less concentrated.

**Caves.** In the study area, a significant number of caves have been lost in the Stanislaus River Canyon due to inundation by New Melones Lake. As evidenced by notations in caver's websites that emphasize caves as fragile resources to be protected and studied, interest in cave formation, protection, and ecology has grown (Columbia Grotto 2007).

### **Hydrology**

**Water Quality.** A 1987 agreement between Reclamation and California Fish and Game requires water releases ranging between 98,300 and 302,100 acre-feet per year in order to maintain instream flows to benefit fish resources and habitat. The 98,300 acre-feet may be considered a firm supply (water that must be released each year), while the maximum amount of 302,100 acre-feet is only released during the wettest years. Ongoing efforts to restore historic fish populations to the Stanislaus and San Joaquin Rivers will likely require additional water releases for instream use in the coming years, although there is much scientific debate over how much water is actually necessary and the timing of when that water is needed to restore native fish populations and ensure their survival. Changing regulatory requirements and the development of TMDLs for the Stanislaus River will also likely impact how water is allocated from the lake.

Features managed by New Melones resources staff that may influence water quality include watershed health, soil disturbance and erosion, amount of impervious surface, condition of utilities such as wastewater and sewage management, concession and boat repair operations, weed management, fire management, management of recreation areas, and illegal dumping:

- **Watershed health.** Most watershed lands located on Reclamation lands are part of larger watersheds, meaning that Reclamation shares management of the watersheds with other agencies. Shared features of watershed management include amount of development, management of riparian zones, use of chemical herbicides, pesticides, or fire retardants, and erosion and runoff control.
- **Soil conditions and erosion.** Soils are disturbed in certain areas by illegal vehicle use, livestock trespass, and construction of facilities and may contribute to increased turbidity and

sedimentation. Shoreline erosion caused by wakes from boats is also a contributor to soil erosion. Reclamation manages soil disturbance on construction projects through proactive use of Best Management Practices and complies with local, state, and Federal requirements for soil management. Soil disturbances due to illegal vehicle use or trespassing livestock often require a reactive response such as road closures, restoration of disturbed areas, or fence repair.

- **Impervious surfaces.** Impervious surfaces are found on paved roads, around maintenance and administration facilities, and at boat ramps and camping areas. Impervious surfaces reduce percolation and may alter drainage patterns by concentrating runoff into drainages, increasing runoff velocity, and contributing to formation of erosion gullies.
- **Utilities.** Utilities include wastewater and sewage management facilities. Facilities must be maintained to contain all wastewater and sewage and must be periodically upgraded to comply with increased lake use and new regulatory requirements.
- **Concessions and boat repair.** Concessionaires are required to comply with water quality standards as part of the concessions agreement. This includes measures to minimize the risk of release of sewage, petroleum products, or hazardous materials through operations or maintenance of facilities. Boat repairs may only be performed by a concessionaire at Glory Hole Recreation Area; lake visitors are not allowed to work on their own boats at the lake. However, concessionaires may pay a contractor to conduct boat repairs.
- **2-Stroke Motors.** Some lakes have banned the use of watercraft powered by 2-stroke motors, due to high concentrations of burned and unburned gasoline products left in their wake. One such lake is Lake Tahoe, which banned 2-stroke motors in 1999 ([www.newrules.com](http://www.newrules.com)).
- **Weed management.** Weeds may be managed by mechanical or chemical means. Mechanical means may lead to soil disturbance that can affect water quality. Use of herbicides may lead to contaminated runoff. Increased regulation of use of herbicides in or near aquatic areas has led to the development of new herbicides that pose less risk of water contamination and bio-uptake amongst aquatic organisms.
- **Fire management.** Fire management practices such as suppressing wildfire by chemical means and constructing fire breaks may compromise water quality. Reclamation recognizes such issues in their fire management plan. Potential effects of these practices may be minimized by use of carefully planned prescribed burns.
- **Management of recreation areas.** Recreation areas must be managed for capacity limits to prevent overuse, pollution, and soil compaction leading to increased runoff.
- **Illegal and accidental dumping.** Illegal dumping of household wastes occurs frequently on or around Reclamation lands. Household wastes may contain toxic chemicals that can compromise water quality. Fuel or lubricants may be spilled accidentally by boaters or campers while refueling boats or camp stoves. Other potential sources of pollution include dumping of sewage, petroleum products, or other chemicals.
- **Global warming.** New Melones Lake resource managers manage natural, cultural, and recreational resources in response to changes in water operations. Reclamation's water

operation is determined by the complicated obligations of the Central Valley Project and the system-wide management of California's water infrastructure. Although there is little consensus on predicted local effects of global warming on water resources, the trend will likely be for more precipitation to fall as rain and less as snow. Such an effect would require changes in water resource management on the part of Reclamation, as a greater percentage of water would enter the lake in the winter and early spring and less would enter the lake in the late spring and summer. Ultimately, this effect could significantly alter recreational opportunities at the lake if water levels during the summer were so low as to diminish the value of the lake as a recreational resource.

### ***Aesthetic, Visual, and Scenic Resources***

New residences and roads on the east side of the lake on private land are being constructed, resulting in the loss of the natural landscape and a greater visibility of human-made structures from Reclamation land.

During peak use times such as summer weekends and holidays, the large numbers of vehicles, boats and people present in the Tuttle town and Glory Hole Recreation Areas, and the large numbers of boats on the lake, have a significant influence on the visual character of the New Melones Lake basin (Reclamation 1995). Because the demand for recreation opportunities at Tuttle town and Glory Hole Recreation Areas is expected to increase, the effects from recreation on visual resources is expected to increase. Furthermore, the smaller recreation areas are expected to experience greater use as demand for recreation opportunities at Tuttle town and Glory Hole Recreation Areas increases. Increased recreation can result in greater refuse and debris on land and in the lake, use of previously undisturbed areas, and greater opportunities for unauthorized activities that could harm the visual environment, such as illegal campfires.

## **2.2 Climate**

### **2.2.1 Current Conditions**

The foothills in which New Melones Lake is located are part of the Sierra bioregion, which includes the entire Sierra Nevada mountain range, extending approximately 380 miles along California's eastern side. Climate at the lake is Mediterranean, meaning that it has wet winters and dry summers. The location of the lake between the higher elevations of the Sierra and the low-lying floor of California's Central Valley means that temperatures are moderate and between those found at these two extremes. Because of this transitional location, climatic features such as temperature and precipitation fluctuate widely throughout the year. This fluctuation in turn leads to profound yet predictable seasonal variations in the conditions of various resources, including water temperatures and levels, vegetative vigor, and wildlife residency.

Localized fluctuations in temperature and precipitation within the project area result from aspect and elevation. These fluctuations are apparent as differences in vegetation patterns, soil formation and stability, and moisture retention. Although these localized variations in resource

conditions may affect planning on a project level, climatic resource conditions reported for the RMP/EIS are reported on a regional level.

Climate data shown in Table R-1 reflect average high and low temperatures and average precipitation from 1992 to 2006. During this time, the maximum recorded temperature at New Melones Dam was 110 degrees F, while the lowest temperature was 24 degrees F. Extended periods of temperatures at or below freezing are uncommon. Mean annual rainfall at the dam during this period was about 33 inches (Western Regional Climate Center [WRCC] 2006).

More annual precipitation is expected in some of the higher watersheds that ultimately contribute to New Melones Lake. Most precipitation in the immediate vicinity of the lake falls as rain, with a very small amount falling as snow, and occurs primarily between November and April (WRCC 2006). Although the dry season at New Melones is long, hot, and dry, lake levels are maintained during this time by melting snowpack. Other climatic variables such as global warming, drought, or long-term regional changes in precipitation may affect resources over the next 15 to 20 years.

**Table R-1: New Melones Dam, California (046174), Period of Record Monthly Climate Summary**

Period of Record: 3/1/1992 to 10/31/2006													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	56.2	59.3	64.8	69.2	79.3	88.1	96.5	95.8	90.1	79.2	64.6	56.6	75.0
Average Min. Temperature (F)	38.4	40.1	43.6	45.2	52.5	58.2	65.0	63.8	59.4	51.9	43.3	38.1	50.0
Average Total Precipitation (in.)	7.67	5.35	4.18	2.75	1.82	0.48	0.05	0.07	0.23	1.33	2.86	5.71	32.50

Source: WRCC 2006

### 2.2.2 Resource Management

Management of climatic variables is beyond the scope of an RMP/EIS and beyond Reclamation’s mission. However, global climate change could affect management decisions. It has been predicted that climate change will lead to more precipitation falling as rain and smaller snowpack in the Sierra Nevada. This would lead to an altered hydrological regime, where the lake would receive a larger proportion of runoff in the winter and spring and less in the critical summer months. Global climate change could also lead to altered vegetation patterns and a longer fire season.

Although Reclamation does not manage climate, it does manage in response to seasonal climatic variables. Actions include adjusting releases from the dam in response to greater or less precipitation or in anticipation of spring and summer snowmelt. This response is carried out by the Reclamation operations manager, not by Reclamation resource managers, and will not be planned for in the RMP/EIS.

## 2.3 Topography

### 2.3.1 Current Conditions

Topographical features of the New Melones planning area include steep, rolling hills, incised river canyons, and distinct cliff and plateau features formed by unique geological processes. This variety of features contributes to a dramatic visual setting and provides for a wide variety of recreational opportunities and habitat types. The lake itself is situated primarily along the historic canyon of the Stanislaus River, which was first flooded upon completion and closure of Melones Dam and later by the much larger New Melones Dam. The orientation of the main stem of the Stanislaus River follows a general heading from northeast to southwest, with the canyons of several tributaries joining at different angles. The main body of the lake, stretching between Table Mountain in the south and Angels Arm in the north, follows a northwest-to-southeast bearing. The various ridges appear as islands as the lake is drawn down over the dry season or during a period of below-average precipitation.

Figure R-3 shows the physical details of the planning area as well as the major topographical features. The main stem of the Stanislaus River between the Clark Flat and Mark Twain planning units is dominated by very steep canyon walls that make much of the lakeshore inaccessible except by boat. The original streambed of the Stanislaus River is evident upstream of Clark Flat, which is above the flooded zone. The northeast side of the main body of the lake, which includes the Tutletown, Carson, and Glory Hole planning units as well as lake headquarters, has more gently rolling and accessible terrain. The south end of the main body of the lake is dominated by Table Mountain, which is within the Table Mountain planning unit and exhibits dramatic topographical relief provided by fluted cliffs and a flat top. Sheer cliff faces of up to 300 vertical feet are found on the north side of Table Mountain, which is composed of more erosion-resistant bedrock than the surrounding area and thus was exposed as fluvial processes eroded softer materials around it. The mesa top slopes very gently downwards to the west and ranges between 1,500 and 1,800 feet. Both the cliffs and the flat top provide unique opportunities for recreation, as the cliffs offer climbing and bird-watching opportunities and the mesa top offers scenic views.

The topography of the top of Table Mountain, being very flat and exposed to few eroding features such as rockfalls or streams, creates conditions conducive to vernal pool formation. Such pools form where rainwater is trapped in impervious pools and dissipates solely as a result of evaporation, allowing for concentric rings of vegetation to establish. Plant and animal species that colonize vernal pools are often rare and endemic only to vernal pools.



In the Peoria Wildlife Area planning unit, 1,832-foot Peoria Mountain dominates the southwest end of the main body of the lake, and compared to terrain in the north fork arm, is marked by rolling topography and gentler ridgelines. This terrain and a north-facing aspect have allowed moderately deep to deep soils to develop, which in turn supports a healthy and productive oak savannah habitat type. Peoria Mountain peaks on the south side of the dam and plunges steeply into Iron Canyon that contains New Melones Dam. On the north side of the dam, Bostick Mountain rises steeply to an elevation of 1,814 feet, then gradually slopes down to Bowman Gulch, which spills into Bean Gulch before it enters Lake Tulloch. North of the spillway, Barth Mountain rises to an elevation of 1,916 feet. Gently sloping terrain is found at the eastern foot of Bear and Barth Mountains in the Texas Charley planning unit and on the other side of the Angel Creek Arm in the vicinity of Glory Hole. Peoria, Bostick, Barth, and Bear Mountains form a major ridgeline on the west side of the main body of the lake. This ridgeline drops at a fairly steep angle into the lake, making development on this side of the lake difficult due to lack of access and staging areas.

### **2.3.2 Resource Management**

Reclamation manages in response to topographic variables. This includes compliance with standards for siting facilities and sensitivity to the effects of recreational activities, trail construction, or road construction on features that may be prone to slides or slumping. There are no specific management actions codified for this resource.

## **2.4 Air Resources**

### **2.4.1 Current Conditions**

New Melones Lake Area's location in Calaveras and Tuolumne Counties places it in the Mountain Counties Air Basin in the central Sierra Nevada foothills. Air quality problems in the Mountain Counties Air Basin include periodic high levels of ozone and suspended particulate matter. Other air pollutants generally do not occur in concentrations high enough to constitute a problem.

Air quality management programs in California are the responsibility of local air pollution control districts (APCDs), the California Air Resources Board (CARB), and the US Environmental Protection Agency (EPA). The local air pollution control districts for the New Melones Lake area are the Calaveras County APCD and the Tuolumne County APCD.

Federal and state air quality management programs have evolved using a combination of two different approaches:

- The state implementation plan (SIP) process of setting ambient air quality standards for acceptable exposure to air pollutants, conducting monitoring programs to identify locations experiencing air quality problems, and then developing programs and regulations designed to reduce or eliminate those problems; and

- The hazardous air pollutant process of identifying specific chemical substances that are potentially hazardous to human health and then setting emission standards to regulate the amount of those substances that can be released by individual commercial or industrial facilities or by specific types of equipment.

Both the EPA and CARB have adopted ambient air quality standards for various pollutants. Federal ambient air quality standards have been adopted for ozone, suspended particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. State ambient air quality standards have been adopted for these same pollutants plus sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles. Federal and state ambient air quality standards for suspended particulate matter have been established for two different size ranges of suspended particles: inhalable particles (designated as particulate matter less than 10 microns in equivalent aerodynamic diameter [PM10]), and fine particles (designated as particulate matter less than 2.5 microns in equivalent aerodynamic diameter [PM2.5]).

Ambient air quality in Tuolumne County is monitored in Sonora, where ozone, PM10, PM2.5, and carbon monoxide are monitored. Ambient air quality in Calaveras County is monitored in San Andreas, where ozone and carbon monoxide are monitored. There is no monitoring of PM10 or PM2.5 in Tuolumne County. Ozone monitoring data from Sonora and San Andreas show that the state and Federal ozone standards typically are exceeded several times each year (CARB 2007).

High ozone levels in Calaveras and Tuolumne Counties are due almost entirely to pollutant transport from the Central Valley and the San Francisco Bay Area (California Air Resources Board 2001b). Air quality management programs for Calaveras and Tuolumne Counties rely primarily on emission control programs in upwind source areas to provide for eventual attainment of state and Federal ozone air quality standards.

Most hazardous air pollutant regulations relate to specific industrial sources and operations. However, California has identified naturally occurring asbestos as a toxic air contaminant. Naturally occurring asbestos is found in serpentine rock and in some types of ultramafic rocks (most often in zones associated with faults). CARB has adopted regulations for limiting the amount of naturally occurring asbestos in aggregate material that is used for surfacing applications, including but not limited to roads, road shoulders, parking areas, trails, or playgrounds (CARB 2000). CARB also has adopted separate regulations for construction, grading, quarrying, and surface mining operations that disturb areas of serpentine, ultramafic rock units, or other areas found to have naturally occurring asbestos (CARB 2001a). The local APCDs enforce these regulations.

Air pollutant emission sources associated with New Melones Lake Area include car and truck traffic, boat and personal watercraft engine emissions, and generators, camp stoves, and campfires at campground facilities. Localized air quality can be lowered at boat ramps where cars, boats, and personal watercraft may idle while launching. Wildfires and prescribed burns occurring on lands surrounding New Melones Lake Area, as well as seaplanes, are an additional but infrequent source of air pollutant emissions. Facility construction activities would be an additional temporary and localized source of fugitive dust and vehicle emissions.

Ozone monitoring data from Sonora and San Andreas (CARB 2007) show that the state and Federal ozone standards typically are exceeded several times each year, with considerable year-to-year variation. Ozone monitoring data from Sonora and San Andreas show no clear trend in either the frequency of violations or the maximum measured ozone levels. PM10 monitoring data from San Andreas in Calaveras County (CARB 2007) do not show any clear trends in annual average PM10 levels.

## 2.4.2 Resource Management

Reclamation manages air resources to stay within requirements set by local and state air quality management agencies. Current management actions to maintain air quality are listed in Table R-2 below:

**Table R-2: Current Decisions and Internal Guidance for Air Quality**

Internal Guidance	Guidance or Reference Source
Comply with applicable asbestos regulations regarding friable asbestos.	Calaveras and Tuolumne county ordinance, Clean Air Act, OSHA
Comply with smoke production limitations during period of poor air quality, i.e. restrict sanctioned visitor fires and Reclamation use of fire during designated 'Burn Days'.	Calaveras County APCD, Tuolumne County APCD, and California Air Quality Control Board

## 2.5 Noise

### 2.5.1 Current Conditions

In general, background noise levels vary with wind conditions and relative location (on the lake, along the shoreline, or in inland areas away from the lake shore). Typical background noise levels are expected to vary from 35 dBA to 50 dBA, depending on wind conditions. Aircraft overflights represent an intermittent contributor to overall background noise levels. Noise levels are often somewhat higher in proximity to identifiable noise sources such as highway traffic, occupied campgrounds, and areas of the lake with boat and personal watercraft use.

Intermittent but intense noise sources may occur as a result of floatplane landings and takeoffs, model aircraft flying, and construction or maintenance activities at various facilities (Reclamation 2006a) or detonations of explosives at the nearby Carson Hill Mine, as well as Blue Mountain Minerals Mine in River Canyon. Hunting represents a seasonal, localized, and intermittent source of noise in areas away from campgrounds and other heavily used visitor facilities. Unauthorized off-road vehicle use represents another intermittent noise source affecting some portions of the New Melones Lake Area.

The highest overall noise levels are expected to be in the vicinity of campgrounds, the marina, boat launching facilities, and occupied day use areas. In general, noise conditions in the New Melones Lake Area would not be expected to interfere with recreational activities and experiences. However, a visitor survey conducted in 1993 during the Independence Day holiday reported some visitor complaints about excessive nighttime noise in campgrounds and high noise levels from boats. Boats and jet skis with underwater engine exhaust generally produce noise levels of 75 – 85 dBA at a distance of 50 feet during full-throttle operation (Lanpheer 2000).

## 2.5.2 Resource Management

If needed, Reclamation can request enforcement of noise policies on their lands, however some noise sources, including those from intermittent detonations at a nearby mine, are beyond their reach. Rangers can request that campers and boaters minimize noise, but lack of enforcement authority for such requests. Current decisions for noise management are listed in Table R-3 below. Table R-4 provides a summary of State boating standards set by law.

**Table R-3: Current Decisions and Internal Guidance for Noise**

Decision	Source
Monitor and seek voluntary compliance with boat noise regulations.	43 CFR 423, CA boating law
Monitor and seek voluntary compliance with visitor noise regulations.	43 CFR 423

**Table R-4: Summary of State Boating Law Noise Standards**

Year or Engine Manufacture	Full Throttle Pass-by Test Procedure	Engine Idle Test Procedure	Shoreline Pass-by Test Procedure
1993 or later	82 dBA at 50 feet	88 dBA at 1 meter	75 dBA at shoreline
1978 – 1992	82 dBA at 50 feet	90 dBA at 1 meter	75 dBA at shoreline
1976 or 1977	84 dBA at 50 feet	90 dBA at 1 meter	75 dBA at shoreline
1974 or 1975	86 dBA at 50 feet	90 dBA at 1 meter	75 dBA at shoreline
Prior to 1975	Not subject to this test	90 dBA at 1 meter	75 dBA at shoreline

Notes: State law provides exemptions for various racing and speed trial events conducted under proper permits.  
Source: California Harbors and Navigation Code, Sections 654.05 and 654.06.

## 2.6 Geologic Resources

### 2.6.1 Current Conditions

**Overall Geology.** The Geological Resources section has been organized into the following subsections:

- **Geologic Formations:** Discussion of geological formations focuses on subterranean features that shape the topography of the lake and its surroundings.
- **Seismicity:** The seismicity discussion focuses on faults found in the area.

- **Mineral Resources:** This section focuses primarily on minerals that have been mined commercially in the area or for which there may be specific management actions in the RMP/EIS.
- **Soils:** The soils section discusses soil types found in the area as well as the geologic features that produce them.
- **Caves:** This section discusses the numerous caves that are found in the limestone formations in the northern part of the lake.

**Geological Formations.** The interpretation of the geology of the foothills of the Sierra Nevada is difficult, since understanding of the geology has undergone many changes and refinements. A narrative discussion of the major geologic features has been included in this section to highlight the formations and stratigraphic units particularly influential to the New Melones Lake Area.

One of the noteworthy features of the study area that is apparent in Figure R-4 is a general tendency of the mapped units and of lines representing structural features to have a northwest trend. In fact, it is clear that the main body of New Melones Lake is similarly oriented. This northwest-trend is produced by the Foothills Metamorphic Belt (FMB), which extends about 150 miles from the Modoc Plateau in the north to about the latitude of Merced in the south. In the study area, the FMB is bounded on the east by the Calaveras Formation (also referred to as the Calaveras Complex) and on the west by sedimentary rocks of the Great Valley sequence. The two most prominent structural features within the FMB are the Melones Fault Zone and the Bear Mountain Fault Zone.

The Sierra Nevada mountain range is the result of relatively recent uplift of the range by faulting. The block containing the Sierra Nevada Batholith was pushed up to the east and tilted down to the west. As this happened, the rocks into which the batholith had intruded eroded away, exposing the younger and more resistant granitic rocks of the batholith. However, small remnants of the original continental rocks were preserved, including bodies of limestone that belong to the Calaveras Formation.

The uplift of the Sierra Nevada was preceded and accompanied by volcanic activity that resulted in significant deposits of volcanic material, some of which have been given formation names. Among the most prominent of these within the study area is the Table Mountain Latite.

Table Mountain is the east of an ancient river valley. During the early to middle Miocene, large volumes of andesitic lava erupted from volcanoes east of the study area in what is now the Carson Pass area. Large quantities of andesitic mud and debris washed down the existing stream channels. Subsequent eruptions of latite lava followed and filled these ancient stream channels, forcing the rivers to find other routes. The river channels buried under these volcanic deposits contained placer gold deposits. The lava buried and preserved both the placer gold deposits and the Mehrten Formation deposits. Eventually, the surrounding land surface eroded, leaving behind flat-topped ribbons of the resistant latite lava.





**Seismicity.** The two major faults within the dam foundation are the IF-83 Fault and the Powerhouse Fault. The Powerhouse Fault passes through the Powerhouse foundation, across the canyon floor downstream of the toe of the dam, and curves toward the east crossing the left abutment of the dam at an elevation of about 940 feet. The IF-83 Fault strikes N 75 degrees W and dips 65 degrees S. It passes through the foundation of the sloping intake structure, under the extreme upstream toe of the dam, and continues up the left abutment where it intersects the Powerhouse Fault. Two smaller faults occur within the foundation, one located high on the right abutment and the other on the lower left abutment (Reclamation 2006).

Faults found in the vicinity of the New Melones Lake Area are not considered active, and the lake area's situation atop shallow bedrock would minimize shaking in the result of an earthquake. Reclamation will construct any new facilities in compliance with the California Building Code, which requires measures to minimize building failure in the event of an earthquake. Reclamation must also comply with the Alquist-Priolo Earthquake Zone Act, although this act would not restrict building since there are no Alquist-Priolo faults in the project area.

**Mineral Resources.** The following mineral resources are found within the project area:

*Gold.* Gold occurs in lode deposits and placer deposits within the study area. The study area overlies the Carson Hill Gold District and the Jamestown Gold District. The Carson Hill District (also known as the Melones District) includes the portion of the Mother Lode Belt that extends from Carson Flat to the town of Melones on the Stanislaus River. (The town of Melones was abandoned when New Melones Lake was filled). The Jamestown District extends south to the town of Stent. Milling ore of the Carson Hill District was usually low in grade, but the ore bodies were extensive (Oakland Museum of California 1998).

The Carson Hill (Melones) Mine is the largest recently active lode mining operation adjacent to New Melones Lake Area. It is between SR 49 Stevenot Stanislaus River Bridge and Coyote Creek, just outside the study area boundary. The Jamestown Mine is on the southeast side of Table Mountain, outside the study area.

The town of Melones was historically the site of a placer gold dredging operation, and there are several former hydraulic mining locations within the study area. More important are the placer deposits contained in the ancient stream channels that were buried beneath Miocene Mehrten Formation and Table Mountain latite flows.

*Chromite.* Chromite deposits with moderate potential are present in the ultramafic rocks associated with the Bear Mountain Fault Zone. Little or no exploration has been conducted since the 1940s.

*Limestone and Dolomite.* High-calcium limestone suitable for cement production is present in the Paleozoic limestone deposits of the Calaveras Complex.

*Talc.* Talc is present in localized hydrothermally altered schist deposits within the Melones Fault Zone. There are currently no active talc mining operations in the vicinity of the study area.

*Asbestos.* Asbestos minerals, such as chrysotile, are present in the serpentine deposits associated with the New Melones and Bear Mountain Fault Zones. The Jefferson Lake Asbestos Company operated the largest open pit asbestos mine in the United States at a site just south of the New Melones Dam, along the upper inlet of Lake Tulloch. The mine was closed in 1987. Calaveras Asbestos, Ltd. has operated the former pit as a landfill for disposal of asbestos-containing material.

*Axonite.* Axonite is a rare mineral known to only a few locations worldwide. Although not particularly valuable in and of itself, it is sought after by rock collectors due to its scarcity. Axonite has been identified at a single location on Reclamation lands. Collection of this mineral is not permitted.

**Soils.** Soils result from weathering of rock material. They can be formed in place, or the parent material may be transported during a part of its history, as occurs with alluvial soils (deposited by flowing water). Soils reflect not only the geologic and mineral character of the parent rock material, but to an even greater extent, they reflect the climate conditions to which the material is exposed and the slopes on which they form. The study area is generally steep, with narrow V-shaped valleys and steep stream channels. There are few significant areas in which alluvium accumulates. The soils tend to be shallow and rocky. Soils on north-facing slopes are generally deeper than soils developed on south-facing slopes.

As part of an effort to classify the ecological regions of the United States into successively smaller units, the USFS has produced a map of the ecological subregions of California. Among other elements, the project identifies the broad categories of soils within the subregions (USFS 1997). The study area is in the Lower Sierra Nevada Foothills Metamorphic Belt Ecological Subregion. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main processes driving soil formation. Soil temperature regimes are mostly thermic. Soil moisture regimes are xeric.

Soils are most vulnerable where they have been denuded. This is most apparent in areas that have been burned by a very hot wildfire, at the site of landslides, or below the top of the “bathtub ring” that is found below the high water mark of the lake. Soils in the bathtub ring are vulnerable to runoff from precipitation, and also erode readily as a result of boat wakes or where vehicles have been driven across them. Soil management measures are most apparent in the Shell Road and Peoria Wildlife Management Areas. Reclamation attempts to control illegal grazing and inappropriate vehicle use by fencing sensitive areas, installing educational or warning signs, closing access roads, maintaining roads and trails, and creating stormwater pollution prevention plans for areas where construction or use may occur. Reclamation also limits the construction season to minimize soil disturbance, initiates ranger patrols, and creates no-wake zones to minimize shoreline erosion.

**Caves.** This section addresses cave conditions in the Calaveras Terrain bordering the Stanislaus River, the South Fork Stanislaus River, and the headwaters of Coyote Creek. The cave area is north of the Melones Fault Zone, and most of it is north of the former Parrots Ferry Bridge (Figure R-5). Limestone deposits within the Calaveras Formation consist of isolated blocks of recrystallized limestone and dolomite, which have been identified in some reports as marble.

About 44 sq km (11,000 acres), or roughly half of the known marble and limestone within the Calaveras Formation, is found in the vicinity of the New Melones Lake Area, although most of these deposits are outside the management area.

The limestone and dolomite within the Calaveras Formation, known as the Calaveras Karst, is one of the most important karst areas in the state. Over 100 caves have been identified in the limestone of the Calaveras Formation. A study of cave resources performed by the New Melones Reservoir Project (1978) prior to filling of New Melones Lake divided their study area into four subareas: the Stanislaus River Canyon, Coyote Creek, Skunk Gulch, and Grapevine Gulch. These areas overlap the New Melones Lake Area, as shown in Figure R-5.

The 1978 study identified 87 caves in the inventory area. Thirty of the forty-four caves identified in the Stanislaus River Canyon are below the current spillway elevation (1,088 ft msl) and therefore are now inundated or subject to inundation by the lake. Nineteen caves were identified in the Coyote Creek Canyon. All but one of these (Lower Natural Bridges Cave) are above the current spillway elevation. Upper and Lower Natural Bridges caves are popular destinations for day hikers and have been since the Gold Rush. Coyote Creek flows through both caves. An early description of the Natural Bridges is included in a traveler's guide written by James Hutchings (1862). Moaning Caves, a large commercial cave, is located in the Coyote Creek watershed upstream of the study area. Fifteen caves were identified in the Skunk Gulch Recreation Area (now part of the Parrotts Ferry Management Area), none of which are below the spillway elevation. Northeast of Skunk Gulch, the Grapevine Gulch Recreation Area (now part of the Stanislaus River Canyon Management Area) contains nine known caves, all above spillway elevation.

Table R-5 gives a summary of the study areas and the numbers of caves in each. Appendix A lists the caves identified in the 1978 study and summarizes pertinent information regarding each cave. The specific locations of the caves are not provided in the report in order to protect fragile resources. The study ranked each cave based on priority for implementation of mitigation recommendations for various resource values. The ranking criteria included geological, paleontological, taphonomic, archaeological, biological, aesthetic, and recreational significance. Caves 9, 16, 25, 43, 51, and 54 received the highest geological resource rankings. Of these, caves 25 and 54 are below the 1,088 ft elevation.



**Table R-5: Summary of Pertinent Cave Study Area Information**

Study Area	Elevational Range of Caves in Study Area (feet above sea level)	Number of Caves	Caves above High Water (1,088')	Significant Caves*
Stanislaus River Canyon	910-1,550	44	13	3
Coyote Creek	1,060-1,980	20	19	2
Skunk Gulch	1,525-1,800	14	14	0
Grapevine Gulch	1,200-1,980	8	8	0

\*Significant caves are those which have been nominated as "significant" and therefore eligible for protection under the Federal Cave Resources Protection Act of 1988.

Source: 1978 New Melones Reservoir Project Cave Study

In December 1994, the Mother Lode Grotto of the National Speleological Society nominated five caves in the vicinity of New Melones Lake as significant caves eligible for protection under the Federal Cave Resources Protection Act of 1988. These included Caves 25, 54, 77, Upper and Lower Natural Bridges (caves 52 and 85, respectively), and Dragon's Breath caves. Lower Natural Bridges cave may be inundated at high lake elevations.

## 2.6.2 Resource Management

Management actions for geological resources are listed in Table R-6 below.

**Table R-6: Summary of Current Decisions and Internal Guidance for Geological Resources**

Decision	Source
Confine all public vehicles to existing roadways and continue to enforce ban on OHV operation.	43 CFR 423
Internal Guidance	Source
Prohibit mining and material excavation activities and allow dredging within the study area and coordinate with adjacent landowners/managers to prevent degradation of Reclamation lands.	DRMP 1995
Continue closure of old mine workings after conducting appropriate studies.	DRMP 1995
Review and comment on all proposed mining plans and Reclamation plans that may affect the New Melones watershed.	DRMP 1995
Protect significant caves in a manner consistent with the 1988 Federal Cave Resources Protection Act.	DRMP 1995
A cave inventory will be conducted to identify and classify caves.	New Melones Lake Revised Cave Management Plan. 1996
A protection plan for caves with significant resource value or potential hazards will be implemented.	New Melones Lake Revised Cave Management Plan. 1996
Minimize development and disturbance on serpentine outcrops to control erosion of asbestos fibers into waterbodies.	DRMP 1995

Internal Guidance	Source
Minimize erosion impacts within the project area.	DRMP 1995
Locate and design roads, trails, and access easements to follow the natural topography, minimizing steep slopes and the number of stream crossings.	DRMP 1995
Avoid soil disturbance, to the extent possible, of areas that are particularly vulnerable to erosion and sediment loss.	DRMP 1995
Confine all public vehicles to existing roadways and continue to enforce ban on OHV operation.	DRMP 1995
Measures to control access to caves will be implemented.	New Melones Lake Revised Cave Management Plan. 1996
Stabilize and construct waterbars on all roads and trails to control erosion.	DRMP 1995

## 2.7 Hydrology

This section discusses water resources and water quality in the New Melones Lake Area. The water resources section includes discussion of water sources, storage, streams, and the watershed that surrounds and feeds the lake. The water quality section describes the physical, biological, and chemical properties of waters in and around the lake and discusses factors that influence water quality in the lake. A management summary at the end of the section lists measures that Reclamation currently takes to manage water resources and maintain water quality.

### 2.7.1 Current Conditions

**Overall Hydrology.** The Hydrology section has been organized into the following subsections:

- **Water Resources:** This section focuses on water resources in the New Melones Lake Area and gives a brief introduction to dam operations, including storage and release requirements.
- **Water Quality:** This discussion focuses on water quality issues and current conditions in New Melones Lake.

**Water Resources.** Although dam operations are not managed by New Melones resource staff and will not be addressed in the RMP/EIS, this introduction is given to provide an overview of issues that relate to water levels, which in turn influence management of resources that will be addressed in the RMP/EIS.

One of the primary purposes of New Melones Lake is water storage for flood control. The primary operational criteria for New Melones Lake are provided in the California State Water Resources Control Board (SWRCB) Water Right Decision 1422, which was issued in 1973. This

decision allowed Reclamation to appropriate water from the Stanislaus River into New Melones Lake for irrigation, municipal, and industrial uses but required that lake operations include releases of water for existing water rights, fish and wildlife enhancement, and the maintenance of water quality conditions (primarily temperature and dissolved oxygen) on the Stanislaus and Lower San Joaquin Rivers (Reclamation Plan of Action, New Melones Revised Plan of Operations).

The maximum storage volume of the lake is 2,420,000 acre-feet, and the maximum surface area is 12,500 acres. The lake has a shoreline of approximately 100 miles when filled to capacity. Between the years of 2000 and 2006, storage in New Melones Lake ranged from approximately 1.1 to 2.1 million acre-feet, with the highest levels typically in the early summer months and the lowest levels at the beginning of the water year in October. According to Reclamation’s rating curve for the lake, this translates into water level elevations ranging between 956 feet and 1,061 feet above mean sea level. These levels vary as a result of climatic variables such as drought, seasonal variables such as varying amounts of precipitation, and discharge requirements for flood control, power generation, irrigation, municipal requirements, and maintenance of aquatic habitat. Surface levels may also vary as a result of managed releases from storage facilities on streams above New Melones. At least 10 reservoirs with storage capacities ranging from 250 acre-feet to 189,000 acre-feet store water above New Melones. Those facilities and their storage capacities are shown in Table R-7. The New Melones Lake Area’s position in the regional watershed is shown on Figure R-6 and the watershed draining directly to the New Melones Lake Area is shown on Figure R-7.

Daily outflows from the lake vary widely and are generally lowest during the rainy season (approximately October through April). Between 2000 and 2006, outflows ranged from 0 to 3,000 cubic feet per second, with the highest outflows typically in the summer months (US Geological Survey [USGS] 2007).

**Table R-7: Existing Storage Above New Melones Lake**

Fork of the Stanislaus River	Reservoir	Storage Capacity (acre-feet)
North		
	Lake Alpine	4,120
	Union Reservoir	3,130
	Utica Reservoir	2,330
	Spicer Meadows Reservoir	189,000
	Hunters Reservoir	250
Middle		
	Relief Reservoir	15,500
	Donnel Lake	64,300
	Beardsley Lake	97,800
South		
	Pinecrest Reservoir	18,310
	Lyons Reservoir	6,220

Source: Moore, T. PG&E, May 1994





*Streams.* All three forks of the Stanislaus River originate in the Sierra Nevada range. There are also a number of small creeks, both ephemeral (flowing only a portion of the year) and perennial (flowing year round), that discharge into New Melones Lake, including Coyote Creek, Carson Creek, and Angels Creek; however, the Stanislaus River is the main source of water for New Melones Lake. The main factor that determines whether streams within the planning area maintain perennial or ephemeral characteristics is their place of origin. In general, streams originating higher in the Sierra Nevada range and fed by melting snowpack are more likely to flow year round than streams fed primarily by rainfall. The exception to this is Coyote Creek, which is spring fed and maintains year-round flows of cold, clear water.

With the exception of the Stanislaus River, which contains weirs and other diversion structures, streams on Reclamation lands and their associated riparian areas are largely unaltered from their original conditions, except in cases where historic placer or dredge mining altered geomorphologic features. Some modification of stream substrate from recreational gold dredge operations may continue today, but these operations are small and focus on sandy or gravelly substrate that regains its natural form quickly.

*Watersheds and Drainage.* New Melones Dam is on the Stanislaus River below the confluence of its three forks (North, Middle, and South Fork), forming New Melones Lake. The majority of the water comes from the North and Middle Forks, with a lesser amount coming from the South Fork drainage. New Melones Lake is in the Upper Stanislaus River watershed, US Geological Survey (USGS) hydrologic unit code 18040010. This watershed is called the Stanislaus River Hydrologic Unit in the SWRCB hydrologic code system. Figure R-6 shows the location of New Melones Lake within the Upper Stanislaus River watershed and several subbasins that have been delineated by the SWRCB.

The Upper Stanislaus River watershed has a drainage area of approximately 980 square miles. Over 90 percent of this area (approximately 904 square miles) drains into New Melones Lake. Those areas draining directly to the lake include the following:

- Subbasins draining directly to the Stanislaus River and New Melones Lake, below the confluence of the North and Middle Forks of the Stanislaus River;
- The portion of the South Fork of the Stanislaus River drainage basin below the confluence of Wet Gulch;
- The lower watersheds of eastern tributaries to the main stem of the Stanislaus River, including the Rose Creek, Knight Creek, and Stony Gulch drainage basins;
- Watersheds of several small eastern tributaries to the main stem, including Experimental Gulch, Sandy Wash, Wolf Gulch, Deadman Gulch, Chile Gulch, Quail Gulch, Grizzly Gulch, Devils Canyon, and Norwegian Gulch;
- Coyote Creek drainage basin below Wades Flat Gulch;
- Small western tributaries to the main stem, including Squirrel Gulch, Snake Gulch, Skunk Gulch, Deep Gulch, Mariana Gulch, Grapevine Gulch, Wool Hollow, Cataract Gulch, and Yea Hoo Gulch;

- Slopes along the eastern portion of the lake, including portions of Mormon Creek, Bear Creek, Jackass Hill, and French Flat; and
- Slopes along the northwestern portion of the lake, including portions of Carson Creek, Greenhorn Creek, Indian Gulch, Indian Creek, Six Mile Creek, Angels Creek, Vonich Gulch, and Texas Charlie Gulch.

Upstream of New Melones Lake and within the lake's watershed, the Middle Fork of the Stanislaus is dammed at Beardsley Lake and Donnell Lake. Water from New Melones Lake feeds into Tulloch Lake, located directly downstream.

**Water Quality.** Water quality refers to physical, biological, and chemical properties of a water body. These properties include temperature, organic content, carbon and dissolved oxygen, turbidity, and pathogen content. Water quality is influenced by vegetation, soil and mineral substrate, livestock and human activities, and the source of the water. Surface water has less mineral content than groundwater and is indicative of the majority of water entering New Melones Lake.

Water quality issues at New Melones Lake are typical of those found in most reservoirs. Compared to natural lakes or streams, reservoirs may have elevated surface water temperatures in shallow areas or areas with poor circulation, high incidence of suspended sediments from shoreline erosion, high nutrient levels, and diminished dissolved oxygen. Localized water quality problems may occur as a result of recreational boaters, particularly in refueling areas or in areas where boaters congregate.

In some reservoirs, pollution from historic mining sites has been cited as a major water quality issue. Although this has not been reported as a problem at New Melones, its location in the heart of the Mother Lode gold mining region and its proximity to both active and abandoned mines greatly increases the chances that mine-based pollution will find its way into the lake. One of the most likely sources of mine-based pollution is acid mine drainage, which is metal-rich water formed from chemical reaction between water and rocks containing sulfur-bearing minerals. The runoff formed is usually acidic and frequently comes from areas where ore- or coal mining activities have exposed rocks containing pyrite, which is a sulfur bearing mineral. Problems that can be associated with mine drainage include contaminated drinking water, disrupted growth and reproduction of aquatic plants and animals and the corroding effects of the acid on parts of infrastructures such as bridges (USGS 2004).

Under Section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality-limited segments. The waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology (SWRCB 2007).

The most recent 303(d) list for California is the 2002 list, which was approved by the EPA in July 2003. The 2002 list indicates that the Lower Stanislaus River is the only waterbody in the Upper Stanislaus River watershed which is impaired, suggesting that water quality in New Melones Lake is generally very good. This segment of the Stanislaus River is at the bottom of the watershed, below both New Melones Lake and Tulloch Reservoir. Water quality

impairments for this section of the Stanislaus River include diazinon, group A pesticides, and mercury. Total maximum daily loads (TMDLs) have not been established for these chemicals for this watershed.

## 2.7.2 Resource Management

Decision and guidance documents for water resource management in the New Melones Lake planning area include the 1976 Master Plan, the New Melones Dam Memorandum of Agreement (MOA) (MOA 1980), the Internal Draft Resource Management Plan (Reclamation 1995), the Draft Peoria Wildlife Management Area Environmental Assessment (Reclamation 2006a), and the Draft Fire Management Plan (Reclamation 2006b). Management direction relevant to water resources is provided in Table R-8 below.

**Table R-8: Summary of Current Decisions and Internal Guidance for Water Resources**

<b>Decision</b>	<b>Source</b>
Confine all public vehicles to existing roadways and continue to enforce ban on OHV operation.	43 CFR 423
Prohibit active discharge of sediment to any waterbody.	Clean Water Act, 43 CFR 423
Comply with Clean Water Act	Clean Water Act
Waste treatment systems will continue to comply with applicable waste discharge requirements.	Master Plan 1976, Clean Water Act
Manage marina concession to prevent active discharge of sewage and hazardous materials.	Reclamation Manual, Concession Management Policy
<b>Internal Guidance</b>	<b>Source</b>
The use of pesticides and fertilizers on Reclamation lands shall be in accordance with the Integrated Pest Management Plan for the New Melones Management Area.	DRMP 1995
Work with property owners and agencies to ensure that land use changes and activities within the watershed, beyond Reclamation's lands, do not contribute to the degradation of water quality, particularly non-point sources, which are more difficult to manage than point sources.	DRMP 1995
Review environmental documents for projects within the watershed and provide comments to the lead agency regarding limiting increases in impervious surfaces, minimizing soil disturbances, and other water quality impacts.	DRMP 1995
Provide and maintain appropriate restroom facilities at existing high-use areas and as a part of all new development. Provide floating restroom facilities for use by boaters. Locate the toilets in high-visibility areas to minimize vandalism. Locate permanent facilities above gross pool. Use concrete vault toilets or portables where facilities are	DRMP 1995

Internal Guidance	Source
needed below gross pool.	
Promote sound fish waste management through a combination of fish-cleaning facilities and public education.	DRMP 1995
Comply with applicable Hazard Waste/Materials regulations such as storage, transfer, containment, and disposal of oil, solvents, antifreeze, and paints at Reclamation and lessee concession facilities and encourage recycling of these materials.	DRMP 1995
Respond to any hazardous waste problems discovered on Reclamation lands immediately to minimize any water quality degradation.	DRMP 1995
Continue to require emergency spill plans for the marina and all other facilities that store fuels. Continue to require that these facilities have spill containment equipment.	DRMP 1995
Continue to require marina to use automatic shut-off nozzles and promote the use of fuel/air separators on air vents or tank stems of inboard fuel tanks to reduce the amount of fuel spilled into surface waters during fueling of boats.	DRMP 1995
Restrict vehicle and vessel maintenance, repairs, and construction on Reclamation lands except in designated areas.	DRMP 1995
Prohibit dumping of any kind on Reclamation lands and water.	DRMP 1995
Review environmental documents for projects within the watershed and provide comments to the lead agency regarding limiting increases in impervious surfaces, minimizing soil disturbances, and other water quality impacts.	DRMP 1995
Minimize erosion impacts within the project area.	DRMP 1995
Locate and design roads, trails, and access easements to follow the natural topography, minimizing steep slopes and the number of stream crossings.	DRMP 1995
Avoid soil disturbance, to the extent possible, of areas that are particularly vulnerable to erosion and sediment loss.	DRMP 1995
Confine all public vehicles to existing roadways and continue to enforce ban on OHV operation.	DRMP 1995
Stabilize and construct waterbars on all roads and trails to control erosion.	DRMP 1995
Minimize development and disturbance on serpentine outcrops to control erosion of asbestos fibers into waterbodies.	DRMP 1995
Identify areas where storm water runoff from paved surfaces is concentrated and drains directly to waterbodies; develop retention basins and/or other water quality control features for these areas.	DRMP 1995

Internal Guidance	Source
The use of prescribed burning on Reclamation lands shall be in accordance with the Fire Management Plan for the New Melones Management Area.	DRMP 1995

## 2.8 Aesthetic, Visual, and Scenic Resources

### 2.8.1 Current Conditions

The New Melones Lake Area is in Calaveras and Tuolumne Counties among the foothills of the west slope of the Sierra Nevada. The primary dominant visual elements are the hills, ridges, small valleys, the patterns created by the vegetation on the hills, and the surface of the lake (Reclamation 1995; Reclamation 2006b).

The landscape within this region is characterized by relatively steep sided and rolling hills that range from a few hundred to a thousand feet in height (Photographs 1 and 2 in Appendix B) (Reclamation 1995; Reclamation 2006b). Occasional rock outcrops are also visible (Photograph 3 in Appendix B). Visual contrast is provided by Table Mountain, which forms the watershed boundary to the south and is a long, flat-topped ridge of volcanic origin (Photograph 4 in Appendix B).

The dominant natural vegetation is annual grassland and native oak woodlands occurring in varying densities (Photographs 5 - 8 in Appendix B) (Reclamation 2006b). The tree canopy cover and species diversity increases in small draws and valley bottoms where the moisture is more readily available. Gray pine and lower shrub masses are found in drier locations, mixed with oaks in some areas (Reclamation 1995). In summer, the grasses become dry and turn from bright, rich green to soft golden yellow.

New Melones Lake Area occupies two fairly distinct areas contained within the Stanislaus River Canyon: a long, narrow upper reach and the wider main body of the lake (Reclamation 1995). The upper reach of the lake extends north-northeast from the SR 49 Stevenot Stanislaus River Bridge across the middle fork of the Stanislaus River (Photograph 9 in Appendix B) (Reclamation 1995). This part of the lake becomes increasingly narrow from the bridge northward and is characterized by steep-sided slopes which give way to near vertical limestone cliffs in the canyon's far upper reaches. The Camp Nine, Stanislaus River Canyon, Parrotts Ferry, Carson, and Coyote Creek planning units are in this area. Also, the Mark Twain and Carson planning units straddle the SR 49 Stevenot Stanislaus River Bridge. In contrast to the main body of the lake, the majority of the upper reach resembles an enlarged river rising up the sides of the steep canyon walls (Photograph 10 in Appendix B).

The main body of the lake is located south of the SR 49 Stevenot Stanislaus River Bridge. This area of the lake is relatively open, providing expansive views of the lake's primary body of water and the surrounding hillsides (Photograph 11 in Appendix B). Because of the many convolutions

in the hills and their steep sides, the shoreline along this part of the lake is quite irregular. It features many fingers that project inward, and branches that extend back for varying distances from the main body of water (Photograph 12 in Appendix B). This configuration prohibits views of the entire main body of the lake surface at one time from any single location. Many areas of the lake are somewhat hidden from view until approached directly by boat. In a few areas, small hills that stood near the original river channel have been surrounded by water with the construction of the lake, forming islands. These visual features are found in the vicinity of Tuttle town French Flat, Bear Creek, Peoria Wildlife Area, Dam and Spillway, West Side, Greenhorn Creek, and Glory Hole planning units.

In general, the qualities of the scenic landscape increase with distance from the lake. The long, narrow upper reaches, have dramatic aesthetic qualities. Further down the river and around the main body of the lake, the aesthetic qualities of the landscape are compromised by greater development, including administration and recreational facilities, homes in the upper watershed, and a large mine that is visible from the visitor center and other areas (Photographs 13 and 14 in Appendix B).

Due to the orientation of the lake in the river canyon, views of the water and surrounding shoreline are only possible from locations within the basin itself, and usually only from points relatively close to the lake (Reclamation 1995). Views of the upper reach of the lake are generally limited to a vehicular turnout and scenic overlook located on the east side of Highway 49 near the west end of the bridge, from recreation areas, from Parrotts Ferry Road, and from Camp Nine Road. In general, views of the main body of the lake are limited to the developed recreation facilities associated with the lake (Tuttle town and Glory Hole Recreation Areas), from the lake surface itself, and to a lesser extent from the SR 49 Stevenot Stanislaus River Bridge.

From some of the higher elevation points near the main body of the lake, such as at the admission/ranger booth along the entrance road to the Glory Hole Recreation Area, more distant, open, and panoramic views of the basin and portions of the lake are available (Reclamation 1995). Distant features are often the focus of attention even though details are not readily perceptible (Photograph 15 in Appendix B). From points that are mid-range in terms of elevation with respect to the lake surface and the surrounding ridges, such as some of the day use areas and parking lots above the boat ramps, views become somewhat confined by the surrounding topography and are more focused on the lake and the hillsides that rise from the edge of the water (Photograph 16 in Appendix B). From the shore of the lake and the water's surface, views become oriented out across the water, which is by far the most dominant element of the scene, and up the hillsides to the ridge tops that form the skyline. At these locations, views are relatively confined and tend to be focused on foreground details.

**Fluctuation Zone.** One of the most striking visual characteristics of the lake basin is the band-like scar created by the high water mark of the lake and zone of former inundation (the area between the present water level and the high watermark), referred to as the fluctuation zone (Photograph 17 in Appendix B) (Reclamation 1995). The fluctuation zone forms a wide, horizontal band that completely encircles the lake and stands out in sharp contrast with the hillsides immediately above it. The contrast is created by an abrupt and complete absence of shrubs and trees on the hills below the high water mark resulting in significant differences in

texture and color above and below the high water mark. Above the high water mark, the hillsides appear to be in a relatively natural state with respect to vegetation and land surface. Some portions of the fluctuation zone contain stands of dead trees and shrubs which were originally inundated but have since been exposed as the water has receded.

Within the upper reach of the lake, riparian vegetation becomes established as the lake recedes (Reclamation 1995). This area begins to resemble its former river corridor as the water course narrows and the shoreline vegetation thickens. However, as water levels rise it forces the inundation zone further up into this section of the lake, thereby inundating the reestablished vegetation.

Below the high water mark, and within the main body of the lake, few live trees or shrubs occur (Reclamation 1995). Live vegetation in this zone is limited to grasses and some riparian vegetation, which have become established as the water has receded to its present levels and the area has remained dry. In some locations, minor rock outcrops are visible within this barren zone and in a few areas evidence of erosion can be seen.

**Development.** The overall visual character of the lake basin is distinctly rural and undeveloped, although there are numerous indicators that the landscape has been strongly affected in several ways by human influence (Reclamation 1995). In general, the most noticeable developed features are the various recreation facilities at the Tuttle town and Glory Hole Recreation Areas (Photograph 18 in Appendix B). However, these features appear relatively minor in scale within the overall visual context of the basin, particularly when viewed from a distance. Widely scattered private residential development within the basin, for the most part, is quite unobtrusive. Communications facilities that exist within the basin, such as hillside microwave towers and antennae, are minor features that do not attract the viewer's attention. Overhead utility lines, while present and noticeable in a few locations, seem to attract little attention.

Prominent human-made features within the basin, aside from the lake, are the spillway situated along the ridge on the west side of the main body of the lake (Photograph 19 in Appendix B) and the Marble Quarry. Also noticeable are the mined hillsides at Carson Hill (Photograph 20 in Appendix B) (Reclamation 1995). The abrupt, strong contrast in color and landform created by the stepped benches, together with their very large scale, are readily evident from many locations and are capable of attracting and holding the viewer's attention. In this way, the features compete for visual dominance with the surrounding hillsides and with the lake itself.

The Tuttle town and Glory Hole Recreation Areas are the two primary locations within the basin where land-based recreation occurs (Reclamation 1995). Both feature a network of roadways providing public access to a host of facilities that serve the needs of visitors. Together, they include campgrounds and boat launch areas consisting of concrete ramps and extensive parking for cars and trailers.

At both Tuttle town and Glory Hole, boat ramps were designed to provide service under differing lake surface elevations (Reclamation 1995). In these cases, the ramps appear on the hillsides as large, abandoned slabs of concrete. The New Melones Marina complex is situated in an inlet within the Glory Hole Recreation Area. The marina complex is contained far enough back in the

inlet that it can only be seen from a few relatively nearby locations or from Tuttletown (across the lake).

Many of the recreation facilities (i.e. most campsites and the day use areas) are located among groves of trees taking advantage of topography to screen views of these uses from other areas (Reclamation 1995). Some facilities, particularly the boat launch ramps and adjacent parking areas, are fully exposed to view.

Some of the smaller recreation areas appear as little more than roadways that disappear beneath the surface of the lake (Reclamation 1995). Camp Nine Recreation Area, located at the north end of the lake's upper reach, is rustic and the water body takes on the appearance of a flowing river corridor rather than a lake, particularly during times of low lake levels.

### **2.8.2 Resource Management**

There are no direct provisions for visual resource management in management or guidance documents for the New Melones Lake Area. Reclamation briefly addresses visual resources in its WROS Users Guidebook (Reclamation 2004), which establishes standards for modifying the physical setting. Also, the visual quality object for primitive areas requires the preservation of the physical setting. Management of other elements, such as biological resources, vehicle use, and fire, indirectly affects visual resource management.