POST-AUDIT OF NEW MELONES DAM,
CENTRAL VALLEY PROJECT,
STANISLAUS RIVER, CALIFORNIA

A thesis submitted to the faculty of
San Francisco State University
in partial fulfillment of the
requirements for the
degree

Master of Arts
in
Geography

by

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Oakland, California

May, 2000

CERTIFICATION OF APPROVAL

I certify that I have read *Post-Audit of New Melones Dam, Central Valley Project, Stanislaus River, California*, by Kimra Dawn McAfee, and that in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree: Master of Arts in Geography at San Francisco State University.

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POST-AUDIT OF NEW MELONES DAM,
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2000

This study compares the actual impacts of the New Melones Dam and Reservoir to those predicted in the environmental review documents. The post-audit method serves as the framework for examining each of the multi-purpose project's benefits: enhancement of the fishery and water quality; provision of water supply, flood control, and reservoir recreation; and hydropower generation. To identify the changes resulting from the project, interviews were conducted with the people managing the dam and reservoir, other agency representatives involved in Stanislaus River issues, and people affected by the project. A preliminary Geographic Information System (GIS) assessment of downstream land use changes showed an increase in urban uses and a shift toward higher value crops, such as orchards, along the lower Stanislaus River. As the U.S. Bureau of Reclamation attempts to create a Long-Term Operating Plan for New Melones, the pervading opinion is that there is inadequate water to serve all of the project purposes and to satisfy all of the stakeholders.

I certify that the Abstract is a correct representation of the content of this thesis.

____________________________________ _______________
(Chair, Thesis Committee) (Date)

ACKNOWLEDGMENTS

I wish to thank everyone who took the time to talk to me about New Melones Dam and Reservoir and the Stanislaus River. Betty Andrews expressed an early interest in my research and guided me to Kevin Wolf and the Stanislaus Stakeholders, whose assistance made this thesis possible. A special thank you to Mark Volkoff, who helped me to obtain photos from the USBR archive, and to Tom Hawkins of DWR for his assistance with the land use study.

My committee chair, Professor Nancy Wilkinson, helped me to understand the complexity of water resources in California and passed on the love for the study of these issues to me. She has been both a mentor and a friend and I can never thank her enough. Professor Roger Crawford inspired in me a thorough and enthusiastic research approach in Land Use Planning that I carried through to my thesis. I am also grateful to my parents for their love and support; to Feride, who volunteered as a peer reader; and to my employer, Lonely Planet. Finally, I simply could not have completed this project (especially the land use maps) without the constant encouragement, support, assistance, and love of my husband, Scott. We created a far grander work than this in the course of my research—our daughter, Corona Shea. Her patience with me in the first few months of her life will never be forgotten.

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GLOSSARY

af	acre feet
AFRP	Anadromous Fish Restoration Program
CDFG	California Department of Fish and Game
cfs	cubic feet per second
CSJWCD	Central San Joaquin Water Conservation District
DWR	Department of Water Resources (State of California)
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FY	Fiscal Year
maf	million acre feet
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
OID	Oakdale Irrigation District
SEWD	Stockton East Water District
SSJID	South San Joaquin Irrigation District
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
VAMP	Vernalis Adaptive Management Plan
WAPA	Western Area Power Administration

NEW MELONES PROJECT TIMELINE

1944	Congress authorizes dam (Flood Control Act of 1944)
1962	Congress re-authorizes larger dam (Flood Control Act of 1962)
1966	USACE begins preliminary construction
1969	Congress passes National Environmental Policy Act (NEPA)
1972	USACE issues initial Environment Impact Statement (EIS)
1973	State Water Resources Control Board issues Decision 1422
1974	Friends of the River (FOR) formed to campaign for Proposition 17
1974	Proposition 17 (to limit the size of the reservoir) defeated
1978	Dam completed
1982	Proposition 13 (to restrict storage and sale of water) defeated
1983	State Water Resources Control Board issues final permits to fill reservoir
1992	Congress passes Central Valley Project Improvement Act (CVPIA)
1992	Reservoir drops to lowest point during drought (83,360 af)
1997	USBR issues Interim Plan of Operation for New Melones

Sources: Hundley 1992, 351-356; Palmer 1982; Seglund 1982; Ungvari 2000; USBR 1997a; USBR 199b.

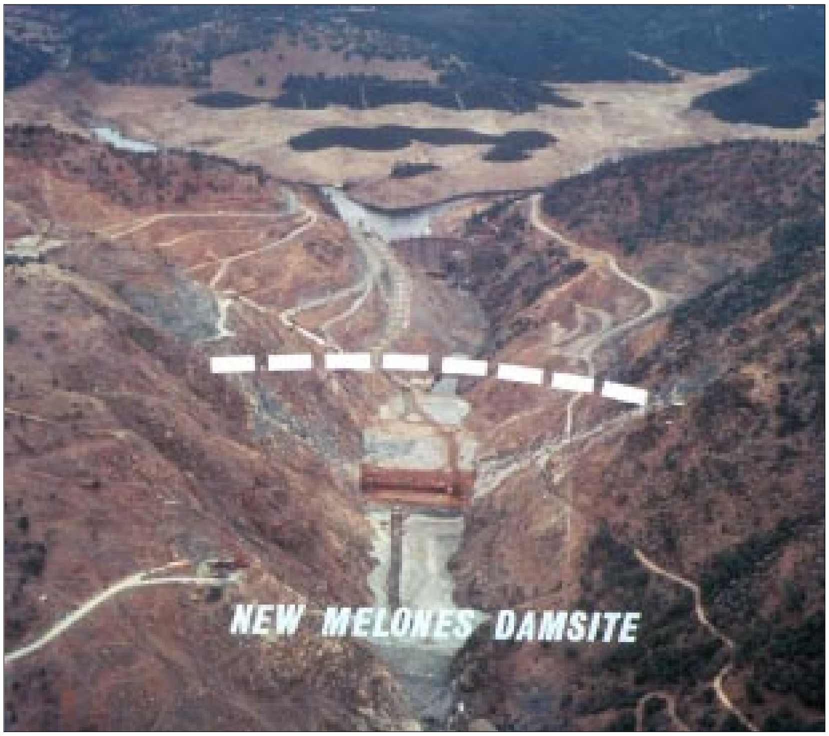
INTRODUCTION

NEW MELONES DAM: OVERVIEW, BACKGROUND, AND ISSUES

New Melones Reservoir captures all three forks of the Stanislaus River, a westward-flowing stream on the flank of the Sierra Nevada (Map 1). At Iron Canyon, the river becomes a lake behind a 625 foot high rock and earthfill dam (Photographs 1 and 2). A component of the Central Valley Project, the multi-purpose New Melones Dam was designed to generate hydropower; to provide flood control, water supply, and reservoir recreation; and to enhance water quality and the fishery (USACE 1972; 1, 11).

In California water history, New Melones Dam is a landmark project. When completed, it was the second largest earthfill dam in California, and the fourth tallest dam in the United States (Palmer 1986, 125; Seglund 1982, 2). It was the last major dam completed in California—perhaps because of the controversy that surrounded its completion. While opposition failed to stop the filling of its reservoir, nearly two decades have passed without the authorization of another comparable project. Friends of the River, who came together in 1974 to push for Proposition 17 to limit the size of New Melones Reservoir, is now a leader in promoting river conservation throughout the state (Palmer 1982; FOR Undated).

MAP 1: CENTRAL VALLEY PROJECT



Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 1:
New Melones Dam
and Reservoir Site,
October 1976

PHOTOGRAPH 2:
New Melones Dam
and Reservoir,
1 April 1983

Surface Elevation:
1,058 ft.

Source: USBR Public Affairs Photo Lab

Project History

The New Melones Project was first approved by Congress in the Flood Control Act of 1944. The core of the project as authorized was a 450,000 acre foot (af) flood control reservoir, but there were provisions for enlarging the reservoir to 1.1 million acre feet (maf). While studies in the late 1940s concluded that a 1.1 maf reservoir would best meet California's water needs, in the late 1950s the USBR began studying the feasibility of an even larger reservoir at New Melones to serve the proposed East Side Division of the Central Valley Project. Subsequent studies, along with flooding of the lower Stanislaus River in 1950, 1952, and 1955, culminated in authorization of a 2.4 maf reservoir in the Flood Control Act of 1962. In the meantime, local irrigation districts struggled to put together the project independently as a 1.1 maf capacity reservoir. The federal government prevailed, the U.S. Army Corps of Engineers was charged with constructing the project, and in 1966 preliminary construction began. Three years later, Congress passed the National Environmental Policy Act of 1969 (NEPA). Consequently, the Corps issued an Environmental Impact Statement (EIS) for New Melones in 1972. In 1979, the completed dam and reservoir were transferred to the U.S. Bureau of Reclamation (USBR) for operation and maintenance as part of the Central Valley Project (Randolph and Ortolano 1975; USACE 1980, 1-5). Environmentalists and, most visibly, whitewater rafters, ardently fought the filling of the reservoir, but lost the battle during the unusually wet winter of 1982-1983 (Hundley 1992, 356; Palmer 1982).

The Need for Post-Audit Analysis

New Melones' place in California water history merits a review of its impacts. The costs for the last large dam in California included the drowning of the deepest limestone canyon on the West Coast—at the time, the second most frequently boated stretch of whitewater in the U.S. (Palmer 1986, 125). Those who fought the project still remember with heartache the steep Stanislaus Canyon and the running river (Photograph 3). The immense pool touches more people's lives now as they make use of the recreation area, but there is no question that the new form of recreation is very different from that before the dam. With the opening of the New Melones Visitor Center in June 1998, more people are learning the story of the dam and the reservoir.

Post-audit analysis is one approach for reviewing a project. Comparing the actual impacts to those expected is beneficial not only for management of New Melones, but for improving future planning efforts. One of the difficulties in reviewing a project is deciding when to go about the task; how long must a project be completed before we begin comparing the plan to the results? As of this writing, the amount of time spent planning (1944-1966), constructing (1966-1979), and finalizing permits (1979-1983) for New Melones Dam exceeds the

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 3:
Camp Nine to
Parrotts Ferry
Whitewater:
Six-Pac Rapid near
Rose Creek,
18 June 1980

Flow:
4,570 cfs

amount of time the project has operated at maximum capacity. Still, twenty years have passed since the dam was completed, and it is not too early to begin documenting the effects of the New Melones Project.

The New Melones Project is not an isolated landscape feature but an integral part of a region—economically, socially, and culturally. This post-audit attempts to begin the process of reviewing the cumulative impacts of the project within the dynamic region—a never-ending task. Over time, more changes may be quantifiable, but some impacts will always be left to description. Furthermore, this description will change over time.

This thesis is therefore a first attempt at comparing the actual impacts to those predicted in the environmental review documents. Chapter 1 discusses methods used in previous post-audits and the difficulties of assessing project impacts. In Chapter 2, I review the literature generated to build New Melones Dam, the struggle against the filling of the reservoir, and the current long-term planning process. Chapter 3 examines each of the project's benefits, comparing predicted impacts to the current situation. The post-audit concludes with a summary of findings and future research needs in Chapter 4.

CHAPTER 1

THE POST-AUDIT ANALYSIS AND ASSESSMENT APPROACH: REVIEW OF THE RELATED LITERATURE

. . . It's nice to be the drafter of a well-constructed plan
For spending lots of money for the betterment of Man,
But Audits are a threat, for it is neither games nor fun
To look at pleas of yesteryear and ask, 'What have we done?'
And learning is unpleasant when we have to do it fast,
So it's pleasanter to contemplate the future than the past
(Boulding 1972, 957)

A post-audit is an assessment of a completed project. In reviewing the actual outcomes and impacts of a project, it helps to evaluate the accuracy of the predictions made during the planning process, and serves to improve future planning, monitoring, and assessment techniques. The most useful post-audits strive to be comprehensive—including a review of the biological, environmental, social, and economic impacts of a project—and thus demand expertise from diverse technical fields. A multi-disciplinary team of specialists should ideally work together on such a study. Integral to this team is the geographer, who brings an overall generalist's point-of-view along with a specialty within the field of geography.

There are multiple obstacles to carrying out a comprehensive post-audit. One of these is the lack of necessary expertise within any single individual. Assembling a qualified team can be costly both in time and money. Another difficulty is a paucity of previous examples; rarely are the outcomes of any type of project methodically measured against original expectations. Several people have commented on the dearth of comprehensive post-audit analyses and the obstacles to completing such studies (White 1996, 59; Galloway 1980, 3; Cook 1974a, 1.41). Numerous non-comprehensive post-audits assess specific aspects of a project from the point of view of a particular discipline (*e.g.*, agricultural economics, sociology). Galloway (1980, 10) observes that such studies are either environmental *or* biological *or* social *or* economic, but never integrate all of these perspectives.

This chapter first reviews some examples of non-comprehensive post-audits, then describes methods employed in comprehensive post-audits. It concludes by elaborating on the difficulties involved in conducting a post-audit.

Non-Comprehensive Post-Audits

Non-comprehensive post-audits assess outcomes for a particular aspect of a project. Usually the scope of the study is limited to the accepted realm of the particular discipline of the researcher. Economics is traditionally the primary consideration for project implementation; it follows that many post-audits would focus on the actual financial performance of a project. Arthur D. Little, Inc. (1975) traces the origin of post-audit analysis to the 1935 Natural Resources Board, but not until 1968 did the Federal Council for Science and Technology recommend that an economic post-audit be integral to project performance analysis. Arthur D. Little, Inc. (1975, 11) was contracted to conduct the first examination of "the performance of a major river basin program," the multi-unit Pick-Sloan Missouri Basin Program. The trial methodology involved assembling information on the goods and services produced under the program, documenting or estimating the costs incurred, applying economic values to the program outputs, and comparing the costs to the values achieved. In essence, Little re-did the benefit-cost analysis to compare with the original benefit-cost ratio. In a previous study, Arthur D. Little, Inc. (1973) had examined the management of the project in an effort to improve future policy formulation and public administration. The management post-audit included a review of the priority given to each project purpose (*e.g.*, flood control, irrigation, recreation) in the planning phase, and its relative prominence and importance in the final project.

While the overall benefit-cost ratio for the Pick-Sloan Missouri Basin Program was higher than expected, Arthur D. Little, Inc. (1975) questioned the effectiveness of benefit-cost analysis. Looking at the major program categories independently, Little found that for irrigation, navigation, and municipal and industrial water supply the costs had outweighed the benefits, while power generation, flood control, recreation, and fish and wildlife outcomes proved more economically beneficial than costly. However, in many cases, determining the values of services was very difficult. In applying the method of estimating costs of a viable alternative, Little repeatedly emphasized the possibility of error in the estimates. Although the projected benefit-cost ratio of 2.57:1 rose to 3.42:1 for the completed project, combining all of their estimates, they expressed “belief in the limitations, if not the futility, of benefit-cost analysis as a decision tool” (Arthur D. Little, Inc. 1975, 188).

Andrews, Madsen, and Legaz (1974) focused on the social impacts of the Weber Basin Project in Utah. They justified the exclusion of economic impacts based on the increasing importance of non-economic human values in behavioral choices, believing that this shift in concerns has not received its due attention in research. As for environmental impacts, the plan for the Weber Basin Project dates “prior to the development of widespread public interest and awareness in environmental and ecological problems.” The discussion did not introduce these elements since they were not “a major behavioral motivating concern” during planning, construction, or operation of the project (Andrews, Madsen, and Legaz 1974, 156). Thus, this study comparing the actual outcomes of a project to the projected outcomes justifies *excluding* environmental considerations.

Andrews, Madsen, and Legaz (1974) employed a “multi-dimensional” methodology to determine the social implications of the Weber Basin water management project. One goal was to explore the various methods for evaluating social and aesthetic impacts. Secondary data from records and reports identified the original project goals, changes to these goals, and the social reasons behind the changes. Existing data on impacts were used to measure how successful the project had been at accomplishing its social objectives, and to identify unanticipated impacts. The authors believed that interviews were necessary since secondary data dealt primarily with economic and physical aspects, to the exclusion of social impacts. Interviews were conducted with federal, state, and local officials, and randomly sampled farm and non-farm people in the service area were interviewed. Interviews with public officials utilized mostly standardized, open-end questions, as well as follow-up interviews in many cases. The objective was to ascertain the "respondent's knowledge, opinions, and attitudes concerning impacts of the project." Data collected from the public served the same purposes, as well as to identify the uses of the water and the types of recreation occurring at project facilities. Unanticipated social impacts revealed in the study included land-use changes associated with water allocation and distribution problems, problems associated with subdividing agricultural land for residential use, law enforcement problems associated with recreational uses, and potential conflicts between water sales and recreational interests.

The Middle Fork of the Clearwater River in Idaho, one of the first National Wild and Scenic Rivers, commanded two post-audits. VanLeuven (1980) focused on the efforts to involve the public in the development and management of the scenic river program. He reviewed and critiqued the public involvement program that led up to the development of the federally mandated River Plan, as well as the following public education period that prepared people for the acquisition of scenic land easements according to the plan. Following from this study, Brooks and Michalson (1980) evaluated the economic impacts of wild and scenic status upon the area's resources and land values.

VanLeuven (1980) employed three methods to review the human impacts of the public participation program. First, he surveyed landowners along the river corridor and other individuals involved to gauge their reactions to the scenic river status and their opinions on development issues facing the program; he inquired about their participation in the public involvement program; and he ascertained the sources by which the public had gained information about the river's designation and ongoing management program. His second method, a "personal value analysis," created general personal and social value profiles for the various groups based on how the respondents ranked values such as freedom, a world of beauty, and social recognition. VanLeuven asserts that such approaches are useful planning tools; determining personal or group values facilitates development of appropriate public involvement techniques and reduces communication problems. Finally, VanLeuven evaluated the public involvement program based on U.S. Forest Service public involvement objectives, drawing in part on concerns expressed during interviews with participants in the public attitude and personal value surveys. VanLeuven concluded that there was a lack of understanding of scenic easement appraisal procedures, and that the public perceived inconsistencies between the expectations of private landowners with easements and the management of lands by government agencies. He recommended a new public information and involvement effort to improve the situation and to renew public support for the program.

Agricultural economists Brooks and Michalson (1980) applied qualitative and quantitative methods to examine the economic effects of the scenic easement program for the Middle Fork of the Clearwater River. They used regression analysis to determine the significant variables influencing easement payments in order to evaluate the consistency of the appraisal process and the equity of the payments. They also compiled data on agricultural, timber, and mining resources over time, using descriptive analysis to estimate the economic impacts of the program on the industries. To collect this data, Brooks and Michalson interviewed public and local industry officials, and also utilized VanLeuven's (1980) data collected from private landowners. Finally, they compared the value of land with and without easements based on the appraised values and on recent sales in the scenic river corridor and surrounding area. They concluded that the easement program had decreased the price of land within the corridor, although not as significantly as originally thought, but that the effects on the timber, agriculture, and mining industries were insignificant. Finally, they found the appraisal techniques to be consistent and acceptable, but were unable to draw definitive conclusions concerning the equity of the easement payments due to unexplained variation in the regression model.

With increasing attention on assessing projects' environmental impacts, both nationally and internationally, the need to monitor and audit impacts after project completion has risen. To make post-project analysis more systematic among Canadian agencies, Davies and Sadler (1990) prepared post-project analysis guidelines for Environment Canada. The guidelines include general checklists for planning and conducting the post-project audit. Auditing identifies changes as a result of the project, compares the predictions made to the actual impacts, and reviews the utility of mitigation. While monitoring can be used to adjust mitigation, it can also serve as the basis for the audit. Davies and Sadler (1990, 30) recognize that their report focuses on the "physical and natural environments," and call for new guidelines for use in monitoring and auditing social impacts and improving social impact assessment methodology. Analyzing projects' effects is important not only for the particular project under study, but for improving the design of future projects and the assessment of their likely environmental impacts.

INTASA (1972) conducted condensed post-audits for the primary purpose of improving planning techniques. The study goal was to propose a methodology for planning and evaluating multi-purpose water resource projects, taking into account economic, social, and environmental considerations. Three post-audits illustrated the proposed methodology. The authors contrast the multi-objective planning approach with the use of benefit-cost analysis, a single objective method geared toward national economic efficiency. After introducing the procedural concepts behind multi-objective project analysis for planning and evaluation, the post-audits serve to identify and analyze project issues in order to clarify and validate the new planning concept. The observations regarding the Coyote Valley Dam (Lake Mendocino) and the Solano Project (Lake Berryessa) in California, and the Crooked River Project (Prineville Reservoir) in Idaho, point out specific examples where economic predictions failed to address actual regional impacts, needs, and changes. The authors call for more post-audit analyses, ranging from “detailed evaluations of a single project aspect to comprehensive overviews of integrated project impacts” in order for the new concept to replace traditional planning with its emphasis on economic efficiency (INTASA 1972, iii).

Comprehensive Post-Audits

The leading proponent of comprehensive post-audits is geographer Gilbert White. White (1988b, 53) defines post-audit as "…a convenient descriptor of the process by which the outcomes—intended or unintended—of an activity are evaluated, assessed, or audited. Objective analysis of all the relevant evidence is implied." A post-audit "can only be as complete as the number of impacts that are examined" (White 1977, 11). Unfortunately, post-audits are usually limited in scope. White holds, "To my knowledge there has not yet been a thorough, comprehensive post-audit of any major water project" (1988a, 38), and only one "searching appraisal" of a river basin affected by flood control act expenditures exists: Galloway's (1980) "ex post evaluation" of the regional water resources development in the Yazoo-Mississippi Delta (White 1988b, 53).

In his post-project review, Galloway (1980) sought to demonstrate the utility of geographic analysis by integrating a range of factors into a single study. His research question is: "[W]hat would the Delta look like today if there had been no federal support of flood control and navigation efforts over the last fifty years?" To answer this question, he applied a variety of analytic techniques. He did not aim to judge the *value* of flood control, but to provide a *methodology* capable of identifying the differences with or without project implementation (in this case, water resource development). At the same time, he explored the capabilities of this method in determining the macro effects (basin scale) of individual projects. Galloway identified four broad categories of research approaches utilized in previous ex post evaluations: studies that compared predicted to actual performance; studies that examined only what happened; studies that created a picture of the "without project" conditions; and historical reviews. He developed a multi-step procedure incorporating aspects of each of these, culminating in a comparison and contrast of conditions "with" and "without" development.

Galloway's study illustrated the possibilities of taking both physical geography and human geography into account, incorporating analysis of both "man and environment" relationships and spatial relationships of social and economic factors (1980, 5). The technique of analog analysis enabled him to determine "without" water development conditions by locating and analyzing an area analogous to the study area. He used both qualitative and quantitative (cluster analysis and factor analysis) analyses to locate an analog area. A number of economic, socio-cultural, and environmental indicators provide the comparison between conditions with and without water development.

Galloway found that without the development of the levee system, the Yazoo-Mississippi Delta area would have returned to a largely uninhabited bottomland wilderness. Had only the main stem levees been developed but not the interior water resources, there would have been less land available for agriculture, but manufacturing would have been more developed; although fewer people would be living in the area, they would be better off than under the actual conditions of water resources development.

Galloway concluded that there were several limitations in applying his methodology to future studies. He noted that the methodology as developed decreases in accuracy as the magnitude of the physical impacts diminish. In addition, the analog techniques were more appropriate in this case because the development involved primarily flood control; the relationship between the physical geography of an area and the potential for flooding allowed contrasts to be more clearly defined than if the development had pertained to hydropower, recreation, navigation, or water supply. Still, Galloway felt that his approach allowed a relatively quick and inexpensive assessment of the total impacts of a water resources project. While his study took two “man-years,” a professional team might conduct the necessary field work and achieve a similar product in six to eight months (Galloway 1980, 198).

Geographer Earl Cook led a team conducting a comprehensive reservoir impact study on Canyon Dam and Reservoir on the Guadalupe River in Texas (Cook *et al.* 1974). The research objective was to compare the actual impacts of the project to the expected results from construction of the dam. One major obstacle was determining the baselines of measurement. The team drew upon the benefit-cost analysis of the U.S. Army Corps of Engineers and the records from the 30-year planning period, but found that data on streamflow, vegetation, wildlife, and economics were either non-existent or defective. The study included a sociological analysis focusing on perceptions of the impacts of dam-reservoir projects in the area (Schaffer 1974); an examination of how the dam may have affected both community and individual adoption of damage-reducing adjustments, in particular flood insurance (Baumann and Simkowski 1974, Baumann 1974, Simkowski 1974); a review of the hydrologic implications of the project (Clark 1974); an assessment of the impacts on wildlife (Cain 1974); a comparison of the achieved benefits and costs to the anticipated benefits and costs (Cook 1974b); and projections on the recreational, demographic, and economic impacts of the project (Stribling *et al.* 1974).

The researchers employed a wide variety of methods to compare the actual conditions to the conditions that would have prevailed had the dam not been built. To study the perceptions toward dam projects in the area, Schaffer (1974) followed up a mail questionnaire with in-depth interviews, surveying both early reactions to construction and later views on impacts on the community. She found that community members were generally satisfied with the Army Corps of Engineers' performance in planning, construction, and operation of the projects. The one exception to this satisfaction was with the Corps' process of land acquisition. Interviews of community members also provided data for a study of the relationship between the perceived protection of Canyon Dam and the purchase of flood insurance (Baumann 1974). Floodplain dwellers to be interviewed were selected from two communities downstream from Canyon Dam. Baumann found that the people more likely to have bought flood insurance included those with more education and higher incomes and those who had experienced damage in the past.

The lack of data on pre-project conditions made it difficult for Cook's team to assess the physical impacts of the project. The hydrologic portion of the study presented data on the reservoir operations, including the storage record, evaporation, precipitation, inflow, outflow, and peak flood flows (Clark 1974). Two significant findings were that dam construction reduced flood peaks below the dam and that, despite fears during planning, there has not been detectable leakage from the reservoir. Because little pre-impoundment information was available on wildlife in the reservoir area, Cain (1974) conducted a biological survey above and below the reservoir to detect changes, assuming that these habitats would be similar to the one inundated. Based on surveys of birds, mammals, reptiles, and fish, Cain concluded that mammals were least affected by the creation of the reservoir, while fish were the most affected group.

Assessment of the project's economic impacts included a comparison of predicted to actual performance and a comparison of the actual conditions to hypothetical "without project" conditions. In his review of the actual benefits and costs of Canyon Dam, Cook (1974b) found that the benefits of flood-loss reduction and water conservation were less than anticipated, while the benefits of recreation exceeded the predictions. Finally, Stribling, *et al.* (1974) extrapolated historic recreation, demographic, and economic data to compare the existing post-project condition to predicted conditions had the dam not been built. Major impacts attributed to the dam included development of residential and recreational facilities in the floodplain downstream from the dam, numerous new subdivisions around the reservoir, and some new developments along access roads and in surrounding urban areas in the county. Land values around the reservoir were rising, and the new residents had significantly higher incomes than older residents in the area.

In assessing the wide range of impacts produced by a project, one of the fundamental questions is how long you must wait after project completion before reviewing the effects. For water resource development projects, Cook (1974a, 1.43) suggests a balance between the need for the impacts to have "reached a certain maturity," but before they "become overlaid thickly by the effects of other developments, some of which may be nationwide." He tentatively suggests a window of ten to forty years. His team waited until ten years had elapsed after the dam was completed, but their research went back more than thirty years before the beginning of construction. White's (1988a, 5) examination of the effects of the Aswan High Dam was issued twenty-one years after the completion of the dam; he judged this "sufficient time to permit a first approximation of what is known about the dam's environmental effects and how they compare to what was anticipated when engineers and politicians decided to undertake the massive project."

Unlike Cook (1974a), who assembled a team to conduct a post-audit, White (1988a) summarized the existing literature on the Aswan High Dam, augmenting this information with his personal experience with the project. He found that extensive study of environmental effects allowed him to more fully identify these impacts than the social costs and benefits. For the most part, the side effects of controlling river flow, increasing irrigation, and generating hydropower were predicted. In three areas, however, he found that impacts were not fully anticipated: changes in water quality due to increased use of chemical fertilizer to compensate for the lack of nutrient-rich silt; the reduction of material for brick-making due to the silt deprivation downstream (which in turn caused brick-makers to encroach on agricultural lands); and the need for an upstream emergency flood outlet.

Obstacles to Post-Audit Analysis

Before undertaking a comprehensive post-audit, it is illuminating to examine why there are so few examples to follow. White (1988b, 57) presents three common reasons for avoiding post-audits: inadequate data, political hesitation, and cost. Fearing additional public criticism of a project, proponents minimize the study of impacts that provide the baseline data integral to post-audit analysis. Once the project is constructed, critics lose the incentive for evaluating it. Proponents and administrators are more concerned with showing the project's values than its impacts, and are content to merely address "immediate difficulties" as they arise (White 1988a, 38). In such an atmosphere, covering the costs of monitoring and researching impacts is a low priority.

Cook (1974a, 1.41-1.43) places deterrents to post-audits into four categories: psychological, political, institutional, and social. Psychological deterrents reflect three conventional doctrines: that of positive externalities, which holds that the benefits of resource development will extend beyond those directly involved to larger regional and national benefits; the belief that water resource use, particularly for agriculture, is inherently virtuous; and the belief that ties economic progress to water availability. Political deterrents include the "political currency" which public projects afford to politicians who support them. Institutional deterrents result from the large number of people in the business of planning and building projects, making the selection of non-development alternatives difficult. Finally, Cook notes a social deterrent that will exist as long we continue to price water based on what communities will pay instead of its actual cost; studies that suggest more sustainable development are not socially acceptable.

The lack of a clear paradigm does make the post-audit task difficult, but not impossible. As White (1988b, 58) notes, "An obvious impediment to executing a solid, careful post-audit is that it is difficult to do. There are few precedents for it and there are not many people skilled in the methods (asserted with conviction from my own failures)." Ideas on methods to apply and on what to look for abound in the above examples of non-comprehensive and comprehensive post-audits. What stands to be gained by careful review of a project should outweigh the inherent risk that significant impacts will be overlooked. After all, a post-audit is not the final word on a project; rather, it attempts to capture the apparent effects to date, and in doing so provides the basis for the next project review.

CHAPTER 2

THE PROJECT AND ITS ENVIRONMENTAL IMPACTS

Largely because of the controversy surrounding New Melones Dam, there is a wealth of literature on the project. In addition to the environmental review documents, background studies, and plans produced by government agencies, there are several commentaries by academics and environmentalists.

This chapter briefly reviews the environmental review documents, major commentaries, and master plans relating to New Melones. Although federal government agencies won all the legal battles that ultimately enabled the project to be fully operational, the century ended with the USBR still struggling to produce a long-term operating plan for New Melones Dam. By understanding the current planning process, and the integral involvement of the Stanislaus River Basin Stakeholders, it becomes easier to understand why so many of the issues raised in the environmental review documents remain unresolved twenty years after the dam was completed.

The Environmental Review Documents

Three years after Congress passed the National Environmental Policy Act of 1969 (NEPA), the Corps issued the initial Environmental Impact Statement (EIS) for the New Melones Project (USACE 1972). The document described the project itself, the environmental setting without the project, and the environmental impacts of the proposed actions. The Corps estimated benefits from flood control, irrigation, power generation, recreation, fish and wildlife, water quality control, and area redevelopment. They found, however, five unavoidable adverse environmental effects: the loss of whitewater boating; the loss of historic, archeological, and geological sites; the loss of scenic values; the reduction of water quality; and the loss of wildlife and wildlife habitat. The brief discussion of alternatives included an examination of other reservoir sites, various reservoir sizes, options other than constructing a reservoir, and alternatives to the planned operation. The Corps committed the U.S. Bureau of Reclamation to filing a supplemental environmental impact statement on the impacts of operating the reservoir and the use of its water supply prior to operating the reservoir for water conservation (USACE 1972, 78). Because the USBR could not determine the exact areas where the water would be used in the first supplemental EIS (USBR 1972b), the Federal District Court ordered a second supplemental EIS be produced prior to operating the project and executing water service contracts (USBR 1980a, i and1980b, 26).

Even after the USBR completed the second supplemental EIS (USBR 1980a and 1980b), it was still restricted from operating the project at full capacity. In April 1973, the State Water Resources Control Board issued Decision 1422, denying the filling of the reservoir to capacity until the Bureau showed firm commitments for the water. For the State, this was an issue of state power; the state had not opposed the project throughout the planning process until the time came to issue the final permits to fill the project. The State sought to restrict the federal government from storing a state resource (the water of the Stanislaus River) without demonstrating how the water was to be used. The legal battle over how much water could be stored and delivered by New Melones raged for a decade (Seglund 1982; 5, 10-11).

While the project was tied up in the courts, opponents sought a variety of other means to stop the project. Voters had the opportunity to change history at the polls through the state initiative process, but both Proposition 17 in November 1974 and Proposition 13 in November 1982 failed to pass. In 1974 and 1976, opponents tried to achieve protection of the Stanislaus through California Wild and Scenic Rivers System designation. They next turned to the national front, seeking federal legislation in 1979 to add portions of the Stanislaus River to the National Wild and Scenic Rivers System under the Wild and Scenic Rivers Act (Seglund 1982, 6). None of these attempts proved successful.

Commentaries on the Controversy

As the battle over New Melones raged, numerous published accounts captured the controversy. Randolph and Ortolano (1975) examined how NEPA impacted the Corps' decision-making process for New Melones, a particularly intriguing question because the project was authorized and preliminary construction begun before NEPA. In order to explore project design changes attributable to NEPA, Randolph and Ortolano analyzed the history of the project and the opposition to it. Jackson and Mikesell (1979) wrote a detailed history of water use in the larger Stanislaus River Basin. For them, New Melones was only one element, albeit the “most ambitious of several proposed development plans for the river” (Jackson and Mikesell 1979, iii). Distinct from the academic literature, the Western Water Education Foundation (Seglund 1982) published a “layperson’s guide” to the project and the controversy—just before the wet winter of 1982-1983 decided the fate of the Stanislaus Canyon. Finally, Tim Palmer (1982) produced the most colorful account of the place and the people struggling to save it from inundation.

Parry and Norgaard (1975) argued that construction of New Melones Dam should be held up until the Corps reevaluated its benefit-cost analysis, that is, the ratio of the predicted annual benefits to the predicted annual costs. According to their calculations, the Corps greatly overestimated benefits and underestimated costs of the project in the EIS (Table 1). Interestingly, the benefit-cost ratio in the 1972 EIS (1.7:1) was considerably lower than the previous 1962 estimate (2.5:1) or the later 1979 estimate (2.3:1) (Parry and Norgaard 1975, 18; Palmer 1982, 58).

TABLE 1: NEW MELONES DAM: BENEFITS AND COSTS (in dollars)

	Estimate of the Corps (USACE 1972)	Estimate of Parry and Norgaard (1975)	
		Low	High
BENEFITS:			
Flood Control	1,940,000	700,000	1,300,000
Irrigation	3,610,000	0	0
Power generation	5,578,000	3,900,000	7,240,000
General recreation	910,000	0	0
Fish and wildlife	640,000	270,000	494,000
Water quality	180,000	0	0
Area redevelopment	635,000	0	0
TOTAL	13,493,000	4,870,000	9,034,000
COSTS:			
Interest and amortization	5,972,000 (3-1/8 percent)	13,500,000 (6-7/8 percent)	
Taxes foregone	935,000	935,000	
Operation and maintenance	934,000	934,000	
Free-flowing river recreation lost	0	200,000	
TOTAL	7,841,000	15,569,000	
Benefit-cost ratio	*1.7-to-1*	*0.31-to-1*	*0.58-to-1*

Managing New Melones Dam and Reservoir and the Lower Stanislaus River

A number of documents outline the management, policy, and operation of the completed project. It is these plans, not the environmental review documents, that are shelved at Central Valley Project Operations (USACE 1980), New Melones Administrative Offices (USACE 1976a), and Stanislaus River Parks headquarters (USACE 1977). However, there is currently no overall plan for operations that takes into account all of the project purposes and the needs of all of the stakeholders.

Long-Term Operating Plan and the Stanislaus Stakeholders

The USBR is currently planning New Melones operations on a year-to-year basis as officials continue to work toward developing a long-term operating plan. In 1995, the USBR set its goal of developing “a management plan with clear operating criteria for available water supplies in the Stanislaus Basin on a long-term basis.” As this effort continued into the following year, stakeholders sought to stay informed of the USBR’s progress, plans, and decisions. With Stanislaus River Basin Stakeholders’ involvement, the focus shifted to developing an interim plan for 1997 and 1998 operations. A final interim plan for operation of New Melones Reservoir (USBR 1997b) was agreed upon at a stakeholders meeting on 29 January 1997, a product of the efforts of the USBR and the U.S. Fish and Wildlife Service, along with the Stanislaus Stakeholders (Ploss 1997). Because stakeholders could not agree on how New Melones should be managed during an extended drought, the interim plan does not cover drought conditions—one important reason why a long-term plan is needed before such conditions occur. The USBR’s current timeframe for the long-term operating plan is to complete the plan formulation in fiscal year (FY) 2000, analyze and evaluate the plan in FY 2000-2001, develop the draft plan and draft

EIS/EIR in FY 2002, and finalize the operating plan and EIS/EIR in December 2002 (USBR 1999).

The USBR acknowledges that there are numerous ongoing processes and regulatory uncertainties affecting the long-term operating plan, but the agency remains committed to completing it. While the precise regulatory requirements affecting the basin are uncertain, the plan will undoubtedly be affected by the Federal Energy Regulatory Commission's hydropower relicensing on the Stanislaus River; the State Water Resources Control Board's Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta; state and federal listings of endangered species; and water allocations for fish and wildlife under the Central Valley Project Improvement Act (CVPIA). In addition, a long-term operating plan is needed in order to extend the interim water supply contracts with Stockton East Water District and Central San Joaquin Water Conservation District (USBR 1999, Moore 1999).

As the process of developing a long-term operating plan continues, the future of the stakeholders group is uncertain. From monthly meetings through most of 1997, the USBR dropped the frequency of the meetings to quarterly in 1998, and announced that funds would not be available for facilitation of the meetings after 1 October 1998, although the USBR would continue to participate in the meetings. While the USBR did come up with carryover funds for the next meeting in January 1999, it withdrew funding for facilitator Kevin Wolf for the following meeting in April 1999 (Stanislaus Stakeholders Undated-a, Undated-b, 1998a, and 1999a). The long-term operating plan's project manager explained, "Kevin has served us very well these past three years. His meeting skills and knowledge of the issues have been invaluable in the progress that has been made to date. However, a facilitator must serve with the consent of all major stakeholders" (Whitson 1999). As became obvious at the meeting of 19 April 1999, the majority of the stakeholders supported Kevin Wolf, but the senior water rights holders, Oakdale and South San Joaquin Irrigation Districts, vehemently opposed having him continue to serve as facilitator for the group. A USBR staffperson facilitated the only other stakeholder meeting held in 1999. When the stakeholders again convened on February 24, 2000, the USBR announced that the stakeholders group as it had existed was not going to function anymore. Given limited funds, it was decided that it was more important to put the available money toward ongoing studies (Moore 2000). The USBR is developing a Findings Report to summarize the stakeholder process to date and to identify stakeholder issues and alternatives relating to the long-term operating plan (USBR 1999).

I attended several Stanislaus Stakeholder meetings in 1998 and 1999, and can understand the frustration of everyone involved. At each meeting, more than thirty attendees fill the conference room at the Stockton East Water District. The agendas of the half-day meetings include updates from committees on the multitude of issues and studies that will influence the final long-term operating plan. Attendees include representatives of local, state, and federal government agencies and of water districts, as well as representatives from the Stanislaus River Flood Control Association, formed by locals to push for the completion of New Melones after the December 1964 flood (Randolph and Ortolano 1975, 241). These include a downstream dairy farmer and a rancher who come to voice the concerns of the agriculturalists along the lower Stanislaus River. There is something exemplary about the gathering together of so many of the concerned parties on a regular basis, but it is difficult to envision solutions that will satisfy all stakeholders. It is also interesting to note who is not participating. As one fish biologist pointed out, most of the people attending the meetings are either bureaucrats or lawyers—missing are local environmentalists, fishers, canoe paddlers, and birdwatchers (Hamilton 2000). Appendix A contains a list of participants in the stakeholder process.

The comparison of expected to actual impacts that follows is closely tied to the current planning process. The discussion is structured according to the planned multi-purpose project benefits, but the discussion of the issues themselves is reminiscent of a stakeholders meeting. Managing these benefits to the satisfaction of the stakeholders is the task at hand.

CHAPTER 3

THE POST-AUDIT: EVALUATION OF PROJECTED VERSUS ACTUAL IMPACTS

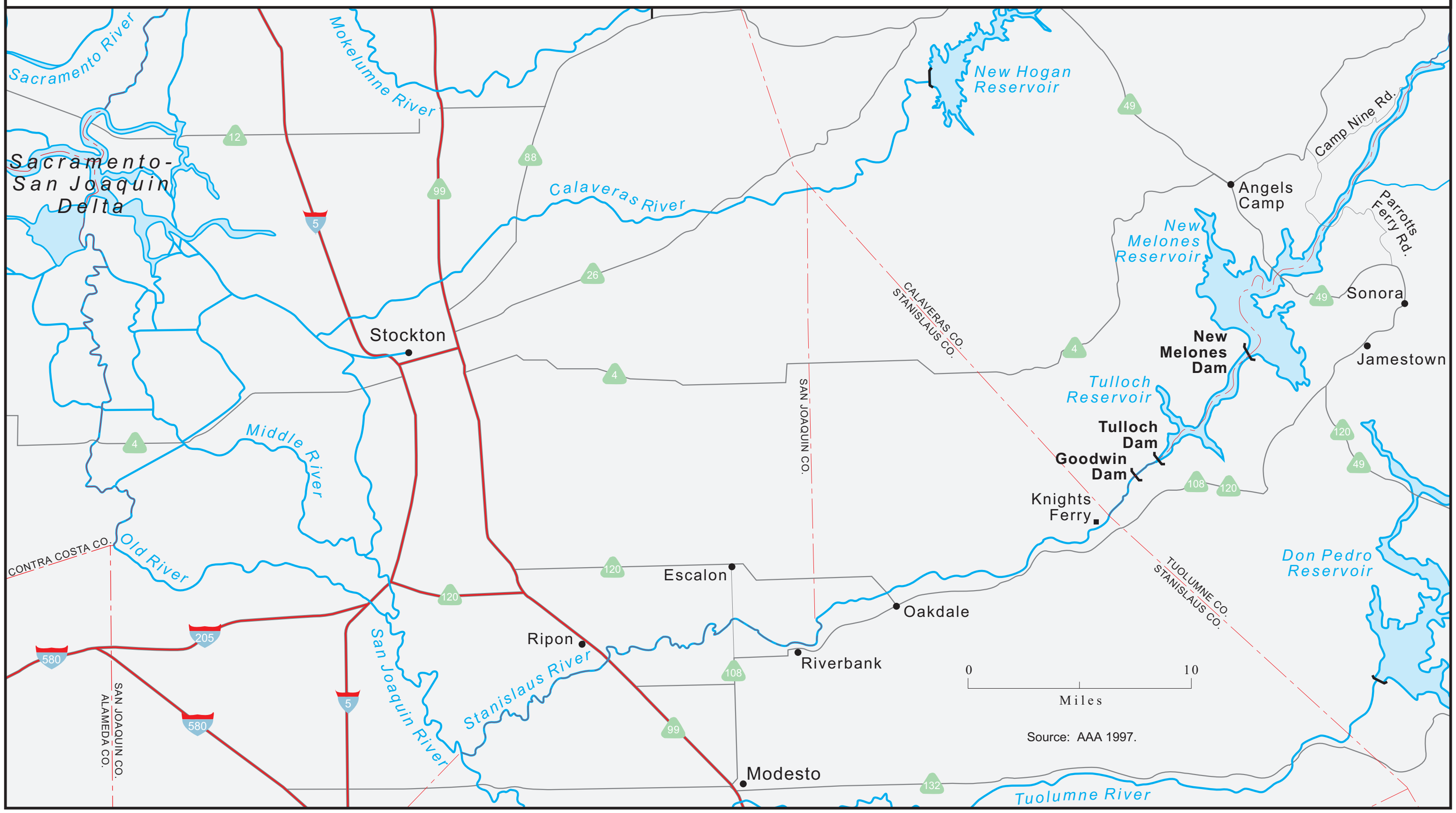
This chapter compares the actual impacts of the New Melones Project to the benefits predicted. After briefly reviewing the history of water development in the area and the historic flows of the Stanislaus River at the dam site, each project purpose will be looked at in detail: fishery and water quality, water supply, flood control, hydropower, and recreation. The baseline for comparison of actual to projected impacts is the U.S. Army Corps of Engineers' Environmental Impact Statement (EIS) (USACE 1972). The supplemental environmental review documents, governmental studies and plans, and commentaries introduced in Chapter 2 are also important references. To assess the situation today, I attended Stanislaus Stakeholder meetings and had numerous conversations with people managing the dam and reservoir, other agency representatives involved in Stanislaus River issues, and people affected by the project. Despite the many conflicting points of view about management of New Melones, I strove to develop a balanced description of the issues. In trying to assess the actual impacts, future research needs become apparent; Chapter 4 will summarize these needs.

BACKGROUND AND ENVIRONMENTAL SETTING

The Gold Rush spurred water development along the Stanislaus River. Initially, water companies formed to divert water in the foothills to serve the mines. With the formation of utility companies in the late 1890s, hydroelectric power generation began; much of this power was exported for use outside of the area. In the early 1900s, irrigation districts continued the tradition of water development along the Stanislaus River. Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID) constructed Melones Dam and Reservoir in 1926, capable of storing 112,000 af of water. The two districts again joined forces in the 1950s to build the Tri-Dam Project. With a total reservoir capacity of 230,000 af, the Tri-Dam Project consisted of Donnells and Beardsley Dams, Reservoirs, and Powerplants on the upper Stanislaus River; and Tulloch Dam, Reservoir, and Powerplant downstream from Melones Dam (Map 2). As part of the project, the districts also enlarged Goodwin Diversion Dam "to provide some afterbay capacity for operation of Tulloch Powerplant" (USBR 1980b, 23; CDFG/USBR 1987b).

OID and SSJID opposed the federal government's New Melones Project, supporting instead a New Melones Dam constructed through local cooperation. However, the Christmas Day flood of 1964 broke down local resistance to the federal project; downstream landowners now urged the government to build New Melones as quickly as possible, sparing them future damage. Congress

MAP 2: NEW MELONES DAM REGIONAL MAP



responded by increasing appropriations for the project. While the amount of money appropriated was insignificant compared to the total construction costs, it assured the local community of the government's commitment to finally constructing New Melones Dam (Jackson and Mikesell 1979, 77-80).

With a reservoir capacity of 2.4 maf, the storage available in the completed federal project was much greater than the 1.1 maf reservoir that local interests had hoped to build. Above the dam site, the Stanislaus River drains an area of about 900 square miles. The Corps calculated the average annual flow of the Stanislaus River at the dam site to be 1,130,000 af. Taking into account existing diversions, future water needs in the basin, and allocations for water quality, the Corps initially estimated an additional 150,000 af of water would be available due to the project (Randolph and Ortolano, 1975; USACE 1972; 12, 34-35).

Looking at average monthly streamflow, the Corps found considerable variation from year to year at the dam site during the period of record (1921 to 1946). Within each year, there was also a considerable range of flows. The average monthly flows ranged from a low of 329 cfs in November to a high of 3,846 cfs in May. It must be noted that the existing Melones Dam, ¾ of a mile upstream from the New Melones Dam site, was completed in 1926, so the figures obtained for the period of record are largely based on managed flows.

The highest recorded flow into the existing Melones Reservoir was 102,000 cfs on 22 December 1955 (USACE 1972; 1, 12-15).

FISHERY AND WATER QUALITY ISSUES

The project objectives of enhancing the fishery and improving water quality are best discussed together. Both efforts benefit the environment, and both require that water be left in the Stanislaus River downstream of New Melones Dam, rather than being removed from the river to be used as water supply. In addition, fishery and water quality issues are not confined to the lower Stanislaus River, but are closely linked to management of the lower San Joaquin River, the Sacramento-San Joaquin Delta, and San Francisco Bay (Maps 1 and 2). How have fishery and water quality issues evolved since the 1972 EIS? Final decisions on fishery and water quality requirements for the lower Stanislaus River hinge on ongoing studies and decisions at both the state and federal level. In sharp contrast to the marginal attention they received when the Army Corps of Engineers drafted the environmental review documents, fishery and water quality issues are now controlling factors in the long-term operating plan. Resolution of these issues now threatens the fulfillment of other project purposes.

Fishery and Water Quality Benefits

In the EIS (USACE 1972), the Corps established minimum releases for meeting water quality criteria and sustaining the fishery. Up to 70,000 af each year would be released to enhance water quality. The $180,000 in water quality benefits were two-fold. Water released from New Melones Dam would improve water quality in the lower San Joaquin River, limiting the total dissolved solids (TDS) to 500 ppm, and would also benefit the downstream fishery by maintaining a dissolved oxygen concentration of at least 5 ppm in the Stanislaus River. Fish and wildlife benefits of $640,000 per year were based upon increased fishing both in the reservoir and downstream (excluding commercial fishing). The fishery in the lower Stanislaus River would be supported by minimum releases of 98,000 af during normal years and 69,000 af during dry years (USACE 1972; 3, 9-10).

According to the Corps, the fishery in the lower Stanislaus River would be enhanced by both the water quality and fishery releases as well as by other plans in progress. Looking at downstream temperatures between 1926-1946, the Corps found that during August, September, and October temperatures were "almost never in the range specified as acceptable for fish." With the project in place, however, they predicted that only rarely (during extreme drought conditions such as those experienced from 1931-1936) would temperatures exceed recommended conditions during these same months (USACE 1972, 54-55). Another existing problem was that Melones, Tulloch, and Goodwin Dams blocked gravel from replenishing the downstream salmon spawning grounds, and mining of downstream gravel for building material exacerbated the problem

(Map 2) (USACE 1972, 19). However, the Corps' plan for the Lower Stanislaus River would include plans for preserving streambed gravels, in addition to increasing public use and maintaining a downstream flood carrying capacity of 8000 cfs (USACE 1972, 58-59).

1987 Agreement between the CDFG and the USBR

The California Department of Fish and Game (CDFG) and the USBR reached an agreement regarding interim instream flows and fishery studies to be completed for the lower Stanislaus River in 1987. In 1984, the USBR had filed applications for water diversions that would affect both the amount and timing of instream flows in the river below New Melones Dam. The CDFG protested the applications, asserting that without scheduling appropriate flows the USBR would be adversely affecting salmon and other resources in both the Stanislaus and the lower San Joaquin Rivers, and identified studies needed to establish appropriate flows. The State Water Resources Control Board had already identified the need for such studies in Decision 1422, and although some work had been completed, there were still not adequate data to determine the flows necessary for the salmon fishery. The 1987 agreement served to dismiss the CDFG's protest against the USBR by providing for appropriate flows for the fishery until the habitat requirements could be better defined and by detailing the biological studies necessary to identify long-term instream flow needs of the

Stanislaus River chinook salmon fishery. In addition to the study program, the USBR and the CDFG agreed to work with other agencies to develop conjunctive use programs that would augment flows to improve the fish habitat (CDFG/USBR 1987a).

The interim instream flow agreement set a wide range of acceptable flows to be made available for the fishery until long-term needs could be established. The agreement provided a schedule and equation for the USBR to compute the water available for fishery instream flow releases so that the CDFG could provide annual release schedules, setting a minimum annual supply of 98,300 af and a maximum annual supply of 302,100 af. The minimum annual supply roughly matched the minimum release of 98,000 af for normal years as set forth in the EIS (USACE 1972, 3). However, in the 1987 agreement the CDFG suggested that the fishery might actually require flows up to 302,000 af at Goodwin Dam (Map 2). “Flows of this magnitude would require the full yield of the project and could significantly alter the project operations and economics” (CDFG/USBR 1987b, 1). In addition to the agreed upon range of the annual supply available for the fishery, the CDFG agreed that flows would at no time exceed 1,250 cfs except at the discretion of the USBR (*e.g.*, flood control and water quality) (CDFG/USBR 1987a).

The study plan in the 1987 agreement estimated that data collection and evaluation by the USBR, the CDFG, and the U.S. Fish and Wildlife Service

(USFWS) would take seven years. With study elements divided among the three agencies, the agreement was to (1) evaluate instream flow requirements; (2) evaluate distribution and growth of juvenile salmon; (3) define timing and magnitude of downstream migration; (4) determine annual spawning escapements; (5) evaluate spawning habitat suitability and improvement needs; (6) install and monitor temperature stations and develop a temperature model; and (7) coordinate and integrate studies with other agencies and groups (CDFG/USBR 1987b, 7-12). Upon completion of the studies, the State Water Resources Control Board would work with the USBR and the CDFG to develop a long-term plan to protect the fishery (CDFG/USBR 1987a).

Evolving Fishery and Water Quality Issues

In October 1999, the Stanislaus Fish Group organized a presentation for the Stanislaus Stakeholders. Originally formed when the Stanislaus Stakeholders began helping to formulate the long-term operating plan for New Melones, the Fish Group still meets periodically to coordinate Stanislaus River fish restoration actions and evaluations. One of their goals is to provide information; to this end, they organized a symposium where presenters explained the roles and responsibilities of the various agencies involved in the Stanislaus River and described past and present fishery work on the Stanislaus (Fleming 1999). The progress report on completion of the study elements in the

1987 CDFG/USBR agreement indicated that while some of the work had been partially completed, all of the study elements were in need of more work (Guinee 1999, Loudermilk 1999). Despite the progress, fundamental gaps in understanding the fishery remain, forming an obstacle to developing a long-term operating plan for New Melones Reservoir.

Stakeholders view the federal listing of Central Valley spring-run chinook salmon and Central Valley steelhead as additional impediments to the resolution of Stanislaus fishery management issues. The National Marine Fisheries Service (NMFS) listed Central Valley steelhead as threatened in March 1997; although the proposed critical habitat map will probably not be finalized until 2000, it is known that steelhead are currently spawning in the Stanislaus River below Goodwin Dam. In September 1999, the NMFS listed Central Valley spring run chinook salmon as threatened; Central Valley fall/late fall run chinook salmon were not listed at that time, but remain a candidate for listing (Stern 1999, NMFS 1999).[1] The finalization of the habitat identification for the spring run salmon will be forthcoming, and will likely impact the Stanislaus River since the spring run was probably eliminated in the Stanislaus River by water developments in the period 1910-1930 (CDFG/USBR 1987b). The Federal Endangered Species Act

[1] Spring run chinook salmon move upstream during the period of heaviest snowmelt (May-June) but do not spawn until the fall; fall run chinook salmon move upstream during fall or early winter and spawn shortly after their arrival (CDFG/USBR 1987b).

requires that federal agencies taking action that would affect a listed anadromous species consult with the NMFS, making the NMFS another player in the development of the New Melones long-term operating plan (Stern 1999). As fishery biologists continue to study what flows and temperatures are ideal for both chinook salmon and steelhead at different life stages, the listings may affect both the amount and timing of water released down the lower Stanislaus River.

New Melones Dam's place in a far larger system further complicates the management of the fishery as well as water quality. On an administrative level, New Melones Dam is but one component in the USBR's Central Valley Project. The Stanislaus River is one of many San Joaquin River tributaries, and the delta at the confluence of the San Joaquin and Sacramento Rivers marks the entrance to the San Francisco Bay. Plans for the Central Valley Project and for all features downstream of the Stanislaus River influence the development of a long-term operating plan for New Melones. The Central Valley Project Improvement Act (CVPIA), enacted by Congress in 1992, set the goal of doubling anadromous fish populations from the average levels between 1967-1991 by the year 2002 (PL 102-575, Sec. 3406(b)(1)). Toward meeting this objective, CVPIA directed the development of the Anadromous Fish Restoration Program (AFRP), and allocated 800,000 af of Central Valley Project yield for fish, wildlife, and habitat restoration purposes (USBR 1997a). One plan emerging out of discussions between agencies and stakeholders on how to implement environmental measures in the lower San Joaquin River is the Vernalis Adaptive Management Plan (VAMP). VAMP is an ongoing experiment to determine the effects of increasing the water flow at Vernalis (just downstream from the confluence of the Stanislaus and San Joaquin Rivers) on the salmon smolt survival through the Delta (U.S. Dept of the Interior 1997a and 1997b). For water quality, the State Water Resources Control Board is responsible for establishing water quality requirements and the flows necessary at Vernalis to meet the objectives (California Environmental Projection Agency 1995).

With so many ongoing studies, programs, and plans, and with the complexity of the bureaucracy governing the fishery and water quality, the Stanislaus Fish Group plays a vital role in disseminating information. In assessing what biologists do and don't know about the fishery, the Fish Group also serves to identify information gaps and to guide future efforts so that funds can be used most effectively and duplication of efforts can be avoided. Although they are a technical advisory group without decision-making authority, the Fish Group is thus necessary even if the Stanislaus Stakeholders ceases to meet (Fleming 1999). Table 2 is a summary report of ongoing Stanislaus River fishery projects put together by the Stanislaus Fish Group.

TABLE 2: STANISLAUS RIVER FISHERY SUMMARY REPORT

NAME	PROJECT DESCRIPTION	STATUS
Adaptive Management Plan (by Carl Mesick)	Plan developed to be a guiding document for Stanislaus Restoration	Awaiting implementation
CalFed Gravel Restoration (by Carl Mesick)	Replenishing gravel in spawning areas	Scheduled for 1998-2001. Pre-project monitoring underway, gravel in water August-September 1999.
Ecosystem Assessment Plan (by Steve Cramer)	Effort to assess ecosystem function	Not funded thru CalFED; could be reviewed again
Goodwin Canyon Gravel Restoration	Introducing gravel into Goodwin Canyon	Gravel introduced in 1998 and 1999 was utilized by salmon in Fall 1999. Funded by San Joaquin River Management Program for years 2000-2002.
Land Acquisition Efforts	USFWS (AFRP & Refuge system) acquiring parcels for restoration	Mohler property acquisition underway. 2-Mile Bar property acquisition year 2000 action.
OID Radio Tracking Experiment	Evaluation of salmonid behavior and outmigration	Study completed 1998-1999, waiting on report
Rotary Screw Trap Monitoring	USFWS at Caswell, OID-SSJID at Oakdale	Ongoing 1993-present
Scale Reading and Growth Proposal	AFRP funding CDFG to carry out basin effort	2.5 year project that will incorporate others
Stanislaus River Temperature Modeling	Team effort to develop a comprehensive temperature model (USBR, OID-SSJID, USFWS, SEWD, CDFG)	Underway December 1998
USBR	Study flow fluctuations, ramping effects, and flows on root systems; data gathering; geomorphic evaluation	Underway; CDFG's effort to begin Fall 1999 and run three years
Willms Project	Restoration of an in-river gravel pit (funding from CalFed, AFRP, 4-Pumps Agreement)	Scheduled for 1998-2000+ but on hold indefinitely because landowner withdrew support

Sources: Stanislaus Fish Group 1999, Reed 1999, Spaulding 1999.

Resolving Fishery and Water Quality Needs with Other Project Purposes

After three years of working on development of a long-term operating plan, it is frustrating to the Stanislaus Stakeholders that management decisions hinge on the completion of scientific studies that will seemingly never be finished. Some stakeholders feel that the Stanislaus River has been shouldering more than its fair share of the burden to meet San Joaquin River water quality criteria considering the small proportion of flow contributed by the Stanislaus River[2]. One solution employed under the Interim Operations Plan has been to purchase water from senior water rights holders Oakdale and South San Joaquin Irrigation Districts, so that rather than the districts using some of their allotment, it is released as needed for the fishery (Read 2000).

The bottom line is that there is simply not enough water to fulfill all the purposes of New Melones Dam as planned. "It became clear during the 1987 to 1992 drought—before passage of the CVPIA—that the sustainable yield of New Melones Reservoir is insufficient to meet the demands which have been placed on it" (USBR 1997a). As the USBR models water year scenarios to develop a long-term operating plan, modeling efforts confirm that there is not enough water to meet the original water quality and fishery allotments in all water years

[2] The average annual unimpaired streamflow for the Stanislaus River is approximately 14% of the average annual unimpaired streamflow for the San Joaquin River (DWR 1998, 3-3; DWR 2000, 5; Stephens 2000).

(Thomas 1999). Although the average annual inflow between 1980 and 1999 (1,237,000 af) has exceeded the Corps' calculated average annual flow of the Stanislaus River at the dam site (1,130,000 af), the annual inflow has ranged from 324,000 af in 1988 to 2,747,400 af in 1983. Between 1987 and 1992, the six-year average was only 462,500 af (Ungvari 2000, USACE 1972, 34). Many stakeholders are leery of the future because decisions made to meet fishery needs and water quality criteria could limit the water supply available for agricultural and municipal uses; could influence how the project is managed for flood control; could restrict the amount of hydropower generated by dictating the timing and amount of releases; and could affect recreation both upstream and downstream.

WATER SUPPLY

Water Supply from the New Melones Project

Before any water could be diverted for use by the Central Valley Project, the enabling legislation for New Melones Dam (PL 87-874) required that the Secretary of the Interior determine all existing and future needs within the basin and give these needs precedence. In conjunction with the Corps' EIS (USACE 1972), the USBR (1972b) produced a supplemental EIS to address the use of stored water (conservation yield). At that time, however, the USBR was unable to determine the exact areas where the water would be used (USBR 1980a, i).

As a result of the Environmental Defense Fund's challenge of the adequacy of the EIS (*Environmental Defense Fund, Inc. v. Armstrong*), the Federal District Court ordered that a second supplemental EIS "relating to use of the yield of New Melones Reservoir within specific areas, be filed prior to operation of the project and before execution of water service contracts" (USBR 1980b, 26).

In order to determine the needs of the basin, the basin itself first had to be defined. The second supplemental EIS examined three alternative Stanislaus River Basin areas. In 1961, the Stanislaus River Basin Group, composed of the Calaveras County Water District, the Tuolumne County Water District No. 2, and Oakdale and South San Joaquin Irrigation Districts, produced a study of the Stanislaus River which included a plan for their version of New Melones Dam plus additional storage and hydropower facilities. The second supplemental EIS states, "The term 'Stanislaus River Basin' as used in PL 87-874 originated from the name of the Stanislaus River Basin Group. Reauthorization, it is believed, was intended to benefit the areas served by the agencies comprising this group and possible adjacent areas interested in that local development" (USBR 1980b; 1, 23-24).

Between the original EIS (USACE 1972) and the second supplemental EIS (USBR 1980a and 1980b), the federal government changed its estimates of how much conservation yield would be available and how this yield would fit into the Central Valley Project. Initially, the Corps calculated that of the 1,130,000 af average annual flow of the Stanislaus River at the dam site, 535,000 af was currently being diverted for irrigation in the Stanislaus River Basin (USACE 1972, 34). They tentatively projected that the annual requirements of the local basin would increase by 100,000 af. Taking into account that the maximum allocation of 70,000 af per year for water quality would, in the long-term, average only 35,000 af per year, the Corps found that "about 150,000 af of the conservation yield would remain available for export to other areas on the east side of the San Joaquin Valley, including San Joaquin and Stanislaus Counties" (USACE 1972, 35). In the second supplemental EIS, the USBR (1980a, iv) amended the conservation yield estimate to be 230,000 af for the year 2000 and 180,000 af for 2020. Furthermore, although the Corps initially envisaged New Melones yield as feeding the canals of the future East Side Division of the Central Valley Project, this controversial extension has been put off indefinitely (USACE 1972, 2; USBR 1980b, 30).

Following completion of the second supplemental EIS studying Stanislaus River Basin alternatives and water allocation (USBR 1980a and 1980b), the Commissioner of Reclamation resolved water supply issues in the April 1981 Decision of Record. The decision identified Stanislaus River Basin needs and made recommendations for allocations, estimating through 2020. As directed in PL 87-874, before considering outside uses, in-basin allocations must be supplied. Besides the water rights held by OID and SSJID, there are "active and dormant riparian rights, appropriative rights including applications on file with the State Water Resources Control Board and other undefined rights which are direct diversions downstream of the dam" (USBR 1995; 3-1, 3-2).

Senior Water Rights Holders: OID and SSJID

While it was the federal government rather than the senior water rights holders who brought New Melones Dam to fruition, the federal government and the water rights holders needed an agreement on how the government would uphold the prior water rights while operating the new project. Sixteen years after the original 1972 agreement, major water rights holders OID and SSJID went back to the table to renegotiate with the federal government. As the USBR struggles to create a long-term operating plan, the water rights of OID and SSJID give these districts a strong voice in the Stakeholder process.

In 1972, the USBR entered into the original agreement with OID and SSJID establishing the districts' water entitlements. The USBR studied the districts' water rights, the average water use per acre by the districts prior to New Melones, and the ultimate area to be developed and irrigated by the districts (USBR 1972a). The agreement granted the districts 200,000 af of storage in New Melones Reservoir, 36,000 af for storage in Woodward Reservoir (offstream of the lower Stanislaus River), and the portion of the New Melones Reservoir inflow needed to meet their direct diversion requirements (placing a 1,816.6 cfs limitation on their diversions). The total delivery was to be limited to 654,000 af or the total inflow into New Melones Reservoir during the October 1 to September 30 water year, whichever was smaller (USBR 1972c).

This agreement was superseded in 1988 by an agreement that changed the total delivery limitation and outlined the operational relationship between New Melones Dam and Tulloch Dam (Map 2). The limitation on the total delivery for any water year was reduced from 654,000 af to 600,000 af. In exchange, the minimum amount available to the districts was increased from merely the inflow to the inflow plus an additional amount calculated by the formula 600,000 af minus inflow, divided by three. Faced with a lack of available water for irrigation in 1988, this new agreement entitled the districts to more water during drought years in return for accepting less water than previously agreed upon in more abundant water years. In addition, the 200,000 af of storage available to the districts in New Melones Reservoir became a conservation account: if all of the 200,000 af stored by OID and SSJID in any given year was not used in that year, part or all of it could be banked and used by the districts in any subsequent year (USBR 1988, OID 1988).

The revised agreement also stipulated that Tulloch Dam and Reservoir would be operated by the districts as an afterbay for New Melones, with the districts making releases from Tulloch Dam based on the instructions of the USBR. The agreement recognized that there would be daily fluctuations in the level of Tulloch Reservoir based on New Melones power operations. If maintenance at New Melones Dam required dropping Tulloch Reservoir below elevation 495 feet, the USBR must obtain prior agreement from the districts. The USBR would also reimburse the districts for all past and future costs incurred as a result of operating Tulloch Dam as an afterbay and for using Goodwin Dam to regulate or divert New Melones Project water (USBR 1988).

The ramifications of negotiations between OID, SSJID, and the USBR are open to interpretation. In talking to Stakeholders about the situation, both a river advocate and a federal bureaucrat raised the issue of whether the districts were given a particularly sweet deal. Personally, I have seen evidence of the power of OID and SSJID in Stanislaus Stakeholders meetings. Most significantly, the districts were able to have facilitator Kevin Wolf removed from his duties by telling the USBR that if he were to continue as facilitator, they would not participate in the stakeholder process. At the 19 April 1999 meeting, numerous stakeholders (including representatives of other water districts, downstream landowners, fishery biologists, environmentalists, and USBR employees) expressed support for Mr. Wolf, and several people suggested ways to make his role more acceptable to OID and SSJID. Many stakeholders expressed their dismay that allowing a minority such power would undermine the stakeholder process. Whether appropriate or not, it is clear that all stakeholders do not hold equal weight.

New Melones Water Contracts

Controversy has also surrounded the availability of New Melones water for Central Valley Project contractors. Water year conditions and the Central Valley Project Improvement Act (CVPIA) have caused water deliveries to fall short of the contracted amounts. While deliverable amounts are currently negotiated on a year by year basis, the long-term availability of water for CVP contractors is very much in question.

To date, the USBR has entered into two major contracts for New Melones water. The Central San Joaquin Water Conservation District (CSJWCD), located partially inside the hydrologic basin, was allocated a firm annual supply of 49,000 af and an additional interim annual supply allocation of 31,000 af. In addition, 75,000 af per year of interim supply was allocated to Stockton East Water District (SEWD). Interim water is available until the needs of the service areas within the basin increase (USBR 1995, 3-2; Philip Williams & Associates, Ltd.1992).

Table 3 shows water taken by SEWD and CSJWCD. The districts completed delivery facilities and were ready to accept water from New Melones for water year 1993. However, as a result of a drought and implementation of the CVPIA, no water was delivered for 1993 or 1994. In the Interim Plan of Operation for 1997 and 1998, the USBR negotiated with CVP contractors, agreeing that they would receive 50,000 af per year. The USBR continues to use the Interim Plan to govern New Melones operations until a long-term operating plan is completed. According to the Interim Plan, if New Melones storage-plus-inflow is between 1.4 and 2 maf, no water will be allocated to CVP contracts; if storage-plus-inflow is between 2 and 2.5 maf, the CVP contractors can obtain up to 59,000 af; and if storage-plus-inflow is greater than 2.5 maf, then 90,000 af will be available for CVP contractors (Zolezzi 1999, USBR 1997b).

TABLE 3: NEW MELONES WATER TAKEN BY CVP CONTRACTORS

WATER YEAR (4/1-3/30)	SEWD	CSJWCD
1995-1996	4,470 af	1,070 af
1996-1997	12,240 af	17,186 af
1997-1998	11,152 af	27,848 af
1998-1999 (estimated)	27,000 af	30,000 af

Source: Zolezzi 1999.

Current USBR thinking is that interim water contracts will not be renewed until the USBR can determine whether there is adequate water. The USBR is also considering a joint EIS for both the Long-Term Operating Plan and the Long-Term Contract Renewal. The USBR hopes to finalize the Long-Term Operating Plan in December 2002 (Moore 1999, USBR 1999).

FLOOD CONTROL

New Melones Dam was originally authorized for flood control. As the size of the planned reservoir swelled to 1.1 maf and then to the final 2.4 maf to allow for other project benefits, the original 450,000 af of reservoir space for flood control remained constant. Soon after the dam was completed, downstream landowners objected to the volume of flows released in the lower Stanislaus River, claiming that higher flows were damaging their crops. Consequently, the USBR manages flows to prevent such damage; this flow limitation is an ongoing subject of debate among the stakeholders. This section reviews the flood control issues that supported construction of the dam, summarizes how New Melones Dam has affected downstream flood flows, and looks at how flood control and land use issues are affecting other aspects of project management.

The Need for Flood Control

Historically, two types of flood events occurred along the Stanislaus River: rain and snowmelt floods. In the winter and spring, heavy rains coupled with snowmelt resulted in flooding along the lower Stanislaus River. Later in the year, in May or June, melting snow brought sustained high flows. When the U.S. Army Corps of Engineers (USACE 1961, 6) recommended the final New Melones Project to Congress, they noted that historical data and Indian legends indicated that there had been greater floods prior to 1900 than since. Heavy rainfall brought flooding in 1862 and 1867, and snowmelt induced the 1890 flood. Flood events between 1900 and 1926—when the Melones Dam was completed—"were not as great in intensity or volume as those occurring since 1926," with the exception of 1907, which had a smaller peak but greater volume than the 1955 flood of record (USACE 1961, 6). On 22 December 1955, the flow at the old Melones Reservoir peaked at 102,000 cfs. Downstream at Ripon, the Stanislaus River flow was regulated to 62,500 cfs (USACE 1972, 15).

A larger reservoir at Melones would protect against both rain and snowmelt flood events. "Without the project, up to 35,000 acres of highly developed agricultural land along the Stanislaus River and suburban areas of Oakdale, Riverbank, and Ripon will continue to be subject to periodic flooding" (USACE 1972, 15). In addition to providing flood protection for the agricultural and suburban areas along the lower Stanislaus River, New Melones flows impact the lower San Joaquin River and the Sacramento-San Joaquin Delta. The EIS predicted,

> "[T]ogether with other projects on the lower San Joaquin and Tuolumne Rivers, New Melones will aid substantially in reducing flooding along the lower San Joaquin River and in the Sacramento-San Joaquin Delta. It will assist in protecting 235,000 acres of intensively developed agricultural lands, military installations, and industrial and suburban areas in the vicinity of Stockton" (USACE 1972, 34).

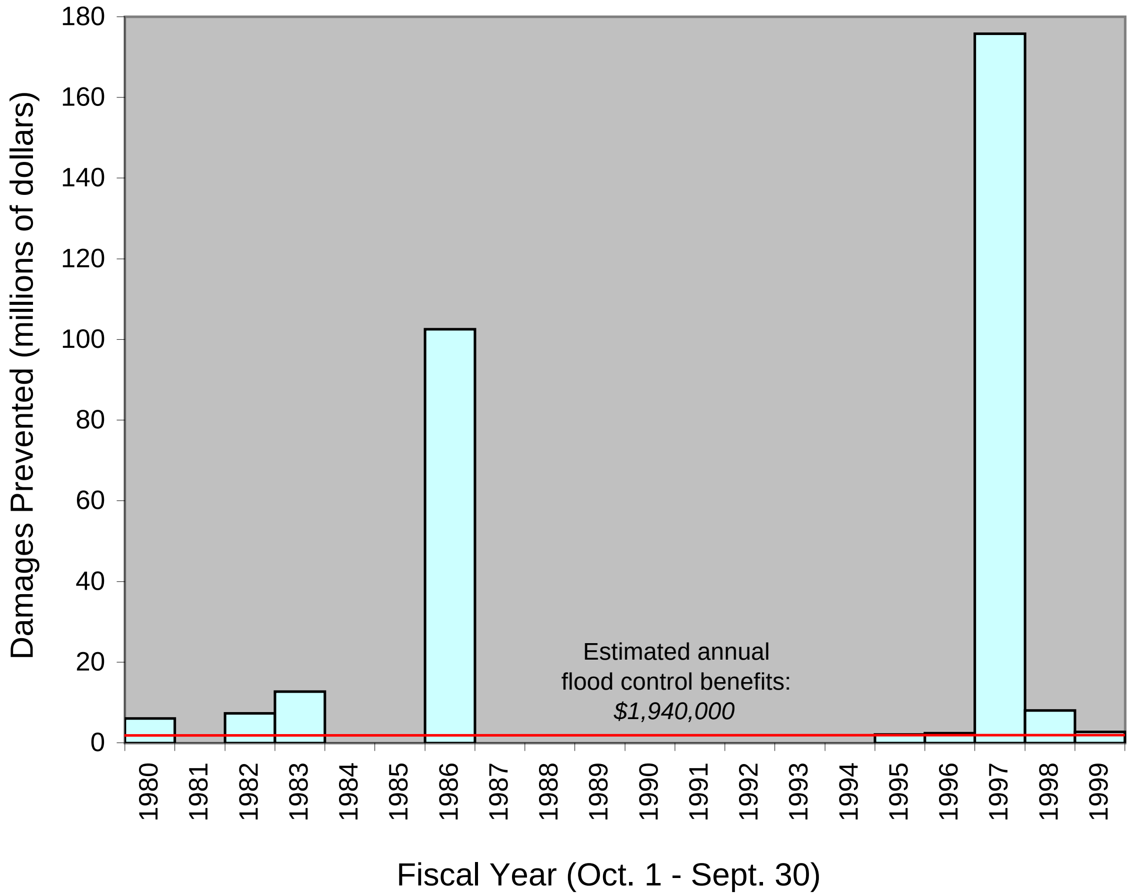
Flood Control Provided by New Melones Dam

The Corps calculated flood control benefits of New Melones based on the entire 100-year economic life of the project. Generalizations about the accuracy of the estimates are therefore impossible, although damages prevented in individual years can be estimated. For each fiscal year, the Corps calculates the flood damages prevented by looking at the flow-damage relationship. The maximum inflow and outflow of the reservoir for the year are compared to the non-damaging flows that were estimated in original project studies, deriving the damages corresponding to the specific flows. The non-damaging flows range from 8,000 to 70,000 cfs depending upon where the damage areas are located within the system. Over the life of the project, the average of all of the annual damages prevented would ideally match the average annual damage calculated by the Corps in the EIS (Herman 2000).

The Corps originally estimated annual flood control benefits of $1,940,000 from New Melones Dam. The difference in damages with and without the project made up the bulk of this estimate, but the Corps also considered land use benefits and the prevention of bank erosion. Damages prevented included physical damages (mostly agricultural), flood fighting and emergency repair costs, and business losses (USACE 1972, 8).

Figure 1 shows the Corps' estimates of annual damages actually prevented since the completion of New Melones based on the flow-damage

FIGURE 1: ANNUAL FLOOD DAMAGE PREVENTED BY NEW MELONES



Sources: Herman 2000; USACE 1972, 8.

relationship. The average annual damage prevented for the twenty years since project completion is just under $16 million. In over half of the years there have been no damages prevented, but wet years like 1986 and 1997 raise the average to well above the original estimated benefits. Again, however, the Corps' original estimate cannot be fairly evaluated when just twenty years have elapsed since project completion.

As of May 2000, the 100,000 cfs capacity spillway for New Melones has not yet been used. The ungated spillway, separate from the dam structure, is designed so that water will flow through it rather than overtopping the earthfill dam should the reservoir fill to capacity (Photographs 4 and 5). The bypass begins with a long, wide passage where the building material for the dam was excavated, which flows into a ravine. Dam operators are not eager to see the results of 100,000 cfs of water coursing through this landscape (Cawthorne 1998).

Effect of Flood Control Downstream

Management of flows along the lower Stanislaus River poses a complicated problem for the USBR. Various stakeholders, including downstream landowners, fishery managers, and rafting operators, hold very different opinions about what the flows should be. The legal history of the controversy does not provide clear directives for the USBR to follow. I believe the issues are further

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 4:
New Melones Spillway,
7 October 1991

Surface Elevation:
805 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 5:
New Melones Dam,
Back Side,
During Drought,
1 October 1991

Surface Elevation:
805 ft.

complicated by the fact that the Corps built the dam, produced the documentation for downstream flow management, and remains responsible for downstream flow easements and management of downstream recreation, while the USBR struggles to operate New Melones Dam within the Central Valley Project. The bureaucratic tangle means that even for each agency, the issues and flow objectives are not clear. The current controversy between stakeholders is directly related to the multi-purpose nature of the project. How can agencies reconcile flood control with fishery and recreation needs? How do landowners fit into the scheme?

The designation of the 8,000 cfs floodway in the lower Stanislaus River, as set forth in the EIS (USACE 1972), stems back to the enabling legislation. Congress decreed

> "…[t]hat the Stanislaus River Channel, from Goodwin Dam to the San Joaquin River, shall be maintained by the Secretary of the Army to a capacity of at least eight thousand cubic feet per second subject to the condition that responsible local interests agree to maintain private levees and to prevent encroachment on the existing channel and floodway between the levees" (PL 87-874).

In the EIS, the Corps stated that releases greater than 8,000 cfs from New Melones Dam would occur less frequently than once every hundred years, so in any given year the estimated chance of such a flow is less than 1%. This suggests that in the life of the hundred-year project, such high flows shouldn't occur. The Corps was to be responsible for maintaining an 8,000 cfs floodway downstream from Goodwin Dam; since this was roughly the capacity of the existing floodway, no significant alternations were necessary (USACE 1972; 31, 34).

As stated in PL 87-874 and reiterated by the Corps in the EIS, one condition of maintaining this floodway capacity is preventing encroachment into the floodway. This objective stands in direct opposition to the fact that, with the flood control protection provided by New Melones, this fertile floodplain would become increasingly attractive to farmers. The Corps recognized in the EIS that "[l]and use downstream could be altered at an accelerated rate due to flood control and irrigation benefits. Continuous agricultural enchroachment [*sic*] is the greatest single threat at the present time to riparian lands" (USACE 1972, 60). Therefore, to ensure the 8,000 cfs floodway, as well as for wildlife mitigation, the EIS suggested that downstream land be acquired (USACE 1972, 60).

<u>Protecting the 8,000 cfs Floodway</u>

Land acquisitions to replace the habitat lost by filling New Melones and maintain an 8,000 cfs floodway were both heralded. According to the Master Plan for the lower Stanislaus River, the Corps was to acquire easements on 5,100 acres within the 8,000 cfs flowline to provide for flood control; on approximately 3,700 of these acres, additional easements would provide protection of vegetation and spawning gravels. In addition, the Corps would acquire 725 acres in fee simple for downstream recreation areas as well as other project purposes. The schedule for easement acquisitions "should insure completion in time to provide for project releases," with the dam and powerplant scheduled to be completed in 1979 (USACE 1977, 5-6).

Twenty years after project completion, the Corps is still working on acquiring land downstream from New Melones Dam. As of 1993, when the latest real estate report was issued, the Corps had bought more land outright than originally agreed (904 total acres), but was still 837 acres short on easement acquisitions (Bain 2000, Holcomb 1999). Interestingly, as early as 1980, a Corps' report sounded as if the process were complete. "Easements for flood control were acquired on about 5,100 acres within the 8,000-cfs-capacity area; easements for protection of vegetation and spawning gravels were obtained on about 3,700 of the 5,100 acres" (USACE 1980, 26). I do not think the Corps was being purposefully misleading, but attribute this discrepancy to lack of communication between those responsible for regulating the reservoir and flood flows and those responsible for procuring the easements; indeed, the easements should have been procured by that time.

Flood Plain Encroachment

While the Corps has not yet assessed the total easements acquired for the floodway and their success at maintaining an 8,000 cfs floodway, neither has any agency (governmental or private) examined the actual encroachment into the floodplain. In my informal survey of downstream landowners in 1998, two members of the Stanislaus River Flood Control Association commented that the dam had allowed some agricultural land to be used for high value, permanent crops, such as orchards (McAfee 1998). Numerous other stakeholders acknowledge this change, made possible by the flood control provided by New Melones, although it has never been formally documented by the USBR, USACE, or any other agency or individual.

In January 1999, representatives of the USBR, USACE, U.S. Fish and Wildlife Service, and National Weather Service took a field trip to the lower Stanislaus River with two landowners. The purpose of the trip was to become familiar with the conditions along the river in order to improve operating procedures.

> "It was discovered that farming of lands close to the river (river bottom lands) is extensive in the Stanislaus Basin. These lands are fertile and are suited to crops such as walnuts because of their porous nature. Many of these lands lie between the Stanislaus River and some of the dikes and levees that define the floodway that was purchased by COE during the construction of New Melones Dam. Others lie outside of dikes and levees but are affected by the elevation of the river because of seepage" (Read 1999c).

According to the field trip summary, during the growing season, flows greater than 1,500 cfs are detrimental to the low-lying orchards.

"Landowners have repeatedly stated that extensive damage occurs above this flow rate and that they would not be able to withstand losses from higher flow rates other than normal flood control operations" (Read 1999c). During the flood control season, damage begins occurring with flows around 3,000 cfs. The agency representatives and landowners agreed that by increasing releases from Goodwin Dam to 3,000 cfs as early as possible, the peak release for an event could be reduced, allowing more chance that 3,000 cfs would not have to be exceeded and therefore minimizing damage. "At about 5,000 cfs, water reaches most dikes in the basin and extensive damage occurs to lands not protected by dikes and levees" (Read 1999c). Obviously, a release of 8,000 cfs down the floodway—the design capacity—would be extremely destructive given current land use.

Preliminary Study of Land Use Changes along the Lower Stanislaus River

As a first attempt at documenting the land use changes along the lower Stanislaus River, I compared California Department of Water Resources (DWR) land use surveys from before and after New Melones Dam was built. The DWR conducted surveys for Stanislaus County in 1975 and San Joaquin County in 1976, and again in both counties in 1996. Aerial photography was used to delimit field boundaries on USGS 7.5-minute (1:24,000) quads. Surveyors used field maps to note all agricultural classes encountered on the ground. Although the techniques for the aerial photography and for storing the data have been updated, the same agricultural classes were applied using the same on the ground survey methods (Hawkins 2000). The DWR supplied me with paper copies of the 1976 quad surveys for San Joaquin County and scans of the 1975 quad surveys for Stanislaus County, from which I digitized the data using MapInfo. The DWR also supplied me with digital files of the 1996 surveys for both San Joaquin and Stanislaus Counties. MapInfo was then used to calculate the areas of each agricultural class.

There were several problems with using the DWR land use maps to conduct a preliminary assessment of downstream land use changes. It was very difficult to discern some of the boundaries and agricultural classes on the 1975 scans and 1976 paper maps. It was especially difficult to distinguish between the river and adjacent riparian vegetation, and it seemed that these land use classes were not consistently applied across the counties and the quads. These areas were probably difficult to survey due to the scale of the field maps. In addition, the river's course may have shifted since the USGS quads were last updated. Because no up-to-date data are available for the course of the entire lower river, I had to aggregate native vegetation on both sides of the river and the river itself into one class. Although every attempt was made to create flush boundaries between areas on the data I digitized, and to clean up boundaries on the 1996 digital data from the DWR, the total acreage of classified regions within the same study area is slightly different between the 1975/1976 data and the 1996 data (0.09%).

For the purposes of this preliminary study, I applied an arbitrary boundary of two thousand feet from the centerline of the river on the USGS 1:24,000 quads. Map 3 shows the land use for 1975/1976 and 1996. Table 4 indicates the total acreage by agricultural class from 1975/1976 and 1996. Most significantly, land classified as urban increased from 1,123 acres to 3,529 acres. Acreage fell for all agricultural crops with the exception of deciduous fruits and

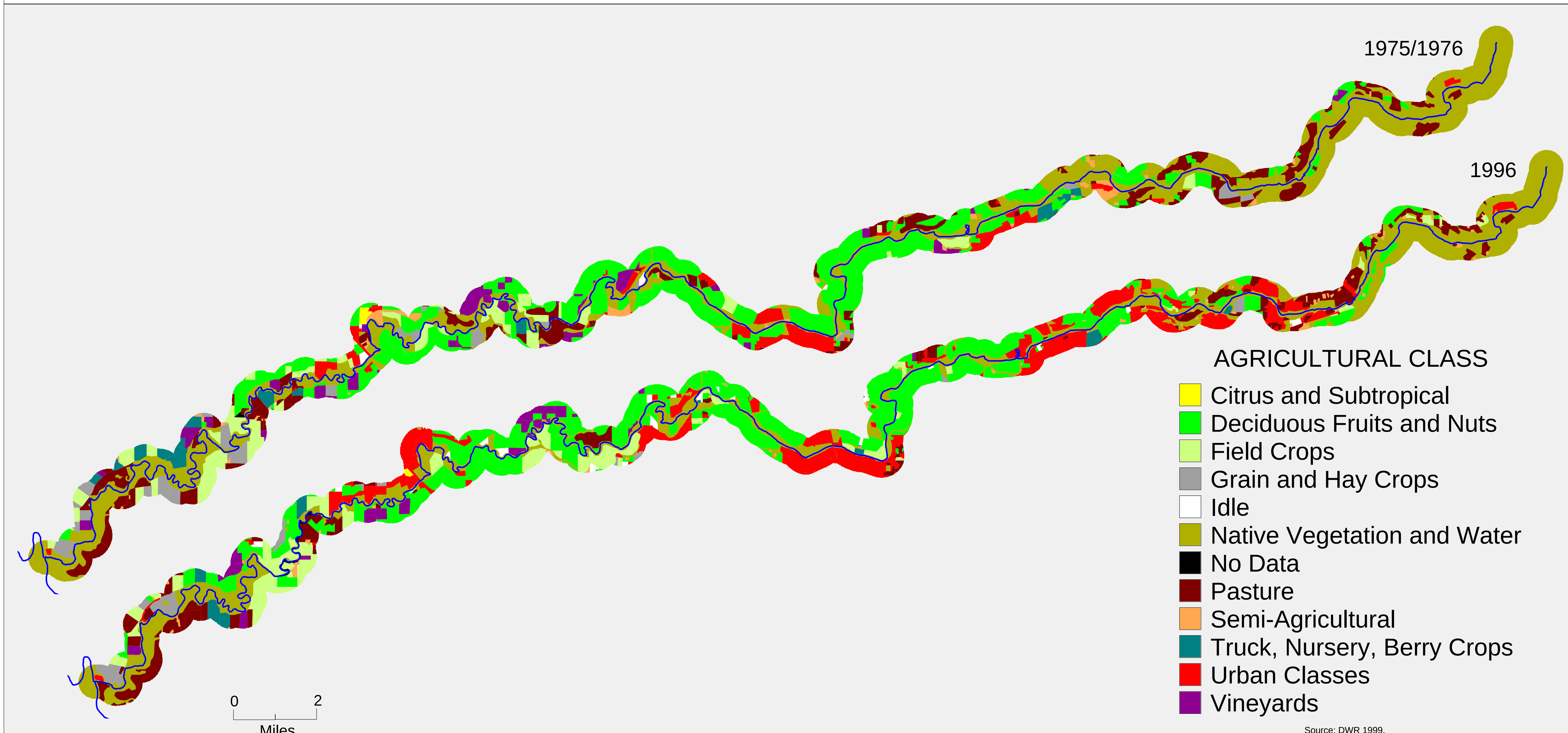
TABLE 4: LAND USE, 1975/1976 AND 1996, LOWER STANISLAUS RIVER, SAN JOAQUIN AND STANISLAUS COUNTIES

AGRICULTURAL CLASS	1975/1976 (Acres)	1996 (Acres)
Citrus and Subtropical	48	15
Deciduous Fruits and Nuts	6,067	6,755
Field Crops	1,640	1,891
Grain and Hay Crops	828	413
Idle	60	217
Native Classes (Native Vegetation, Riparian Vegetation, and Water Surface)	9,099	7,433
No Data	10	61
Pasture	2,907	2,165
Semi-Agricultural	382	222
Truck, Nursery, and Berry Crops	1,123	327
Urban Classes	1,123	3,529
Vineyards	879	599

Source: DWR 1999

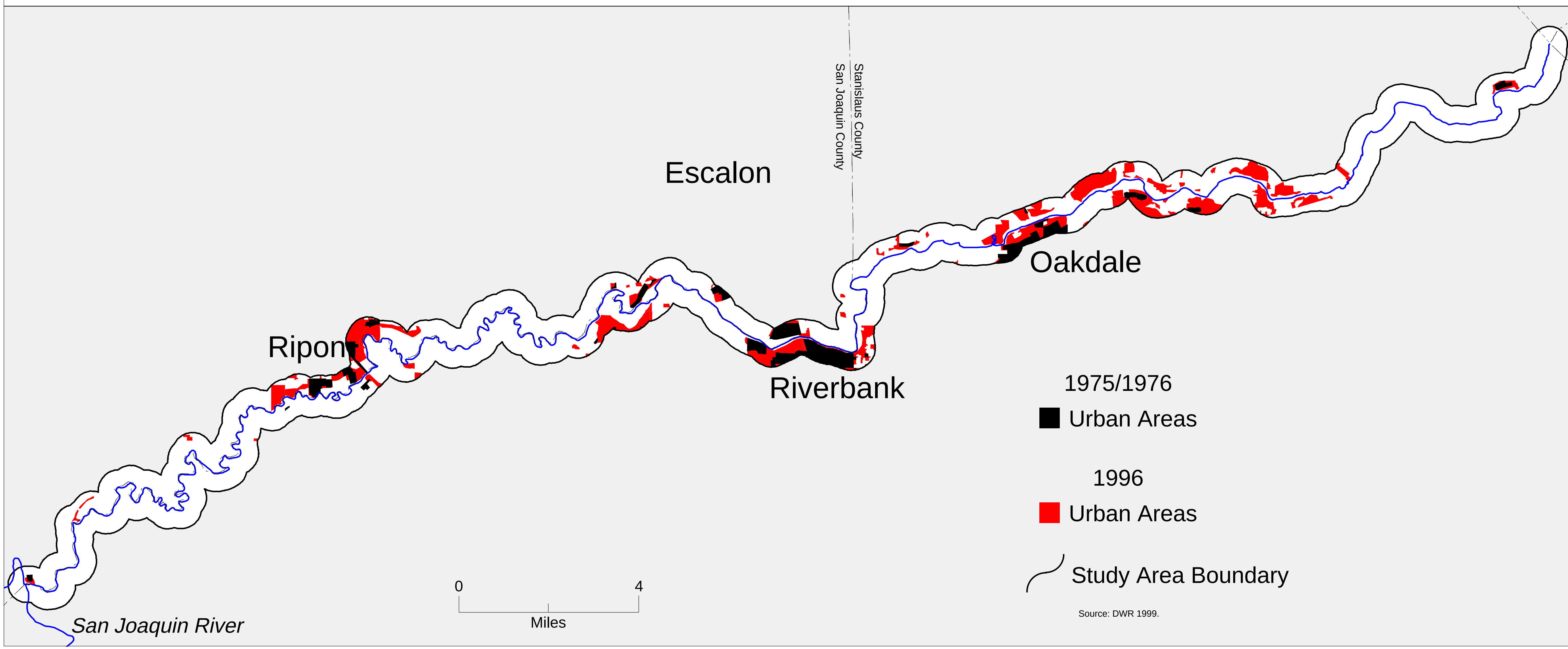
MAP 3: LAND USE, 1975/1976 AND 1996

Lower Stanislaus River - Knights Ferry to San Joaquin River



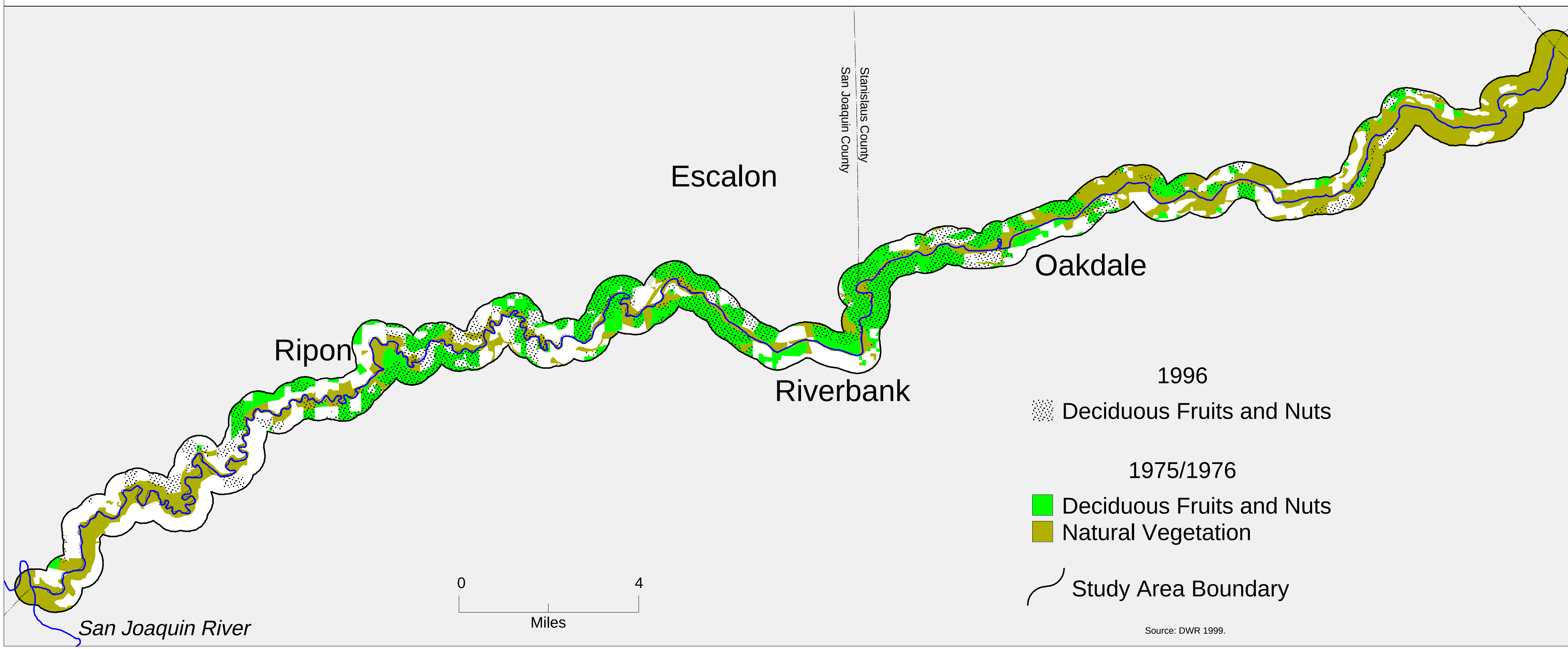
MAP 4: URBAN AREAS, 1975/1976 AND 1996

Lower Stanislaus River



MAP 5: DECIDUOUS FRUITS AND NUTS, 1975/1976 AND 1996

Lower Stanislaus River



nuts and field crops. Acreage of native classes, which includes native vegetation, riparian vegetation and water surface, also fell. Map 4 shows the change in urban areas between 1975/1976 and 1996. The greatest increase in urban area occurred around Riverbank, and, to a lesser degree, Ripon and Oakdale. In Map 5, the areas with deciduous fruits and nuts in 1996 are overlain on the areas with natural vegetation and deciduous fruits and nuts in 1975/1976. While there are areas with natural vegetation in 1975/1976 that were converted to deciduous fruits and nuts by 1996, most of the expansion of these trees was in areas previously used for other agricultural uses. There are also some areas that contained deciduous fruits and nuts in 1975/1976 but not in 1996. From the DWR data, it does appear that since New Melones Dam was built, farmers have shifted to higher value crops downstream from the dam, in particular walnut and almond orchards (DWR 1999).

Given these preliminary results, there are several ways that land use changes along the lower Stanislaus River could be further explored. More accurate land use data may be derived from larger scale aerial photos taken before and after the construction of New Melones Dam. A less arbitrary study boundary could be applied, such as the 100-year flood line prior to the construction of New Melones Dam. The Corps is currently conducting an aerial survey of the Stanislaus River up to River Mile 47.6 above the confluence with the San Joaquin River (Stonestreet 2000). With an up-to-date survey of the river, it would be useful to digitize the 8,000 cfs floodway as determined by the Corps for the purpose of purchasing easements and compare it to the current 8,000 cfs floodway. Land use changes within both the former and the current 8,000 cfs floodway could then be analyzed.

The Legal Controversy of Lower Stanislaus River Flows

Although easements were to allow for an 8,000 cfs floodway, there is some legal precedent for the USBR attempting to limit flows to levels that will not damage the crops. After the dam was completed, the battle raged to keep the reservoir from being filled to avoid inundating the Camp 9 to Parrotts Ferry whitewater stretch. A court order on 27 June 1980 yielded a temporary victory: water was restricted from rising above 820.1 feet in elevation, forcing the USBR to begin releasing water so long as it would not cause damage downstream from the dam. Of principal concern were orchards (mostly walnuts) adjacent to the lower Stanislaus River (DeBruyn 1980).

Subsequent to the court order, the USBR studied the potential damages to downstream crops so that appropriate flows could be prescribed. The basis for their studies was that “seepage from river sources, percolating and saturating the crop-root zone, does have the potential of seriously affecting crop production and/or death of the trees by direct suffocation of the crop-root system” (DeBruyn 1980). After studying the situation, the USBR’s Chief of the Land Resources

Branch set up and monitored downstream releases to bring down the reservoir elevation. The USBR estimated that flows above 1,500 cfs at Ripon (Map 2) could cause excessive seepage and potentially damaging soil saturation; this meant that releases from New Melones had to be limited to 1,000 cfs because of the contribution of irrigation return flows below the dam but above the town of Ripon. Such releases were maintained until the court ordered elevation was achieved, and the USBR found that "[f]lows of 1,500 cfs at Ripon have not caused problems of crop stress along the lower Stanislaus River" (DeBruyn 1980). In documenting a series of field trips in 1980, the supervising geologist found that lower flows were necessary. He reported, "the majority of crops should be protected with flows of 1,250 cfs and that ground-water levels would rise to heights that potential damage could occur to crops at flows exceeding 1,250 cfs" (Cooke 1982).

In 1982, the U.S. Court of Appeals, 9th Circuit, issued two orders mandating that releases be made to bring the reservoir level down to 844 feet in elevation provided that damage would not be caused to downstream properties or interests. However, the orders allowed that "[t]he United States may impound and store or release waters as it deems necessary for flood control purposes." Both orders required that the federal government document "the criteria and assumptions which provide the basis for regulation for flood control purposes and for protection of downstream property from damages caused by inundation or seepage based upon the 844 feet impoundment limitation." The second order further required that the federal government document flood control easements downstream and the damage to downstream properties at various release rates between 1,200 cfs and 3,500 cfs (U.S. Court of Appeals, 9th Circuit, 1982a and 1982b).

While the USBR complied with the court's requirements for documentation within the timeframe set forth, no further court documents address the resolution of downstream flows. Consequently, the question of what magnitude of flow is allowed downstream from New Melones Dam and exactly where this maximum flow is to be measured remain very much in question. While flows in the early 1980s may be viewed as setting a precedent, legal action will probably be necessary to set exact limits—and this is what landowners have threatened if flows go above 1,500 cfs except when necessitated for flood control (Read 1999a and b; Turner 1999). Meanwhile, with landowners stating that flows greater than 1,500 cfs, but much lower than the 8,000 cfs floodway, can extensively damage crops, and with documentation provided to the court in 1982 that flows greater than 3,500 cfs could cause damage to Ripon sewage plants, including industrial treatment ponds, it is likely that the USBR's handling of flood control flows will be much criticized in wet years (Lyford 1982).

Lower Stanislaus River Flows: Opinions of Other Stakeholders

Other stakeholders hold their own opinions concerning desirable downstream flows. Although fishery flow releases were limited to 1,250 cfs in the 1987 instream flow agreement, and the USBR is holding to the 1,500 cfs maximum flow precedent, fishery biologists would like to experiment with higher releases for spring flow regimes. In addition to benefiting the fishery, different regimes may save more water than the current restricted regime. Further, if farmers were to convert floodplain crops to annuals, plantings could be timed depending upon the type of water year and the planned flow regime, and crop damage thereby prevented (CDFG/USBR 1987a, Stanislaus Stakeholders 1997).

Commercial rafters argue that flows of 1,500 cfs "are excessive and extremely unsafe for the float trips below Knights Ferry and the whitewater trips above Knights Ferry." Foust (1997) suggests that different day and evening flows, or different flows on different days of the week, could meet the needs of the fishery interests as well as the commercial rafting operators. However, such alterations of stream flow may be harmful for both the fishery and for fishermen (Murphy 1997).

The 1997 Flood

In closing this discussion of New Melones flood control and flows along the Stanislaus River, a brief look at the 1997 flood may lend some perspective. According to the Corps' estimates, this was the flood event where New Melones Dam yielded the most damages prevented (over $175 million). The flood peaked on 2 January with an inflow into New Melones of 84,857 cfs. (Recall that inflow into Melones Dam during the flood of record in 1955 was 102,000 cfs, and that the flow at Ripon was regulated to 62,500 cfs.) On 2 January 1997, the mean daily release at Goodwin Dam was 4,080 cfs; the Goodwin Dam release peaked nine days later at 6,780 cfs (Read 1999b). Whatever is decided in court or agreed to among stakeholders, this event shows the kinds of flows that course down the lower Stanislaus River, even with the flood protection provided by New Melones Dam. There was some damage to agricultural lands, but downstream landowners are confident that without the dam, damage would have been far worse. As one expressed, "Without New Melones, all property owners and municipalities adjacent to the river would have been devastated" (Anonymous in McAfee 1998).

HYDROPOWER

Of all of the benefits of New Melones Dam, the U.S. Army Corps of Engineers attributed the greatest monetary value to hydropower. An estimated

$5.5 million annually would be gained from the 300,000 kilowatt powerplant; the existing PG&E powerplant it replaced had a capacity of only 26,000 kilowatts (USACE 1972; 9, 11, 34). Operating at capacity, New Melones would satisfy the domestic needs of 200,000 people (Seglund 1982, 4). According to the Corps,

> "The additional power developed from the project will help meet the increasing need for power in the Central Valley. Since hydroelectric power is generated without air, water, or thermal pollution, it is significant in that an average of 430,000,000 kilowatt-hours of energy will be generated annually without the need for utilizing fossil fuel or nuclear methods with their attendant environmental problems" (USACE 1972, 35).

In their review of the benefit-cost analysis, Parry and Norgaard (1975, 20) did not take issue with the Corps' estimate, agreeing that a market for the electricity does exist, although they note that costs for pumping irrigation water need to reflect the increasingly higher value of electricity.

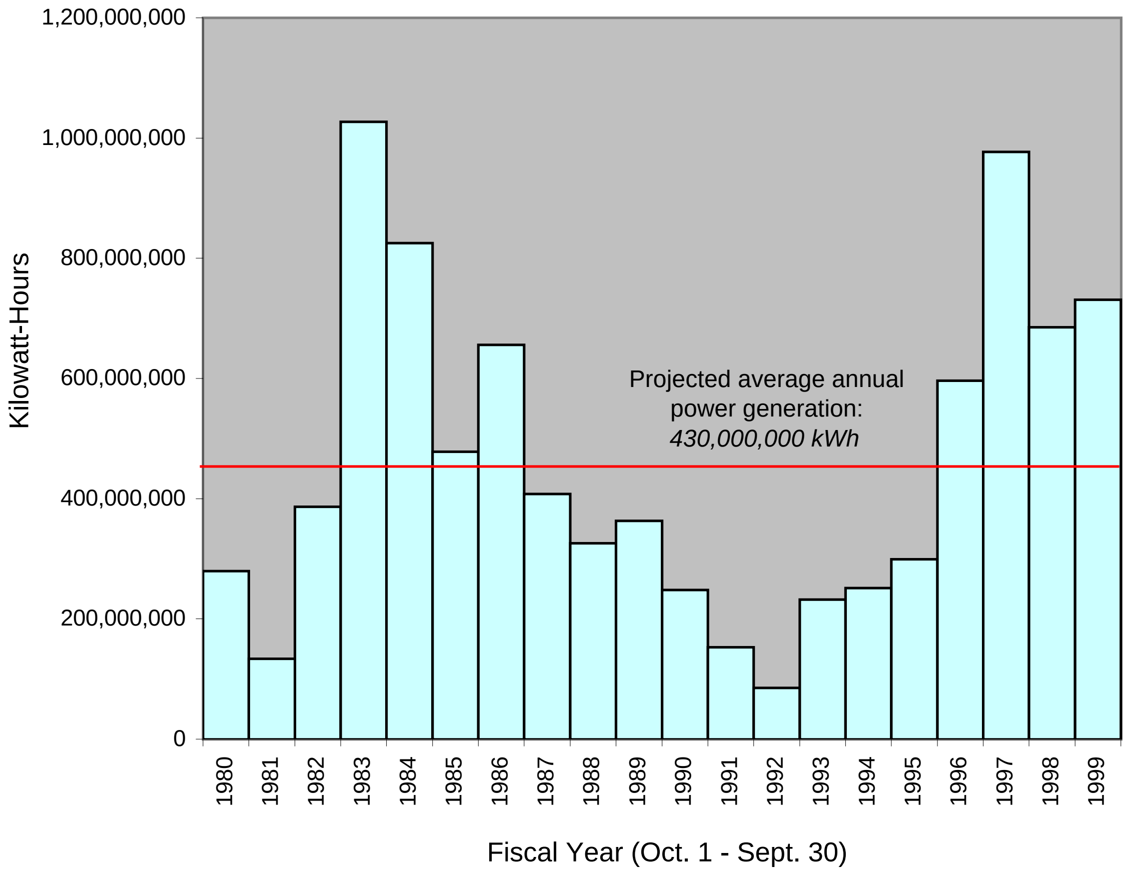
New Melones is a peaking plant, meaning that power is generated to meet the needs for electricity when the demand is greatest (USBR 1996, MP-E2). Typically the two generators begin operation in the late morning and shut down in the late afternoon. Because Tulloch Reservoir provides storage directly downstream from New Melones Dam, the USBR can maximize the generation of peak power (Cawthorne 1998). The operation of Tulloch Dam and Reservoir as an afterbay for the New Melones Project is stipulated in the agreement between the USBR and Tulloch Dams owners, Oakdale Irrigation District and South San Joaquin Irrigation District (USBR 1988).

Power production can, however, be hindered by the pool elevation. Inactive pool elevation is technically 808 ft., (or approximately 300,000 af storage), but power can be generated below this elevation (the intake is at 769.71 feet). During the drought in the early 1990s, the powerplant did generate electricity after the reservoir fell below 808 ft. even though operation under these conditions is not optimal: the turbines begin to run rough, the amount of power being generated goes down, and eventually the intake begins sucking in air, which is not good for the turbines. When the reservoir surface elevation drops below the power production intake, releases must be made through the low level outlets at the old river level (540 ft.), flowing under the dam and powerhouse and directly back into the streambed (Cawthorne 1999).

A low pool in the reservoir also affects the temperature of the water being released downstream; this is a crucial concern because of the anadromous fishery below Goodwin Dam. When the reservoir elevation was low during the early 1990s, the USBR discovered that the underwater barrier created by the old dam interfered with normal outflow patterns in New Melones Reservoir. If the reservoir elevation is still above the old dam spillway crest (723 ft.), the coldest water may be blocked behind the dam, causing warmer than desirable water to flow out the low level outlets. However, by bringing the level to below the crest of the old dam, colder water can be released—in October 1992, this was just in time for the fall salmon spawning (Rowell 1994). Integral to the creation of a long-term operating plan, the USBR is developing a model to describe the interrelationship between the temperature of water released from New Melones and the temperature of the water in the lower Stanislaus River, taking into account both Tulloch and Goodwin Reservoirs in between (Stanislaus Stakeholders 1998b). It is possible that in the future, temperature controls needed for the fishery may dictate when the powerplant must be bypassed and releases made from the outlet at the bottom of the old river channel—effectively reducing the hydropower production at New Melones (Rowell 1998). Another option is to dismantle the old dam. Because a dam has never been removed while under water, it might be necessary to wait for another drought to expose Melones Dam (FOR 1999).

Looking at the power generation at New Melones since 1983 (when the final permits for operation at full capacity were issued), New Melones has fulfilled its hydropower objectives. Figure 2 shows the gross power generation by year. The red line denotes the average annual power generation of 430,000,000 kilowatt-hours predicted in the EIS (USACE 1972, 9). Because of low pool elevations and temperature concerns, the USBR did not produce electricity at New Melones powerplant in October or November 1991, nor from August 1992 to January 1993. Despite the overall slump between 1987 and 1995, New Melones Powerplant generated an annual average of 490,624,689 kilowatt-hours/year between 1983 and 1999—well above the EIS predicted average. To

FIGURE 2: GROSS POWER GENERATION



Source: Rawlings 2000; USACE 1972, 9.

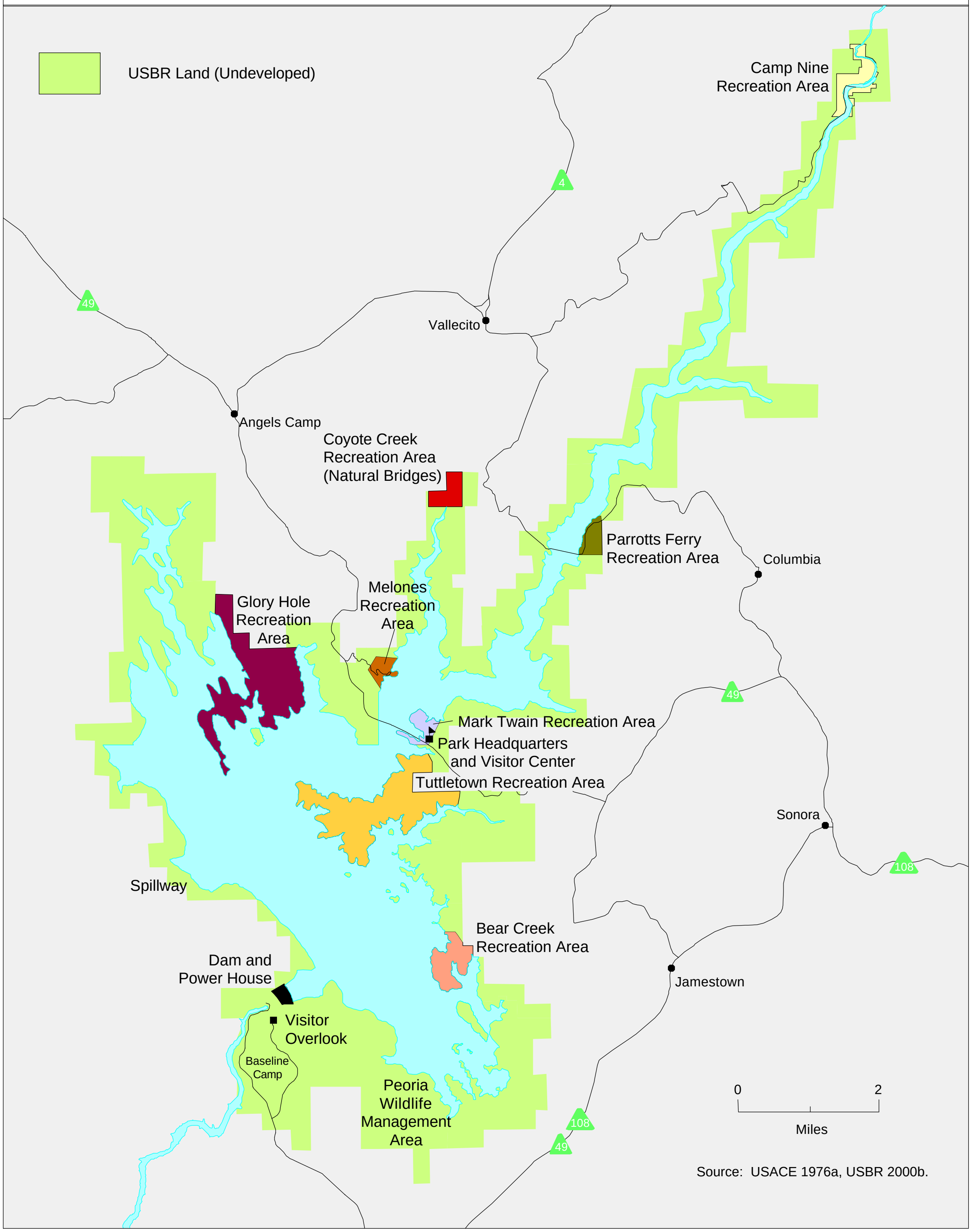
produce this power, an annual average of 1,091,525 af of water was used (Rawlings 2000).

RECREATION

Recreational use of the Stanislaus River was central to the debate over filling New Melones Reservoir. The unique attributes of the river canyon between Camp Nine and Parrotts Ferry made it ideal for whitewater rafting, a pastime enjoyed by a relatively small sector of the population (Map 6). Depending upon the year, the new reservoir would inundate much of this nine mile whitewater rafting stretch, yet this loss would be mitigated. Downstream from Parrotts Ferry, the existing reservoir behind Melones Dam did not offer recreational facilities, but the new reservoir would have a surface area seven times larger, with 100 miles of shoreline. The federal government planned to develop several recreation areas for public use, predicting that far more people would be able to enjoy the enlarged artificial lake than the free flowing river could support (USACE 1972; 2, 36-37). “With 12,500 surface acres of water, Houseboaters, Fishermen, Skiers and Personal Water Craft operators will find wide open spaces for their enjoyment” (USBR Undated).

The public would also enjoy recreational benefits downstream from the dam. Recreation had been limited along the lower Stanislaus River due to a lack of public access, but the federal government hoped to provide public access

MAP 6: NEW MELONES RESERVOIR AREA



areas along the lower river as part of the mitigation for the New Melones Project (USACE 1972, 7). As conflicts over completing New Melones mounted, management of the lower river divided environmentalists, which impeded opponents' struggle against the dam. Today, lack of development of downstream recreation areas as planned, coupled with more visitors than expected, is causing problems of overuse.

Above the Dam: Background

Tim Palmer (1982) wove together words and photographs to portray the Stanislaus Canyon prior to inundation and to portray the people who fought to save it. The purpose of his account was not merely to depict the striking beauty of the river, but to describe the individuals who struggled intensely to keep the place intact and those who wanted to get the dam fully operational. As proponents of the dam liked to remind the public, a relatively small whitewater rafting community vehemently opposed the fruition of the New Melones Project. While it seems that most dam opponents did raft the river at some point, for many neither river rafting nor river conservation was a full-time occupation. Scientists, economists, and politicians supported the outfitters and guides who tried to stop a federal project that had been in the making for over thirty years.

Whitewater rafting on the Stanislaus River was a relatively new pursuit but one that was rapidly growing in popularity. The first party ran the Camp Nine to Parotts Ferry stretch in 1960, sixteen years after Congress authorized the New Melones Project. Two years later Congress reauthorized the project and expanded its purposes beyond flood control—and the first commercially-guided tour carried passengers between the steep limestone canyon walls (Jackson and Mikesell 1979, 103). The Stanislaus River quickly became the most popular whitewater destination in California; according to Friends of the River, it was the most popular whitewater west of the Mississippi River (Kay 1971; Jackson and Mikesell 1979, 101). Annual recreation days attributable to commercial rafting trips swelled to 9,000 in 1970, and 13,000 the following year. In addition, private rafting and kayaking contributed 10,000 recreation days each year (EDF in USACE 1972, 36). As use soared, outfitters came together to regulate the river trips, but this effort failed when not all companies rafting the river would participate. According to BLM officials, their institution of a permit system in 1974 came at the request of private outfitters (Jackson and Mikesell 1979, 103). In addition to rafting, in 1970 fishing on the river contributed 26,000 recreation days, and other activities (gold panning, hiking, and sightseeing) another 15,000 recreation days (Bureau of Sport Fisheries & Wildlife and EDF in USACE 1972, 36).

Jackson and Mikesell (1979) explain the growth in whitewater rafting on the Stanislaus both by the generalized national increase in whitewater recreation, as well as by the unique features of the upper Stanislaus River. With its high walls, the river route is virtually the only way to access the canyon. Its whitewater rating ranges from Class II to Class VI depending upon the time of the year, providing conditions suitable for inexperienced rafters as well as experts. The Camp Nine to Parrotts Ferry segment was rated Class III to Class IV. Another bonus for rafting purposes is the consistency of water flows.[3] Limestone caves dot the region, sheltering species unique from the surrounding countryside as well as being a resource valuable in its own right. Located within the Mother Lode, the area is also rich in mining artifacts, including the ruins of Melones, the mining town that lent its name to the original dam. Prior to the miners, the Mi-wuk and other tribes inhabited the area, evidenced by petroglyphs and mortars. Finally, all of these recreational attributes are located a few hours from the San Francisco Bay Area and Sacramento (Jackson and Mikesell 1979, 101-102; Wolf 2000; USACE 1972, 24).

In the EIS, the U.S. Army Corps of Engineers (USACE 1972) acknowledged the loss of whitewater rafting as one of five unavoidable adverse impacts, but predicted a massive increase in general recreation. From the estimated initial visitation of 250,000 "recreation days" in 1980 (the predicted first year after completion), the Corps estimated an ultimate annual visitation of three

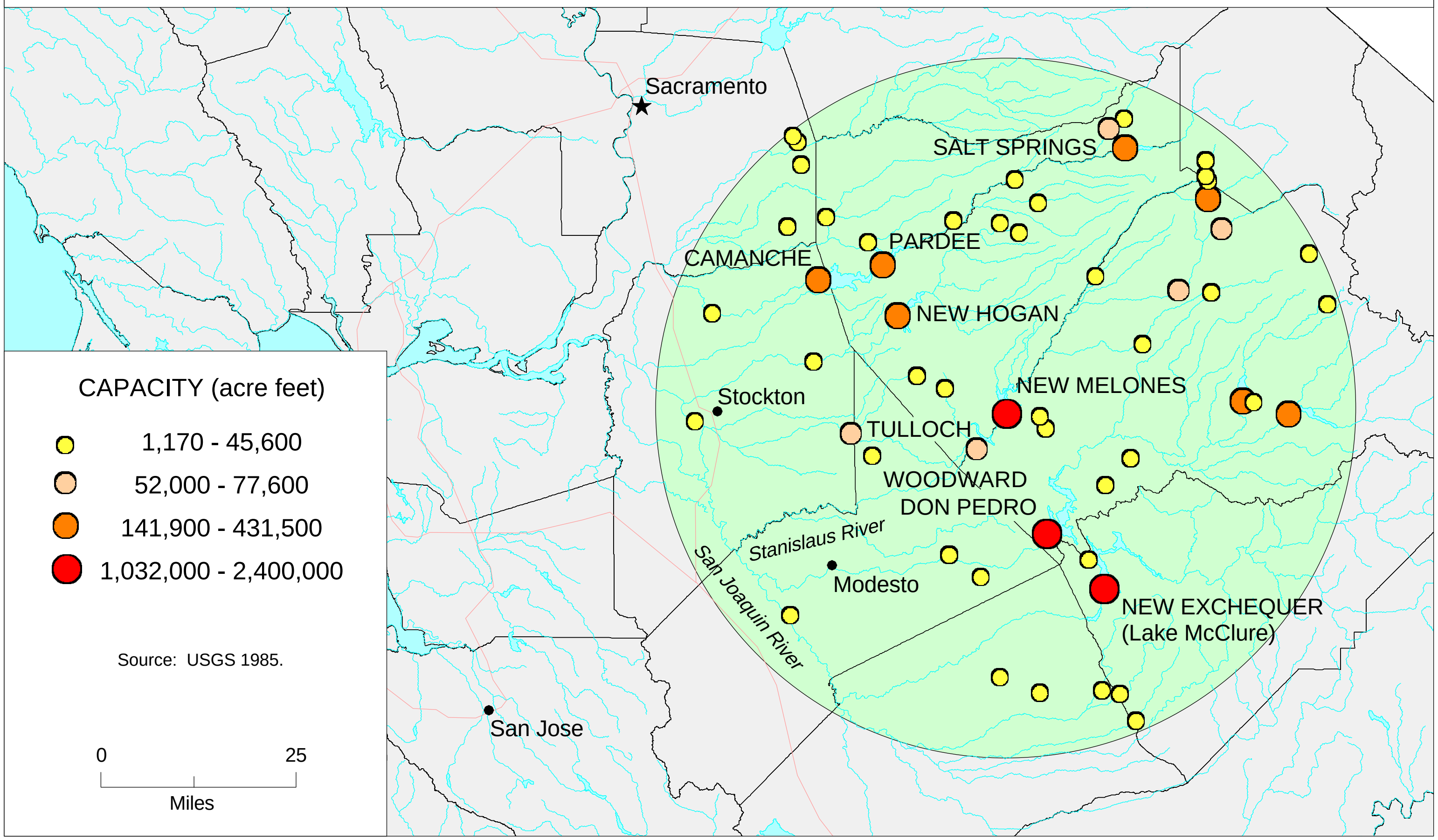
[3] This consistency is largely due to water storage facilities on the middle and south forks of the river. Just upstream from Camp Nine, a penstock carries the water down 1,500 ft. to redeposit it in the river—a point used by dam proponents to question the "wildness" of the river (Jackson and Mikesell 1979, 102).

million visitors in 2080 (USACE 1976a, 21). This figure, presented in the final Master Plan, was a drastic reduction from that given in the EIS; initially, the Corps predicted that visitation would peak at four million visitors per year (USACE 1972, 36).

While the U.S. Army Corps of Engineers predicted huge increases in visitation, it acknowledged that some people might choose *not* to visit New Melones Reservoir. A large number of reservoirs already existed in the vicinity of New Melones, providing ample opportunities for flat water recreation. Furthermore, the management of a multi-purpose reservoir creates a shoreline that is very different from a natural lake.

Both the Corps and the dam opposition studied reservoir recreation in the area. The Master Plan for the project (USACE 1976a, 26) identifies eight "lakes" within 50 miles of New Melones. These eight, all reservoirs, are labeled on Map 7. The plan concludes, "Although flat water recreation is extensive throughout the region, the lack of facilities at many of the lakes and the high demand for water-oriented activities within the San Francisco Bay and central California metropolitan market areas will sustain a high level of use at New Melones Lake." In questioning the Corps' conclusion, Meral (1971, 15-16) examined twenty-one major flat water recreation areas within 75 miles of New Melones. He found that there were 200,000 acres of flat water within this area, not including the Sacramento-San Joaquin Delta; twelve of the areas were closer

MAP 7: DAMS WITH RESERVOIRS OVER 1,000 AF WITHIN 50 MILES OF NEW MELONES DAM



to Sacramento than New Melones, and sixteen were closer to San Francisco than New Melones. Combining the fact that "New Melones is right in the middle of a bunch of other reservoirs" with less customer-friendly policies than its main competition, Don Pedro, he concluded that "the prognosis for New Melones as a magnet for flat water recreation is not very good."

Parry and Norgaard's (1975, 20-21) review of the cost-benefit analysis for New Melones argues that the Corps overestimated the annual recreation benefits from New Melones, but failed to assign any monetary cost to the loss of whitewater recreation (Table 1, Chapter 2). The basis of their argument is the current underutilization of the large supply of flat water in the region, both in the form of other reservoirs as well as in the Delta. In addition, they hold that the Corps' assignment of $1.00 per recreation-day is an arbitrary figure. Since development of other unused flat water would be roughly equal to the cost to develop facilities at New Melones, they assign a value of zero to the recreational benefits of New Melones. In marked contrast, the Corps estimated $910,000 in annual recreation benefits. Parry and Norgaard (1975, 26) suggest that the Corps should have included $150,000 to $200,000 in the project costs to account for the annual losses of free-flowing river recreation. They based their estimate on the Water Resources Council's standard of $3.00 to $9.00 per recreation-day for specialized recreation.

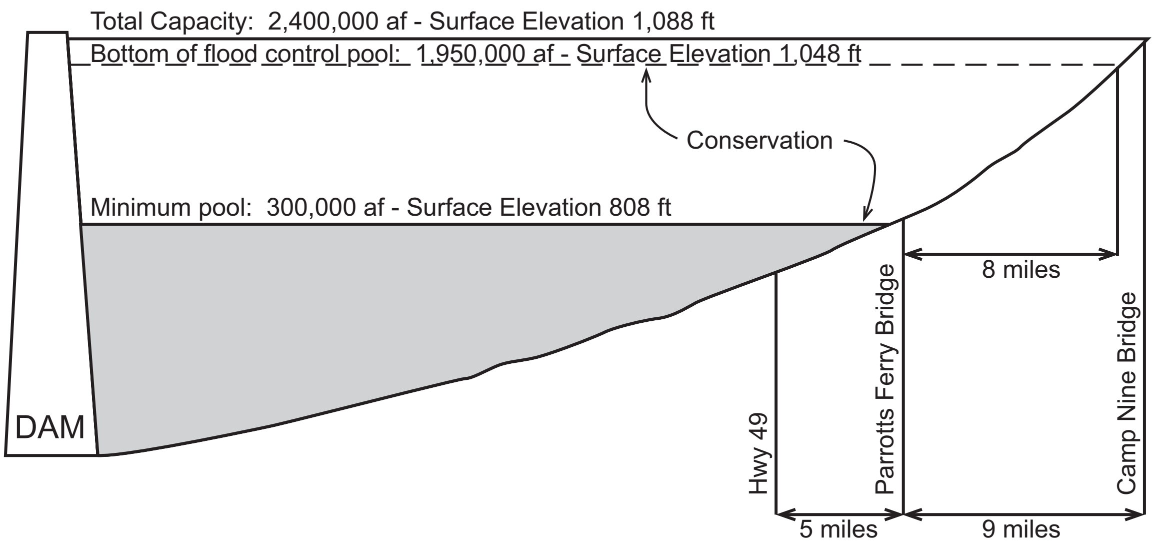
Another disadvantage of recreating at New Melones is shared by all reservoirs: the aesthetics of reservoir “lakes.” The EIS (USACE 1972; 37, 69) recognized that the reservoir operations would result in a fluctuating shoreline, seasonally creating an unattractive drawdown zone. When water levels are low, the periodically submerged zone is visible. Because of the frequent fluctuations in water level, the area between the minimum pool level and the maximum pool level is largely devoid of vegetation, creating what is frequently called a “bathtub ring.” “Shoreline erosion due to steepness of slopes and waves from wind and operation of power boats is expected to occur and will contribute to the unattractiveness of the drawdown zone between gross pool and recreational pool” (USACE 1972, 69). The surface elevation of the pool also varies depending upon the amount of precipitation, resulting in worse conditions year-round during drought periods. The Resource Management Plan (1995, 3-42) called this “band-like scar” the most striking visual characteristic of the reservoir basin, deeming it “reminiscent of the aftermath of a forest fire, [the] grey, weathered trunks and barren branches contrasting with the golden-yellow carpet of grasses.” The plan also noted that while many groves of trees had been cut and removed, in some areas they had been cut and stacked but not removed, and in other areas of the drawdown zone trees were still standing, sometimes extending into the water.

Research on how reservoir levels affect rates of visitation is largely absent from the literature on reservoir management. This can be attributed to the fact that recreational uses are usually secondary to the other purposes of multi-use reservoir projects. Recreation can claim neither the high economic returns of hydropower, flood control, or irrigation water, nor the environmental virtues of enhancing fish and wildlife or water quality. Consequently, most large multi-purpose dams are managed to maximize hydropower generation, flood control capacity, and available water supply, and to satisfy the project requirements for improving navigation, water quality, and fisheries. Frequently the multiple objectives are at odds with one another.

Actual Surface Elevation and Visitation Above the Dam

Integral to the planning process for a multi-purpose project is making decisions regarding the management of the reservoir surface elevation and predicting what the actual surface elevation will be over the range of climatic conditions. In Figure 3, a simplified cross section of the full reservoir illustrates the relationship between the size of the reservoir and the inundation of the Camp 9 to Parrotts Ferry whitewater reach (see also Photographs 6, 7, and 8) . Figure 4 shows the pool management elevations as defined in the Master Plan (USACE 1976a) and the actual reservoir surface elevation between 1981 and 1996. The Master Plan anticipated that the reservoir level would drop to Inactive

FIGURE 3: RESERVOIR CROSS SECTION



Source: USBR 1980b.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 6:
Parrotts Ferry Take-Out,
Old Parrotts Ferry Bridge,
and New Parrotts Ferry Bridge,
7 July 1980

Flow:
2,200 cfs

Surface Elevation:
827 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 7:
New Parrotts Ferry Bridge
and the Filling Reservoir,
17 February 1982

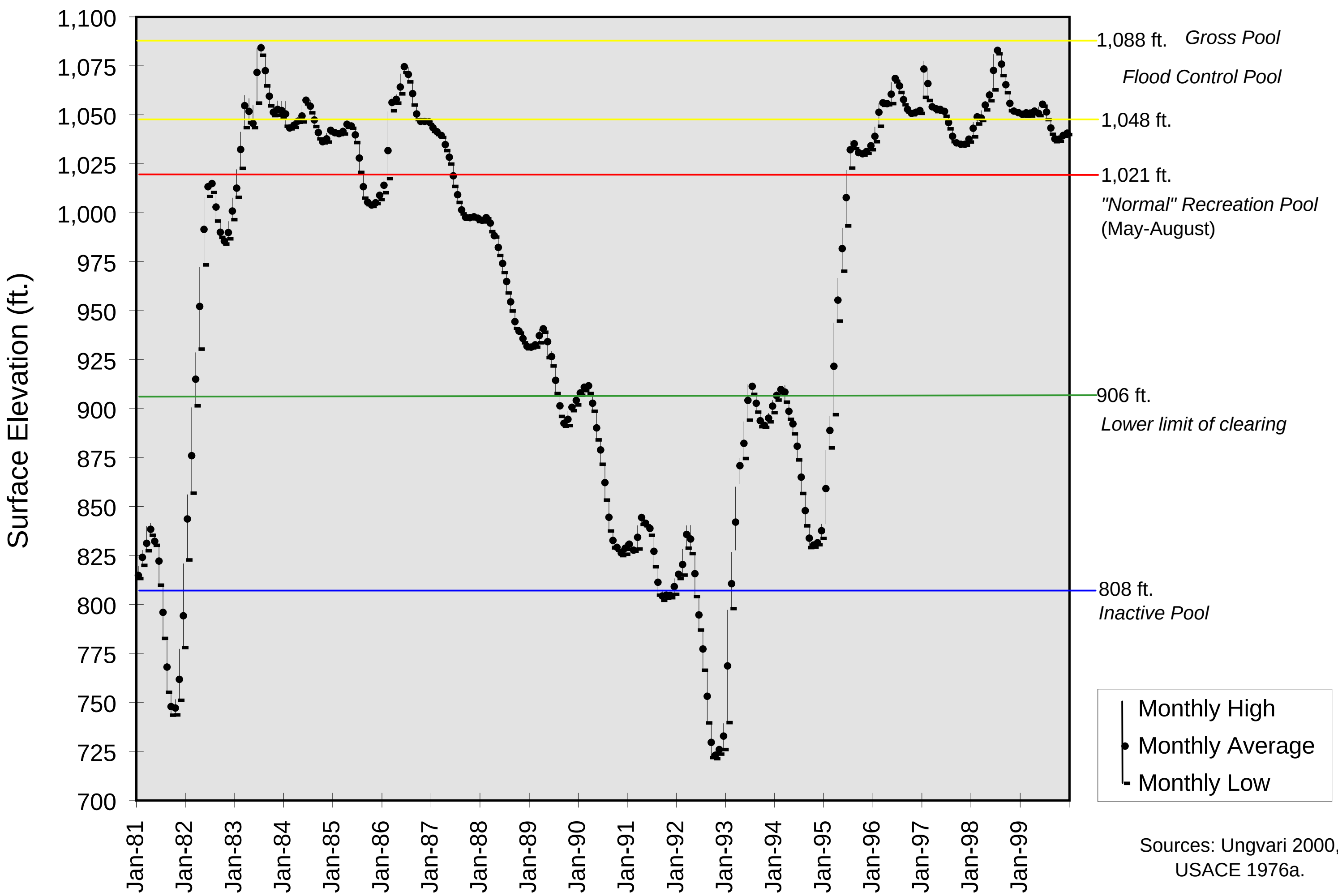
Surface Elevation:
887 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 8:
New Parrotts Ferry Bridge,
14 February 1983

Surface Elevation:
1,033 ft.

FIGURE 4: RESERVOIR SURFACE ELEVATION



Pool (808 feet) and rise to Gross Pool (1,088 feet) less than once every thirty years (USACE 1976a, 4)[4]. Once in ten years, the level was expected to drop to 916 feet (ten feet above the lower limit of clearing) (USACE 1976a, 39). Two out of three years, the reservoir would reach into the flood control pool. Finally, the average, or "normal," recreation pool for the peak visitation months of May through August was expected to hover around 1,021 feet—providing optimum conditions for recreation during the warm, dry summer months (USACE 1972, 2).

In the relatively short time that New Melones has been operating at capacity, the reservoir seems to have covered all extremes. Since 1983, the summer recreation pool fell below "normal" ten out of seventeen years. Several years the pool level dropped below the lower limit of clearing, reaching the Inactive Pool elevation in 1991 and falling well below this elevation in 1992 (Photographs 9 through 18). Annual evaporation from the reservoir has ranged from 13,921 af in 1992 to 59,430 af in 1984, averaging 38,183 af per year between 1980 and 1999.

Figure 5 shows the estimated and actual visitation to New Melones. The U.S. Army Corps of Engineers (USACE 1976a, 21) predicted that visitation would increase by 600,000 recreation days between 1980 and 1983. As

[4] Note that in the EIS (USACE 1972, 2) the frequency of filling to gross pool and dropping to inactive pool was given as an average of less than once in 25 years. Four years later in the Master Plan (USACE 1976a, 4), the Corps changed the likelihood of these occurrences to once in 30 years.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 9:
New Melones Reservoir,
Near Capacity,
9 May 1983

Surface Elevation:
1,045 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 10:
Highway 49 Bridge,
During Drought,
7 October 1991.

Surface Elevation:
805 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 11:
Glory Hole
Recreation Area,
Near Capacity,
28 February 1984.

Surface Elevation:
1,043 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 12:
Tuttletown Recreation
Area, During Drought,
7 October 1991

Surface Elevation:
805 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 13:
New Melones Marina
and Glory Hole
Recreation Area,
During Drought,
7 October 1991

Surface Elevation:
805 ft.

PHOTOGRAPH 14:
New Melones Marina
and Glory Hole
Recreation Area,
During Drought,
7 October 1991

Surface Elevation:
805 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 15:
Glory Hole Recreation Area - Angels Arm, During Drought, 7 October 1991

Surface Elevation: 805 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 16:
Glory Hole Recreation Area - Angels Arm, During Drought, 7 October 1991

Surface Elevation: 805 ft.

Source: USBR Public Affairs Photo Lab

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 17:
Tuttletown Recreation Area, Near Capacity, 28 February 1984

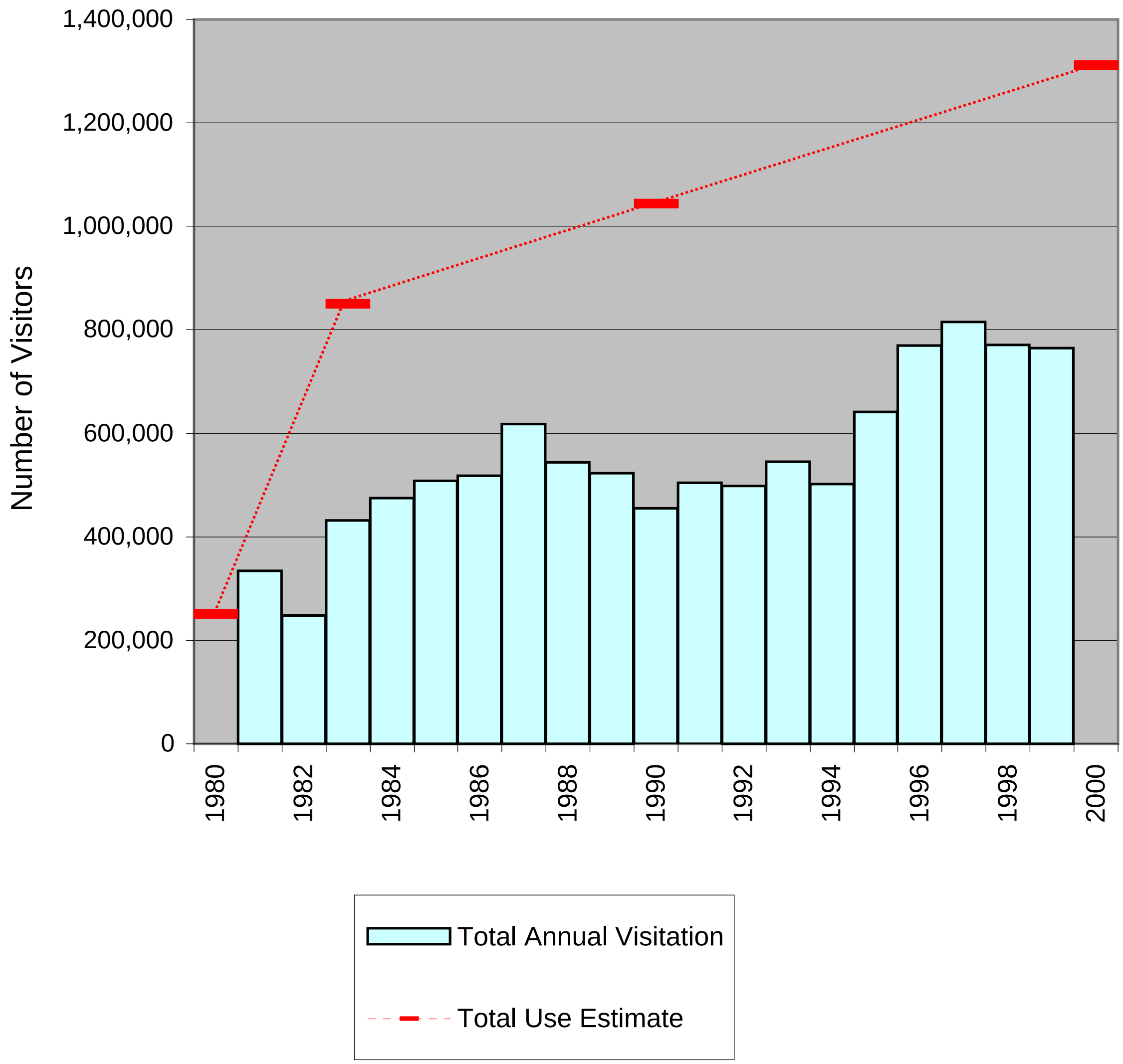
Surface Elevation:
1,043 ft.

Source: USBR Public Affairs Photo Lab

PHOTOGRAPH 18:
Tuttletown Recreation Area, During Drought, 7 October 1991

Surface Elevation:
805 ft.

FIGURE 5: ESTIMATED AND ACTUAL ANNUAL VISITATION



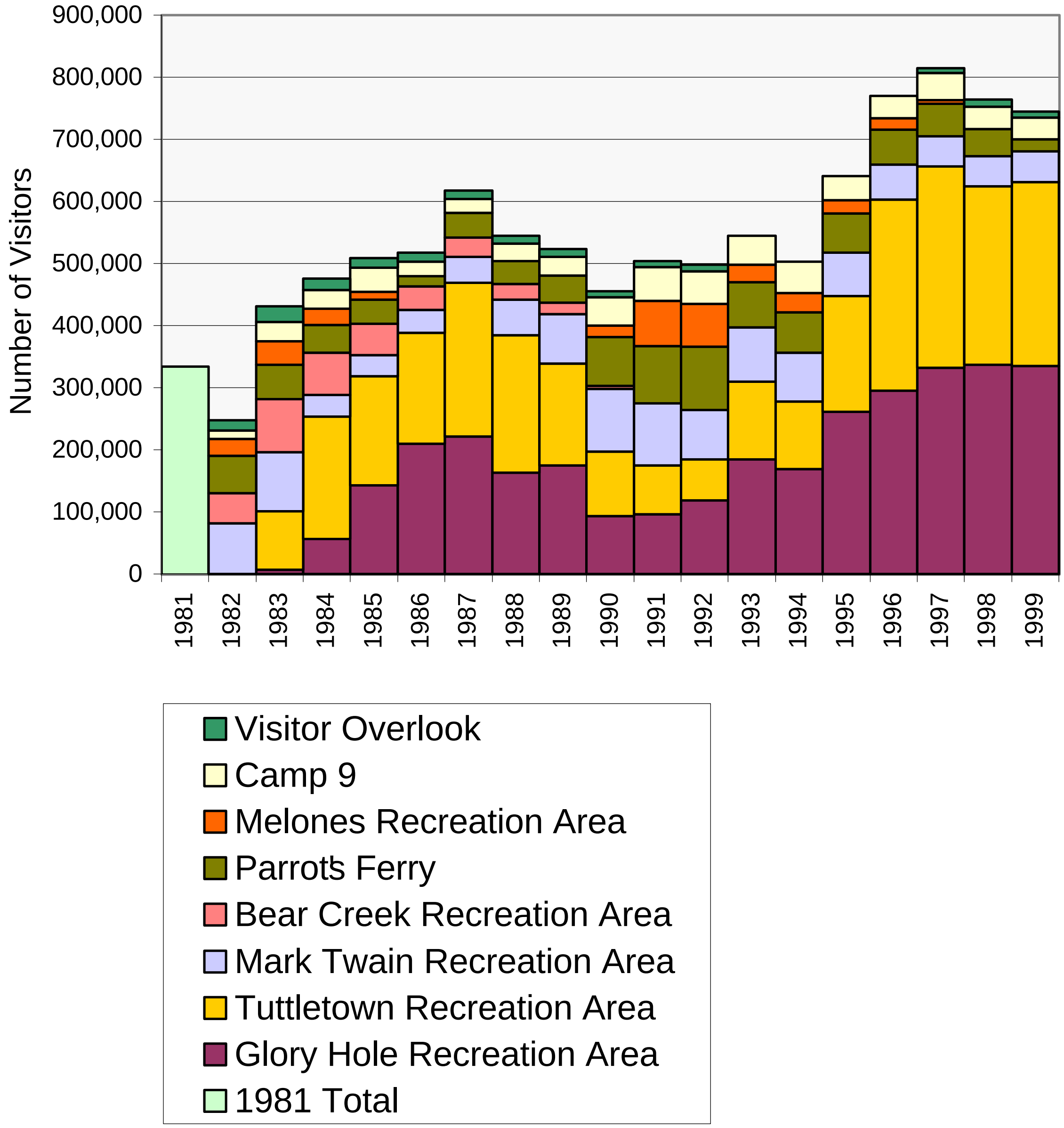
Sources: USACE 1976a, 21; USBR 2000a.

predicted, visitation did increase during the first three years of project operation (considering that the reservoir was not operated at full capacity until March 1983). Overall, however, actual visitation is only about half of that predicted by the Corps. In addition, instead of continually rising, it slumped between 1987 and 1995. This downtrend coincides with a period of drought in California, which impacted the surface elevation of the reservoir.

Annual visitation to each of the recreation areas at New Melones is shown in Figure 6. The proportion of visitation reflects the amenities of the recreation area. The largest two, Glory Hole and Tuttletown, feature all of the 320 campsites along with several boat launching areas (USBR Undated). Since opening in 1983, these recreation areas have consistently attracted the most visitors. This difference in scale is important to note when examining the patterns between monthly visitation at the individual recreation areas and reservoir level.

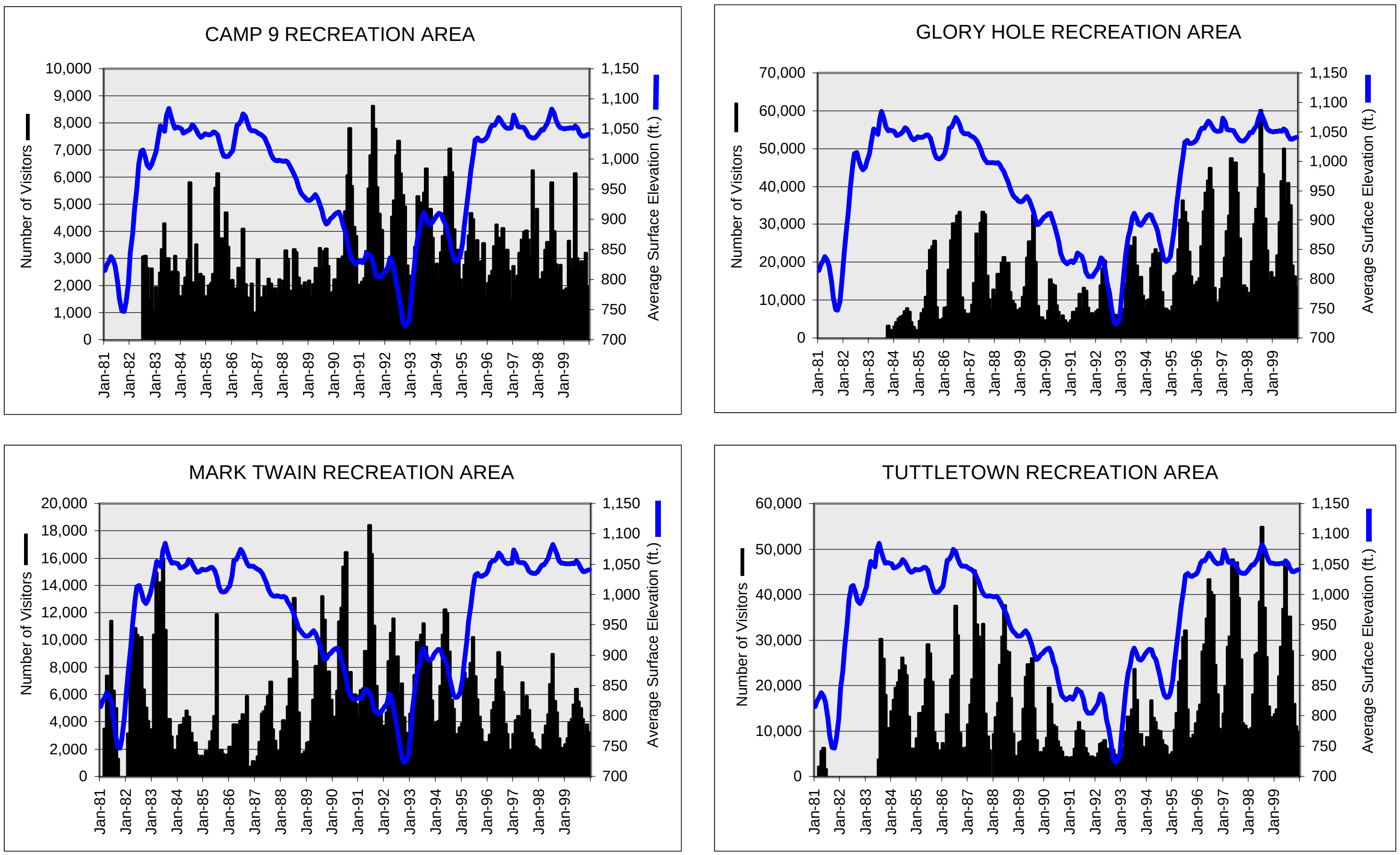
Comparing monthly visitation at the individual recreation areas to reservoir surface elevation, two patterns emerge (Figures 7a and 7b). At the areas with camping (Glory Hole and Tuttletown), as well as at Bear Creek Recreation Area and the Visitor Overlook, visitation more or less follows the reservoir surface elevation. When the reservoir water level is high, visitation is high; when the water level drops, visitation drops. Conversely, at Camp Nine, Mark Twain, Parrotts Ferry, and Melones Recreation Areas, visitation is higher when the

FIGURE 6: ANNUAL VISITATION BY RECREATION AREA



Source: USBR 2000a.

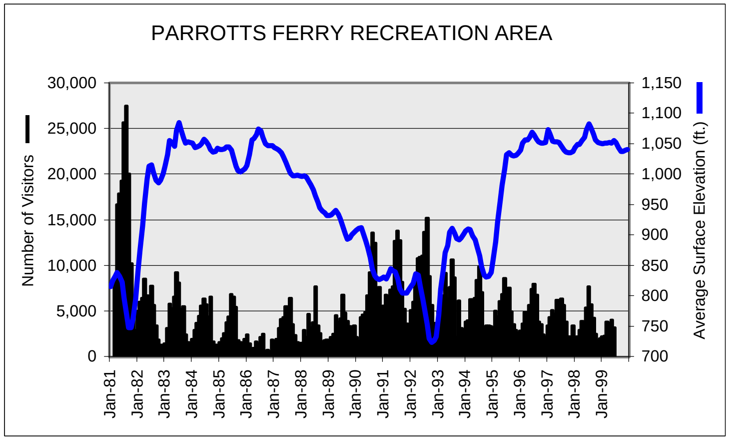
FIGURE 7A: RESERVOIR LEVEL AND MONTHLY VISITATION BY RECREATION AREA

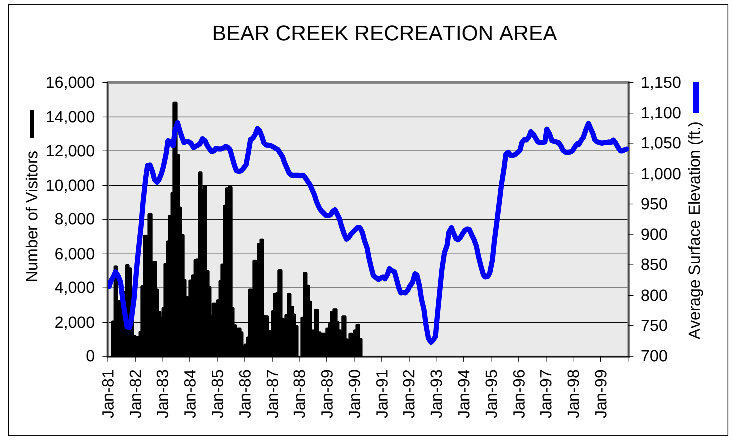


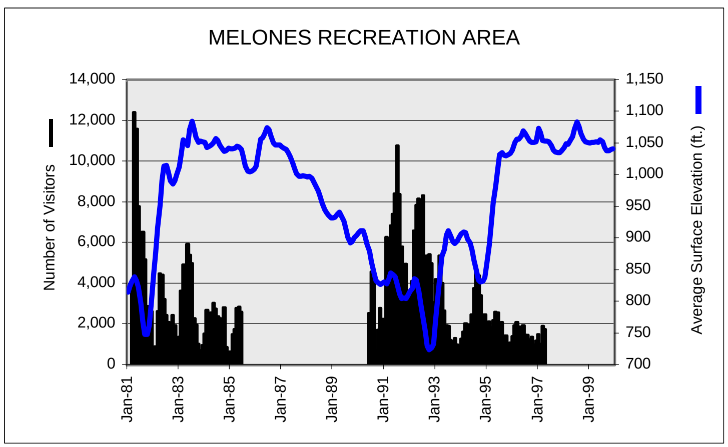
Note: Visitation scales vary.

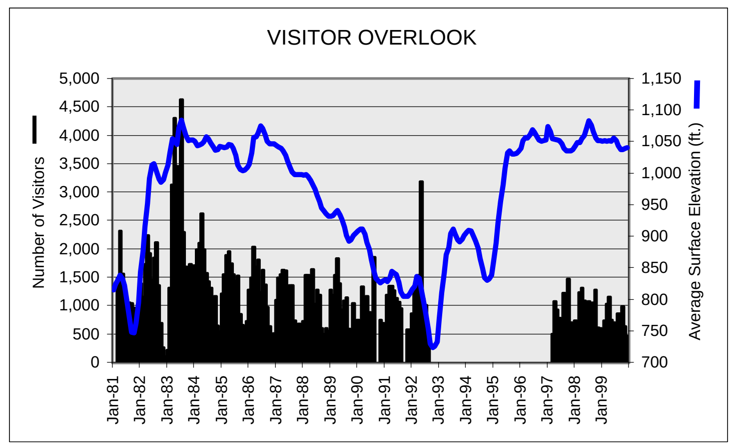
Sources: Ungvari 2000, USBR 2000a.

FIGURE 7B: RESERVOIR LEVEL AND MONTHLY VISITATION BY RECREATION AREA









Note: Visitation scales vary.

Sources: Ungvari 2000, USBR 2000a.

reservoir level is lower. The boat launching facilities at Melones and Mark Twain Recreation Areas simply consist of the old highway leading directly into the reservoir. These two ramps, along with the lower portion of Parrotts Ferry Road, were the only ramps planned to reach the reservoir at minimum pool, making them still usable after a series of dry years (USACE 1976a; 88, 96, 117). In 1989, it took a group of volunteers to extend a boat ramp at Glory Hole Recreation Area to elevation 860 feet, making the reservoir again accessible from one of the popular camping areas during low water levels (Sanders 1997). However, the next three years, the reservoir elevation dropped even lower, making the extended ramp unusable. Photographs 12, 14, 15, 16, and 18 show the unusable boat ramps at Glory Hole and Tuttletown Recreation Areas in 1991.

Although the Corps (USACE 1972, 37) and the USBR (1980b) advised that whitewater rafting would not be possible after the reservoir was filled, the stretch between Camp Nine and Parrotts Ferry has been run since project completion. Table 5 shows the commercial rafting of this stretch during the drought. For those who knew the canyon before inundation, the transformation of the landscape was deeply disturbing. One Friends of the River (FOR) volunteer recalls,

> “I was in tears my first trip after the waters had receded. I recalled all of the greenery. There was an incredible amount of silt in such a short time. It was now a wasteland, a moonscape, with an occasional naked tree here and there….The channel now running was carved through silt. Unlike the original water course, defined by rocks, trees, and

> shrubbery, it was now defined by silt. Coming out of the river was like going up a snowbank—it was hard work to get up from the river. Looking up, there was a giant area without vegetation, above that it was natural but below that it was dead" (Evans 1999).

Although Evans became a member of FOR back when the battle to stop New Melones Dam raged, the painful experience of rafting the river after inundation was a turning point for him. He now considers himself a conservation activist, and spends more time volunteering with FOR. In his footsteps, his daughter now guides rafting trips for Friends of the River.

TABLE 5: CAMP 9 TO PARROTTS FERRY RAFTING DURING DROUGHT

YEAR	NUMBER OF RAFTERS (Commercial Only)
1991	8,441
1992	11,624
1993	7,541
1994	7,543

Source: Sutton 2000.

<u>Management of New Melones Recreation Areas</u>

The drought alone may not account for the lower-than-expected visitation to New Melones Reservoir. A variety of management issues also affect visitation. USBR administration at New Melones faces budget constraints and misuse of project facilities by the public. These circumstances have influenced the management decisions made at New Melones Reservoir over the years.

While Congress authorized the Corps to build the project and the USBR to administer it, the USBR's administrative tasks did not initially include management of recreational facilities. According to Jackson and Mikesell (1979, 85), the USBR hoped to find a local agency to oversee the recreational facilities, perhaps the counties or park districts in which the project is located. Local agencies were reticent to take on the responsibility and expense, and in the years after authorization federal agencies were busy working out other project elements. In the mid-1970s, the USBR formalized plans to administer New Melones recreation itself. The USBR rarely undertakes the management of recreational facilities for multi-purpose projects directly; rather, the USBR finds local or state agencies or gets the National Park Service to assume responsibility. New Melones and Berryessa, also in California, are by far the largest projects in the country for which the USBR manages the recreation; in other states, management by the USBR of recreation areas is limited to relatively minor projects. Recently, the philosophy evolving within the USBR is that recreation is important, but long-term impacts of this shift are uncertain (Davis 1999).

The development of the unimplemented Resource Management Plan for New Melones exemplifies the USBR's lack of funds for improving facilities management. Private individuals and government representatives put a great deal of effort into developing the preliminary draft document. Participants in the process seem to be happy with the quality of the plan. However, the USBR ran out of funding, and it is uncertain when the plan will be finalized. In the meantime, the draft plan is becoming outdated (Squire 1999, Macoubrie 1999, Davis 1999).

Without money for management, volunteerism is increasingly relied upon to improve New Melones facilities. New Melones Partners, a volunteer group that encourages and coordinates volunteerism for the reservoir, formed because of the lack of federal funds. The group emerged from interested citizens who had contributed to the development of the Resource Management Plan. In an effort to fulfill the needs of the project area, the group meets monthly with the USBR and assists in programs that the USBR does not have the means to complete independently. One important contribution of New Melones Partners was to assist the USBR in getting a state grant for two floating restrooms on the reservoir to improve water quality. They also helped install four osprey platforms around the perimeter of the reservoir (Squire 1999, Rheault 1999, Davis 1999, Burgeron 1999).

The Cave Management Committee grew out of New Melones Partners. The Master Plan (USACE 1976a, 180-183) suggested provisions for the protection and public use of caves and natural bridges in the project area as the EIS had said it would (USACE 1972, 42), but the USBR has been unable to offer financial support for recreational caving in the area (Davis 1999). The volunteer

Cave Management Committee is responsible for the low budget management of the more than 80 caves in the project area. The committee installed registers in most of the caves and monitors visitation. It decided that the best policy for long-term preservation of the caves is secrecy, and refers the public to three commercial caves in the area (Moaning, Mercer, and California Caverns). Insistent individuals are referred to local grottos of the National Speleological Society to arrange to tour caves in the area. Without federal money, plans to lock cave entrances have been abandoned; instead, they have simply attempted to keep trails away from cave entrances. Because the steep terrain limits access, there have not been problems with damage to the caves, thus the system is apparently working (Squire 1999).

One major disadvantage at New Melones Recreation Area is that there is no reservation system for the campgrounds—they are run on a first come, first served basis. Just to the south, Don Pedro Reservoir offers reservations. Don Pedro Dam was built jointly by the City and County of San Francisco, the Turlock Irrigation District, and the Modesto Irrigation District. The Don Pedro Recreation Agency operates and maintains the recreational facilities, and administrates contracts with the concessionaires of the two marinas (DPRA Undated). Staff at New Melones concede that federal ownership puts them at a disadvantage for recreational use. Don Pedro Reservoir operates competitively—the goal is to make money—and seeks to accommodate visitor needs. At New Melones

Administrative Offices, the receptionist sometimes recommends Don Pedro to potential customers who seek reservations (Cato 1997). There is no particular reason why a reservation system has never been implemented at New Melones, and the USBR is currently conducting a feasibility study examining the prospect of bringing in a concessionaire to manage the recreational facilities. New Melones Lake Marina at Glory Hole Recreation Area is already privately operated. If the USBR decides to contract for the management of the recreation areas, one requirement would be to have a reservation system (Davis 1999).

Closure of New Melones Recreation Areas (Map 6)

Over the years, the USBR has closed several of the smaller recreation areas because of misuse by the public. The Resource Management Plan cites the USBR's lack of enforcement powers as part of the problem. Rangers can issue warnings but they cannot issue citations or take other enforcement actions; congressional legislation would be necessary to change this (USBR 1995; 1-2, 3-52). In August 1992, the USBR closed public access to Bear Creek Recreation Area, which had suffered repeated incidences of misuse, particularly by local teenagers. Unfortunately, the USBR was unable to coordinate assistance with the sheriff to police the area. However, the Resource Management Plan (USBR 1995, 3-62) notes scarred terrain beyond the locked gate, evidence that motorcycles and other off-road vehicles are accessing the area, even though the USBR does not allow such uses anywhere around the reservoir. To prevent access to Melones Recreation Area, the USBR installed a locked gate at Highway 49 in May 1997. Although the USBR owns the reservoir shoreline, some of the land between Highway 49 and the reservoir is privately owned. In early 1997, someone dumped pesticide along the access road. The USBR paid $2000 to analyze and remove the material; subsequently, the private property owner and the USBR agreed to the locked gate. Parrotts Ferry Recreation Area was closed to traffic indefinitely in June 1999 because of garbage being dumped in the area (Davis 1999, Cato 1997). With the closure of Melones and Parrotts Ferry Recreation Areas, two of the three ramps that extend into the reservoir when the water is very low are no longer open to the public.

The downstream Visitor Overlook, the only spot from which the face of the dam is visible, is no longer accessible to the public. This area, consisting of a parking lot, restrooms, and a plaque, was originally intended as a public viewpoint during construction of the dam. After completion, the gate was left open, until problems with teenagers partying at the overlook led administration to lock the gate every night. When New Melones Administrative Offices moved from below the dam to near the reservoir in 1993, staff stopped opening the gate during the day. The general area is still used by equestrian riders, hunters, and model airplane enthusiasts, who make use of parking lots outside the gated area (Davis 1999, Sanders 2000).

Another reason for the closure of the Visitor Overlook is the cost of maintenance. At the juncture of the road leading to the Visitor Overlook is the gated entrance to a Baseline Camp, a joint effort of State of California Departments of Corrections and Forestry. This facility is the last stop for inmates about to return to society, and although a gate stops people from driving in, the area itself is not fenced. The USBR leases the land for the facility, and in return crews of inmates are provided for fire protection and other maintenance of New Melones Project lands. At the end of the Baseline Camp, the road winds down to the base of New Melones Dam and the powerhouse. The water pipeline for the overlook restrooms comes up from this area. The pipeline, suffering leakage that the USBR has been unable to pinpoint, is another factor in the closure of the overlook area. Lack of funds to fix this problem and to properly manage the overlook make it highly unlikely that it will be reopened (Cawthorne 1998, Davis 1999).

New Melones administration does have one reason for celebration: a new visitor center. In the EIS, the Corps (USACE 1972, 6) mentioned that a public overlook and visitor center were being considered upstream from the dam. Located adjacent to the administrative offices, the long awaited facility was finally completed and opened to the public in June of 1998, amid USBR concerns over being able to adequately staff the center (Cato 1998). Thanks to the assistance of volunteers, visitors now have the opportunity to learn about the natural and cultural history of the area, including the controversy over building the dam and the wild river buried by the reservoir.

Future Issues

One interesting question beyond of the scope of this thesis is how the recreational facilities might be different today if they had been locally managed. Would better management make New Melones competitive with surrounding reservoir recreation, particularly Don Pedro? If so, would the USBR expand the recreational facilities at New Melones? Would a larger staff and better funding mean that greater efforts could be made to keep recreation areas open, rather than the current solution of shutting them down when problems occur?

The division of the project between the Corps and the USBR continues to affect the development of recreation at New Melones. The Master Plan (USACE 1976a) discusses several recreation areas that have not yet been developed, and describes much fuller development at the existing areas, including those that are not currently open to the public. According to the recreation area manager for the past twenty years, Keith Davis (1999), the current facilities are not operating at full capacity constantly, but they do fill up occasionally. He believes that additional facilities will be needed in the future. However, the Corps, not the

USBR, has the congressional authority to construct recreational facilities.[5] Currently the Corps does not have any money for additional development. Davis feels that they would need the assistance of their congressman to receive such funding. With reapportionment, their congressman changed from Congressman Layman to Congressman Doolittle, and so far indications are that Congressman Doolittle will not make it his interest to procure additional funding for New Melones recreational facilities (Davis 1999).

One recent proposal is the construction of an RV park off of Parrotts Ferry Road in Calaveras County, adjacent to Coyote Creek Recreation Area. Coyote Creek Recreation Area was one of the USBR sites charted for development in the Master Plan (Map 6). Two natural bridges span Coyote Creek, and there are numerous limestone caverns in the area. Although the USBR never formally developed the day use area, an abandoned road has been used as a parking area for an interpretive trail, and in August 1999 a traffic counter was added so that visitation could be recorded. According to the Master Plan, five of the caves in the area were to be gated for the protection of both the natural resources and the public. How the RV park will impact the geologic features in the area, as well

[5] The Master Plan (USACE 1976a, 221) incorrectly states that while initial developments would be constructed by the Corps of Engineers, “future recreation facilities and wildlife habitat improvements should be constructed by the Bureau of Reclamation at Federal expense in accordance with project authorization” (Davis 1999).

as the use of New Melones campgrounds, is unknown. The Negative Declaration filed with the county Planning Department means that an EIS will not have to be generated—in fact, the USBR was unaware that the project was being planned (CERES 1999; USACE 1976a, 99; Sanders 2000; Davis 1999).

Downstream Recreation: Background

The lower Stanislaus River, downstream from New Melones Dam, played a central role in the debate over the project. Prior to New Melones Dam, recreation along the lower river was limited by both lack of public access and by low and inconsistent flows, particularly during the summer. New Melones Reservoir could improve flows and water quality, which would not only make the lower river more attractive for canoeing, kayaking, and swimming, but would also enhance the fishery (USACE 1972, 37). Members of the Yokut Wilderness Group, structured under the Mother Lode Chapter of the Sierra Club, foresaw the potential for protecting and enhancing the lower river through the New Melones Project. To avoid isolating themselves from the local community, they worked with local landowners supporting the dam, who were organized under the Stanislaus River Flood Control Association. By compromising and jointly supporting the project, they hoped to work mitigation and protection of the lower river into the New Melones Project (Jackson and Mikesell 1979, 93; Palmer 1982, 65).

The national Sierra Club did not support the New Melones Project, causing a rift between the local Yokut Wilderness Group and the national organization. This split among environmentalists worked to the benefit of supporters of the dam; proponents proudly pointed to the fact that a portion of the Sierra Club endorsed the project. Members of the Yokut Wilderness Group disagreed with the Environmental Defense Fund's challenge of the adequacy of the EIS, and opposed Proposition 17 to stop the dam. The campaigning of some Sierra Club members against the initiative certainly contributed to voter confusion and the failure of the initiative to pass (Jackson and Mikesell 1979, 94; Palmer 1982, 65).

Planning for Lower Stanislaus River Parks

The Corps generated the *Lower Stanislaus River Master Plan* to outline resource management and recreational development "for the Lower Stanislaus River portion of the New Melones Lake project" (USACE 1977, i). Unlike the New Melones Recreation Area, which is managed by the USBR, the Lower Stanislaus River Parks are the jurisdiction of the U.S. Army Corps of Engineers. In the EIS, the Corps alludes to the forthcoming master plan, which would mitigate for riparian and habitat losses of the reservoir by preserving fish and wildlife habitat downstream; preserve streambed gravels and enhance the downstream fishery[6]; provide for greater public access and use along the lower river; and provide for the management of the 8,000 cfs floodway (USACE 1972; 7, 59). To accomplish these objectives, the lower river plan stipulated that the Corps would acquire in fee simple 725 acres and acquire in easement 5,100 acres. The acreage bought outright by the Corps would be used for parks to allow public access, but would also serve flood control and fish and wildlife preservation and enhancement purposes. The easement acquisitions would be within the 8,000 cfs floodway to allow for flood control releases; a subset of these easements would also serve to protect vegetation and spawning gravels. To partially mitigate for the loss of whitewater upstream, a four mile reach below Goodwin Dam would be available for whitewater kayaking (USACE 1977, 4-5).

In conducting background studies, the Corps recognized the limited potential of the lower Stanislaus River to make up for the whitewater lost by inundation. The lower river contained three distinct landscapes, but even the uppermost area did not replicate the Camp 9 to Parrotts Ferry stretch.

> "Just below Goodwin Dam, the river tumbles over boulders in a deep, narrow canyon walled by rugged cliffs. Below Knights Ferry, the river is in transition between the swiftflowing upper area and the slow, meandering flow in the lower portion....Near Oakdale and downstream the meandering river is bordered by levees typical of those in the San Joaquin Delta area" (USACE 1977, 14-16).

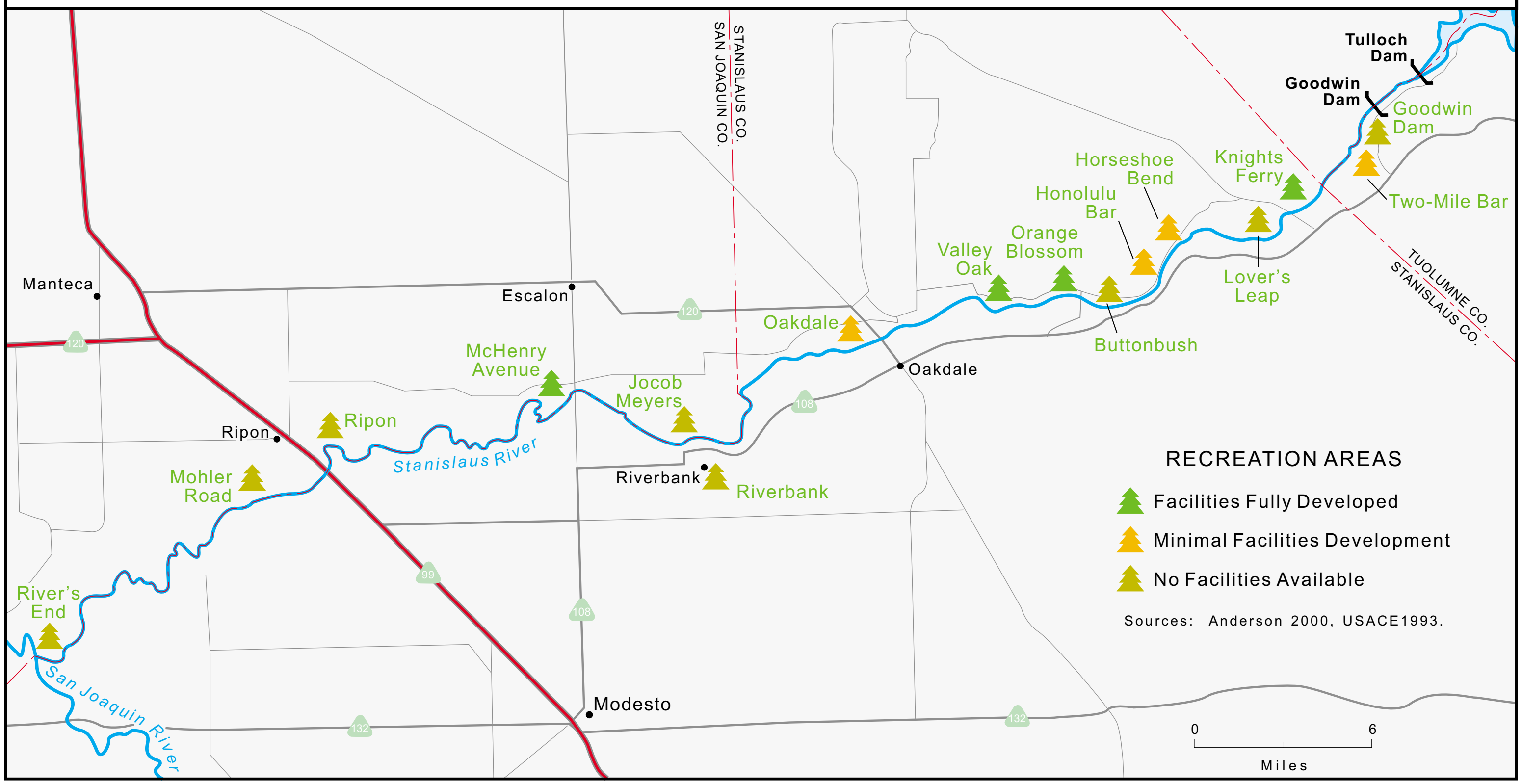
[6] Because of the existing Melones, Tulloch, and Goodwin Dams, the loss of sediment in the lower Stanislaus River for replenishing spawning gravel was a condition that pre-existed the building of New Melones Dam.

The difficult rapids in the four mile stretch between Goodwin Dam and Knights Ferry could only be managed by experienced kayakers (Class II-VI), and was not feasible for commercial use. With scheduled releases, this stretch is now runnable by kayakers for part of the year. While in no way comparable to the lost whitewater run, boating for the general public would be possible below Knights Ferry with the improved public access and planned facilities. This Class I-II stretch is also now usable because of the increased flows, although not all of the public access sites have been improved as planned, and managing the flows for boaters sometimes conflicts with other project purposes (USACE 1977, 37; USACE 1976b, 3; Deal 1996, 101; Foust 1997).

<u>The Lower Stanislaus River Parks Today (Map 8)</u>

The "string of pearls" parks are not exactly as envisaged for a variety of reasons. In the master plan, the Corps calculated the maximum practical use, or carrying capacity, of the lower river based on the eleven planned public access sites. It acknowledged that the river "cannot sustain mass recreation use" and estimated that by 2020 the maximum practical use of 386,000 recreation days would be reached (USACE 1977; 21, 30-31). The Stanislaus River Parks recreation guide (USACE 1993) lists sixteen recreation areas, but there are no facilities available at eight of these areas; in fact, only four of the recreation areas received funding from Congress for full development. The developed

MAP 8: STANISLAUS RIVER PARKS



areas, however, were approached with environmental sensitivity, and the Corps is actively involved in several habitat restoration projects (Holcomb 1999; Deal 1996, 94).

Despite the fact that the parks have not been fully developed as planned and promised to the public, visitation has exceeded expectations. In the period between 1996 and 1999, the number of annual visitors ranged from 276,164 to 370,766 (Table 6); in the Master Plan (USACE 1977, 35), the Corps predicted that annual visitation in 2000 would be 285,700 visitors. Stanislaus River Parks' rangers recognize some problems in their methods for estimating visitation as the Corps designed the system to measure *reservoir* recreation; rangers are therefore working on improving visitation estimates for the river park system. However, there is no question in the rangers' minds that the current facilities are overused, and the number of boaters downstream from Knights Ferry is a large part of the problem (Holcomb 1999). "The current high level of boater traffic is significantly contributing to overcrowded parking lots, eroding beaches, loss of vegetation, trespassing, poor visitor experiences, crowded and noisy river conditions, visitor conflicts, excess amounts of trash and litter, and overused public restrooms and septic systems" (USACE Undated).

TABLE 6: STANISLAUS RIVER PARKS VISITATION

FISCAL YEAR (Oct. 1 - Sept. 30)	NUMBER OF VISITORS
1996	301,003
1997	276,164
1998	370,766
1999	330,217

Source: Faridi 1999.

Park managers are working with the public and commercial boating operators to update their recreation and resource management plans and improve operations. Lack of funding hinders one of the more obvious solutions—to disperse use by developing more areas and facilities. The Corps hopes that cost-share partners, such as local cities like Ripon and Riverbank, will be able to assist them in developing recreation areas (USACE Undated, Holcomb 1999).

CHAPTER 4

SUMMARY AND CONCLUSIONS

Despite the efforts put forth by the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation, the federal government could not predict the impacts that shifting environmental priorities would have on the New Melones Project. Most notably, the Central Valley Project Improvement Act of 1992 and efforts to improve Sacramento-San Joaquin Delta and San Francisco Bay water quality have made fishery and watery quality issues the driving forces behind management of New Melones. With so many conflicting project purposes, it is a difficult task for the USBR to re-prioritize the intended benefits of the project. Were there enough water to satisfy fishery and water quality needs and still provide water supply, optimum power generation, and optimum reservoir and downstream recreation, most stakeholders' needs could be satisfied. The reality is that there is not enough water, and the much needed development of a long-term operating plans hinges on the USBR's ability to compromise the agency's goals with the stakeholders' needs. Most importantly, the plan must be flexible, because fishery and water quality requirements will continue to change as more is learned about the larger natural system, as state and federal water policy evolves, and as public attitudes change.

As the Stanislaus Fish Group recognizes, continuing to study and gain understanding of the Stanislaus River fishery is vital. To improve the chances of anadromous fish survival, researchers must be able to make educated decisions on the timing and amount of flows and the other conditions required by the fish. Different flow regimes may actually save water, allowing it to be allocated for other project purposes. As optimal temperatures for the fish are established, methods for uptake of water from the reservoir may have to change, including the potential removal of the existing Melones Dam. Stanislaus River research will also contribute to the larger body of knowledge on the Central Valley fishery. While state and federal endangered species classifications will change over time, the more that is known about the fishery, the more easily management decisions can be made. Similarly, understanding water quality will help decision-makers make better management decisions. Since it appears that fishery and water quality needs will dictate flows, farmers may have to change the types of crops being grown near the river and manage their planting schedules to minimize damage. Until the water needs for improving the fishery and water quality are established, long-term decisions on allocating water to Central Valley Project contractors are impossible. The ability of the USBR to optimize hydropower generation and to improve recreation may also change depending upon the decisions made.

In the area of recreation, the federal government has not lived up to its promises. Upstream from the dam, lack of funding is the major reason for this. Management improvements, such as implementing a reservation system, could increase visitation to the reservoir—although it seems unlikely that visitation will ever reach the exceedingly high predictions. However, attempts to satisfy other project purposes could cause even greater fluctuations in reservoir levels in the future. At present, there is little reason to even think about developing the numerous recreation areas originally planned for development. Given the management problems the USBR has encountered at some of the recreation areas, prior to future development, management strategies and environmental impacts should be reassessed.

Downstream from the dam, the Corps is struggling to update its park plan to accommodate the large number of visitors while protecting the riparian environment. Inadequate funding has also limited the development of the downstream lands purchased for public access. While decisions made regarding flows may affect boating in the lower river, it is prudent for the Corps to consider ways to disperse public use and provide adequate facilities (such as restrooms) for the public.

New Melones Dam has reduced the threat of flooding along the lower Stanislaus River, but the potential for flooding will never be eliminated. Although the Corps did purchase numerous easements to provide a floodway downstream from the dam, this does not appear to have stopped farmers from growing orchards on this fertile land. Farmers assert that flows much lower than the 8,000 cfs designated floodway damage their crops, and it seems likely that in the future the USBR will be taken to court to resolve the issue. My preliminary assessment of changes in land use downstream from the dam indicates that further study is needed of both the encroachment of agriculture into the floodplain and the effectiveness of the Corps' easements.

As the USBR and other agencies complete the studies necessary for the long-term operating plan, it will be possible to more thoroughly assess the impacts of New Melones Dam. I have attempted to provide an overview of the situation to date, and to document the research in progress. There are many questions regarding the impacts of a large dam and reservoir on a region that I did not attempt to address. What flood control benefits has New Melones actually provided for the lower San Joaquin River and the Delta? How has the reservoir and associated recreation affected wildlife in the area? Has the reservoir benefited the surrounding counties as predicted in the benefit-cost analysis? For each of the project purposes, how do the economic benefits that were used to justify the project compare with the actual benefits?

In conducting this post-audit, the most striking discovery concerning the New Melones Project is that issues that were unresolved when the project was built are still unresolved. In the project's *Statement of Findings*, Colonel James Donovan (1972) stated,

> "The loss of the white water area between Camp 9 and Parrotts Ferry can be partially mitigated but in exchange for that which cannot be mitigated the conserved storage made available will reduce significantly the ground water overdrafts in the upper San Joaquin basin and may be used in solving some of the serious environmental problems related to water quality in the lower San Joaquin River. I find that even if it were not possible to completely mitigate the loss of the upstream white water area, continued construction and completion of the New Melones Lake would provide economic, social, and environmental benefits of such magnitude that they would be a desirable tradeoff for the environmental loss incurred."

Just before the final permits to fill the reservoir were issued, the Western Water Education Foundation noted, "New Melones has become a symbol of California's apparently irreconcilable conflicts over water and its uses" (Seglund 1982, 2). Nearly twenty years later, this statement still holds true.

The Post-Audit Approach

What can be learned from this post-audit? The large number of unresolved issues is probably not unique to the New Melones Project. Attempting to assess the cumulative impacts of any project, particularly a multi-purpose water resource one, cannot be done independent of the ever-changing region in which it is located. As far as the question of how long to wait before attempting such a comparison, I think the most efficient approach would be to build into the project planning methods for monitoring impacts, collecting data, and assimilating the data into a periodically updated post-project review. As expected, I found the task of assessing New Melones' impacts to be never ending. This study ended up being a sort of status report, documenting the benefits to date and noting the ongoing studies and unresolved issues. This assessment of the project management is similar to what the USBR is currently attempting to do in its Findings Report.

One of the primary objectives of any post-audit should be usability. After all, the idea is to not only improve the management of the project being assessed, but to also improve future planning efforts. The interest and support of many of the Stanislaus Stakeholders in my efforts has reassured me that my post-audit will contribute to the ongoing decisions being made on New Melones Dam and Reservoir. USBR staff will be consulting this post-audit not only as they develop their Findings Report, but also as the Administrative Offices for the reservoir continue to try to improve the management of the recreation areas.

Although the future of the stakeholders as a group is highly uncertain, the USBR is making progress on the Long-Term Operating Plan, and the individual stakeholders will be watching closely. I am hopeful that the many studies going into the Long-Term Operating Plan will provide the baseline data so that the new plan can be reassessed over time and be a truly adaptive plan, changing to meet the yearly water conditions and the needs of all of the stakeholders as best as possible.

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Sources: Stanislaus Stakeholders 1999b, and voluntary responses to request made to Stanislaus Stakeholders e-mail list, stan-stake@mplists.mp.usbr.gov.