

**OVERVIEW**  
**MIDDLE CREEK FLOOD DAMAGE REDUCTION AND**  
**ECOSYSTEM RESTORATION PROJECT**

October 3, 2012

**INTRODUCTION**

The Middle Creek Flood Damage Reduction and Ecosystem Restoration Project (Project) will eliminate flood risk to 18 residential structures, numerous outbuildings and approximately 1,650 acres of agricultural land and will restore damaged habitat and the water quality of the Clear Lake watershed. Reconnection of this large, previously reclaimed area, as a functional wetland is anticipated to have a significant affect on the watershed health and the water quality of Clear Lake.

The Project is located at the north end of Clear Lake in the area bounded by State Highway 20 and Rodman Slough, see Figure 1. Clear Lake is a large, natural, shallow, eutrophic lake. It is the headwaters of Cache Creek, a tributary of the Bay-Delta. The Scotts Creek and Middle Creek watersheds, which comprise approximately one half of the Clear Lake watershed, drain through Rodman Slough adjacent to the Project area. These two watersheds provide 57 percent of the inflow and 71 percent of the phosphorus loading to Clear Lake. Fourteen hundred acres of "reclaimed" wetlands are located in the Project area.

**BACKGROUND AND PROJECT DESCRIPTION**

The Project area was "reclaimed" between 1900 and 1940 by constructing levees, creating a slough and reclaiming approximately 1,200 acres of lake bottom and shoreline wetlands for agricultural purposes. In 1958, the U.S. Army Corps of Engineers (Corps) added to the levee system, reclaiming an additional 200 acres of shoreline wetlands. These projects resulted in the physical isolation of over 1,650 acres of wetland and floodplain from the largest tributaries of Clear Lake. Figures 2 and 3 show the 1916 and current configurations of the Project area.

The levees in the Project area have settled up to three feet below design grade, are prone to slope failure and have inadequate cross-section. These levees were never constructed to proper standards and are the most prone to failure during a major flood event. The pumping station is 49 years old and in need of major repairs, primarily due to age and levee settlement. The Corps has determined that the levees provide only a four-year level of protection (the levees were designed to provide a 50-year level of protection) and will overtop during a 35-year flood event, unless emergency flood fight measures are implemented. The area was evacuated in 1983, 1986 and 1998, with evacuation imminent in 1995. Reconstruction of the levees and pump station repair are estimated to be in excess of \$6,000,000. Since the reconstruction costs exceed the benefits received (reduced flood damages), neither the State or Federal governments are authorized to participate in the repair of the levees.

In 1994, the EPA Clean Lakes Diagnostic/Feasibility Study for Clear Lake was completed. Sediment nutrients are primarily responsible for the cultural eutrophication of Clear Lake and the resulting chronic blue-green algal blooms. The Clean Lakes Study identified a significant degradation in Clear Lake's water quality between 1920 and 1940. Sediment cores collected by the University of California, Davis (UCD), shows an abrupt increase in sedimentation rates around 1927, corresponding to the beginning of the large-scale reclamation of the Project area, start of strip mining at the Sulphur Bank Mine, and other major construction projects in the Clear Lake watershed. The Clean Lakes Study recommends numerous actions be taken to reduce the frequency and magnitude of the blue-green algal blooms, including erosion control and wetland and riparian restoration. The County of Lake adopted an Implementation Plan on July 19, 1994 identifying the recommended actions and a time line for their implementation. The Plan is to improve the watershed health of the Clear Lake watershed and improve the quality of Clear Lake.

The District is currently implementing stream bank and wetland rehabilitation projects and actively encouraging the implementation of erosion control projects within the Clear Lake watershed. The District is cooperating with the USDA Forest Service, USDA Natural Resources Conservation Service, the USDI Bureau of Land Management, East Lake and West Lake Resource Conservation Districts, and local watershed groups to improve management of the watershed. Restoration of the Project area is one of the recommendations as it would restore the largest damaged wetland located at the base of the largest sediment source within the watershed, serving as the single largest recommended water quality improvement project.

In 1995, Lake County requested the Corps assist the County in evaluating the project to reduce flood risk and to improve water quality. The Corps undertook the Project under the environmental restoration authority, where it is authorized to provide up to sixty-five percent of the construction cost. The Project consists of reconnecting Scotts and Middle Creek to the historic wetland and floodplain areas by acquiring the reclaimed land, and breaching the existing levee system to create inlets that direct flows into the historically flooded area. The Project removes the flood risk from the properties behind the levee, provides significant water quality benefits and restores large areas of shoreline and riparian habitat that were lost over two-thirds of a century ago.

In May 1997, a Reconnaissance Study was completed by the Corps that established that the Project was practical and there was a federal interest in pursuing the Project further.

In June 1999, the Corps began a Feasibility Study that evaluated six alternative projects, including the No Action, three restoration alternatives, and a non-structural and a structural flood damage reduction alternative. The restoration alternatives all include reconnecting the area adjacent to Clear Lake and Rodman Slough, with the primary difference being the northern limit of the Project area. The pure flood damage reduction alternatives were not cost-effective. During the Feasibility Study that reviewed flood damage reduction, habitat and other benefits, it was determined the most beneficial project would be full restoration of the Project area, see Figure 4. Environmental review as required by NEPA and CEQA was conducted concurrent with the Feasibility Study. The Final Feasibility Study/Environmental Impact Statement/Environmental Impact Report was completed in October 2003. The CEQA process was completed in May 2004. The Project was approved by the Corps in November 2004. The Project was authorized by the Water Resources Development Act (WRDA) in November 2007.

In April, 2008, the Corps began working on resolving some issues remaining from the Feasibility Study. They were required to complete a Cultural Resource study, evaluate the Project impacts on methyl mercury generation, and evaluate the Project impacts on the endangered red legged frog. The latter two special studies were requested by the U.S. Fish and Wildlife Service (USFWS) after their review of the NEPA document. These two studies were approved by USFWS in 2012. The Cultural Resource study will be completed during the design. At this time, the Corps can approve the Record of Decision, completing the NEPA process. Funds then have to be appropriated to start the Project Design.

## **PROJECT BENEFITS**

The Project will provide the following Flood Damage Reduction benefits:

- Reduce flood risk by removing structures and property at risk of severe flooding as a result of levee failure. There are 18 homes and numerous outbuildings subject to flooding should the levees fail. Approximately 1,650 acres of agricultural land would be flooded. Because flood depths are great (over 5 feet in most locations) and would extend for extended periods, potential flood damages are high.

- Protect over three miles of public roads and a major, high voltage PG&E transmission line that cross the Project area and are currently vulnerable to flood damage by elevating or retrofitting the existing structures.
- The California Department of Water Resources (DWR) currently maintains the Middle Creek Flood Control Project in the Project area. The Project would remove approximately three miles of substandard levees, one pumping station and one weir structure from the Flood Control Project. The Project would result in lower O&M (\$110,000 to \$160,000 per year) and emergency response costs (estimated in excess of \$300,000 per major flood event) for DWR and cooperating State and Federal agencies<sup>1</sup>.

The Project will reduce the amount of sediment and nutrient inputs to Clear Lake producing the following water quality benefits:

- Sediment is the primary nutrient source (97 percent of Clear Lake's total phosphorus load is sediment bound) contributing to the cultural eutrophication of Clear Lake. It has been estimated that the current sediment and phosphorus load is twice the pre-European sediment load. Approximately 71 percent of the sediment and phosphorus entering Clear Lake is from Scotts and Middle Creek watersheds. It has been estimated that the Project would remove up to 40 percent of phosphorus entering Clear Lake from Middle and Scotts Creeks. Reduced phosphorus concentrations in Clear Lake would potentially reduce the chlorophyll concentrations by 33 percent. A corresponding reduction in total organic carbon would also be realized;
- Wetlands are known to efficiently remove nitrogen from the water column. Because the Project area is hydraulically connected to Clear Lake, it would provide some nitrogen removal benefits to Clear Lake. These benefits are unknown and have not been quantified;
- Improved water quality in Clear Lake will reduce the cost of treating lake water to drinking water standards; and
- Recreation and tourism will be enhanced by improving the water quality in Clear Lake. In 1994, the USDA Soil Conservation Service estimated that \$7 million in tourism is lost annually due to water quality issues in Clear Lake.

The Project would provide the following habitat benefits:

- Restore up to 1,400 acres of the 7,520 acres of historic wetlands in the Clear Lake Basin that have either been lost or severely impacted. This is a 79 percent increase in the Basin's existing wetland habitat. Of the historic 9,300 acres of freshwater wetlands that existed in the Clear Lake Basin, approximately 7,520 acres (80 percent) have been lost or severely impacted. Restored habitat includes open water, seasonal wetlands, instream aquatic habitat, shaded aquatic habitat, and perennial wetlands. Additional upland habitat will be protected adjacent to the wetland and stream areas.
- Provide a significant increase in habitat for fish and wildlife. This Project would greatly improve the bird-nesting habitat and increase the available spawning habitat for native and non-native fish. The area is currently used extensively by migratory waterfowl.
- Preserve the fish and wildlife resources and the cultural resources in the project area.

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<sup>1</sup> The 10.8 miles of levee on Scotts, Middle, Clover and Alley Creeks in the Upper Lake area are maintained by the District and are not affected by the Project.

- Several special-status wildlife species could benefit from the creation of wetland, open water, and riparian habitats in the expanded floodplain. Some species include the northwestern pond turtle, American white pelican, double-crested cormorant, western least bittern, osprey, white-tailed kite, bald eagle, northern harrier, Cooper's hawk, American peregrine falcon, California yellow warbler, yellow-breasted chat, tricolored blackbird, fringed myotis, long-eared myotis, long-legged myotis, pallid bat, and Townsend's western big-eared bat.

The Project will have an unknown, and possibly beneficial, impact on vector control issues in the area. A diverse wetland and riparian community will replace several hundred acres of rice fields and flood-irrigated pasture. Natural predators may result in lower insect populations in the area.

It is anticipated that the Project will impact the Clear Lake ecosystem quickly. The project area was active freshwater marsh less than 100 years ago and already has significant quantities of native wetland vegetation in the Project area. The existing vegetation and the inherent soil properties will facilitate rapid re-establishment of the native habitat. Pilot plantings will be used in the Project area to supplement natural revegetation.

Water quality improvement in Clear Lake should be fully realized within 10 years, with some improvement almost immediately apparent. Improved regulation of instream gravel mining was implemented in 1980, with instream mining decreasing each year until 1991, when essentially all instream mining ceased. The clarity of Clear Lake improved significantly in 1991, and has been the clearest in the last fifty years records. We anticipate the reduced phosphorus loading to Clear Lake after the Project is constructed to become apparent within a similar time frame.

### **THE NEXT STEP**

With completion of the Feasibility Study and all environmental documentation, the following phases remain in the Project:

- The Project has been authorized by WRDA. Limited Federal funds have been appropriated. Additional funds must be appropriated to complete the design.
- Several parcels in the Project area are held by the United States In-Trust for the Robinson Rancheria Band of Pomo Indians. The Corps does not have the authority to adversely impact these In Trust lands with the Project. The District is working with the Rancheria to have the "trust" transferred to other parcels owned by the Rancheria outside the Project area and have developed a mutually agreeable mitigation Plan to address the remaining "trust" property.
- Design: Detailed plans and specifications will be developed by the Corps for the alternative selected in the Feasibility Study.
- Significant land acquisition will be required, including relocation of up to 22 residents. Land acquisition and relocation will be according to Federal requirements. In August 2003, the District was awarded a \$5.214 million grant by DWR to begin acquiring residential properties within the Project area. Properties may only be acquired from willing sellers with these funds. In December 2006, the grant amount was increased to \$5.714 million. As of November 2008, seven residential parcels have been acquired and structures demolished. In December 2008, these funds were frozen by the State, with no estimate of when the funds will be made available. After funds were frozen, one parcel was acquired and the structures demolished. In April 2011, a grant amendment for an additional \$7 million was approved. Four residential parcels have been acquired with these

funds. Six additional residential parcels are proposed for acquisition in 2012-2013. Purchase of agricultural land will also begin in 2013, with up to 1,390 acres of land, depending on land values.

- The California Department of Fish and Game (DFG) has prepared a Clear Lake Wildlife Area Conceptual Area Protection Plan (CAPP) that includes acquisition of all of the property required for the Project. If the DFG proceeds with the CAPP, the District will work closely with DFG to meet the mutual goals of each agency.
- Construction: The Project will be constructed. The USACE will administer the construction contract, while contracting out the actual construction work.

Under current funding guidelines, approximately 35 percent of the costs for future phases of the project are the responsibility of the Project Sponsor, the District. These costs are beyond the District's ability to pay. The District is currently developing partnerships to assist in completion of the Project. Current and potential partners include:

- U. S. Army Corps of Engineers
- Central Valley Flood Protection Board
- California Department of Fish and Game/Wildlife Conservation Board
- California State Water Resources Control Board
- Central Valley Regional Water Quality Control Board
- California Bay-Delta Authority
- California Department of Water Resources
- Local Native American Tribes
- Resource Conservation Districts
- Lake County Special Districts
- Lake County watershed groups
- Nonprofit organizations

<b>PROJECT COST</b>	
Federal Share	\$31,300,000
Non-Federal Share	\$16,700,000
Total Cost	\$48,000,000
<b>PROJECT SCHEDULE</b>	
Reconnaissance Study	1996-1997
Feasibility Study/EIS/EIR	1998-2004
Chief of Engineers Report	2004
Design	2012-2014
Construction	2014-2016

## REFERENCES

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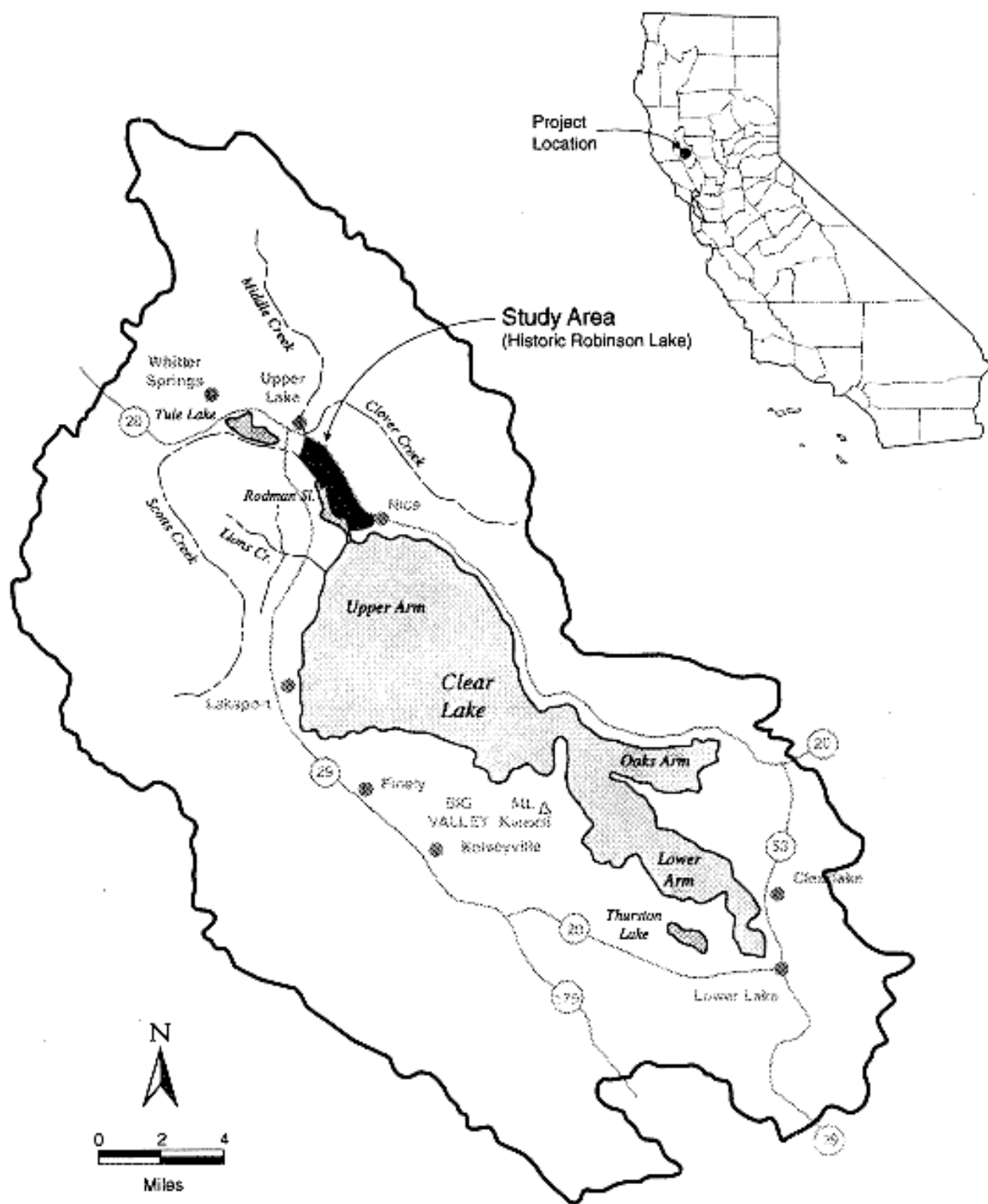
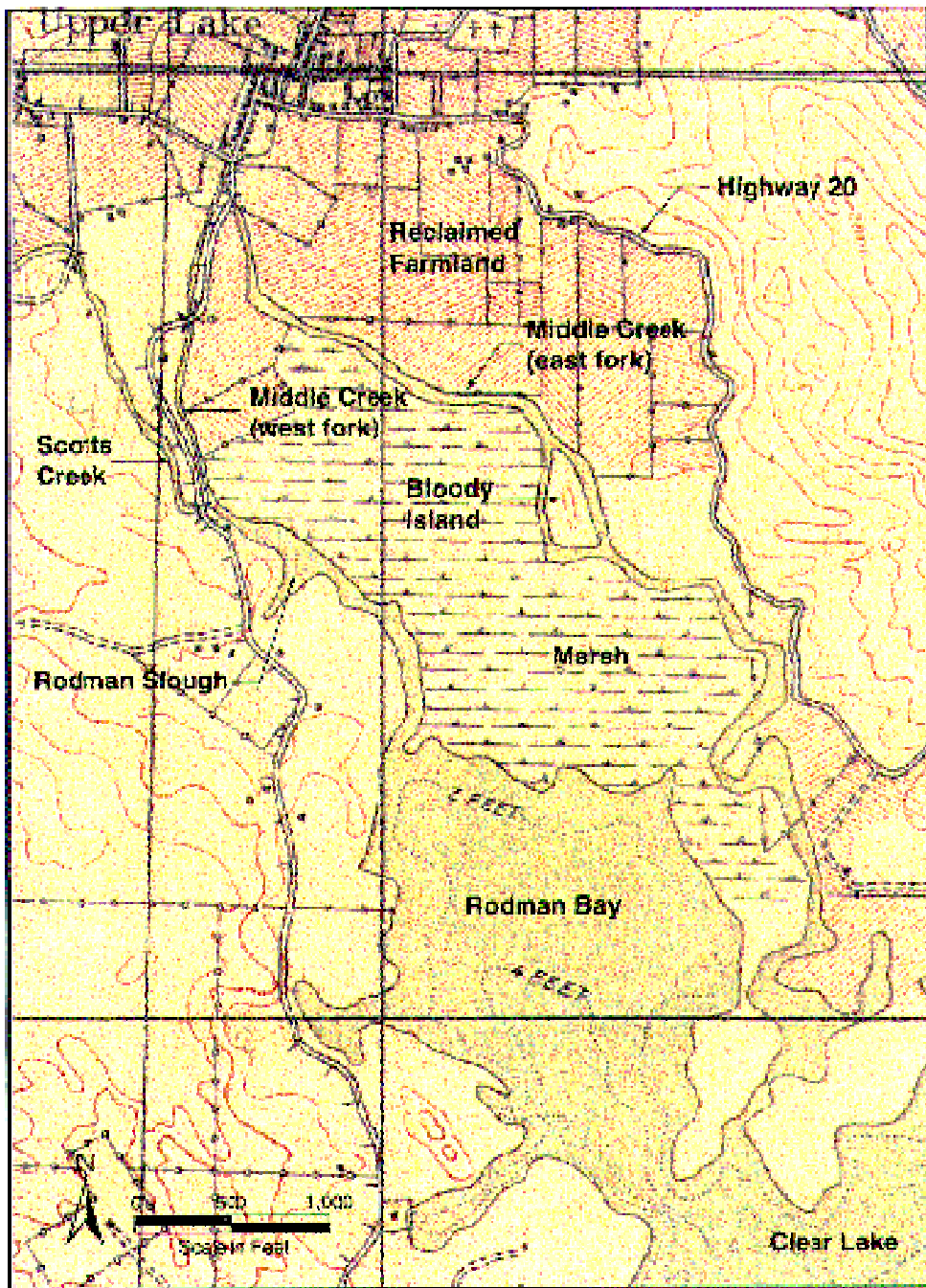


Figure 1

Figure 2.1  
Project Study Area Location Map



Source: USGS Topographic, California quadrangle 1924 (surveyed in 1916).

Figure 2

Historic Conditions of the Study Area, 1916



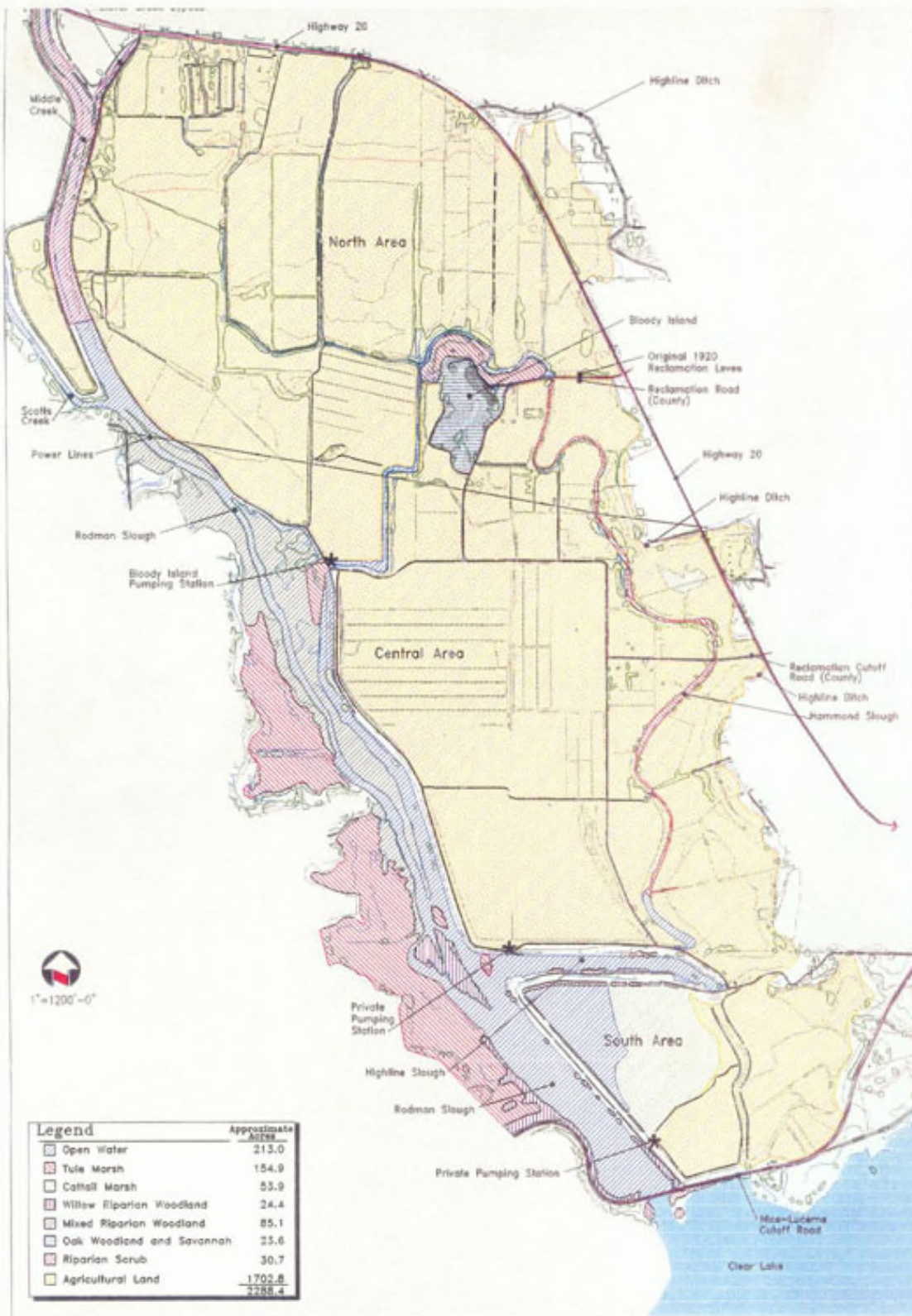
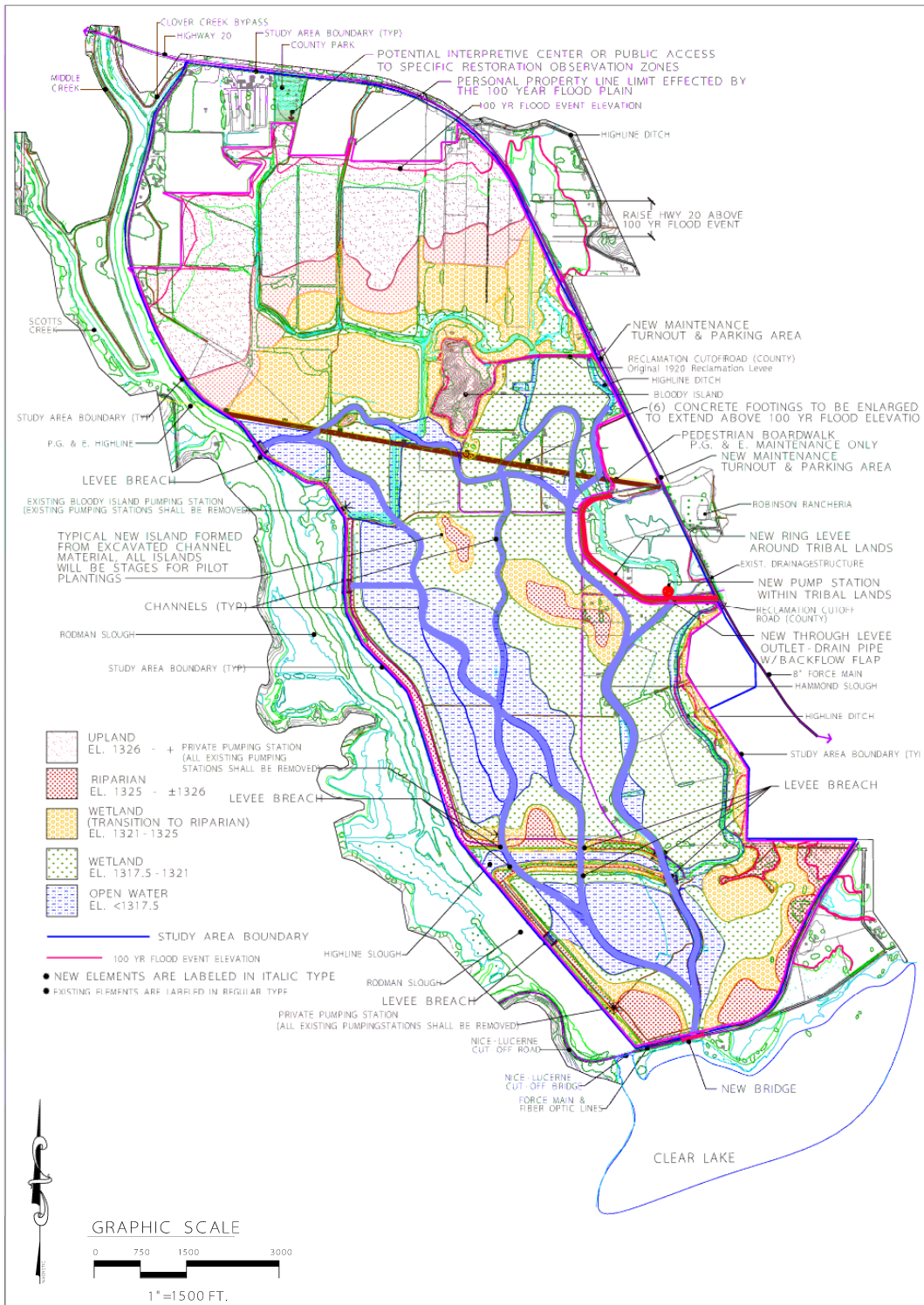


Figure 2.9  
Existing Vegetation and Wildlife Habitat  
in the Study Area





MIDDLE CREEK, LAKE COUNTY, CALIFORNIA  
 FLOOD DAMAGE REDUCTION AND ECOSYSTEM RESTORATION

**Restore Entire Robinson Lake Flood Plain  
 ALTERNATIVE 2**

**Figure 4**



US Army Corps  
 of Engineers  
 Sacramento District