

7. FLOOD MANAGEMENT



BACKGROUND¹

San Joaquin County has a long history of flooding. Native American legends and journals of Spanish explorers and early settlers record widespread flooding in the county in 1776, 1805, 1826, 1828, 1830 and 1847. Between 1847 and 1900, nine major and eight minor floods occurred. The flood of 1861-62 is the largest flood event recorded in the county with flood stages of 6-15 feet higher than those of earlier reported floods. Between 1903 and 1969, 32 rain floods and 7 significant snow melt floods are documented with the most damaging, countywide, occurring in November and December of 1950 and in December of 1955. Other major rain floods in the county occurred in 1906, 1907, 1909, 1911, 1938 and 1958. The most damaging of these was the 1938 snow melt flood. More recently, notable flooding in the county has occurred in 1980, 1982, 1983, and 1997/98.

Historically, flooding along the Mokelumne River has been caused primarily by rainstorms in the late fall and winter and by snow melt runoff in the spring and early summer, however, rain floods can occur in the watershed anytime between November and March. These floods are characterized by high peak flows of moderate duration and large volumes of runoff. Flooding is more severe when previous rains have already saturated the ground or when rain falls on snow in the higher elevations adds snow melt to the rain flood runoff. Snow melt floods on the Mokelumne can occur between April and July. Snow melt flooding is of much larger volume and longer duration than rain flooding, but it lacks the high peak flows characteristic of rain

¹ Unless otherwise noted, the following narrative is an excerpt of: *Flood Insurance Study of San Joaquin County, California - Unincorporated Areas, Revised February 5, 1997*, by the Federal Emergency Management Agency (FEMA)

Lower Mokelumne River Watershed Stewardship Plan

floods. Snow melt floods may be exacerbated by late spring rains on snow fields or lower elevation tributary watersheds.

Due to the rural nature of much of the Mokelumne River watershed, specific records about flooding on the Mokelumne River are limited prior to 1904. Major flood events along the Mokelumne River since 1904 are listed in Table 7-A.

1907	1928	1964*
1909	1937	1967
1911	1950*	1969
1914	1952	1970
1921	1955/56*	1997/98
1925	1963	

* See text below

The most destructive flood along the Mokelumne was the November, 1950, flood which resulted in approximately \$1.1 million in damage. The December 1955-January 1956 created nearly three-quarters of a million dollars in damage. The flood of December, 1964, is the largest recorded flood along the Mokelumne River. However, due to the completion of Camanche Dam in early 1964, damage was limited to several thousand dollars.

The Camanche Dam, constructed by the East Bay Municipal Utility District with financial assistance from the Federal Government for flood control benefits, provides the primary flood control for areas adjacent to the Lower Mokelumne River. Completed in April, 1964, the Camanche Dam and Reservoir has a channel capacity of 5,000 cubic feet per second (cfs) between Camanche Dam downstream to State Highway 99. However, when channel flows exceed 3,000 cfs, some flooding can occur on adjacent farmlands. Releases of 5,000 cfs have occurred in 1969, 1970, 1986, and 1997. The storage capacity of Camanche Dam is approximately 430,900 acre feet with 200,000 acre-feet of that total reserved for flood storage. A diversion dam at Woodbridge, operated by the Woodbridge Irrigation District provides some incidental flood protection to areas downstream of Woodbridge.

As indicated in the preceding, limited flooding can occur when the Lower Mokelumne River exceeds 3,000 cfs with major flooding occurring over 5,000 cfs. Some of the Mokelumne River's major flood events, recorded in cubic feet per second, are provided in Table 7-B.

Table 7-B Representative Recorded Maximum Monthly Mean Stream Flows (cfs) for Major Flood Events Along the Lower Mokelumne Measured below Camanche Dam & Woodbridge Dam			
Year	Month	Stream flow (Cubic Feet per Second, cfs)	Location of Measurement
1950	Dec	4,568	Below Camanche Dam
1950	Dec	4,283	Below Woodbridge Dam
1952	May	4,217	Below Camanche Dam
1952	May	3,990	Below Woodbridge Dam
1956	Jan	3,529	Below Camanche Dam
1956	Jan	3,435	Below Woodbridge Dam
1963	May	2,997	Below Camanche Dam
1963	May	2,646	Below Woodbridge Dam
1964	Dec	406	Below Camanche Dam
1964	Dec	299	Below Woodbridge Dam
1967	May	3,091	Below Camanche Dam
1967	May	2,602	Below Woodbridge Dam
1969	Feb	2,651	Below Camanche Dam
1969	Feb	2,586	Below Woodbridge Dam
1970	Feb.	2,652	Below Camanche Dam
1970	Feb.	2,698	Below Woodbridge Dam
1982	May	3,889	Below Camanche Dam
1982	May	3,523	Below Woodbridge Dam
1983	April	3,726	Below Camanche Dam
1983	April	3,640	Below Woodbridge Dam
1986	March	5,116	Below Camanche Dam
1986	March	4,712	Below Woodbridge Dam
1995	June	3,847	Below Camanche Dam

Table 7-B Representative Recorded Maximum Monthly Mean Stream Flows (cfs) for Major Flood Events Along the Lower Mokelumne Measured below Camanche Dam & Woodbridge Dam			
1995	June	3,504	Below Woodbridge Dam
1997	January	4,978	Below Camanche Dam
1997	January	4,748	Below Woodbridge Dam

Ten reservoirs along the upper Mokelumne River above Camanche Dam provide a combined storage capacity of 433,000 acre-feet (See Table 7-C). The primary use of these reservoirs is not flood storage. However, these reservoirs can assist in controlling or reducing small to moderate floods, but have little effect on large flood flows. The most important reservoirs assisting Camanche Dam in the protection of lands from flooding along the lower Mokelumne are: Pardee Reservoir, Salt Springs Reservoir and the Lower Bear Reservoir.

Table 7-C Water Storage Projects on the Upper Mokelumne River (Above Camanche Dam)				
Name	Stream	Operating Agency	Storage Capacity (acre feet)	Year Complete
Pardee Reservoir	Mokelumne River	EBMUD/a/, /b/	210,000	1929
Lake Tabeaud	Jackson Creek	PG&E/c/	1,258	1901
Tigers Creek Afterbay	N. Fork Mokelumne River	PG&E	2,607	1931
Lower Bear Reservoir	Bear River	PG&E	50,680	1952
Upper Bear Reservoir	Bear River	PG&E	7,310	1900
Salt Springs Reservoir	N. Fork Mokelumne River	PG&E	141,857	1931
Twin Lake	Tributary to Blue Creek	PG&E	1,207	1898
Meadow Lake	Tributary to Blue Creek	PG&E	5,656	1903
Lower Blue Lake	Blue Creek	PG&E	5,091	1885
Upper Blue Lake	Blue Creek	PG&E	7,300	1881
Total Storage Capacity			432,966	

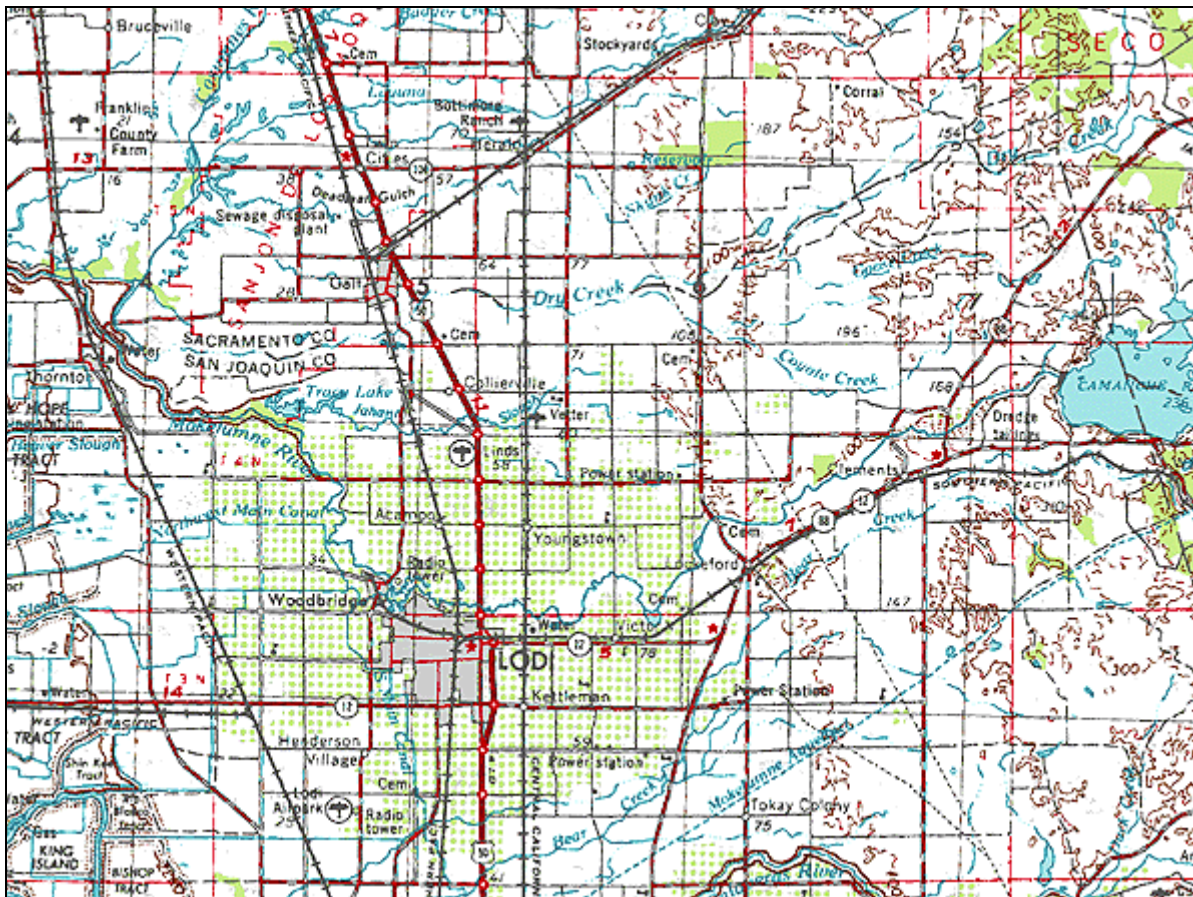
/a/ East Bay Municipal Utility District

/b/ Rounded to nearest hundred or thousand

/c/ Pacific Gas and Electric Company

Lower Mokelumne River Watershed Stewardship Plan

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs) for San Joaquin County identify numerous locations along the LMR which are subject to recurring flood events as illustrated on FEMA's Flood Insurance Rate Maps (FIRMs) summarized in the following figures (Detailed copies of these maps indicating the watershed's 100 and 500-year flood plains may be ordered through the San Joaquin Resource Conservation District's website at www.sjcrd.org)



Flood Map

Lower Mokelumne River Watershed Stewardship Plan

In the absence of a major flood event, annual mean flows within the lower Mokelumne River have ranged from a low of 54.7 in 1961 to a high of 2,280 in 1983.

Public comments received during the LMSP community input workshops indicate that issues associated with flooding along the LMR include:

- ✓ Privately-owned levees along the river are in need of regular repair and are subject to failures due to a lack of programs and funding to maintain these levees for public and landowner benefit.
- ✓ Debris and vegetative overgrowth is blocking and clogging the Mokelumne in many places resulting in flooding and bank erosion which destroys private property and degrades gravel habitats for spawning. There is a need to balance flood control and the management of biological resources.
- ✓ Flooding destroys property, erodes banks and increases sedimentation throughout the watershed.
- ✓ Water releases by EBMUD may sometimes adversely affect downstream landowners
- ✓ Flood improvement projects upstream on the Mokelumne sometimes adversely affect downstream properties.

EXISTING FLOOD MANAGEMENT PROGRAMS

Lower Cosumnes - Mokelumne Rivers Feasibility Study: The U.S. Army Corps of Engineers is serving as lead agency in a multi-agency effort to evaluate potential ecosystem restoration projects and non-traditional flood damage reduction in the Mokelumne and Cosumnes River flood plains extending from the Woodbridge Irrigation District (WID) Dam to the confluence of the two rivers with the San Joaquin River. Non-federal sponsors of the effort include the Sacramento Area Flood Control Agency (SAFCA), The Nature Conservancy, Sacramento County, the State Resources Agency, the Sacramento County Water Agency (SCWA) and the East Bay Municipal Utility District (EBMUD). The project management plan is expected to be adopted in July, 2002. Specific projects to implement the plan have not yet been adopted, but discussions have included: construction of levees, stabilizing levees, breaching levees, construction of grade-control structures and/or levee weirs, modifying channels, revising the Camanche flood control curves and modifying the pattern of flood flow releases. Completion of the program is anticipated in 2004.

RCD/Humboldt State University Historic River Mapping Project: The San Joaquin Resource Conservation District is currently working with Humboldt State University, as part of the Lower

Mokelumne River Watershed Stewardship planning process, to map the history of the Mokelumne River, including the movements of the river along its course. This information will be used to assist LMSP planners to refine locations which have historically flooded along the LMR for use in the various LMSP implementation programs, including the LMSP's flood management programs.

GOALS

- ✓ **Facilitate the implementation of flood management practices which encourage resource conservation, protect water quality, protect private property and the rights of private property owners.**
- ✓ **Balance the necessity for flood management activities with the needs of biological resources in designing flood management programs.**

IMPLEMENTATION PROGRAMS:

1. Facilitate Debris Redistribution

The San Joaquin County Resource Conservation District will oversee coordination between landowners and other stakeholders to: a) oversee acquisition of a regional general permit from the U.S. Army Corps of Engineers to permit debris redistribution, b) acquisition of a programmatic Section 1600 Streambed Alteration Permit from the CA Dpt. of Fish and Game to permit debris redistribution; and c) identify funding sources to hire qualified companies to manage and redistribute debris, as needed, on an ongoing basis. Work conducted pursuant to permits shall be undertaken through a voluntary participation program. Work performed on private property is subject to landowner permission. Involvement of the U.S. Fish and Wildlife Service, California Department of Fish and Game and U.S. Army Corps of Engineers is crucial to successfully addressing this issue. A model for permitting associated with this program exists through the Joint Aquatic Resource Permit Application (JARPA) which was developed to streamline permitting for work in or near wetlands or water in the San Francisco Bay Area. The San Francisco Estuary project and the Association of Bay Area Governments can provide additional information. The Napa River Flood Protection Project, spearheaded by the Citizens for Napa River Flood Management, also provides a model for this proposed LMR program. Additional information can be obtained from the Napa County Flood Control and Water Conservation District and the County of Napa Public Works Department.

Time Frame for Implementation: Commence within 24 months of plan adoption.

2. Promote Voluntary Management Practices which Reduce Erosion Potential Caused

by Flooding While Promoting Resource Conservation

See Program #7 of the Water Quality Element and Appendix 6E.

Time Frame for Implementation: Ongoing.

3. Investigate the Feasibility of Forming a Reclamation District for Non-Project LMR Levee Maintenance

Notify private landowners within the watershed to gauge interest in forming a private reclamation district for the maintenance of non-project levees along the Mokelumne River. If landowners express interest, facilitate the formation of a reclamation district.

Time Frame for Implementation: Commence within 24 months of plan adoption.

4. Assist in Making Water Release Information Accessible to Landowners along the lower Mokelumne River

Provide river flow and water release information on the San Joaquin County Resource Conservation District/Lower Mokelumne River Watershed Stewardship Plan Website at www.sjcrd.org and links to other on-line resources providing ongoing flow information to facilitate landowner access to information which will assist in predicting potential flood events (e.g., Department of Water Resources CA Data Exchange Center, U.S. Geological Survey real-time flows, East Bay Municipal Utility District Gauging Station Daily update site, American Whitewater). Include flow information from tributaries which contribute to flood levels in the Lower Mokelumne River (e.g., Cosumnes River) and include monitoring information from multiple locations along the Lower Mokelumne.

Time Frame for Implementation: Commence within 12 months of plan adoption.

5. Assist Landowners Along the LMR to Anticipate Flood Levels on Individual Parcels Based on Water Release Information Provided Under Program #4

Develop an interactive program on the San Joaquin County Resource Conservation District/Lower Mokelumne River Watershed Stewardship Plan Website(www.sjcrd.org) to assist landowners in converting water releases in cubic feet per second to surface water elevations (and flood levels) on individual properties along the LMR.

Information may be derived from the publication *A Determination of Channel Capacity of the Mokelumne River Downstream From Camanche Dam San Joaquin and Sacramento Counties, California*, US Dpt. of the Interior Geological Survey Water

Lower Mokelumne River Watershed Stewardship Plan

Resources Division, Menlo Park, CA 1972 (See Appendix 7A). The document includes 122 cross sections extending through individual properties from the confluence of the Cosumnes and Mokelumne Rivers to the base of Camanche Dam. Surface water elevations are provided for each of the 122 cross sections for water releases at Camanche Dam of 3,000; 4,000; 4,500; 5,000 and 6,000 cubic feet per second.

Time Frame for Implementation: Commence within 12 months of plan adoption

6. Facilitate Efforts to Improve the Efficiency of EBMUD’s Early Warning System to Notify Landowners of Potential Flooding Along the Lower Mokelumne River

In coordination with EBMUD, facilitate the establishment of an automatic dial-up or similar service which provides automated notification to all landowners along the Lower Mokelumne River when flooding is predicted. The current system requires individual dial-up of scattered landowners.

Time Frame for Implementation: Commence within 12 months of plan adoption.

7. Facilitate Communications Between Dam Operators and Landowners

Facilitate the improvement of communications between landowners and dam operators by providing landowners with a phone number or alternative means of communication allowing direct contact with dam operators to report incidents of downstream flooding.

Time Frame for Implementation: Within 18 months of plan adoption.

8. Support the Completion of and Provide Input to the U.S. Army Corps of Engineers’ San Joaquin Comprehensive Study

Establish contact (through the RCD Watershed Coordinator) with the U.S. Army Corps of Engineers to facilitate support for and to provide input to the San Joaquin Comprehensive Study. Specifically, the RCD Watershed Coordinator shall facilitate the generation of a flood plain study for the Lower Mokelumne River which identifies potential flooding areas at various flow levels. This information shall be included on the RCD/LMR website (see Program #4).

Time Frame for Implementation: Commence within 12 months of plan adoption.

9. Facilitate Voluntary Landowner Participation in Implementing Management Practices Promoting Resource Conservation Offered through or Resulting from the Lower Cosumnes-Mokelumne Rivers Feasibility Study

The Lower Cosumnes-Mokelumne Rivers Feasibility Study has identified the following programs to facilitate flood management within the LMR: construction of setback/backup levees, stabilizing levees, breaching levees, construction grade-control structures and/or levee weirs, modifying channels, revising the Camanche Reservoir flood control curves and modifying the pattern of flood flow releases. The Watershed Coordinator shall keep abreast of the status of this program and inform landowners of opportunities available through this program which assist in implementing voluntary management practices which promote resource conservation. Landowners should be encouraged to design projects to minimize public health vectors (e.g., mosquitoes, ticks, bees, rats), especially when designing setback levees.

Time Frame for Implementation: Ongoing.

10. Promote the use of Native Grasses and Other Native Plants in Restoration and Landscape Projects

Promote the use of native grasses and other native plants, (including native perennial bunch grasses, with roots of 4-8' in length, to assist in bank stabilization), in restoration and landscape projects, to assist in bank stabilization during flood events. Include descriptions, drawings or photographs of these natives and sources for purchasing native grasses on the sjcrd.org website.

Time Frame for Implementation: Ongoing.