6. Water Quality

A. Identified Water Quality Impairments in the LMR Watershed

Overview

Water Quality in the Lower Mokelumne River Watershed affects drinking water, aquatic life and other beneficial water uses (e.g., recreational uses, irrigation, stock watering). The maintenance and improvement of water quality for all of these uses throughout the LMR watershed is a primary goal of this LMR Watershed Stewardship Plan (LMSP).

In 1991, the City of Lodi concluded a limited assessment of water quality within the LMR watershed. The study was performed by Brown and Caldwell Consultants of Sacramento. The findings are contained in an April 29, 1991, report entitled "Final Report on Monitoring of the Mokelumne River" (Brown and Caldwell, 1991). Results of this study evaluated the potential impacts of the Mokelumne River on groundwater in and around Lodi, but contains information applicable to both drinking water and water quality in the LMR, in general. The study identifies the primary sources and constituents affecting the Water Quality of the Lower Mokelumne River as summarized in Appendix 6-C.

Mokelumne River Day Use Area

Other measured parameters within the Lower Mokelumne River indicate variable water quality conditions including:

Impairments Designated by the Central Valley Regional Water Quality Control Board: Copper, Zinc, Aluminum

The Mokelumne River below Pardee Dam is designated as an impaired waterway by the State Water Resources Control Board in its Clean Water Act Section 303(d) submittal. The impairment designation is currently for copper, zinc and aluminum due to the presence of these elements in concentrations above the hardness based aquatic toxicity criteria. The presence of these metals is linked to abandoned mines in the Mokelumne watershed. The largest of these mines is the Penn Mine located on the southeastern shore of Camanche Reservoir. During the late 1990's, Penn Mine was restored through a joint effort by the East Bay Municipal Utility District (EBMUD) and the Central Valley Regional Water Quality Control Board. Per Joe Karkoski of the Central Valley Regional Water Quality Control Board, ongoing remediation practices at the Penn Mine appear to be improving water quality associated with the mine, however, the state has determined that ongoing monitoring is required before zinc and copper are removed as an impairment concern. In addition, a new listing cycle for 303(d) waters was completed in Summer, 2001. As a result, Aluminum is being added as a parameter of concern associated with abandoned mines contributing to the Mokelumne's continued designation as an impaired waterway.

Dissolved Oxygen

In addition to impairments described above, and possibly related to them, the Lower Mokelumne River has recurring incidences of Low Dissolved Oxygen (DO). CALFED's Water Quality Program Plan, 2000, states that high deposits of fine sediment from channel disturbance and increased water temperature probably cause low dissolved oxygen levels.

Aerator at the Mokelumne Hatchery

Trihalomethane Formation Potential

The 1991 study conducted for the City of Lodi (Brown and Caldwell, 1991) recommends monitoring by the City of Trihalomethane Formation Potential (THMFP). Trihalomethane can be formed as a by-product of chlorinating drinking water. THMFP concentrations at Pardee between 1983 and 1984 measured approximately .25 milligrams /liter. The current California drinking water standard is 0.01 mg/l. Monitoring stations are recommended at Bruella Road Bridge and Lower Sacramento Road Bridge to "bracket" measurements of Lodi's water quality for THMFP.

B. Monitoring Gaps

Overview

As indicated in Appendix 6-B, monitoring is restricted within the LMR to those areas stretching from Camanche Dam to Woodbridge Dam. In particular, water quality data monitoring from Woodbridge Dam to the Cosumnes River along the lower Mokelumne River is sparse. In addition, not all identified impairments to LMR water quality are currently monitored at some locations making it difficult to accurately assess watershed health and to identify sources of water quality impairments (and therefore to reduce or eliminate the impairments and avoid potential future impairment listings by the state).

Therefore, to accurately assess the success of LMR Watershed Stewardship Programs, to assist in accurately assessing watershed health and to avoid potential future impairment listings by the state (and, subsequent new state and federal regulations), the following is proposed to fill data gaps:

- ✓ **Optimize the location of monitoring stations**
- ✓ **Formulate a voluntary, stewardship-based water quality monitoring strategy**

Optimizing the Location of Monitoring Stations

The following water quality monitoring station gaps exist along the LMR:

- ✓ Bruella Road Bridge
- ✓ Lower Sacramento Road Bridge
- ✓ Below Woodbridge Dam to below the Mokelumne's confluence with the Cosumnes
- ✓ Other areas which may be identified through implementation of the LMSP

The addition of new monitoring stations in these areas should be tied to the water monitoring strategy described in the following paragraphs.

Water Quality Monitoring Strategy

Based on stakeholder input, the LMR Watershed Stewardship Planning Committee concluded that a successful stewardship-based water quality monitoring strategy should:

A Water Quality Monitoring Strategy Should:

- Be voluntary
- Include a broad coalition of watershed stakeholders
- Protect private property rights–including agreements protecting data ownership and restricting data distribution
- Be affordable
- Be suitable for regular, long-term implementation
- Measure and assess those water quality indicators most likely to detect both degeneration of and improvements in water quality within the LMR Watershed
- Measure those water quality indicators which have predictive value (i.e., may be used to determine the cause of degraded water quality, if detected)
- Include provisions for assisting stakeholders to maintain or improve water quality

Water Quality Indicators and Approaches Suitable for Stakeholder - Citizen Monitoring
Pursuant to the U.S. Environmental Protection Agency's Office of Water Quality, Volunteer Stream Monitoring Program, volunteers can be easily trained to monitor many of the "core" indicators of water quality and watershed health. Water quality indicators recommended by the EPA for citizen or stakeholder monitoring programs include:

Water Quality Indicators Suitable for Citizen Monitoring

- Stream Flow
- Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD)
- Temperature
- pH
- Turbidity
- Phosphorous
- Nitrate
- Visual description

The importance of monitoring for each of these indicators is detailed in Appendix 6-D.

Recommended standards and guidelines for monitoring these water quality indicators per the USEPA Office of Drinking Water's *Volunteer Stream Monitoring: A Methods Manual*, may be obtained from the USEPA at www.epa.gov/volunteer/stream or at www.sjcrcd.org/mokelumne.

Due to the expense and difficulty involved in monitoring for toxic substances such as heavy metals and organic chemicals (e.g., pesticides, herbicides, solvents, PCBs), volunteers normally do not monitor for these parameters. However, if a funding source can be identified, volunteers should be encouraged to collect water samples for analysis at an accredited lab. These parameters should be combined with biosurveys of the watershed. Guidelines for biosurveys also can be found in: *Volunteer Stream Monitoring: A Methods Manual.*

Members of the LMSP Steering Committee initially investigated the feasibility of monitoring for specific toxic substances used in agricultural and urban land uses within the watershed. However, as noted in the EPA's Citizen Monitoring Guidelines, it soon became clear that monitoring for toxic substances would be both extremely expensive and difficult. Not only is the list of potential toxic chemicals extensive, but the list is also changeable over time and seasonally. A better model for assessing the health of the watershed through water quality monitoring was sought.

Based on discussions with the San Joaquin County Agricultural Commissioner's Office and the California Environmental Protection Agency's Office of Pesticides, the LMR Steering Committee ultimately adopted a broader approach to assessing watershed health and identifying potential toxic substances based on the Sustainable Land Stewardship International Institute's (SLSII) "Measuring the Health of California Streams and Rivers-A Methods Manual for Water Resource Professionals, Citizen Monitors and Natural Resources Students."

This approach emphasizes bioassessment of benthic macroinvertebrates (BMIs) to assess stream health. BMIs common to California rivers and streams include such organisms as: flatworms, roundworms, leeches, water mites, aquatic sow bugs, crayfish, scuds (an organism resembling a saltwater shrimp in appearance), horsehair worms, aquatic worms, snails and limpets, mussels and clams, and water fleas. BMIs also include adults and/or larvae of mayflies, stoneflies, caddisflies, true flies, aquatic beetles, dragonflies, damselflies, true bugs, hellgrammites, alderflies, and aquatic moths.

Diversity and composition of these organisms in collected water samples indicates the overall stream health and can even point towards toxic substances which may be present in streams and rivers. Based on these biological indicators, focused efforts testing for specific toxic substances may then be pursued.

Because many citizens do not have the necessary skills to identify all of these aquatic organisms, the SLSII provides three-day training sessions to assist local communities in implementing this approach. In addition, services of aquatic biologists can be included as part of this monitoring approach.

Voluntary, Stewardship-based Approach: The Coalition of Central Coast County Farm Bureaus' (CCCCFB) Model

In addition to identifying strategies for what to sample and where to sample, the LMR Steering Committee also investigated voluntary monitoring programs which include both the endorsement of regulatory agencies, while allowing site-specific data to remain confidential, thereby protecting private property owners. The Steering Committee adopted the Coalition of Central Coast Farm Bureaus' Agricultural Water Quality Program as a model for its own LMSP Water Quality Monitoring Program.

Based on a framework adopted as part of the California Farm Bureau Federation's Non-Point Source Initiative, the CCCCFB program, which began in the mid-1990s, works with voluntary watershed-level landowner groups to allow landowners to develop confidential plans that fulfill the requirements of state and federal legislation pertaining to water quality while protecting landowners from intrusive regulations on their land and water management practices.

Assisting in this voluntary water quality monitoring effort along with local farm bureaus and

landowners, are the USDA's Natural Resources Conservation Service (NRCS), the California Association of Resource Conservation Districts and local Resource Conservation Districts which provide financial assistance, technical expertise, and can assist in protecting the confidentiality of information collected.

Also participating in the monitoring approach are the U.S. Environmental Protection Agency and the California Water Quality Control Board (CWQCB). The CWQCB has extended reporting exemptions to agriculture through 2003. However, a recent lawsuit against the CWQCB seeks to eliminate this exemption.

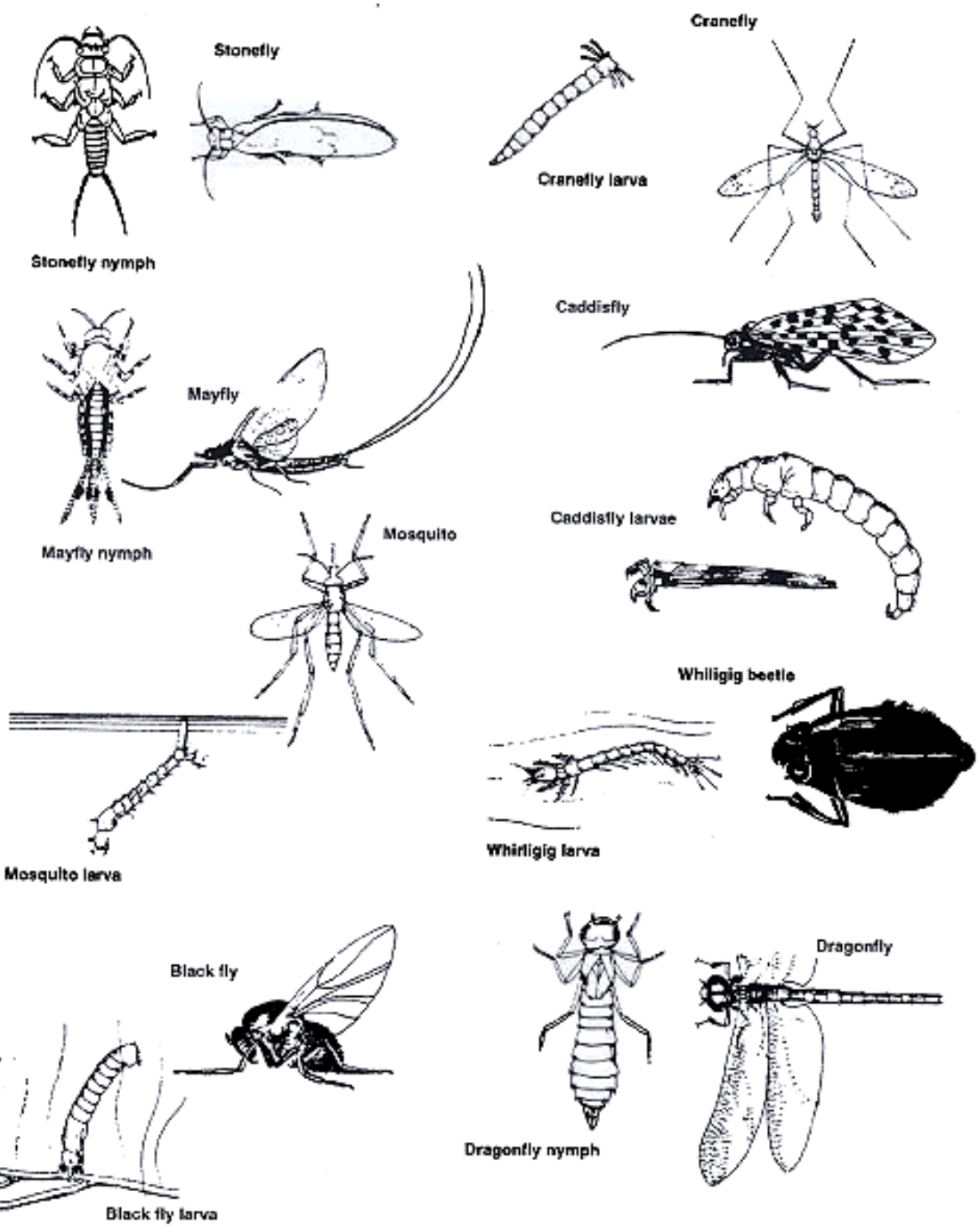
Locally, the CCCCFB model is being pursued by the Coalition of San Joaquin River County Farm Bureaus for San Joaquin, Stanislaus, Merced, Madera, and Fresno counties. This group is in the initial stages of establishing its goals and objectives.

Maintaining Confidentiality of Data Collected

As noted in the preceding paragraphs, maintaining the confidentially of collected data is a high priority to many landowner. For many, participation in a water quality monitoring effort depends on the landowner's ability to develop confidential plans that fulfill the requirements of 1state and federal legislation while protecting landowners from additional regulations on their land and water management practices. There are numerous mechanisms for protecting the confidentiality of data collected by landowners as part of a voluntary, stewardship-based water quality monitoring effort. These include:

- ✓ **Restrictions on the disclosure of data** gathering sites and information to public agencies and the general public. Restrictions are enforced by releasing information only after it is transformed into statistical aggregate form that does not allow identification of individual landowners, operators or data-gathering sites. [Upper Mississippi River Basin Conservation Act of 2000 to develop a coordinated public-private approach to reducing nutrient and sediment losses in the Upper Mississippi River Basin (House of Representatives, 4013)]

1 Upper Mississippi River Basin Conservation Act of 2000 to develop a coordinated public-private approach to reducing nutrient and sediment losses in the Upper Mississippi River Basin (House of Representatives, 4013)



Common macroinvertebrates found in stream systems. (Source: 1987 Western Regional Environmental Council)

- ✓ **Use of non site-specific information only** to create spatial data layers to identify priority areas for the implementation of best management practices without identifying individual landowners or data collection sites (e.g., grower acreage, agricultural commodity, Township, Range, Section).

- ✓ **Use of a third-party contractor or non-profit** (operating between the landowner and a public agency) to serve as the clearinghouse for monitoring data. Contractors are charged with developing a program acceptable to both the landowners and public agencies which both protects confidentiality of information collected from individual landowners while allowing access to the data in some format useful to public agencies.

- ✓ **Retain environmental checklists and records involved with monitoring on site**. Those records remain the property of the landowner. Evaluations of progress/improvements are made by a non-regulatory third party. This is the process used by the California Dairy Quality Assurances Program.

- ✓ **Existing law**. In California, a state law considers a record to be confidential if it is so characterized by a federal agency (therefore, characterization of data collected as part of a voluntary monitoring program by a federal agency would extend protection to landowners for the information collected).

- ✓ **Agency intervention**. In 1999±, the U.S. Environmental Protection Agency (Region 9, California) demanded from two districts of the Natural Resources Conservation Service (NRCS) in California, data collected by the NRCS at local dairies. The EPA intended to use the data to conduct inspections of individual diaries pursuant to the Federal Clean Water Act. The data was collected by the NRCS for a different purpose and under the assumption that it would not be used to identify individual dairies. The NRCS took the issue to Washington D.C., where the NRCS successfully argued that compliance with the request would threaten the basic trust that the NRCS relies upon to attract voluntary participation in its programs. In response, the EPA issued a new policy agreeing not to request records of this type again.

  The NRCS further noted that, pursuant to the Federal Clean Water Act, the EPA can compel records to be produced only from owners or operations of *point* sources of pollution–however, this ability does not extend to federal record.

The LMR Steering Committee will fashion a confidentiality program for its voluntary water quality monitoring program, based on these examples and tailored to the specific concerns of individuals participating in the monitoring program.

EXISTING WATER QUALITY-RELATED PROGRAMS IN THE LMR WATERSHED

Please refer to the Education Element for additional programs which assist in maintaining and improving water quality within the Lower Mokelumne River.

Existing Water Quality Monitoring Efforts:
One of the best ways to avoid the need for new state and federal regulatory programs is to implement proactive plans to maintain and improve water quality. These programs are best-evaluated when baseline information on water quality is collected before, during and after program implementation. Extensive water quality monitoring which establishes baseline levels of many contaminants and indicators of watershed health are ongoing along the Lower Mokelumne River. Locations of monitoring stations along the Mokelumne River are shown in Appendix 6-A. The water quality parameters currently monitored on the LMR and the agencies or groups involved in those monitoring activities are listed in Appendix 6-B.

San Joaquin Farm Bureau Federation Water Quality Program: This is a voluntary program for farmers to participate in improving water quality overseen by the San Joaquin Farm Bureau Federation.

Lodi-Woodbridge Winegrape Commission (LWWC): LWWC has produced the *Lodi Winegrower's Workbook* (see the Education Element for a more detailed description). This self-assessment guide to integrated farming practices addresses viticulture, soil management, water management, pest management, habitat management, management of human resources and evaluation of wine quality.

CA Dairy Quality Assurance Program (CDQAP): The San Joaquin County U.C. Cooperative Extension office assist in implementation of this voluntary program to encourage management practices promoting resource conservation (including water quality conservation) in dairy operations. Additional program details may be found at www.CDQA.org.

California Cattleman's Association (CCA) CA Rangeland Water Quality Management Plan, Riparian Grazing Project, Beef Quality Assurance Program: The California Rangeland Water Quality Management Program (CRWQMP) was developed by the CCA, U.C. Cooperative Extension, environmental agencies and interest groups to improve water quality on private rangeland under a voluntary program officially adopted in 1995 and includes rangeland water quality management strategies, policy and coordination mechanisms as well as sample plans and sources of assistance.

The Riparian Grazing Project is a joint effort of the CCA and U.C. Cooperative Extension to determine correct and incorrect methods for grazing to ensure riparian success . The project is a state-wide study of rangeland riparian areas in which riparian area health, specific site watershed conditions, and site specific management are simultaneously examined and address both past and present grazing methods. Program assistance is being provided by the CA Department of Forestry and Fire Protection, the U.S. EPA, the CA Department of Fish and Game, the U.S.

Department of Forestry, the U.S. Bureau of Land Management, UC Davis and others. The LMSP is currently working with the voluntary Murphy Creek Restoration Group which has used some of the evaluation methods included in this project as part of its overall restoration program.

Much like the CA Dairy Quality Assurance Program, this program was begun in 1986 as an industry effort to encourage cattlemen to follow certain quality control measures exceeding those of the U.S. Department of Agriculture and the Food and Drug Administration. The California Cattleman's Association Quality Assurance Program grew from this effort in 1992 and emphasizes a partnership with the U.C. Cooperative Extension. Surveys and workshops are used to evaluate multiple activities, including animal handling and sanitation activities which may affect the watershed, including watershed water quality.

San Joaquin County Resource Conservation District Technical Assistance Program: In partnership with the USDA's Natural Resources Conservation Service, the San Joaquin County Resource Conservation District, provides technical assistance and on-the-ground resource conservation technical assistance to landowners and local organizations. NRCS assistance allows the San Joaquin County Resource Conservation District to assist in providing expertise in the areas of range conservation, soil conservation, engineering, biology, agronomy and similar resource conservation areas. Through this technical assistance program, many of the practices voluntarily implemented by landowners to protect their natural resources directly and indirectly protect water quality within the LMR watershed and throughout San Joaquin County.

San Joaquin County Agricultural Commissioner's Office Dormant Spray Program: This office designs and implements numerous educational programs including a Dormant Spray Education Program for growers around watersheds which is ongoing and stresses best management practices. The program currently focuses on the San Joaquin River watershed. The agency also provides educational programs including its most recent seminar pertaining to best management practices related to sulfur use.

San Joaquin County Resource Conservation District's Mokelumne River Watershed Owner's Manual: A voluntary, stewardship-based workbook to guide homeowners in reducing non-point source pollution. Please refer to the Education Element, [Chapter 2, Page 1] for a full description of this program.

City of Lodi's Citizen Monitoring Program/Storm Drain Detectives: In October, 2000, the City of Lodi's Public Works Department began a local Mokelumne River Citizen Monitoring Program focusing on locations where the City's storm drains enter the river. Also called the "Storm Drain Detectives," this Citizen Monitoring Program is a collaborative effort of the City of Lodi Public Works Department, State Water Resources Control Board Division of Water Quality, Lodi Lake Nature Area Docent Council and four local high schools. Monthly monitoring of the Mokelumne River and Lodi's storm water is done by students and teachers, grades 7-12, and other volunteers who have been trained by a program coordinator. Students

participating in the program may receive school credits. In April, 2001, a CALFED grant was awarded to the City of Lodi to expand this monitoring and education effort in the Lodi area.

For more details about the program, sampling locations, and monitoring results, go to the City of Lodi web site at www.lodi.gov and search for "Storm Drain Detectives."

Total Maximum Daily Load Program (TMDL): The TMDL process was established by the U.S. Environmental Protection Agency pursuant to Section 303(d) of the Federal Clean Water Act to assist in attaining state water quality standards (i.e., goals to protect aquatic life, drinking water, and other water uses) for waters classified as impaired. The process provides a flexible assessment and planning framework for identifying load reductions or other actions needed to attain water quality standards.

Because abandoned mines, the source of the impairment listing for the LMR, are under the jurisdiction of individual landowners and agencies (and, therefore, outside of the control of watershed residents), TMDL planning for the LMSP focuses on avoiding future impairment listings related to urban and agricultural runoff. The LMSP envisions accomplishing this task through filling in data gaps and facilitating implementation of voluntary best management practices to maintain and improve water quality in the watershed while avoiding or reducing the need for new state and federal regulations.

Appendix 6-A includes a more detailed accounting of the TMDL process and program.

GOALS

One of the primary objectives of the LMR Stewardship Plan is to proactively and voluntarily avoid the need for additional state or federal regulations pertaining to water quality within the LMR watershed to maintain and improve water quality both for overall watershed health and for human health. Of the three broad categories generating discharges within the LMR watershed (Abandoned mines, Urban runoff, Agricultural runoff), private citizens and local public agencies are best equipped to maintain and improve water quality in the LMR watershed by focusing on reducing contaminants originating from urban runoff and agricultural runoff. The following goals and implementation programs are intended to achieve that objective.

- ✓ **Facilitate the implementation of stewardship-based non-point source pollution reduction practices to maintain and improve water quality**

- ✓ **Facilitate the implementation of stewardship-based naturally-occurring pollution reduction practices to maintain and improve water quality**

- ✓ **Promote voluntary programs to maintain and improve water quality standards to**

avoid the need for new state and federal water quality regulatory programs

IMPLEMENTATION PROGRAMS:

1. Facilitate Implementation of the *Mokelumne River Watershed Owner's Manual*

Continue ongoing efforts to involve watershed residents in implementing practices which promote water quality maintenance and improvement through use of the *Mokelumne River Watershed Owner's Manual*.2 Make the handbook available on the LMR website (www.sjcrcd.org) and to other local, state and federal agencies; continue working with local schools to encourage student participation in formulating and implementing action plans to reduce non-point source pollution; continue to involve local community groups and organizations and homeowner's associations in actively preserving and improving water quality in the LMR watershed.

Time Frame for Implementation: Commenced in January, 2002. Ongoing throughout the LMSP implementation process.

2. Facilitate Implementation of the *Lodi Winegrower's Workbook*

Continue ongoing efforts to involve winegrape growers in implementing practices which promote water quality maintenance using the *Lodi Winegrower's Workbook* (Ohmart, Matthiasson, 2000). Make the workbook available on the LMR website (www.sjcrcd.org) or through a link with the Lodi Woodbridge Winegrape Commission. Support implementation of the program (e.g., through grant assistance, promoting the program in LMR publications and at LMR events). Promote the workbook to other local, state and federal agencies.

3. Expand Self-Evaluation/Self-Assistance Educational Programs to Other Land Uses to Promote Management Practices Promoting Resource Conservation

2 ©2002 by the San Joaquin County Resource Conservation District. Written and edited by John Brodie. Collaborating Authors: Alyson McCann, Carl DuPoldt, Carolyn Johnson, Bill McCowan, Barbara Kneen Avery, Elaine Andrews, Karen Filchak, Richard Castelnuovo, Dean Solomon, Shirley Niemeyer, Michael P. Vogel, and Kathleen Parrott. Adapted with permission from *Home*A*Syst: An environmental Risk Assessment* guide for the Home © 1997 by the Regents of the University of Wisconsin System, and with the cooperation of the Northeast Regional Agricultural Engineering Service (NRAES).

Facilitate the expansion of self-evaluation/self-assistance educational programs (e.g., Farm*A*Syst/Home*A*Syst and the CA Dairy Quality Assurance Program-CDQAP) throughout the watershed to encourage the implementation of management practices promoting resource conservation for agricultural operations. Using the *Lodi Winegrower's Workbook* (Ohmart, Matthiasson, 2000) and the *Mokelumne River Watershed Owner's Manual* (Brodie, 2002) as models, expand these programs to address rangeland operations, orchard farming, public agency operations, and other land uses which may affect water quality. Facilitate the expansion of the CA Dairy Quality Assurance Program, overseen by San Joaquin County's U.C. Cooperative Extension, to encourage implementation of management practices promoting resource conservation on dairies. Facilitate implementation of the California Cattleman's Association statewide resource conservation program, the Biologically Integrated Orchards System (BIOS) program, and the Biologically Integrated Farming Practices (BIFS) program.

Timeframe for Implementation: Ongoing.

4. Facilitate Efforts to Monitor the Success of Water Quality Improvement Programs and to Fill Existing Needs/Data Gaps

Assist in establishing new monitoring locations and expanding parameters monitoring at existing locations to fill identified data gaps for monitoring water quality and water quality improvement along the LMR. Consider working with the City of Lodi, EBMUD, San Joaquin County and other groups and organizations to expand participation in the citizen's monitoring program and to expand monitoring sites to include areas of the LMR watershed throughout its reach to implement this program. Facilitate certification of citizen's monitoring groups by the state to validate data collected by these monitoring programs.

Monitor "core" indicators including: Stream Flow, Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD), temperature, pH, turbidity, phosphorous and Nitrates as directed in the USEPA Office of Drinking Water's *Volunteer Stream Monitoring: A Methods Manual.*

In addition to monitoring "core" water quality parameters, undertake bioassessment of macroinvertebrates as indicators of overall watershed health and to direct studies of specific toxic chemicals pursuant to the Sustainable Land Stewardship International Institute's (SLSII) "Measuring the Health of California Streams and Rivers-A Methods Manual for Water Resource Professionals, Citizen Monitors and Natural Resources Students."

Time Frame for Implementation: Commence within one year of Plan adoption.

5. **Facilitate the Formation of a Voluntary Water Quality Monitoring Coalition Consisting of Watershed Stakeholders**

Facilitate the formation of a voluntary water quality monitoring coalition consisting of watershed stakeholders (e.g., existing citizen-monitoring program participants and agencies; landowners; public and quasi-public agencies, schools, youth groups and other stakeholders) and based on the Coalition of Central Coast Farm Bureaus' Agricultural Water Quality Program (CCCFB). CCCFB's program works with voluntary watershed-level landowner groups to allow landowners to develop confidential plans that fulfill the requirements of state and federal legislation pertaining to water quality while protecting landowners from intrusive regulations on their land and water management practices (see introductory text for additional details).

This program also should include elements which support the continuance of the City of Lodi's Citizen's Monitoring Program (e.g., through assistance in preparing grants, promoting the program in LMR publications and at LMR events).

This program will assist in monitoring the effectiveness of programs implemented pursuant to this Water Quality element.

Time Frame for Implementation: Commence within one year of Plan adoption.

6. Participate in TMDL Planning Efforts

Provide representation to TMDL planning efforts to ensure coordination with the LMR Watershed Stewardship Plan and to promote the use of stewardship-based models to reduce non-point source pollution.

Time Frame for Implementation: Ongoing, as needed.

7. Promote Voluntary Management Practices which Reduce Erosion While Promoting Resource Conservation

Promote voluntary management practices which reduce erosion potential while promoting resource conservation. Practices should be based on the activities included in **Appendix 6-E**, "*Stream Corridor Restoration: Principles, Processes, and Practices*; Federal Interagency Stream Restoration Working Group, 1998."

Time Frame for Implementation: Incorporate into ongoing efforts implementing the

Lodi Winegrowers Workbook and Mokelumne River Watershed Owner's Manual.

Appendix 6-A
Total Maximum Daily Load (TMDL): Process and Program

The TMDL process was established by the U.S. Environmental Protection Agency pursuant to Section 303(d) of the Federal Clean Water Act to assist in attaining state water quality standards (i.e., goals to protect aquatic life, drinking water, and other water uses) for waters classified as impaired. The process provides a flexible assessment and planning framework for identifying load reductions or other actions needed to attain water quality standards.

The TMDL process has three steps:

- ✓ *Identify Quality Limited Waters:* States must identify and prepare a list [303(d)list] of waters that do not or are not expected to meet water quality standards after applying existing required controls (e.g., minimum sewage treatment technology, etc.).[3] As noted, the LMR is classified as impaired due to metals discharged by the Abandoned mines.

- ✓ *Establish Priority Waters/Watersheds:* States must prioritize waters/watersheds and target high priority waters/watersheds for TMDL development. Impairments resulting from copper and zinc in the LMR have been given a Low TMDL Priority with TMDLs anticipated by 12/31/2011. The US EPA and SRWQCB indicate that undertaking proactive efforts within a community to maintain or improve water quality may assist in assigning lower priorities for the establishment of TMDLs for existing and potential new impairment listings.

- ✓ *Develop TMDLs:* For listed waters, States must develop TMDLs that will achieve water quality standards, allow for seasonal variations and an appropriate margin of safety. A TMDL is a quantitative assessment of water quality problems, contributing sources, and load reductions or control actions needed to restore and protect individual water bodies. State and territorial water
- ✓ quality agencies are usually responsible for implementing the TMDL process.

[3] The state evaluates water quality within hydrological units. The LMR is within the Lower Mokelumne-Lower Cosumnes unit for the purposes of assessing 303(d) impairments. The boundaries of that hydrological unit differ from the boundaries of the Lower Mokelumne River Watershed. Per David Smith of the U.S. EPA's TMDL program and Joe Karkoski of the CVRWQCB, hydrologically defined watersheds (like the LMR identified watershed) rather than the state's hydrological units are used in determining the contents of TMDL plans. Therefore, for the LMR, the true hydrologically-defined watershed is applicable to the TMDL process (rather than the state's Lower Mokelumne River-Lower Cosumnes River hydrological unit which includes Mosher Slough and Five-Mile Slough as additional impaired waterways within the unit).

TMDLs address all significant stressors which cause or threaten to cause water body impairment including:

- ✓ *Point Sources* (e.g., sewage treatment plant discharges, discharges from mining operations),
- ✓ *Non-point Sources* (e.g., runoff from fields, streets, range, or forest land) and
- ✓ *Naturally Occurring Sources* (e.g., runoff from disturbed lands).

Appendix 6-B
LOWER MOKELUMNE RIVER MONITORING LOCATIONS and PARAMETERS MONITORED

Monitoring Location	Agency Conducting Monitoring	Parameters Monitored
Upstream of Camanche Dam: Camanche Reservoir, Below Penn Mine, ½ Mile above Penn Mine, Highway 49 Bridge, Pardee Reservoir	USGS, EBMUD	*Conductivity, Dissolved Oxygen, pH, Temperature, Chemical Oxygen Demand, Oxidation/Reduction Potential, Hardness/Total, Total Dissolved Solids, Volatile suspended solids, Turbidity* *Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Scandium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc* *Nitrate as N, Sum Nitrate & Nitrite as N, Nitrite as N* *Sulfate, Orthophosphate as P, Total Phosphate as P, Alkalinity (Total as CACO3), Ammonia as N, Total Organic Carbon* *Bacillariophyceae (Asterionella, acnanthes, cymbella, cyclotella, fragilaria, gyrosigma, melosira, navicula, nitzschia, pinnularia, rhizosolenia, rhopalodia, stephanodiscus, synedra, tabellaria)* *Chlorophyceae (ankistrodesmus, cruicigenia, dinobryon, elakotothrix, eudorina, hormidium, mallomonas, pediastrum, scenedesmus, schiroederia, spondylosium, staurastrum)* *Ciliata (codonella); Cyanophyceae (anabaena); crustaceans* *Dinophyceae (ceratium, peridinium); Euclenophyceae (trachelomonas); rotifers; Zooflagellates (aulomonas, domatomonas); Chlorphyll A, Chlorophyll A (corrected), Pheophytin A*
Camanche Fish Hatchery: Below Camanche Dam at Camanche Dam Valve House; 1994-present		
Camanche Dam Powerhouse 100 yds. upstream of Power House effluent		
Camanche Dam Powerhouse 100 yds. downstream of Power House effluent		

Van Assen Park (1994 - Present)		*Conductivity, pH, Temperature, Total Dissolved Solids, Total Suspended Solids, Volatile Suspended Solids, Turbidity, Alkalinity (total as CACO3), hardness: total, Chemical Oxygen Demand, Total Organic Carbon,* *Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Vanadium, Zinc* *Nitrate as N, Nitrite as N, Sum Nitrate & Nitrite (as N) Orthophosphate as P, Total Phosphate as P, Sulfate, Ammonia as N*

Elliott Bridge: (199?-present)	USGS, EBMUD	*Conductivity, pH, Temperature, Total Dissolved Solids, Total Suspended Solids, Volatile Suspended Solids, Turbidity, Alkalinity (total as CACO3), hardness: total,* *Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Vanadium, Zinc* *Nitrate as N, Nitrite as N, Sum Nitrate & Nitrite (as N) Orthophosphate as P, Total Phosphate as P, Sulfate* *Bacillariophyceae (Asterionella, acnanthes, attheya, ceratoneis, cymbella, cyclotella, diatoma, fragilaria, gomphonema, gyrosigma, hantzschia, melosira, navicula, nitzschia, pinnularia, rhopalodia, stephanodiscus, synedra, tabellaria); Chlorophyceae (ankistrodesmus, bulbochaete, closterium, crucigenia, dinobryon, elakotothrix, eudorina, hormidium, pediastrum, scenedesmus, schroederia, spirogyra, spondylosium, tetraedron, ulothrix); Ciliata (codonella); Chrysophyceae (dinobryon); Chrysophyceae (Mallomonas); crustaceans , Cyanophyceae (anacystis, coccochloris, oscillatoria); Dinophyceae (ceratium); Euclenophyceae (trachelomonas); rotifers; Zooflagellates (aulomonas, domatomonas); Chlorphyll A, Chlorophyll A (corrected), Pheophytin A*

City of Lodi - Storm Drains	City of Lodi, Public Works Dpt. **Citizen Monitoring-Storm Drain Detectives (Jan, 2001 – Present)**	Site #1: East of Cluff Ave near Solid Waste Transfer Station (River above storm drains) Site #2: Cluff Ave. near Solid Waste Transfer Station (Storm drain #1) Site #3: 317 Mokelumne River Dr. (Storm Drain #3) Site #4: Awani Dr. @ Mokelumne River (River) Site #5: 1202 Rivergate Dr. (Storm drain #5) Site #6: 1050 N. Lincoln @ Edgewood Dr. (Storm drain #8) Site #7: Ham Ln @ Lodi Lake Wilderness Area (River, by storm drain) Site #8: Lodi Lake at North Pump Station Outlet (City storm drain #16) Site #9: Woodbridge Dam (River near dam *PH, Dissolved Oxygen, Turbidity, Water Temperature, Total Dissolved Solids (Conductivity)* *Toxicity Test: (Ceriodaphnia dubia)*
Woodbridge	USGS, EBMUD	*Multiple parameters – See Elliot Bridge for Partial Listing*
Lodi Lake Lagoon (Middle Swim, Deep Swim , Lake Inlet, Lagoon Outlet), and River (at Point)	**City of Lodi** Public Works (2000)	*Temperature, Dissolved Oxygen, Total Coliform, Fecal Coliform*
	City of Lodi Public Works Department 8/7 through 8/27 - 1985	*Total Coliform, Fecal Coliform*

Appendix 6C

Primary Discharges to the Mokelumne River (Brown & Caldwell, 1991)

Discharge Source	Constituent	Regulated Drinking Water Constituent
Abandoned Mines (The Mokelumne River is designated by the Regional Board as impaired per 303(d) of the Federal Clean Water Act due to metals from abandoned mines, such as the Penn Mine–see discussion under "impairment" following)	Aluminum, Copper, Iron, Lead, Zinc	Aluminum, Copper, Iron, Lead, Zinc
Agricultural return flows	Dissolved solids, Nutrients, Pathogens Organic matter, Sulfur	Dissolved solids, Nitrate, Coliform, Trihalomethanes/a/, Sulfate
Urban runoff	Copper, Lead, Zinc, Hydrocarbons, Fecal coliform bacteria, Arsenic, Cadmium, Chromium, Nickel	Copper, Lead, Zinc, Arsenic, Cadmium Chromium, Nickel, Fecal coliform bacteria, Various hydrocarbon constituents/b/

/a/ Formed when water high in organic carbon is chlorinated
/b/ Includes benzene, ethylbenzene, toluene, and xylene

Appendix 6-D
Importance of Monitoring Indicators for Water Quality
(Source: US EPA Office of Water *Volunteer Stream Monitoring: A Methods Manual*)

Parameter	Importance/Influences
Stream Flow	**Importance:** Large, swiftly moving rivers can receive pollution discharges and be little af have less capacity to dilute and degrade wastes. Velocity determines the kinds of organism Flow affects the amount of silt and sediment carried by the stream (sediments in a slow-fl sediments in fast-flowing systems stay suspended longer). Fast-moving streams generally oxygen due to better aeration. **Influencing Factors:** Weather, industrial and agricultural use levels, dams
Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD)	**Importance:** Aquatic animals are vulnerable to low dissolved oxygen levels, especially in summer days when stream flows are low, water temperatures are high and aquatic plants ha oxygen since sunset. **Influencing Factors:** Watershed uses which may reduce oxygen include: storm water ru streets, feedlots and failing septic systems; microorganisms using oxygen to decompose org discharged from sewage treatment plants.
Temperature	**Importance:** Influences oxygen content, rates of photosynthesis, metabolic rates of aquat of organisms to toxic wastes, parasites and disease. **Influencing Factors:** Weather, removal of shading stream bank vegetation, impoundments cooling water, urban storm water and groundwater inflows to streams.
pH	**Importance:** Influences chemical and biological processes. Most aquatic animals prefer a Outside this range, diversity decreases. Low pH can allow toxic elements and compounds "available" for uptake by aquatic plants and animals creating conditions toxic to aquatic lif like rainbow trout). **Influencing Factors:** Atmospheric deposition (acid rain), surrounding rock and some was
Turbidity	**Importance:** High turbidity can increase water temperature because suspended particles ab reduces the concentration of dissolved oxygen. High turbidity also reduces the amount of l reduces photosynthesis and production of dissolved oxygen. Turbidity can clog fish gills, disease, lowering growth rates, and affecting egg and larval development. As particles set bottoms and smother fish eggs and benthic macroinvertebrates. **Influencing Factors:** Include soils erosion, waste discharge, urban runoff, eroding stream bottom feeders (e.g., carp) which stir up bottom sediments, excessive algal growth
Phosphorous	**Importance:** Essential nutrients for plants and animals. Phosphorous is normally a nutri even a modest increase in phosphorous can set off undesirable events including accelerated low dissolved oxygen and the death of certain fish, invertebrates and other aquatic animals. **Influencing Factors:** There are numerous natural and human sources of phosphorous incl

	treatment plants, runoff from fertilized lawns and crop land, failing septic systems, runoff f areas, disturbed land areas, drained wetlands, water treatment and commercial cleaning ope
Nitrate	**Importance:** Essential plant nutrients. Together with phosphorous, in excess, can accele dramatic increases in aquatic plant growth and changes in the types of plants and animals li turn, affects dissolved oxygen, temperature and other indicators. Excess nitrates can cause dissolved oxygen) and can be toxic to warm-blooded animals under certain conditions. **Influencing Factors:** Sources include effluent from wastewater treatment plants, runoff f land, failing on-site septic systems, runoff from animal manure storage areas and industrial corrosion inhibitors.