8 Performance and Monitoring

This section summarizes the current state of knowledge across the Sacramento Valley with respect to monitoring surface water and groundwater use and quality, and proposed future performance and monitoring actions. Data collected at the local and regional level by federal, state, and local entities associated with projects and programs throughout the region continue to support an understanding of the valley's physical, hydraulic, and hydrologic properties. Availability of data throughout the region varies, but generally includes information related to streamflows, groundwater levels, groundwater quality, surface water quality, and environmental habitat. Efforts to date have focused on measuring surface water at the diversion point and using various methods/points within a given water district/company as appropriate. Monitoring of groundwater use has also varied across the valley, typically focusing on water levels, quality, and subsidence in some areas. Surface water quality monitoring has increased in response to the proposed cessation of the agricultural waiver, which has led to additional coordination across the valley.

Continued monitoring will remain key to ensuring water supply reliability and quality as the valley continues to respond to population growth and land and water use changes. Cooperation at the local level within and across counties and subbasins will continue to be encouraged, as well as the sharing of data and monitoring locations and approaches. As discussed below, the proposed Performance and Monitoring Plan included as Appendix B to this IRWMP outlines the continuation and enhancement of monitoring efforts focused on surface water quantity and quality, as well as groundwater levels and quality. It is recommended that data be made available to support the development of a single data repository. Sharing of these data will allow for consistent evaluation of surface water and groundwater conditions and make such data available to support other collaborative monitoring efforts.

In addition to the monitoring objectives described above, the increased use of groundwater in-lieu of surface water diversions to increase the availability of surface water for other environmental, agricultural, and urban needs has increased interest in stream/aquifer interaction. In addition to obtaining additional information on groundwater level and quality, implementation of many of the projects proposed as the first phase of the program for Proposition 50 funding includes a project-specific monitoring component that will provide data to assist in evaluating potential streamflow effects related to groundwater production. Other projects included in the first phase of the program include efforts that will increase understanding of and support improved monitoring of the Lower Tuscan Formation. Sustainable use of the Lower Tuscan will continue to be a priority issue for many water users and interests on both the west and east sides of the Sacramento River.

8.1 Status of Groundwater Monitoring in the Region

Groundwater levels and quality and surface water quality have been historically monitored throughout the Sacramento Valley IRWMP Region for decades, primarily by the Department, U.S Geological Survey, the California Department of Health Services, and local municipalities and/or water purveyors. As described above, surface water use (both agricultural and urban) is typically measured at the diversion point as well as within the water purveyor service area using methods appropriate to a given purveyor district. Several agencies including counties and cities, the U.S Geological Survey, the Department, water purveyors and districts, watershed groups, and others have all been involved in monitoring different parameters of water quality and quantity. Some of these monitoring efforts have been ongoing for many years, and others have been initiated only recently. The status of monitoring in the region is constantly changing as new programs evolve and monitoring wells are drilled, constructed, upgraded, or abandoned. The following provides a brief summary of the status of groundwater monitoring for each county in the Sacramento Valley IRWMP Region.

8.1.1 Shasta County

As of 1996, there were 38 active Department groundwater monitoring stations in the Redding Basin. Since that time, at least 13 additional monitoring wells have been installed in the ACID service area, which are monitored by the Department. The Shasta County Water Agency serves as the information and data collection coordinator for the Redding Area Water Council.

8.1.2 Tehama County

As of 2002, Tehama County had 187 groundwater monitoring stations. To date, the Tehama County FCWCD has installed three 1,000-foot-deep multi-completion groundwater monitoring wells in three known areas where depressed groundwater levels have been observed. The district has secured funding to instrument several existing Department multiple-completion monitoring wells with pressure transducers and dataloggers to provide real-time water level data. Grant funds will also be used to install additional monitoring wells in areas slated for large-scale residential developments. Hourly groundwater level data, including hydrographs, are available at the district's Web site (http://www.tehamacountywater.ca.gov).

8.1.3 Glenn County

In 2002, 136 groundwater monitoring wells were used to measure groundwater levels across Glenn County. The Department also conducts short-term specialty groundwater quality studies. Data and reports are available from the Department's regional and field offices. The county monitors a standard network of monitoring wells regularly as part of their BMOs program. The objective of this program is to perform periodic monitoring of historical and current groundwater levels to detect any impacts to groundwater resources due to climatic

conditions and/or groundwater use in the area. If impacts are detected, a technical advisory committee analyzes the available data and evaluates whether potential remedial actions are warranted. The results of the BMO program are available on the Glenn County Web site (http://www.countyofglenn).

8.1.4 Colusa County

The Department routinely monitors domestic and agricultural wells for groundwater levels and, at a lesser frequency, water quality. Water quality samples are analyzed primarily for naturally occurring heavy metals. The California Department of Health Services also periodically monitors wells for water quality. Additionally, the Water Board and U.S. Geological Survey have historically done water quality surveys in the county. The Department water level and quality data are available online (http://www.nd.water.ca.gov/PPAs/Indexes/GW/). As of 2002, Colusa County had 67 groundwater monitoring stations monitored at least semiannually.

8.1.5 Butte County

There are presently 164 groundwater monitoring wells in Butte County (Groundwater Status Report, 2004). Groundwater level monitoring in the Sacramento Valley portion of Butte County is conducted by a number of different private and public agencies, although historically, the Department has maintained the most comprehensive, long-term groundwater level monitoring grid. Since 1997, Butte County and the Department have coordinated water level monitoring efforts. Approximately 29 wells are equipped to continuously monitor and record changes in groundwater level, and approximately 60 municipal wells are monitored monthly for level changes in the City of Chico. Butte County is currently developing a BMO that has a total of approximately 50 monitoring sites. As in Glenn County, the objective of this program is to perform periodic monitoring of historical and current groundwater levels to detect any impacts to groundwater resources due to climatic conditions and/or groundwater use in the area. If impacts are detected, a technical advisory committee analyzes the available data and evaluates whether potential remedial actions are warranted. The county also encourages agricultural irrigation districts supplied by surface water to be involved in the groundwater monitoring program.

8.1.6 Yuba County

There are 74 groundwater monitoring wells in Yuba County, a joint effort of the Department and the YCWA. As of 2004, 58 of the wells in the monitoring network are monitored by the Department. Of those wells, 22 are monitored semiannually and 36 are monitored monthly. The YCWA monitors 16 of the wells in the monitoring network. Measurements are generally taken in either (1) March and October or (2) April and November. Currently, the Department collects data for 13 water quality wells in the two subbasins of Yuba County regularly (i.e., data for seven wells are collected in one year and data for the other six wells are collected the next year). A number of municipalities also collect water quality data for

required constituents and measure water levels in their production wells at least monthly. In the summer and fall of 2006, YCWA installed eight dedicated groundwater monitoring wells in the South Yuba and North Yuba Groundwater Subbasins to supplement the existing groundwater monitoring network in the county. The purpose of these wells is to support YCWA's groundwater conjunctive use activities and monitoring of BMOs as described in the YCWA Groundwater Management Plan (Montgomery Watson Harza, 2005). YCWA's expanded groundwater monitoring program also supports groundwater resource management activities associated with Phase 8 and the proposed Lower Yuba River Accord.

8.1.7 Yolo County

The YCFCWCD monitors groundwater levels through an extensive network of 153 wells throughout the county. The Department (Central District) currently measures 12 wells for groundwater levels in Yolo County monthly.

8.1.8 Sutter County

In Sutter County, the Department and other local agencies monitor domestic and agricultural wells for groundwater levels and water quality, primarily naturally occurring heavy metals. The Department Data Library currently includes 183 groundwater monitoring stations within portions of the Sutter, North American, and East Butte Groundwater Subbasins located within Sutter County. In the spring of 2004, a total of 99 wells were measured for groundwater levels. Groundwater quality data are available from the Department Data Library for 40 wells within the county with observations between 1998 and 2006. Sutter Extension Water District recently installed nine monitoring wells (three triple-completion wells) as part of their conjunctive use program, and the monitored data from these wells will be provided to the Department Data Library. The California Department of Health Services and their cooperating agencies monitor additional selected wells for drinking water quality.

8.2 Current Surface Water Quality Monitoring in the Region

The Coalition was formed in 2003, to enhance and improve water quality in the Sacramento River, while sustaining the economic viability of agriculture, functional values of managed wetlands, and sources of safe drinking water. The Coalition is composed of more than 7,500 farmers and wetlands managers encompassing more than 1 million irrigated acres and supported by more than 200 agricultural representatives, natural resource professionals, and local governments throughout the region to improve water quality for Northern California farms, cities, and the environment.

To implement the Sacramento Valley IRWMP and to meet the Water Board's regulations, the Coalition prepared and submitted two documents on April 1, 2004, that serve as the foundation for a phased water quality management program: (1) a watershed evaluation report and (2) a Monitoring and Reporting Program Plan. The watershed evaluation report is a comprehensive watershed assessment prepared by local agricultural representatives,

wetlands managers, and natural resource professionals. The watershed evaluation report provides a detailed description of the landscape in each of the 10 Coalition subwatershed areas, including cropping patterns, soil quality, water quality issues, management practices implementation, and pesticide use.

The ultimate output of the watershed evaluation report is a drainage prioritization table for each subwatershed area. Using the Department land use survey data, the entire 21 county region was divided into nearly 250 geographic areas. The Coalition evaluated raw acreage numbers for orchard, annual, and pasture crops (excluding short- and long-grain rice), respectively, in each drainage area and then multiplied these raw acreages by a weighting factor, with orchards receiving the greatest emphasis and pasture the least. Adding each of these weighted acreages in each subwatershed area produced an index that was used as the primary criterion for ranking a drainage area. The Coalition also evaluated diazinon, chlorpyrifos, copper, and pyrethroid use in each drainage area and used this data as the second criterion. The third criterion was the existence of impaired water bodies listed under the SWRCB Section 303(d) list of water quality limited segments. Each subwatershed group then evaluated the ranked drainages in their subwatershed, and using their local knowledge of the hydrology and current issues, selected monitoring sites for the initial sampling.

In 2004, the Coalition prioritized 10 subwatersheds in the Sacramento River watershed that were based on potential relative impact on water quality using three main data sources: drainage mapping, land use, and pesticide use. Of the ten subwatersheds, three subwatersheds were categorized as high priority, and four were categorized as medium priority. The subwatersheds were further evaluated by drainage. Of the 244 drainages within the 10 subwatersheds, 42 drainages were identified as medium or high priority. The Coalition has identified numerous priority drainages and is involved in the monitoring of 32 sites in 2006. To ensure compliance with the Irrigated Lands Waiver Program, monitoring of priority drainages will rotate over time.

8.3 Monitoring and Assessment

Regional leaders recognize that successful implementation of the IRWMP strategies and projects requires participating entities to have a monitoring and assessment program to ensure that the region's groundwater and surface water resources are protected and can sustain long-term beneficial uses.

This IRWMP was developed using data and input supplied by stakeholders, counties, and various state and federal agencies that were used to depict current conditions, needs, and conflicts in the region. Data necessary to develop specific projects has and will continue to be obtained from investigations sponsored by individual project sponsors and obtained from the Department, Reclamation, and local counties and agencies as available and appropriate.

8.3.1 Technical Analyses and Plan Performance

The evaluation of IRWMP performance will be determined in accordance with individual project characteristics and proponent and participant goals, identified benefits, and impact avoidance measures. For those projects included as part of the SVWMA Phase 8 process, individual implementation agreements will be developed for each project with the project proponent, the Department, and Reclamation in accordance with local county ordinances and groundwater management plans. These agreements will stipulate operational criteria including monitoring protocol and impact avoidance measures. Seven primary parameters will be evaluated/monitored including water produced, surface water/groundwater interaction, water quality, and the potential for impacts to local ecosystem habitat. It is proposed that the monitoring approach developed as part of the SVWMA project formulation be used for all groundwater projects proposed as part of the IRWMP. It is anticipated that the IRWMP will assist in the regionwide monitoring effort in conjunction with other ongoing monitoring programs across the valley.

Data on groundwater levels and quality are limited in the Sacramento Valley; therefore, the implementation of this IRWMP is proposed to support increasing the understanding of the region's groundwater and surface water hydrology and interaction. Performance evaluation will include either measurement or mutually agreed upon estimation of decreased river diversion associated with the performance of each groundwater production project. Measurement is anticipated to vary from actual gage measurements to numerical estimates depending on the quantity of water to be produced for a given project and individual project characteristics.

System improvement strategies (proposed to improve water management through water district actions such as canal lining, increased water reuse, operational spill reduction, or improved access to water supplies) will be evaluated in terms of performance in a similar manner to the groundwater conjunctive management projects. The determination of benefits will include the project proponent and participants and will include the measurement of water made available through the operation of the plan in terms of measured decreased diversions (at the point of diversion) and/or mutually agreed upon numerical estimates. As with the groundwater projects, the method of determining actual measured benefit will be finalized as part of the implementation agreement for each project. Anticipated water quality benefits will be evaluated through monitoring of individual projects and through the continued implementation of the Coalition's monitoring program summarized below.

The approach to performance evaluation of specific projects will be tailored to the scale and type of project. Typically, a project-specific Performance Assessment and Evaluation Plan will be developed as part of each implementation agreement to articulate project goals and targets and to describe how information will be gathered and analyzed to evaluate the project's success. Each Performance Assessment and Evaluation Plan will specify monitoring approach and protocols for water quality monitoring and analysis to ensure quality assurance. The individual Performance Assessment and Evaluation Plan will also be useful in

determining why a project might have exceeded or undershot expectations. Data collected by projects engaged in surface water monitoring may be entered into the California Surface Water Ambient Monitoring Program to advance regional and statewide integration of information on surface water quality.

8.3.2 Proposed Monitoring Program

8.3.2.1 Groundwater Monitoring

Continued urban development and increases in orchards across the valley are increasing regional demand on groundwater resources and the need for monitoring. All counties within the Sacramento Valley have completed or are in the process of developing a groundwater management plan in accordance with AB3030 and SB1938, and water districts/companies have either prepared their own plans or have/intend to sign on to county management plans. A comprehensive groundwater monitoring program has been developed as part of the proposed implementation of the SVWMA. This monitoring program would be in addition to and in coordination with existing local and county monitoring efforts and is recommended to be used as a template for future monitoring across the valley. The proposed program relies on a network of groundwater monitoring wells, stream stage recorders, and extensometers to assess any program-related impacts to groundwater levels, groundwater quality, streamflows, or the inducement of land subsidence. The primary objectives of the monitoring program are as follows:

- Performance
  - Water produced and groundwater level/well impacts
- Surface Water/Groundwater Interaction
  - Effects on streamflows caused by groundwater pumping
- Habitat
  - Shallow groundwater levels
- Water Quality
  - Changes in groundwater quality
- Basin Recharge
  - Recovery of water levels over winter
- Aquifer Testing
  - Verification of modeling predictions
- Interpretation and Reporting
  - Documentation of groundwater produced, net augmentation in streamflows, pumping impacts on groundwater levels, and groundwater basin conditions

The infrastructure required to fulfill these monitoring objectives was evaluated, and a generic monitoring template was developed. This template identified the critical monitoring components that are necessary at each project location to gather the data needed to assess impacts and improve understanding of the hydrogeologic system. This template was then compared with existing monitoring facilities in the valley and new wells, extensometers, and stage gages recommended where existing infrastructure does not exist. The frequency of water level and water quality monitoring was recommended, and all of this information was compiled into a SVWMA Groundwater Monitoring Plan. This plan not only discusses monitoring infrastructure and frequency, but also data management strategies and data interpretation methodology. This plan will serve as a blueprint to gather and evaluate monitoring data as the program proceeds.

It is acknowledged that this monitoring network will likely take years to be fully implemented; therefore, opportunities exist to integrate this program with the overall regional effort of managing groundwater resources in the Sacramento Valley. The monitoring network under development and proposed as part of the SVWMA and as part of each project is primarily designed to measure impacts to groundwater levels and streamflows associated with particular projects, but the information collected through the program will also provide critical input to regional water resource managers that are managing irrigation season drawdown and winter recovery on a countywide or districtwide scale. Therefore, as future applications for the grant funding are received by the Department, this plan will be used as a tool to identify monitoring infrastructure that will benefit both project-specific and regional monitoring needs. This approach would help maximize the benefits obtained from any future expenditure of funds to support groundwater monitoring throughout the valley.

Continued data management and data collection are proposed to draw heavily from ongoing Department, SVWMP, and other subregional efforts. Data to be collected will provide a framework for developing policy recommendations including overall regional objectives and priority actions. Any new data collected as part this program will be made available to the stakeholders, agencies, and the public. As discussed above, the data collected will support subregional, regional, and statewide data needs. Additional detail is provided in the Sacramento Valley IRWMP Performance and Monitoring Plan (Appendix B).

8.3.2.2 Surface Water Quality Monitoring

The Coalition has identified numerous priority drainages and is involved in the monitoring of 34 sites in 2006 (see Table 8-1). Figure B-12 in Appendix B shows the location of those sites proposed for monitoring in 2006. To ensure compliance with the Irrigated Lands Waiver Program, monitoring of priority drainages will rotate over time. Attachment 1 to Appendix B is the full monitoring plan for 2006, which was provided as an attachment to the Coalition's amended MRPP.

TABLE 8-1
Sacramento Valley Water Quality Coalition 2006 Monitoring Locations

Map Index	Subwatershed	Site Name	Latitude	Longitude
1	Pit River	Pit River at Pittville	41.0454	-121.3317
2	Pit River	Fall River at Fall River Ranch Bridge	41.0351	-121.4864
3	Pit River	Pit River at Canby Bridge	41.4017	-120.931
4	Shasta/Tehama	Burch Creek at Woodson Ave Bridge	39.90528	-122.18368
5	Colusa Basin	Stony Creek on Hwy 45 near Rd 24	39.71005	-122.00404
6	Colusa Basin	Colusa Drain near Maxwell Rd	39.2756	-122.0862
7	Colusa Basin	Stone Corral Creek near Maxwell Rd	39.2751	-122.1043
8	Colusa Basin	Rough and Ready Pumping Plant (RD 108)	38.86209	-121.7927
9	Colusa Basin	Colusa Basin Drain above KL	38.8121	-121.7741
10	Colusa Basin	Butte Creek at Gridley Rd Bridge	39.3619	-121.8927
11	Placer/Nevada/S Sutter/ N Sacramento	Coon Creek at Striplin Rd	38.8661	-121.5803
12	Butte/Yuba/Sutter	Butte Slough at Pass Rd	39.1873	-121.90847
13	Butte/Yuba/Sutter	Wadsworth Canal at South Butte Rd	39.15337	-121.73435
14	Butte/Yuba/Sutter	Pine Creek at Nord Gianella Rd	39.78114	-121.98771
15	Butte/Yuba/Sutter	Sacramento Slough	38.7833	-121.6338
16	Solano/Yolo	Z Drain – Dixon RCD	38.4157	-121.6752
17	Solano/Yolo	Toe Drain at NE corner of Little Holland	38.3491	-121.645
18	Solano/Yolo	Tule Canal at I-80	38.57	-121.58
19	Upper Feather River	Spanish Creek above confluence with Greenhorn Creek	39.96777	-120.91643
20	Upper Feather River	Middle Fork Feather River at County Rd A-23	39.81892	-120.39179
21	Upper Feather River	Indian Creek downstream from Indian Valley	40.0507	-120.97406
22	Lake/Napa	McGaugh Slough at Finley Rd East	39.00417	-122.86233
23	Lake/Napa	Pope Creek upstream from Lake Berryessa	38.64637	-122.36424
24	Lake/Napa	Capell Creek upstream from Lake Berryessa	38.48252	-122.24107
25	El Dorado	North Canyon Creek	38.7604	-120.7102
26	Sacramento/Amador	Consumnes River at Twin Cities Rd	38.29098	-121.38044
27	Sacramento/Amador	Dry Creek at Alta Mesa Rd	38.248	-121.226
28	Sacramento/Amador	Big Indian Creek at Bridge	38.5498	-120.8478
29	Solano/Yolo	Shag Slough at Liberty Island Bridge	38.30677	-121.69337
30	Shasta/Tehama	Andersen Creek at Ash Creek Rd	40.418	-122.2136
32	Solano/Yolo	Ulatis Creek at Brown Rd	38.307	-121.794
33	Butte/Yuba/Sutter	Gilsizer Slough at George Washington Rd	39.009	-121.6716
34	Shasta/Tehama	Burch Creek at Rawson Rd		

Note:

In summer 2006, the Coalition will work with the Water Board to update their Monitoring Program Plan for 2007.

The following several management plans were initiated as a result of 2005 and 2006 water quality data collection.

8.3.3 E. Coli Monitoring Plan

This sampling plan is designed to evaluate the causes of exceedances of E. coli Basin Plan objectives observed in the Solano/Yolo Subwatershed during monitoring for the Yolo Bypass Program and the Coalition monitoring for the Irrigated Lands Program. As a result of these exceedances, the Coalition has agreed to conduct this pilot study to investigate bacterial sources in this subwatershed. This pilot study is part of a broader management plan provided to the Water Board January 6, 2006, to address exceedances of several water quality parameters. This monitoring plan is currently being implemented.

8.3.4 Diazinon Management Plan

The Coalition submitted its Diazinon Runoff Management Plan for Orchard Growers in the Sacramento Valley to the Water Board on January 19, 2006. The plan was approved by the Water Board in March 2006. In fulfillment of the requirements set forth in the plan, the Coalition submitted the 2006 Annual Report on June 1 summarizing the 2005-2006 monitoring objectives, location and results, outreach efforts, grower survey follow-up, and management practices effectiveness.

Results from the first year of this multi-year effort include the following:

- All sites were in compliance with load-based TMDL objectives, and most samples were in compliance with the concentration-based TMDL objectives for diazinon. These results indicate that the combination of changes in diazinon use patterns, changes in management practices, and modifications to labeling have been successful in reducing instream ambient diazinon concentrations and loads to below historically observed levels that have resulted in these waters being listed as impaired.

- The recently finalized National Water Criteria for diazinon and the proposed Basin Plan objective for the San Joaquin River have significant implications for the TMDL for diazinon for the Sacramento and Feather Rivers. These objectives may be used to modify the targets of the TMDL or potentially to re-evaluate the need to list the Sacramento and Feather Rivers as 303(d)-listed impaired water bodies. The affected water bodies already appear to comply with potential TMDL targets that would be based on these new criteria. At a minimum, future compliance should be more easily achieved. This issue is currently being considered by Water Board staff responsible for implementation of the TMDL.

- Landowners and crop advisors have indicated a strong interest in learning more about Best Management Practices for diazinon. Over 700 landowners and crop advisors have attended nine outreach presentations given in the fall and winter of 2005, prior to the dormant-season spraying initiated in December 2005 and January 2006. The outreach

presentations focused on the diazinon label changes and the finalized diazinon TMDL. Information on available Best Management Practice options to best protect surface waters from the potential impacts of dormant season runoff from diazinon alternatives, specifically pyrethroid insecticides, was also included during the presentations.

- Of the 335 surveys mailed in 2005, 211 surveys were completed and returned to the Coalition by August 26, 2005. The survey results were submitted as part of the Diazinon Management Plan in January 2006. The Coalition worked with County Agricultural Commissioners to identify the 124 nonrespondents and to determine the reason for their failure to respond or fully complete a survey. As a result of the follow-up, 11 additional surveys were completed by growers, with the remaining not being submitted for various reasons including the grower no longer farmed, the grower did not respond to attempts to contact them, or the grower refused to complete the survey.

- Other management practices are currently being evaluated in the Sacramento Valley for their effectiveness in reducing or eliminating runoff of dormant orchard sprays. The Best Management Practice evaluations are being performed through grant funding provided by the SWRCB.

8.3.5 Yolo County Technical Report

The Water Board requested a technical report for boron, conductivity, dissolved oxygen, E. coli and fecal coliform bacteria, and Selenastrum toxicity that were observed to exceed numeric or narrative Basin Plan limits at several monitoring sites in Yolo County. The sites identified were monitored as part of the City of Woodland's Yolo Bypass Program in late 2003 and 2004, which included sites on Cache Creek, Putah Creek, Ridge Cut, and Willow Slough.

A technical report was submitted on January 27, 2006, calling for an evaluation of existing/ future management practice effectiveness in achieving water quality objectives and a detailed approach to be taken in identifying the causes of toxicity and water quality exceedances within the subwatershed. Implementation began in summer 2006.