California Rice

February 2, 2012

Ms. Pamela Creedon, Executive Officer
Central Valley Regional Water
Quality Control Board
11020 Sun Center Drive, #100
Rancho Cordova, California 95670-6114

RE: TRANSMITTAL LETTER FOR THE ANNUAL MONITORING REPORT (AMR) IRRIGATED LANDS CONDITIONAL WAIVER MONITORING AND REPORTING PROGRAM

Dear Ms. Creedon:

The California Rice Commission (CRC) submitted the draft Conditional Waiver for Rice (CWFR) 2011 AMR by December 31, 2011, to comply with the reporting requirements of the *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands,* or the Irrigated lands Regulatory Program (ILRP). We worked with your staff on corrections and amendments in the draft AMR in order to submit one final report. Please see Chapter 7, Summary and Recommendations for a description of the 2011 CWFR monitoring results.

In 2011, the CRC did core monitoring of copper and field parameters. Through the propanil management plan, we did additional monitoring and educational outreach resulting in a very successful outcome. The CRC program will rotate to assessment monitoring in 2012. We will continue with propanil outreach and evaluate the monitoring plan with your staff along with the constituents to monitor.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations."

Sincerely,

Tim Johnson
President & CEO

Roberta L. Firoved
Manager, Industry Affairs

FINAL

Conditional Waiver for Rice and Rice Pesticides Program

2011 Annual Monitoring Report Sacramento River Drainage Basin

WBG121311182744SAC

December 2011

Prepared for

California Rice Commission

Prepared by

CH2MHILL

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Acronyms and Abbreviations

2008 Coalition MRP	CVRWQCB Order No. R5-2008-0005
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
µS/cm	microSiemens per centimeter
ACP	agricultural civil penalty
AMP	Algae Management Plan
AMR	Annual Monitoring Report
Basin Plan	*Water Quality Control Plan for the Sacramento and San Joaquin River Basins*
BMP	Best Management Practice
$CaCO_3$	calcium carbonate
CAC	County Agricultural Commissioner
CDEC	California Data Exchange Center
CDPH	California Department of Public Health
cfs	cubic feet per second
CLS	California Laboratory Services
COC	chain-of-custody
CRC	California Rice Commission
CTR	California Toxics Rule
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CWFR	Conditional Waiver for Rice
DFG	California Department of Fish and Game
DO	dissolved oxygen
DPR	California Department of Pesticide Regulation
DWR	California Department of Water Resources
DWR PP	DWR pumping plant

EC	electrical conductivity
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
Irrigated Lands Conditional Waiver	CVRWQCB Resolution R5-2003-0105, *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Central Valley*
Irrigated Lands Regulatory Program	CVRWQCB *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands*
K	potassium
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LT-ILRP	Long-Term Irrigated Lands Regulatory Program
MAI	McCampbell Analytical, Inc.
MCL	maximum contaminant level
MDL	method detection limit
mg/L	milligrams per liter
MRL	method reporting limit
MRP	Monitoring and Reporting Program
MRP Order	Monitoring and Reporting Program Order No. R5-2003-0826
MS/MSD	matrix spike and matrix spike duplicate
N	nitrogen
NASS	National Agricultural Statistics Service
ND	non-detect
NOA	Notice of Applicability
NOI	Notice of Intent
NPS	nonpoint source
NTU	nephelometric turbidity unit
P	phosphorus
PCA	pest control advisor
ppb	parts per billion
PUR	Pesticide Use Report

QA/QC	Quality Assurance/Quality Control
QAO	quality assurance objective
QAPP	Quality Assurance Project Plan
RPD	relative percent difference
RPP	Rice Pesticides Program
SOP	standard operating procedure
SSB	Sacramento Slough Bridge
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TOC	total organic carbon
TMDL	total maximum daily load
UC	University of California
UCCE	UC Cooperative Extension
UC IPM	University of California Integrated Pest Management
USDA	U.S. Department of Agriculture
WQO	water quality objective
Zn	zinc

SECTION 1

Introduction

The California Rice Commission (CRC) is a statutory organization representing approximately 2,500 rice farmers who farm approximately 500,000 acres of California farmland. Rice is one of the top 20 crops produced in California, and adds nearly a half billion dollars in revenue and thousands of jobs vital to the state's economy. The California rice industry contributes significantly to the foundation of many rural economies and the positive balance of international trade. Rice produced in the United States provides 1.5 to 2 percent of global production, competes in the global market, and constitutes a large proportion of internationally traded medium-grain (north Asian) rice.

The CRC implements water quality monitoring and reporting activities in compliance with the following two programs of the Central Valley Regional Water Quality Control Board (CVRWQCB):

- Conditional Waiver for Rice (CWFR) monitoring and reporting, a rice-specific Monitoring and Reporting Program (MRP) under the CVRWQCB's *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands* (Irrigated Lands Regulatory Program). Monitoring and reporting requirements for the 2011 CWFR are specified in CVRWQCB Resolution No. R5-2010-0805 (CRC MRP).
- Rice Pesticides Program (RPP) monitoring and reporting, pursuant to the Conditional Prohibition of Discharge requirements specified in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan). The RPP requirements are specified in CVRWQCB Resolution No. R5-2010-9001.

This report serves as the 2011 Annual Monitoring Report (AMR) for the CWFR and RPP efforts, and describes the CRC-conducted program activities for the 2011 calendar year.

Key CWFR activities include:

- Rice acreage information reporting
- Rice pesticide use information reporting
- Water quality monitoring
- Laboratory coordination
- Laboratory analysis and reporting
- Data validation and review
- Coordination of early-season data submittals between the County Agricultural Commissioners (CACs) and the California Department of Pesticide Regulation (DPR)
- Interaction with pesticide registrants to support the development of reduced-risk pesticides
- Annual reporting and review

Key RPP activities include:

- Rice acreage information reporting
- Rice pesticide use information reporting
- Water quality monitoring
- Laboratory coordination
- Laboratory analysis and reporting
- Data validation and review
- Coordination of early-season data submittals between the CACs and the DPR
- Pesticide use compliance inspections and enforcement
- Communication with the water utilities, including the City of Sacramento, City of West Sacramento, and Freeport Regional Water Authority
- Interaction with pesticide registrants to support the development of reduced-risk pesticides
- Triennial reporting and review

Program Administration

The CRC has long been recognized by the CVRWQCB as an entity with the authority and capacity to implement water quality program activities to achieve water quality protection. The CRC is a statutory organization with authorities and restrictions as established in the California Food and Agricultural Code. In July 2003, the CRC was issued a Notice of Applicability (NOA) as a watershed coalition under the CVRWQCB's Irrigated Lands Regulatory Program and has implemented rice-specific program activities since then.

Kleinfelder was contracted by the CRC to collect water samples at specified sites to obtain data to characterize water quality. CH2M HILL prepared this AMR under contract to the CRC.

California Rice

Rice is grown in nine Sacramento Valley counties (Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Tehama, Yolo, and Yuba). Rice is also farmed in counties outside the Sacramento Valley; however, the acreages are generally small and rice is not the dominant crop in these areas. For the purposes of the rice-specific MRP, the monitoring area is defined as the nine rice-producing counties in the Sacramento Valley.

Rice fields provide numerous environmental and commercial advantages that no alternative land use would, including a variety of upland and shallow aquatic habitat. In efforts to reduce rice straw burning and improve wildlife habitat, rice farmers routinely flood their fields in the winter (when no rice is present) to degrade the straw and reduce the need for rice straw burning.

Rice farming requires flooded field conditions that contribute to favorable habitat conditions. More than 230 species of wildlife and millions of migratory waterfowl thrive in California rice fields. In 2003, California rice lands were designated as shorebird habitat of international significance by the Manomet Center for Conservation Sciences in partnership with the Western Hemisphere Shorebird Reserve Network.

In 2011, an estimated 579,281 acres of rice (as reported by the CACs) were planted in the nine rice-growing counties of the Sacramento Valley.[1] The CAC acreage numbers are usually higher than actual planted acres because of accounting through pesticide applications; multiple applications on single acres can result in double counting of acreage under the CAC method. Figure 1-1 shows the distribution of acreage within the Sacramento Valley (as reported by the CACs).

Rice Farming's Influence on Water Quality

Because rice is farmed in standing water, the importance of good farming practices to water quality is evident. However, water quality problems associated with other crops and locales (such as soil erosion and sediment transport, saline drainage waters, and high concentrations of trace elements in subsurface drainage) are typically not problems associated with rice drainage. The generally slow rate of flow through rice fields and the controlled rate of water release tend to minimize significant soil erosion. With regard to salinity, much of the water used to irrigate rice fields initially has a low salt concentration and there is little possibility for salt accumulation in a continuously flooded system, so salt concentration in return flows is usually relatively low.

History of Rice Water Quality Efforts

The CRC has undertaken water quality management activities since the 1980s. The efforts began under the RPP and, beginning in 2004, included efforts under the CWFR.
A description of the historical context of rice water quality management efforts in the Sacramento Valley follows.

RPP

A rice pesticide regulatory program has been in place since the 1980s. Implementation of the program included a proactive, industry-led effort to meet water quality objectives. The rice industry not only met the challenge, but also created an example for other commodity groups and coalitions to follow.

In the early 1980s, fish losses occurred in Sacramento Valley agricultural drains dominated by rice drainage. Because of these losses, the California Department of Fish and Game (DFG) conducted investigations that indicated molinate was responsible for some fish losses. In response, increased in-field holding times for irrigation waters containing molinate were implemented, and no additional fish losses have been documented since

[1] Figures from the National Agricultural Statistics Service (NASS) have been provided in previous years. NASS was contacted and the 2011 rice acreage county level figures will be available in June 2012. The CRC advises the SWRCB to use the final NASS statistics and not the preliminary acreage information from this report when calculating the administrative fee for this program.

June 1983. At approximately the same time, monitoring studies found that thiobencarb concentrations as low as 1 microgram per liter (µg/L) at the city intakes resulted in increases in water taste complaints from people whose drinking water was supplied by the Sacramento River downstream of agricultural drain inputs.

CVRWQCB monitoring studies in the early 1980s determined that molinate, thiobencarb, carbofuran, malathion, and methyl parathion were present in agricultural drains dominated by rice drainage. As a result of studies and chemical monitoring conducted in the early 1980s, the rice industry worked collaboratively with the registrants, CACs, Rice Research Board, University of California (UC) at Davis, UC Cooperative Extension (UCCE), DFG, CVRWQCB, State Water Resources Control Board (SWRCB), and the California Department of Food and Agriculture initiated the Rice Pesticide Control program, the precursor to the RPP, in 1984 to manage and regulate the discharge of pesticides from rice fields. The Department of Pesticide Regulation (DPR) was later shifted from the California Department of Food and Agriculture into the California Environmental Protection Agency, and maintained oversight of the rice pesticides program.

Findings by DFG and the CVRWQCB further moved the SWRCB to contract for scientific studies to develop a toxicity database and to suggest limits for pesticide levels in the Sacramento Valley's rivers and agricultural drains.

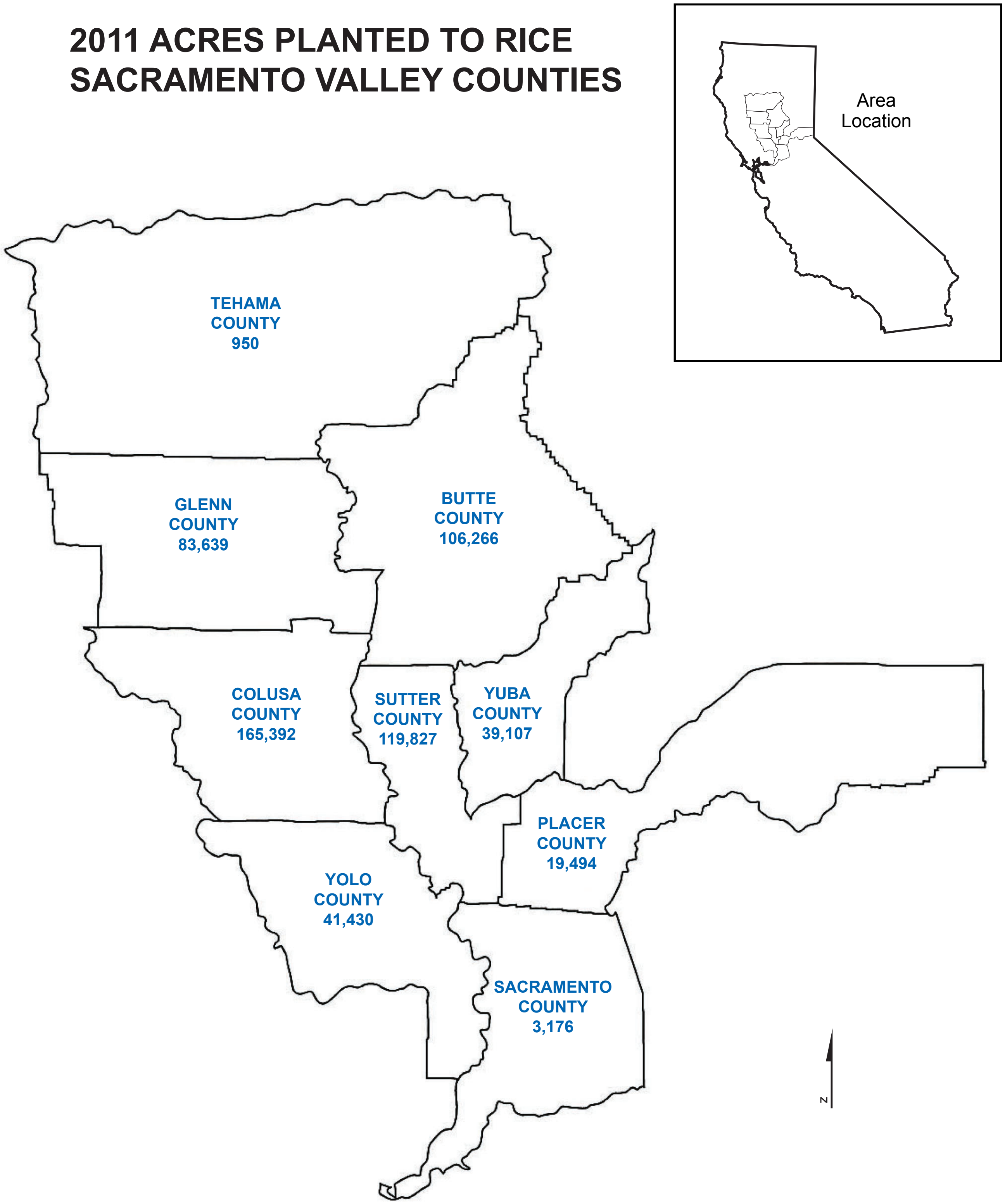
A review of information on the effects of molinate and thiobencarb was conducted by the SWRCB (1984). This review was used to develop specific water quality criteria and performance goals for those pesticides. In 1990, the CVRWQCB amended the Basin Plan for the Central Valley Region to include a conditional prohibition of discharge for irrigation return flows containing molinate and thiobencarb, and in 1991, carbofuran, malathion, and methyl parathion. The conditional prohibition of discharge required that a CVRWQCB-approved management practice be followed as a condition of pesticide discharge. Proposed management practices are intended to control pesticide concentrations in return flows from rice fields so that specific performance goals are met.

Environmental monitoring in the RPP was among the most intense ever undertaken by California's agricultural producers and resulted in a substantial knowledge base regarding the movement of rice pesticides in the Sacramento Valley. Through the implementation of industry-wide Best Management Practices (BMPs), the rice industry has been successful in meeting water quality performance goals set by the CVRWQCB.

The RPP undergoes annual CVRWQCB review, at which time the CVRWQCB considers re-certifying the program through Board approval of management practices. Annual reports are due to the CVRWQCB each December.

As in 2010, pursuant to CVRWQCB Resolution No. R5-2010-9001, the 2011 RPP includes only thiobencarb. Of the five rice pesticides originally specified in the Basin Plan performance goals, a review of water quality data and pesticide use trends indicates that only thiobencarb is still used on rice in quantities that could potentially result in exceedances of performance goals or water quality objectives, absent implementation of CVRWQCB-approved management practices.

This is the fifth year that the CRC has submitted a single report combining information for the CWFR and RPP programs.



Note: Acreage totals based on preliminary data provided by the County Agricultural Commissioners

FIGURE 1-1
Sacramento Valley Rice Acres, 2011
CRC 2011 Annual Monitoring Report

Conditional Waiver of Waste Discharge Requirements for Rice

The CRC was granted an NOA to serve as a watershed coalition group under the CVRWQCB Resolution R5-2003-0105, *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Central Valley* (Irrigated Lands Conditional Waiver) and Monitoring and Reporting Program Order No. R5-2003-0826 (MRP Order).

In October 2004, the CRC submitted a technical report, *Basis for Water Quality Monitoring Program: Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands for Rice* (*CWFR*), to the CVRWQCB. The report served as the basis for the CVRWQCB's rice-specific MRP. The report presented mapping information, including subwatersheds and drainages, rice acreage, and hydrography (lakes, reservoirs, rivers, creeks, canals, and drains); an overview of rice cultural practices; information on the use of and a review of historical data for pesticides and nutrients; a discussion of other potential constituents of concern; a proposed future rice-specific sampling program, including sample locations, sample parameters, and sample timing; and a discussion of the framework for future program review. The geographic and historical data were analyzed and employed to select appropriate water quality monitoring sites. Specifically, the report included information on the study area, rice pesticide use and water quality data, nutrient use and water quality data, copper use and water quality data, proposed future sampling, and framework for program review and update.

Since 2004, the CVRWQCB has issued additional monitoring and reporting requirements, which have been refined based on water quality results and evolving requirements of the Irrigated Lands Regulatory Program.

The current monitoring and reporting requirements for the CWFR are specified in the MRP Order R5-2010-0805 (CRC MRP), under Resolution No. R5-2006-0053 as amended by R5-2006-0077. Monitoring and reporting requirements for the 2011 RPP are specified in CVRWQCB Resolution No. R5-2010-9001.

AMR Requirements

The AMR for the CWFR program is to be submitted by December 31 of each year. The AMR is to include the following:

1. Title page
2. Table of contents
3. Description of the watershed
4. Monitoring objectives
5. Sample site descriptions
6. Location map of sampling sites and land use
7. Tabulated results of analyses
8. Sampling and analytical methods used

9. Copies of chains of custody
10. Associated laboratory and field quality control sample results
11. Summary of precision and accuracy
12. Pesticide use information
13. Data interpretation, including an assessment of data quality objectives
14. Summary of management practices used
15. Actions taken to address water quality impacts identified, including but not limited to revised or additional management practices to be implemented
16. Communication reports
17. Conclusions and recommendations

Table 1-1 shows the location of the required information within this report.

TABLE 1-1
Location of Required AMR Information in this Report

Required Information	Location in this Report
Table of contents	Page iii
Description of the watershed	Section 2
Monitoring objectives	Section 4
Sample site descriptions	Section 4
Location map of sampling sites and land use	Appendix A
Tabulated results of analyses	Section 5
Sampling and analytical methods used	Section 4
Copies of chains of custody	Appendixes B and C
Associated laboratory and field quality control sample results	Appendixes B and C
Summary of precision and accuracy	Section 6
Pesticide use information	Section 2
Data interpretation, including an assessment of data quality objectives	Section 5
Summary of management practices used	Section 3
Actions taken to address water quality impacts identified, including but not limited to revised or additional management practices to be implemented	Section 3
Communication reports	The information herein supersedes the communication reports.
Conclusions and recommendations	Section 7
Field documentation	Appendixes B and C
Laboratory original data	Appendixes B and C
Summary of field conditions, including a description of the weather, rainfall, stream flow, color of the water, odor, and other relevant information that can help in data interpretation	Section 2 and field sheets

SECTION 2

Growing Season, Hydrology, and Applied Materials

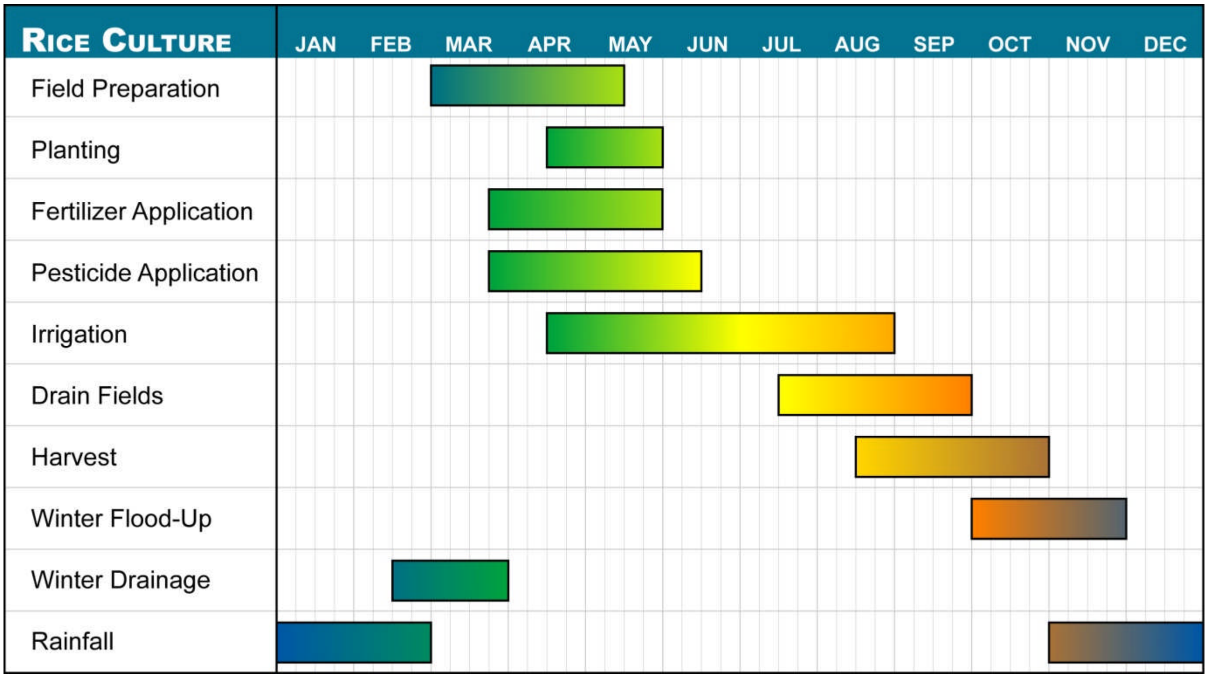
The rice water quality monitoring programs are based on a thorough understanding of how rice is grown in the Sacramento Valley, including key events such as irrigation, drainage, and runoff, and an understanding of when and how products such as pesticides and nutrients are applied. Hydrologic conditions during the year can also influence the timing of key events. This section includes descriptions of the "typical" Sacramento Valley rice farming calendar and the 2011 rice growing season (including 2011 Sacramento River hydrology), and includes data on the materials applied to rice during the 2011 growing season.

Rice Farming in the Sacramento Valley

Most California rice is produced by direct seeding into standing water, and a continuous flood is maintained for most of the season. Limited acreage is drill seeded (planted with ground equipment), which also uses permanent flood after stand establishment. Key events in the rice farming cycle are:

- Field preparation
- Planting
- Fertilizer application
- Pesticide application
- Irrigation
- Drainage
- Harvest
- Winter flood-up
- Winter drainage

Figure 2-1 illustrates the typical timeline for these key events.



Source: UCCE and grower input

FIGURE 2-1
Key Events in a Typical Rice Year

Hydrology

Seasonal rainfall and weather conditions influence rice planting and rice pesticide application. The 2011 rice farming year was atypical, with rains and unseasonably cooler weather. Heavy rains extended into April, resulting in delayed field preparation and planting. As a result, peak pesticide use shifted to June. After planting, rice growth and development was delayed by the cooler weather, and as a result, harvest was delayed until mid-October and extended until mid-November.

Flow data for the Sacramento River at Colusa were acquired from the California Department of Water Resources (DWR) California Data Exchange Center (CDEC), and precipitation data for a sensor in Colusa were obtained from the University of California Integrated Pest Management (UC IPM) California Weather Database. Data were collected for the period January 1, 2011, through October 31, 2011. Flow and precipitation data for January through October 2011 are shown in Figure 2-2, and minimum and maximum air temperatures are shown in Figure 2-3.

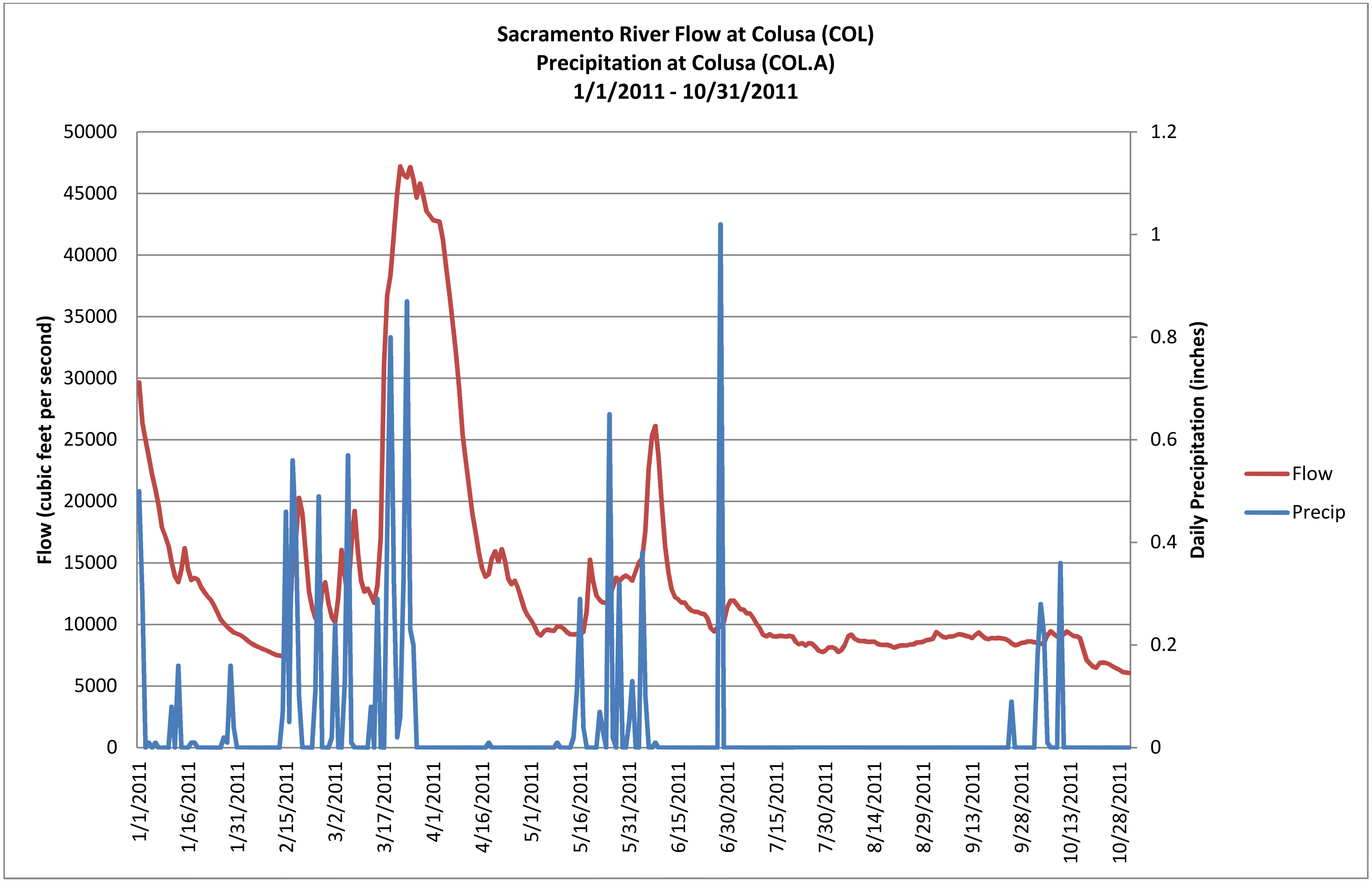


FIGURE 2-2
2011 Flow and Precipitation Data

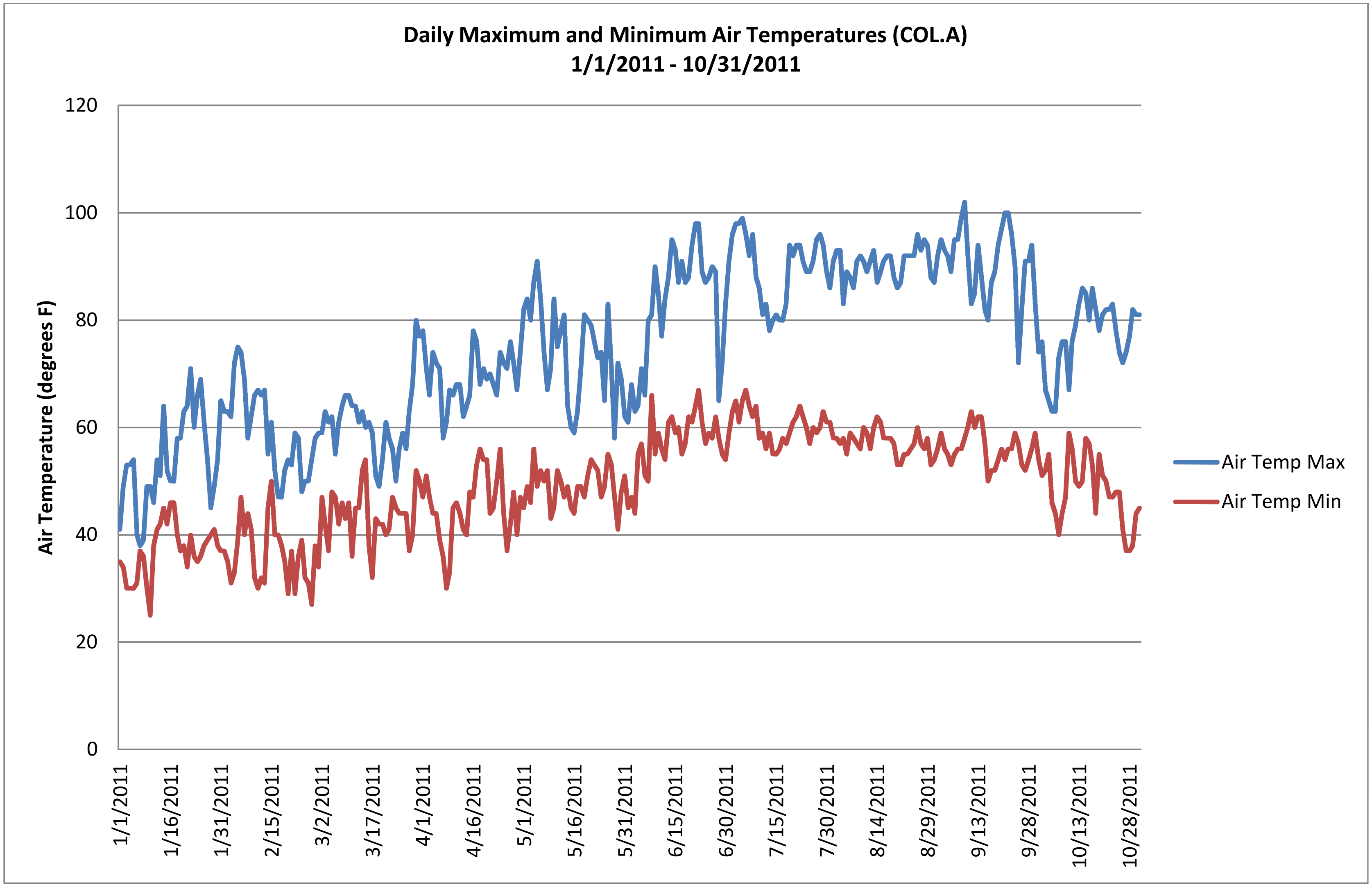


FIGURE 2-3
2011 Daily Maximum and Minimum Air Temperatures

Applied Materials

Agricultural use of pesticides in California is regulated by DPR. Growers, pesticide applicators, pest control advisors, and pest control operators report pesticide use to CACs and these data are included in DPR's Pesticide Use Report (PUR). DPR provides the CRC with early review/draft PUR data and enforcement data for inclusion in the CRC's annual report. Data presented in the following discussions of pesticide use and nutrient application are for the Sacramento Valley rice-growing counties.

Pesticide Use

The CACs report preliminary pesticide use information to DPR. All pesticide use numbers reported herein are preliminary and have not been audited or quality control checked by DPR.

The pesticides with acreage increases in 2011 were malathion (+145 acres), propiconazole (Tilt) (+273 acres), lambda cyhalothrin (+1,062 acres), bensulfuron-methyl (+9,093 acres), trifloxystrobin (+9,903 acres), propiconazole (+9,903 acres), triclopyr TEA (+50,745 acres), propanil (+56,258 acres), and azoxystrobin (+59,976 acres).

The pesticides with acreage decreases in 2011 were diflubenzuron (-119 acres), bispyribac-sodium (-798 acres), penoxsulam (-2,535 acres), (s)-cypermethrin (-3,328 acres), carfentrazone-ethyl (-4,950 acres), cyhalofop-butyl (-17,890 acres), clomazone (-25,739 acres), and thiobencarb (-26,046 acres).

Treated acreage has a direct correlation to pounds of active ingredient applied. According to the preliminary CAC data, planted acreage in 2011 increased by 13,750 acres, or approximately 2.4 percent, from 565,531 (2010) to 579,281 acres (2011).

Tables 2-1 and 2-2 show the preliminary Sacramento Valley rice herbicide data, including acres treated and pounds applied, respectively. Tables 2-3 and 2-4 show the preliminary Sacramento Valley rice insecticide data, including acres treated and pounds applied, respectively. Tables 2-5 and 2-6 show the preliminary Sacramento Valley rice fungicide data, including acres treated and pounds applied, respectively. Sacramento Valley acres treated with thiobencarb for the time period 2009 through 2011 are listed in Table 2-7, and pounds of thiobencarb applied during this same time are listed in Table 2-8.

Nutrient Use

Like most other farmland, rice acreage is fertilized annually. Fertilizer suppliers are the best source of information regarding the rates of fertilizer application. Suppliers were consulted to determine the range of fertilizer rates commonly applied to rice in the Sacramento Valley. The information obtained from the suppliers is summarized in Table 2-9. The table shows that fertilizer may be applied to rice before planting (granular starter, aqua ammonia, zinc) and later in the season (topdressing). The totals for the high and low ends of the reported range are shown for each element in the lower section of Table 2-9.

Nitrogen (N) is essential for all commercial rice production in California. The general rate is 120 to 150 pounds per acre. Specific N requirements vary with soil type, variety, cropping history, planting date, herbicide used, and the kind and amount of crop residue

TABLE 2-1
Herbicides: Acres Treated, Sacramento Valley, 2011

	Acres Treated									
County	**Bensulfuron-methyl**	**Bispyribac-sodium**	**Carfentrazone-ethyl**	**Clomazone**	**Cyhalofop-butyl**	**Molinate**	**Penoxsulam**	**Propanil**	**Thiobencarb**	**Triclopyr TEA**
Butte	21,986	23,246	954	12,932	10,782	0	17,332	78,162	10,515	57,203
Colusa	7,323	19,698	967	6,892	23,866	0	11,795	104,599	5,292	101,063
Glenn	7,767	16,177	90	58,643	9,305	0	12,721	62,213	5,325	50,187
Placer	2,085	488	641	8,427	1,653	0	5,126	11,309	40	9,647
Sacramento	0	100	0	794	0	0	473	0	1,006	0
Sutter	8,825	16,919	1,913	69,864	9,982	0	51,947	99,321	11,292	84,331
Tehama	284	0	0	284	0	0	0	331	0	160
Yolo	599	1,133	323	8,117	8,880	0	6,684	20,113	12,186	19,859
Yuba	5,844	5,924	140	6,178	1,365	0	10,368	27,981	236	18,724
Total acres	54,713	83,685	5,028	172,131	65,833	0	116,446	404,029	45,892	341,174

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-2
Herbicides: Pounds Applied, Sacramento Valley, 2011

	Pounds Applied									
County	**Bensulfuron-methyl**	**Bispyribac-sodium**	**Carfentrazone-ethyl**	**Clomazone**	**Cyhalofop-butyl**	**Molinate**	**Penoxsulam**	**Propanil**	**Thiobencarb**	**Triclopyr TEA**
Butte	1,975	896	226	5,691	3,450	0	622	364,235	41,009	11,441
Colusa	568	556	56	3,032	7,637	0	423	487,431	20,638	20,213
Glenn	654	743	42	25,803	2,978	0	457	289,913	20,759	10,037
Placer	138	21	275	3,708	523	0	184	52,700	156	1,929
Sacramento	0	4	0	349	0	0	17	0	3,923	0
Sutter	741	585	439	30,740	3,194	0	1,865	135,077	44,038	16,866
Tehama	26	0	0	125	0	0	0	1,542	0	32
Yolo	44	41	22	3,572	2,842	0	240	93,727	47,525	3,972
Yuba	392	188	70	2,718	437	0	372	130,391	920	3,745
Total pounds	4,538	3,034	1,130	75,738	21,061	0	4,180	1,555,016	178,968	68,235

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

incorporated during seedbed preparation. Winter flooding for straw decomposition and waterfowl management has greatly reduced N use in some rice fields. Most N is applied preplant and either soil incorporated or injected 2 to 4 inches before flooding. Some N may be topdressed mid-season (panicle differentiation) to correct deficiencies and maintain plant growth and yield.

Phosphorus (P) is applied at a rate of 18 to 26 pounds per acre and is incorporated into the seedbed before flooding. Most rice fields are above a critical need for P and do not require repeated use of this fertilizer. Phosphate fertilizer also may be topdressed when a deficiency occurs, usually in the early seedling stage.

Potassium (K) is generally unnecessary in California.

Zinc (Zn) deficiency or "alkali disease" is common in alkaline soils and areas where topsoil has been removed. If Zn is used, the rate is 2 to 16 pounds per acre at preflood, and it is not incorporated into the soil. Zinc deficiencies most commonly occur in cool weather during stand establishment (early season).

Iron deficiency is rare in California and can usually be corrected by lowering the soil pH.

TABLE 2-3
Insecticides: Acres Treated, Sacramento Valley, 2011

	Acres Treated			
County	**Diflubenzuron**	**(s)-Cypermethrin**	**Lambda Cyhalothrin**	**Malathion**
Butte	394	150	11,348	0
Colusa	0	1,061	8,578	0
Glenn	137	12,316	13,790	0
Placer	358	308	5,588	0
Sacramento	0	0	1,118	0
Sutter	29	5,247	41,057	145
Tehama	0	0	0	0
Yolo	0	75	6,795	0
Yuba	248	700	6,373	0
Total acres	1,166	19,857	94,647	145

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-4
Insecticides: Pounds Applied, Sacramento Valley, 2011

County	Pounds Applied			
	Diflubenzuron	(s)-Cypermethrin	Lambda Cyhalothrin	Malathion
Butte	59	8	340	0
Colusa	0	53	257	0
Glenn	21	616	414	0
Placer	54	15	168	0
Sacramento	0	0	34	0
Sutter	4	262	1,232	265
Tehama	0	0	0	0
Yolo	0	4	195	0
Yuba	37	35	191	0
Total pounds	175	993	2,831	265

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-5
Fungicides: Acres Treated, Sacramento Valley, 2011

County	Acres Treated			
	Azoxystrobin	Propiconazole*	Trifloxystrobin*	Propiconazole (Tilt)
Butte	52,736	0	0	0
Colusa	67,357	5,083	5,083	0
Glenn	58,093	54	54	0
Placer	4,922	0	0	0
Sacramento	0	0	0	0
Sutter	37,973	11,005	11,005	0
Tehama	0	0	0	0
Yolo	3,960	800	800	0
Yuba	9,950	2,847	2,847	273
Total acres	234,991	19,789	19,789	273

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-6
Fungicides: Pounds Applied, Sacramento Valley, 2011

County	Pounds Applied			
	Azoxystrobin	**Propiconazole***	**Trifloxystrobin***	**Propiconazole (Tilt)**
Butte	8,965	0	0	0
Colusa	11,451	661	661	0
Glenn	9,876	7	7	0
Placer	837	0	0	0
Sacramento	0	0	0	0
Sutter	5,945	1,431	1,431	0
Tehama	0	0	0	0
Yolo	673	104	104	0
Yuba	1,692	370	370	35
Total pounds	39,439	2,573	2,573	35

Note:

Data are preliminary and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-7
Acres Treated with Molinate and Thiobencarb, 2007 through 2011

County	Acres Treated		
	Thiobencarb		
	2009	**2010**	**2011**
Butte	1,923	9,624	10,515
Colusa	35,201	22,629	5,292
Glenn	4,660	4,089	5,325
Placer	0	0	40
Sacramento	0	99	1,006
Sutter	859	15,529	11,292
Tehama	0	0	0
Yolo	14,698	14,863	12,186
Yuba	3,092	5,105	236
Total treated acres	**60,433**	**71,938**	**45,892**
Total planted acres	**569,320**	**565,531**	**579,281**

Note:

Data are preliminary has and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

TABLE 2-8
Pounds of Molinate and Thiobencarb Applied, 2007 through 2011

	Pounds Applied		
	Thiobencarb		
County	2009	2010	2011
Butte	7,265	32,642	41,009
Colusa	137,420	81,908	20,638
Glenn	17,806	14,148	20,759
Placer	0	0	156
Sacramento	0	297	3,923
Sutter	2,843	50,340	44,038
Tehama	0	0	0
Yolo	58,152	52,269	47,525
Yuba	9,868	16,302	920
Total pounds	**233,354**	**247,906**	**178,968**
Total planted acres	**569,320**	**565,531**	**579,281**

Note:

Data are preliminary has and have not been audited or error checked by DPR. Official release is anticipated by the end of 2012 – start of 2013.

Table 2-9
Range of Fertilizer Components Applied to Rice

	Pounds per Acre		
Material/Element	Low	High	Form and Method
N	80	120	Injected aqua
16-20	150	200	
N	24	32	Solid 16-20-0-13 starter
P	30	40	Solid 16-20-0-13 starter
K	0	0	Solid 16-20-0-13 starter
S	19.5	26	Solid 16-20-0-13 starter
Zn	1	5	Metallic
NH_4SO_4	0	200	
N	0	42	Topdressed
S	0	49	Topdressed
Total for all application methods			
N	104	194	
P	30	40	
K	0	0	
S	20	75	
Zn*	1	5	

*Seldom applied

SECTION 3

Management Practices

Management practices are a key component of the rice water quality programs. During the early phases of the RPP, management practices were developed to increase efficacy and ultimately to protect water quality. The cornerstone of rice management practices is a thorough understanding of the rice calendar, including the application methods and timing of pesticide use.

Management practices include field-level management of rice pesticides and discharges, CAC enforcement programs, grower education efforts, and communication programs. This section includes the pesticide use calendar, general information on rice water quality management practices, and specific 2011 enforcement data.

Pesticide Use Calendar

Figure 3-1 depicts the rice growth stages and the season or timing of pesticide applications to rice, including herbicide applications, tank mix combinations, insecticide applications, and sequential herbicide applications. A ″sequential″ is the application of an herbicide followed by another herbicide with a different mode of action. Sequential applications are used to achieve better coverage and efficacy for weed control. The second application usually occurs in the next growth stage of the rice plant. For example, clomazone is applied at germination. A sequential application of bispyribac-sodium is applied at tiller initiation.

Rice pesticide applications are timed for specific growth stages of the rice plant. To simplify the rice growth schedule, Tables 3-1 through 3-4 group pre-flood and germination into early season; tiller initiation and tillering are mid-season, and panicle initiation and flower are late season.

This calendar of applications provides information that is useful for understanding potential water quality concerns relative to particular times during the year.

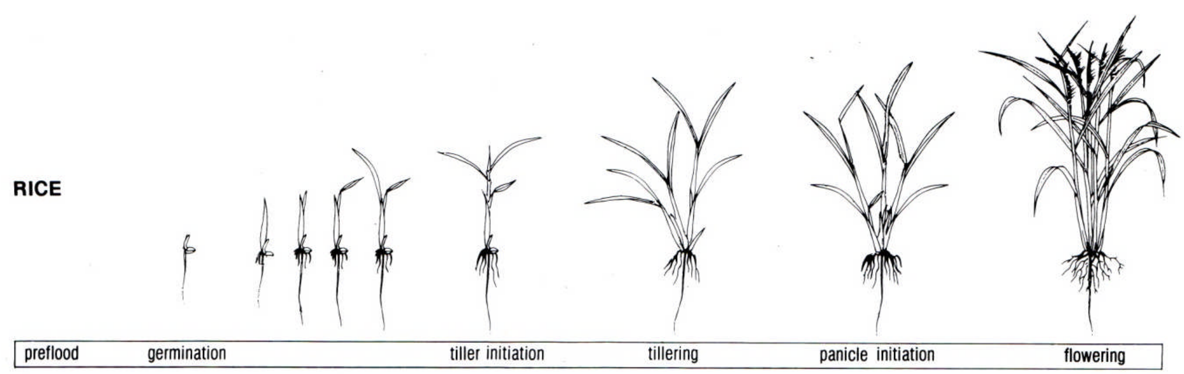


FIGURE 3-1
Rice Growth Stages

TABLE 3-1
Timing of Specific Rice Herbicide Applications

<table>
<tr><th colspan="2">Early Season
(March–April)</th><th colspan="2">Mid Season
(May–June)</th><th colspan="2">Late Season
(June–July)</th></tr>
<tr><th>Pre-Flood</th><th>Germination</th><th>Tiller Initiation</th><th>Tillering</th><th>Panicle Initiation</th><th>Flowering</th></tr>
<tr><td></td><td>Bensulfuron-methyl
Permanent flood</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Bensulfuron-methyl
Pinpoint flood</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Bispyribac-sodium
Pinpoint flood</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Carfentrazone-ethyl
Permanent flood
5-day static; 30-day release</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Clomazone
Permanent flood
14-day water hold</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Cyhalofop-butyl
Pinpoint flood
7-day water hold</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Propanil
Pinpoint flood</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Thiobencarb (Bolero and Abolish)
Permanent flood
30-day water hold</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Triclopyr TEA
Pinpoint flood
20-day water hold</td><td></td><td></td></tr>
</table>

TABLE 3-2
Examples of the Timing of Herbicide Tank Mix Combinations as Provided by Dr. Albert Fischer, UC Davis

Early Season (March–April)		**Mid Season (May–June)**		**Late Season (June–July)**	
Pre-Flood	**Germination**	**Tiller Initiation**	**Tillering**	**Panicle Initiation**	**Flowering**
		Bispyribac-sodium/Thiobencarb (Abolish) Pinpoint flood 30-day water hold **Propanil/Thiobencarb** (Abolish) Permanent flood 30-day water hold			

TABLE 3-3
Timing of Specific Rice Insecticide Applications

Early Season (March–April)		**Mid Season (May–June)**		**Late Season (June–July)**	
Pre-Flood	**Germination**	**Tiller Initiation**	**Tillering**	**Panicle Initiation**	**Flowering**
	Lambda cyhalothrin Border treatment 7-day water hold **(s)-cypermethrin** Border treatment 7-day water hold				**Lambda cyhalothrin** Border treatment 7-day water hold **(s)-cypermethrin** Border treatment 7-day water hold

TABLE 3-4
Timing of Sequential Rice Herbicide Applications

Early Season (March–April)		Mid Season (May–June)		Late Season (June–July)	
Pre-Flood	**Germination**	**Tiller Initiation**	**Tillering**	**Panicle Initiation**	**Flowering**
	Bispyribac-sodium, Thiobencarb (Bolero) 30-day water hold Permanent Flood				
		Bispyribac-sodium, Propanil Pinpoint flood			
	Clomazone, Bensulfuron-methyl 14-day water old Permanent flood				
		Clomazone, Bispyribac-sodium 14-day water hold Permanent flood			
		Clomazone, Carfentrazone-ethyl up to 30-day water hold Permanent flood			
		Clomazone, Propanil 14-day water hold Permanent flood			
		Clomazone, Propanil/Triclopyr TEA 20-day water hold			
		Cyhalofop-butyl, Bensulfuron-methyl 7-day water hold Pinpoint flood			
		Cyhalofop-butyl, Bispyribac-sodium 7-day water hold Pinpoint flood			
		Cyhalofop-butyl, Propanil 7-day water hold Pinpoint flood			
		Propanil, Cyhalofop-butyl 7-day water hold Pinpoint flood			
		Carfentrazone-ethyl, Cyhalofop-butyl 30-day water hold, 7-day water hold Pinpoint flood			

Role of Management Practices in Attaining Water Quality Protection

Over the years, BMPs such as water hold requirements, grower information meetings, and inspection and enforcement were implemented to ensure compliance with performance goals and attainment of water quality objectives and maximum contaminant levels (MCLs) for the pesticides regulated under the RPP. The water holds, which are specified on pesticide use labels and through permit conditions, were developed to provide for in-field degradation of pesticides prior to the release of treated water to drains and other surface waters. For 2011, required water holds were the same as those required during the 2005 to 2010 growing seasons.

Water Holds

The primary field-level water quality management practice is the water hold. The nature of rice farming, which requires standing water during the growing season, provides rice farmers with a unique opportunity to manage water flow. Water hold durations vary based on requirements that are adopted in consideration of the persistence of specific registered rice pesticides in the environment, and are used to provide time for the applied product to degrade in the field. The goal of this strategy is to discharge rice drainage water that meets Basin Plan Performance Goals or other benchmarks.

The management practices developed under the RPP have been the foundation for development and implementation of water hold requirements for other pesticides. Over the years, water holds have become industry standard practice to address aquatic toxicity, taste complaints, environmental fate, and product efficacy. Water holds were developed with input from technical resources such as the UCCE and pesticide registrants. In the early 1980s, when the RPP began, water holds were generally not a pesticide-use label requirement. Over time, rice-specific registrations of pesticides were developed to require specified water holds as a condition of the permitted use of these products. Additionally, DPR and the CACs have the authority to impose additional water hold requirements necessary to protect water quality.

Water hold requirements for thiobencarb and molinate are pesticide-use permit conditions under the RPP. Table 3-5 specifies the water hold requirements for the two registered formulations of thiobencarb. These water hold requirements are the same as those required during the 2005 to 2010 growing seasons. Table 3-6 lists the water holds for other products registered for use on rice.

Actions Taken to Address Identified Water Quality Impacts

The CACs are the local enforcement agencies working with DPR to enforce the California Food and Agricultural Code and the California Code of Regulations pertinent to pesticide use. CACs issue restricted materials permits to growers purchasing and using California-restricted materials in their respective counties. Thiobencarb is a restricted material with additional use restrictions (permit conditions) not found on the registered product label. The most common permit conditions for thiobencarb are water holds. Since 2003, the CVRWQCB RPP authorizing resolutions have included permit conditions that required increased inspections for seepage control; buffer zones during application; a pre-season mandatory meeting for growers, pest control advisors, and applicators; and formation of a Storm Event Work Group. The resolution authorizing the 2010 RPP (R5-2010-9001) adopted additional conditions recommended by the CRC. The conditions included in the current RPP authorization are summarized below:

- Continuation of the management practices incorporated in the 2009 use permit conditions, including water-holding requirements for thiobencarb, drift minimization, mandatory preseason thiobencarb stewardship training, water management (including emergency releases), and seepage mitigation measures [R5-2010-9001 (1)(a)].
- Additional outreach to applicators on the results of the 2009 thiobencarb water quality monitoring and required management practices, including clarification of hold time requirements, application procedures, and notification requirements associated with elevated results near the Sacramento River drinking water intakes [R5-2010-9001 (1)(b)].
- Consultation with the ten thiobencarb dealers and distributors in the Sacramento River Basin [R5-2010-9001 (1)(b)].
- Funding of additional county surveillance at non-traditional hours to double the level of 2009 and extension of the program to counties not previously funded, resulting in surveillance inspections increase to approximately 1.5 times the 2009 level [R5-2010-9001 (1)(c)].
- In the event of flooding from a storm event, the CRC would coordinate with the reclamation district previously operating as a closed system just north of Sacramento to collect and analyze samples [R5-2010-9001 (1)(d)].
- If the performance goal or water quality objective for thiobencarb is not met or increasing thiobencarb concentrations are observed in waters designated for municipal or domestic water supply, the CRC, after consultation with DPR, will submit to the Executive Officer proposed actions to be implemented to achieve the performance goal or water quality objective [R5-2010-9001 (1)(e)].

The restricted materials permits require the CACs to keep records of pesticides applied to rice acreage, while full use reporting documents all agricultural use pesticides. The CACs meet the notification requirements by complying with the Notice of Intent (NOI) and NOA process. Rice growers or pest control operators submit NOIs to the CACs at least 24 hours prior to application so that CAC staff can observe applications. NOAs are reported 24 hours after an application occurs so that water holding times can be recorded, inspected, and tracked.

Compliance with pesticide-use restrictions is a critical component of the RPP's ability to achieve water quality protection. A range of label restrictions and permit conditions apply to the use of rice pesticides, including mix/load, application, and water hold requirements. CACs perform inspections to enhance compliance with each of the label restrictions and permit conditions. Mix/load inspections are performed primarily for worker protection and to evaluate whether pesticides are being properly handled and contained to prevent releases to the environment. Application inspections are performed to evaluate label and permit condition application restrictions such as buffer zones, adherence to rate and wind speed and other local requirements, and water management. Seepage inspections evaluate the efficacy of farm water management levees to hold water in-field throughout the duration of water holds.

TABLE 3-5
Water Hold Requirements in Days for Thiobencarb

Release Type	Thiobencarb	
	Bolero® 15-G and Bolero® UltraMax	**Abolish™ 8EC**
Single field	30	19
Single field southern area only[a]	19	—
Release into tailwater recovery system or pond onto fallow field (except southern area)[b]	14[b]	14[b]
Multi-growers and district release onto closed recirculating systems	6	6
Multi-growers and district release onto closed recirculating systems in southern area	6	—
Release into areas that discharge negligible amounts to perennial streams	19	6[c]
Pre-flood application: release onto tailwater recovery system	—	—
Emergency release of tailwater	19	19
Commissioner verifies the hydrologic isolation of the fields	6	6

[a] Sacramento–San Joaquin Valley defined as south of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County
[b] Thiobencarb permit condition allowed Bolero® 15-G label hold period of 14 days
[c] Applies to verified hydrologically isolated fields

TABLE 3-6
Hold Times for Insecticides, Fungicides, and Herbicides Not Covered by RPP

Active Ingredient	Trade Name	Water Hold Time	Provisions
Insecticides			
Diflubenzuron	Dimlin® Insect Growth Regulator	14 days	None
(s)-cypermethrin	Mustang® 1.5 EW Insecticide	7 days	None
Lambda-cyhalothrin	Warrior® Insecticide	7 days	None
Methyl Parathion	None	24 days	None
Malathion	None	4 days*	None
Fungicides			
Azoxystrobin	Quadris® Flowable Fungicide	14 days	None

TABLE 3-6
Hold Times for Insecticides, Fungicides, and Herbicides Not Covered by RPP

Active Ingredient	Trade Name	Water Hold Time	Provisions
Herbicides			
Carfentrazone-ethyl	Shark®	5-day static 30-day release	None
Clomazone	Cerano™	14 days	Less if closed system
Cyhalofop-butyl	Clincher™	7 days	None
Propanil	Stam™ 80 EDF	7 days	None
Triclopyr TEA	Grandstand™ CA Herbicide	20 days	Less if closed system
Molinate	Ordram®	28 days	

*Voluntary hold

Release Inquiries and Emergency Releases

In 2011, there were five release inquiries and no reported emergency releases. One release inquiry occurred in Colusa County, three occurred in Sutter County, and one occurred in Yolo County.

Seepage Control and Inspections

Seepage is a water quality concern because rice field water can move laterally through levees bordering rice fields, especially when levees are constructed in a manner that does not prevent water seepage. Often, levee borrow pits, commonly called “sweat ditches,” are used to contain this water. When water gets high enough, it can flow into local agricultural drainage conveyances. The CVRWQCB expressed concern that seepage was a contributing factor to increased thiobencarb concentrations in the Sacramento River in the past.

Current program recommendations require securing weir boxes in rice fields with a soil barrier to a depth higher than the water level. At rice pesticide permit issuance, the CACs provide rice growers with a handout, *Closed Rice Water Management Systems*, prepared by the U.S. Department of Agriculture (USDA) and the UCCE. Additionally, the CACs provide the growers a brochure, *Seepage Water Management – Voluntary Guidelines for Good Stewardship in Rice Production*, cooperatively developed by the UC Davis Department of Agronomy and Range Science, DPR, and UCCE. The brochure is also distributed at the mandatory thiobencarb meetings. The brochure explains the causes of seepage and identifies voluntary management activities that growers should use to minimize and prevent seepage.

For several years, the CRC has contracted with three CACs to fund “off duty” enforcement activity on weekends and holidays during RPP pesticide use season. As in 2010, the CRC increased funding to double the level of 2009 and extended the program to four additional counties not previously funded. Surveillance inspections continued to be at levels 1.5 times the 2009 inspections, and include seven of the nine counties in the RPP. The number of inspections is in correlation with the thiobencarb notices of intent and the amount of product used. Please see Tables 2-7 and 2-8, which reflect a sharp decrease in thiobencarb use from 2009 to 2010. Excessive spring rains delay the start of the use season and the short window to apply thiobencarb for optimal effectiveness for early weed control.

In 1998, DPR and the CACs implemented a Prioritization Plan and a Negotiated Work Plan. One component of both plans was to negotiate a number of water hold inspections. The plans allow the counties to set priorities within the Pesticide Use Enforcement Program Standard Compendium under the Restricted Materials and Permitting manual. All rice pesticide water holding requirements are ranked as high-priority inspections when rice pesticides are used as restricted materials.

Some pre-flood inspections were per grower request, while most inspections were in response to an NOI filed at the CAC office. Some permits were denied due to seepage conditions upon inspection. Information was gathered from the CACs on number of inspections, types of inspections, violations, agricultural civil penalties (ACPs), and water seepage inspection activities in 2011. The CRC provided the CAC offices with weekly updates of the rice herbicide monitoring results in order to coordinate water quality protection activities.

CACs conducted seepage inspections, as summarized in Table 3-7. Based on the inspection data provided to the DPR by the CACs, 959 thiobencarb use sites were inspected for seepage. Of these inspected sites, 919 sites reported no discharge, 33 had reported discharges of less than 5 gallons per minute (gpm), and seven sites had reported discharges of greater than 5 gpm. The seven sites with flow greater than 5 gpm constitute less than 1 percent of inspected sites. No enforcement actions were issued.

Water Hold Inspections

CACs conducted water-hold inspections of 993 thiobencarb use sites in 2011 (Table 3-8). CACs reported inspections for the two formulations of thiobencarb (Bolero and Abolish). There were five release inquiries and no reported emergency releases. Of the 993 use sites inspected, no water hold violation ACPs were issued.

TABLE 3-7
Thiobencarb Water Seepage Inspections in 2011

County	Chemical	Number of Seepage Inspections	Number of Sites with No Seepage	Number of Sites w/ Less than 5 gpm Seepage	Number of Sites w/ More than 5 gpm Seepage	Enforcement Actions
Butte	Bolero	167	167	0	0	0
	Abolish	17	17	0	0	0
	County Total	184	184	0	0	0
Colusa	Bolero	180	180	0	0	0
	Abolish	17	17	0	0	0
	County Total	197	197	0	0	0
Glenn	Bolero	153	136	14	3	0
	Abolish	20	8	8	4	0
	County Total	173	144	22	7	0

TABLE 3-7
Thiobencarb Water Seepage Inspections in 2011

County	Chemical	Number of Seepage Inspections	Number of Sites with No Seepage	Number of Sites w/ Less than 5 gpm Seepage	Number of Sites w/ More than 5 gpm Seepage	Enforcement Actions
Placer	Bolero	1	1	0	0	0
	Abolish	0	0	0	0	0
	County Total	1	1	0	0	0
Sacramento	Bolero	14	14	0	0	0
	Abolish	0	0	0	0	0
	County Total	14	14	0	0	0
Sutter	Bolero	252	251	1	0	0
	Abolish	33	28	5	0	0
	County Total	285	279	6	0	0
Tehama	Bolero	0	0	0	0	0
	Abolish	0	0	0	0	0
	County Total	0	0	0	0	0
Yolo	Bolero	100	95	5	0	0
	Abolish	0	0	0	0	0
	County Total	100	95	5*	0	0
Yuba	Bolero	5	5	0	0	0
	Abolish	0	0	0	0	0
	County Total	5	5	0	0	0
Total		**959**	**919**	**33**	**7**	**0**

Notes:
Bolero includes Bolero 15G and Bolero UltraMax; the counties did not differentiate between the products.
Data are preliminary.
*County notes all five sites with seepage of less than 5 gpm were corrected prior to thiobencarb application.

TABLE 3-8
Thiobencarb Water Hold, Application, and Mix/Load Inspections in 2011

County	Chemical	Water Hold Inspections	Release Inquiries	Emergency Releases	Water Hold ACPs	Appl. Inspections	Mix-Load Inspections	ACPs
Butte	Bolero 15G	167	0	0	0	9	6	0
	Abolish EC	17	0	0	0	3	2	0
	County Total	184	0	0	0	12	8	0
Colusa	Bolero 15G	180	0	0	0	0	0	0
	Abolish EC	17	1	0	0	2	0	0
	County Total	197	1	0	0	2	0	0

TABLE 3-8
Thiobencarb Water Hold, Application, and Mix/Load Inspections in 2011

County	Chemical	Water Hold Inspections	Release Inquiries	Emergency Releases	Water Hold ACPs	Appl. Inspections	Mix-Load Inspections	ACPs
Glenn	Bolero 15G	153	0	0	0	0	1	0
	Abolish EC	20	0	0	0	1	0	0
	County Total	173	0	0	0	1	1	0
Placer	Bolero 15G	5	0	0	0	0	0	0
	Abolish EC	0	0	0	0	0	0	0
	County Total	5	0	0	0	0	0	0
Sacramento	Bolero 15G	44	0	0	0	0	0	0
	Abolish EC	0	0	0	0	0	0	0
	County Total	44	0	0	0	0	0	0
Sutter	Bolero 15G	252	2	0	0	1	2	0
	Abolish EC	33	1	0	0	0	0	0
	County Total	285	3	0	0	1	2	0
Tehama	Bolero 15G	0	0	0	0	1	1	0
	Abolish EC	0	0	0	0	0	1	0
	County Total	0	0	0	0	1	2	0
Yolo	Bolero 15G	100	1	0	0	1	1	0
	Abolish EC	0	0	0	0	0	0	0
	County Total	100	1	0	0	1	1	0
Yuba	Bolero 15G	5	0	0	0	0	0	0
	Abolish EC	0	0	0	0	0	0	0
	County Total	0	0	0	0	0	0	0
Total		**993**	**5**	**0**	**0**	**18**	**14**	**0**

Notes:

Bolero includes Bolero 15G and Bolero UltraMax; the counties did not differentiate between the products.
Data are preliminary.

Application and Mix/Load Inspections

CACs conducted application and mix/load inspections, as summarized in Table 3-8. Based on the inspection data the CACs provided to the DPR, eighteen application inspections and fourteen mix/load event inspections were performed. No enforcement actions were issued as a result of these inspections.

SECTION 4

Monitoring and Reporting Requirements

This section provides an overview of the monitoring and reporting requirements of the CRC MRP and RPP, including the overall purpose and objectives; monitoring periods, sites, and constituents; program administration; sampling procedures; and analytical labs and methods used to assess water quality.

Monitoring Purpose and Objectives

Although similar, the CWFR and RPP programs each have different purposes and objectives for monitoring and reporting.

CWFR

The purpose of the CRC MRP is to monitor the discharge of wastes in irrigation return flows and stormwater from irrigated rice lands. These objectives are consistent with the State's Nonpoint Source (NPS) Policy and include the following:

- Determine whether the discharge of waste from irrigated lands within the Coalition Group boundaries causes or contributes to exceedances of applicable water quality standards or causes nuisance.
- Provide information about the Coalition Group area characteristics, including but not limited to land use, crops grown, and chemicals used.
- Monitor the effectiveness of management practices implemented to address exceedances of applicable water quality standards.
- Determine which management practices are most effective in reducing wastes discharged to surface waters from irrigated lands.
- Specify details about monitoring periods, parameters, protocols, and quality assurance.
- Support the development and implementation of the CWFR.
- Verify the adequacy and effectiveness of the CWFR's conditions.
- Evaluate the Coalition Group's compliance with the terms and conditions of the CWFR.

RPP

The purpose of the RPP is to achieve compliance with the CVRWQCB Board-approved management practices and attainment of the thiobencarb Performance Goal established in the Basin Plan and the agreed-upon secondary MCL as a water quality objective at the Sacramento and West Sacramento city intakes. Monitoring is conducted under the RPP to determine attainment of Performance Goal and the secondary MCL water quality objective. Similar to the CWFR, though not specifically stated in regulatory documents, the purposes of the monitoring under the RPP are:

- Assess the impacts of the rice pesticides regulated under the Basin Plan.
- Determine the degree of implementation of rice pesticide management practices.
- Monitor the effectives of management practices and strategies to attain the Performance Goal.
- Determine concentration of Basin Plan rice pesticides at specific sites.
- Evaluate compliance with the Performance Goal and attainment of the thiobencarb water quality objective to determine whether additional management practices are necessary to improve and/or protect water quality.

Overview of Requirements

The monitoring requirements for both programs define the types of monitoring, monitoring schedule, sites, constituents, program administration, and quality control and quality assurance requirements. The details of each program are described below.

CWFR

In January 2008, the CVRWQCB adopted Order No. R5-2008-0005 (2008 Coalition MRP), which required Coalition Groups to revise their MRP plans to incorporate refined approaches to implementation of the Irrigated Lands Regulatory Program. The 2009 and 2010 CRC MRPs were developed to be functionally equivalent to the 2008 Coalition MRP.

Monitoring requirements defined by the 2008 Coalition MRP incorporate a 3-year cycle of assessment monitoring and core monitoring. Core monitoring is conducted at a subset of core sites considered representative of the Coalition Group's area, and for a reduced set of parameters. Assessment monitoring is to include an expanded suite of parameters and may include an expanded list of sites, including assessment sites and core sites. The purposes of the expanded suite are to confirm that core monitoring continues to adequately characterize water quality conditions or identify changed conditions and to provide the technical basis for use of core sites.

CWFR assessment monitoring was conducted in 2009. The current CWFR requirements span a 3-year monitoring schedule, which includes 2 years of core monitoring (2010 and 2011), followed by a year of assessment monitoring (2012). Table 4-1 provides the sequential schedule for assessment and core monitoring.

TABLE 4-1
Assessment and Core Monitoring Cycle[a]

Monitoring Type	2009	2010	2011	2012
Assessment[b]	✓	✓[c]		✓
Core[d]		✓	✓	

[a]Repeat cycle every 3 years, or as specified in an approved MRP plan.
[b]Assessment monitoring is conducted at core sites and assessment sites. Site-specific monitoring requirements may be included.
[c]Assessment sites were monitored during the initial two events of 2010 to report dissolved copper (total copper was reported in 2009).
[d]Core monitoring is conducted only at core sites.

Both core and assessment monitoring can include special project monitoring. Special project monitoring includes monitoring and reporting implemented pursuant to approved and proposed management plans, as well as other focused investigations that may assist in addressing data gaps or other technical evaluations.

Consistent with the approach outlined in the MRP, the CRC's approach for its monitoring program includes three types of monitoring:

- Core monitoring to track trends
- Assessment monitoring to determine the condition of a water body
- Special project monitoring for source identification and other problem solving

Core Monitoring

Core monitoring sites and constituents are used to measure trends at the selected representative sites over extended periods of time. The core monitoring component of the monitoring strategy will:

- Focus on a diversity of monitoring sites across the Coalition Group's area (hydrology, size, and flow).
- Include sites that through assessment monitoring or other information have been shown to be characteristic of key crop types, topography, and hydrology within the Coalition Group's boundaries.
- Provide scientific rationale for the site selection process based on the assessment monitoring, existing monitoring projects, or historical information.
- Discuss the criteria for the selection of each monitoring site.
- Propose the approach, including schedule, to sampling core monitoring sites.
- Include water bodies that carry agricultural drainage, are dominated by agricultural drainage, or are otherwise affected by other irrigated agriculture activities.
- Have management practice information provided to establish relationships (status and trends) with water quality monitoring information.
- In conjunction with assessment monitoring, demonstrate the effectiveness of management practices and implement new management practices as needed.

- Use data generated from the core monitoring sites to establish trend information about the effectiveness of the Coalition Group's efforts to reduce or eliminate the impact of irrigated agriculture on surface waters.

The 2011 MRP includes monitoring at the four core sites (BS1, CBD1, CBD5, SSB) monitored in previous Irrigated Lands Regulatory Program monitoring efforts. The four core sites and assessment Site F were monitored for propanil as a part of the voluntary Propanil Management Plan. Because 2011 was a core monitoring year, the other two CWFR assessment sites were not included in the monitoring requirements.

Assessment Monitoring

Assessment monitoring is used to provide supporting data for sites that a Coalition Group wishes to select as core monitoring sites for trends. Supporting data also may allow consideration for the use of some monitoring sites to be representative of other locations within the CRC study area.

The January 2008 Coalition MRP describes the technical requirements of the proposed assessment monitoring. These requirements include:

- Focus on a diversity of monitoring sites across the Coalition Group's area (hydrology, size, and flow).
- Evaluate different types of water bodies for assessment.
- Include a sufficient number of sampling sites to assess the entire Coalition Group area and all drainages.
- Propose the approach, including schedule, to sampling assessment monitoring sites.
- Include sampling sites in areas of known water quality impairments, even if they are not currently identified on the Clean Water Act (CWA) 303(d) listing.
- Include sampling sites that are compliance monitoring sites for total maximum daily loads (TMDLs), where implementation is conducted by the Coalition Group.
- Provide scientific rationale for the site selection process based on historical and/or ongoing monitoring, drainage size, crop types and distribution, and topography and land use.
- Discuss the criteria for the selection of each monitoring site.
- Conduct the initial focus of monitoring on water bodies that carry agricultural drainage or are dominated by agricultural drainage.
- Identify priorities with respect to work on specific watersheds, subwatersheds, and water quality parameters.
- In conjunction with core monitoring for trends and special projects focused on specific problems, demonstrate the effectiveness of management practices, and identify locations for implementation of new management practices, as needed.
- Include the requirements provided in Parts I through III of the 2008 Coalition MRP.

The three assessment sites, shown in Table 4-2 and described in the following sections, were not included in the 2011 MRP, as it was a core monitoring year.

TABLE 4-2
CWFR and RPP Monitoring Sites

Site Code	Site Name	Latitude	Longitude	Estimated Rice Area Captured by Station (acres)	Program(s)	Site Type
CBD1	Colusa Basin Drain above Knights Landing	38.81255	-121.775	171,165	CWFR, RPP	Core
CBD5	Colusa Basin Drain #5	39.18648	-122.045	156,000	CWFR, RPP	Core
BS1	Butte Slough at Lower Pass Road	39.18763	-121.908	183,617	CWFR, RPP	Core
SSB	Sacramento Slough Bridge near Karnak	38.7842	-121.654	24,549	CWFR, RPP	Core
F	Lurline Creek; upstream site of CBD5	39.21838	-122.151	--	CWFR	Assessment
G	Cherokee Canal; upstream site for BS1	39.362	-121.868	--	CWFR	Assessment
H	Obanion Outfall at DWR Pumping Plant on Obanion Road	39.02536	-121.728	--	CWFR	Assessment
SR1	Sacramento River at Village Marina/ Crawdads Cantina	38.60359	-121.518	~500,000	RPP	River

Note: LAT/LON coordinates are NAD83 datum.

Special Project Monitoring

Special project monitoring is to be established on water bodies where waste-specific monitoring or targeted source identification studies are needed. The CRC's Algae Management Plan and Propanil Management Plan are considered special project monitoring (Appendixes B-4 and B-5). The 2011 MRP incorporated propanil special project monitoring, but no additional monitoring was required for algae in 2011.

RPP

The RPP requires the following types of water quality monitoring and evaluation:

- Thiobencarb water quality monitoring
- Pesticide use reporting

Monitoring Sites

Monitoring under both the CWFR and the RPP is conducted at specific sites. Table 4-2 lists site names, locations, and drainage area for each of the sites under the CWFR and RPP monitoring programs. Figure 4-1 shows the locations of the CWFR assessment and core monitoring sites, and the locations of the RPP monitoring sites.

CWFR Sites

The 2011 monitoring season was a core monitoring season (Table 4-1), and monitoring was conducted at assessment Site F as a part of the voluntary Propanil Management Plan. Assessment sites G and H were not included in 2011 monitoring because 2011 was a core monitoring year and the two sites are not included in a management plan. Figure 4-1 shows the locations of the four CWFR core sites and the three CWFR assessment sites.

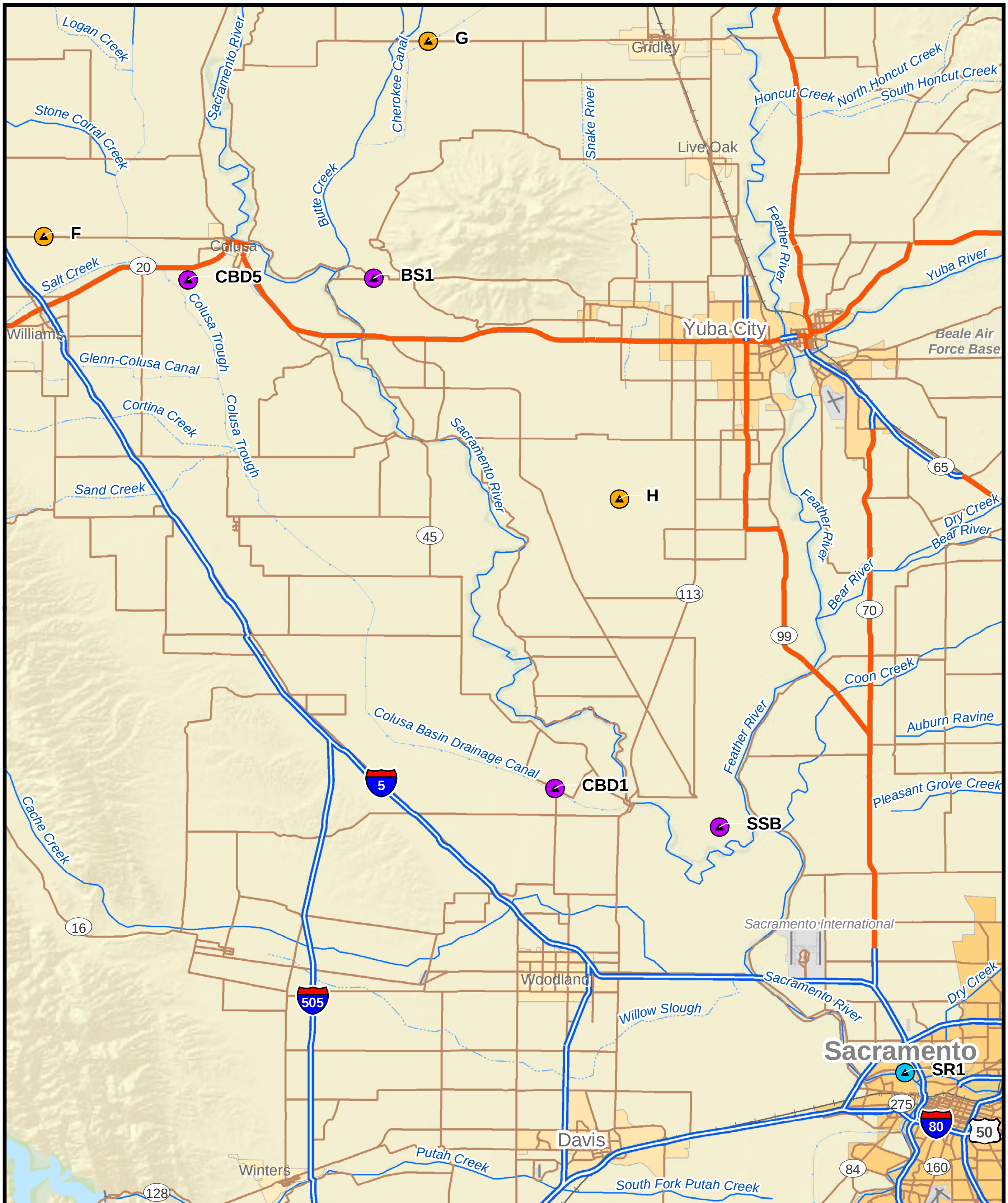
RPP Sites

Under the RPP, the CRC performs water quality and flow monitoring at five sites. Four of these sites (CBD1, CBD5, BS1, and SSB) are also monitored under the CWFR, while the fifth site (SR1) is monitored only under the RPP. Figure 4-1 shows the five RPP monitoring sites.

CBD1

CBD1 is located on the Colusa Basin Drain. Water samples at CBD1 were collected from the middle of the bridge along Road 99E as it crosses Colusa Basin Drainage Canal near Road 108 west of Knights Landing. CBD1 is monitored under both the CWFR (core) and the RPP.

PHOTO 1
CBD1: Colusa Basin Drain #1



Legend

- CWFR Assessment Sites
- CWFR & RPP Core Sites
- RPP River Site

N

0 7 14

Miles

FIGURE 4-1

MONITORING SITES

RICE PESTICIDES PROGRAM

CALIFORNIA RICE COMMISSION

CBD5

CBD5 is located on the Colusa Basin Drain within the Colusa National Wildlife Refuge. Water samples at CBD5 were collected from the middle of the second bridge at the Colusa National Wildlife Refuge south of Highway 20. CBD5 is monitored under both the CWFR (core) and the RPP.

PHOTO 2
CBD5: Colusa Basin Drain #5

BS1

BS1 is located on Butte Slough. Water samples at BS1 were collected from the middle of the bridge along Lower Pass Road, which crosses Butte Sough northeast of Meridian, California. In 1995 and 1996, samples were collected at the west end of the washed out bridge. Sampling at the new bridge site started in 1997. BS1 is monitored under both the CWFR (core) and the RPP.

PHOTO 3
BS1: Butte Slough #1

SSB

The RPP historically monitored Sacramento Slough at a location known as Sacramento Slough 1 (SS1), which was located at the DWR gauging station downstream of the Karnak pumps. Beginning in 2006, the monitoring site for Sacramento Slough was moved slightly upstream to a location named Sacramento Slough Bridge (SSB) to provide improved safety for field technicians accessing the site. SSB is monitored under both the CWFR (core) and the RPP.

PHOTO 4
SSB: Sacramento Slough Bridge

F

Site F is located on Lurline Creek. Water samples on Site F were collected from the middle of the bridge located along Lurline Avenue between San Jose Road and Two Mile Road, northwest of Colusa, east of Interstate 5. This site serves as the upstream assessment site for core site CBD5. Site F is monitored as an assessment site under the CWFR.

PHOTO 5
F: Lurline Creek

G

Site G is located on Cherokee Canal. Water samples on Site G were collected from the middle of the bridge located along Colusa Highway, west of Hatch Road and east of Gridley Road and Butte Creek. This site serves as the upstream assessment site for ore site BS1. Site G is monitored under the CWFR (assessment).

PHOTO 6
G: Cherokee Canal

H

Site H is located at the Obanion Outfall at DWR pumping plant (DWR PP) on Obanion Road. Water samples on Site H were collected from the middle of the bridge along Obanion Road west of Boulton Road and immediately east of the Sutter Bypass levee. Site H is monitored under the CWFR (assessment).

PHOTO 7
H: Obanion Outfall

SR1

SR1 is located on the Sacramento River. Water samples at SR1 were collected from the Sacramento River at the Village Marina along the Garden Highway in Sacramento. The SR1 water samples were collected from the edge of a floating dock near the entrance of a restaurant along the east bank of the Sacramento River. Kleinfelder noted the river level on a staff gauge located along a middle dock between the sampling point and the riverbank. SR1 is monitored under only the RPP.

PHOTO 8
SR1: Sacramento River Village Marina

Schedule and Constituents

The monitoring schedules for CWFR and RPP sampling are based on the timing and frequency of discharge from rice fields that may contain constituents that affect water quality. The current monitoring periods for the CWFR were developed based on the understanding of the rice growing season and analysis of historical data, including data collected since 2004 under the CWFR.

The period with the greatest risk to water quality occurs during the peak pesticide application period from April through June. During this period into July, water may be released from the field. From mid- July to mid-August, water is held on rice fields to protect grain development. A top-dressing of nutrients may be added during the water hold. Rice drainage season, when the rice fields are drained prior to harvest, typically occurs from mid-August through September. After harvest, rice fields are generally flooded to decompose rice straw and to provide waterfowl habitat. No application of fertilizers or pesticides occurs on rice fields during the winter until the fields are drained in mid-February or March. Field preparation for the next season may include applications of fertilizers.

The monitoring calendar has been developed to focus sampling on the periods of risk to water quality. Monitoring is scheduled to provide for water quality assessment during the peak rice-pesticide application period. A typical monitoring calendar is established in the CRC MRP, but annual weather conditions and other factors may affect planting and pesticide application, and therefore the actual start-date of monitoring is established annually to ensure that sampling brackets the actual pesticide use season. In 2011, the monitoring start-date was delayed due to atypical weather that delayed planting. CRC water quality monitoring for 2011 generally included:

- Monthly CWFR sampling of general parameters at core sites, May through August
- Monthly CWFR dissolved copper sampling at core sites, May and June
- Weekly CWFR special project monitoring for propanil during June and July
- RPP sampling for 10 weeks (May-July), with weekly samples during weeks 1, 2, 3, 8, 9, and 10, with more intensive biweekly sampling conducted during weeks 4, 5, 6, and 7.

CWFR

The MRP specifies the constituents for which monitoring and laboratory analyses are to be conducted. Table 4-3 presents the constituents for which monitoring was required during 2011.

TABLE 4-3
CWFR Monitoring Requirements, 2011

Constituent	Units	Sample Type	Type of Monitoring	Irrigation Season Sampling Frequency (May to August)
Flow	cfs	Field[a]	Core	Monthly
pH	pH units	Field	Core	Monthly
Electrical conductivity	µmhos/cm	Field	Core	Monthly
Dissolved oxygen	mg/L	Field	Core	Monthly
Temperature	degrees C	Field	Core	Monthly
Turbidity	NTUs	Field	Core	Monthly
Total dissolved solids (TDS)	mg/L	Grab	Core	Monthly
Total organic carbon (TOC)	mg/L	Grab	Core	Monthly
Hardness	mg/L	Grab	Core[b]	May and June events
Dissolved copper	µg/L	Grab	Core[b]	May and June events
Propanil Management Plan	µg/L	Grab	Core + assessment site F	Weekly (June 7 – July 26)

[a]Flow also may be obtained from DWR monitoring stations, where available.
[b]Only monitored during the first two events, as required in the MRP.

Notes:

µg/L = micrograms per liter
µmhos/cm = micromhos per centimeter
cfs = cubic feet per second
mg/L = milligrams per liter
NTU = nephelometric turbidity unit

RPP

Monitoring for the RPP is conducted during the period of peak rice pesticide use. Monitoring is conducted once per week for the first 3 weeks, then is increased to twice per week for the following 4 weeks (corresponding with peak usage), and then is decreased to once per week for the final 3 weeks, as shown in Table 4-4.

TABLE 4-4
RPP Monitoring and Reporting Requirements, 2011

Constituent	Units	Sample Type	Sampling Frequency		
			Weeks 1–3	Weeks 4–7	Weeks 8–10
Thiobencarb	µg/L	Grab	Weekly	Biweekly	Weekly

2011 Monitoring Calendar

Rice planting was delayed in 2011 because of atypical weather conditions. As a result, the typical April start date for monitoring would not have captured pesticide use. Therefore, the first week of monitoring was delayed to May to better coincide with the peak use season. This decision was made in consultation with the CACs, rice growers, Pest Control Advisers, Farm Advisers, and the CVRWQCB staff.

CWFR

CWFR monitoring was conducted May through August. The first sample date was May 10, and sampling concluded on August 23. Dissolved copper, which is specified in the MRP for monitoring in April and May, was sampled in May and June to provide for sampling during the peak copper use period.

Propanil special project monitoring was conducted weekly for 8 weeks, from June 7 through July 26. This sampling duration exceeds the requirements of the MRP and was implemented at the CRC's discretion because of the unusual weather and planting conditions.

RPP

RPP sampling was conducted for 10 weeks, beginning on May 10 and concluding on July 12, 2011.

Administration and Execution

For the CWFR and the RPP, the CRC contracted with Kleinfelder to collect water samples and coordinate with laboratories. Following each monitoring event, field data sheets, chain-of-custody (COC) forms, and calibration logs were scanned and e-mailed to CH2M HILL. Kleinfelder was the primary contact for all laboratory services. After analysis, the labs submitted data to Kleinfelder, which then forwarded the data to CH2M HILL for review and analysis.

Sampling Procedures

Sampling was conducted pursuant to the procedures described in the CRC's Quality Assurance Project Plan (CH2M HILL, 2010), unless otherwise noted.

Field Measurements

Field water quality parameters for the CWFR, provided in Table 4-3, were measured prior to sample collection at each site, and flow was measured after samples were collected. At each site, a water quality sheet was completed; this documented the surface water level, width of the waterway, sample depth at the middle of the water column, total depth to sediment, general weather observations, time arrived on site, and field water quality measurements. Unless otherwise noted, field measurements were taken at a depth equal to approximately half the water column.

Flow

Flow is measured only under the CWFR. Measurements are taken at 10 cross-sections at each site. The wetted width of the water body was measured, recorded, and divided by 10 to determine the width of each cross-section. The midpoint of each cross-section was calculated by dividing the cross-section width in half. Velocity was measured at the midpoint of each cross-section at 0.2 and 0.8 of the total depth from the water surface, and then averaged. Flow was then calculated using the following equation:

$$Q = \sum_{n=1}^{10} W_n D_n V_n$$

Where:

Q	=	estimated flow at the site (cfs)
W	=	section width (feet)
D	=	depth of measurement (feet)
V	=	velocity (feet per second)

Electrical Conductivity, Dissolved Oxygen, Temperature, and pH

Electrical conductivity (EC), dissolved oxygen (DO), temperature, and pH measurements are taken for the CWFR monitoring programs. These parameters were measured using a multiprobe instrument that was lowered directly into the water column. The meter was allowed to equilibrate for at least 90 seconds before data were recorded. The meter was calibrated at the beginning of the sampling day. Calibration logs for the CWFR monitoring events are included in Appendix B-1, and the logs for the RPP monitoring events are included in Appendix C-1.

Turbidity

Turbidity was measured using a turbidity meter. Turbidity measurements were recorded for the CWFR.

Grab Samples

For the CWFR and the RPP, a qualified and trained crew of Kleinfelder technicians collected the grab samples. The water grab samples were collected using a Kemmerer water sampler (either stainless steel and Teflon model or clear acrylic and PVC model; approximately 1.5-liter volume) at a depth equal to one-half the water column. The Kemmerer was emptied into a stainless steel container and the process repeated until the appropriate volume of water was acquired to split into the required number of samples. This process allowed for homogenization as additional sample volume was added to the container. Certified sample containers were filled with the composite sample using a stainless steel funnel, with an additional bottle filled, and to be held in sample control as a backup sample.

Non-disposable equipment used in sample collection was decontaminated after each use by rinsing thoroughly with distilled water. The sample equipment was also rinsed at each site with water from the middle of the water column before sample collection. Clean sampling equipment was not allowed to touch the ground, and field personnel wore clean, disposable gloves. New, clean sample bottles and jars were provided by the analytical laboratories or purchased from a supply company.

Sample containers were labeled at the time of sample collection with a unique sample ID number. The label contained the following information:

- Sample ID
- Sample location
- Date and time of sample collection
- Kleinfelder project number
- Sampling technician identification

Samples were held on wet or blue ice at 4°C until delivered to the laboratory for analysis.

Sample Custody and Documentation

For the CWFR and the RPP, custody of samples was maintained and documented from the time of sample collection to completion of analysis. Each sample was considered to be in the sampler's custody, and the sampler was responsible for the care and custody of the samples until they were delivered to the laboratory. Field data sheets and copies of COC forms were maintained in the project file for samples collected during each event.

A COC form, sample labels, and field documentation were crosschecked to verify sample identification, type of analyses, sample volume, and number and type of containers.

Field data sheets, COC forms, and calibration forms were scanned by Kleinfelder and submitted to CH2M HILL. CWFR and RPP COC forms are included in Appendixes B-1 and C-1, respectively.

Sample Delivery and Analysis

For the CWFR and the RPP, after each sampling event, Kleinfelder submitted the samples under COC to the laboratories. Sample shipments were accompanied by the original COC form, which identified contents. Samples were transported after sample collection to the lab for analysis within the sample holding time. The laboratories performing the analyses and the methods used are listed in Table 4-5.

TABLE 4-5
Analytical Laboratories and Methods, 2011

Laboratory	Analytes	Analytical Method(s) Standard Operating Procedures	Notes
California Laboratory Services (CLS) 3249 Fitzgerald Road Rancho Cordova, CA 95742	Total Hardness as Calcium Carbonate ($CaCO_3$)	SM2340B	
	Dissolved Copper	EPA 200.8	
	TOC	SM5310B	
	TDS	SM2540C	
	Thiobencarb (QC samples)	EPA 507	
McCampbell Analytical, Inc. (MAI) 1534 Willow Pass Road Pittsburg, CA 94565	Propanil	EPA 532	
Valent Dublin Laboratory (Registrant Laboratory) 6560 Trinity Court Dublin, CA 94568	Thiobencarb	Registrant method	Analyzed under the RPP

SECTION 5

2011 Monitoring

The 2011 CWFR and RPP monitoring season information and results are provided separately according to the relevant required information for each program. CWFR monitoring information is provided in the following order:

- Sampling schedule
- Field parameter results
- Lab parameter results
- 2011 flow data
- Dissolved copper and hardness analysis
- Management Plans (including the Algae Management Plan [AMP] and the Propanil Management Plan)

RPP monitoring information is provided in the following order:

- RPP Performance Goals
- Water holds
- Pesticides monitored
- Sampling schedule
- Sampling collection, delivery, and analysis
- Results

CWFR Monitoring

Monitoring is conducted under the CWFR according to the MRP. Monitoring at the four core sites included measurement of general physical parameters (including lab analysis of total dissolved solids [TDS], total organic carbon [TOC], dissolved copper, and hardness). Monitoring at assessment Site F was also conducted when the CWFR and Propanil Management Plan sampling dates coincided. The 2011 CWFR monitoring requirements and results follow.

Sampling Schedule

The MRP specifies the general calendar for monitoring. Based on an understanding of the rice growing season, a rice-specific monitoring calendar was developed to sample the April through August "irrigation season," with an event in August to sample a typical drainage event. In 2011, sampling began in May because of late rains that delayed planting. Table 5-1 lists regularly scheduled monitoring. No resampling was required in 2011.

Field Parameter Results

The following field parameters were measured as part of the 2011 sampling effort: temperature, DO, pH, EC, turbidity, and flow.

TABLE 5-1
2011 CWFR Sampling Calendar

Event Type	Month	Sample Date	Field	Copper	Hardness	TDS	TOC	QC Samples
Irrigation	May	5/12/2011	✓	✓	✓	✓	✓	CBD1
	June	6/14/2011	✓	✓	✓	✓	✓	CBD1
	July	7/19/2011	✓	NR	NR	✓	✓	NA
	August	8/23/2011	✓	NR	NR	✓	✓	NA

Notes:

NR = not required by the MRP
NA = not applicable

Temperature Measurements

Temperature measurements were taken during field sampling using a multiprobe instrument. Figure 5-1 shows the 2011 field temperature results. Temperatures in water bodies are typically lowest in the winter and highest in the summer. Peak water temperatures were observed during the June (Event 2) sampling event, with a high of 80.3°F. As seen in previous years, water temperature in these water bodies essentially tracks with ambient air temperature. During peak temperatures, these drain sites would not provide habitat for coldwater fisheries, although they may provide coldwater habitat during other times of the year.

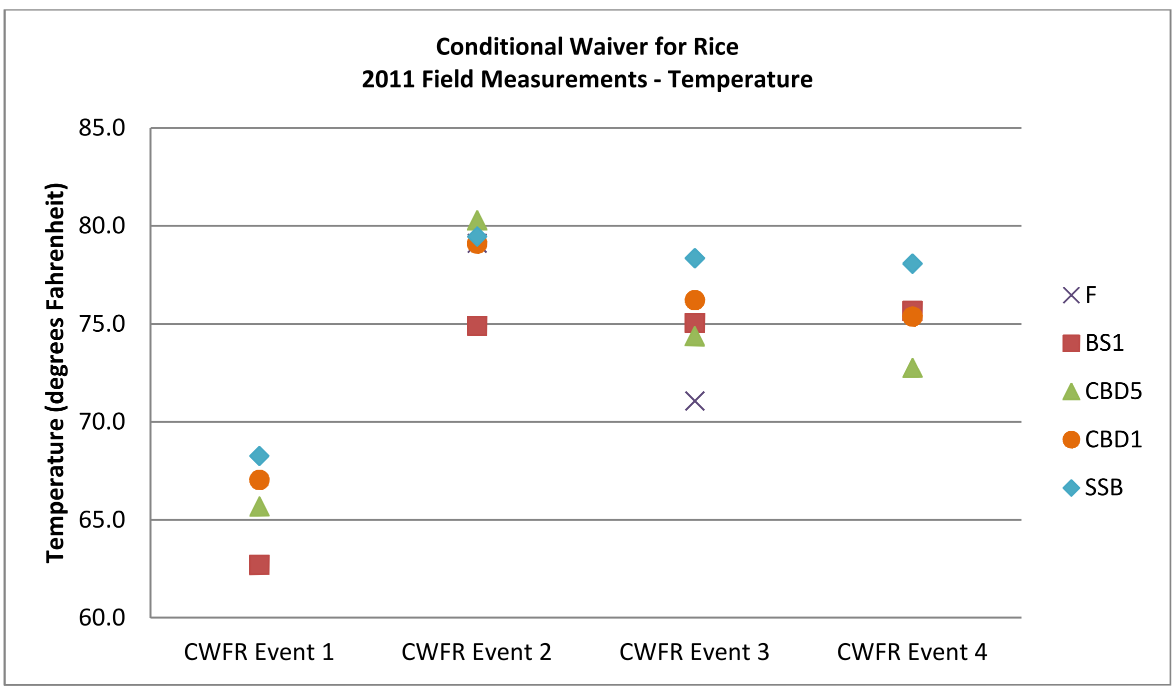


FIGURE 5-1
Field Temperature Measurements, 2011

Table 5-2 presents temperature results and summary information, including site minimum, maximum, mean, and median observed temperatures, as well as event minimum, maximum, mean, and median observed temperatures. Table 5-2 also includes an evaluation of the number of times the observed field temperature exceeded 68°F, which is the Basin Plan water quality objective (WQO) for the lower Sacramento River.

DO Measurements

The multiprobe instrument was used to take field DO measurements. Figure 5-2 shows the 2011 DO measurements. Table 5-3 presents DO results and basic summary information, including site minimum, maximum, mean, and median observed DO, as well as event minimum, maximum, mean, and median observed DO. Table 5-3 also includes an evaluation of the number of times the observed field DO values were less than 5 milligrams per liter (mg/L), 6 mg/L, and 7 mg/L.

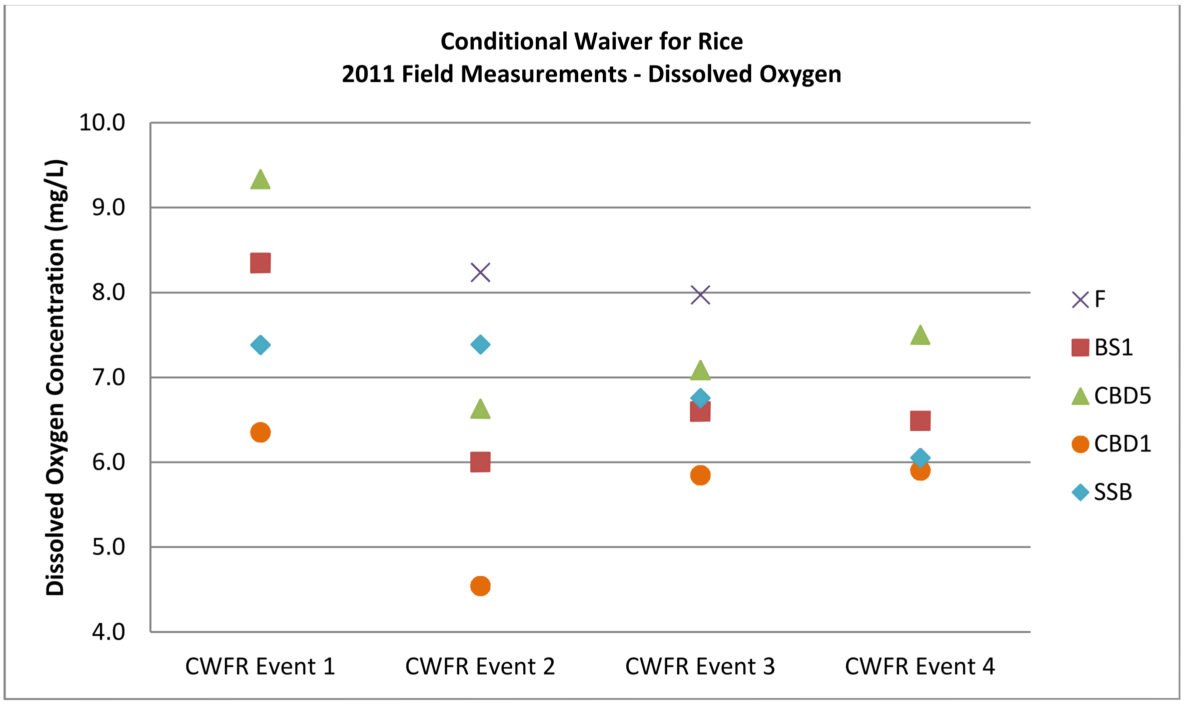


FIGURE 5-2
Dissolved Oxygen Field Measurements, 2011

TABLE 5-2
Field Temperature Measurements, 2011

		Temperature (°F)											
Sample Event	**Sample Date**	**BS1**	**CBD5**	**CBD1**	**SSB**	**F**	**Event Low**	**Event Mean**	**Event Median**	**Event High**	**Event Variance**	**Event Standard Deviation**	**N**
CWFR Event 1	5/12/2011	62.7	65.7	67	68.3	NR	62.7	65.9	66.4	68.3	5.7	2.4	4
CWFR Event 2	6/14/2011	74.9	80.3	79.1	79.5	79.1	74.9	78.6	79.1	80.3	4.4	2.1	5
CWFR Event 3	7/19/2011	75.1	74.4	76.2	78.4	71.1	71.1	75	75.1	78.4	7.1	2.7	5
CWFR Event 4	8/17/2011	75.7	72.8	75.4	78.1	NR	72.8	75.5	75.5	78.1	4.7	2.2	4
Site Low		62.7	65.7	67	68.3	71.1							
Site Mean		72.1	73.3	74.4	76	75.1							
Site Median		75	73.6	75.8	78.2	75.1							
Site High		75.7	80.3	79.1	79.5	79.1							
Site Variance		39.1	36.1	26.8	27.2	32.4							
Site Standard Deviation		6.3	6	5.2	5.2	5.7							
N		4	4	4	4	2							
Number of obs. Temp >68°F		3	3	3	4	2							
Number of obs. Temp <68°F		1	1	1	0	0							
Percent of obs. where Temp >68°F		75%	75%	75%	100%	100%							
Percent of obs. where temp <68°F		25%	25%	25%	0%	0%							

Note:

NR = not required

TABLE 5-3
Dissolved Oxygen Field Measurements, 2011

		Dissolved Oxygen Concentration (mg/L)																	
Sample Event	**Sample Date**	**BS1**	**CBD5**	**CBD1**	**SSB**	**F**	**Event Low**	**Event Mean**	**Event Median**	**Event High**	**Event Variance**	**Event Standard Deviation**	**N**	**Number of obs. DO<7**	**Number of obs. DO<6**	**Number of obs. DO<5**	**Percent of obs. DO<7**	**Percent of obs. DO<6**	**Percent of obs. DO<5**
CWFR Event 1	5/12/2011	8.35	9.34	6.36	7.39	NR	6.36	7.86	7.87	9.34	1.64	1.28	4	1	0	0	25%	0%	0%
CWFR Event 2	6/14/2011	6.01	6.64	4.55	7.39	8.24	4.55	6.56	6.64	8.24	1.97	1.4	5	3	1	1	60%	20%	20%
CWFR Event 3	7/19/2011	6.6	7.09	5.85	6.76	7.98	5.85	6.86	6.76	7.98	0.6	0.77	5	3	1	0	60%	20%	0%
CWFR Event 4	8/17/2011	6.49	7.51	5.91	6.06	NR	5.91	6.49	6.27	7.51	0.52	0.72	4	3	1	0	75%	25%	0%
Site Low		6.01	6.64	4.55	6.06	7.98													
Site Mean		6.86	7.64	5.66	6.9	8.11													
Site Median		6.55	7.3	5.88	7.07	8.11													
Site High		8.35	9.34	6.36	7.39	8.24													
Site Variance		1.05	1.41	0.61	0.4	0.04													
Site Standard Deviation		1.03	1.19	0.78	0.63	0.19													
N		4	4	4	4	2													
Number of obs. DO<7		3	1	4	2	0													
Number of obs. DO<6		0	0	3	0	0													
Number of obs. DO<5		0	0	1	0	0													
Percent of obs. DO<7		75%	25%	100%	50%	0%													
Percent of obs. DO<6		0%	0%	75%	0%	0%													
Percent of obs. DO<5		0%	0%	25%	0%	0%													

Note:
NR = not required

DO values of less than 6 mg/L were observed at CBD1 (Table 5-3). These observations occurred in June, July, and August. CBD1 is also the only site with a DO reading of less than 5 mg/L during the season (June). These results are consistent with prior observations at CBD1, which has historically had low DO throughout the summer months.

Factors that may contribute to low DO include in-stream biological oxygen demand from high organic loads and productive algal communities (resulting from available nutrients) and the diurnal oxygen depletion resulting from nighttime algae uptake and/or uniform channel character that limits natural aeration.

Warm water temperatures also can contribute to low DO values. As temperature increases, oxygen solubility decreases and approaches the WQO of 7 mg/L DO. This means that biological activity (such as microorganisms breaking down detritus or other organic matter) can easily consume enough oxygen to depress DO below the WQO, particularly under warmer conditions. Figure 5-3 shows oxygen solubility as a function of temperature. Oxygen solubilities on the graph are approximate because additional factors, such as salinity, influence oxygen solubility.

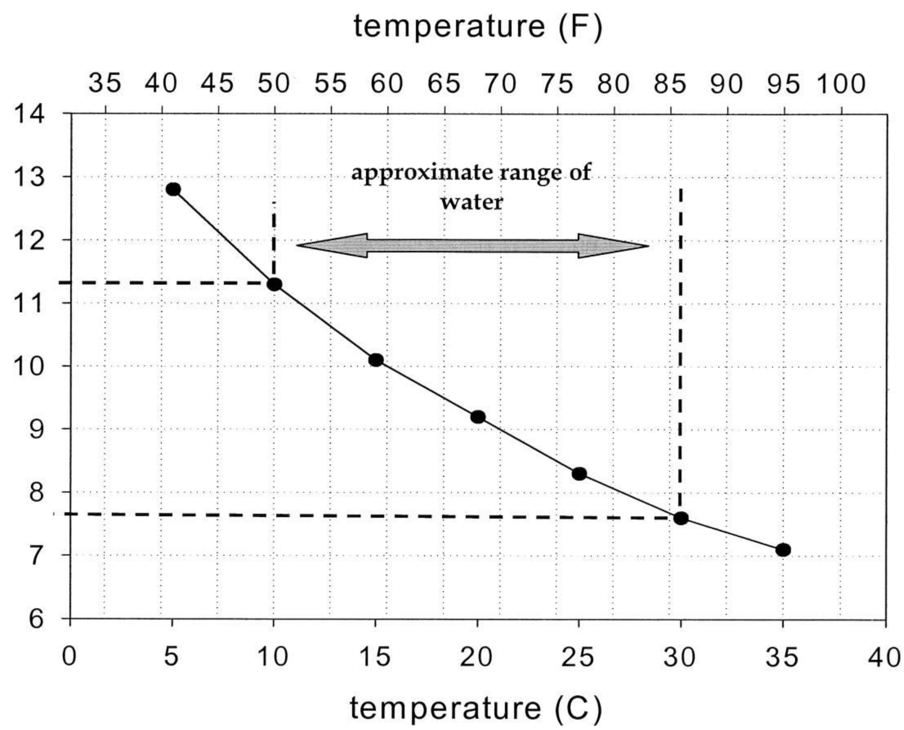


FIGURE 5-3
Oxygen Solubility as a Function of Temperature

pH Measurements

The multiprobe instrument was used in the field to measure pH. Figure 5-4 shows the 2011 pH measurements. Table 5-4 presents pH results and basic summary information, including site minimum, maximum, mean, and median observed pH, as well as event minimum, maximum, mean, and median observed pH. Table 5-4 also includes an evaluation of the number of times the observed field pH was less than 6.5 or greater than 8.5 (WQOs). There was only one observation that fell outside the 6.5 to 8.5 pH range; this was the June reading at CBD1, with a pH of 4.55.

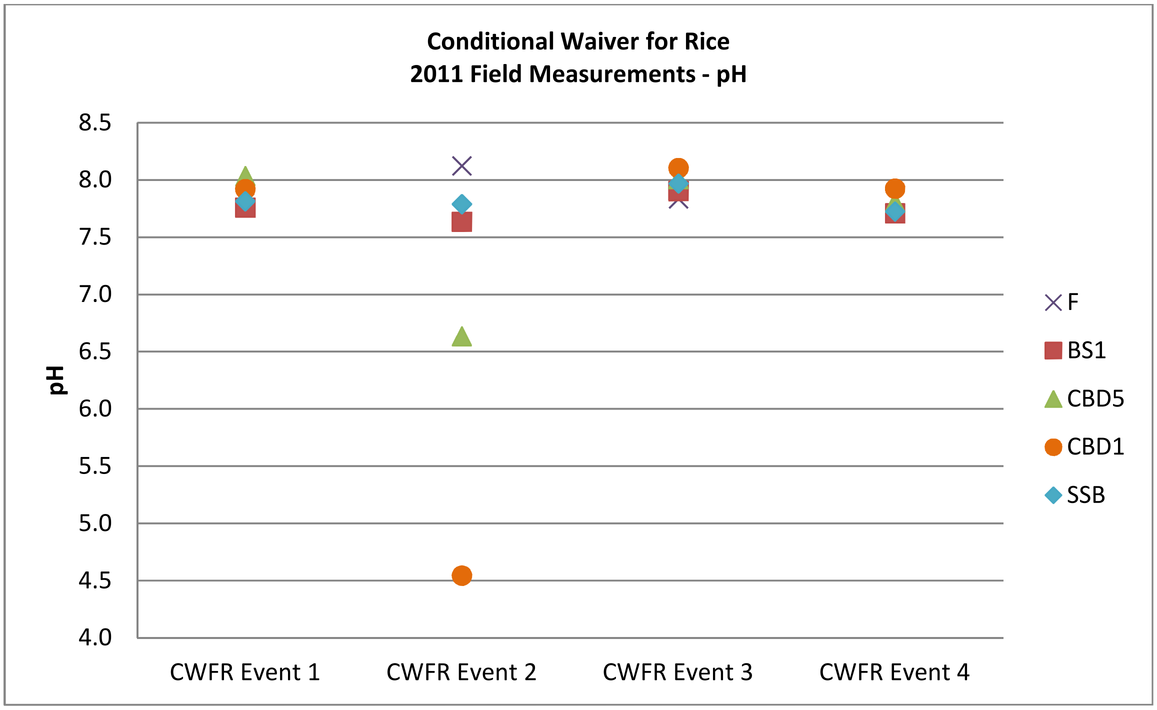


FIGURE 5-4
pH Field Measurements, 2011

TABLE 5-4
pH Field Measurements, 2011

Sample Event	Sample Date	pH					Event Low	Event Mean	Event Median	Event High	Event Variance	Event Standard Deviation	N	Number of obs. pH<6.5	Number of obs. pH>8.5	Percent of obs. pH<6.5	Percent of obs. pH>8.5
		BS1	CBD5	CBD1	SSB	F											
CWFR Event 1	5/12/2011	7.76	8.04	7.92	7.82	NR	7.76	7.88	7.87	8.04	0.01	0.12	4	0	0	0%	0%
CWFR Event 2	6/14/2011	7.64	6.64	4.55	7.79	8.13	4.55	6.95	7.64	8.13	2.11	1.45	5	1	0	20%	0%
CWFR Event 3	7/19/2011	7.91	8.01	8.11	7.97	7.84	7.84	7.97	7.97	8.11	0.01	0.1	5	0	0	0%	0%
CWFR Event 4	8/17/2011	7.71	7.81	7.93	7.73	NR	7.71	7.79	7.77	7.93	0.01	0.1	4	0	0	0%	0%
Site Low		7.64	6.64	4.55	7.73	7.84											
Site Mean		7.75	7.62	7.12	7.83	7.98											
Site Median		7.74	7.91	7.92	7.8	7.98											
Site High		7.91	8.04	8.11	7.97	8.13											
Site Variance		0.01	0.44	2.96	0.01	0.04											
Site Standard Deviation		0.11	0.67	1.72	0.1	0.21											
N		4	4	4	4	2											
Number of obs. pH<6.5		0	0	1	0	0											
Number of obs. pH>8.5		0	0	0	0	0											
Percent of obs. pH<6.5		0%	0%	25%	0%	0%											
Percent of obs. pH>8.5		0%	0%	0%	0%	0%											

Note:
NR = not required

Electrical Conductivity Measurements

The multiprobe instrument was used to take field EC measurements. Figure 5-5 shows the 2011 EC measurements. Table 5-5 presents EC results and basic summary information, including site minimum, maximum, mean, and median observed EC, as well as event minimum, maximum, mean, and median observed EC. Table 5-5 also includes an evaluation of the number of times the observed field EC exceeded 700 µmhos/cm, which has been cited by CVRWQCB as a threshold for reporting. This threshold is based on the citation in Recommended Numerical Limits to Translate Water Quality Objectives (CVRWQCB, 2004) and is an agricultural water quality value (Ayers and Westcot, 1985). Inclusion of this reference value is for screening purposes only and does not imply that the CRC recognizes this value as an adopted salinity WQO.

There was one sample with an EC greater than 700 µmhos/cm during the 2011 sampling season, the June sample from CBD1. This site has typically had high EC during the summer events during prior sampling seasons.

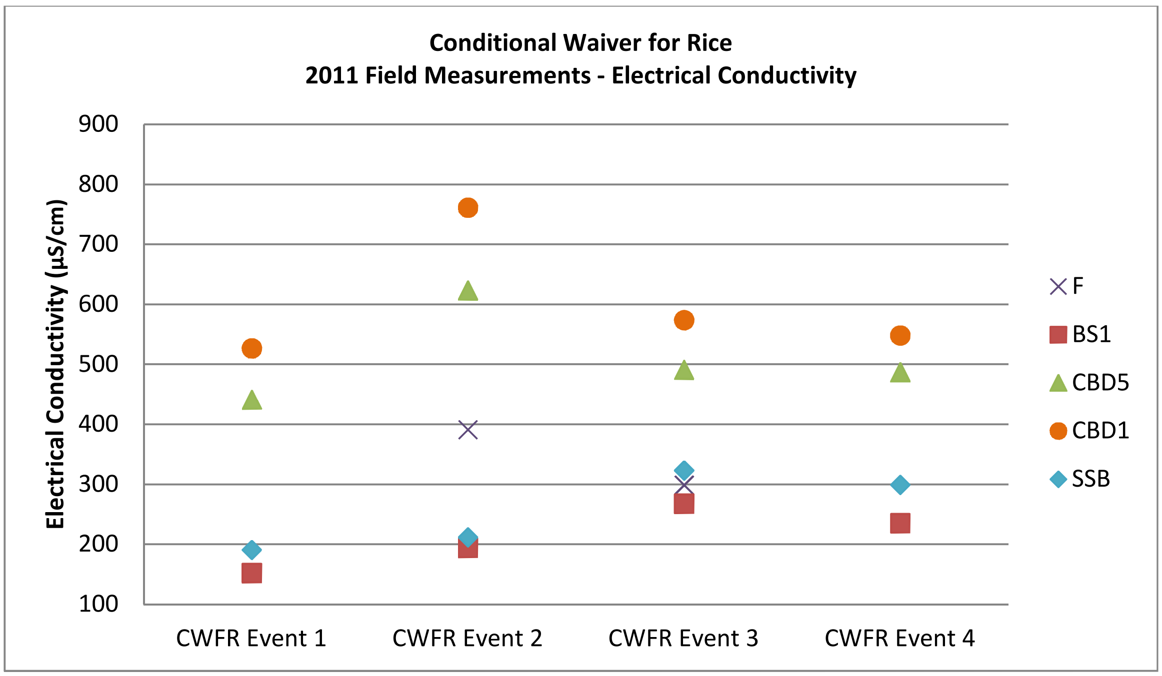
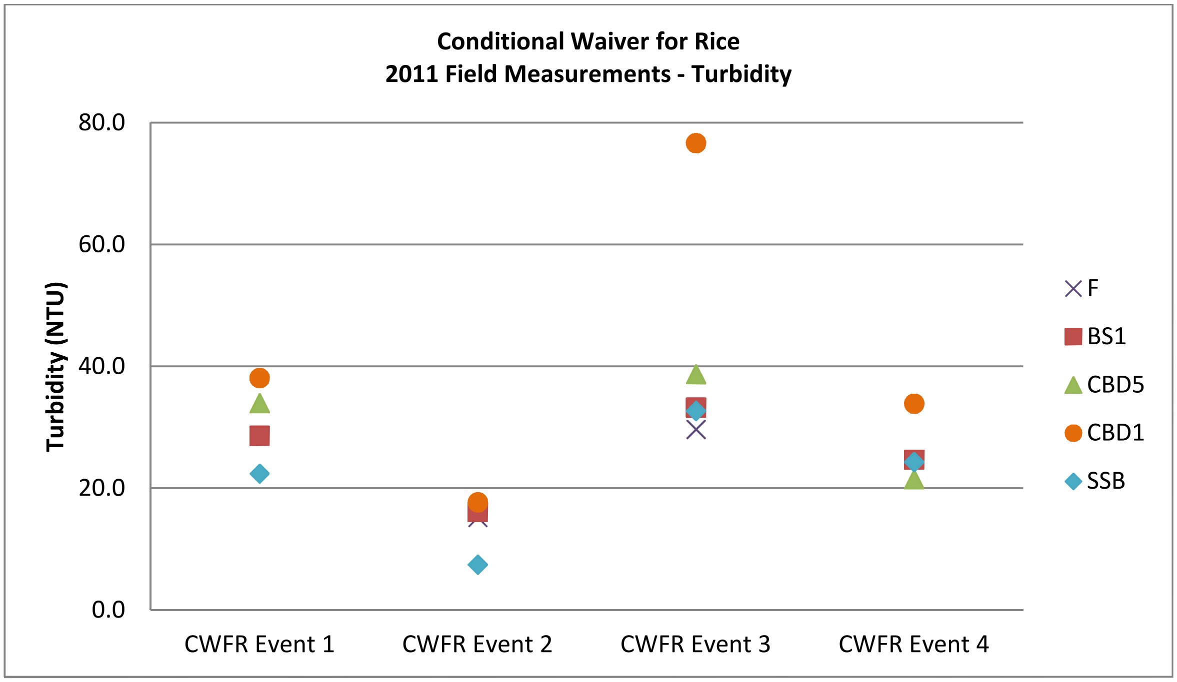


FIGURE 5-5
Electrical Conductivity Field Measurements, 2011

Turbidity

Turbidity measurements are taken in the field using the multiprobe instrument. Figure 5-6 shows the 2011 turbidity measurements. Table 5-6 presents turbidity results and basic summary information, including site minimum, maximum, mean, and median observed turbidity, as well as event minimum, maximum, mean, and median observed turbidity.



Note:
NTU = nephelometric turbidity unit

FIGURE 5-6
Turbidity Field Measurements, 2011

TABLE 5-5
Electrical Conductivity Field Measurements, 2011

		Electrical Conductivity (µS/cm)													
Sample Event	**Sample Date**	**BS1**	**CBD5**	**CBD1**	**SSB**	**F**	**Event Low**	**Event Mean**	**Event Median**	**Event High**	**Event Variance**	**Event Std. Deviation**	**N**	**Number of obs. EC>700**	**Percent of obs. EC>700**
CWFR Event 1	5/12/2011	152	441	527	191	NR	152	328	316	527	34018	184	4	0	0%
CWFR Event 2	6/14/2011	194	623	761	212	391	194	436	391	761	62896	251	5	1	20%
CWFR Event 3	7/19/2011	268	491	574	323	299	268	391	323	574	17935	134	5	0	0%
CWFR Event 4	8/17/2011	235	487	548	299	NR	235	392	393	548	22220	149	4	0	0%
Site Low		152	441	527	191	299									
Site Mean		212	511	602	256	345									
Site Median		215	489	561	255	345									
Site High		268	623	761	323	391									
Site Variance		2511	6140	11570	4203	4278									
Site Std. Deviation		50.1	78.4	107.6	64.8	65.4									
N		4	4	4	4	2									
Number of obs. EC>700		0	0	1	0	0									
Percent of obs. EC>700		0%	0%	25%	0%	0%									

Note:
NR = not required

TABLE 5-6
Turbidity Field Results, 2011

Sample Event	Sample Date	Turbidity (NTU)					Event Low	Event Mean	Event Median	Event High	Event Variance	Event Standard Deviation	N
		BS1	CBD5	CBD1	SSB	F							
CWFR Event 1	5/12/2011	28.6	34	38.1	22.4	NR	22.4	30.78	31.3	38.1	46.31	6.81	4
CWFR Event 2	6/14/2011	16.1	TE	17.7	7.45	15.2	7.45	14.11	15.65	17.7	20.8	4.56	4
CWFR Event 3	7/19/2011	33.24	38.75	76.66	32.69	29.66	29.66	42.2	33.24	76.66	381.84	19.54	5
CWFR Event 4	8/17/2011	24.7	21.5	33.9	24.3	NR	21.5	26.1	24.5	33.9	29.07	5.39	4
Site Low		16.1	21.5	17.7	7.5	15.2							
Site Mean		25.7	31.4	41.6	21.7	22.4							
Site Median		26.7	34	36	23.4	22.4							
Site High		33.2	38.8	76.7	32.7	29.7							
Site Variance		52.81	79.4	623.98	110.36	104.55							
Site Standard Deviation		7.27	8.91	24.98	10.51	10.22							
N		4	3	4	4	2							

Notes:

NR = not required
TE = Technician error. Turbidity not recorded on field sheet

Lab Parameter Results

Core monitoring includes laboratory analysis of TDS, TOC, dissolved copper, and hardness.

TDS Measurements

TDS samples were collected in the field and analyzed in the lab. Figure 5-7 shows the 2011 TDS results. Table 5-7 presents TDS results and basic summary information, including site minimum, maximum, mean, and median observed TDS, as well as event minimum, maximum, mean, and median observed TDS.

TOC Measurements

TOC samples were collected in the field and analyzed in the lab. Figure 5-8 shows the 2011 TOC results. Table 5-8 presents TOC results and basic summary information, including site minimum, maximum, mean, and median observed TOC, as well as event minimum, maximum, mean, and median observed TOC.

Dissolved Copper and Hardness Analysis

Samples were collected for copper and hardness analysis during the first two events of the season, in accordance with the MRP. The early season monitoring events represent the time of copper application and possible release. Samples were analyzed for copper using U.S. Environmental Protection Agency (EPA) Method 200.8, and hardness using EPA Method 200.7 and calculation SM2340B. Results are shown in Table 5-9.

The California Toxics Rule (CTR) 1-hour maximum criterion for dissolved copper is:

$$\text{1-hour maximum copper concentration } (\mu g/L) = (e^{0.9422[\ln(\text{hardness})]-1.700}) \times 0.960$$

The CTR 4-day maximum criterion for dissolved copper is:

$$\text{4-day maximum copper concentration } (\mu g/L) = (e^{0.8545[\ln(\text{hardness})]-1.702}) \times 0.960$$

The hardness-adjusted copper criteria, based on the actual hardness measured for the sample location and date, are shown in Table 5-10. All 2011 samples were below the 1-hour and 4-day maximum copper criteria.

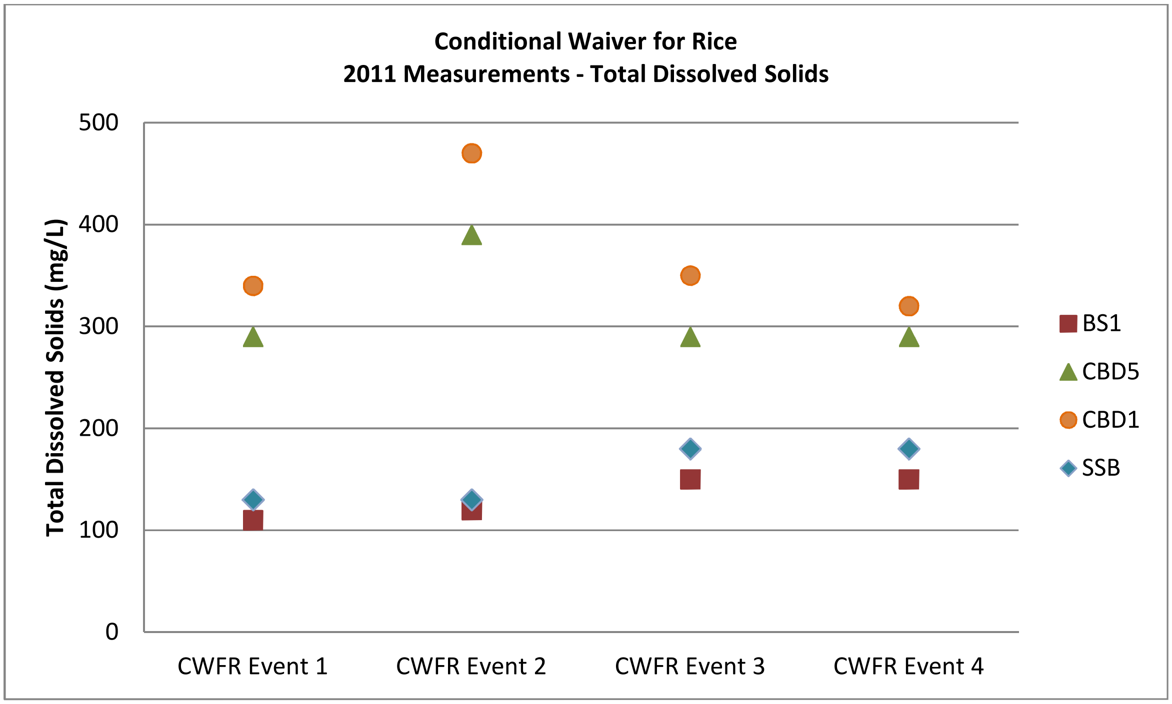


FIGURE 5-7
TDS Results, 2011

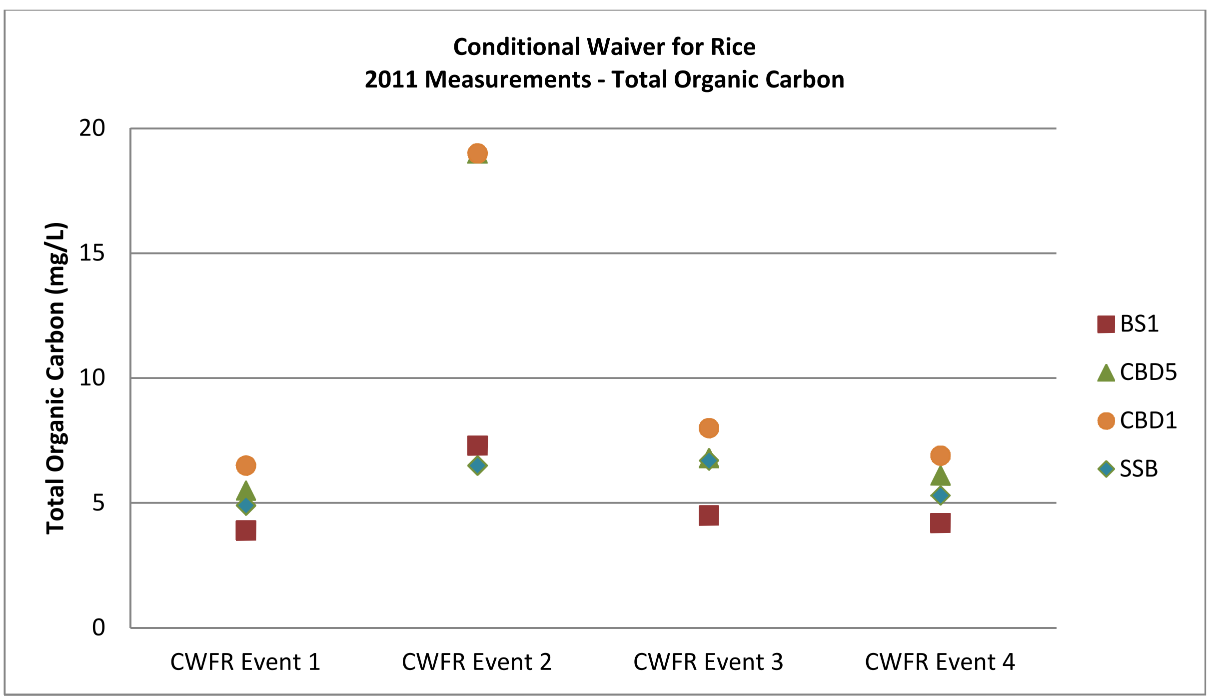


FIGURE 5-8
TOC Results, 2011

TABLE 5-7
TDS Lab Results, 2011

Sample Event	Sample Date	Total Dissolved Solids (mg/L)				Event Low	Event Mean	Event Median	Event High	Event Variance	Event Standard Deviation	N
		BS1	CBD5	CBD1	SSB							
CWFR Event 1	5/12/2011	110	290	340	130	110	218	210	340	13158	115	4
CWFR Event 2	6/14/2011	120	390	470	130	120	278	260	470	32092	179	4
CWFR Event 3	7/19/2011	150	290	350	180	150	243	235	350	8758	94	4
CWFR Event 4	8/17/2011	150	290	320	180	150	235	235	320	6833	83	4
Site Low		110	290	320	130							
Site Mean		133	315	370	155							
Site Median		135	290	345	155							
Site High		150	390	470	180							
Site Variance		425	2500	4600	833							
Site Standard Deviation		20.6	50	67.8	28.9							
N		4	4	4	4							

TABLE 5-8
TOC Lab Results, 2011

Sample Event	Sample Date	Total Organic Carbon (mg/L) BS1	CBD5	CBD1	SSB	Event Low	Event Mean	Event Median	Event High	Event Variance	Event Standard Deviation	N
CWFR Event 1	5/12/2011	3.9	5.5	6.5	4.9	3.9	5.2	5.2	6.5	1	1	4
CWFR Event 2	6/14/2011	7.3	19	19	6.5	6.5	13	13.2	19	49	7	4
CWFR Event 3	7/19/2011	4.5	6.8	8	6.7	4.5	6.5	6.8	8	2	1	4
CWFR Event 4	8/17/2011	4.2	6.1	6.9	5.3	4.2	5.6	5.7	6.9	1	1	4
Site Low		3.9	5.5	6.5	4.9							
Site Mean		5	9.4	10.1	5.9							
Site Median		4.4	6.5	7.5	5.9							
Site High		7.3	19	19	6.7							
Site Variance		2	42	36	1							
Site Standard Deviation		1.57	6.46	5.97	0.89							
N		4	4	4	4							

TABLE 5-9
2011 Copper and Hardness Results

Sample Event	Sample Date	Dissolved Copper Concentration (µg/L)				Hardness as $CaCO_3$ (mg/L)			
		CBD5	BS1	CBD1	SSB	CBD5	BS1	CBD1	SSB
CWFR Event 1	5/12/2011	2.8	1.0	2.5	1.4	130	61	150	77
CWFR Event 2	6/14/2011	5.5	4.1	4.3	3.0	170	86	210	87

TABLE 5-10
Hardness-adjusted CTR Copper Water Quality Criteria (1-hour and 4-day maximum)

Sample Event	Sample Date	1-hour maximum copper concentration (µg/L)				4 -day maximum copper concentration (µg/L)			
		CBD5	BS1	CBD1	SSB	CBD5	BS1	CBD1	SSB
CWFR Event 1	5/12/2011	17.2	8.4	19.7	10.5	11.2	5.9	12.7	7.2
CWFR Event 2	6/14/2011	22.2	11.7	27	11.8	14.1	7.9	16.9	8

2011 Flow Data

Table 5-11 contains the calculation of flow from the flow measurements collected during the 2011 monitoring season. Flow measurements were taken at 10 cross-sections at each CWFR monitoring site. The wetted width of the waterbody was measured, recorded, and divided by 10 to determine the width of each cross-section. The midpoint of each cross-section was calculated by dividing the cross-section width in half. Velocity was measured at the midpoint of each cross-section, at 20 and 80 percent of the total depth from the water surface, and then averaged. Field measurements were documented on field sheets contained in Appendix B-1.

TABLE 5-11
Flow Results

Sample Event	Sample Date	Estimated Flow (cubic feet per second)				
		BS1	CBD5	CBD1	SSB	F
CWFR Event 1	5/12/2011	383	191	10	146	NR
CWFR Event 2	6/14/2011	619	306	77	1314	51
CWFR Event 3	7/19/2011	33	745	472	2.0	82
CWFR Event 4	8/17/2011	76	940	497	701	NR

Note:
NR = not required

Management Plans

CVRWQCB Resolution No. R5-2006-0077 requires that coalitions implementing water quality control programs under the Irrigated Lands Regulatory Program submit management plans when monitoring results show two or more observed "exceedances" over a 3-year period. Past results have triggered management plans. Additionally, the CRC implemented a voluntary Propanil Management Plan following one high monitoring detection. Both final plans were submitted to the CVRWQCB in April 2010, in compliance with the 2010 MRP. Management plan implementation in 2011 continued under both 2010 plans.

Algae Management Plan

Results obtained during CRC's 2005 through 2008 monitoring showed aquatic toxicity for *Selenastrum capricornutum*, an algae specified by EPA to determine chronic aquatic toxicity of receiving waters, triggering the submittal of an AMP. Observed toxicity for *Selenastrum capricornutum* was much lower during 2009 monitoring, and the frequency and magnitude of algae reductions showed a general downward trend. The 2010 AMP evaluated the observed toxicity and rice pesticides concentration data collected to date, and the decision was made to commence monitoring under a core monitoring program regime and suspend additional algae toxicity testing and herbicides analysis under an AMP. No algae-specific monitoring was required in 2011.

Propanil Management Plan

Propanil monitoring at assessment and core sites was included in 2009. The CRC surpassed the monitoring requirements by conducting additional core site propanil monitoring weekly, from June through July (peak use). Propanil results from 2009 included one detection 47 µg/L at Site F, 11 µg/L at CBD5, and 12 µg/L at SSB. As a result, CVRWQCB staff proposed that propanil monitoring be conducted at assessment and core monitoring sites on a weekly basis during June 2010. The CRC voluntarily proposed a Propanil Management Plan to formalize implementation of additional grower education and outreach. This monitoring is considered "special project monitoring" under the conditions of the Irrigated Lands Regulatory Program.

This year propanil monitoring continued under the 2010 Propanil Monitoring Plan. Monitoring was conducted at core sites and Lurline Creek (assessment Site F), during June and July. This timing coordinates with the typical peak application period for propanil. In addition to monitoring, the plan included implementation of additional grower outreach.

Outreach activities included providing propanil use information in the CRC newsletter and grower letter, including links to the regulations, and coordination with the registrants on a brochure, *Propanil Rice Herbicide: Stewardship Practices for Protecting Water Quality*.

The 2010 Propanil Management Plan is attached as Appendix B-5. The management plan includes background information on WQOs and propanil results from the 2006 through 2009 monitoring seasons.

Propanil Monitoring Results

Field sheets and results for the propanil sampling are located in Appendix B-3.
Eight consecutive weeks of propanil sampling, at the four core and one assessment site, were completed in 2011 (Table 5-12). The highest detections were observed for the June 21 event at site CBD5 (6.5 µg/L) and the June 28 event at site F (5.4 µg/L). These sites and events also had the highest detections in 2010.

The June 28, July 5, and July 12 sampling events had the most detections. The June 28 and July 12 events had detections at three out of five sites, and the July 5 event had detections at four of five sites. The first and last sampling events had no detections at any of the sampling locations, and site CBD1 had no detections.

TABLE 5-12
2011 Propanil Monitoring Results

	Monitoring Results (µg/L)				
Sample Date	**CBD5**	**BS1**	**CBD1**	**SSB**	**F**
6/07/2011	ND[a]	ND[b]	ND[a]	ND[b]	ND[a]
6/14/2011	**2.5**	ND[b]	ND[a]	ND[b]	ND[a]
6/21/2011	**6.5**	**0.22**	ND[a]	ND[b]	ND[a]
6/28/2011	**2.0**	**1.8**	ND[a]	ND[b]	**5.4**
7/05/2011	**0.75**	**0.48**	ND[a]	**0.21**	**4.5**
7/12/2011	**0.42**	**0.49**	ND[a]	**1.2**	ND[a]
7/19/2011	ND[a]	ND[b]	ND[a]	**0.47**	ND[b]
7/26/2011	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]

Notes:

Concentrations are reported in µg/L (parts per billion)

ND[a] = ND<0.50 (0.50 µg/L laboratory reporting limit)
ND[b] = ND<0.20 (0.20 µg/L laboratory reporting limit)

RPP Monitoring

RPP monitoring is conducted according to CVRWQCB Resolution No. R5-2010-9001. Thiobencarb samples are collected at the five RPP sites and laboratory analysis is conducted to determine sample concentrations.

The RPP is reviewed by the CVRWQCB, which has authority to authorize the program or use another regulatory approach to achieve water quality protection, including compliance with Performance Goals and attainment of the Basin Plan thiobencarb WQO. The RPP has achieved substantial improvements in water quality with an increased understanding of rice water quality concerns and serves as a model of grower engagement and follow through.

RPP Performance Goals

Since 1990, Sacramento Valley rice farmers have operated pursuant to water quality regulations that prohibit the discharge of irrigation return flows containing carbofuran, malathion, methyl parathion, molinate, and thiobencarb unless the discharger is following management practices approved by the CVRWQCB. The Basin Plan requires that practices only be approved if implementation of such practices can be expected to result in compliance with adopted numeric performance goals and narrative toxicity standards. The Basin Plan was amended to establish performance goals for the five pesticides. The goals were established to be protective of the aquatic ecosystem. The established performance goals for the five pesticides regulated under the conditional prohibition of discharge are shown in Table 5-13. Of these pesticides, only thiobencarb is still used on rice in quantities that could potentially result in exceedances of performance goals or WQOs, absent implementation of CVRWQCB-approved management practices.

TABLE 5-13
Basin Plan Performance Goals for the Five RPP Pesticides

Pesticide	Basin Plan Performance Goal
Molinate	10.0 ppb
Thiobencarb	1.5 ppb
Malathion	0.1 ppb
Methyl parathion	0.13 ppb
Carbofuran	0.4 ppb

Note:
ppb = parts per billion

In addition to achieving the Basin Plan performance goal, thiobencarb levels in drinking water delivered to municipal customers must meet enforceable MCLs. MCLs are enforceable drinking water standards set by the EPA and the California Department of Public Health (CDPH, formerly the California Department of Health Services). Primary MCLs are health-based standards, and secondary MCLs are based on aesthetic properties such as taste, color, odor, and appearance. The primary MCL for thiobencarb is 70.0 parts per billion (ppb) (toxicity), and the secondary MCL is established for nuisance at 1.0 ppb (off-taste).

Water Holds

Over the years, BMPs such as water hold requirements, grower information meetings, and inspection and enforcement were implemented to ensure compliance with performance goals and attainment of MCLs. The water holds, which are specified on the labels and in the DPR permit conditions, are in place to provide for in-field degradation of pesticides prior to the release of treated water to drains and other surface waters. Thiobencarb water hold requirements were the same during 2011 as during previous growing seasons.

Monitored Pesticides

RPP samples were analyzed for thiobencarb during the 2011 monitoring season. As in previous years, samples were *not* analyzed for molinate, carbofuran, malathion, and methyl-parathion because of registration cancellation, decrease in use, and no reportable applications to rice. Specifically, carbofuran is no longer registered for use on rice and has had no reportable use since 2000. Malathion has not been monitored since 2003 because of a dramatic decrease in its use. Historical information indicates that the maximum rice acreage treated with malathion was 9,278 acres in 1991. Annual malathion use on rice has been less than 1,000 acres since 2001. The preliminary 2011 DPR PUR documented 145 acres of malathion usage. Molinate was removed from monitoring during 2010 because it is now a prohibited pesticide and is no longer applied to rice.

Sampling Schedule

The sampling calendar was developed based on historical data, rice pesticide use and drainage patterns, and actual 2011 conditions. The sampling start date was selected in consultation with growers, CACs, Pest Control Advisers, Farm Advisers, and the CVRWQCB staff. Sampling was conducted for 10 weeks according to the schedule listed in Table 5-14. Sampling was initiated on May 12, 2011, at sites SR1, CBD1, CBD5, BS1, and SSB.

Weekly samples were collected on Tuesdays during weeks 1 through 4 and 8 through 10. Samples were collected on Tuesdays and Thursdays during weeks 5, 6, and 7. The CVRWQCB requested this sampling frequency to monitor attainment of water quality performance goals established for rice pesticides; this sampling frequency provides a sound technical basis for screening for water quality concerns to inform prompt follow-up.

TABLE 5-14
RPP Sampling Schedule, 2011

Week	Sample Date	Sample Event
Week 1	5/12/2011	W1D1
Week 2	5/17/2011	W2D1
Week 3	5/24/2011	W3D1
Week 4	5/31/2011	W4D1
	6/2/2011	W4D2
Week 5	6/7/2011	W5D1
	6/9/2011	W5D2
Week 6	6/14/2011	W6D1
	6/16/2011	W6D2
Week 7	6/21/2011	W7D1
	6/23/2011	W7D2
Week 8	6/28/2011	W8D1
Week 9	7/5/2011	W9D1
Week 10	7/12/2011	W10D1

Sample Collection, Delivery, and Analysis

During the 2011 sampling season water samples were collected to measure whether the Basin Plan Performance Goal was being attained. The registrant laboratory conducted sample analysis, with additional samples submitted to a third-party laboratory for analysis.

Water samples were collected from specified surface water locations within the Sacramento River Basin. Each site serves as an end-of-basin drainage point designed to trigger further study and potential scrutiny, should measured conditions indicate an impact (non-toxic event) on existing instream habitat suitability. Sites included one river site and four drain sites, as shown on Figure 4-1. Samples were collected, split if required as part of the quality assurance requirements, and submitted under COC directly to the analytical laboratories for thiobencarb analysis. Detailed maps of each station are included in Appendix A; field sheets and COCs are included in Appendix C-1.

The registrant, Valent Dublin Laboratory, performed thiobencarb analyses. California Laboratory Services, Inc. (CLS) was used as a secondary laboratory for analysis of the thiobencarb quality control samples. Contact information for these laboratories is included in Section 4, and full laboratory results are included in Appendixes C-2 through C-4.

Results

The 2011 RPP water quality results and city results are summarized in Table 5-15. In 2011, there were no measured exceedances of thiobencarb at the five RPP monitoring sites. All samples collected at City drinking water intakes were non-detect (ND) except for a single detection of 0.12 µg/L at WSR on June 1. Field data sheets and COC forms are presented in Appendix C-1, and laboratory data sheets are presented in Appendixes C-2 through C-4.

TABLE 5-15
Summary of Detections (RPP and City Monitoring), 2011

	Thiobencarb		
Site	**Detections Greater than MRL**	**Detections Greater than Performance Goal**	**Range of Detected Concentrations**
CBD5[a]	2	0	ND to 1.4 µg/L
BS1[a]	2	0	ND to 0.6 µg/L
CBD1[a]	4	0	ND to 1.2 µg/L
SSB[a]	0	0	ND
SR1[a]	0	0	ND
SRR[b]	0	0	ND
WSR[c]	1	0	ND
Total Drain Site Detections	**8**	**0**	
Total River Site Detections	**1**	**0**	
Totals	**9**	**0**	**-**

[a]RPP site
[b]City of Sacramento intake site (as reported by the city)
[c]City of West Sacramento intake site (as reported by the city)

Notes:

MRL = method reporting limit
ND = non-detect (below the method reporting limit)

RPP Thiobencarb Results

During the 10 weeks of sampling, levels of thiobencarb above the MRL were detected eight times. None of the detections were above the 1.5 µg/L Basin Plan Performance Goal. The highest measured concentration, which occurred at drain site CBD5 on May 24, was 1.4 µg/L. This concentration was lower than the peak measured concentration in 2010

(CBD1, June 8, 2010, 1.8 µg/L). The average concentration (counting non-detects equivalent to zero) was 0.10 µg/L for the period of monitoring, which is lower than the 2010 average of 0.18 µg/L. Results are shown in Figure 5-9 and Table 5-16.

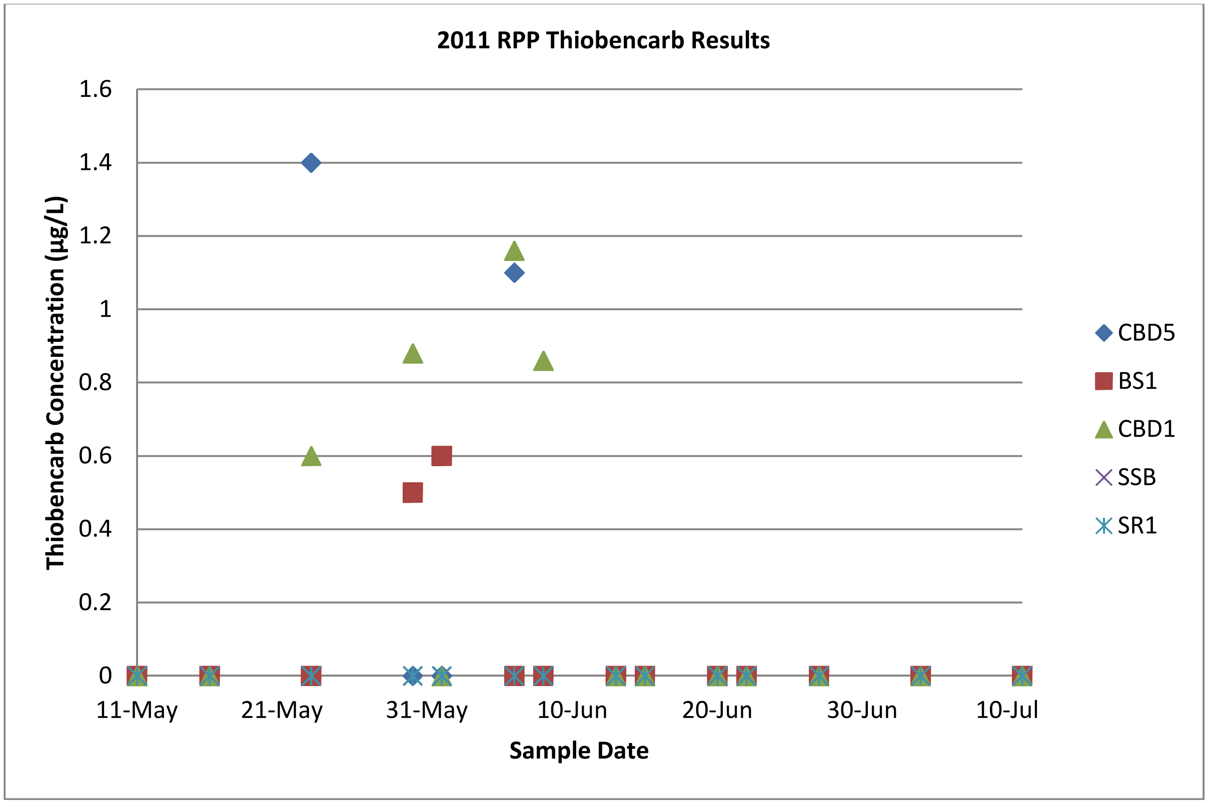


FIGURE 5-9
Thiobencarb Results, RPP, 2011
Non-detects are shown as zero (0) on the graph, and only the highest value of a reported duplicate sample is shown

TABLE 5-16
Thiobencarb Monitoring Results, RPP 2011

	Concentrations at Monitoring Sites (µg/L [ppb])				
Sample Date	**CBD5**	**BS1**	**CBD1**	**SSB**	**SR1**
5/12/2011	<0.5	ND	ND	ND	ND
5/17/2011	<0.5 (V)	ND	ND	ND	ND
	ND (CLS)				
5/24/2011	1.4	ND	0.6	ND	ND
5/31/2011	<0.5	0.5	0.9	<0.5	ND
6/2/2011	<0.5	0.6	<0.5	<0.5 (V)	ND
				ND (CLS)	
6/7/2011	1.1	<0.5 (V)	1.2	<0.5	ND
		ND (CLS)			
6/9/2011	<0.5	ND	0.9	<0.5	ND (V, CLS)
6/14/2011	ND	ND	<0.5	ND	ND
6/16/2011	ND	ND (V, CLS)	ND	ND	ND
6/21/2011	<0.5	ND	ND	ND	ND
6/23/2011	<0.5	<0.5	<0.5	ND (V, CLS)	ND
6/28/2011	ND	ND	ND	ND	ND
7/5/2011	ND	<0.5	<0.5	<0.5	ND
7/12/2011	ND	ND	ND	ND	ND

Notes:

ND = not detected above laboratory reporting limits
ppb = parts per billion

If a sample was tested at the primary and secondary laboratories, each result is provided with the respective laboratory's name (V = Valent; CLS = California Laboratory Services)
Detection limit for Valent is <0.5 µg/L; detection limit for CLS is <0.15 µg/L
The Basin Plan Performance Goal for thiobencarb is 1.5 µg/L (ppb)

City Intake Results

The City of Sacramento provided the CRC with analytical results for drinking water intake sampling for Sacramento and West Sacramento. The cities of Sacramento and West Sacramento monitor at two separate locations:

- **SRR:** Sacramento River at the intake to the water treatment facility in Sacramento, California, approximately 0.3 kilometer downstream from the confluence with the American River in Sacramento County
- **WSR:** Sacramento River at the intake to the water treatment facility in West Sacramento, California, approximately 100 yards west of Bryte Bend Bridge in West Sacramento

City sampling was performed from April 25 through June 20, 2011. The intake results for thiobencarb, as provided to the CRC, are provided in Table 5-17. Only one of the drinking water samples had a result above the reporting limit, with a detection of 0.12 µg/L at WSR on June 1.

TABLE 5-17
Cities of Sacramento and West Sacramento Thiobencarb Results, 2011

Sample Date	Thiobencarb Concentration (µg/L)		Percent Sacramento River Water at SRR[a]
	WSR	SRR*	
4/25/2011	< 0.1	< 0.1	65.6
5/5/2011	< 0.1	< 0.1	62.3
5/9/2011	< 0.1	< 0.1	58.7
5/17/2011	< 0.1	< 0.1	58.6
5/18/2011	< 0.1	< 0.1	70.6
5/23/2011	< 0.1	< 0.1	67.2
5/26/2011	< 0.1	< 0.1	64.2
5/30/2011	< 0.1[b]	< 0.1	67.0
5/31/2011	< 0.1	< 0.1	70.9
6/1/2011	0.12	< 0.1	70.1
6/2/2011	< 0.1	< 0.1	73.6
6/6/2011	< 0.1	< 0.1	67.5
6/7/2011	< 0.1	< 0.1	70.0
6/13/2011	< 0.1	< 0.1	55.2
6/20/2011	< 0.1	< 0.1	43.1

[a]The sampling location SRR, which is located on the Sacramento River at the City of Sacramento's municipal water treatment intake, is downstream of the confluence of the Sacramento and American rivers. Based on the daily flows of the two rivers, the sample taken at SRR will represent varying proportions of Sacramento and American river water. This column represents the City of Sacramento's reported information regarding the blending ratio of Sacramento River and American River water on the day of sampling.
[b] Sampled at Riverbank Marina.

Notes:

Monitoring Site Locations:

SRR = Sacramento River Water Treatment Plant Intake
WSR = Bryte Bend Water Treatment Plant Intake

SRR Results. Upstream of the City of Sacramento drinking water intake, some water mixing occurs from the American River at the Sacramento River confluence. In 2011, concentrations of thiobencarb were less than 0.1 µg/L at SSR, with no detections above the detection level.

WSR Results. WSR is located upstream from the confluence of the American River, so the mixing and dilution prior to the drinking water intake that occurs at the City of Sacramento water intake (SRR) does not occur at WSR. Most concentrations of thiobencarb were non-detect (less than 0.1 µg/L) at WSR. One detection of 0.12 µg/L was observed on June 1. These results demonstrate achievement of both the RPP Basin Plan Performance Goals and the drinking water MCLs.

SECTION 6

Review of Quality Assurance/Quality Control

The validity of water quality monitoring results relies on defining and rigorously following a Quality Assurance/Quality Control (QA/QC) Program. QA/QC requirements are specified in a Monitoring Quality Assurance Project Plan (QAPP), and the laboratory QA/QC requirements are specified in QA/QC plans for each lab.

QA/QC requirements for the CWFR sampling are specified in a QAPP submitted December 2010 (CH2M HILL, 2010). QA/QC requirements for the RPP sampling are specified in the same QAPP. Project schedules (sampling dates, parameters, and sites) specified for each program are revised at the beginning of each monitoring year based on actual weather conditions and grower schedules. The QAPPs were prepared in accordance with Attachment C (Quality Assurance Project Plan Guidelines for California Rice Commission) of the Monitoring and Reporting Program under Order No. R5-2010-0805.

The QAPP specifies several types of QA/QC samples, including:

- Field QA/QC samples
  - Field blanks
  - Field duplicates
  - Rinse blanks
- Lab QA/QC samples
  - Method blanks
  - Matrix spikes and matrix spike duplicates (MS/MSDs)
  - Laboratory control spikes (LCSs)
  - Surrogate samples

The QAPP also specifies numeric QA/QC objectives for precision, accuracy, representativeness, comparability, and completeness.

This section describes the QA/QC samples and their purposes, presents the quality assurance objectives, and then evaluates the 2011 CWFR and RPP QA/QC results against the objectives.

Internal QC

Internal QC is achieved by collecting and analyzing a series of duplicate, blank, spike, and spike duplicate samples to confirm that analytical results are within the specified QC objectives. The QC sample results are used to qualify precision and accuracy, and to identify any problem or limitation in the associated sample results. The internal QC components of a sampling and analysis program ensure that data of known quality are produced and documented.

Field QA/QC Samples

Field QA/QC samples are used to assess the influence of sampling procedures and equipment used in sampling. The results from these samples are examined to ensure that field procedures yield acceptable results. Two types of field quality control samples were used during the 2011 sampling, field blanks and field duplicates.

Field Blanks

A field blank is a bottle of reagent water that is exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample. This blank is used to provide information about contaminants that may be introduced during sample collection, storage, and transport.

Field Duplicates

Field duplicates, or split samples, consist of an additional bottle of sample collected at a randomly selected sample location. The results from the duplicate sample are compared to the results from the primary sample; if the relative percent difference (RPD) between the samples is greater than 35 percent, a thorough evaluation of the samples will be performed to determine whether to take corrective action (to either report the data or resample). Duplicate samples provide precision information for the entire measurement system, including sample acquisition, homogeneity, handling, shipping, storage, laboratory sample preparation, and laboratory analysis.

Rinse Blanks

Rinse blanks were collected for two RPP events, and were analyzed with the environmental samples. Rinse blanks consist of distilled water processed through the sampling equipment using the same procedures used for environmental samples, after decontamination has been performed. Results from these blank samples are examined to ensure that concentrations of constituents of concern are below detection limits. If there are concentrations above the detection limit, then sampling and decontamination procedures will be reevaluated. Results from the rinse blanks represent a total of field and laboratory sources of contamination.

Laboratory QA/QC Samples

Laboratory QA/QC samples are prepared to ensure that the required level of laboratory accuracy is being achieved. Four types of quality control samples are used to determine laboratory accuracy: method blanks, MS/MSDs, LCSs, and surrogate standards.

Method Blanks

Method blanks consist of deionized water that is run through all of the same steps as the environmental samples at the lab. These samples are used to determine the existence of any laboratory sources of contamination.

Matrix Spikes and Matrix Spike Duplicates

MS/MSD samples are collected at the same time as the environmental samples and are spiked at the laboratory with known concentrations of the analyte(s) to be measured. These samples are used to evaluate the effect a particular sample matrix has on the accuracy of the measurement. The MSD sample serves as another check of accuracy and allows calculation of the analysis method's precision. The difference in the measured concentrations of the original sample and the spiked sample is compared with the spike concentration, and a percent recovery (the concentration that the laboratory measures divided by the known concentration of a spiked sample multiplied by 100) of the spiked concentration is reported.

Laboratory Control Spikes

LCSs consist of known concentrations of a constituent in distilled water. The measured concentrations are compared with the spike concentration, and a percent recovery can be determined. Results are acceptable if the percent recovery falls within a predetermined range.

Surrogate Standards

Surrogate standards are samples that have been spiked with an organic compound that is chemically similar to the analyte of interest, but is not expected to occur in the environmental sample. The recovery of the surrogate standard is used to monitor for errors, unusual effects, and other anomalies. Surrogate recovery is evaluated by comparing the measured concentration with the amount added to the sample.

Quality Assurance Objectives

Quality assurance objectives (QAOs) are the detailed QC specifications for precision, accuracy, representativeness, comparability, and completeness. QAOs are used as comparison criteria during data quality review to evaluate whether the minimum requirements have been met and the data can be used as planned. The basis for assessing each element of data quality for this project is discussed in the following subsections.

Precision

Precision is a measure of the reproducibility of analyses under a given set of conditions. Precision is assessed by replicate measurements of field and laboratory duplicate samples. The routine comparison of precision is measured by the RPD between duplicate sample measurements. The overall precision of a sampling event is determined by a sampling component and an analytical component.

The following formula determines the RPD between two samples:

$$RPD = \frac{|D1 - D2|}{(D1 + D2)/2} x100$$

Where:

RPD = relative percent difference
D1 = first sample value
D2 = second sample value (duplicate)

The maximum acceptable RPD for this project is 35 percent.

Accuracy

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed using MS/MSD, LCS, calibration standard, and spiked environmental samples. The accuracy of the data submitted for this project will be assessed in the following manner:

- The percent recovery of LCS, MS/MSD, and spiked surrogates will be calculated and evaluated against established laboratory recovery limits. **Acceptable laboratory recovery limits for this project are 75 to 120 percent.**

Laboratory method blanks will be tested to determine levels of target compounds. If a target compound is found above the method detection limit (MDL) in the method blank corresponding to a batch of samples, and the same target compound is found in a sample, then the data will not be background subtracted but will be flagged to indicate the result in the blank.

Accuracy is presented as percent recovery. Because accuracy is often evaluated from spiked samples, laboratories commonly report accuracy using this formula:

$$\% \text{ Recovery} = R / S * 100$$

Where:

S = spiked concentration
R = reported concentration

The laboratories monitor accuracy by reviewing MS/MSD, LCS, calibration standard, and surrogate spike recovery results.

Representativeness

Representativeness refers to the degree to which sample data accurately and precisely describe the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter that is primarily concerned with the proper design of the sampling program or of the subsampling of a given sample. Representativeness will be assessed by the use of duplicate field and laboratory samples because they provide information pertaining to both precision and representativeness.

Samples that are not properly preserved or are analyzed beyond acceptable holding times will not be considered to provide representative data. Also, detection limits above applicable MCLs or screening criteria will not be considered representative.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable for similar samples collected under like conditions. This goal is achieved through the use of standard techniques to collect and analyze representative samples and reporting analytical results with appropriate units.

Comparability is limited by other analytical control parameters; therefore, only when precision and accuracy are known can data sets be compared with confidence. Using standard operating procedures (SOPs) promotes comparability.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount as expected to be obtained under normal conditions. To be considered complete, the data set must contain all analytical results and data specified for the project. Additionally, all data are compared to project requirements to ensure that specifications are met. Completeness is evaluated by comparing the project objectives to the quality and quantity of the data collected to assess whether any deficiencies exist. Missing data can result from any number of circumstances, ranging from sample acquisition and accessibility problems to sample breakage and rejection of analytical data because of quality control deficiencies. Completeness is quantitatively assessed as the percent of controlled QC parameters that are within limits. Percent completeness for each set of samples for each individual method can be calculated as follows:

$$Completeness = \frac{\text{valid data obtained}}{\text{total data analyzed}} \times 100\%$$

Where:

Valid data are defined as those data points that are not qualified as rejected.

The requirement for completeness is 90 percent for each individual analytical method for all QC parameters except holding times. These QC parameters will include:

- Initial calibration
- Continuing calibrations
- LCS percent recovery
- MS/MSD
- Field duplicate RPDs
- Surrogate percent recoveries

The requirement for holding times is 100 percent. Any deviations are reported in the report narrative.

CWFR QA/QC Sample Results and Analysis

In 2011, one “QC set” was required for each analytical method batch per sampling event. The minimum required samples for chemical analysis were:

- Field blank
- Field duplicate
- MS/MSD
- LCS and laboratory control spike duplicate (LCSD)
- Laboratory blank
- Laboratory duplicate (MS/MSD or LCS/LCSD pair may serve this function).

Note that field duplicates and field blanks are not required for events where only general parameters are collected.

Field QA/QC Samples

Field CWFR QA/QC samples collected during 2011 sampling included field blanks and field duplicates. The dates, events, and sites of these samples are shown in Table 6-1. Results for field QA/QC samples are provided below.

TABLE 6-1
CWFR Field QA/QC Samples, 2011

Sample Date	Sample Event	QA/QC Sample Type(s)
5/10/2011	CWFR Event 1	Field Blank at CBD1 Field Duplicate at CBD1
6/7/2011	Propanil 1	Field Blank at BS1 Field Duplicate at BS1
6/14/2011	CWFR Event 2 Propanil 2	Field Blank at CBD1 Field Duplicate at CBD1
6/21/2011	Propanil 3	Field Blank at CBD5 Field Duplicate at CBD5
6/28/2011	Propanil 4	Field Blank at BS1 Field Duplicate at BS1
7/5/2011	Propanil 5	Field Blank at CBD1 Field Duplicate at CBD1
7/12/2011	Propanil 6	Field Blank at BS1 Field Duplicate at BS1
7/19/2011	CWFR Event 3 Propanil 7	Field Blank at BS1 Field Duplicate at BS1
7/26/2011	Propanil 8	Field Duplicate at BS1 Field Duplicate at BS1
8/23/2011	CWFR Event 4	None (Sampling event was for general parameters only)

Field Blanks

Field blank samples were collected and analyzed for the same constituents as the environmental samples. The results for the field blanks were below the MRLs for all analytes (Table 6-2).

Field Duplicates

Field duplicate samples were collected and analyzed for the same constituents as the primary environmental samples. Results between primary and duplicate samples were similar, as was expected (Table 6-2).

TABLE 6-2
2011 CWFR Field Blank and Field Duplicate Results

Field Blank Results

Sample Event	Sample Location	Analyte: Dissolved Copper (MRL = 0.5 µg/L)	Analyte: Propanil (MRL = 0.5 µg/L)
CWFR Event 1	CBD1	ND	--
Propanil 1	BS1	--	ND
CWFR Event 2	SSB	ND	--
Propanil 2	CBD1	--	ND
Propanil 3	CBD5	--	ND
Propanil 4	BS1	--	ND
Propanil 5	CBD5	--	ND
Propanil 6	BS1	--	ND
Propanil 7	BS1	--	ND
Propanil 8	SSB	--	ND

Primary and Duplicate Results

Sample Event	Sample Location	Dissolved Copper (MRL = 0.5 µg/L)		Propanil (MRL = 0.1 µg/L)	
		Primary	Duplicate	Primary	Duplicate
CWFR Event 1	CBD1	2.5	2.6	--	--
Propanil 1	BS1	--	--	ND<0.20	ND<0.20
CWFR Event 2	SSB	3.0	2.8	--	--
Propanil 2	CBD1	--	--	ND<0.50	ND<0.50
Propanil 3	CBD5	--	--	6.5	6.8
Propanil 4	BS1	--	--	1.8	*
Propanil 5	CBD5	--	--	0.75	0.81
Propanil 6	BS1	--	--	0.49	0.48
Propanil 7	BS1	--	--	ND<0.20	ND<0.20
Propanil 8	SSB	--	--	ND<0.20	ND<0.20

Notes:

-- = not scheduled during that sampling event
* = Sample was recorded as broken by the lab; Kleinfelder was not alerted to this during the holding time, so the backup sample was not usable. Lab has been informed of proper procedure in case of future broken samples.
ND = non-detect above the MRL

Laboratory QA/QC Samples

The laboratory QA/QC samples included method blanks, matrix spikes, LCSs, and surrogate standard samples; the results for each follow.

Method Blank

Method blank samples were prepared by the laboratory and tested for the same analytes as the environmental samples. The results of all the method blank samples were below the MRL (non-detect) for these analytes (Table 6-3).

TABLE 6-3
2011 CWFR Method Blank Results

	Analyte (MRL)				
Sample Event	**TDS (10 mg/L)**	**TOC (1.0 mg/L)**	**Hardness (1.0 mg $CaCO_3$/L)**	**Copper (1.0 µg/L)**	**Propanil (0.1 µg/L)**
CWFR Event 1	ND	ND	ND	ND	--
CWFR Event 2	ND	ND	ND<1.0	ND	--
Propanil 1	--	--	--	--	ND
Propanil 2	--	--	--	--	ND
Propanil 3	--	--	--	--	ND
Propanil 4	--	--	--	--	ND
Propanil 5	--	--	--	--	ND
CWFR Event 3	ND	ND	--	--	--
Propanil 6	--	--	--	--	ND
Propanil 7	--	--	--	--	ND
Propanil 8	--	--	--	--	ND
CWFR Event 4	ND	ND	--	--	--

Notes:

-- = not scheduled during that sampling event
ND = non-detect above the MRL

MS/MSD

MS and MSD samples were prepared and analyzed for every 2011 sampling event (Table 6-4). All recoveries and RPD values were within the acceptable range.

LCS

LCS samples were prepared and analyzed for every 2011 sampling event. The recoveries and RPD percentages for all samples were within the acceptable limits (Table 6-5).

TABLE 6-4
2011 Laboratory MS/MSD Samples

Sample Event	Analyte	Spike Level (µg/L)	Matrix Result (µg/L)	Spike Recovery (%)	Duplicate Recovery (%)	Recovery Limits	RPD (%)	RPD Limits
CWFR Event 1	Hardness (MS1)	166	160	91	89	75-120	0.8	35
	Hardness (MS2)	166	148	99	100	75-120	0.3	35
	TOC	10.0	6.48	108	111	75-120	2	35
	Copper (MS1)	100	2.48	101	105	75-120	3	35
	Copper (MS2)	100	24.6	100	100	75-120	0.1	35
Propanil 1	Propanil	1	ND<0.20	96.8	96.6	75-120	0.22	35
CWFR Event 2 Propanil 2	Hardness (MS1)	166	87.9	98	94	75-120	3	35
	TOC	10.0	ND	104	107	75-120	3	35
	Copper (MS1)	100	3.91	102	97	75-120	5	35
	Copper (MS2)	100	1.10	93	86	75-120	8	35
	Propanil	1	ND<0.50	90.4	91.8	75-120	1.5	35
Propanil 3	Propanil	1	6.5	105	110	75-120	0.67	35
Propanil 4	Propanil	1	1.8	94.2	100	75-120	2.1	35
Propanil 5	Propanil	1	0.75	91	87.3	75-120	2.3	35
Propanil 6	Propanil	1	0.49	91.5	91	75-120	0.35	35
CWFR Event 3 and Propanil 7	TOC	10.0	6.68	106	106	75-120	0.1	35
	Propanil	1	ND<0.20	91.6	92.4	75-120	0.84	35
Propanil 8	Propanil	1	ND<0.20	98	99.7	75-120	1.7	35
CWFR Event 4	TOC	10.0	5.32	92	108	75-120	11	35

Note:

ND = non-detect

TABLE 6-5
2011 CWFR Lab Control Spikes (LCS)

Sample Event	Analyte	Spike Level (µg/L)	Spike Recovery (%)	Duplicate Recovery (%)	Recovery Limits	RPD (%)	RPD Limits
CWFR Event 1	Hardness	166	97	98	75-120	1	35
	TOC	10.0	107	99	75-120	8	35
	Copper	100	116	108	75-120	7	35
Propanil 1	Propanil	1	94	95.3	75-120	1.3	35
CWFR Event 2 Propanil 2	Hardness	166	97	97	75-120	0.6	35
	TOC	10.0	98	100	75-120	2	35
	Copper	100	114	112	75-120	2	35
	Propanil	1	91.3	95.4	75-120	4.3	35
Propanil 3	Propanil	1	100	102	75-120	1.3	35
Propanil 4	Propanil	1	96.2	96.9	75-120	0.71	35
Propanil 5	Propanil	1	93	93.5	75-120	0.50	35
Propanil 6	Propanil	1	93.4	97.6	75-120	4.4	35
CWFR Event 3 and Propanil 7	TOC	10.0	92	94	75-120	2	35
	Propanil	1	96.8	90.7	75-120	6.6	35
Propanil 8	Propanil	1	104	100	75-120	3.6	35
CWFR Event 4	TOC	10.0	92	88	75-120	5	35

Surrogate Standard

Surrogate standard samples were prepared for analysis with each propanil sample batch. All the surrogate standards fell within the QAPP recovery limits (Table 6-6).

TABLE 6-6
2011 CWFR Surrogate Standard Sample Results

Sample Event	Sample Location	Surrogate Recovery Results (%) Carbazole (EPA 532) (65-135)*
Propanil 1	SSB	90
	BS1-Dup	94
	BS1	95
	BS1-FBL	94
	CBD5	93
	CBD1	81
	F	96

TABLE 6-6
2011 CWFR Surrogate Standard Sample Results

Sample Event	Sample Location	Surrogate Recovery Results (%) Carbazole (EPA 532) (65-135)*
Propanil 2	BS1	101
	F	107
	CBD5	101
	CBD1	101
	CBD1-Dup	100
	CBD1-FBL	98
	SSB	97
Propanil 3	SSB	102
	BS1	104
	F	95
	CBD5	104
	CBD5-Dup	106
	CBD5-FBL	102
	CBD1	110
Propanil 4	SSB	108
	BS1	107
	BS1-FBL	106
	F	106
	CBD5	110
	CBD1	106
Propanil 5	SSB	85
	BS1	87
	F	86
	CBD5	84
	CBD5-Dup	86
	CBD5-FBL	84
	CBD1	90
Propanil 6	SSB	85
	BS1	84
	BS1-Dup	82
	BS1-FBL	86
	F	88
	CBD5	83
	CBD1	81

TABLE 6-6
2011 CWFR Surrogate Standard Sample Results

Sample Event	Sample Location	Surrogate Recovery Results (%) Carbazole (EPA 532) (65-135)*
Propanil 7	BS1	85
	BS1-Dup	87
	BS1-FBL	86
	F	87
	CBD5	86
	CBD1	87
	SSB	86
Propanil 8	BS1	87
	SSB	87
	SSB-Dup	89
	SSB-FBL	88
	F	90
	CBD5	88
	CBD1	91

*Control limits

FBL = field blank

DUP = duplicate

Analysis of Precision

Field duplicate samples were collected during the first two CWFR events and all propanil events for each matrix and analyzed for each primary analyte. Duplicate results were found to be consistent with the original matrix results. Field duplicate results are presented in Table 6-2.

MS/MSD sample sets were prepared and analyzed for every sampling event during the 2011 season. All the sample sets had acceptable RPD limits for all analytes. MS/MSD results and RPD values are presented in Table 6-4.

LCS samples were prepared and analyzed for every sampling event during the 2011 season. The RPD percentages for all samples were within the acceptable limits. LCS results and RPD values are presented in Table 6-5.

Analysis of Accuracy

Field blank samples were utilized during each sampling event, and were analyzed for each primary analyte. All field blank samples were found to have analyte levels below the MRLs. Field blank results are presented in Table 6-2.

Method blank samples were run with every batch of analytical samples. All method blank samples were found to have analyte levels below the MRLs. Method blank results are presented in Table 6-3.

MS and MSD samples were prepared and analyzed for every sampling event during the 2011 season. All MS/MSD results were within the acceptable recovery limits (Table 6-4).

LCS samples were prepared and analyzed for every sampling event during the 2011 season. All LCS results were within the acceptable recovery limits (Table 6-5).

Surrogate standard samples were prepared for analysis with the propanil samples from each propanil event. All the surrogate standards fell within the required recovery limits (Table 6-6).

Analysis Summary

All QA/QC samples were within acceptable limits during 2011.

RPP QA/QC Sample Results and Analysis

As described in Section 5, the registrant, Valent Dublin Laboratory analyzes thiobencarb samples. In addition, the CRC submits QA/QC samples to CLS throughout the monitoring season.

During each QC sampling event, two sets of samples were collected. One set was sent to the analyte-specific laboratory (Valent), and the other set was sent to the CLS laboratory for comparison.

The field RPP QA/QC samples are shown in Table 6-7. In addition to the field QA/QC samples, analytical laboratories typically perform method blank, LCS, and surrogate standard analyses with each event.

TABLE 6-7
RPP Field QA/QC Samples, 2011

Sample Date	Sample Event	QA/QC Sample Type
5/17/2011	RPP W2D1	Field duplicate at CBD5
5/31/2011	RPP W4D1	Rinse blank at CBD5
6/2/2011	RPP W4D2	Blind spikes at SSB Field duplicate at SSB
6/7/2011	RPP W5D1	Field duplicate at BS1
6/9/2011	RPP W5D2	Field duplicate at SR1
6/14/2011	RPP W6D1	Rinse blank at CBD1
6/16/2011	RPP W6D2	Blind spikes at BS1 Field duplicate at BS1
6/23/2011	RPP W7D2	Field duplicate at SSB

Field QA/QC Samples

Field QA/QC samples collected during the 2011 season included rinse blank, field duplicate, and MS/MSD samples; the results for each follow.

Rinse Blank

Rinse blank samples were collected twice during the sampling season, at the W4D1 and the W6D1 sampling events. The results for all rinse blank samples were below the MDL for thiobencarb (Table 6-8).

TABLE 6-8
2011 RPP Comparison of Rinse Blank Samples to Primary Samples

Sample Date	Sample Event	Monitoring Site	Sample Type*	Thiobencarb (µg/L)
5/31/2011	RPP W4D1	CBD5	Primary	0.48
			Rinse	ND
6/14/2011	RPP W6D1	CBD1	Primary	0.30
			Rinse	ND

*Primary thiobencarb samples were analyzed at Valent Dublin Laboratories, and rinse samples were analyzed at CLS.

Field Duplicate

Field duplicate samples were collected during six RPP sampling events (Table 6-9). Although the primary and duplicate samples are analyzed at two different labs, all sample pairs yielded similar results for the primary and duplicate samples.

TABLE 6-9
2011 RPP Field Duplicate Results

Sample Date	Sample Event	Monitoring Site	Sample Type*	Thiobencarb (µg/L)
5/17/2011	RPP W2D1	CBD5	Primary	<0.5
			Duplicate	ND
6/2/2011	RPP W4D2	SSB	Primary	<0.5
			Duplicate	ND
6/7/2011	RPP W5D1	BS1	Primary	<0.5
			Duplicate	ND
6/9/2011	RPP W5D2	SR1	Primary	<0.5
			Duplicate	ND
6/16/2011	RPP W6D2	BS1	Primary	<0.5
			Duplicate	ND
6/23/2011	RPP W7D2	SSB	Primary	<0.5
			Duplicate	ND

TABLE 6-9
2011 RPP Field Duplicate Results

Sample Date	Sample Event	Monitoring Site	Sample Type*	Thiobencarb (µg/L)

*Primary samples are analyzed at Valent Dublin Laboratories, and duplicate samples were analyzed at CLS.

Note:

Reporting limit for both labs is 0.5 µg/L.

MS/MSD

Matrix (environmental) spike samples were collected during the W4D2 and W6D2 sampling events. These samples were spiked by Kleinfelder and submitted to the laboratory with fictitious sample site identification for analysis for thiobencarb (Table 6-10).

TABLE 6-10
Matrix Spike Sample Results, RPP 2011

Sample Date	Sample Event	Sample Location	Lab	Spike Level (µg/L)	Spike Result (µg/L)	Spike Recovery (Percent)	Recovery Limits
6/2/2011	W4D2	CRC1*	Valent	1.5	1.7	113	75–120
			CLS	1.5	1.8	120	75–120
6/16/2011	W6D2	CRC1*	Valent	1.0	1.3	**130**	75–120
			CLS	1.0	1.4	**140**	75–120

Notes:

Bold indicates values that do not meet QAPP recovery limits.
Reporting limit for both labs = 0.5 µg/L.
*CRC1 is a fictitious sample location name given to the spike samples for laboratory analysis.

An RPD value could not be calculated for these samples because the two sets of values for each analyte were spiked and analyzed at different laboratories.

Both samples from the W6D2 event had recovery percentages outside the acceptable range for recovery limits.

Laboratory QA/QC Samples

The laboratory QA/QC samples included method blanks, LCSs, and surrogate standard samples; the results for each follow.

Method Blank

Method blank samples were prepared and tested for the same analytes as the environmental samples. The values below are for the CLS analysis. All samples had values below the MRL for thiobencarb (Table 6-11).

TABLE 6-11
Method Blank Results (CLS), RPP 2011

Sample Date	Sample Event	Thiobencarb (MRL = 0.50 µg/L)
5/17/2011	W2D1	ND
5/31/2011	W4D1	ND
6/2/2011	W4D2	ND
6/7/2011	W5D1	ND
6/9/2011	W5D2	ND
6/14/2011	W6D1	ND
6/16/2011	W6D2	ND
6/23/2011	W7D2	ND

Laboratory Control Spikes

LCS samples were utilized at both laboratories as an internal QC for the data. The results of both laboratories' LCS samples are included in Table 6-12.

TABLE 6-12
2011 RPP Laboratory LCS/LCSD Samples (Thiobencarb)

Event	Lab	Spike Level (µg/L)	Matrix Result (µg/L)	Spike Recovery (%)	Duplicate Recovery (%)	Recovery Limits	RPD (%)	RPD Limits
W1D1	Valent	1.0	NR	103.3	103.6	75-120	0.3	35
W2D1	Valent	1.0	NR	99.8	107.1	75-120	7.1	35
	CLS	5.00	NR	**143**[a]	**142**[a]	75-120	0.1	35
W3D1	Valent	1.0	NR	103.7	106.6	75-120	2.8	35
W4D1 & W4D2	Valent	1.0	NR	103.8	102.3	75-120	1.5	35
	CLS (D1)	5.00	NR	109	102	75-120	7	35
	CLS (D2)	5.00	NR	**133**[a]	95	75-120	34	35
W5D1 & W5D2	Valent	1.0	NR	101.6	89.0[b]	75-120	13.2	35
	CLS	5.00	NR	104	84	75-120	21	35
W6D1 & W6D2	Valent	1.0	NR	98.7	98.7	75-120	0	35
	CLS	5.00	NR	101	109	75-120	7	35
W7D1 & W7D2	Valent	1.0	NR	99.1	101.4	75-120	2.3	35
	CLS (W2)	5.00	NR	101	93	75-120	8	35
W8D1	Valent	1.0	NR	102.7	101.0	75-120	1.7	35
W9D1	Valent	1.0	NR	90.0	101.0	75-120	11.5	35

[a]CLS's spike and/or duplicate recoveries were above acceptable limits; however, because the associated environmental sample result was ND, a reanalysis was not performed.
[b]Valent Laboratories reported a small spill during preparation of the spike duplicate extract sample, however the RPD was still within range, so no corrective action was taken.

Note:

NR = no value reported

Valent Laboratories. LCS samples were spiked with thiobencarb and analyzed at Valent Laboratories for selected sampling events. The RPD percentages and recovery limits for all samples were within acceptable ranges.

CLS. LCS samples were analyzed at the secondary QA/QC laboratory, CLS, for selected sampling events. The RPD percentages for all samples were within acceptable ranges; however, a few samples had recovery limits outside the QAPP acceptable range. These samples included the spike and spike duplicate results from W2D1, and the spike result from W4D2. After the second occurrence of out-of-range samples, a corrective action report was issued (attached to results for the W4D2 event; Appendix C-3). Following consultation among CH2M HILL, Kleinfelder, and CLS, it was decided that a second bottle of sample would be provided to allow for reruns if out-of-range QA/QC samples occurred. No subsequent results were out of range.

Surrogate Standard

Surrogate standard samples were prepared by CLS for analysis with the environmental samples. All sample results were within the acceptable recovery limits except for the surrogate for the W4D1 event. The result was below the control limits; however, lack of sample prevented a rerun. In the future, a re-extraction/analysis will be performed when the QC control limits have not been met (Table 6-13).

TABLE 6-13
Surrogate Standard Results, RPP 2011

Sample Date	Sample Event	Sample Location	Surrogate Recovery Results (%) EPN (65-135)*
5/17/2011	W2D1	CBD5	91
5/31/2011	W4D1	CBD5	**53**
6/2/2011	W4D2	SSB	117
		CRC1	124
6/7/2011	W5D1	BS1	82
6/9/2011	W5D2	SR1	79
6/14/2011	W6D1	CBD1	73
6/16/2011	W6D2	BS1	71
		CRC1	74
6/23/2011	W7D2	SSB	66

*Control limits

Note:
EPN is CLS's surrogate.

Analysis of Precision

Duplicates were collected for both CWFR and RPP monitoring. Duplicates for CWFR were analyzed at the same lab. Duplicates for the thiobencarb sampling were uniquely processed, with the primary and duplicate samples analyzed at different laboratories (primary samples at Valent, duplicate samples at CLS). Although this prevents a direct comparison of results from within a site, it allows a comparison of laboratories.

A field duplicate sample was collected during six of the fourteen sampling events. Although the primary and duplicate samples were analyzed at two different laboratories, all sample pairs yielded similar results for the primary and duplicate samples. This shows good correlation between the two laboratories used for this analysis. Field duplicate results are presented in Table 6-9.

MS/MSD samples were utilized for each matrix during the W4D2 and W6D2 sampling events. Although two samples for each analyte were taken at each event, the samples were spiked and analyzed at different laboratories, making an RPD comparison inappropriate. MS/MSD results are presented in Table 6-10.

LCS samples were prepared at MAI and CLS for the W1D1, W2D1, W3D1, W4D1&D2, W5D1&D2, W6D1&D2, W7D1&D1, W8D1, and W9D1 sampling events. All LCS sample results from both laboratories fell within the acceptable RPD limits for thiobencarb. LCS sample results are presented in Table 6-12.

Analysis of Accuracy

Rinse blank samples were collected twice during the 2011 sampling season, at the W4D1 and W6D1 sampling events. All rinse blank samples were found to have analyte levels below the MRLs. Rinse blank results are presented in Table 6-8.

Method blank samples were run with every batch of analytical samples. All method blank samples were found to have analyte levels below the MRLs. Method blank results are presented in Table 6-11.

MS/MSD samples were prepared for the W4D2 and W6D2 sampling events. Both samples from W6D2 had recovery percentages above the acceptable range. MS/MSD results and recovery limits are presented in Table 6-10.

All LCS samples analyzed at Valent had recovery limits within the acceptable range; however, two LCS sets analyzed at CLS had recoveries outside acceptable ranges (W2D1, W4). A corrective action report was issued. As follow-up, CLS requested that more sample water be sent so a rerun could be performed if necessary. Valent samples met the LCS requirements and should be considered the primary dataset for the W2D1 and W4 events. LCS sample results are presented in Table 6-12.

Surrogate standard samples were evaluated with the analytical samples at CLS. All sample results were within the acceptable recovery limits except for the surrogate for the W4D1 event. The result was below the control limits; however, lack of sample prevented a rerun. In the future, a re-extraction/analysis will be performed when the QC limits have not been met (Table 6-13).

Analysis Summary

The following summarizes the results of the QA/QC analysis performed on the RPP data:

- Primary and duplicate samples were analyzed at two different laboratories, making a comparison for RPD inappropriate.
- MSD samples were not submitted for analysis to each laboratory in conjunction with MS samples. Rather, the submittal of MS samples to CLS provided an in-lieu MSD for the MS samples submitted to Valent.
- Both MS samples from W6D2 had recovery percentages outside the acceptable range. The recoveries for those samples were above the acceptable recovery range.
- Some of the LCS samples from the secondary QA/QC laboratory CLS had recovery limits outside the acceptable range. It is noted that the primary Valent samples met the LCS requirements and should be considered the primary dataset for the LCS sets flagged above.
- Surrogate standard samples were run at CLS. Nearly all the samples had recoveries within acceptable limits; one sample was below acceptable limits.

Chains of Custody

COC forms documented sample possession from the time of field sampling until the time of laboratory analysis. A COC form was completed after sample collection at each sample event and prior to sample shipment or release. The COC record forms were completed with indelible ink. Unused portions of the form were crossed out and initialed by the sampler. The COC form, sample labels, and field documentation were cross-checked to verify sample identification, type of analyses, sample volume, and number and type of containers.

COC forms for the CWFR and RPP monitoring programs are included in Appendixes B-1 and C-1, respectively.

SECTION 7

Summary and Recommendations

The CRC implemented water quality monitoring and reporting activities in compliance with the following two programs of the CVRWQCB:

- CWFR monitoring and reporting, pursuant to MRP Order R5-2010-0805 issued under the CVRWQCB's *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands.* The monitoring and reporting requirements for the 2011 CWFR are specified in CRC MRP, under Resolution No. R5-2006-0053 as amended by R5-2006-0077.
- RPP pursuant to the Conditional Prohibition of Discharge requirements specified in the Basin Plan. Monitoring and reporting requirements for the 2010 RPP are specified in CVRWQCB Resolution No. R5-2010-9001.

Each program is summarized below, and recommendations are included.

CWFR

CWFR monitoring included field assessment of field parameters, including temperature, DO, pH, and EC. Lab analyses were conducted as required for TDS, TOC, hardness, and dissolved copper. Propanil monitoring was conducted under the voluntary Propanil Management Plan at four core sites and assessment Site F. The following summarizes the CWFR water quality results:

- **Temperature:** Temperature results indicate warm water conditions during the monitoring season. Core site temperatures were consistent with results observed in previous years. Water temperatures track with observed air temperatures. Peak temperatures were observed during the June monitoring event, with a high of 80.3°F.
- **DO:** DO results were generally consistent with observations in previous years. DO typically trended above the 6 mg/L warm water standard. Low DO (less than the WARM WQO of 5 mg/L) was observed at one event in 2011, CBD1 at the June event.
- **pH:** There was only one observation outside the 6.5 to 8.5 WQO range during 2011; the CBD1 sample from the June event had a pH of 4.55.
- **EC:** The 2011 sampling season yielded one sample with an EC greater than 700 µmhos/cm; the CBD1 sample from the June event had an EC of 761 µmhos/cm.
- **TDS:** TDS samples were collected at core sites at all CWFR events. TDS was generally highest in June. The maximum observed TDS was 470 mg/L, at CBD1 in June.
- **TOC:** TOC samples were collected at core sites at all CWFR events. TOC was generally lowest in May and highest in June. The maximum observed TOC was 19 mg/L at both CBD5 and CBD1 in June, while all other observed TOC values were less than 8.0 mg/L.

- **Copper and Hardness:** Samples from the first two events were analyzed for hardness and dissolved copper, in accordance with the MRP. The 1-hour and 4-day CTR hardness-adjusted copper criterion also were calculated based on the actual hardness measured for the sample location and date. All the copper samples taken during the 2011 monitoring season fell below the 1-hour and 4-day criteria.

- **Propanil Management Plan:** Eight consecutive weeks of propanil sampling were completed in 2011. All results were below trigger values.

Assessment of the 2011 CWFR Program

This year represents the seventh full year of the CWFR program. The key successes and challenges faced during 2011 program implementation are summarized as follows:

- Water quality results as compared to trigger values did not trigger resampling or management plan actions.

- Late rains and unseasonable cool weather resulted in an atypical year for rice production. Late rains delayed planting, and cool weather postponed plant maturity, resulting in a later harvest.

- Monitoring and assessment were conducted in accordance with the requirements of the MRP and Propanil Management Plan. Regularly scheduled CWFR sampling was conducted as required under the MRP. This sampling included core site analysis for field parameters (temperature, DO, pH, electrical conductivity, and flow), core sampling for lab parameters (TOC and TDS), core site analysis for dissolved copper and hardness during the first two events, and propanil sampling and analysis during a eight week period consistent with the use period.

- CWFR water quality monitoring was conducted at four core sites. Dissolved copper was included during the first two events in 2011 to provide for comparison to CTR criteria, which use dissolved copper as the basis of calculation. This effort satisfies the MRP requirement for implementation of a phased core/assessment monitoring regime, which includes assessment monitoring on a 3-year cycle. Assessment monitoring will next take place in 2012.

- The CRC continued to implement a Surface Water Ambient Monitoring Program (SWAMP)-compliant electronic data submittal system, including laboratory prepared SWAMP-compliant Electronic Data Reports for chemistry analyses. The CRC submitted results to the CVRWQCB on a regular basis to provide for real-time discussion of results, their potential implications, and appropriate management actions.

- The CRC's SWAMP-compliant QAPP was updated in 2010, and was implemented in 2011.

- Review of field and laboratory QA/QC samples indicates substantial achievement of quality objectives.
    - All field blank samples were found to have analyte levels below the MRLs. Field duplicate sample results were consistent with primary sample results.

  - Laboratory QA/QC substantially achieved data quality objectives. Method blanks achieved data quality objectives, with all results non-detect, as expected. MS/MSD and LCS samples achieved data quality objectives, with all recoveries and RPD values within the target range.

- Propanil analysis demonstrated that management practices are substantially protecting water quality, with results two orders of magnitude below trigger limits that would indicate continued assessment monitoring or additional implementation actions.
- Core monitoring sites for trend monitoring of rice water quality impacts continue to be appropriate because of the uniformity of rice farming practices across the valley. Rice water management and rice water quality management practices are relatively consistent throughout the valley: The same sets of field preparation, irrigation, and harvest practices are available to growers. Additionally, the water hold requirements apply to all rice growers, leaving little variation in the methods of rice farming from the various drainage areas.
- Implementation of management practices continued in 2011, including water hold requirements; education and outreach (newsletters and grower meetings); stakeholder involvement with enforcement activities; and coordination with the UCCE, UC Davis, and the Rice Research Board. Additionally, the CRC has the ability to directly contact each of its members and is committed to using its outreach capabilities to address water quality concerns when they are identified.
- The CRC continues to be engaged in the CVRWQCB's efforts to refine the Irrigated Lands Regulatory Program through its regular consultation with CVRWQCB staff and through its participation in the CVRWQCB's Technical Issues Committee, CV-SALTS Salinity Coalition, Central Valley Pesticide Total Maximum Daily Load and Basin Plan Amendment, and Drinking Water Policy Workgroup.

CWFR Recommendations for 2012

- The CRC's 2011 monitoring satisfies the MRP requirements for a phased monitoring regime that includes assessment and core monitoring on a 3-year cycle. Consistent with the MRP, it is recommended that monitoring in 2012 include assessment monitoring parameters at assessment sites. Specific parameters included in the assessment regime should be identified in consultation with CVRWQCB staff and in consideration of existing water quality monitoring data.
- It is recommended the results of the Propanil Monitoring Plan be evaluated collaboratively with CVRWQCB staff. It is also recommended that the CRC continue implementation of its propanil outreach.
- Close consultation with CVRWQCB staff regarding the program should continue in an effort to refine the program to focus on identified water quality concerns and appropriate implementation actions, if warranted. The CVRWQCB is developing a Long-Term Irrigated Lands Regulatory Program (LT-ILRP), scheduled for Board consideration in 2012. The CRC anticipates developing a rice-specific MRP under the LT-ILRP.

RPP

The results of all monitoring of drinking water intakes and the SR1 river site during 2011, including intake monitoring conducted by the cities of Sacramento and West Sacramento and RPP monitoring conducted by CRC, showed thiobencarb concentrations below the drinking water MCL and Basin Plan Performance Goals. These results demonstrate that existing management practices, including water holds and other use restrictions, are protective of water quality.

Assessment of the 2011 RPP Program

- The RPP continues to be an example of an effective agricultural water quality regulatory program. The RPP implements an aggressive monitoring schedule designed to focus sampling activities during the 10 weeks of peak thiobencarb use to demonstrate compliance with the Basin Plan's Conditional Prohibition of Discharge.
- There were no exceedances of the thiobencarb Basin Plan Performance Goal or the secondary MCL.
- The CRC's RPP monitoring schedule continues to provide a rigorous sampling regime designed to rapidly assess compliance with the thiobencarb Performance Goal and the effectiveness of management practices.
- Water holds and other management practices implemented by rice growers and the CRC continue to be critical to protect water quality. Additional holiday and weekend CAC inspections continued to be funded by the CRC, consistent with the CVRWQCB Resolution.
- Two new management practices were required initially required 2010, pursuant to Resolution No. R5-2010-9001, and were implemented again in 2011. These new management practices are included verbatim below and the CRC's 2010 implementation of these practices is described in the next bullet.

  1)b). The California Rice Commission will provide additional outreach on results from 2009 thiobencarb monitoring and required management practices to pesticide applicators. This outreach will include, but not be limited to, clarification of hold time requirements, application rates, proper application procedures, and notification of the finding of elevated thiobencarb levels in the Sacramento River near drinking water intakes. The California Rice Commission will also contact ten thiobencarb dealers and distributors in the Sacramento River Basin to discuss the Rice Pesticides Program and possible areas of improvement."

  1)c). The California Rice Commission will increase the funding of additional county surveillance at non-traditional hours to double the level of 2009 and extend the program to counties not previously funded. Surveillance inspections will increase to approximately 1.5 times the current level with the new funding."

- As in 2010, management practices were implemented as follows:

  1)b). The CRC was successful in increasing outreach to the dealers and distributors in order to identify possible areas of improvement. The dealers and distributors confirmed that they attended the Mandatory Thiobencarb Stewardship Meeting and could not identify any improvements to the RPP.

1)c). The additional surveillance inspections were specific to the major rice growing counties (Butte, Colusa, and Glenn) at the time of implementation. For the 2010 growing season, the CRC approached other rice -growing counties to determine their interest in participating in the surveillance program. Sacramento and Tehama counties declined because of the limited rice acreage remaining in the counties. Sutter County declined to participate directly in the surveillance program, but committed 20 percent inspection time to the RPP through the Pesticide Use Enforcement set of goals and objectives with DPR. The counties participating in the additional inspections for 2011 include Butte, Colusa, Glenn, Placer, Yolo, and Yuba.

RPP Recommendations for 2012

- The CRC should continue to implement aggressive efforts to implement additional, industry outreach and education to growers, pest control advisors (PCAs), applicators, dealers, and distributors during the 2012 season, as was accomplished early in the 2011 season. Examples include:
  - Continuance of the mandatory thiobencarb stewardship meetings
  - Close coordination with the CACs
  - Outreach via the CRC newsletter and website
  - Maintenance of the ongoing relationships with applicators and PCAs
  - A continued outreach focus on management practices for Bolero UltraMax, which is the newer formulation of thiobencarb
  - Grower implementation of measures to effectively manage thiobencarb discharges, as detailed in the CVRWQCB Resolution and the DPR Permit Conditions
- The CRC plans to continue the approved recommendations as outlined in Resolution No. R5-2010-9001. From experience in managing the RPP and communication with the CACs, the CRC recognizes additional refinement in the following program areas:
  - Coordination with DPR by providing feedback on updating documents that define the water holding and early/emergency release requirements to the CACs
  - Reminding the CACs to provide DPR with the rice pesticide use data by October 31
- It is recommended that the CRC continue to implement RPP water quality monitoring and reporting activities consistent with the program implemented during 2008 and renewed and approved in 2010 through Resolution No. R5-2010-9001. The results of this monitoring confirm compliance with Basin Plan requirements.
- The CRC will continue its stakeholder outreach activities, including collaboration with the cities, DPR, CACs, and the CVRWQCB.

SECTION 8

References

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