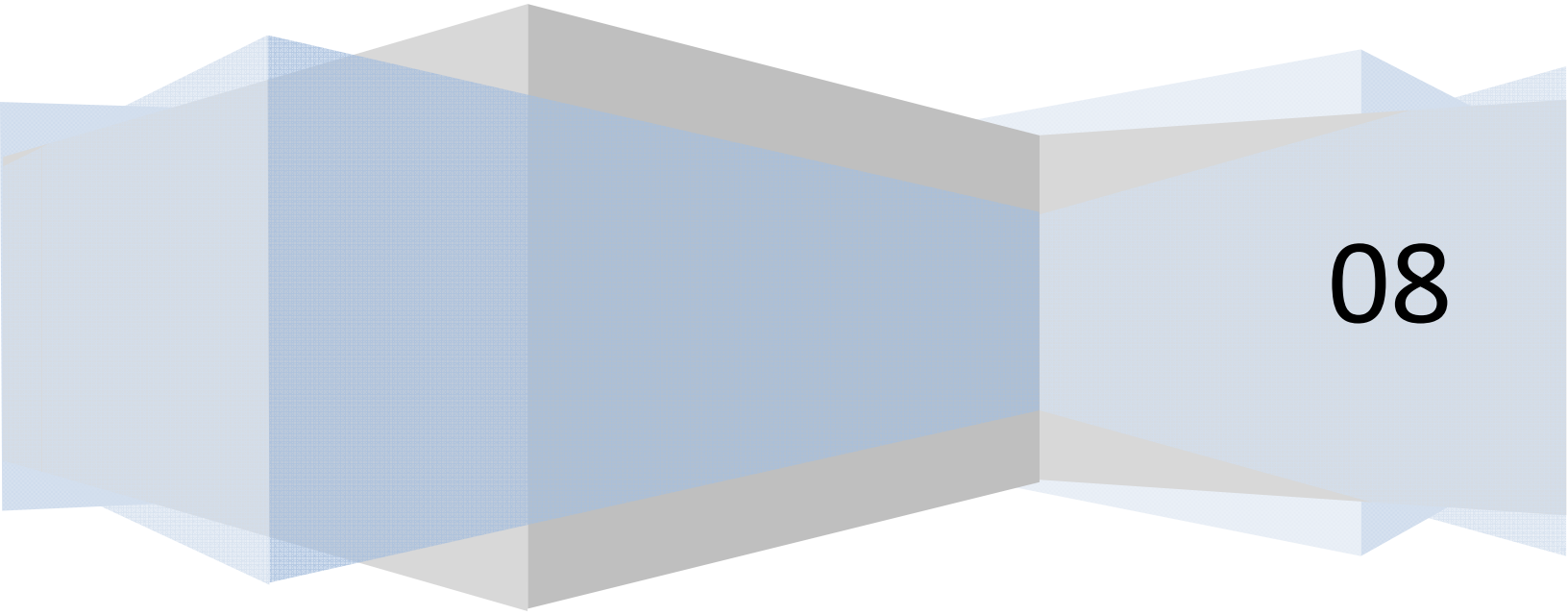
Management Plan

East San Joaquin Water Quality Coalition

Submitted on September 30, 2008

Irrigated Lands Regulatory Program
Central Valley Regional Water Quality Control Board



08

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FIGURE XV-3. POUNDS OF COPPER APPLIED WITHIN THE HIGHLINE CANAL @ LOMBARDY AVE SITE SUBWATERSHED BY MONTH FOR 2005-2007. ASTERISK (*) DENOTES MONTHS WITH EXCEEDANCES. 345

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List of Acronyms

AI	Active Ingredient
APN	Assessor Parcel Number
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BU	Beneficial Use
CURES	Coalition for Urban and Rural Environmental Stewardship
CVRWQCB	Central Valley Regional Water Quality Control Board
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DFG	(California) Department of Fish and Game
DHS	(California) Department of Health Services
DO	Dissolved Oxygen
DPR	(California) Department of Pesticide Regulation
DWR	(California) Department of Water Resources
E	Environmental sample
EC	Specific Conductance
EC_{50}	Effective Concentration of 50% of the measured endpoint
EQIP	Environmental Quality Incentives Program
ESJWQC	East San Joaquin Water Quality Coalition
EPA	Environmental Protection Agency
ILRP	Irrigated Land and Regulatory Program
IPM	Integrated Pesticide Management
IRIS	Integrated Risk Information System
K_{oc}	Organic Carbon Partitioning Coefficient
LC_{50}	Lethal Concentration at 50% mortality
MCL	Maximum Contaminant Level
MLJ-LLC	Michael L. Johnson, LLC
MP	Management Plan (monitoring)
MPN	Most Probable Number
MRP	Monitoring and Reporting Program Order No. R5-2005-00833
MUN	Municipal and Domestic Supply (beneficial use)
NA	Not Applicable
ND	Not Detected
NiCd	Nickel-cadmium
NM	Normal Monitoring
OP	Organophosphate
PAM	Polyacrylamide
PCA	Pesticide Control Advisor

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pH	Power of Hydrogen
PUR	Pesticide Use Report
QAPP	Quality Assurance Project Plan
RB	Regional Board
RfD	Reference Dose
SAMR	Semi-Annual Monitoring Report
SG	Statistically significantly different from control; Greater than 80% threshold
SL	Statistically significantly different from control; Less than 80% threshold
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRS	Township, Range, Section
UC	University of California
USEPA	United States Environmental Protection Agency
WQG	Water Quality Guidelines
WQTL	Water Quality Trigger Limit

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List of Units

cfs	cubic feet per second
L	Liter
lbs	pounds
mg	milligram
NTU	Nephelometric Turbidity Units
ppm	parts per million
sec	second
TUa	Toxic Unit (acute)
TUc	Toxic Unit (chronic)
µg	microgram

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INTRODUCTION

As required by the California Regional Water Quality Control Board Central Valley Region Monitoring and Reporting Program Order No. R5-2008-0005 for Coalition Groups (MRP Order) under Amended Order No. R5-2006-0053 Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharge from Irrigated Lands (Conditional Waiver), the East San Joaquin Water Quality Coalition (ESJWQC or Coalition) is submitting a management plan to identify agriculture sources, implemented management practices, and performance goals in response to water quality impairments within the Coalition as assessed by the most recent water quality trigger limits and monitoring information. The Management Plan has been developed to work with the Coalition's Monitoring and Reporting Program Plan (MRPP) and identifies when constituent-specific monitoring will occur to identify sources and evaluate effectiveness of management practices. In addition, this document includes management plan implementation schedules and timelines for reporting to the Central Valley Regional Water Quality Control Board (CVRWQCB or Regional Board) on the effectiveness of the management plan.

The ESJWQC Management Plan includes all site subwatersheds and constituents that have had more than one exceedance within three years (as required by the Conditional Waiver). The Coalition first identified locations and constituents that would require a management plan in April 2007. At that time 18 individual draft management plans were submitted to the Regional Board for review. Since that time, the Coalition has performed additional monitoring, and discussions have taken place between Regional Board staff and the Coalition about the draft management plans submitted in April 2007. The Coalition agreed to submit a single updated management plan for data collected between August 2004 and September 2007 discussing the Coalition's Management Plan strategy and Management Plan activities in each of the individual site subwatersheds. The ESJWQC Management Plan will be updated on a yearly basis to assess monitoring results and the effectiveness of Coalition outreach efforts from the year before. Yearly updates allow the Coalition to conduct outreach to growers, collect information about pesticide use, and obtain water quality data for both irrigation and dormant seasons when pesticide uses are highest.

It is important for the Coalition to assess management of water quality at two levels: at the Coalition regional level and an individual subwatershed level. Therefore the ESJWQC Management Plan is divided into two parts: a Management Plan introduction followed by individual Site Subwatershed Management Plans. The Management Plan introduction provides an overview of the Coalition's Management Plan strategy including:

- a brief background of watershed information,
- Coalition monitoring history,
- the Management Plan process of prioritization,
- overview of general constituent sources and characteristics and

- overall goals, performance measures and schedules.

The individual Site Subwatershed Management Plans address specific water quality issues for each site subwatershed including all exceedances of water quality trigger limits, analysis of sourcing techniques, recommendations of management practices that can be used to improve water quality and specific schedules for outreach and evaluation of management practice effectiveness.

The MRP Order requires that the Coalition answer five key program questions relating to waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within the Coalition's boundaries. The ESJWQC Management Plan will be used to evaluate the magnitude and extent of water quality problems as determined using monitoring information (Q#2), identifying contributing source(s) from irrigated agriculture to water quality problems (Q#3), identifying management practices that are being implemented to reduce the impacts of irrigation agriculture (Q#4) and assess whether water quality conditions are getting better or worse through implementation of management practices (Q#5). In addition the MRP Order requires that the Coalition's Management Plan include eight components to address the above five questions. Table 1 identifies each of these components and the corresponding ESJWQC Management Plan section where they can be found. In addition, Table 2 identifies in which sections of the individual Site Subwatershed Management Plan each of the requirements and MRP Order questions will be addressed.

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Table 1. ESJWQC Management Plan sections that address the MRP Order components and requirements.

Management Plan Sections	MRP Order Management Plan Components	Section Description
Introduction	Not Required.	Describes the Management Plan organization and outlines the purpose of the Management Plan.
Watershed Setting	Not Required.	Provides background of the Coalition area and soil, crop and water flow characteristics. For more detail see the ESJWQC MRPP.
History of Coalition Monitoring	(Q#2) Evaluate the magnitude and extent of water quality problems as determined using monitoring information.	Includes a tally of water quality trigger exceedances and a brief description of when and where monitoring has occurred.
Management Plan Process	Not Required.	Overview of the process that the Coalition will use to manage a Management Plan site and associated Management Plan constituents for four years.
Constituent Specific Traits	1. Identification of irrigated agriculture source (general sources). (Q#3) Identify contributing source(s) from irrigated agriculture to water quality problems. 2. Identification of management practices to be implemented to address the exceedances (general practices).	General background of Management Plan constituents including description of solubility characteristics, general transport and agricultural source.
Prioritization of Exceedances	Not required.	Overview of the process that the Coalition will use to prioritize exceedances.
Priority-specific Management Goals and Plans	(Q#5) Assess whether water quality conditions are getting better or worse through implementation of management practices. 4. Management practice performance goals with a schedule.	Priority-specific strategy to identify sources, perform outreach and conduct evaluations. Assessments of site specific water quality improvements and management practice implementations are included in the Individual Site Specific Management Plans.
Management Plan Schedules	(Q#4) Identify management practices that are being implemented to reduce the impacts of irrigation agriculture. 3. Management practice implementation schedule. 5. Waste-specific monitoring schedule. 6. A process and schedule for evaluating management practice effectiveness. 7. Identification of the participants and the Coalition Group(s) that will implement the Management Plan. 8. An identified routine schedule of reporting to the Regional Water Board.	Schedules of management plan monitoring, outreach meetings and handouts, management practice implementation and management practice implementation effectiveness.
Individual Site Subwatershed Management Plans	Q#2-5 and requirements 1-7.	See Table 2 for specific section descriptions.

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Table 2. ESJWQC individual Site Subwatershed Management Plan sections that address the MRP Order components and requirements (for priority site subwatersheds).

Individual Site Subwatershed Management Plan Sections	MRP Order Management Plan Components	Section Description
Description of Site Subwatershed	Not required.	Provides background of the Coalition area and soil, crop and water flow characteristics. For more detail see the ESJWQC MRPP.
Subwatershed Monitoring History	Not required.	Description of what constituents have been sampled and when.
Exceedance History	(Q#2) Evaluate the magnitude and extent of water quality problems as determined using monitoring information.	Overview of water quality exceedances.
2007 Management Plan Monitoring Results	(Q#2) Evaluate the magnitude and extent of water quality problems as determined using monitoring information.	Overview of results from Management Plan Monitoring (for sites that are in at least their second year of the Management Plan).
Load Calculations	Not required.	Calculation of instantaneous loads for conserved constituents.
Source Identification (by priority)	1. Identification of irrigated agriculture source. (Q#3) Identify contributing source(s) from irrigated agriculture to water quality problems. 2. Identification of management practices to be implemented to address the exceedances. 5. Waste-specific monitoring schedule.	Constituent specific identification and analysis of agricultural sources. Identification of possible management practices that could reduce agricultural impairment of water quality. Strategy for further understanding agricultural sources.
Outreach	(Q#4) Identify management practices that are being implemented to reduce the impacts of irrigation agriculture. 7. Identification of the participants and the Coalition Group(s) that will implement the Management Plan.	Outline of strategy of the Coalition to identify management practices within this site subwatershed.
Evaluation	(Q#5) Assess whether water quality conditions are getting better or worse through implementation of management practices. 3. Management practice implementation schedule. 4. Management practice performance goals with a schedule. 6. A process and schedule for evaluating management practice effectiveness.	Strategy and schedule for evaluating management practice implementation within this site subwatershed.

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WATERSHED SETTING

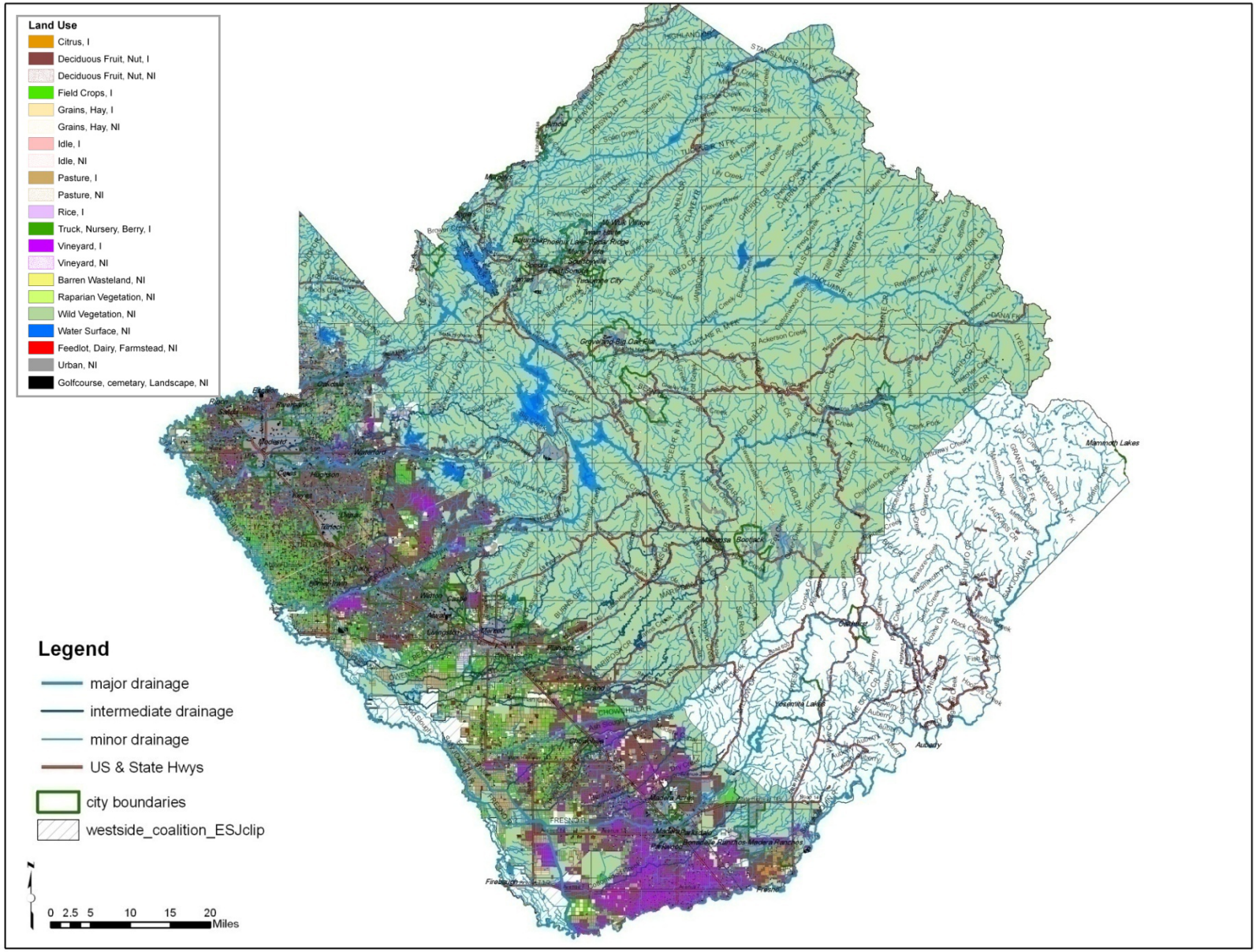
The ESJWQC area includes Stanislaus, Merced, Madera, Tuolumne, and Mariposa Counties and the portion of Calaveras County that drains into the Stanislaus River. The region that drains into the Coalition area is bordered by the crest of the Sierra Nevada on the east and the San Joaquin River on the west, the Stanislaus River on the north to the San Joaquin River on the south. The Coalition has been expanded since its inception in 2004 and now includes the area that was formerly within the Root Creek Coalition area, and the agricultural lands in the Sierra Nevada foothills in Tuolumne, Mariposa, and a small portion of Calaveras County. Additionally, there are landholdings in the vicinity of the Lone Willow Slough drainage area (west of the Eastside Bypass) that have joined the Westside Coalition. The only surface water export from the Coalition area is northward via the San Joaquin River. This river drains watersheds on the east and west side of the California Central Valley (Valley), though only east side watersheds are relevant with respect to the Coalition area. San Joaquin River water is eventually either exported to the San Francisco Bay through the Delta, or conveyed southward via the State Water Project and the Delta Mendota Canal. The Coalition area includes within its boundaries portions of six irrigation districts: Oakdale Irrigation District, Merced Irrigation District, Turlock Irrigation District, Modesto Irrigation District, Chowchilla Water District and Madera Irrigation District. Water bodies may have both irrigation district and Coalition involvement only when they convey both irrigation supply and agriculture return water. Irrigation districts are covered by individual waivers.

The impact of urban areas on water quality may be equal to the effects from agricultural land use, especially due to the rapid and ongoing growth of urban centers. The rapid growth of cities such as Modesto, Merced, Livingston, and Turlock are consuming large amounts of irrigated agricultural land. Land designated as agricultural only a few years ago, is now covered by housing developments and shopping malls.

Although exact acreage is difficult to estimate due to rapidly changing land use, the Coalition area contains approximately 1,186,889 acres that are considered irrigated agriculture (based on 2001 DWR data at http://www.landwateruse.water.ca.gov/annualdata/landuse/2001/landuselevels.cfm).

A variety of crops are grown within the Coalition boundaries and different crops are often found in regions specific to microclimate, soil type, and local farming history (Figure 1). A more detailed discussion of crop type will be provided in the ESJWQC MRPP submitted for review on July 25, 2008.

Figure 1. ESJWQC region map showing land use.



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Apart from the San Joaquin River, there are five major rivers in the watershed: the Fresno River, Chowchilla River, Merced River, Tuolumne River and Stanislaus River. In addition, the Eastside Bypass is considered a major water body. These east side tributaries of the San Joaquin River drain the Sierra Nevada range from east to west. Typically, only the Stanislaus, Merced, and Tuolumne Rivers maintain flows during the summer months. Flow in the Chowchilla and Fresno Rivers is intermittent to nonexistent throughout the year and remain dry unless major storm events produce sufficient precipitation in the immediate vicinity of the rivers. Intermediate sized water bodies in the Coalition area (e.g. Dry Creek, Duck Slough, and Highline Canal) originate either in the Sierra Nevada foothills or the Valley itself and are tributaries to the major rivers. The remaining water bodies are small in size (e.g. Silva Drain, Mustang Creek) and are primarily agricultural canals and ditches that convey water to one of the larger rivers or intermediate-sized creeks/sloughs. In general, flows are greatest during the winter and spring due to wintertime precipitation and subsequent springtime snowmelt. Reservoir releases during the summer have increased flows in these tributaries, relative to the discharge record. The numerous small creeks with headwaters located in the foothills and western portion of the Sierra Nevada mountain range are primarily ephemeral with no flow from early summer through the first rains of the winter. More discussion of hydrology specific to each of the water bodies monitored by the Coalition can be found in the MRPP.

There is an increased propensity for runoff with increased slope, soil water saturation, and volume of water, conditions that arise primarily due to large amounts of rainfall and are more likely in the increased gradient of the valley margins. During the winter, runoff is moved through the myriad of creeks, rivers, and drains. Runoff can also occur during the irrigation season if water entering the field is greater than the amount that can infiltrate the soil. Recent sampling efforts indicate that many of the drainages in the southern portion of the Coalition region do not always carry runoff even during substantial rainfall events. For example, Ash Slough has remained dry throughout the 2007-2008 storm monitoring seasons, despite the rainfall events that have taken place. In addition, water bodies throughout the Coalition region tend to be “flashy” in that water from runoff events moves through the systems very quickly leaving very little flow shortly after the storm ends. During the 2008 storm season, Livingston Drain did not sustain enough water to collect a second sample (resample) approximately one week after the storm event occurred.

HISTORY OF COALITION MONITORING

Coalition ambient water and sediment quality monitoring was initiated in 2004 in the ESJWQC region following the inception of the Irrigated Lands Program in 2002. Each year both the number of sites monitored and the constituents analyzed have been increased in accordance with the most recent CVRWQCB adopted orders and resolutions for the Irrigated Lands Regulatory Program (ILRP). During the first season of monitoring in 2004, samples were

collected from four sites and were sent to laboratories to test for nine constituents/analytes plus water column toxicity testing for three different species. Ash Slough was sampled in July of 2004 but was dry and was not sampled again until the irrigation season 2005. By 2007, 24 monitoring sites were sampled and over 50 total analytes tested in addition to testing samples for toxicity. Table 3 lists the sites monitored during each the storm and irrigation seasons across years of sampling. Specific subwatershed sampling information including number of constituents and events when the site was dry are included in the subwatershed management plan section of this document.

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Table 3. Sample sites and years monitored.

A site marked as "Dry" was dry for all sampling events during that season. A blank box means that this location was not sampled for during that year and season.

Station Name	2004	2005		2006		2007		2008
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm
Ash Slough @ Ave 21			x	x	x	Dry	Dry	Dry
August Road Drain upstream of Crows Landing Bridge (Hogin Rd)	x							
Bear Creek @ Kibby Rd		x	x	x	x	x	x	x
Berenda Slough along Ave 18 1/2					x	Dry	x	x
Black Rascal Creek @ Yosemite Rd					x	x	x	x
Cottonwood Creek @ Rd 20		x	x	x	x	Dry	x	x
Deadman Creak @ Hwy 59					x	x	x	x
Deadman Creek (Dutchman) @ Gurr Rd	x				x	x	x	x
Dry Creek @ Rd 18			x	Dry	x	x	x	x
Dry Creek @ Wellsford Rd		x	x	x	x	x	x	x
Duck Slough @ Gurr Rd	x	x	x	x	x	x	x	x
Duck Slough @ Hwy 99		x	x	x	x	x	x	x
Hatch Drain @ Tuolumne Rd							x	x
Highline Canal @ Hwy 99			x	x	x	x	x	x
Highline Canal @ Lombardy Rd		x	x	x	x	x	x	x
Hilmar Drain @ Central Ave		x	x	x	x	x	x	x
Jones Drain @ Oakdale Rd		x	x	x	x	x	x	
Livingston Drain @ Robin Ave							x	x
Lone Willow Slough @ Madera Ave		x	x					
Merced River @ Santa Fe	x	x	x	x	x	x	x	x
Miles Creek @ Reilly Rd							x	x
Mustang Creek @ East Ave					x	x	x	x
Prairie Flower Drain @ Crows Landing Rd		x	x	x	x	x	x	x
Silva Drain @ Meadow Dr					x	x	x	x
South Slough @ Quinley Rd					x	Dry	x	x
Westport Drain @ Vivian Rd							x	x

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Overview of 2007 Monitoring

The Coalition's Management Plan will be updated yearly starting April 1, 2009 and the previous year's monitoring will be reviewed and assessed for water quality improvements and exceedances. Generally, the update will include an assessment of water quality during the last 12 months including new exceedances and new site/constituents requiring management plans. This is the first update since the original individual site subwatershed Management Plans were submitted in early 2007 and therefore this Management Plan will focus on changes to water quality within the Coalition area during the irrigation season of 2007.

During 2007, storm and irrigation monitoring was conducted as outlined in the Coalition's MRPP submitted in 2006. In addition, Management Plan sampling was initiated during irrigation months. Management Plan sampling involved collection of an additional sample for constituents that exhibited more than one exceedance of water quality limit triggers (WQTL). The Coalition's Semi Annual Monitoring Report (SAMR) submitted on December 30, 2007 lists the locations, dates and type of sampling that was conducted during the irrigation season including Management Plan sampling (MP), Normal monitoring (NM) and sediment. There were a total of 24 sites that were monitored during 2007 and 13 sites where Management Plan monitoring was conducted.

Overview of 2007 Water Quality Trigger Limit Exceedances

At this time, 23 water bodies in the Coalition region require a management plan. Jones Drain, August Drain and Lone Willow Slough are not included in Table 6 since these locations are no longer monitored by the Coalition. The Coalition removed August Drain from sampling due to safety issues. Lone Willow Slough was removed since this waterway was within a delivery area that is a part of the Westside Coalition. Jones Drain does not connect to any downstream water bodies and therefore was removed from sampling after 2007. These locations are not included in the site subwatershed Management Plan attachments.

Beneficial Uses

The Regional Board has assigned beneficial uses (BU) to many water bodies within the Coalition region, but many water bodies monitored by the Coalition do not have assigned BU's. Using the tributary rule, the Coalition applied BUs to upstream tributaries based on the assigned BU in downstream water bodies as listed in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basin (Basin Plan) (Table 4). Water Quality Trigger Limits (WQTLs) are based on the BUs applied to the specific water body. Consequently, identifying an appropriate group of BUs specifies the appropriate WQTLs which in turn determine the exceedances managed by the Coalition and outlined in this document.

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Water Quality Trigger Limits

Water quality trigger limits (WQTLs) have been established to preserve water quality within the Valley. The most recent WQTLs are listed in Table 5. For sites and constituents that have exceeded a WQTL two or more times, a management plan is required to be implemented. A tally of WQTL exceedances have been compiled in Table 6 for all years and all sampling locations. WQTLs have changed over years of monitoring and therefore the Coalition may have reported exceedances in the past that are no longer considered exceedances of current WQTL and there may also be exceedances reported in this document that have not been reported in previous documents. The WQTL table that is listed in Table 5 included WQTL that were updated by the Regional Board in March 2008. The Coalition received updated WQTLs on September 18, 2008 and the Coalition will water quality data based on the updated WQTL table for the Management Plan update to be submitted on April 1, 2009. Objectives and limits listed in the WQTL table are based on the following beneficial uses: Agricultural Supply; Cold Freshwater Habitat; Municipal and Domestic Supply; Spawning, Reproduction, and/or Early Development of Freshwater Aquatic Life; Water Contact Recreation; and Wildlife Habitat.

2007 Exceedances

An important aspect of the ESJWQC Management Plan is to maintain yearly updates of exceedances. Table 7 depicts a tally of exceedances that occurred during the 2007 irrigation season. Management plans submitted during 2007 included exceedances experienced from 2004 through the storm season of 2007. Therefore, the tally in Table 7 only includes the 2007 irrigation season.

Table 4. Primary water bodies that drain directly into the major rivers of the ESJWQC region and the beneficial use for each of the major river reaches.

Site Subwatershed (site name)	Immediate Downstream River	Beneficial Use of Immediate Downstream River
Ash Slough @ Avenue 21**	San Joaquin River[2]	1-4, 7-9, 11-15
Bear Creek @ Kibby Rd**	San Joaquin River[2]	1-4, 7-9, 11-15
Berenda Slough along Avenue 18 ½	San Joaquin River[2]	1-4, 7-9, 11-15
Black Rascal Creek @ Yosemite Rd	San Joaquin River[2]	1-4, 7-9, 11-15
Cottonwood Creek @ Rd 20	San Joaquin River[2]	1-4, 7-9, 11-15
Deadman Creek @ Gurr Rd	San Joaquin River[2]	1-4, 7-9, 11-15
Deadman Creek @ Hwy 59	San Joaquin River[2]	1-4, 7-9, 11-15
Dry Creek @ Rd 18**	San Joaquin River[2]	1-4, 7-9, 11-15
Dry Creek @ Wellsford Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Duck Slough @ Gurr Rd	San Joaquin River[2]	1-4, 7-9, 11-15
Duck Slough @ Hwy 99	San Joaquin River[2]	1-4, 7-9, 11-15
Hatch Drain @ Tuolumne Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Highline Canal @ Hwy 99	Merced River[5]	1, 3-15
Highline Canal @ Hwy 99	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Highline Canal @ Lombardy Rd	Merced River[5]	1, 3-15
Highline Canal @ Lombardy Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Hilmar Drain @ Central Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Livingston Drain @ Robin Ave	San Joaquin River[2]	1-4, 7-9, 11-15
Merced River @ Santa Fe	Merced River[5]	1, 3-15
Miles Creek @ Reilly Rd	San Joaquin River[2]	1-4, 7-9, 11-15
Mustang Creek @ East Ave	Merced River[5]	1, 3-15
Mustang Creek @ East Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Prairie Flower Drain @ Crows Landing Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
Silva Drain @ Meadow Dr	Merced River[5]	1, 3-15
South Slough @ Quinley Rd	San Joaquin River[2]	1-4, 7-9, 11-15
Westport Drain @ Vivian Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15

[1] Friant Dam to Mendota Pool reach
[2] Sack Dam to Merced River reach (all waterbodies that drain to this reach enter via the East Side Bypass with the exception of Livingston Drain)
[3] Mouth of Merced River to Vernalis
[4] New Don Pedro Reservoir to San Joaquin River reach
[5] McSwain Reservoir to San Joaquin River reach
[6] "Beneficial uses vary throughout the Delta and will be evaluated on a case-by-case basis" (wording from the Basin Plan).
[7] Goodwin Dam to San Joaquin River
** Surface water flow in these water bodies terminates in subterranean flow except for periods of increased runoff during large winter storms.
* Beneficial Use code list:

1 - Municipal and Domestic Supply
2 - Agriculture Supply (irrigation)
3 - Agriculture Supply (stock watering)
4 - Industrial Process Supply
5 - Industrial Service Supply
6 - Hydropower Generation
7 - Water Contact Recreation
8 - Non-contact Water Recreation
9 - Warm Freshwater Habitat
10 - Cold Freshwater Habitat
11 - Migration of Aquatic Organisms (warm)
12 - Migration of Aquatic Organisms (cold)
13 - Spawning, Reproduction, and/or Early Development (warm)
14 - Spawning, Reproduction, and/or Early Development (cold)
15 - Wildlife Habitat

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Table 5. WQT limits for constituents and parameters measured during Coalition monitoring.

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
pH	6.5 - 8.5 units	Numeric		Sacramento/San Joaquin Rivers Basin Plan (page III.6.00)
Electrical Conductivity (maximum)	700 umhos/cm	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Dissolved Oxygen (minimum)	7 mg/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin.
	5 mg/L		Warm water habitat	Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan
Total Dissolved Solids	450 mg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Turbidity	variable	Numeric	Municipal and Domestic Supply	Basin Plan Objective - increase varies based on natural turbidity
E coli	235 MPN/100 ml			EPA ambient water quality criteria, single-sample maximum
TOC	NA			
Pesticides - Carbamates				
Aldicarb	3 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health)
Carbaryl	2.53 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game)
Carbofuran	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00 (MUN, human health)
Methiocarb	0.5 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates/Resour.Publ.137, Fish Wildl.Serv., U.S.D.I., Washington, D.C :98 p. (OECDG Data File) -(Detect at .5 ug/L - no limit set)
Methomyl	0.52 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life)

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Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Oxamyl	50 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan, page III-3.00, under "Chemical constituents." Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL
Pesticides - Organochlorines				
DDD(p,p')	0.00083 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan (page III-6.00, pesticides, third bullet). CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)
DDE(p,p')	0.00059 ug/L			
DDT(p,p')	0.00059 ug/L			
Dicofol	NA			
Dieldrin	0.00014 ug/L	Numeric	Municipal and Domestic Supply	CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)
Endrin	0.036 ug/L	Numeric	Cold Freshwater Habitat, Spawning	CTR, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average
Methoxychlor	0.03 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum (aquatic life)
Pesticides - Organophosphates				
Azinphos methyl	0.01 ug/L	Narrative	Cold Freshwater Habitat, Spawning	National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection (Instantaneous)
Chlorpyrifos	0.015 ug/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan, page III-6.01; San Joaquin River & Delta, pending Sacramento & Feather Rivers (aquatic life); more stringent 4-day average selected over less stringent 1-hour average (Central Valley Regional Water Quality Control Board; recent ammendment for Diazinon and Chlorpyrifos in the Lower San Joaquin River).
Diazinon	0.1 ug/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento San Joaquin Basin Plan, San Joaquin River & Delta numeric standard pending Sacramento & Feather Rivers numeric standard
Dimethoate	1.0 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services)
Disulfoton	0.05 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous

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Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Malathion	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Methamidophos	0.35 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Methidathion	0.7	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health)
Parathion, Methyl	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00
Phorate	0.7 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Phosmet	140 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Pesticides - Pyrethroids				
Biphenthrin	110 ug/L	Narrative		Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (human health)
Cypermethrin, total	0.002 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game)(aquatic life)
Cyhalothrin, lambda, total	35 ug/L	Narrative		Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health)
Permethrin, total	0.03 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). USEPA National Ambient Water Quality Criteria, CA DFG, 2000
Cyfluthrin, total	NA			
Esfenvalerate/ Fenvalerate, total	NA			
Pesticides - Herbicides				

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Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Atrazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan, page III-3.00, under "Chemical constituents." California Primary MCL
Cyanazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, USEPA Health Advisory (human health)
Diuron	2 ug/L	Narrative	Municipal and Domestic Supply	One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment). Value modified using more recent information in USEPA Office of Pesticide Programs Registration Eligibility Decisions Documents. From Reference 36. (August 2007 Update Edition of the WQG)
Glyphosate	700 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, page III-3.00, California Primary MCL (MUN, human health)
Linuron	1.4 ug/L	Narrative	Municipal and Domestic Supply	USEPA IRIS Reference Dose as a drinking water level*
Molinate	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Paraquat dichloride	3.2 ug/L	Narrative	Municipal and Domestic Supply	USEPA IRIS Reference Dose as a drinking water level*
Simazine	4.0 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, California Primary MCL (MUN, human health)
Thiobencarb	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Metals				
Arsenic	10 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health)
Boron	700 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Cadmium	for aquatic life; variable (see cadmium worksheet). For MUN, trigger limit is 0.04 regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning/ Municipal and Domestic Supply	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/ California Public Health Goal for Drinking Water

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Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Copper	for aquatic life; variable (see copper worksheet). For MUN, trigger limit is 170 regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning/ Municipal and Domestic Supply	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/ California Public Health Goal for Drinking Water
Lead	for aquatic life; variable (see Lead worksheet). For MUN, trigger limit is 2.0 regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning/ Municipal and Domestic Supply	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/ CA Public Health Goal for Drinking Water
Nickel	For aquatic life variable (see Nickel worksheet). For MUN nickel trigger limit is 12 ug/L regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning / Municipal and Domestic Supply	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/ CA Public Health Goal for Drinking Water
Selenium	50 ug/L	Numeric	Municipal and Domestic Supply	California Primary MCL
Selenium	5 ug/L (4-day average)	Numeric	Cold Freshwater Habitat, Spawning	Table III-1: Trace Element Water Quality Objective. Applicable Water Bodies - San Joaquin River, mouth of the Merced River to Vernalis. Also CTR
Zinc	For aquatic life variable (see Zinc worksheet). For MUN nickel trigger limit is 5000 ug/L regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning, Municipal and Domestic Supply	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/ CA Public Health Goal for Drinking Water
Nutrients				

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Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Nitrate as NO3 Nitrate as N	45,000 ug/L as NO3 10,000 ug/L as N	Numeric	Municipal and Domestic Supply	California Primary MCL
Nitrite as Nitrogen	1,000 ug/L as N	Numeric	Municipal and Domestic Supply	California Primary MCL
Ammonia	For aquatic life variable (see ammonia worksheet). For MUN ammonia trigger limit is 1.5 mg/L regardless of pH and Temperature values	Numeric	Cold Freshwater Habitat, Spawning/ Municipal and Domestic Supply	USEPA Freshwater Aquatic Life Criteria, Continuous Concentration/ Taste and Odor Threshold
Hardness	NA			
Phosphorus, total	NA			
Orthophosphate, soluble	NA			
TKN	NA			

NA: Not Available at that time. (May be pending on completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.)
ND: Non Detect

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Table 6. ESJWQC exceedance tally based on results through September 2007 including irrigation and storm sampling events. Sites are listed alphabetically by station name and constituents are listed alphabetically within each of the following groups: field parameters, inorganics, bacteria, metals, pesticides and toxicity. Constituents under a management plan are highlighted.

Station Name	Oxygen, Dissolved, mg/L	pH, none	SpecificConductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Ammonia, mg/L	Nitrate as N, mg/L	Nitrite as N, mg/L	Arsenic, µg/L	Cadmium, µg/L	Copper, µg/L	Lead, µg/L	Nickel, µg/L	Zinc, µg/L	Aldicarb, µg/L	Chlorpyrifos, µg/L	DDD(p,p'), µg/L	DDE(p,p'), µg/L	DDT(p,p'), µg/L	Diazinon, µg/L	Dieldrin, µg/L	Dimethoate, µg/L	Diuron, µg/L	Malathion, µg/L	Methoxychlor, µg/L	Permethrin, total, µg/L	Thiobencarb, µg/L	Hyalella azteca, Survival (%)	Ceriodaphnia dubia, Survival (%)	Pimephales promelas, Survival (%)	Selenastrum capricornutum, Total Cell Count
Ash Slough @ Ave 21				9		3						5	2				4															1
Bear Creek @ Kibby Rd	2	2		14		5					1	1	1				2			1										3		
Berenda Slough along Ave 18 1/2	8			9		2											3							1						1		3
Black Rascal Creek @ Yosemite Rd	9			13		6											4													5		
Cottonwood Creek @ Rd 20	12	1		18		6						8	1																			
Deadman Creek (Dutchman) @ Gurr Rd	9			16		13				2	2	3	1	1			1								1						2	1
Deadman Creek @ Hwy 59	9			12		6											2	1		1												
Dry Creek @ Rd 18	1	2		11		3					1	14	4		1		2				1								1	1		1
Dry Creek @ Wellsford Rd	11	3		22		12					1	2					5							2				1		2		4
Duck Slough @ Gurr Rd	3	2	1	25	1	14					1	6	4	3			1											2	3	3		2
Duck Slough @ Hwy 99	1	2		21		9					2	9	9	2			3													1		1
Hatch Drain @ Tuolumne Rd	6		5	5	4	5	1	5	1	4	2												1			1			2			
Highline Canal @ Hwy 99	1	4		11		4					1	5	7				2							1					3	4		1
Highline Canal @ Lombardy Rd		2		12		2						2	7		1		3							1					4	4		3
Hilmar Drain @ Central Ave	3	3	21	22	18	16	2	9			7	2					1	1						2					1	1		2
Livingston Drain @ Robin Ave		3		2								4					1															
Merced River @ Santa Fe	1	1		16		1							1				1													3		1
Miles Creek @ Reilly Rd				5		3						3	1			1	1												1	1		1
Mustang Creek @ East Ave	5		1	7	1	5													2													
Prairie Flower Drain @ Crows Landing Rd	10	5	31	22	22	17	1	10	1	1	7						3												4	2	2	1
Silva Drain @ Meadow Dr	7			13		9											3												2	1		
South Slough @ Quinley Rd	3	2		6		2																1										
Westport Drain @ Vivian Rd			7	4	5	2		5					1				1															1

*All data was evaluated including field QCs. If a field QC has an exceedance, and the associated environmental sample does NOT have an exceedance, than that field QC exceedance is included in the tally.

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Table 7. ESJWQC exceedance tally based 2007 irrigation sampling events.

All sites are listed that have had at least one exceedance. Sites are listed alphabetically by station name and constituents are listed alphabetically within each of the following groups: field parameters, inorganics, bacteria, metals, pesticides and toxicity. Blue highlighted cells refer to sites/constituents that require a management plan due to 2007 irrigation exceedancs; green highlights refer to sites/constituents already in management plans.

Sample Site	Oxygen, Dissolved, mg/L	pH, none	SpecificConductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Ammonia as N, mg/L	Nitrate as N, mg/L	Nitrite as N, mg/L	Arsenic, µg/L	Cadmium, µg/L	Copper, µg/L	Lead, µg/L	Zinc, µg/L	Aldicarb, µg/L	Chlorpyrifos, µg/L	DDE(p,p'), µg/L	Dieldrin, µg/L	Dimethoate, µg/L	Diuron, µg/L	Methoxychlor, µg/L	Hyalella azteca, Survival (%)	Ceriodaphnia dubia, Survival (%)	Pimephales promelas, Survival (%)	Selenastrum capricornutum, Total Cell Count
Ash Slough @ Ave 21												5	2												
Bear Creek @ Kibby Rd		1		1								1				1							1		
Berenda Slough along Ave 18 1/2	6			4		1										1				1					3
Black Rascal Creek @ Yosemite Rd	5			6		2										3							5		
Cottonwood Creek @ Rd 20	3	1		4								5													
Deadman Creek (Dutchman) @ Gurr Rd	3			6		3					1	3												1	1
Deadman Creek @ Hwy 59	6			5		4										1									
Dry Creek @ Rd 18		1		3		1						9	1			1									1
Dry Creek @ Wellsford Rd	5			6		2					1	2				2									
Duck Slough @ Gurr Rd	1			6		2						4	2												1
Duck Slough @ Hwy 99		1		5		1						7	6			1									
Hatch Drain @ Tuolumne Rd	6		6	5	4	5	1	5	1	4	2								1		1	2			
Highline Canal @ Hwy 99		3		2		3					1	5	5			1									
Highline Canal @ Lombardy Rd												2	3			1						2			
Hilmar Drain @ Central Ave			6	6	6	5		5			3	1								2					1
Livingston Drain @ Robin Ave		3		2								4				1									
Merced River @ Santa Fe													1			1									
Miles Creek @ Reilly Rd				5		3						3	1		1	1						1	1		1
Mustang Creek @ East Ave	2			2		2											1								
Prairie Flower Drain @ Crows Landing Rd	4	1	11	6	6	3		5		1	4					1						2	1		1
Silva Drain @ Meadow Dr	5			6		5										2									
South Slough @ Quinley Rd	3	2		4														1							
Westport Drain @ Vivian Rd			7	4	5	2		5					1			1									1

*All data was evaluated including field QCs. If a field QC has an exceedance, and the associated environmental sample does NOT have an exceedance, than that field QC exceedance is included in the tally.

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MANAGEMENT PLAN PROCESS

The ESJWQC Management Plan process is a combination of years and tiers. The first year that a site is within the Management Plan is termed Year 1 (Figure 2). The ESJWQC Management Plan will be updated with new sites and constituents requiring management plans on April 1 of each year and will include all Coalition actions and water quality monitoring results from January to December of the previous year. Therefore Year 1 for new monitoring sites/constituent combination begins in January of the same year that the April 1 update is submitted. Each year that a site/constituent remains in the Management Plan requires specific actions by the Coalition. An overview of this process is included in Figure 2. Tiers are determined by whether or not there were exceedances the previous year. Each tier has specific actions determined by the priority and number of years that the site/constituent has been under a management plan (Figure 3).

Year 1

Exceedances are reviewed on a yearly basis to determine if a constituent sampled at a specific location has exceeded a WQTL more than once. The first year within a Management Plan includes prioritizing individual exceedances based on the constituent as well as the magnitude, frequency and load associated with that exceedance. This process is described further in the section, Prioritization of Exceedances. Depending on the priority given to that constituent within that site subwatershed, appropriate actions are established by the Coalition to address the source of the exceedance, outline appropriate outreach to growers and, where relevant, evaluate previous actions taken by the Coalition.

Year 2

At the end of the first year, monitoring data are reviewed to determine if that site subwatershed experienced additional exceedances. If there are no new exceedances, the Coalition continues to monitor within the site subwatershed to evaluate the actions of the Coalition and effectiveness of management practices within that site subwatershed. If, however, after the first year within the Management Plan there were exceedances, then the Coalition will progress in the number and types of actions which may include individual contact, specific grower meetings, and increased monitoring. All of these actions are focused on identifying the source of the exceedance, increasing the amount of outreach within the site subwatershed of concern and also evaluating the effectiveness of Coalition and grower actions including the implementation of management practices (MPs).

Year 3

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If at the end of the second year there are again no exceedances in a specific site subwatershed, the Coalition will petition to remove that constituent from the Management Plan. At the end of the second year, for a site that has had exceedances within the first year of management plan implementation, the monitoring data are again reviewed to determine whether there were exceedances for the constituent of concern during the second year. If there are no exceedances during the second year after applying actions A (see Figure 2), then the Coalition will continue managing that site with the same level of effort in sourcing, outreach and evaluation. If there were exceedances during the second year then the Coalition will follow up with individual growers and determine the level of effort and actions taken by the growers to address the exceedances. For growers that have implemented MPs and have changed practices in efforts to reduce runoff, the Coalition will work with the Regional Board to determine the next steps that should be taken to deal with water quality impairments. This may involve a joint agency effort between the Regional Board and Department of Pesticide Regulation (DPR) to determine better practices to prevent water quality impairment. For those growers that have been identified as potential sources of exceedances, and who have not been willing to work with the Coalition or adopted MPs, the Coalition will provide appropriate information to the Regional Board.

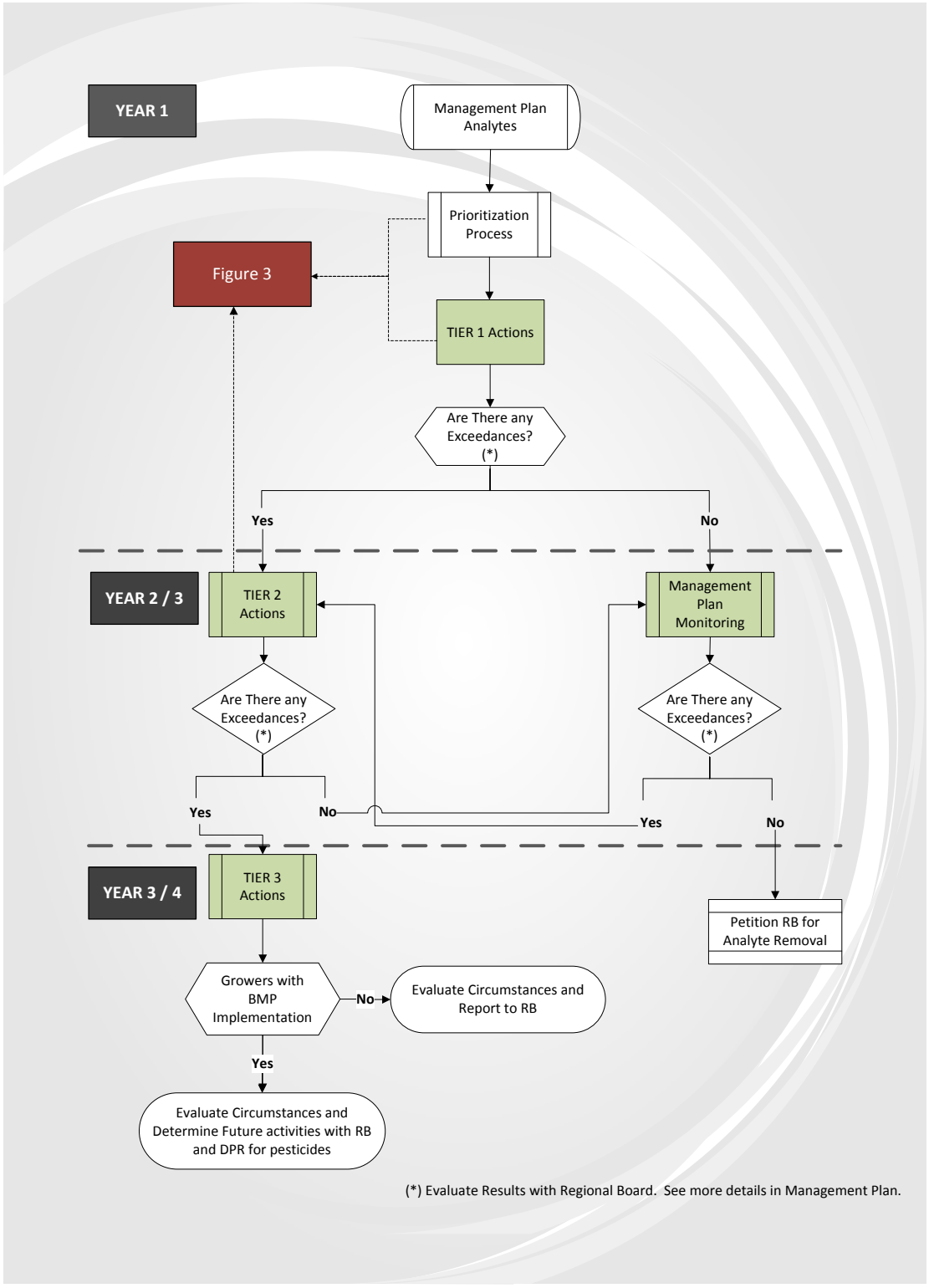
Year 4

Actions in the fourth year are dependent on the sequence of monitoring results in the previous three years. If in the second year, there were no exceedances but there were exceedances in the first year, then the Coalition will continue for another year to monitor to better understand sources (if sources are not already identified), continue with outreach and additional evaluation. If after this third year of monitoring, there are additional exceedances, despite a lack of exceedances during the second year, the same actions will be followed as described in Year 3 for locations that had two years of exceedances while under the Management Plan. If there were no exceedances during this third year, the Coalition will petition the Regional Board for the removal of this constituent from the site subwatershed management plan.

Although this process is described as occurring year to year, it is possible that the actions occurring within a site subwatershed will remain constant across years due to the time lag between the discussion of appropriate management practices and the implementation of those practices. For example, a grower may submit an application for Environmental Quality Incentives Program (EQIP) funds to build a sediment pond and it may take over a year to receive the funds plus another year to build the pond. As these situations arise, they will be documented in the Site Subwatershed Management Plans and those locations/constituents may remain at a lower level of action the Coalition documents effectiveness. The Coalition will maintain communication with the Regional Board in regards to these situations.

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Figure 2. Coalition Management Plan process and associated actions. The prioritization process (including TIER actions) is included in Figure 3.



RB- Regional Board
DPR- Department of Pesticide Regulation
BMP- Best Management Practices

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CONSTITUENT SPECIFIC TRAITS

The following section includes information about the possible sources and common characteristics of constituents included in the ESJWQC Management Plan. Specific actions taken by the Coalition to source, conduct outreach and perform evaluation of management practice implementation are described in the following sections, Prioritization of Exceedances and Priority Specific Management Goals and Plans.

Pesticides

Sourcing

Pesticide applications are identifiable to township, range and section (TRS) through the use of pesticide use reports (PURs). Monitoring results are compared against PURs as soon as they become available from County Agriculture Commissioners. Exceedances of pesticide water quality triggers or significant toxicity experienced in samples collected from high priority site subwatersheds are matched to applications that occurred on parcels (based on Assessor Parcel Numbers or APNs) within the subwatershed upstream of the sample site (the site subwatershed). Determining within a TRS which APN applied the pesticide is difficult and is done by matching the amount of acreage that the active ingredient was applied to with the amount of acreage in the APN. The difficulty is that there are multiple APNs per TRS and sometimes a single APN may occur over multiple TRS'. Therefore the Coalition will only attempt to determine source of pesticide use information down to the APN level in priority site subwatersheds.

Applied Pesticides

Applied pesticides include any chemical that is currently applied to agriculture and is reported in PURs. The Coalition analyzes for a total of 39 pesticides however four (DDD, DDE, DDT and dieldrin) are considered legacy pesticides or degradation products since they are no longer registered for use. In addition, five pesticides have prohibited discharges within the San Joaquin Valley outside of applications to rice: carbofuran, thiobencarb, molinate, malathion and methyl parathion. Of these, two are applied only to rice (thiobencarb and molinate) and are therefore reported to both the Regional Board and the Rice Coalition if a water quality exceedance occurs.

There are over 800 chemicals registered as active ingredients. The pesticides in Table 8 are a subset of all pesticides applied within the Coalition area since 2004. The subset was selected based on total pounds active ingredient (AI) applied, toxicity, and data availability. Table 8 includes 109 applied pesticides, including the 39 pesticides currently monitored for by the Coalition, their solubility, half-life and K_{oc}.

Legacy Pesticides

Exceedances of DDT and its breakdown products, DDE and DDD, are a result of applications in the past. DDT, aldrin, and dieldrin are no longer registered or applied within the United States but persist because of their exceptionally high K_{oc} and long half life. It is estimated that the K_{oc} for DDT is between 100,000 and 1,000,000 years depending on the source, and the half life in aquatic systems is probably over 150 years (http://www.speclab.com/compound/c50293.htm). DDT was banned in 1972, and the USEPA prohibited application of aldrin and dieldrin in 1974 except for uses on termites and banned all uses in 1987. These pesticides may be bound to sediment in the channels and mobilized periodically by unknown mechanisms.

Metals

In the context of management plans, metals can be divided into two groups: those metals which are currently registered for use by agriculture, and those that are not registered for use or currently applied as soil amendments. The Coalition currently monitors for arsenic, boron, copper, cadmium, lead, nickel, selenium and zinc. All metals are monitored as total metal in the sample. Only copper and zinc are known to be used by agriculture within the Coalition region and only copper is applied as a pesticide. Zinc may be applied as a foliar nutrient and is a part of zinc phosphide, a rodenticide used around stored grain products to control ground squirrels. Rodenticide use is not covered by the Irrigated Lands Regulatory Program.

Each time an exceedance of copper occurs, PUR data for parcels of land upstream of the sample site are reviewed for applications of products containing copper within three months of the sample date. If relevant applications have occurred then it is assumed that these applications may have contributed to the exceedance experienced at the sample site.

The Coalition will consider establishing background levels of specific metals once higher priority constituents within the Coalition area are managed (see Figure 3 for the prioritization process).

Arsenic

Arsenic is found in sodium cacodylate which is applied by agriculture for broadleaf weed control and as a cotton defoliant. The registrations on many products with this active ingredient have been cancelled. However, there are four products currently registered for use on citrus, for weed control around ditches, for use on ornamental plants, for nonagricultural weed control, and for weed control around buildings, driveways, sidewalks, rights-of-way, and fencerows. Several products are available for use by homeowners and nonagricultural users (e.g. county road maintenance) (http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC34358&Chem_Name=Sodium%20cacodylate&PC_Code=012502) and the product may have been purchased for use by local homeowners for use on their property. California Department of Pesticide Regulation records indicate minimal use of sodium cacodylate across the Coalition region between 1996 and 2006, and in areas where exceedances have occurred (Hatch Drain and Prairie Flower Drain), there is no record of any sodium cacodylate application.

At this point the source of arsenic is unclear although native soils can contain elevated concentrations of arsenic. The Coalition is presently investigating methods for establishing background levels of arsenic in surface waters. The Coalition will work with the Regional Board to determine if it is feasible to obtain the necessary data to establish background levels when arsenic becomes a priority.

Boron

Boron is not applied by agriculture in the Coalition region. There are no pesticides or fertilizers that contain boron. Boron is naturally elevated in many locations along the west side of the San Joaquin Valley and surface waters originating in the coastal ranges contain elevated concentrations of boron. Surface waters originating in the Sierra Nevada Mountains do not contain elevated concentrations of boron.

Cadmium

Elevated concentrations of cadmium in a water body may be a result of agricultural application of sludge fertilizer, but also may arise from the erosion of soils and bedrock, atmospheric deposition, discharge from industrial operations or leakage from landfills and contaminated sites. Cadmium has high tendency to adsorb to sediments and persists indefinitely in the environment.

Copper

Copper is commonly applied throughout the Coalition region and is considered an organic herbicide, fungicide, and algicide. Copper is known to contribute to the toxicity of *Selenastrum* by reducing growth of the algae. Copper AIs include copper, copper hydroxide, copper sulfate and copper sulfate pentahydrate. Copper can also become available to water bodies through the weathering of rocks and soils that naturally contain metals. Copper is also found in automobile components and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Since copper does not degrade, it is possible that applications can cause exceedances several months after application.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that have lead as a material, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal

of lead paint in the vicinity, burial of old buildings with lead paint, or leaching lead from lead arsenate deposition could all be contributors to lead detections. Sampling soil in the vicinity in search of lead sources could result in years of sampling with few results because it is not clear how deep the lead may be in the soil or how widespread the lead contamination could be. Also, identifying one source does not eliminate additional source contributions. Regardless of the source, it is in all likelihood not manageable by implementing agricultural management practices.

Nickel

Nickel is a naturally occurring metal that is found in soils as a normal constituent. It is also applied by agriculture as a foliar nutrient on crops such as cotton and pecans to improve nitrogen utilization when nitrogen is applied as urea. Nickel is also a constituent in fertilizers originating with wastes from industry and sewage treatment plants. It can also be released into the environment from the disposal of nickel-cadmium batteries. Metallic nickel is insoluble in water but complexes with several other compounds in oxidation states from -1 to +4 and the most common oxidation state is +2. Ni^{2+} can be found in the dissolved state and its bioavailability is determined by the amount of organic carbon in the water body. Nickel is also a potential contaminant in sediments where its bioavailability is determined by the amount of organic carbon and acid volatile sulfides. The amount of nickel applied in the Coalition region is unknown but because urea is not the most commonly used form of nitrogen fertilization, its use is assumed to be low.

Selenium

Selenium is a naturally occurring element in soils that is mostly found in the southwestern portions of the San Joaquin Valley. The ESJWQC soils are not generally elevated in selenium and irrigation water originating from ground water in the western portions of the Coalition region do not have elevated concentrations of selenium. Irrigation water originating in the Sierra Nevada Mountains is low in selenium. While acute toxicity from selenium is possible, the bioaccumulation and biotransfer of selenium is far more important. Selenium readily bioaccumulates and is transferred up the trophic chain to upper level consumers such as fish and birds where chronic effects on reproduction and development are well documented.

Zinc

Like nickel, zinc is a naturally occurring metal that is found in soils as a normal constituent. In some locations, zinc is added to fertilizers to improve phosphorus use efficiency on crops such as corn. It is also applied as a foliar nutrient to many crops including grapes and orchard crops. Like nickel, there are numerous anthropogenic sources of zinc including wastes recycled as fertilizer, and storm water runoff from roadways. Zinc is a component in brake pads and is produced in a dust form as pads wear with use. Zinc is also a component of tires although the exact amounts and formulations for tires are considered proprietary information and not available. Tire wear is a large contributor to zinc in the environment. Zinc bioavailability is controlled in the same manner as nickel with organic carbon being the primary factor

determining zinc toxicity in the water column and organic carbon and acid volatile solids determining bioavailability and toxicity in sediments.

Field Parameters (Dissolved Oxygen, pH, Specific Conductance)

Exceedances of the dissolved oxygen (DO) water quality objective are common and have been present throughout the Coalition region since monitoring was implemented. DO and pH are expected to vary diurnally and can exceed the standards as a result of natural processes in the water column such as changing water temperature, photosynthesis and respiration. Changes in DO can be exacerbated by the addition of nutrients which stimulate production of organic material which eventually dies and is eventually released into the water column and sediment where it is broken down by microbial activity. The respiration of the bacteria during the breakdown process is termed Biological Oxygen Demand (BOD).

The Coalition conducted a special study which attempted to determine if BOD was the cause of the low DO. The results of this study were included in Appendix VIII of the December 30, 2007 Semi Annual Monitoring Report. The majority of the samples contained no measurable BOD. The reasons for this could be the long holding time prior to initiation of the test or already depleted dissolved oxygen concentrations in the water column. BOD and Total Organic Carbon (TOC) were positively correlated and TOC was used as a surrogate for BOD in a multiple regression analysis. Water temperature, BOD, and nitrate in the water column were all significant predictors of dissolved oxygen. As water temperature and BOD increased, dissolved oxygen decreased. As nitrate increased, dissolved oxygen increased although the explanation for this latter relationship is not clear. It is clear that both water temperature and BOD are significant factors causing the decrease in DO although other, as yet unknown factors are also important.

Specific conductance (EC) is a measure of salt as is total dissolved solids (TDS). Further discussion of EC, as it is related to TDS, is provided in the next section.

Physical Parameters (Color, TDS/EC, TOC)

Color is a derived parameter in that it is not delivered to surface waters from any single source, with the possible exception of color derived from suspended sediments. Color is a result of other constituents (e.g. organic carbon) or processes (e.g. photosynthesis, turbulent flow and re-suspension of particulate matter). Consequently, management of color is not possible unless the process(es) that contribute to color are understood. Color exceedances at different water bodies may be a result of different factors. As the Coalition conducts the special studies to determine the cause(s) of exceedances of constituents such as DO and pH, information may become available that will allow us to address color exceedances.

TDS describes all solids (usually mineral salts) that are dissolved in water and were frequently associated with exceedances of EC. Potential sources of EC and TDS are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. There are two general sources of EC (or TDS) in agricultural landscapes; fertilizers and native soils. A commercial fertilizer can be made up of dozens of different chemicals, each of which ionize and contribute to the EC of the solution. Different brands of fertilizer can use different chemicals to make up the total formula indicating that there will not be a universal signal for fertilizer-generated EC or TDS.

All four sites shown to contain elevated levels of EC and TDS, Hatch Drain, Hilmar Drain, Prairie Flower Drain and Westport Drain are located very close to the San Joaquin River where depth to ground water is very shallow and local field drains remove high salinity ground water to lower the water table and allow plant growth. In addition, these drains are not concrete lined and can be recharged directly from shallow ground water. In fact, many of the unlined drains in the vicinity were dug to directly drain shallow ground water. Data developed by Modesto Irrigation District suggests that the exceedances of TDS/EC are a function of ground water in the region and have been for almost a century. Geologically, the ground water from both the east and west side of the Valley moves toward the San Joaquin River trough, the low point in the Valley that is naturally high in salts. The movement of water down gradient toward the San Joaquin River creates a shallow ground water table, as evidenced by the numerous wetlands that are in the vicinity of the river. This shallow ground water appears to be the cause of the salinity problems in the ESJWQC region close to the river.

The CVRWQCB recognizes that EC/TDS is a region-wide problem and must be solved at that level. The Coalition will work with the CVRWQCB to address the problem over the next several years.

E. coli

E. coli is an indicator of fecal contamination in surface waters. Potential sources of *E. coli* include deposition or runoff from irrigated pasture, dairies, leaky sewer lines, leaky septic systems, application of manure, biosolids and liquid dairy waste, and a large array of wildlife. A study designed to identify the source of fecal contamination in Coalition water bodies was initiated in August 2006. Obligate anaerobic bacteria of the genus *Bacteroides* were extracted from water samples and their DNA analyzed to determine the source(s) of the fecal matter. Anaerobic *Bacteroides* were used because they persist in the environment for only a short period of time (days), meaning any detection of *Bacteroides* DNA in the sample is from a recent contamination event. As a facultative anaerobe, *E. coli* can reproduce and persist in an oxygenated environment for an unknown period of time, thus detecting *E. coli* in a water sample is an indicator of fecal contamination but the timing of the contamination is not possible to determine.

For the study, water sampling occurred at 27 sites (4 baseline and 23 monitoring) within the Coalition region during non-monitoring events. Results of the study indicate that the source of the fecal contamination is a combination of human, cows, and chickens depending on the location. The sampling occurred only during late summer low flow conditions and should be repeated during winter storm events. Samples can be analyzed for additional molecular markers and chemical markers that can confirm the contamination by human sewage, but those analyses will require a much larger research effort that is outside the capabilities of the Coalition.

Toxicity

Water Column Toxicity

Toxicity in the water column can occur as a result of natural or anthropogenic causes, including the discharge, release or re-suspension of metals, pesticides, ammonia or other toxicants. The three species used in water column toxicity analyses can often be associated with detections of one or more contaminants in the same sample water. Table 8 lists the top 109 applied active ingredients and the species (both water column and sediment) to which each chemical has the potential to cause toxicity.

Pesticides that potentially could be detected dissolved in surface water runoff and cause water column toxicity are separated from those that tend to bind to sediment and organic matter and cause sediment toxicity. The Department of Pesticide Regulation (DPR) provides criteria to identify those pesticides that could leach to ground water which means they could also be mobilized during runoff events and moved to surface waters in the dissolved phase. The Coalition utilizes the DPR criteria to identify those pesticide applications that could be responsible for water column toxicity:

One of the following must be true

- Water solubility: > 3 ppm (mg/L), or
- Soil adsorption coefficient (K_{oc}): < 1,900 cm^3/g

and one of the following must be true

- Hydrolysis half-life: > 14 days, or
- Aerobic soil metabolism half-life: > 610 days, or
- Anaerobic soil metabolism half-life: > 9 days

The DPR criteria do not always identify all pesticides that could be responsible for water column toxicity. For example, bifenthrin (0.1 ppm solubility), dicofol (1 ppm solubility), chlorpyrifos (0.4 ppm solubility), oryzalin (2.5 ppm solubility) and trifluralin (0.3 ppm solubility) are less than the DPR criteria of 3 ppm but are known to be toxic to water column species. Propanil has a

solubility of 200 ppm although the soil half-life is 1 day which is less than DPR criteria of 9 days. However, studies have shown that propanil is toxic to *Selenastrum*. Therefore the Coalition has applied toxicity species codes to each of the top 109 applied active ingredients based on the DPR criteria and relevant toxicity studies summarized in various online resources such as Extoxnet and Oregon State University's National Pesticide Information Center (Table 8). The toxicity species codes (cer = *Ceriodaphnia*, sel = *Selenastrum*, pim = *Pimephales*, hya = *Hyalella*) are then used to evaluate PUR data associated with those active ingredients for time periods prior to toxicity.

In addition, specific crops are linked with particular exceedances, e.g. almonds and midwinter dormant applications of organophosphate pesticides, and are also identifiable through PURs. Understanding the potential mechanism by which pesticides are moved to surface waters allows the Coalition to target management practices known to be effective in eliminating the exceedances (Table 9).

Applied Pesticides and Associated Toxicity

Table 8 is a list of the top 109 active ingredients applied to agriculture within the Coalition counties. The table of active ingredients and their chemical properties was developed for two purposes: 1) identifying sources of toxicity when TIEs are not performed or are inconclusive and water chemistry does not indicate any detection of the limited number of constituents for which the Coalition monitors, and 2) to target management practices.

Source identification

While performing toxicity tests on some samples in the past, the Coalition experienced toxicity for which the TIE indicated a nonpolar organic material was responsible, or the TIE trigger was not reached. In both of these cases, the Coalition does not have sufficient analytical information with which to determine the potential source(s) of the toxicity. As a result, the Coalition has initiated development of an Active Ingredients (AI) properties table. This table will become more complete as more information becomes available. The number of AIs in the table was determined by taking the total number of AIs used in the Coalition region and eliminating all AIs with less than 5000 lbs applied. The exception to this was any AI for which the Coalition currently analyzes, even if less than 5000 lbs are applied. The list was further reduced by eliminating all adjuvants and multiple formulations for the same AI (e.g. copper hydroxide, copper sulphate). The remaining 109 AIs were assigned a toxicity code based on their prescribed use. For example, any insecticide or miticide was assigned as being potentially toxic to *Ceriodaphnia* and *Pimephales*. Elements such as copper were assigned as being potentially toxic to *Selenastrum*, *Ceriodaphnia*, and *Pimephales*. The literature was then searched for physical/chemical properties such as solubility, half-life, and K_{oc}, and LC50.

In the future, when the Coalition receives information on toxicity with an "unknown" source, PURs will be used to determine the applications in the site subwatershed. If the toxicity is

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associated with the water column, the AIs applied in the watershed will be screened using the DPR criteria and the properties in Table 8 to identify AIs with sufficient solubility and toxicity to be a potential source. Similarly, sources of toxicity in sediment will be identified by determining which applications in the watershed would be associated with particulate deposition.

Toxicity may occur that is not associated with any pesticide applications because not all applications have been reported, applications have been misreported and/or the toxicity of the chemicals applied is not well understood (i.e. insufficient toxicity studies). If the Coalition obtains a toxic sample and PUR data indicate that no pesticide use is reported, the Coalition may use past PUR data in that site subwatershed applied in the same month in previous years to continue to conduct outreach and recommend management practices. In all cases, toxicity will be compared to chemistry results from samples collected at the same time including nutrients, metals and pesticides.

Management Practices Implementation

The list of management practices that can be used to keep pesticides out of surface waters is not large. Generally they fall into three categories: those practices that manage movement of surface water, those that manage the movement of sediment and those that manage applications. Managing the movement of surface water will manage pesticides that are soluble in water and managing the movement of sediment will manage pesticides with high K_{oc} that attach to sediment or organic material. In addition, since some chemicals do not follow DPR criteria, the assigned toxicity code (whether the chemical may be toxic to water column species and/or sediment species) will be included in the evaluation of which practices should be implemented (Table 8 and Table 9). Being able to assign pesticides to either of these two categories and associate chemicals with either water column or sediment toxicity will enable the Coalition to effectively conduct outreach.

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Table 8. Pesticide characteristic table (top 109 used active ingredients). Each active ingredient is associated with a chemical type and possible species that the chemical could be toxic to (Cer = Ceriodpahnia, Sel = Selenastrum, Pim = Pimephales, Hyl = Hyalella). If the Coalition analysis for the chemical (as of September 2008) it is assigned a pesticide group.

Active Ingredients	Pesticide Group	Ref	Solubility (mg/L)	Soil half-life (days)	K_{oc}	Vapor Pressure (mm HG)	Ceriodaphnia LC50 (mean µg/L)	Selenastrum EC50 (mean µg/L)	Pimephales LC50 (mean µg/L)	Chemical Type	Toxicity Code
(S)-CYPERMETHRIN	Pyrethroid				100000					INSECTICIDE	hyl-cer
(S)-METOLACHLOR		5	240	15	170	2.20E-05	15,930			HERBICIDE	sel
1,3-DICHLOROPROPENE		1	2250	10	32	29		4065	2169.5	FUNGICIDE, HERBICIDE	cer-sel
2,4-D, DIMETHYLAMINE SALT		1	200000	10	26		360,000			INSECTICIDE, HERBICIDE	cer-sel
4(2,4-DB), DIMETHYLAMINE SALT		1	709000	10	20		360,000			HERBICIDE	sel
ACEPHATE		1	818000	3	2	1.700E-06			525000	INSECTICIDE	cer
ALDICARB	Carbamate	1	6000	30	30				1143.6	INSECTICIDE	cer
AZINPHOS-METHYL	Organophosphate	5	20.9	21	1000	1.60E-06			1585.6	INSECTICIDE	cer
AZOXYSTROBIN		1	6.7	65	1590			106		FUNGICIDE	hyl-cer
BENSULIDE		1	5.6	120	1000	8.000E-07		1800		HERBICIDE	sel
BIFENAZATE										INSECTICIDE	cer
BIFENTHRIN	Pyrethroid	1	0.1	26	240000	1.800E-07	0.07			INSECTICIDE	hyl-cer
BOSCALID					809					FUNGICIDE	cer
BROMOXYNIL OCTANOATE		4	0.08	7	10000			210		HERBICIDE	sel
CAPTAN		1	5.1	3	200	0.00		3900	132.5	FUNGICIDE	cer
CARBARYL	Carbamate	1	120	10	300	1.20E-06	12	1100	10364	INSECTICIDE	cer
CARBOFURAN	Carbamate	1	351	50	22	6.00E-06	2	667	853.3	INSECTICIDE	cer
CHLOROPICRIN		1	2270	1	62	18				INSECTICIDE	cer
CHLOROTHALONIL		1	0.6	30	1380	0.001		190		FUNGICIDE	cer
CHLORPYRIFOS	Organophosphate	1	0.4	30	6070		0.055		192.35	INSECTICIDE	hyl-cer
CHLORTHAL-DIMETHYL		3	2890	30.3	29					HERBICIDE	sel
CLETHODIM		1	5400	3	10			43700		HERBICIDE	sel
COPPER		2	421000			0	302	428.78	3631.4	FUNGICIDE	cer-sel
COPPER HYDROXIDE										FUNGICIDE	cer-sel
COPPER OXIDE (OUS)										FUNGICIDE	cer-sel
COPPER OXYCHLORIDE										FUNGICIDE	cer-sel
COPPER OXYCHLORIDE										FUNGICIDE	sel-cer-pim

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Active Ingredients	Pesticide Group	Ref	Solubility (mg/L)	Soil half-life (days)	K_{oc}	Vapor Pressure (mm HG)	Ceriodaphnia LC50 (mean µg/L)	Selenastrum EC50 (mean µg/L)	Pimephales LC50 (mean µg/L)	Chemical Type	Toxicity Code
SULFATE											
COPPER SULFATE (BASIC)		1						67.8	3012.8	INSECTICIDE, HERBICIDE, FUNGICIDE	cer-sel
COPPER SULFATE (PENTAHYDRATE)		1	10000	2200	16720		44	3.1		HERBICIDE, INSECTICIDE, FUNGICIDE	cer-sel
CYCLOATE		1	95	30	430	0.0016				HERBICIDE	sel
CYFLUTHRIN	Pyrethroid	1	0.002	30	100000	1.60E-08				INSECTICIDE	hyl-cer
CYPERMETHRIN	Pyrethroid	6	0.000009	16	160000	40×10^{7}				INSECTICIDE	hyl-cer
CYPRODINIL		1		50	1000	3.80E-06				FUNGICIDE	hyl-cer
DIAZINON	Organophosphate	1	60	40	1000	0.0001	0.39	6400	7150	INSECTICIDE	cer
DICAMBA, DIMETHYLAMINE SALT		3		10	5					INSECTICIDE	cer
DICOFOL	Organochlorine	1	1	60	180000	4.00E-07			556.5	INSECTICIDE	hyl-cer
DIFLUBENZURON		3	0.08	2.08	1110					INSECTICIDE	hyl-cer
DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-ANISIC ACID					5					HERBICIDE	sel
DIMETHOATE	Organophosphate	1	39800	7	20			35000		INSECTICIDE	cer
DISULFOTON	Organophosphate	1	25	30	600	0.0002			3538	INSECTICIDE	cer
DIURON	Herbicide	1	42	90	480	6.90E-08		2.4	14200	HERBICIDE	sel
EPTC					200	0.024		6451		HERBICIDE	sel
ESFENVALERATE	Pyrethroid	1	0.002	35	5300	1.10E-08			0.256	INSECTICIDE	hyl-cer
ETHEPHON		1	1239000	10	100000	1.00E-07		1400	130000	GROWTH REGULATOR	hyl
ETHOPROP		1	750	25	70	0.0004				INSECTICIDE	cer
FENAMIPHOS		1	400	50	100	1.00E-06				INSECTICIDE	cer
FENBUTATIN-OXIDE		1	0.013	90	2300	1.80E-11			1.9	FUNGICIDE	cer
FENPROPATHRIN		3	0.04	429.1	5000					INSECTICIDE	hyl-cer
FLUMIOXAZIN					105					HERBICIDE	sel
FOSETYL-AL		1	120000	0.1	20	1.00E-07		4990		FUNGICIDE	cer
GLUFOSINATE-AMMONIUM		3		20	785					HERBICIDE	sel
GLYPHOSATE	Herbicide	1	12000	47	24000			14000	97000	HERBICIDE	sel

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Active Ingredients	Pesticide Group	Ref	Solubility (mg/L)	Soil half-life (days)	K_{oc}	Vapor Pressure (mm HG)	Ceriodaphnia LC50 (mean µg/L)	Selenastrum EC50 (mean µg/L)	Pimephales LC50 (mean µg/L)	Chemical Type	Toxicity Code
GLYPHOSATE, DIAMMONIUM SALT					24000					HERBICIDE	sel
GLYPHOSATE, ISOPROPYLAMINE SALT		1	900000	47	24000			6.915	2300	HERBICIDE, FUNGICIDE	sel-hyl-cer
GLYPHOSATE, MONOAMMONIUM SALT					24000					HERBICIDE	sel
GLYPHOSATE, POTASSIUM SALT					24000					HERBICIDE	sel
HEXAZINONE		1	33000	90	54	2.00E-07		26.1	274000	HERBICIDE	sel
HEXYTHIAZOX		3	0.12	18.7	22					MITICIDE	hyl
HYDROGEN CYANAMIDE										PLANT GROWTH REGULATOR	sel
IMIDACLOPRID		1	580	127	440					HERBICIDE, INSECTICIDE	sel-cer
INDOXACARB					2200					INSECTICIDE	hyl-cer
IPRODIONE		1	13.9	14	700	1.00E-07		130		FUNGICIDE	cer
KAOLIN										FUNGICIDE, INSECTICIDE	cer
LAMBDA-CYHALOTHRIN		3	0.005	61.8	2341					INSECTICIDE	hyl-cer
LINURON	Herbicide	5	75	60	400	1.43E-06		67		HERBICIDE	sel
MALATHION	Organophosphate	1	130	1	1800	8.00E-06	1.63	10	10460	INSECTICIDE	hyl-cer
MANCOZEB		1	6	70	2000			47		FUNGICIDE	hyl-cer
MANEB		1	6	70	2000			14		FUNGICIDE	hyl-cer
MCPA, DIMETHYLAMINE SALT		1	866000	25	20			71000		HERBICIDE	sel
MEPIQUAT CHLORIDE		1	1000000	1000	1000000			200		PLANT GROWTH REGULATOR	sel
METAM-SODIUM		1	963000	7	10	20				FUNGICIDE, HERBICIDE	cer-sel
METHIDATHION	Organophosphate	1	220	7	400	3.37E-06				INSECTICIDE	cer
METHOMYL	Carbamate	1	58000	30	72	0.0001			2044	INSECTICIDE	cer
METHOXYFENOZIDE					350					INSECTICIDE	cer

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Active Ingredients	Pesticide Group	Ref	Solubility (mg/L)	Soil half-life (days)	K_{oc}	Vapor Pressure (mm HG)	Ceriodaphnia LC50 (mean µg/L)	Selenastrum EC50 (mean µg/L)	Pimephales LC50 (mean µg/L)	Chemical Type	Toxicity Code
METHYL BROMIDE		1	13400	55	22	1824				INSECTICIDE, HERBICIDE	cer-sel
METRIBUZIN		5	1050	40	60	4.55E-07	35,360	43		HERBICIDE	sel
MSMA		1	1400000	180	7000			5630	874500	HERBICIDE	sel
MYCLOBUTANIL		1	142	66	500	1.60E-06		830		FUNGICIDE	cer
NALED		1	2000	1	180	0.0002		20	3300	FUNGICIDE	cer
NAPROPAMIDE		1	74	70	400	1.70E-07		3400		HERBICIDE	sel
NORFLURAZON		2	33.7		700	2.89E-08		9.7		HERBICIDE	sel
ORYZALIN		1	2.5	20	600	1.00E-08		42		HERBICIDE	sel
OXAMYL	Herbicide	1	282000	4	25	0.0002			6890	INSECTICIDE	cer
OXYFLUORFEN		1	0.1	35	100000	2.00E-07		26.3		HERBICIDE	sel
PARAQUAT DICHLORIDE	Organophosphate	1	620000	1000	1000000			614.5		HERBICIDE	hyl-sel-cer
PENDIMETHALIN		1	0.275	90	5000	9.40E-06		588.8		FERTILIZER, HERBICIDE	hyl-sel
PERMETHRIN	Pyrethroid	1	0.006	30	100000	1.30E-08	0.55		71.708	INSECTICIDE	hyl-cer
PHOSMET	Organophosphate	1	20	19	820	4.90E-07			8150	INSECTICIDE, FUNGICIDE	cer
POTASSIUM N-METHYLDITHIOCARBAMATE										HERBICIDE, INSECTICIDE	sel-cer
PROMETRYN		1	33	60	400	1.24E-06		21		HERBICIDE	sel
PROPANIL		1	200	1	149		3,833	29	8600	HERBICIDE	sel
PROPARGITE		1	0.5	56	4000	0.003		66.2		INSECTICIDE	hyl-cer
PYRACLOSTROBIN					16000					FUNGICIDE	hyl-cer
PYRIDABEN		3	0.01	86	1553					INSECTICIDE	cer
PYRIMETHANIL					481					FUNGICIDE	cer
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE		3	2.3	6.18	90			148		PLANT GROWTH REGULATOR	sel-cer-pim-hyl
SETHOXYDIM		1	4390	5	100	1.60E-07		302		HERBICIDE	sel
SIMAZINE	Herbicide	1	6.2	60	130	2.21E-08		1240	53200	HERBICIDE	sel
S-METOLACHLOR		5	240	15	170	2.20E-05	15,930			HERBICIDE	sel
SODIUM CHLORATE		1	100000	200	10			133000	13633333	HERBICIDE, FUNGICIDE	sel-cer

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Active Ingredients	Pesticide Group	Ref	Solubility (mg/L)	Soil half-life (days)	K_{oc}	Vapor Pressure (mm HG)	Ceriodaphnia LC50 (mean µg/L)	Selenastrum EC50 (mean µg/L)	Pimephales LC50 (mean µg/L)	Chemical Type	Toxicity Code
SODIUM TETRATHIOCARBONATE		3		79						FUNGICIDE, INSECTICIDE	cer
SPINOSAD					50					INSECTICIDE	cer
SPIROMESIFEN					43319					INSECTICIDE	hyl-cer
TEBUCONAZOLE		1	25	610	1000			2780		FUNGICIDE	cer
THIOBENCARB	Herbicide	1	28	21	900		510	29.45		HERBICIDE	sel
THIOPHANATE-METHYL		1	3.5	10	1830	1.00E-07		950		INSECTICIDE	hyl-cer
TRIFLOXYSTROBIN		1	0.61	5	2709			77100		FUNGICIDE	hyl-cer
TRIFLURALIN		1	0.3	60	8000	0.0001		673	105	HERBICIDE, INSECTICIDE	hyl-sel-cer
ZIRAM		1	65	30	400	1.00E-07		67	126.5	FUNGICIDE	cer

References:

1- ftp://ftp.wcc.nrcs.usda.gov/downloads/pestmgt/AI_LIST.xls
2- http://risk.lsd.ornl.gov/
3- http://www.pesticideinfo.org/
4- http://npic.orst.edu/ppdmove.htm
5- Chemfinder, http://chemfinder.cambridgesoft.com/
6- Extoxnet, http://extoxnet.orst.edu/

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Table 9. Table of management practices, target constituents, mechanism and possible improvements to water quality.

Management Practice	Endpoint	Management Practice Target(s)	Management Practice Mechanism	Effected water/sediment quality monitoring parameter(s)
Sediment basin	Reduce discharge	PI, PS, K, S, NP	Settling of sediment, pesticides bound to sediments; allow time for biodegradation of pesticides.	Color, turbidity, EC, TDS, metals, short half-life pesticides, high K_{oc} pesticides, total phosphorous
Vegetated buffers	Reduce discharge	PI, PS, K, S, NP, NN	Removal of sediment, nutrients, and pesticides bound to sediments or any contaminants with low solubility.	Color, turbidity, EC, TDS, metals, pesticides, nutrients
Cover crop, dormant season vegetation	Reduce discharge	K, S, NP	Removal of sediment, pesticides bound to sediments or any contaminants with low solubility; protect soils and soil nutrients for growing season.	Color, turbidity, EC, TDS, metals, pesticides, nutrients
Sprayer calibration	Reduce discharge	D	Reduce potential for spray drift.	All pesticides
Polyacrylamide (PAM)	Reduce discharge	PI, K, S, NP	A surfactant that removes sediment from the water column, thus pulling out pesticides bound to sediments.	Color, turbidity, metals, pyrethroid pesticides, total phosphorous
Dormant season field retainers	Reduce discharge	PS, S	Reduce/eliminate storm runoff.	Color, turbidity, EC, TDS, copper, pyrethroid pesticides, organophosphate pesticides
Micro irrigation	Reduce water use & discharge	D,W	Increase water efficiency, eliminate potential for spray drift.	All pesticides, copper
Tail water return	Reduce water use & discharge	PI , PS, K, S, W, NP, NN	Re-use of irrigation water, eliminate discharge altogether.	Color, turbidity, EC, TDS, metals, all pesticides, all nutrients

Management Practice Targets Code:

D: Chemical (pesticide) drift
PS: Dormant spray pesticide storm runoff
S: Sediment runoff
NP: Nutrients: phosphorous
PI: Pesticide runoff from irrigation
K: High K_{oc} pesticide runoff
W: Water use efficiency
NN: Nutrients: nitrate, nitrite or Kjeldhal nitrogen

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PRIORITIZATION OF EXCEEDANCES

The ESJWQC has developed a prioritization process which allows the Coalition to focus on constituents of the greatest concern. These constituents are included in the Management Plan process outlined in Figure 3. The prioritization process has been developed in collaboration with the Regional Board and allows the Coalition to focus on constituents where sourcing is possible (i.e. pesticide use reports) and for which management practices are available. Following the flow chart in Figure 3, a priority level is assigned to a Management Plan constituent for a specific site subwatershed. Priority levels will determine the level of activity for sourcing, outreach and evaluation. In the Management Plan process diagram (Figure 2), these actions are listed as TIER 1, 2 or 3 actions. The Management Plan process is based on both the history of exceedances and the actions taken to date. The prioritization process is then used to determine which actions the Coalition will perform based on exceedances or lack of exceedances in the previous year. Tier 1 actions begin with the first year of Management Plan implementation. If exceedances occur during the first year, the Coalition will move to Tier 2 actions the second year. If exceedances occur again, the Coalition will move to Tier 3 actions during the third year. If, however, during the first year there were no exceedances the Coalition continues to perform Tier 1 actions. The Management Plan and prioritization processes (Figure 2 and 3) are intended as general guidelines for the Coalition. The text will augment the actions listed in the flow diagrams where specifics could not be addressed.

Using the prioritization process flow chart (Figure 3), analytes are assigned a priority based on responses to a series of questions which take into account information used for sourcing and managing such as whether or not the analyte is an applied pesticide, metal or nutrient. Assessing whether the analyte is found in association with sediment toxicity (i.e. total metals that may be bound to sediment) addresses whether the constituent of concern may be a result of the mobilization of sediment. The Coalition can address sediment-bound analytes with specific management practices. The responses are used to evaluate the water quality impact of the analyte including whether or not there is an established Total Maximum Daily Load (TMDL), whether the analyte is associated with toxicity (samples collected at the same time had toxicity for a species that the analyte of concern could be responsible for) and whether there are exceedances associated with sediment transport. If an exceedance occurs for a TMDL constituent, a management plan will be required for that constituent and site subwatershed regardless of whether or not there was a second exceedance. Each priority is described in the following section including actions that will be taken by the Coalition to source, conduct outreach and perform evaluation of management practices. The specifics of how and when this will be done are included in appropriate individual Site Subwatershed Management Plans.

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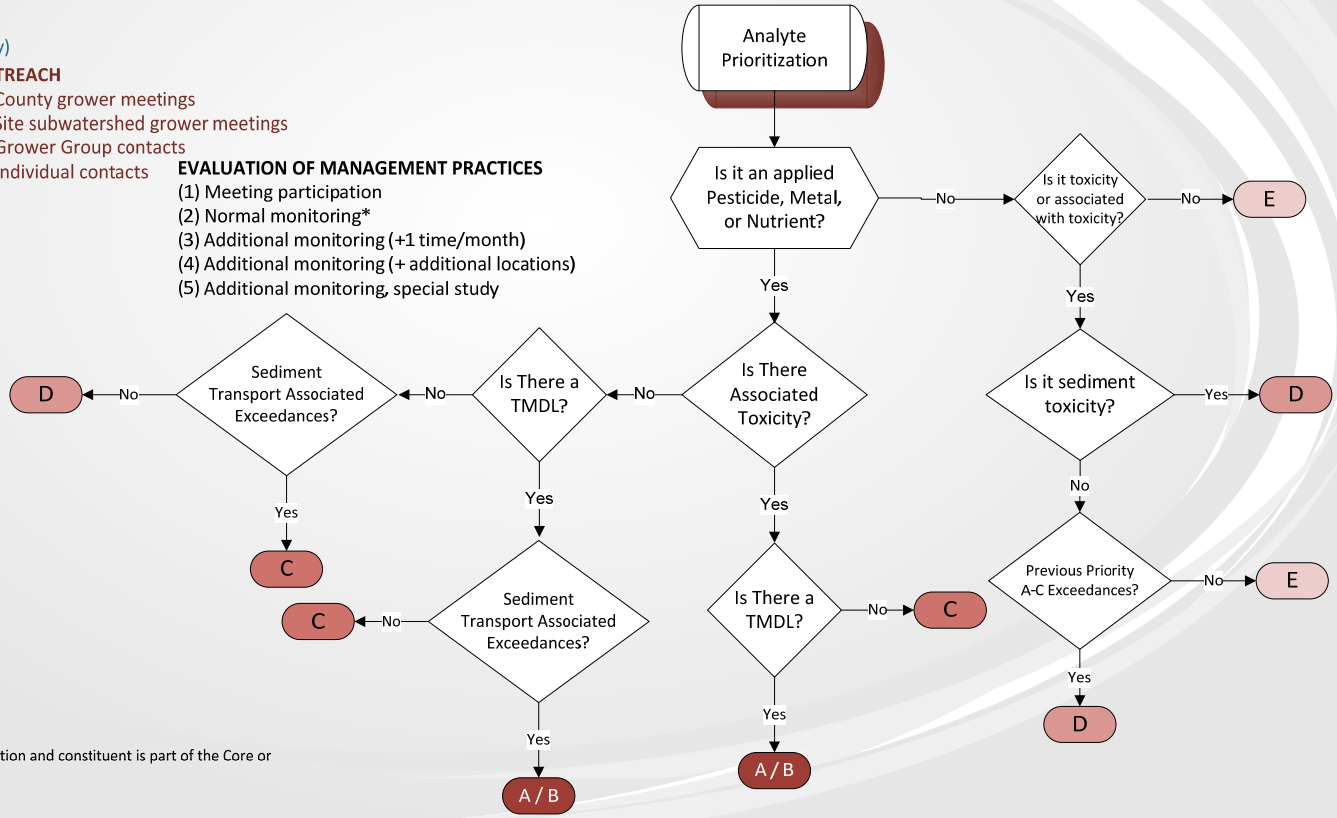
Figure 3. ESJWQC prioritization process including actions for sourcing, outreach and evaluation of management practices.

Priority Level	TIER 1			TIER 2			TIER 3		
	Source	Outreach	Evaluation	Source	Outreach	Evaluation	Source	Outreach	Evaluation
A	1, 3	1, 2	2, 3	1, 2, 3/4	1, 2, 3, 4	1, 2, 3, 4	1, 3, 4	1, 2, 3, 4	1, 2, 3, 4, 5
B	1, 3	1, 2	2, 3	1, 2, 3/4	1, 2, 3	1, 2, 3, 4	1, 3, 4	1, 2, 3, 4	1, 2, 3, 4, 5
C	1, 3	1, 2	2, 3	1, 2, 3/4	1, 2, 3	1, 2, 3, 4	1, 3, 4	1, 2, 3, 4	1, 2, 3, 4, 5
D	1, 3	1, 2	2, 3	1, 2, 3/4	1, 2	2, 3	1, 3, 4	1, 2, 3	1, 2, 3, 4
E		1	2		1	2		1	2

SOURCE
(1) PURs
(2) Creek Walks
(3) Additional Monitoring (upstream/ + frequency)
(4) Special Studies

OUTREACH
(1) County grower meetings
(2) Site subwatershed grower meetings
(3) Grower Group contacts
(4) Individual contacts

EVALUATION OF MANAGEMENT PRACTICES
(1) Meeting participation
(2) Normal monitoring*
(3) Additional monitoring (+1 time/month)
(4) Additional monitoring (+ additional locations)
(5) Additional monitoring, special study



*Normal monitoring will occur if the location and constituent is part of the Core or Assessment Monitoring schedule.

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PRIORITY-SPECIFIC MANAGEMENT GOALS AND PLANS

The prioritization of constituents and site subwatersheds is described above. Figure 3 include actions at each tier and priority levels for sourcing, outreach and evaluation. The overall Management Plan process from year to year is outlined in Figure 2 and described in the section Management Plan Process. Both Figure 2 and 3 should be used during the following descriptions of prioritization, tier actions and progression within the Management Plan process from year to year. Actions listed in Figure 3 are a guideline by which the Coalition will base its actions. The specific actions will be addressed in the individual Site Subwatershed Management Plans and the Coalition may chose to do more actions than are listed based on the magnitude and frequency of exceedances.

Priority A/B

Priority A/B constituents are applied metals, nutrients and pesticides for which there are Total Maximum Daily Loads (TMDLs) established and/or associated toxicity. Currently TMDLs have been established for the San Joaquin River for chlorpyrifos and diazinon. If at the time of an applied pesticide or metals exceedance there was also an associated toxicity exceedance, then this constituent at this site subwatershed would become a priority A/B (Figure 3). Designation of constituents as priority A or B is made by the Coalition in collaboration with the Regional Board and based on factors including frequency of the exceedance, magnitude of the exceedance, flows at the time of the exceedance, and size of the site subwatershed. Prioritization drives the allocation of resources for source identification, outreach and management practice evaluation. The primary difference between priority A and B constituents is the level of Coalition outreach in Tier 2.

Sourcing

Sourcing for priority A and B constituents includes using PUR data and conducting additional monitoring during the first year of the management plan implementation (Figure 3, Tier 1). If an exceedance does not occur during the second year of a Management Plan for the priority A/B constituent within a site subwatershed then the actions of the Coalition stay within Tier 1. If an exceedance does occur during the second year of Management Plan implementation, the Coalition progresses to Tier 2. Tier 2 actions for sourcing include additional efforts such as conducting creek walks by local Agricultural Commissioner staff and possibly conducting a special study or additional upstream monitoring. If an exceedance occurs during the third year of Management Plan implementation the Coalition actions will progress to Tier 3 which includes sourcing with PURs, additional monitoring and possible special studies.

For high priority subwatersheds, the Coalition will attempt to correlate PUR data reported at a TRS level with an APN. This can be done by evaluating the size of the acreage to where the chemical was applied and matching that acreage with acreages associated with individual

parcels. The difficulty with associating TRS to APN is that there may be multiple APNs per TRS and/or one APN may cover more than one TRS.

The correlation does not work in every case but should be sufficiently accurate to aid the Coalition in focusing outreach to Coalition members within the subwatershed and conducting individual outreach. The PUR data will be evaluated for trends in application rates, application months, crops from year to year and between TRS. The Coalition will also review survey results from members that can be associated with APNs within a TRS that have had applications co-occurring with the exceedance. The baseline survey results will enable the Coalition to determine which members to contact first, focusing on those that have implemented minimal or no management practices and discharging directly into a waterbody. The Coalition will conduct grower and/or individual contacts for the high priority subwatersheds based on this information.

Situations may arise that the Coalition needs to source priority A/B constituents and PUR data are not available. It may take three to nine months for the Coalition to obtain PUR depending on the county and the number of pesticide applications in a month. The Coalition may encounter exceedances of such magnitude that notification and outreach to growers in a specific subwatershed must be done immediately and therefore the Coalition cannot wait for PUR data before it begins sourcing. There may also be times when there is an exceedance for a chemical where there has been no reported use. Depending on the exact situation the Coalition may conduct specific outreach for growers in the area to discuss the exceedance and current practices. The Coalition can also focus outreach based on past exceedances, crop types and previous TRS where the constituent of concern was applied during the same month in previous years.

Outreach

Outreach for priority A/B constituents within Tier 1 includes county grower meetings and site subwatershed grower meetings. If actions progress to Tier 2 due to additional exceedances, the Coalition will continue county grower meetings, (site) subwatershed grower meetings but will also initiate specific grower group contacts. For example, the Coalition may conduct a meeting with almond growers if exceedances continue to occur due to dormant sprays on almond orchards. For priority A constituents the Coalition will conduct additional outreach and perform individual contacts. By Tier 3, both priority A and B constituents will lead to all four types of Coalition outreach from County grower meetings to individual contacts.

Evaluation of Management Practices

One of the most difficult actions facing the Coalition is evaluation of the effectiveness of management practices and outreach to growers. During the first year of Management Plan implementation the Coalition will conduct monitoring as outlined in the MRPP as well as additional monitoring (an extra sampling per month during irrigation season) to assess the impact of Coalition outreach. It is the goal of the Coalition that through county and subwatershed meetings and crop-specific direct mailings, Coalition efforts will have eliminated

exceedances. If however exceedances continue during the first year of Management Plan monitoring, the outreach actions will progress to Tier 2. In Tier 2 the Coalition will monitor meeting attendance to assess grower participation and potential changes to grower practices. Tier 3 actions include assessment of meeting participation and additional monitoring.

The individual Site Subwatershed Management Plans for high priority subwatersheds will evaluate the sources of the priority A/B exceedances and use that information to encourage adoption of management practices within the area that has the highest potential of eliminating exceedances. Details on how to select and implement the proper management practices will be discussed at grower group meetings and during individual contacts. Selecting the proper management practice will be based on the characteristics of the applied active ingredients listed in Table 8 and the appropriate management practices listed in Table 9. In most cases, multiple management practices will need to be implemented to improve water quality. Tracking of management practices and evaluation the effectiveness of newly implemented management practices are described further in the section Management Practice Identification, Evaluation and Outreach.

Priority C

Priority C constituents include applied pesticides and metals that are not associated with toxicity and do not have an implemented TMDL but are associated with sediment or have an implemented TMDL but are not associated with sediment. Priority C constituents can also be an applied pesticide or metal that has associated toxicity but does not have an implemented TMDL. For example, diuron is a priority C constituent if there are multiple exceedances in a specific site subwatershed at least one of which is associated with toxicity to *Selenastrum*. Priority C constituents have actions for sourcing, outreach and evaluation of management practices identical to priority A constituents but differs from priority A constituents in that there are no individual contacts for priority C constituents in Tier 2.

Priority D

Priority D constituents include applied pesticides and metals with no implemented TMDLs and which are not associated with sediment transported exceedances. Priority D constituents include water column toxicity associated with other water quality exceedances of priority A, B, and C constituents. Priority D constituents include those that can be associated with sediment toxicity. For water column toxicity that is not associated with an applied constituent, it is difficult for the Coalition to identify a source of the water impairment which then makes it difficult to focus outreach and management practice implementation. Sediment chemistry was not performed by the Coalition previous to this Management Plan and sediment toxicity is difficult to associate with an applied constituent. Under the new MRPP submitted on August 25, 2008 which will be implemented October 2008, the Coalition will analyze for sediment chemistry in samples that exhibit sediment toxicity. Therefore these exceedances are of a lower priority for the Coalition. The Coalition actions for sourcing are the same as for priority B and C constituents. Outreach in Tier 1 and 2 include county grower meetings and site subwatershed grower meetings. In Tier 3, the Coalition will increase outreach activities to

include specific commodity/grower group contacts. Evaluation of management practices for Tier 1 and 2 will include normal monitoring and additional monitoring during the month when exceedances have occurred. In Tier 3 the Coalition will focus on grower meeting participation and may include additional locations for monitoring to better evaluate management practices.

Priority E

Priority E constituents include many of the physical parameters including total dissolved solids (TDS), specific conductance (EC), pH, dissolved oxygen (DO), temperature and any other constituent that is not an applied pesticide or metal. Water column toxicity that has occurred within a site subwatershed where no priority A, B, or C constituent exceedances have occurred will also be classified as priority E. Source identification for these constituents is extremely difficult and can require expensive and sophisticated analytical tools. During grower outreach meetings, priority E exceedances will be addressed although no meetings will be held specifically for these constituents. Normal monitoring will be the only evaluation tool available to assess management of these constituents. It is important to note that exceedances of salt, reflected as either or both EC and TDS, is a problem throughout the Central Valley. Ground and surface water within the Coalition region, particularly the western portions of Merced and Stanislaus Counties, have high salt levels. Sources of salt include discharge of subsurface tile drains or drainage wells into regional irrigation canal systems or to local drains. These flows are then used for irrigation or are discharged to the lower San Joaquin River between the confluences of Merced and Tuolumne Rivers. Existing data suggest that both naturally occurring salts and fertilizers applied to crop land contribute to high salt levels in groundwater which migrate to local surface waters through seepage, springs and by pumping from agricultural drainage systems.

The Coalition will participate in the Regional Board process to address salt issues and participate in discussions focused on reducing the amount of salt discharged by agriculture.

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MANAGEMENT PLAN SCHEDULES

Management Plan Development Timelines

The ESJWQC originally submitted 19 individual management plans during April and May of 2007. Table 10 lists all of the subwatersheds for which management plans were submitted. Some site subwatersheds have multiple dates because of revisions and re-submittals to the draft plans. The Coalition reviewed and compiled 12 individual Management Plans listed below into a single management plan to streamline the approval process and comply with the current Management Plan requirements of the MRP Order No. 2008-0005. The current Management Plan includes updated monitoring results from 2004 through September 2007 and additional site subwatersheds information relevant to the Management Plan requirements. Jones Drain @ Oakdale Rd and August Rd Drain upstream of Crows Landing are not included in this Management Plan. The Coalition removed August Drain from sampling due to safety issues and Jones Drain does not connect to any downstream water bodies and therefore was removed from sampling after 2007.

Table 10. Schedule of Management Plans that have been submitted for each site subwatershed.

Sample Site	Management Plan Due Date
Highline Canal @ Hwy 99 Highline Canal @ Lombardy Rd	11/17/2006 Revised 4/2/2007
Dry Creek @ Wellsford Road	4/2/2007
Duck Slough @ Gurr Rd Duck Slough @ Hwy 99	11/17/2006 Revised 4/2/2007
Ash Slough @ Ave 21	11/17/2006 Revised 4/13/2007
Berenda Slough along Rd 18 1/2	4/13/2007
Jones Drain @ Oakdale Rd	4/13/2007
Silva Drain @ Meadow Drive	4/13/2007
Cottonwood Creek @ Road 20	4/27/2007
Bear Creek @ Kibby Rd	4/27/2007
Merced River @ Santa Fe	11/17/2006 Revised 4/27/2007
Dry Creek @ Rd 18	4/27/2007
August Rd Drain upstream Crows Landing	5/11/2007
Black Rascal Creek @ Yosemite Rd	5/11/2007
Deadman Creek @ Gurr Rd	5/11/2007
Deadman Creek @ Hwy 59	
Mustang Creek @ East Ave	5/11/2007
South Slough @ Quinley Road	5/11/2007
Hilmar Drain @ Central Ave	5/11/2007
Prairie Flower Drain @ Crows Landing	5/11/2007

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Management Plan Performance Goals and Schedules

Management Plan Process

The Coalition Management Plan will be updated annually in April and submitted after the Annual Monitoring Report. The Management Plan will evaluate the impacts on water quality of both monitoring results and Coalition actions during the previous storm and irrigation seasons. An updated exceedance tally will be submitted and each site subwatershed will be evaluated to determine Coalition actions to be implemented during the upcoming year based on Management Plan constituents (both old and new), constituent priority and tier level. Based on updated site subwatershed information (new exceedances, improvements to water quality, implemented management practices), the Coalition will develop new monitoring and action schedules for the upcoming year. A general overview of the Coalition Management Plan activities is included in Table 11 listing the Coalition tasks (both actions and processes) and corresponding months in which those tasks will be performed from January 2008 till December 2009.

During October 2008 the Coalition will mail out Best Management Practice (BMP) Handbooks developed by the Center for Urban/Rural Environmental Stewardship (CURES) to all members. The handbooks were originally designed for the Westside Coalition and contain information on farming practices such as sediment basins, polyacrylamide (PAM), enzyme treatments, tailwater return systems, vegetative ditches, irrigation scheduling and others (Attachment 1, example of Westside handbook). These documents are summaries of technical reports developed by the California Water Institute, Ducks Unlimited, California Department of Pesticide Regulation and others.

The Coalition Management Plan has been developed in accordance with an updated MRPP that was submitted to the Regional Board on August 25, 2008. The new MRPP identifies Core and Assessment sites and provides a new monitoring schedule. Management Plan sampling will commence in April 2008 under the previous MRPP (submitted in 2006). Winter sampling in 2009 will be the first season under the new MRPP and therefore when this Management Plan is reviewed in April 2009 it will integrate exceedances of new constituents and will take into account the new sampling design.

The Coalition will meet with the Regional Board prior to submittal of the Management Plan update and discuss the effectiveness of the current Management Plan design. The Coalition will work with the Regional Board to ensure that the Management Plan's performance goals, listed in the section Management Practice Performance Goals and Schedule, meet the requirements of the ILRP from year to year.

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Table 11. Coalition wide Management Plan activity schedule.

Coalition Task	2008												2009											
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Additional / Upstream Monitoring				x	x	x	x	x	x							x	x	x	x	x	x			
PUR Data	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
County Grower Meetings*										x	x	x										x	x	x
Exceedance Notifications			x				x			x					x				x			x		
CURES ESJWQC BMP Handbooks										x														
Quarterly Data Reports															x			x			x			x
Semi and Annual Monitoring Reports						x									x									
Management Plan Updates				x					x							x								
Updated MRPP and QAPP								x																
New MRPP activation										x														
Meetings with Regional Board											x			x			x			x			x	

*Months of meetings with growers will depend on availability of locations and speakers but are anticipated to occur before and after the irrigation season sampling.
Grower group and individual contacts will depend on the specific exceedances and will be scheduled at a time to best inform growers of the issues and work with them for the months that there have been exceedances. A general range of dates is included in Table 16.

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Management Plan Sampling Schedule

The 2008 Management Plan sampling schedule is outlined in Table 12. The Management Plan monitoring locations and sampling months are based on site subwatershed exceedances, exceedance prioritization and Management Plan tier level. Table 13 lists the sampling coordinates for Management Plan site subwatersheds including upstream sampling locations that were monitored during the 2008 irrigation season.

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Table 12. 2008 Management Plan sampling schedule. Type U = upstream sampling location. Type A = additional sampling per month.

Sample Site	Month	Type	Chlorpyrifos	Bifenthrin	Diuron	Ammonia	Nitrate	Copper	*Ceriodaphnia dubia*	*Selenastrum capricornutum*	*Pimephales promelas*
Deadmans Creek @ Gurr Rd	April	A						x			
Dry Creek @ Rd 22	April	U	x					x			
Duck Slough @ Whealan	April	U						x			
Highline Canal @ Hwy 99	April	A						x			
Hilmar Drain @ Central Ave	April	A			x						
Prairie Flower @ Morgan Rd	April	U					x				
Ash Slough @ Ave 21	May	A						x			
Bear Creek @ Kibby Rd	May	A	x						x		
Berenda Slough at Rd 19	May	U								x	
Black Rascal Creek @ Yosemite	May	A	x						x		
Cottonwood Creek @ Hwy 145	May	U						x			
Deadmans Creek @ Gurr Rd	May	A						x			x
Dry Creek @ Rd 22	May	U						x			
Duck Slough @ Whealan	May	U	x								
Highline Canal @ Hwy 99	May	A							x		
Highline Canal @ Lombardy Rd	May	A						x			
Livingston Drain @ Robin Ave	May	A						x			
Miles Creek @ Reilly Rd	May	A						x			
Prairie Flower @ Morgan Rd	May	U					x				
Ash Slough @ Ave 21	June	A						x			
Cottonwood Creek @ Hwy 145	June	U						x			
Deadmans Creek @ Gurr Rd	June	A									x
Dry Creek @ Rd 22	June	U						x			
Duck Slough @ Hwy 59	June	U						x			
Duck Slough @ Whealan	June	U						x			
Highline Canal @ Hwy 99	June	A						x			
Highline Canal @ Lombardy Rd	June	A							x		
Hilmar Drain @ Central Ave	June	A			x						

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Sample Site	Month	Type	Chlorpyrifos	Bifenthrin	Diuron	Ammonia	Nitrate	Copper	*Ceriodaphnia dubia*	*Selenastrum capricornutum*	*Pimephales promelas*
Livingston Drain @ Robin Ave	June	A						x			
Miles Creek @ Reilly Rd	June	A						x			
Prairie Flower @ Morgan Rd	June	U					x				
Ash Slough @ Ave 21	July	A	x					x			
Bear Creek @ Kibby Rd	July	A	x						x		
Berenda Slough at Rd 19	July	U	x							x	
Black Rascal Creek @ Yosemite	July	A	x						x		
Cottonwood Creek @ Hwy 145	July	U						x			
Dry Creek @ Rd 22	July	U	x					x			
Dry Creek @ Rd 28 ½	July	U						x			
Dry Creek @ Waterford Rd	July	U	x								
Duck Slough @ Hwy 59	July	U						x		x	
North Slough @ Hwy 59	July	U						x		x	
Duck Slough @ Whealan	July	U	x					x			
Highline Canal @ Hwy 99	July	A	x					x			
Highline Canal @ Lombardy Rd	July	A	x								
Hilmar Drain @ Mitchell Ave	July	U				x	x	x		x	
Reclamation Drain @ Williams Ave	July	U				x	x	x		x	
Livingston Drain @ Robin Ave	July	A						x			
Merced River @ Santa Fe	July	A							x		
Prairie Flower @ Morgan Rd	July	U					x				x
Silva Drain @ Meadow Dr	July	A	x								
Ash Slough @ Ave 21	August	A	x					x			
Black Rascal Creek @ Yosemite	August	A	x						x		
Cottonwood Creek @ Hwy 145	August	U						x			
Deadmans Creek @ Hwy 59	August	A	x								
Dry Creek @ Rd 22	August	U						x			
Dry Creek @ Waterford Rd	August	U	x								
Duck Slough @ Whealan	August	U						x			
Highline Canal @ Hwy 99	August	A						x			

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Sample Site	Month	Type	Chlorpyrifos	Bifenthrin	Diuron	Ammonia	Nitrate	Copper	*Ceriodaphnia dubia*	*Selenastrum capricornutum*	*Pimephales promelas*
Highline Canal @ Lombardy Rd	August	A								x	
Merced River @ Santa Fe	August	A							x		
Miles Creek @ Reilly Rd	August	A						x			
Prairie Flower @ Morgan Rd	August	U	x				x				
Silva Drain @ Meadow Dr	August	A	x								
Ash Slough @ Ave 21	September	A						x			
Berenda Slough at Rd 19	September	U	x								
Black Rascal Creek @ Yosemite	September	A	x								
Cottonwood Creek @ Hwy 145	September	U						x			
Deadmans Creek @ Hwy 59	September	A	x								
Dry Creek @ Rd 22	September	U						x			
Dry Creek @ Rd 28 ½	September	U						x			
Dry Creek @ Waterford Rd	September	U	x						x		
Duck Slough @ Hwy 59	September	U								x	
North Slough @ Hwy 59	September	U								x	
Duck Slough @ Whealan	September	U						x			
Highline Canal @ Hwy 99	September	A							x		
Highline Canal @ Lombardy Rd	September	A							x		
Livingston Drain @ Robin Ave	September	A						x			
Prairie Flower @ Morgan Rd	September	U	x				x		x		

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Table 13. 2008 Management Plan sampling locations.

Zone*	Management Plan Site Name	Upstream Site Name	Station Code	Latitude	Longitude
6	Ash Slough @ Ave 21		545XASAAT	37.0545	-120.4158
4	Bear Creek @ Kibby Rd		535XBCAKR	37.3128	-120.4138
6	Berenda Slough along Ave 18 1/2		545XBSAAE	37.0182	-120.3265
		Berenda Slough @ Rd 19	545XBSARN	37.1214	-120.2021
4	Black Rascal Creek @ Yosemite Rd		535BRCAYR	37.3321	-120.3947
6	Cottonwood Creek @ Rd 20		545XCCART	36.8686	-120.1818
		Cottonwood Creek @ Hwy 145	545XCCAHO	36.9002	-120.0555
5	Deadman Creek @ Gurr Rd		535XDCAGR	37.1936	-120.5612
5	Deadman Creek @ Hwy 59		535DMCAHF	37.1981	-120.4869
6	Dry Creek @ Rd 18		545XDCARE	36.9818	-120.2195
		Dry Creek @ Rd 22	545XDCART	37.0057	-120.1471
		Dry Creek @ Rd 28 1/2	545XDCATE	37.0679	-120.0292
1	Dry Creek @ Wellsford Rd		535XDCAWR	37.6602	-120.8743
		Dry Creek @ Waterford Rd	535XDCWF	37.6588	-120.7789
5	Duck Slough @ Gurr Rd		535XDSAGR	37.2142	-120.5596
		Duck Slough @ Hwy 59	535XDSHFN	37.2345	-120.4881
		North Slough @ Hwy 59	535XNSHFN	37.2277	-120.4880
5	Duck Slough @ Hwy 99		535XDSAHN	37.2501	-120.4100
		Duck Slough @ Whealan Rd	535XDSAWH	37.2615	-120.3433
2	Hatch Drain @ Tuolumne Rd		535XHDATR	37.5149	-121.0122
3	Highline Canal @ Hwy 99		535XHCHNN	37.4153	-120.7557
3	Highline Canal @ Lombardy Ave		535XHCHNN	37.4556	-120.7207
2	Hilmar Drain @ Central Ave		535XHDACA	37.3906	-120.9582
		Reclamation Drain @ Williams Ave	535XRDAWA	37.3907	-120.9409
		Hilmar Drain @ Mitchell Rd	535XHDAMR	37.3907	-120.9409
4	Livingston Drain @ Robin Ave		535XLDARA	37.3169	-120.7423
4	Merced River @ Santa Fe		535XMRSFD	37.4271	-120.6721
5	Miles Creek @ Reilly Rd		535XMCARR	37.2582	-120.4755
3	Mustang Creek @ East Ave		535XMCAEA	37.4918	-120.6839
2	Prairie Flower Drain @ Crows Landing Rd		535XPFDCL	37.4422	-121.0024
		Prairie Flower Drain @ Morgan Ave	535XPFDMR	37.4379	-120.9757
4	Silva Drain @ Meadow Dr		535XSDAMD	37.4291	-120.6261
4	South Slough @ Quinley Rd		535XSSAQR	37.2699	-120.5971
2	Westport Drain @ Vivian Rd		535XWDAVR	37.5368	-121.0486

*The ESJWQC MRPP submitted on August 25, 2008 includes a complete description of each zone.

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Management Practice Identification, Evaluation, and Outreach

Each year exceedances are identified and the source of the exceedance is investigated using one or more of the following: PURs, TIEs, past applications (when a pesticide causes an exceedance), and additional monitoring. Sourcing of priority A and B level exceedances will be used to focus outreach. Depending on the tier and priority of the exceedance, the Coalition will identify a list of potential management practices that will be effective within that area on the targeted constituent. If the exceedance is a priority A constituent in Tier 2 or 3, the Coalition will undertake individual contacts as necessary to determine current management practices and inform growers of management practices that can be implemented to improve water quality. Table 14 outlines the site subwatershed by tier level and for each level lists the priority level and Coalition actions that will be performed in 2008/2009.

The Coalition will use various surveys to understand current management practices implemented within the Subwatershed region and to evaluate changes in practices and effectiveness of both current and new practices on water quality. The Coalition will use three types of surveys: general surveys, grower group surveys and individual surveys. The general survey has been mailed to all members within the subwatershed area. Returned surveys have been entered into an Access database and are being linked to member information. The difficulty of using general surveys is that a single grower may fill out a survey for each parcel that he/she manages or they may fill out one survey for multiple parcels in multiple subwatersheds. The Coalition is currently compiling all returned surveys and assigning member IDs, APNs and site subwatersheds to the surveys to be used to create a baseline database of management practices. For high priority subwatersheds, grower group and individual surveys will be used to assess at a grower and parcel level the management practice implementation and effectiveness. Further descriptions of all three surveys are included below.

General Survey

The ESJWQC General Survey is a requirement for all members to submit to be considered an active member. This survey is used as a baseline assessment of overall Coalition management practices. The Coalition will link surveys with individual parcels by November 2008 and conduct an analysis of management practices (as indicated by survey results) for all site subwatersheds by December 2008. The Coalition has previously summarized the results of the surveys by site subwatershed however this analysis will allow the Coalition to evaluate management practices on a parcel level.

Grower Group Survey

The Grower Group Survey will be handed out at grower meetings in priority subwatersheds. Groups could include specific crop growers (row crops, grapes, orchards) and/or groups who use specific types of pesticides (i.e. organophosphates, herbicides, pyrethroids). These surveys will be included with meeting handouts and will assess whether a member has already filled out a general survey and whether they are interested in having a Coalition representative contact them to do an on-site assessment of their current management practices.

Individual Grower Meetings (Checklist)

The Individual Grower Checklist will be filled out by a Coalition representative during meetings with individual growers in high priority subwatersheds. These growers will be identified and contacted based on the following criteria:

- Within a high priority management plan subwatershed,
- Have been identified as applying a chemical that is associated with a water quality exceedance,
- Active member of the Coalition,
- Close proximity to the watershed that could result in discharge of agricultural drain water.

The goal of individual grower meetings is to obtain information about current management practices from growers that have applied chemicals at times co-occurring with water quality exceedances of that chemical. The grower will be asked to meet with Coalition representatives and the Coalition representative will fill out the checklist during the interview with the grower. The grower will be informed of additional management practices that they can implement to reduce agricultural discharge as well as information regarding Proposition 84 and NRCS/EQIP funds for management practice implementation. In addition the grower will be asked if they are willing to update their practices reports on a annual basis. The Coalition representative will return in a year to record newly implemented management practices and discuss water quality monitoring results.

The Individual Grower Checklists are based in part on the Central Coast Irrigated Lands Regulatory Program Management Practice checklist as well as surveys used in the Butte and Glenn County Best Management Practices Evaluation. Separate checklists were created for pest management, irrigation water management, dormant spray management, erosion and sediment management and nutrient management. Only appropriate checklists will be filled out during each interview. The Coalition representative will be knowledgeable about previous pesticide use, current water quality issues for that site subwatershed, and management practices known to be effective for the particular exceedance and conditions on the farm. Therefore, checklists will be selected and filled out based on the exceedances experienced.

Unlike the General Survey, the checklists will be filled out by the Coalition representative in the presence of the grower. Checklist completion will be an interactive process. The same person will fill out each checklist eliminating bias and misinterpretation. In addition, the Coalition expects a 100% return rate since the checklists will be filled out at the time of the interview. Conducting individual grower contacts is both time and money intensive. The Coalition will conduct the first set of interviews in the Dry Creek @ Wellsford Rd subwatershed as a pilot project to determine the effectiveness of this strategy. Effectiveness will be assessed based on:

- Cost to Coalition per interview,
- Ability to compile management practices in one location,

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- Ability to link management practices to grower membership information, past survey, results and current subwatershed water quality results, and
- General response of growers during and after the interviews.

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EXAMPLE CHECKLIST

Grower Group Survey

First Name: _____
Last Name: _____
Are you a Coalition member? Yes / No Since (list year): _____
How many other Coalition meetings have you attended prior to this one? 0 1 2 3 >4
Did you fill out a General Survey (mailed with membership application)? Yes / No
Are you interested in conducting a farm specific assessment of your current management practices and receive additional information (and possibly support) for future management practice implementation? Yes / No
If yes, when would you prefer to conduct a farm specific assessment? _____
How can the Coalition reach you? Email / Phone / Other _____
Email: _____
Phone: _____
Did you find this meeting useful? Yes / No
What management practice(s) do you intend to employ after attending this meeting?
_____

_____

Comments/suggestions:
_____

_____

_____

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EXAMPLE CHECKLIST

Checklist Cover Sheet (applies to all checklists filled out for a grower)

Subwatershed
Grower Name
County

APN(s)	TRS	Crop	Acres
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Crop Type: Field Crop / Row Crop / Orchard / Vineyard / Rice / Pasture / Other: _____
Field properly graded: yes / no
Contaminant pad with sump pump: yes / no
Surface where pesticides/fertilizer mixing/loading takes place: Concrete or asphalt pad / field / soil or gravel / hard packed or paved road
Minimum distance between any pesticide or fertilizer mixing/loading area and any waterway: 0-20 ft / 20-100 ft / > 100 ft
Minimum distance between any pesticide or fertilizer mixing/loading area and any deep well locations: 0-20 ft / 20-100 ft / > 100 ft
Pesticide mixing/loading management practices:

- ☐ Check for faulty hoses and ensure drain is in place prior to filling the tank
- ☐ Do not overflow tank
- ☐ Use an airgap between the fill tube and the tank
- ☐ During mixing/loading tank is less than full to minimize spills
- ☐ Someone is present during pesticide/fertilizer mixing/loading operations to watch for spills
- ☐ Clean up after pesticide/fertilizer spills promptly

How do you dispose of rinsate from your sprayer(s)? Mix with water and reapply to field / Store in a hazardous waste container / dispose in field more than 150 feet from surface waters / dispose in field less than 150 feet from surface waters / Not Applicable

Where do you clean spray application equipment? On a mixing/loading pad / on application site (rinseate re-applied to field) / More than 150 feet from surface waters / Less than 150 feet from surface waters

How do you handle empty pesticide containers? Triple rinsed, taken to landfill or recycling handler / triple rinsed, then put on burn pile / put on burn pile

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EXAMPLE CHECKLIST

Pest Management Checklist

Pesticide exceedances within this subwatershed: Analyte (date)
Chemical and products applied in the past (based on PUR data):
At what rate do you apply (product)? _____ lbs/acre
Structural Management Practices:

Spray management practices (applicable / not applicable):

- ☐ adjust spray nozzles to match crop canopy profile
- ☐ outside nozzles shut off when spraying outer rows next to sensitive sites
- ☐ uses of nozzles that provide largest effective droplet size to minimize drift
- ☐ spray areas close to waterbodies when the wind is blowing away from the waterbodies
- ☐ Use electronic controlled sprayer nozzles (e.g. Smart Sprayer)
- ☐ Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site

How often is spray equipment calibrated? Prior to each application / once per month / once per year / never
Have you considered alternative strategies to using diazinon or chlorpyrfios either during the dormant or growing season? Yes / No
Do you normally spot treat or treat an entire field to prevent further infestation? Spot-treat only / Treat whole field always / Both spot-treat and treat whole field depending on conditions
Is crop rotation used to avoid buildup of pest populations? Yes / No / Not applicable

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EXAMPLE CHECKLIST

Irrigation Water Management Checklist

Irrigation System: Surface / Sprinkler / Microirrigation / None / Other: _____

Irrigation management practices:

- ☐ Optimize irrigation efficiency but maintaining appropriate slopes, tillage, furrow lengths, and irrigation set times
- ☐ Use drainage basins (sediment ponds) or wetlands to capture and retain runoff for 72 hours
- ☐ Use tailwater return system
- ☐ Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion
- ☐ Schedule irrigations based on actual moisture levels

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EXAMPLE CHECKLIST

Dormant Spray Management Checklist

How many acres sprayed with dormant pesticides are within 100' upslope of any surfacewater (including ag ditches)? _____acres
Do you apply when soil moisture is at field capacity? Yes / No
Prior to applying winter dormant sprays, what is the condition of your orchard floor?
Vegetative Cover / Some Vegetation / Vegetated Cover w/Sprayed Berms / Disked / No Vegetation and Not Disked
Do you contain runoff from your orchard(s)? Yes / No / No runoff on property
Have you been informed of methods to reduce the potential of pesticide runoff? Yes / No
Dormant spray management practices:

- ☐ Check weather conditions prior to spraying
- ☐ Use vegetative filter strips
- ☐ Use grass row centers
- ☐ Tailwater return system
- ☐ Maintain setback zones
- ☐ Check droplet size of nozzles
- ☐ Calibrate nozzles

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EXAMPLE CHECKLIST

Erosion and Sediment Management Checklist

Sediment management practices:

- ☐ Vegetation is planted or allowed to grow in and along ditches
- ☐ Maintain vegetated filter strips at least 10’ wide
- ☐ Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion
- ☐ Sediment control basins
- ☐ Settling ponds
- ☐ Constructed wetlands

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EXAMPLE CHECKLIST

Nutrient and Manure Management

What factors are used to determine fertilizer applications? Current crop needs / Current production goals
Is nitrogen supplied in excess of total crop needs? Yes / No
Nutrient management practices:

- ☐ Soil samples are collected and analyzed for current nutrient levels prior to planting
- ☐ Assess plan fertilizer needs by taking plant tissue samples mid to late season
- ☐ Fertilizers are placed where maximum plant uptake can occur
- ☐ Proper backflow devices are installed when injecting fertilizer into irrigation water
- ☐ Applicators are made aware of sensitive areas to be avoided prior to application

Do you currently apply manure to your irrigated lands? Yes / No
What types of manure are you likely to apply in the next 5 years? Dairy / chicken / other: _____
What is the average rate per acre of manure that you apply annually? _____ lbs/acre
How close are surface water ways to the field where you apply manure? Adjacent / <100 ft / <300 ft / >300 ft

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EXAMPLE CHECKLIST

Recommended Practices

Pesticide mixing/loading management practices:

- ☐ Check for faulty hoses and ensure drain is in place prior to filling the tank
- ☐ Do not overflow tank
- ☐ Use an air gap between the fill tube and the tank
- ☐ During mixing/loading tank is less than full to minimize spills
- ☐ Someone is present during pesticide/fertilizer mixing/loading operations to watch for spills
- ☐ Clean up after pesticide/fertilizer spills promptly

Spray management practices (applicable / not applicable):

- ☐ adjust spray nozzles to match crop canopy profile
- ☐ outside nozzles shut off when spraying outer rows next to sensitive sites
- ☐ uses of nozzles that provide largest effective droplet size to minimize drift
- ☐ spray areas close to waterbodies when the wind is blowing away from the waterbodies
- ☐ Use electronic controlled sprayer nozzles (e.g. Smart Sprayer)
- ☐ Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site

Irrigation management practices:

- ☐ Optimize irrigation efficiency but maintaining appropriate slopes, tillage, furrow lengths, and irrigation set times
- ☐ Use drainage basins (sediment ponds) or wetlands to capture and retain runoff for 72 hours
- ☐ Use tailwater return system
- ☐ Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion
- ☐ Schedule irrigations based on actual moisture levels

Dormant spray management practices:

- ☐ Check weather conditions prior to spraying
- ☐ Use vegetative filter strips
- ☐ Use grass row centers
- ☐ Tailwater return system
- ☐ Maintain setback zones
- ☐ Check droplet size of nozzles

Calibrate nozzles

Sediment management practices:

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EXAMPLE CHECKLIST

- ☐ Vegetation is planted or allowed to grow in and along ditches
- ☐ Maintain vegetated filter strips at least 10’ wide
- ☐ Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion
- ☐ Sediment control basins
- ☐ Settling ponds
- ☐ Constructed wetlands

Other:

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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In winter 2008-09, the Coalition will conduct individual contacts within the Dry Creek @ Wellsford Rd, Duck Slough @ Hwy 99 and Prairie Flower Drain @ Crows Landing site subwatersheds and use checklists similar to those provided above to record parcel specific management practices and recommend additional management practices. The recommended management practices will be recorded and participating growers will be visited in a year to determine which, if any, new practices were implemented. This information will be used to evaluate water quality monitoring results to assess any trends/associations between water quality and improved management practices and will remain confidential between the Coalition and the member.

Evaluation of management practices will not be based solely on water quality although the goal of implementing management practices is to improve water quality. The Coalition will monitor how many and what types of new management practices are implemented as well as the number of growers that volunteer to work with the Coalition to track practices from year to year. Table 15 describes management practice identification, evaluation and outreach and who will be responsible for implementing each of those actions. A management practice tracking and evaluation schedule for high priority subwatersheds is included in Table 16. Based on the analysis of source information for high priority subwatersheds, management practices that may reduce agricultural runoff are identified and growers will be encouraged to adopt them during individual contacts. These practices are outlined in Table 17 including the anticipated implementation date (may be implemented sooner) and the date when the Coalition will evaluate the effectiveness of the management practice. The evaluation date is the date when the Coalition will include an evaluation analysis in the Management Plan update.

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Table 14. A list of site subwatershed tiers and corresponding level of actions for 2008. Some site subwatersheds are in both Tier 1 and Tier 2 for different constituents.

		Sourcing				Outreach				Evaluation		
	Priority	PUR Data	Creek Walk	Additional / Upstream Monitoring	Special Studies	County Grower Meetings	Site Subwatershed Grower Meetings	Grower Group Contacts	Individual Contacts	Meeting Participation	Normal Monitoring	Additional / Upstream Monitoring / Special Study
Tier 1 Subwatersheds												
Ash Slough	B	x		x		x	x			x	x	x
Bear Creek	B	x		x		x	x			x	x	x
Berenda Slough	A	x		x		x	x			x	x	x
Black Rascal	A	x		x		x	x			x	x	x
Deadman Creek @ Gurr Rd	C	x		x		x	x			x	x	x
Deadman Creek @ Hwy 59	B	x		x		x	x			x	x	x
Dry Creek @ Wellsford	C	x		x		x	x			x	x	x
Duck Slough @ Gurr Rd	D	x		x		x	x			x	x	x
Hatch Drain	D	x		x		x	x			x	x	x
Highline Canal @ Lombardy Rd	A	x		x		x	x			x	x	x
Highline Canal @ Hwy 99	A	x		x		x	x			x	x	x
Hilmar Drain	B	x		x		x	x			x	x	x
Livingston Drain	C	x		x		x	x			x	x	x
Merced River	D	x		x		x	x			x	x	x
Miles Creek	C	x		x		x	x			x	x	x
Mustang Creek	E	x		x		x	x			x	x	x
Prairie Flower	D	x		x		x	x			x	x	x
Silva Drain	A	x		x		x	x			x	x	x
South Slough @ Quinley Rd	E	x		x		x	x			x	x	x
Westport Drain @ Vivian Rd	E	x		x		x	x			x	x	x
Tier 2 Subwatersheds												
Berenda Slough	B	x		x		x	x			x	x	x
Cottonwood Creek	C	x		x		x	x			x	x	x
Dry Creek @ Rd 18	B	x		x		x	x			x	x	x
Dry Creek @ Wellsford	A	x	x	x		x	x	x	x	x	x	x
Duck Slough @ Gurr Rd	C	x		x		x	x			x	x	x
Duck Slough @ Hwy 99	A	x	x	x		x	x	x	x	x	x	x
Prairie Flower	A	x	x	x		x	x	x	x	x	x	x

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Table 15. Management Plan sourcing, outreach and evaluation schedule (refer to Figure 3 for tier information).

Action	Description	When
SOURCING		
(1) PUR data	Request pesticide use information from County Agricultural Commissioners to identify specific problem applications.	Standing requests with Ag Commissioners to receive data as soon as possible.
(2) Creek Walks	County Agricultural Commissioner staff will walk creeks of high priority and document pipe inputs from fields and residences. Pipes will be documented with photos and GPS.	The Stanislaus Agricultural Commissioner walked Prairie Flower Drain and Dry Creek @ Wellsford subwatersheds in November and December of 2007. New creek walks depend on contracts between the ESJWQC and Ag Commissioners.
(3) Additional Monitoring	Additional monitoring within the subwatershed to either twice during the month to narrow down the temporal source of the problem or move upstream to narrow down possible inputs that may contribute to the exceedance.	Irrigation months when past exceedances occurred.
(4) Special Studies	Special studies will occur when additional information about potential sources needs to be obtained beyond the additional monitoring.	Will be specific to the situation.
OUTREACH		
(1) County grower meetings and (2) site subwatershed grower meetings	Hold meetings for growers in the subwatershed to discuss management practices that can be used to eliminate exceedances and to encourage implementation of new management practices. Provide monitoring results to growers to inform farmers, landowners and/or stakeholders about water quality problems.	Between each season (storm and irrigation).
(3) Grower group meetings	Provide information and outreach materials about management practices that could be used by growers to reduce the impact of agriculture on water quality specific to a group of growers (i.e walnut or alfafa growers).	Between each season (storm and irrigation) and as needed.
(4) Individual contacts	Conduct individual interviews with farmers, landowners and/or stakeholders to discuss water quality issues, current management practices and recommended management practices to improve water quality.	Winter (November to February).
EVALUATION		
(1) Meeting participation	Assess effectiveness of Coalition meetings by tracking attendance, documenting management practice implementation and monitoring water quality exceedances. Document where and when management practices have been implemented in order to track effects on water quality at relevant monitoring sites through individual grower meetings.	Annually in Management Plan updates.

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Action	Description	When
(2) Normal monitoring	Normal monitoring at Core and Assessment Monitoring locations as part of the ESJWQC MRPP submitted in 2008. Not all sites will be monitored under the 2008 MRPP. These results will supplement additional monitoring conducted under the Management Plan.	Once a month, every month of the year.
(3) Additional Monitoring (+1 time/month)	Additional monitoring conducted for specific constituents (Priority A-C) during months where previous exceedances have occurred. Results will be used to evaluate improvements in water quality.	Once a month in months where previous exceedances have occurred as part of Tier 1 actions (Figure 3).
(4) Additional Monitoring (+additional locations)	Additional monitoring conducted for for specific constituents (Priority A-C) during months where previous exceedances have occurred at locations upstream of the site under the Management Plan. Upstream sampling results will be used to evaluate improvements in water quality.	Once a month in months where previous exceedances have occurred as part of Tier 2 and 3 actions (Figure 3).
(5) Additional Monitoring (special study)	Additional monitoring for special studies will be done to evaluate specific management practice effectiveness.	As specified in the Site Subwatershed Management Plan.

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Table 16. Management Plan tracking schedule.

Priority Subwatershed Evaluation of Management Practices	Dry Creek @ Wellsford Rd	Duck Slough @ Hwy 99	Prairie Flower Drain @ Crows Landing Rd
Associate baseline survey responses with member APNs.	December 2008	December 2008	December 2008
Determine number/type of management practices currently in place.	January 2009	January 2009	January 2009
Group Grower Contacts[1]	October 2008 – February 2009	October 2008 – February 2009	October 2008 – February 2009
Individual Contacts	December 2008 – February 2009	January 2009 – March 2009	February 2009 – April 2009
Implementation of new management practices.	April 2009 – February 2010	April 2009 – February 2010	April 2009 – February 2010
Assess number/type of new management practices implemented.	October 2009 - February 2010	October 2009 - February 2011	October 2009 - February 2011
Evaluate effectiveness of new management practices[2].	April 2009 – February 2010	April 2009 – February 2010	April 2009 – February 2010

[1]Grower Group Contacts are outlined in the Site Subwatershed Management Plans and may not be applicable for all constituents.
[2]Evaluating effectiveness will be dependent on the type of management practice implemented. This is general guideline to be used for practices that can be assessed without special study monitoring.

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Table 17. Management Plan implementation schedule for all high priority subwatersheds. Refer to Table 9 for a description of effected water/sediment quality monitoring parameters associated with each Management Practice.

Management Practice	Anticipated Implementation Date	Anticipated Evaluation Date
Reduction in application rates	April - September 2009	April 2010
Spray drift management	April - September 2009	April 2010
Switch to low risk products	April - September 2009	April 2010
Polyacrylamide (PAM)	April - September 2009	April 2010
Sprinkler or microspray irrigation	December 2010	April 2011
Recirculation/tail water return system	December 2010	April 2011
Retention pond/holding basin	December 2010	April 2011
Grass waterways or grass filter strips	December 2010	April 2011

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Management Practice Performance Goals

ESJWQC Management Practice Performance Goal: *To continue to monitor and analyze the water and sediment quality of ESJWQC site subwatersheds and to facilitate the implementation of management practices by providing outreach and support to growers in order to effectively enhance water quality in the Coalition region.*

Water Quality Management Practice Performance Goal #1: Identify potential sources of exceedances.

Strategy

Monitoring during irrigation and storm seasons as outlined in the ESJWQC Quality Assurance Project Plan will continue to provide insight on when and where exceedances, and/or other water quality impairments, are experienced in the Coalition region. As presented in the Coalition's Monitoring and Reporting Program Plan, the primary method of source identification is to use the pesticide use reports (PURs) filed with each County Agricultural Commissioner. For individual pesticide or metals exceedances, results from the PURs are compiled for that specific chemical. For toxicity in either the water column or sediment, PURs are evaluated for pesticides that have either low K_{oc}/high solubility values (water column) or high K_{oc} values (sediment) as outlined above. In situations where PUR data are not available (either no reported use or delays in obtaining PUR information from the Agricultural Commissioner) the Coalition may use PUR data from previous years to focus resources based on trends of crops and applications of the chemical of concern.

Performance Measures

1.1 Continue irrigation and storm monitoring for exceedances at Coalition sites.

1.2 Request pesticide use information from County Agricultural Commissioners.

1.3 Identify applications with the potential to cause toxicity or result in an exceedance of a specific chemical.

Water Quality Management Practice Performance Goal #2: Inform growers with irrigated crop land about water sampling results and obtain information on currently implemented management practices.

Strategy

Each year, the ESJWQC develops an annual report for its membership which presents all of the monitoring results from the previous year. This report is distributed to all Coalition members and provided in a number of locations including the County Agricultural Commissioner's office and as handouts at meetings. Coalition members also receive the Watershed Coalition News, published by the Coalition for Urban/Rural Environmental Stewardship (CURES) that provides

information on current Coalition activities including summaries of significant trends in monitoring results across the ESJWQC and entire Central Valley.

Additionally, the ESJWQC holds meetings in each of the three major counties, Stanislaus, Merced, and Madera, on a seasonal basis. In these meetings results of the Coalition monitoring program are presented, and information on management practices is provided.

Performance Measures

2.1 Provide monitoring results to all Coalition members and other interested parties through the ESJWQC Annual Report.

2.2 Provided monitoring results at annual meetings in the winter of 2008-09.

2.3 Encourage growers to implement new management practices where applicable.

2.4 Document where and when management practices have been implemented in order to track effects on water quality at relevant monitoring sites.

Water Quality Management Practice Performance Goal #3: Conduct meetings in Coalition counties to provide growers with information on management practices to address toxicity or exceedances of water quality standards found in sampling results.

Strategy

Exceedances are communicated to growers by publication of the annual reports and at meetings at the County and site subwatershed level. Presentations on the use of management practices to address specific constituents are made at these meetings. It is the landowner's responsibility to implement management practices on their farms where appropriate and the Coalition's responsibility to provide appropriate resources and support and track the implementation of management practices. Depending on the causes of the exceedances, actions taken by the Coalition could include a targeted outreach program, meeting, and/or educational material dissemination. The overall goal of this outreach is to encourage the adoption of specific management practices or modify specific farm inputs to prevent movement of the constituent of concern into the impacted surface water. Coalition members who have been identified as high potential dischargers and do not implement additional management practices to eliminate water quality exceedances will be identified to the Regional Board at such time as it is apparent that they are not making a good faith effort to improve water quality.

Performance Measures

3.1 Hold meetings for growers to discuss management practices that can be used to eliminate exceedances.

3.2 When available, provide information on the results of the management practices studies (described below).

3.3 Assess effectiveness of Coalition meetings by tracking attendance, documenting management practice implementation and monitoring water quality exceedances.

Water Quality Management Practice Performance Goal #4: Provide support to growers to implement management practices that will reduce the impact of discharges from agriculture on water quality.

Strategy

Using resources and information available to the Coalition, presentations and materials (by handout or by mail) will provide information and support regarding relevant management practices that could be used by growers based on their land use, pesticide use, and region. Information on management practices will be based on current BMP research results or professional advice from non-profit organizations such as CURES or other relevant agencies such as the County Agricultural Commissioner's office, Department of Pesticide Regulation or registrants of pesticides detected in monitoring. The Coalition will also provide members with information for funding of structural management practice implementation through Proposition 84 funds and EQIP funds.

Where general outreach and educational efforts do not show beneficial results (such as the implementation of new management practices or improvements in water quality), management practices will be investigated by Coalition representatives and communicated to growers on a personal basis. Personal or individual contacts will occur in priority subwatersheds (Table 15).

Performance Measures

4.1 Provide information and outreach materials about Management Practices that could be used by growers to reduce the impact of agriculture on water quality.

4.2 Where general outreach and education efforts do not result in the implementation of effective management practices or improvements in water quality in the subwatershed, growers who have the potential to impact water quality through use of specific pesticides will be contacted individually in order to ensure that management practices are being employed.

Water Quality Management Practice Performance Goal #5: Perform evaluations of management practices suitable for East San Joaquin Water Quality Coalition irrigated agriculture.

Strategy

CURES, the Westside San Joaquin River Watershed Coalition, local irrigation and water districts and Coalition landowners/operators are sponsoring a project addressing water quality in Orestimba Creek which will be applicable to areas of the ESJWQC. Funded through a State

Water Resources Control Board grant (*Western San Joaquin Valley Pesticide BMP Implementation Program*), the project emphasizes developing information on the effectiveness of several management practices. Projects goals relevant to the ESJWQC include:

- Evaluate the effectiveness of three management practices installed on commercial farms in the Orestimba Creek watershed for mitigation of pesticide runoff (vegetated ditch, constructed wetland, PAM use in row crops).
- Compile and analyze results of management practice effectiveness studies.
- Perform outreach and education. Present the effects and benefits of the studied management practices to crop advisors and growers. Update informational booklets detailing management practices for row crops and orchard crops.

The Coalition has reviewed use reports and believes that spray drift may be a cause of exceedances of metals (copper), pesticides and toxicity in the Coalition region. Proper application procedures could reduce the amount of drift, and application equipment is one aspect that can be addressed. Information of spray drift management will be relayed to growers in subwatershed meetings and individual contacts. Effectiveness of these practices will be evaluated through monitoring in both the irrigation and storm seasons as described in the QAPP.

Performance Measures

5.1 Communicate results of management practices efficiency studies to landowners as results become available.

5.2 Monitoring at sites with exceedances will occur after implementation of management practices to evaluate effectiveness within each subwatershed.

Water Quality Management Practice Performance Goal #6: Work with pesticide retailers and Pest Control Advisors to assist in providing outreach to growers and applicators in the Coalition region.

Strategy

CURES and the Coalition are working with the sales representatives and pest control advisors (who recommend the use of products) to promote use of management practices when applying the product. Coalition meetings have been held with Continuing education credits units and have been attended by numerous pest control advisors over the last year. The coalition will continue to communicate with pest control advisors that provide recommendations in the management plan area.

Performance Measures

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6.1 Provide management practice information to growers by working with sales representatives and pest control advisors to promote management practices in the management plan region.

Water Quality Management Practice Performance Goal #7: Anticipate potential water quality problems caused by agricultural inputs.

Strategy

Coalition sampling indicates sediment toxicity has been found in many Coalition subwatersheds. Current technology used by commercial laboratories that analyze Coalition samples does not allow for identification of this sediment toxicity. However, studies of numerous water bodies in the San Joaquin River watershed by the University of California indicate presence of pyrethroid insecticides in sediment samples where toxicity is observed. As a result of this information, the Coalition through information provided by CURES is now encouraging growers to adopt various management practices to minimize sediment runoff and spray drift where pyrethroids and other crop inputs are used. Management practices targeted to sediment are outlined in two publications that the coalition has distributed to growers entitled *"Pyrethroid Insecticides/Orchards; Management Practices for Protecting Water"* and *"Pyrethroid Insecticides/Row Crops, Management Practices for Protecting Water."* These 8-page publications outline numerous practices to manage off site movement of Pyrethroids through irrigation runoff or spray drift. Currently, County Agricultural Commissioners in Merced and Madera Counties distribute the booklets to growers when they renew their pesticide application permit as well as provide the hand outs at Coalition outreach meetings.

Actions

7.1 Distribute management practice publications on preventing movement of pyrethroids in irrigation runoff or through drift.

Strategy Summary

The activities outlined in this document address the exceedances in Coalition subwatersheds that triggered this Management Plan, and also any exceedances that may arise in the future. Summarized below is the information presented in this Management Plan (Table 18).

Past Exceedances

- The Coalition has provided information on exceedances in this subwatershed to all coalition members in the subwatersheds that have shown exceedances. Furthermore, and with the initiation of this Management Plan, the Coalition has:
  - Contacted each grower with an explanation of the exceedances and a request for completion of the management practices survey.
  - Contacted growers and distributed management practices surveys.
  - Scheduled meetings for growers to discuss the exceedances and management practices. Regional Water Board staff is invited to attend all meetings.

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- Worked with sales representatives and pest control advisors to promote effective management of chemicals in the management plan region.
- Communicate the results of current management practices studies to growers and operators in the Coalition region.

Future Exceedances

- Contact each grower with an explanation of the exceedances.
- Schedule meetings to discuss the exceedances and management practices. The dates and times of the meetings will be provided to the Regional Water Board when the Coalition can identify meeting locations and available dates. As is true with all meetings with growers, Regional Water Board staff is invited to attend.

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Strategy Planning Table

Management Goal: To continue to monitor and analyze the water and sediment quality of ESJWQC site subwatersheds and to facilitate the implementation of management practices by providing outreach and support to growers in order to effectively enhance water quality in the Coalition region.

Table 18. Strategic plan.

This table outlines the goal of the Management Plan, performance goals as a result of the stated goal, performance measures defined to achieve goals, outputs to describe direct results of actions and outcomes to describe indirect results of actions.

Performance Goal/Performance Measure	Outputs	Outcomes	Who
Performance Goal 1: *Identify sources of pesticides, toxicity and other exceedances in Coalition subwatersheds.*			
Performance Measure 1.1 - Continue irrigation and storm monitoring for exceedances.	Results show what water quality standards are being exceeded per monitoring location.	Results overtime show trends and problem areas to address.	MLJ LLC*
Performance Measure 1.2 - Request pesticide use information from County Agricultural Commissioners.	PUR reports will indicate where chemicals are being used.	Specific problem applications identified.	MLJ LLC*
Performance Measure 1.3 - Identify applications with the potential to cause toxicity or result in an exceedance of a specific chemical.	Possible source applications will be identified.	Particular landowners or application events will be targeted through outreach.	Parry Klassen
Performance Goal 2: *Inform growers with irrigated crop land about water sampling results and obtain information on currently implemented management practices.*			
Performance Measure 2.1 - Provide monitoring results to growers as hard copies through the mail, in the ESJWQC Annual Report and at presentations and meetings.	Coalition landowners and interested parties will read results from Coalition monitoring program.	Farmers, Landowners, and/or Stakeholders will be informed about the water quality problems in the subwatershed.	MLJ LLC*, Parry Klassen
Performance Measure 2.2 – Provided monitoring results at annual meetings in the winter of 2008-09.	New management practices will be implemented.	Chemical or other harmful inputs from agriculture will be reduced.	Growers
Performance Measure 2.3 – Encourage growers to implement new management practices where applicable.	Determine location and type of Management Practice implementation.	Evaluate effectiveness of Coalition program to help implement good Management Practices through water quality sampling.	Parry Klassen, MLJ LLC*

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Performance Goal/Performance Measure	Outputs	Outcomes	Who
Performance Measure 2.4 - Document where and when management practices have been implemented in order to track effects on water quality at relevant monitoring sites.	Record of Management Practices implemented will be available.	The Coalition program can monitor the success or failure of Management Practices implementation from water quality sampling.	Parry Klassen, MLJ LLC*
Performance Goal 3: *Conduct meetings in Coalition counties to provide growers with information on management practices to address toxicity or exceedances of water quality standards found in sampling results.*			
Performance Measure 3.1 - Hold meetings for growers in to discuss management practices that can be used to eliminate exceedances.	Meetings will be held and BMPs will be discussed.	Growers will implement new management practices where needed.	Parry Klassen, Growers
Performance Measure 3.2 – When available, provide information on the results of the management practices studies.	Management practice handouts and pamphlets.	Growers will have up to date information on effective management practices that they can implement.	Parry Klassen, CURES, Growers
Performance Measure 3.3 - Assess effectiveness of Coalition meetings by tracking attendance, documenting management practice implementation and monitoring water quality exceedances.	Coalition will keep track of attendance at meetings, Management Practices changes, and continue to monitor water quality.	Effectiveness of outreach can be judged and Coalition strategies can be shaped around these results.	Parry Klassen
Performance Goal 4: *Provide support to growers to implement management practices that will reduce the impact of agriculture on water quality.*			
Performance Measure 4.1 - Provide information and outreach materials about Management Practices that could be used by growers to reduce the impact of agriculture on water quality.	Educational materials will be provided to growers and outreach will occur in the Coalition region.	Growers will implement new management practices where they are needed.	Parry Klassen, CURES
Performance Measure 4.2 - Where general outreach and education efforts do not result in the implementation of better management practices or better water quality in the subwatershed, growers will be dealt with personally in order to ensure that BMPs are being employed.	Growers will be dealt with personally and outreach will occur in the field to implement good management practices.	Water quality will improve where beneficial management practices have been implemented.	Parry Klassen
Performance Goal 5: *Perform evaluations of management practices suitable for East San Joaquin Water Quality Coalition irrigated agriculture.*			
Performance Measure 5.1 - Communicate results of management practices efficiency studies to	Results made available at meetings with growers and	Grower will use new management practices where it is needed.	Parry Klassen, Growers

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Performance Goal/Performance Measure	Outputs	Outcomes	Who
landowners as results become available.	mailings.		
5.1 Performance Measure 5.2 - Monitoring at sites with exceedances will occur after implementation of management practices to evaluate effectiveness within each subwatershed.	Sites downstream of farms that have implemented new Management Practices will be evaluated for any changes in water quality.	MPs will be proven to show water quality improvements, and can be shared to other growers.	MLJ LLC*, Parry Klassen, and Growers
Performance Goal 6: *Work with pesticide retailers and Pest Control Advisors to assist in providing outreach to growers and applicators in the Coalition region.*			
Performance Measure 6.1 - Provide outreach to growers by working with sales representatives and pest control advisors to promote management practices in the management plan region.	Collaboration will occur and BMPs will be sufficiently communicated to growers.	Grower will use new management practices where it is needed.	Parry Klassen, Growers
Performance Goal 7: *Anticipate potential water quality problems caused by agricultural inputs.*			
Performance Measure 7.1 - Distribute management practice publications on preventing movement of pyrethroids in irrigation runoff or through drift.	Publications will be mailed/and or distributed at meetings.	Coalition members will be more aware of how to prevent pyrethroid seepage.	Parry Klassen

*Michael L. Johnson Limited Liability Corporation – Technical Advisor to the ESJWQC.

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SUMMARY OF COALITION OUTREACH ACTIVITIES

The Semi Annual Monitoring Report submitted on December 30, 2007 included information on Coalition activities, events and deliverables that occurred during the 2007 irrigation monitoring season including all exceedance and communication reports delivered to the Regional Board staff. Coalition activities from April to December, 2007 are categorized into grower notification (Table 19), management practice outreach and evaluation (Table 20), general survey status (Table 21), and collaborations (Table 22) and are summarized below.

Table 19. ESJWQC actions and deliverables dealing with grower notification of exceedances and management practices relevant to the 2007 irrigation monitoring season.

Grower Notification			
Date	**County**	**Details**	**Who**
April 4, 2007	All	Annual Report to growers - including monitoring results.	Parry Klassen
August, 2007	Merced	Contact growers in Black Rascal Creek subwatershed in person regarding toxicity in sample water.	Parry Klassen
August 30, 2007	Stanislaus	Contact growers in Turlock Irrigation District as a result of ammonia detection in Harding Drain.	Parry Klassen
Aug-Sept, 2007	All	Mailing sent to growers including all exceedances from 2007 Storm season, along with a letter and Management Practices Survey.	Parry Klassen
December, 2007	All	Annual Report to growers - including monitoring results.	Parry Klassen

Table 20. ESJWQC actions and deliverables pertaining to BMP outreach and education to address exceedances and management practices relevant to the 2007 irrigation monitoring season.

Management Practice Outreach and Education			
Date	**County**	**Details**	**Who**
April 4, 2007	All	Annual Report to growers - Including Coalition/Ag News and updates and info on BMPs.	Parry Klassen
April 10, 2007	Merced	Merced County Farm Bureau Newspaper - sent to all growers in the county by email and mail. Coalition News and BMP information included.	Parry Klassen
April 10, 2007	Madera	Madera Tribune - sent to all growers in the county by email and mail. Coalition News and BMP information included.	Parry Klassen

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Management Practice Outreach and Education			
Date	**County**	**Details**	**Who**
April 10, 2007	Stanislaus	Stanislaus County Farm Bureau Newspaper - sent to all growers in the county by email and mail. Coalition news and BMP information included.	Parry Klassen
August, 2007	Merced	Growers in Black Rascal Creek subwatershed contacted in person regarding BMP implimentation to avoid runnoff of OP pesticides as a result of toxicity to *Ceriodaphnia*.	Parry Klassen
December, 2007	All	Annual Report to growers - Including Coalition/Ag news and updates and info on BMPs.	Parry Klassen
December 11, 2007	Madera	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants.	Parry Klassen, MLJ-LLC
December 12, 2007	Merced	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants.	Parry Klassen, MLJ-LLC
December 18, 2007	Stanislaus	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants.	Parry Klassen, MLJ-LLC

Table 21. Status of general surveys within the ESJWQC region.

General Surveys			
Date	**County**	**Details**	**Who**
April, 2007	All	Approximately 400-500 surveys received (from handouts in October/November 2006 and mailings to growers).	Coalition members
June 15, 2007	All	Surveys results compiled and summarized per subwatershed	Parry Klassen, MLJ-LLC
Ongoing	All	Additional surveys being received from growers and compiled.	Parry Klassen
August, September, 2007	All	Surveys included with grower notification mailings.	Parry Klassen
November, 2007	All	Surveys results compiled and summarized per subwatershed.	Parry Klassen, MLJ-LLC

Table 22. ESJWQC actions to address exceedances and management practices relevant to the 2007 irrigation monitoring season through collaboration with other entities.

Collaborations			
Date	**County**	**Details**	**Who**
August 8-9, 2007	All	Working with Dow Agro Sciences regarding chlorpyrifos results and management practices.	Parry Klassen, MLJ-LLC
August, 2007	Stanislaus	Work with Turlock Irrigation District to determine sources of ammonia found in Harding Drain.	Parry Klassen

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I. DRY CREEK @ WELLSFORD RD

Management Plan Constituents

Priority A

- Chlorpyrifos

Priority C

- Copper
- Diuron
- *Ceriodaphnia dubia* water column toxicity
- *Selenastrum capricornutum* water column toxicity

Priority E

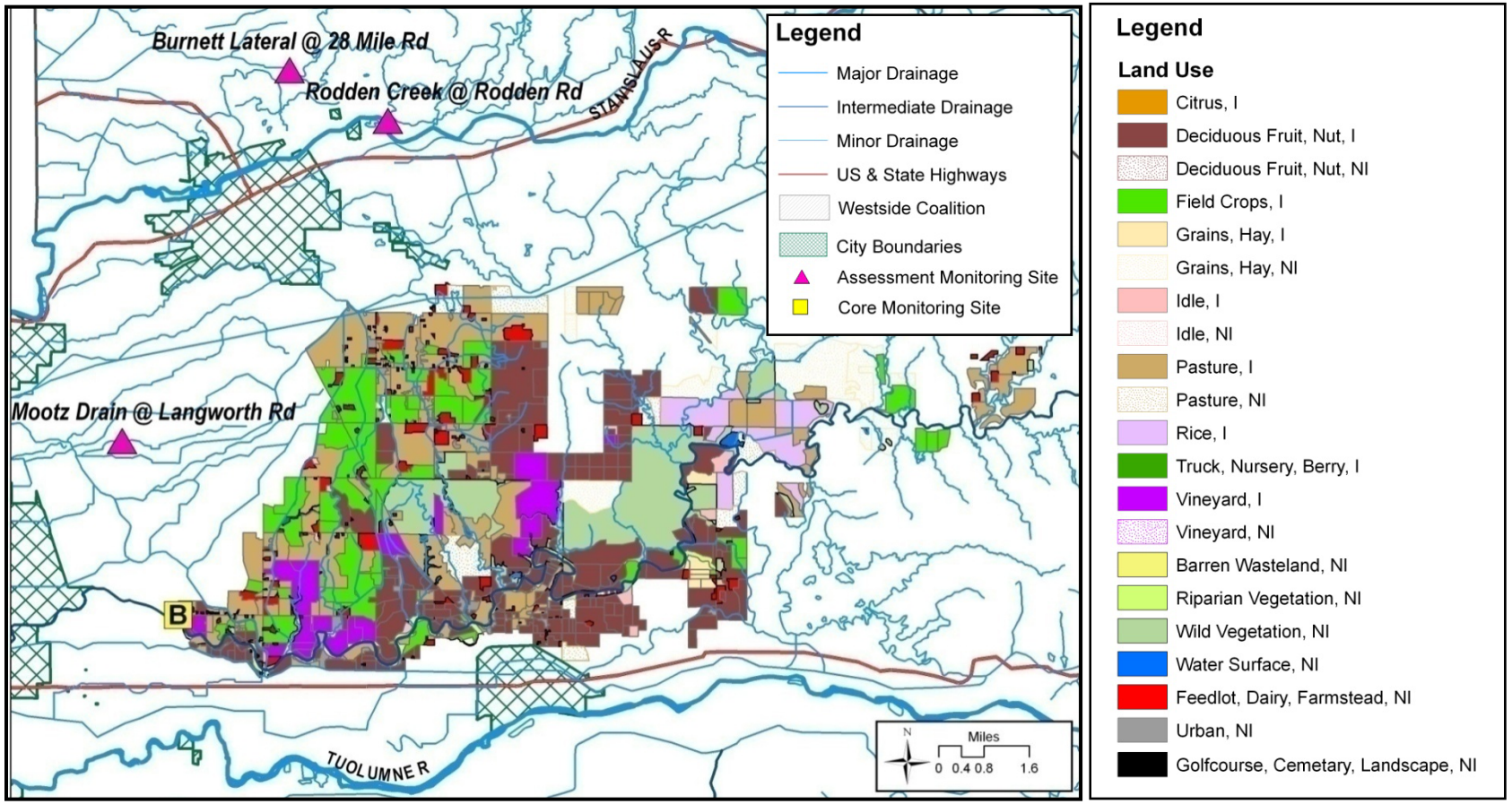
- *E. coli*
- pH
- Cadmium
- Color

Description of Dry Creek at Wellsford Rd Site Subwatershed

Dry Creek @ Wellsford Rd (23,339 irrigated acres) is a site subwatershed within the northern part of the Coalition region. It receives runoff from a combination of field crops, deciduous nuts, and vineyards (Figure I-1). Dry Creek originates in the Sierra foothills to the east of Modesto and drains into the Tuolumne River. This site subwatershed samples Dry Creek at the furthest downstream location that collects agricultural drainage prior to flowing through the urban areas of Modesto. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal.

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Figure I-1. Site subwatershed map of land use for the Dry Creek @ Wellsford Rd sample site (B).



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Subwatershed Monitoring History

The Coalition initiated monitoring at Dry Creek @ Wellsford Rd during the storm season of 2005 (Table I-1). The constituents that have been monitored for are listed in Table I-2 for each year and season.

Table I-1. Dry Creek @ Wellsford Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	2	6
Events Not Sampled	NA	0	0	0	0	0	0
Total	NA	2	5	2	5	2	6

NA - Not applicable. This site was not sampled during this season/year.

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Table I-2. Number of analyses performed per constituent in each sampling season and year for the Dry Creek @ Wellsford Rd sample site. Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5	2	6
EPA 160.1	Dissolved Solids	2	5	2	5	2	6
EPA 180.1	Turbidity	2	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6
SM 9223	E. coli	2	5	2	5	2	6
NA	Dissolved Oxygen	2	5	3	5	3	10
NA	Specific Conductivity	2	5	3	5	3	10
NA	pH	2	5	3	5	3	10
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD(p,p')				5	2	6
EPA 8081A	DDE(p,p')				5	2	6
EPA 8081A	DDT(p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	7
EPA 8141A	Chlorpyrifos	2	5	2	5	2	8
EPA 8141A	Diazinon	2	5	2	5	2	7
EPA 8141A	Dimethoate	2	5	2	5	2	7
EPA 8141A	Disulfoton				5	2	7
EPA 8141A	Malathion				5	2	7
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	7
EPA 8141A	Molinate				5	2	7
EPA 8141A	Parathion, Methyl				5	2	7
EPA 8141A	Phorate				5	2	7
EPA 8141A	Phosmet				5	2	7
EPA 8141A	Thiobencarb				5	2	7
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5	2	6
EPA 8081A	Cyfluthrin, total		1	2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6
EPA 8081A	Permethrin, total	2	5	2	5	2	6

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Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	6
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	6
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	6
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821-02-012	*Ceriodaphnia dubia*	2	5	2	6	2	7
EPA 821-02-012	*Pimephales promelas*	2	5	2	5	2	6
EPA 821-02-013	*Selenastrum capricornutum*	2	5	2	5	2	6
EPA 600/R-99-064	*Hyalella azteca*		1	1	1	1	1

NA - Not applicable

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Exceedance History

Ambient water monitoring within the Dry Creek subwatershed was initiated in the 2005 storm sampling event at the site at Wellsford Rd. Dry Creek @ Wellsford Road samples collected from 2005-2007 have experienced exceedances of water quality trigger limits (WQTL) for field parameters, *E. coli,* pesticides, and metals (Table I-3). Toxicity in the water column to *Ceriodaphnia dubia* and *Selenastrum capricornutum* has also been experienced at the monitoring site (Table I-3). Eleven dissolved oxygen (DO) exceedances, three pH exceedances, 22 color exceedances, and 12 *E. coli* exceedances have occurred. Five exceedances of the chlorpyrifos limit were also experienced, which all occurred in the latter months of the irrigation sampling seasons of 2005, 2006 and 2007. One diuron exceedance occurred in February, 2007 and one exceedance of thiobencarb occurred in September, 2006. The analysis of metals was initiated in 2006, and in 2007 the Dry Creek @ Wellsford Rd site subwatershed experienced one cadmium and two copper exceedances. Water column toxicity to *Ceriodaphnia* occurred in February of 2005 and September of 2006, and *Selenastrum* toxicity occurred four times during the 2007 irrigation season. Dry Creek is not considered impaired and is not included on the current Central Valley Basin Plan 303d list, nor are any of the immediate downstream receiving water bodies.

Although all exceedances are listed in Table I-3, only those that have occurred at a site more than once in a three year period are subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Dry Creek @ Wellsford Rd site subwatershed, the constituents receiving the highest priorities were chlorpyrifos (A), copper (C), diuron (C), and toxicity to *Ceriodaphnia dubia* and *Selenastrum capricornutum* (C).

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Table I-3. All exceedances experienced in samples collected from the Dry Creek @ Wellsford Rd Coalition monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Cadmium, µg/L	Copper, µg/L	Chlorpyrifos, µg/L	Diuron, µg/L	Thiobencarb, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Dry Creek @ Wellsford Rd	Irrigation	11/May/2005		6.26	120								
Dry Creek @ Wellsford Rd	Irrigation	15/Jun/2005	5.9		160	240							
Dry Creek @ Wellsford Rd	Irrigation	13/Jul/2005	5.7		50								
Dry Creek @ Wellsford Rd	Irrigation	17/Aug/2005		9.18	120	900			0.024				
Dry Creek @ Wellsford Rd	Irrigation	21/Sep/2005	6.98		80	500							
Dry Creek @ Wellsford Rd	Irrigation	18/May/2006			120	280							
Dry Creek @ Wellsford Rd	Irrigation	15/Jun/2006	6.08		74								
Dry Creek @ Wellsford Rd	Irrigation	13/Jul/2006	6.69		74				0.026				
Dry Creek @ Wellsford Rd	Irrigation	10/Aug/2006			70				0.024				
Dry Creek @ Wellsford Rd	Irrigation	14/Sep/2006			65	310					0.1	70	
Dry Creek @ Wellsford Rd	Irrigation	17/Apr/2007			90			5.1 (5)[1]					
Dry Creek @ Wellsford Rd	Irrigation	15/May/2007			60								
Dry Creek @ Wellsford Rd	Irrigation	19/Jun/2007	5.77		120								
Dry Creek @ Wellsford Rd	Irrigation	17/Jul/2007	6.64		75				0.021				
Dry Creek @ Wellsford Rd	Irrigation	31/Jul/2007	6.91										
Dry Creek @ Wellsford Rd	Irrigation	14/Aug/2007	6.58		85	440	0.02						
Dry Creek @ Wellsford Rd	Irrigation	11/Sep/2007	6.5		74	420			0.043				
Dry Creek @ Wellsford Rd	Storm	15/Feb/2005			40							80	
Dry Creek @ Wellsford Rd	Storm	22/Mar/2005		8.96	70	900							
Dry Creek @ Wellsford Rd	Storm	01/Mar/2006			70	300							
Dry Creek @ Wellsford Rd	Storm	16/Mar/2006			150	1600							
Dry Creek @ Wellsford Rd	Storm	11/Feb/2007	6.17		50	290				37			508000
Dry Creek @ Wellsford Rd	Storm	22/Feb/2007											220000
Dry Creek @ Wellsford Rd	Storm	28/Feb/2007			250	2400		8.4 (7.2)[1]		4			298750
Dry Creek @ Wellsford Rd	Storm	07/Mar/2007											826000
Priorities			**E**	**E**	**E**	**E**	**E**	**C**	**A**	**C**	**NP[2]**	**C**	**C**

[1] Water quality trigger for each sample is based on hardness and is shown in parenthesis.
[2] NP - not prioritized. The Coalition is not responsible for prioritizing Thiobencarb as a constituent.

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2007 Management Plan Monitoring Results

A draft site subwatershed Management Plan was submitted for Dry Creek @ Wellsford Rd on April 2, 2007. The Coalition did additional sampling at this location for chlorpyrifos and *Ceriodaphnia dubia* during months of previous exceedances (Table I-4).

Table I-4. Dry Creek @ Wellsford Rd. 2007 Management plan monitoring schedule for chlorpyrifos and *Ceriodaphnia dubia*. X = indicates the site, month, and analyte sampled.

Sample Site	Sample Month	Chlorpyrifos	*Ceriodaphnia dubia*
Dry Creek @ Wellsford Rd	July	**x**	
Dry Creek @ Wellsford Rd	August	**x**	
Dry Creek @ Wellsford Rd	September		**x**

There was no toxicity to *Ceriodaphnia* during 2007 including the additional sampling conducted in September. Chlorpyrifos exceeded the WQTL of 0.015 µg/L during normal monitoring sampling in July (7/17/07) and September 2007. Additional samples collected on July 31, 2007 and August 28, 2007 had no detectable levels of chlorpyrifos (<0.003 µg/L) (Table I-5).

Table I-5. Dry Creek @ Wellsford Rd Normal Monitoring (NM) and Management Plan Monitoring (MPM) results for chlorpyrifos from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	NM	NM	MPM	NM	MPM	NM
	4/17/07	5/15/07	6/19/07	7/17/07	7/31/07	8/14/07	8/28/07	9/11/07
Chlorpyrifos (ug/L)	<0.00259	0.011	<0.00259	**0.021**	<0.003	<0.003	<0.003	**0.043**

Load Calculations

Loads have been calculated for the chlorpyrifos, copper and diuron detections (Table I-6) based on the following formula:

Load = Discharge (cfs) X 28.317L X Concentration (milligram/L X 1000 or µg/L).

The load values calculated and presented for pesticides or other constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide the Regional Water Board with a context for the concentrations of various constituents at the time samples were collected.

Table I-6. Instantaneous, calculated loads for chlorpyrifos, copper and diuron loads at Dry Creek @ Wellsford Rd (sorted by analyte and date).

Station Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Wellsford Rd	Chlorpyrifos	17/Aug/2005	0	0.024	0.00
Dry Creek @ Wellsford Rd	Chlorpyrifos	13/Jul/2006	123.91	0.026	91.23
Dry Creek @ Wellsford Rd	Chlorpyrifos	15/May/2007	51.13	0.011	15.93
Dry Creek @ Wellsford Rd	Chlorpyrifos	17/Jul/2007	68.57	0.021	40.78
Dry Creek @ Wellsford Rd	Chlorpyrifos	11/Sep/2007	61.02	0.043	74.30
Dry Creek @ Wellsford Rd	Copper	13/Jul/2006	123.91	3.1	10877.15
Dry Creek @ Wellsford Rd	Copper	17/Apr/2007	30.71	5.1	4435.04
Dry Creek @ Wellsford Rd	Copper	15/May/2007	51.13	6.1	8831.87
Dry Creek @ Wellsford Rd	Copper	19/Jun/2007	32.21	5.9	5381.33
Dry Creek @ Wellsford Rd	Copper	17/Jul/2007	68.57	3.9	7572.62
Dry Creek @ Wellsford Rd	Copper	14/Aug/2007	65.83	5.3	9879.77
Dry Creek @ Wellsford Rd	Copper	11/Sep/2007	61.02	3.3	5702.08
Dry Creek @ Wellsford Rd	Copper	22/Apr/2008	39.8	4.7	5296.98
Dry Creek @ Wellsford Rd	Diuron	17/Apr/2007	30.71	0.29	252.19
Dry Creek @ Wellsford Rd	Diuron	22/Apr/2008	39.8	0.2	225.40

Source Identification

Priority A Constituents

Chlorpyrifos

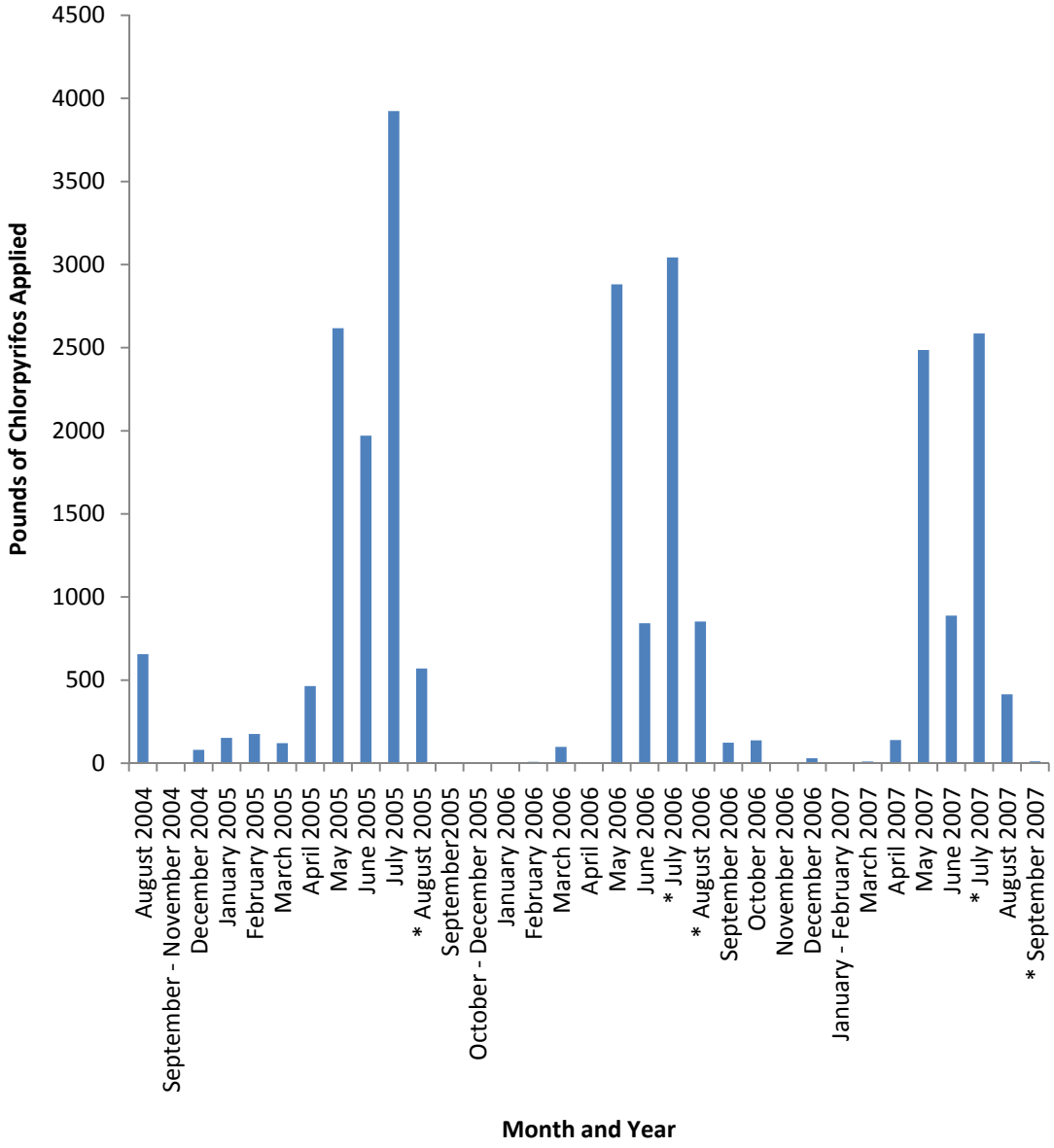
The Coalition uses a combination of monitoring data and evaluation of Pesticide Use Report (PUR) data to identify possible sources. PUR data are reviewed for the number and amount of the active ingredient (AI), chlorpyrifos, applied (pounds applied) and acres treated (Table I-7, Figure I-2). All PUR data has been submitted with previous Semi Annual Monitoring Reports (SAMRs) and is only summarized here.

Table I-7. Number of chlorpyrifos applications, pounds AI applied and acres treated by month for August 2004 through July 2007 in the Dry Creek @ Wellsford Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
August 2004	16	656.35	619.5
December 2004	1	80.04	45
January 2005	1	152.5	75
February 2005	3	175.92	94
March 2005	3	120.95	111
April 2005	6	464.58	521.5

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
May 2005	22	2617.1	2022.4
June 2005	15	1970.3	1244
July 2005	50	3923.3	2312
August 2005	16	569.8	425.75
September2005	1	1.99	0.75
February 2006	1	7.96	83
March 2006	4	98.14	60.5
May 2006	27	2881.3	1842.4
June 2006	14	842.4	538.9
July 2006	55	3042.8	2625
August 2006	27	852.75	475
September 2006	5	123.85	62.5
October 2006	3	137.35	73.91
December 2006	1	29.91	15
March 2007	1	10.16	23
April 2007	7	139.6	260.4
May 2007	23	2486.1	1598.9
June 2007	24	887.85	597
July 2007	40	2585.9	1611.2
August 2007	11	414.65	207.75
September 2007	1	11.63	11
Summaries by Year			
2004 Total	17	736.39	664.5
2005 Total	117	9996.44	6806.4
2006 Total	137	8016.46	5776.21
2007 Total	107	6535.89	4309.25
Total	378	25285.18	17556.36

Figure I-2. Pounds of chlorpyrifos applied within the Dry Creek @ Wellsford Rd site subwatershed by month for 2004-2007. Asterisk (*) denotes months with exceedances.



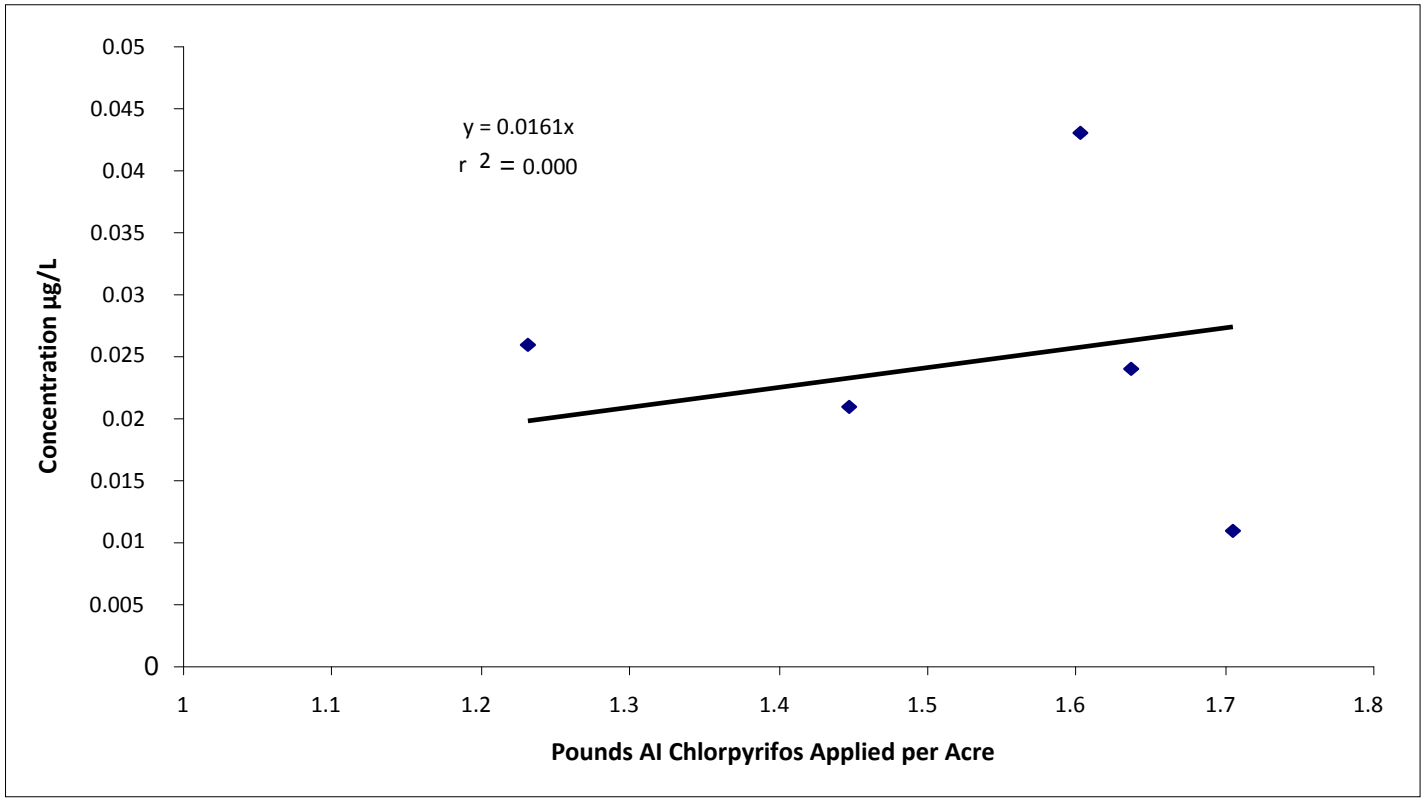
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The Coalition has developed hypotheses to guide the search for sources within the watershed. If the amount of chlorpyrifos (either concentration or load) detected in the sample water was positively associated with amount of chlorpyrifos applied, then the exceedance would most likely be a result of accumulated runoff from numerous parcels. Alternatively, if there was no relationship between the amount applied across the watershed and the amount found in the water, the exceedance would be a result of one or a few parcels with poorly managed discharge. In order to develop an outreach strategy based on PUR data and the above hypothesis, the Coalition assumes that all applications have been reported and that each application has been reported accurately. The outreach strategy of the Coalition varies depending on which hypothesis is correct. The hypotheses are not mutually exclusive as some parcels could always contribute to exceedances, although the magnitude of the exceedance would be determined by the amount of product applied.

Consequently, the Coalition performed an analysis of chlorpyrifos applications within the four weeks prior to each exceedance evaluating concentrations and loads of chlorpyrifos in the water (all detections). Although chlorpyrifos applied more than four weeks before sampling may still be detected, it is more probable that if recent applications were made, exceedances would more likely be the result of these applications, especially in the irrigation season. A linear regression analysis was performed to establish the relationship between application in pounds per acre for those acres on which applications were made (not averaged across the entire site subwatershed) and concentration and load. To associate PUR data (pounds AI per acre) with a single exceedance, the pounds AI were summed and divided by the summed acreage. The small sample size precluded a rigorous statistical treatment but sample sizes are sufficiently large to allow the two hypotheses to be distinguished. The intercept for all analyses was set at zero as there should be no chlorpyrifos in the water if there are no applications. However, this assumes that applications more than four weeks prior to sampling would not contribute chlorpyrifos to the water body.

The regression of concentration of pounds AI applied per acre indicated no significant relationship. In addition, none of the variation in concentration of pounds AI was accounted for by the application rate (Figure I-3). Maximum application rates are set by the label and vary by crop. The average application rate of chlorpyrifos for the Dry Creek subwatershed from 2004-2007 is 1.56 lbs AI/acre (Table I-8). The highest application rates are associated with almond and walnut orchard sprays and corn.

Figure I-3. Chlorpyrifos loads and application rates for the Dry Creek @ Wellsford Rd site subwatershed for applications within four weeks of sampling.



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Table I-8. Average pound of AI per acre for chlorpyrifos based on PUR data from 2004-2007 within the Dry Creek @ Wellsford Rd subwatershed.

Chemical Name	Commodity	Product Name	Average lbs AI/acre
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	NUFOS 4E	0.46
	ALMOND	CHLORPYRIFOS 4E AG	1.75
		GOVERN 4E	2.02
		LORSBAN 4E	1.16
		LORSBAN 4E-HF	2.31
		NUFOS 4E	1.83
		WARHAWK	0.20
	APPLE	LORSBAN 4E-HF	1.42
	APRICOT	LORSBAN 4E-HF	1.99
	CORN (FORAGE - FODDER)	LORSBAN 15G GRANULAR	1.40
		LORSBAN 4E	1.10
		LORSBAN 4E-HF	0.72
		NUFOS 15G	1.42
		NUFOS 4E	1.02
	GRAPES, WINE	LORSBAN 4E	1.86
		LORSBAN 4E-HF	1.62
	N-OUTDR CONTAINER/FLD GRWN PLANTS	LORSBAN 75WG	1.62
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	LORSBAN 4E	2.07
	OP-DEC. TREE	LORSBAN 75WG	2.00
	PEACH	LORSBAN 4E	1.77
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CHLORPYRIFOS 4E AG	1.85
		LORSBAN 4E	2.19
		LORSBAN 4E-HF	1.81
		NUFOS 4E	2.02
Average Pounds Applied Chlorpyrifos per Acre (2004-2007)			**1.56**

Examining the residuals indicated that one application date was associated with an extremely large exceedance relative to the average pounds AI applied. This event was associated with a September (9/11/07) sample collected after 22 applications to almonds and walnuts from July 17 up to September 11, 2007. No chlorpyrifos was detected in samples collected on August 14 and 28, 2007 suggesting that applications on or after August 28 may have contributed to the exceedance. Only one application occurred on that date to a small parcel of walnuts in 3S10E25 (Table I-9), however, the parcel appears to be outside of the watershed as the Modesto Main Canal runs between the site and Dry Creek. The elevated concentration suggests that the exceedance is not associated with spray drift but irrigation tail water runoff containing chlorpyrifos.

The results of the regression analysis (Figure I-3) suggest that in this watershed, the application rate is not critical in determining exceedances and the concentration of chlorpyrifos in the

water. The alternative hypothesis is that specific parcels contribute disproportionately to the load in the creek. To determine if there were specific parcels associated with exceedances on a continuing basis, the Coalition examined the sections (TRS) associated with each exceedance (Tables I-9, I-10, Figures I-4, I-5). There were 36 sections associated with exceedances and each section had between 1 and 7 applications in the period prior to sampling. Generally, these applications were associated with different parcels within the section. Only one section (3S11E29) was associated with all exceedances. This section had applications to almonds and walnuts and the application method was specified as ground. This TRS is not mapped as being a part of the site subwatershed but it is unknown if parcels to which applications were made drain toward the creek. The TRS is located just south of Dry Creek. By comparing parcel size and application rate, it appears that specific individual parcels were associated with as many as three exceedances over the years, although these conclusions are speculative until the parcels and applications are compared individually. This process is anticipated to take the Coalition several weeks. If correct, these results indicate that there may be specific parcels in the site subwatershed that could benefit from improved management of tail water.

Table I-9. TRS' with chlorpyrifos applications in the month prior to each exceedance date. Includes pounds applied and acres treated.

TRS*	Exceedance Date														
	8/17/2005			7/13/2006			8/10/2006			7/17/2007			9/11/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
2S10E24							7/15/06	27.87	16	7/17/07	26.02	14			
2S10E25	7/29/05	303	150												
2S10E36							7/14/06 7/19/06	1.09 6.96	35 149	7/16/07	30.81	30.3			
2S11E19							7/15/06	26.02	14	7/17/07	26.02	14			
2S11E28	7/20/05	10	10												
2S11E29										6/28/07	24.24	120			
2S11E30				7/8/06	75	50									
2S11E31				6/19/06 6/19/06	45 52.5	30 35									
2S11E33	7/30/05	28.91	29	7/5/06	116.05	58	7/14/06	111.5	60	6/26/07 7/8/07	117.94 223	58 120			
2S11E35										7/17/07	613.26	330			
3S10E2				6/19/06	45	30									
3S10E24							7/29/06	25.92	13						
3S10E25				7/3/06	2.03	1	7/22/06 7/29/06 8/10/06	103.2 32.59 2	55 17 10	6/28/07	2.03	1	8/28/07	3.987	2
3S10E26										6/28/07 7/15/07	28.47 5.483	14 5			
3S10E27				6/24/06	15.95	50				6/27/07 7/17/07	20.44 18.58	11 10			
3S10E28	7/26/05 8/4/05	19.94 1.495	10 0.75	6/24/06 6/28/06 6/30/06 7/1/06 7/3/06 7/7/06	103.19 18.58 8.363 8.363 16.73 20	55 10 9 9 18 10	8/5/06	1.495	0.75	7/17/07	18.76	20			
3S11E12				6/30/06 7/8/06	174.45 16	84.9 8				6/29/07	79.75	40			
3S11E13				6/30/06	133.6	62				6/29/07	83.74	42			
3S11E15	8/15/05	39.87 7	20	7/5/06 7/5/06 7/9/06 7/10/06	18.58 399.55 399.55 18.58	20 430 430 35	7/10/06	18.58	35						
3S11E16				7/5/06	223	240				7/3/07	55.75	40			

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TRS*	Exceedance Date														
	8/17/2005			7/13/2006			8/10/2006			7/17/2007			9/11/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
				7/7/06 7/8/06	83.62 224.86	45 242									
3S11E19										7/4/07	44.6	24			
3S11E2	7/31/05 8/3/05 8/13/05	220.1 1 17.94 80.04	220 9 80												
3S11E20	8/3/05 8/3/05	13.95 25.92	7 13	7/3/06 7/3/06	14.23 26.44	7 13	7/17/06 8/2/06	74.33 30.01	40 15	6/27/07 6/27/07 7/17/07 7/17/07	14.23 26.44 48.58 46.45	7 13 10 25			
3S11E21	7/19/05 7/19/05 7/25/05 7/31/05 8/5/05 8/5/05 8/5/05	17.94 27.91 176.0 8 60.03 21.93 33.89 158.0 7	9 14 176 30 11 17 158	7/3/06 7/6/06 7/6/06 7/12/06	18.3 22.36 34.57 36.01	9 11 17 18	7/12/06 7/22/06 7/22/06 7/28/06	36.01 18 28.01 158.1	18 9 14 158	6/27/07 7/5/07 7/5/07 7/11/07 7/11/07 7/11/07	18.3 22.36 34.57 10.16 20 28.01	9 11 17 8 10 14			
3S11E22	7/18/05 7/20/05	0.019 9 19.94	1 10	7/11/06	36.88	35	7/11/06 8/3/06	36.88 9.969	35 10						
3S11E23	7/20/05 7/20/05	27.87 55.75	15 30	6/28/06	55.75	30	7/15/06	37.16	20	6/21/07 7/13/07 7/16/07	55.75 55.75 46.46	30 30 25			
3S11E24										7/14/07	130.08	70			
3S11E25	8/1/05	30.01	30	7/1/06	60	30				6/28/07	60	30			
3S11E28	8/3/05	19.94	9	7/3/06	18.3	9				6/27/07	30.33	9			
3S11E29	7/28/05 7/29/05 7/30/05 7/31/05 8/5/05	12 30.01 55.83 35.88 35.88	6 15 28 18 18	7/7/06 7/7/06 7/8/06	27.87 40.67 36.6	15 18 18	7/25/06 7/26/06 8/9/06	12.03 14.04 12.03	6 7 6	6/23/07 6/28/07 6/29/07 6/29/07 7/1/07 7/2/07	27.87 23.93 27.87 29.91 19.94 35.88	15 12 15 15 10 18	8/11/07	36	18
3S11E3										6/20/07	37.16	40			
3S11E30	7/18/05 7/18/05	11.4 31.9	8 16	7/6/06 7/6/06	18.58 23.93	10 11	7/19/06 7/25/06	37.16 2.99	20 8	6/25/07 6/26/07	17.16 5.722	9 2			

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TRS*	Exceedance Date														
	8/17/2005			7/13/2006			8/10/2006			7/17/2007			9/11/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
	7/30/05 8/1/05	18.58 14.95	20 15	7/6/06	27.87	15	7/25/06 7/29/06	15 32.01	14 16	6/28/07 6/28/07 7/9/07 7/14/07 7/14/07	18.58 27.87 37.16 17.44 34.89	10 15 20 8 20.5			
3S11E4				7/7/06	9	6	7/14/06 7/16/06 7/19/06 7/26/06 7/29/06	139.37 12 6 9 12	75 8 4 6 8	7/8/07	150.07	75	8/17/07 8/18/07	8.01 4.005	4 2
3S11E5	8/12/05	27.87	15				8/10/06 8/10/06	36.02 50.02	18 23.5	7/6/07 7/16/07 7/16/07 7/16/07	27.87 2.17 32.69 44.43	15 43.7 41 43.7			
3S11E7				6/29/06	84.04	56									
3S12E6	7/21/05	77.76	13												

*Bolded TRS are members of the Coalition

Table I-10. All TRS with more than one association between an application and exceedance for chlorpyrifos in 2005-2007. Table summarizes the number of applications associated with an exceedance for a given date and TRS.

TRS*	Chlorpyrifos Applications per Date of Exceedance				
	8/17/2005	7/13/2006	8/10/2006	7/17/2007	9/11/2007
2S10E24			1	1	
2S10E36			2	1	
2S11E19			1	1	
2S11E31		2			
2S11E33	1	1	1	2	
3S10E25		1	3	1	1
3S10E26				2	
3S10E27		1		2	
3S10E28	2	6	1	1	
3S11E12		2		1	
3S11E13		1		1	
3S11E15	1	4	1		
3S11E16		3		1	
3S11E2	3				
3S11E20	2	2	2	4	
3S11E21	7	4	4	6	
3S11E22	2	1	2		
3S11E23	2	1	1	3	
3S11E25	1	1		1	
3S11E28	1	1		1	
3S11E29	5	3	3	6	1
3S11E30	4	4	4	7	
3S11E4		1	5	1	2
3S11E5	1		2	4	

*Bolded TRS are members of the Coalition

Figure I-4. TRS' with applications co-occurring with a chlorpyrifos exceedance.

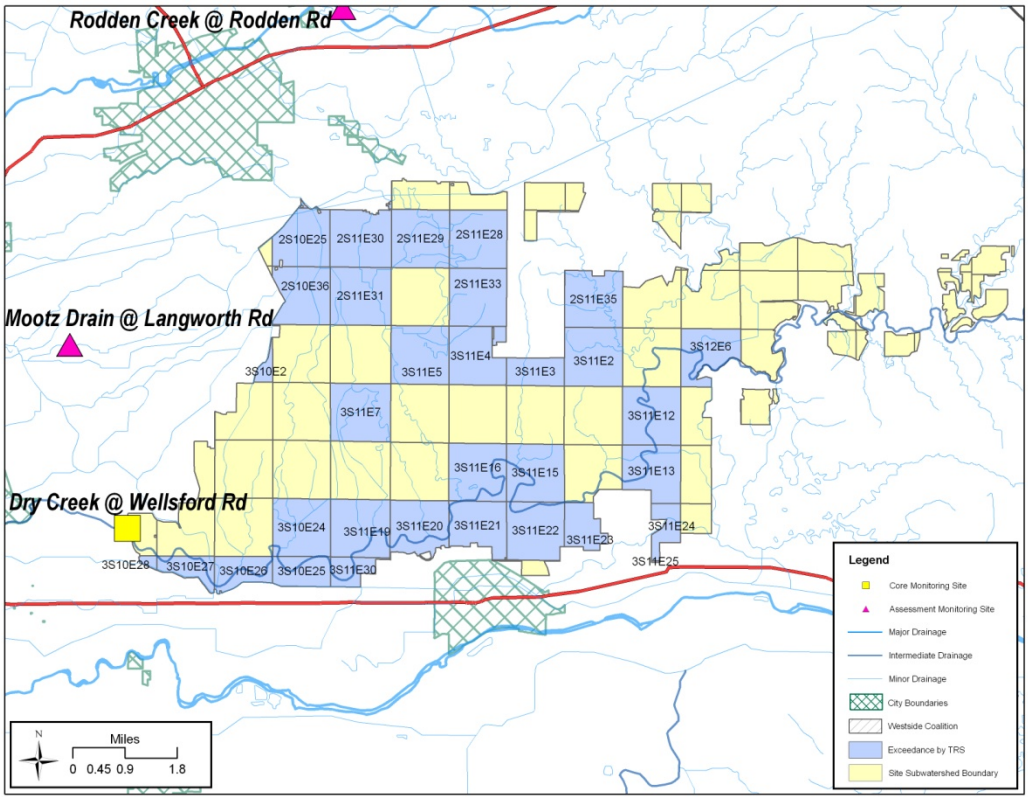
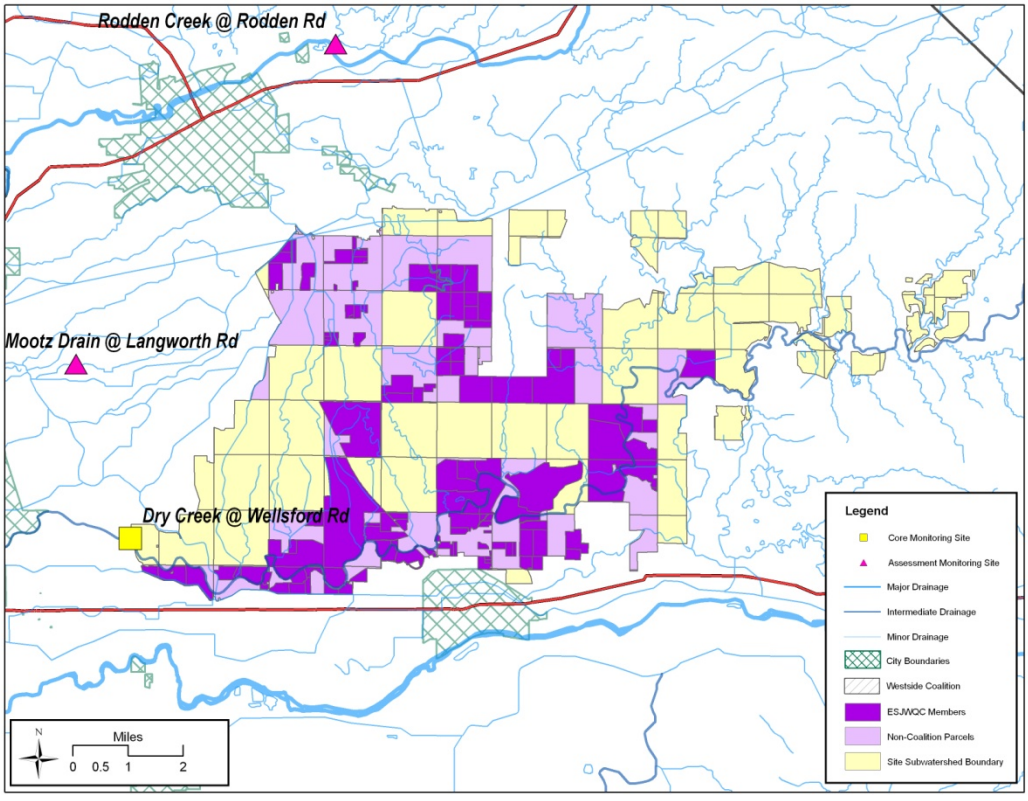


Figure I-5. APNs relative to TRS' with applications co-occurring with chlorpyrifos exceedances.



The analyses conducted by the Coalition suggest that management of chlorpyrifos in this watershed should focus on providing information on a targeted basis to growers to encourage the proper management of irrigation tail water. Almond and walnut growers should be targeted for outreach especially prior to the hull split spray season. Also, those sections adjacent to the creek appear to be primarily associated with the exceedances. Drip or microspray irrigation practices could lower runoff and reduce the amount of chlorpyrifos reaching the creek. The map of members and nonmembers (Figure 5) suggests that a large portion of the watershed consists of members, particularly near the creek itself.

Analysis of the management practices surveys for this watershed indicates that a large number of growers claim there is no discharge from their property. Approximately 39% of the growers who filled out surveys claim no runoff from their parcels; which accounts for approximately 32% of the acreage within the Dry Creek subwatershed. Approximately 25% of the parcels (approximately 27% of member acreage) discharge directly to a waterway (local drainage system or directly to the waterway). Approximately 24% of parcels (approximately 34% of member acreage) use recirculation systems (tail water return system), 1% of parcels (approximately 1% of member acreage) use micro/drip irrigation, approximately 13% of parcels (approximately 20% of member acreage) utilize sediment settling ditches and approximately 10% of parcels (approximately 9% of member acreage) utilize holding basins to reduce runoff. A large number of growers use grass waterways or vegetated filter strips (approximately 61% of parcels, approximately 62% of member acreage) suggesting that there is a mix of management practice intensity in the watershed. Although there is a large amount of acreage that discharges directly into a local drainage system or waterway, a majority of member acreage utilizes one or more management practices to reduce discharge. The Coalition has linked survey results to parcels within this site subwatershed and will use this information to identify where within the watershed management practices could be improved. Outreach could focus on the several sections on which applications were made prior to exceedances and would focus on management of irrigation tail water. This targeted outreach represents a significant effort as each section may contain numerous parcels.

Priority C Constituents

Dry Creek @ Wellsford Rd is listed for the following priority C constituents: copper, diuron and water column toxicity to *Ceriodaphnia dubia* and *Selenastrum capricornutum*.

Copper

PUR data are used to evaluate copper applications within the Dry Creek @ Wellsford site subwatershed prior to an exceedance. Previous SAMRs have included all copper PUR data which is summarized in this management plan. Copper is one of the most heavily applied constituents in the site subwatershed. Copper has been applied in every month except October although applications in September occurred only in 2004 and 2005 (Table I-11). Generally, there are fewer applications from the summer through the fall, with the bulk of the applications occurring in the winter and spring (Table I-11, Figure I-6). The greatest number of pounds AI were applied in January with the second greatest month of application being May (Table I-11, Figure I-6). The large number of applications is spread across the entire site subwatershed with applications in almost every section (Figures I-7, I-8). Within each of the sections, almost every parcel received at least one application (Table I-12).

Only two exceedances occurred in the site subwatershed and consequently it was not possible to perform a regression analysis for copper as was performed for chlorpyrifos (Table I-3). In the few months prior to the first exceedance (2/28/07), there were 67 applications of copper to portions of 23 different TRS' (Table I-12). Although some applications were made to peaches, plums, cherries, and pistachios, the overwhelming majority of the applications were made to almonds. The average application rate was 3.01 pounds AI per acre. -There were 69 applications in the two months between the first and second exceedance (February – April, 2007) in 26 different TRS'. With the exception of one application on grapes and one on peaches, all applications were to walnuts. The average application rate was 3.37 pounds AI per acre.

To determine if there were specific parcels associated with exceedances on a continuing basis, the Coalition examined the sections (TRS) associated with each exceedance (Tables I-12, I-13). There were 23 sections associated with both exceedances, i.e. there were applications to parcels in the same TRS prior to both exceedances. Each TRS had between 1 and 20 applications prior to the exceedances. However, it appears that applications were made to different parcels prior to the first exceedance relative to the second exceedance as almonds received the first application and walnuts the second. The application method was specified as ground. Consequently, applications were made over a large portion of the watershed on parcels of members and nonmembers (Figures I-7, I-8).

Table I-11. Number of copper applications, total pounds AI applied and total acres treated by month for August 2004 through August 2007 in the Dry Creek @ Wellsford site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
September 2004	2	70	20
November 2004	2	154	40
December 2004	9	3601.3	718
January 2005	29	8069.6	1338.4
February 2005	51	3809.9	1905.25
March 2005	38	4863.3	1340.5
April 2005	47	6703.1	2099.3
May 2005	25	2986.1	721.7
June 2005	3	161.6	72
July 2005	1	0.4625	10
August 2005	2	84.3	35.12
September 2005	1	15	10
November 2005	2	2404.9	605
December 2005	8	1243.8	343
January 2006	29	3714.1	916
February 2006	48	3098.8	1844.5
March 2006	8	454.6	503
April 2006	51	4937.9	1196.8
May 2006	47	8561.3	1671.75
June 2006	3	803.6	126
August 2006	2	49.5	22
November 2006	4	177.7	57.5
December 2006	4	353.9	51
January 2007	20	6954	1517.2
February 2007	46	2299.4	1562
March 2007	27	3154.5	940
April 2007	62	7496.8	2287
May 2007	10	1491.9	224.75
June 2007	3	938.1	100
July 2007	2	129	43
August 2007	1	18	6
Summaries by Year			
2004 Total	13	3825.3	778
2005 Total	207	30342.06	8480.27
2006 Total	196	22151.4	6388.55
2007 Total	171	22481.7	6679.95
Total	587	78800.46	22326.77

Figure I-6. Pounds of copper applied within the Dry Creek @ Wellsford Rd site subwatershed by month for 2004-2007. Asterisk (*) denotes months with exceedances.

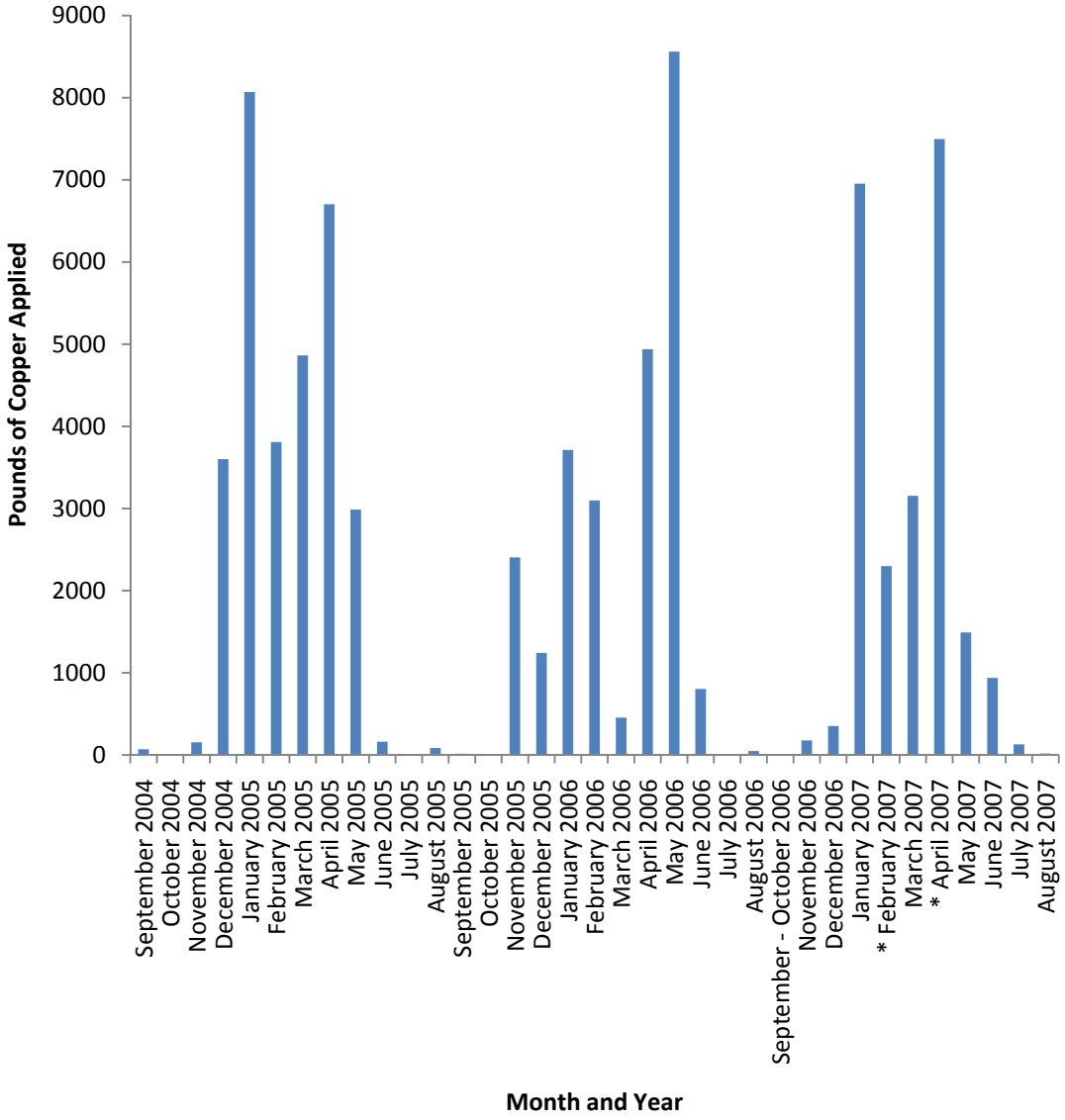


Table I-12. TRS' with copper applications in the month prior to each exceedance date. Includes pounds applied and acres treated.

TRS*	Exceedance Date					
	2/28/2007			4/17/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
2S10E26	1/25/07 2/27/08 2/27/07	335.6 10.78 42.35	80 14 55	1/25/07 2/27/08 2/27/07	335.6 10.78 42.35	80 14 55
2S11E19	1/15/07	73.41	14			
2S11E28	2/20/07	112.5	90	2/20/07 3/21/07	112.5 61.6	90 10
2S11E35				3/21/07	1065.2	330
3S10E14	2/1/07 2/25/07	64.56 10.76	20 20	2/1/07 2/25/07	64.56 10.76	20 20
3S10E21	1/31/07 1/31/07 1/31/07	30.8 38.5 154	4 5 20	1/31/07 1/31/07 1/31/07	30.8 38.5 154	4 5 20
3S10E25	2/3/07 2/21/07 2/21/07	94.38 8.435 33.74	22.5 5 20	2/3/07 2/21/07 2/21/07 3/25/07 4/4/07 4/10/07	94.38 8.435 33.74 15.4 61.6 15.4	22.5 5 20 2 10 2
3S10E26				4/6/07 4/12/07 4/13/07	107.8 107.8 54.03	14 14 11
3S10E27	11/30/06	37.755	9	4/3/07 4/3/07 4/9/07 4/13/07 4/13/07	6.16 613.32 41.38 4.91 123.2	0.75 190 26 0.75 20
3S10E28	2/13/07 2/18/07 2/28/07	107.8 17.192 67.48	17.5 28 40	2/13/07 2/18/07 2/28/07 3/8/07 3/24/07 3/24/07	107.8 17.192 67.48 17.19 55.44 110.88	17.5 28 40 28 9 18
3S11E12				3/27/07 4/3/07	30.8 30.8	5 5
3S11E13				4/10/07 4/11/07	432.87 379.29	235 235
3S11E15	1/6/07 1/8/07	1878.8 184.8	430 35	3/24/07 4/1/07	129.12 123.2	40 20
3S11E16	1/5/07	1478.4	242			

TRS*	Exceedance Date					
	2/28/2007			4/17/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
3S11E18	1/26/07 1/26/07 1/26/07 1/26/07 2/22/07 2/22/07	4.266 23.88 76.78 477.7 42.66 213.3	5.6 5.6 18 112 10 50	1/26/07 1/26/07 1/26/07 1/26/07 2/22/07 2/22/07 3/21/07 3/28/07 4/9/07 4/9/07 4/16/07	4.266 23.88 76.78 477.7 42.66 213.3 209.75 209.75 75.51 197.16 209.75	5.6 5.6 18 112 10 50 50 50 18 47 50
3S11E19				4/7/07	77.47	24
3S11E2	12/19/06	77	10			
3S11E20	12/7/06 2/21/07	77 6.14	10 10	2/21/07 3/23/07 3/23/07 4/1/07 4/1/07	6.14 22.59 41.96 22.59 41.96	10 7 13 7 13
3S11E21	12/19/06 2/22/07	138.6 16.83	18 15	2/22/07 3/23/07 3/30/07 4/1/07	16.83 38.74 75.92 38.74	15 12 30 12
3S11E22	2/24/07	29.05	25	1/23/07 2/28/07 2/28/07	193.68 13.49 202.45	60 16 120
3S11E23	1/23/07 2/28/07 2/28/07	193.68 13.49 202.45	60 16 120	1/23/07 2/28/07 2/28/07 3/24/07 3/26/07 4/4/07 4/10/07 4/11/07	193.68 13.49 202.45 64.56 462 32.28 64.56 308	60 16 120 20 75 10 20 50
3S11E24	2/27/07	141.72	84	2/27/07	141.72	84
3S11E25	2/20/07 2/24/07 2/24/07	6.748 26.9 209.75	4 50 200	2/20/07 2/24/07 2/24/07 3/1/07 3/6/07 4/10/07	6.748 26.9 209.75 6.748 52.44 33.74	4 50 200 4 400 20
3S11E27	2/24/07 2/28/07	12.65 21.08	15 25	2/24/07 2/28/07	12.65 21.08	15 25
3S11E28	2/28/07 2/28/07 2/28/07	6.748 25.31 30.36	8 30 18	2/28/07 2/28/07 2/28/07	6.748 25.31 30.36	8 30 18

TRS*	Exceedance Date					
	2/28/2007			4/17/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
3S11E29	2/19/07 2/21/07 2/23/07 2/23/07 2/26/07 2/26/07 2/28/07 2/28/07 2/28/07 2/28/07 2/28/07	18.59 18.83 13.94 20.92 59.05 67.48 16.03 16.87 25.31 30.36 63.26	16 7 5 10 35 40 18 20 15 36 37.5	2/19/07 2/21/07 2/23/07 2/23/07 2/26/07 2/26/07 2/28/07 2/28/07 2/28/07 2/28/07 2/28/07 3/22/07 3/25/07 3/25/07 3/31/07 4/5/07 4/6/07 4/10/07 4/16/07 4/16/07	18.59 18.83 13.94 20.92 59.05 67.48 16.03 16.87 25.31 30.36 63.26 8.435 1.852 7.407 8.435 14.82 18.51 8.4735 12.96 18.52	16 7 5 10 35 40 18 20 15 36 37.5 5 1 4 5 8 10 5 7 10
3S11E3	1/5/07	1478.4	240			
3S11E30	12/30/06 1/15/07 2/21/07 2/26/07 2/26/07 2/27/07 2/28/07 2/28/07	46.2 50.61 33.74 29.52 30.36 16.87 43.86 59.05	8 20 20 17.5 18 10 26 35	2/21/07 2/26/07 2/26/07 2/27/07 2/28/07 2/28/07 3/22/07 3/30/07 4/13/07 4/17/07	33.74 29.52 30.36 16.87 43.86 59.05 16.87 16.87 16.87 25.31	20 17.5 18 10 26 35 10 10 10 15
3S11E4	2/19/07	123.2	160	2/19/07	123.2	160
3S11E5	1/22/07	32.28	10	1/22/07 3/23/07 4/10/07	32.28 115.5 115.5	10 15 15
3S11E6	1/22/07 1/23/07 1/23/07	201.75 100.87 100.87	100 55 56	1/22/07 1/23/07 1/23/07	201.75 100.87 100.87	100 55 56
3S11E8	2/20/07	36.96	24	2/20/07	36.96	24
3S12E8				3/30/07	197.12	32

*Bolded TRS are members of the Coalition

Table I-13. All TRS with more than one association between an application and exceedance for copper in 2005-2007. Table summarizes the number of applications associated with an exceedance for a given date and TRS.

TRS*	Copper Applications per Date of Exceedance	
	2/28/2007	4/17/2007
2S10E26	3	3
2S11E28	1	2
3S10E14	2	2
3S10E21	4	4
3S10E25	3	6
3S10E26		3
3S10E27	1	5
3S10E28	3	6
3S11E12		2
3S11E13		2
3S11E15	2	2
3S11E18	6	11
3S11E20	2	5
3S11E21	2	4
3S11E22	1	5
3S11E23	3	8
3S11E24	1	1
3S11E25	3	6
3S11E27	2	2
3S11E28	3	3
3S11E29	11	20
3S11E30	8	10
3S11E4	1	1
3S11E5	1	3
3S11E6	3	3
3S11E8	1	1

*Bolded TRS are members of the Coalition

Figure I-7. Dry Creek @ Wellsford Rd. TRS that have had applications co-occurring with a copper exceedance.

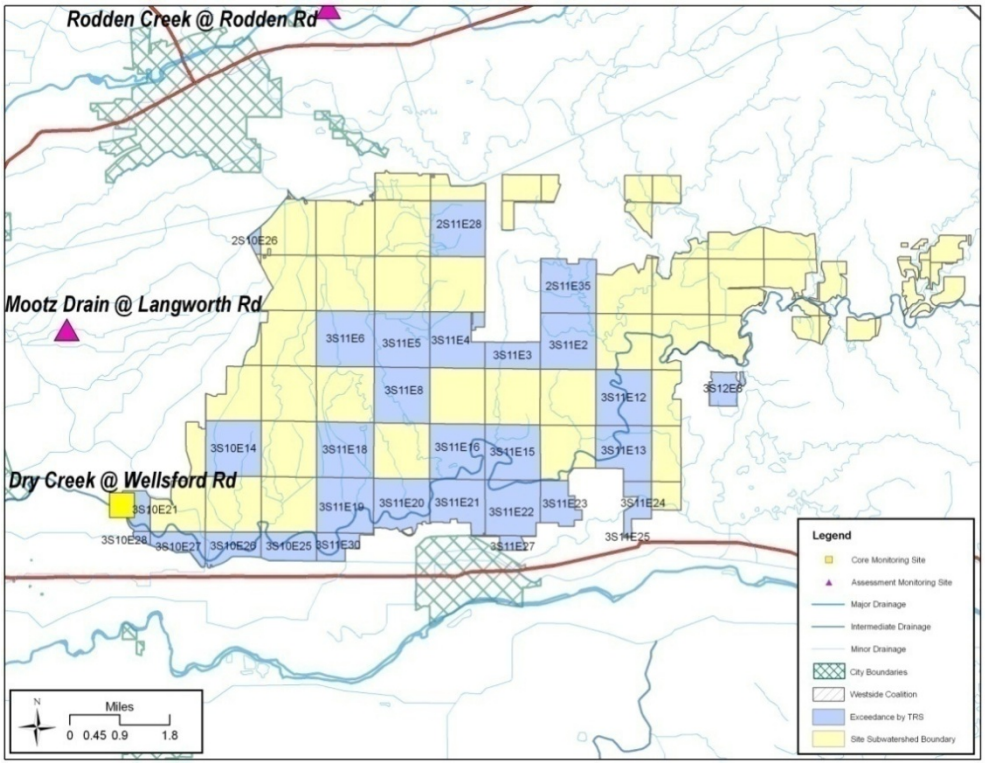
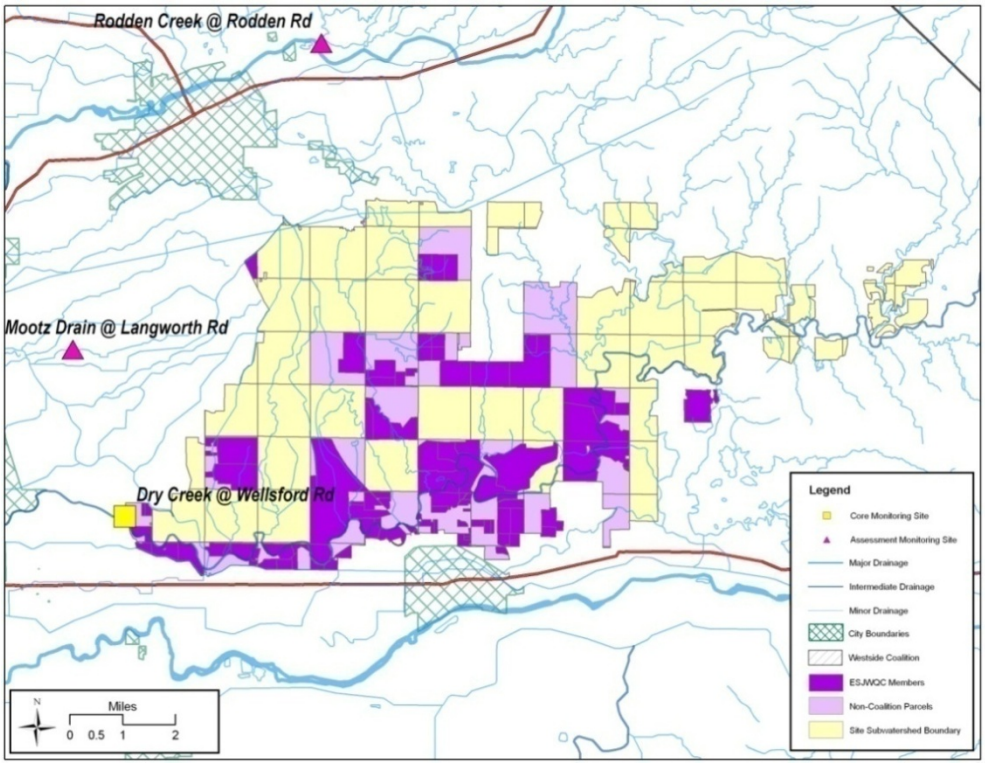


Figure I-8. Dry Creek @ Wellsford Rd. Member APNs relative to TRS with applications co-occurring with copper exceedances.



The analyses conducted by the Coalition suggest that management of copper in this watershed should focus on providing information on a watershed wide basis to growers to encourage the retention of water and sediment on the fields, especially during the dormant season. Copper is measured as total copper and it is unknown which fraction represents the majority of the detectable copper. The Coalition will begin measuring total and dissolved metals this upcoming monitoring season and should be able to more accurately assess which management practices will be effective for copper. Copper is found naturally in soils in the region and consequently, managing copper will take a great deal of effort as only very small amounts of copper applied to crops can move to surface waters without causing an exceedance. Almond and walnut growers should be targeted for outreach especially prior to the dormant spray season. The growers of approximately 39% of the parcels, for which surveys were filled out, claim no runoff from their parcel; which applies to approximately 32% of acreage within the Dry Creek subwatershed. Approximately 25% of the parcels (approximately 27% of member acreage) discharge directly to a waterway (local drainage system or directly to the waterway). Approximately 24% of parcels (approximately 34% of member acreage) use recirculation (tail water return system), approximately 1% of parcels (approximately 1% of member acreage) use micro/drip irrigation, approximately 13% of parcels (approximately 20% of member acreage) utilize sediment settling ditches and approximately 10% of parcels (approximately 9% of member acreage) utilize holding basins to reduce runoff. A large number of growers use grass waterways or vegetated filter strips (approximately 61% of parcels, approximately 62% of member acreage) suggesting that there is a mix of management practice intensity in the watershed. Only a small number utilize retention ponds/holding basin suggesting that outreach could focus on management practices that keep water on the field rather than allowing discharge to surface waters. The exceedances are associated with a large number of sections and parcels indicating that it will be difficult to target individual parcels/growers and make a large difference in copper concentrations in Dry Creek.

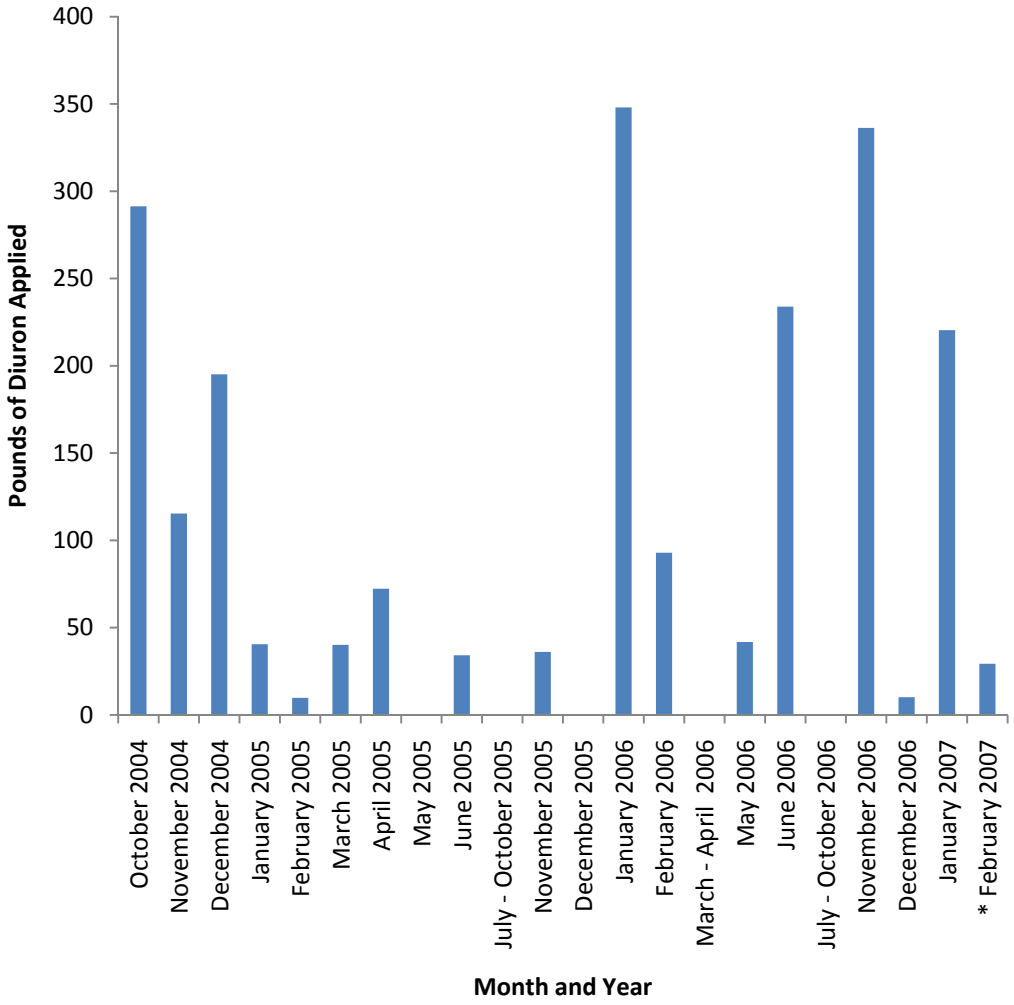
Diuron

Diuron is a soluble herbicide applied in the Dry Creek watershed primarily in the months of October – May. The month with the largest amount AI applied varied from year to year with large applications in October 2004, January and November 2006, and January 2007 (Table I-14, Figure I-9). There are only two applications associated with exceedances (Figures I-10, I-11) within one month of sampling. A third application occurred approximately five weeks prior to the first exceedance and a fourth application occurred approximately seven weeks prior to the first exceedance.

Table I-14. Number of diuron applications, total pounds AI applied and total acres treated by month for August 2004-February 2007 in the Dry Creek @ Wellsford Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
October 2004	3	291.4	196
November 2004	2	115.4	87
December 2004	8	195.1	72.6
January 2005	2	40.47	42
February 2005	1	9.77	6
March 2005	1	40.15	25.76
April 2005	3	72.35	70
June 2005	1	34.22	17.5
November 2005	3	36.08	47
January 2006	2	348.05	338.5
February 2006	3	92.95	38
May 2006	2	41.84	33
June 2006	1	233.9	320
November 2006	4	336.3	430
December 2006	1	10.14	7
January 2007	2	220.4	156
February 2007	1	29.33	40
Summaries by Year			
2004 Total	13	601.9	355.6
2005 Total	11	233.04	208.26
2006 Total	13	1063.18	1166.5
2007 Total	3	249.73	196
Total	40	2147.85	1926.36

Figure I-9. Pounds of diuron applied within the Dry Creek @ Wellsford Rd site subwatershed by month for 2004-2007. Asterisk (*) denotes months with exceedances.



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Figure I-10. Dry Creek @ Wellsford Rd. TRS that have had applications co-occurring with a diuron exceedance.

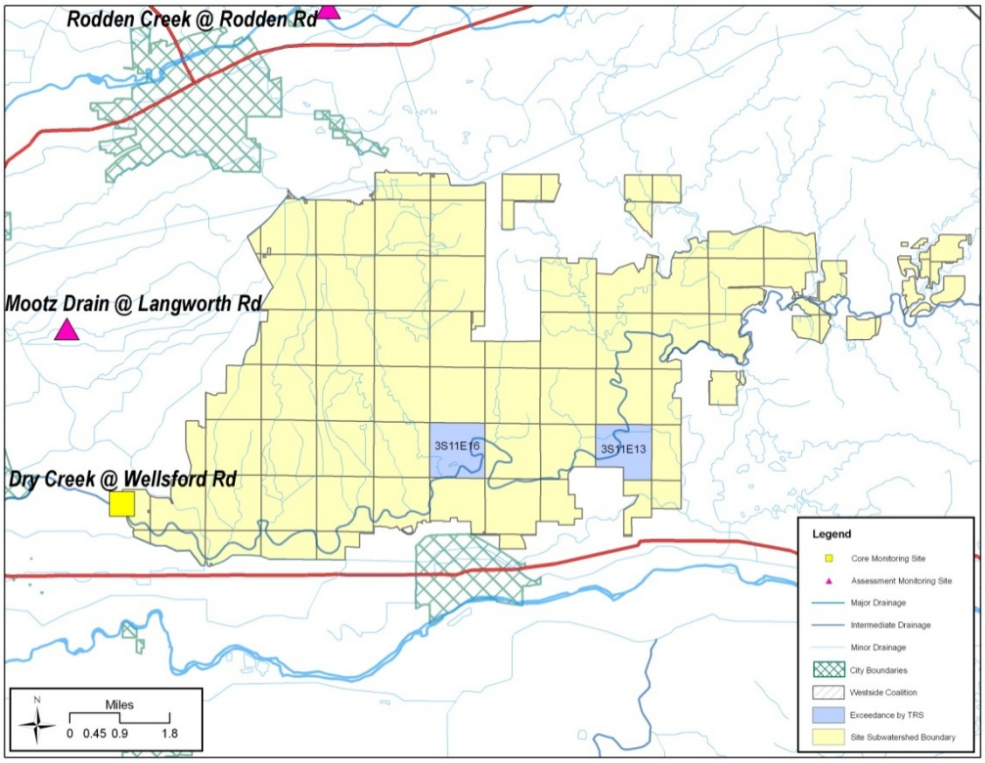
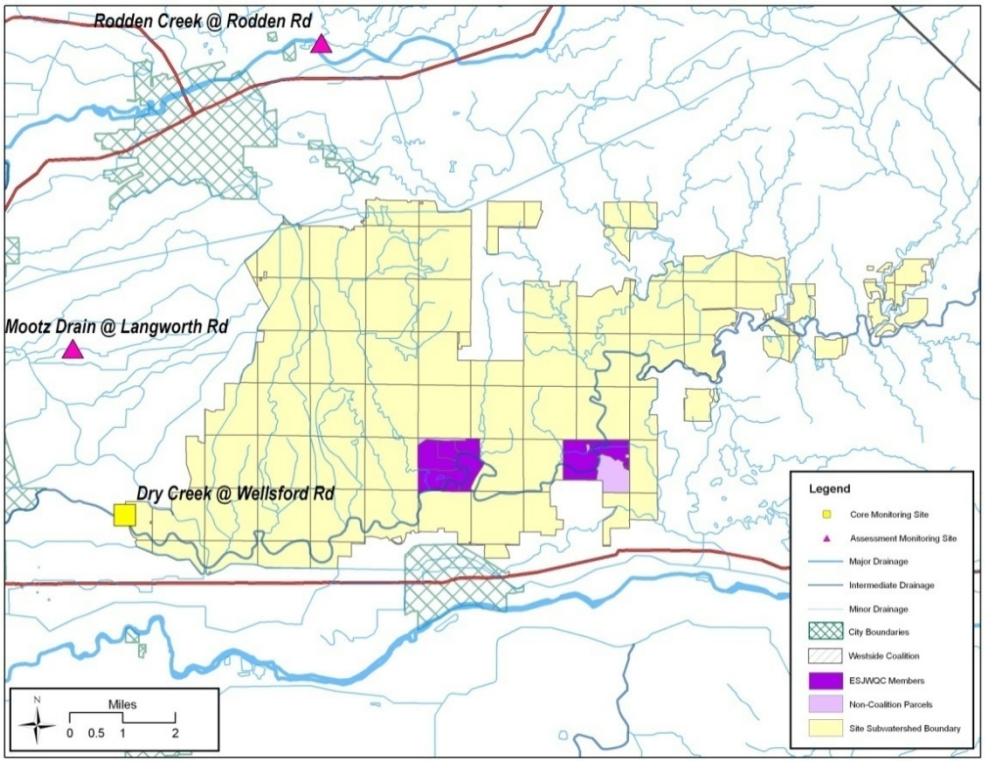


Figure I-11. Dry Creek @ Wellsford Rd. Member APNs relative to TRS with applications co-occurring with diuron exceedances.



The two exceedances occurred in February 2007, and both applications associated with the two exceedances occurred prior to the first exceedance on February 11 (Tables I-15, I-16). No applications were reported in the period between the first exceedance and the second exceedance on February 22. Consequently the applications for both exceedances are identical and it was not possible to perform a linear regression analysis similar to the one performed for chlorpyrifos.

Two small parcels were associated with both exceedances (Tables I-15, I-16). Applications were made to walnuts by ground. Both sections, 3S11E13, 3S11E16, straddle Dry Creek and the high solubility of diuron (K_{oc} = 480) facilitates movement of the product off site to the creek.

Table I-15. TRS' with diuron applications in the month prior to each exceedance date. Includes pounds applied and acres treated.

TRS*	Exceedance Date					
	2/11/2007			2/27/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
3S11E13	1/25/07	171.53	136			
3S11E16	2/10/07	29.33	40	2/10/07	29.33	40

*Bolded TRS are members of the Coalition

Table I-16. All TRS with more than one association between an application and exceedance for diuron in 2005-2007. Table summarizes the number of applications associated with an exceedance for a given date and TRS.

TRS*	Diuron Applications per Date of Exceedance	
	2/11/2007	2/22/2007
3S11E16	1	1

*Bolded TRS are members of the Coalition

The analyses conducted by the Coalition suggest that management of diuron in this watershed should focus on targeting specific growers in the two sections with applications to walnuts. Management practices that facilitate the retention of chlorpyrifos on the fields will also facilitate the retention of diuron. The few growers involved in the exceedances should facilitate contacts although the high solubility of the product will make its management difficult.

Ceriodaphnia dubia toxicity

Ceriodaphnia toxicity was experienced in samples collected in February 2005 and September 2006; no toxicity occurred in samples collected in 2007. *Ceriodaphnia* toxicity and pesticide (i.e. chlorpyrifos) management are usually closely tied especially since chlorpyrifos is often linked to invertebrate toxicity. However, the toxicity to *Ceriodaphnia* was not associated with exceedances of chlorpyrifos, and the relatively low mortality (30% and 20% for the two exceedances) did not generate a toxicity identification evaluation (TIE) or result in any process that would produce a definitive cause of toxicity. Under these conditions, the Coalition's strategy for identifying potential causes of toxicity is to identify all applications in the watershed with a high potential to be mobilized in surface water. Prior to the first exceedance on February 15, 2005, there were 37 applications of diazinon, spinosad, methidathion, iprodione, captan, myclobutanil, and ziram. Applications were made primarily to almonds, with a few additional applications to peaches, plums, nectarines, apricots, and walnuts. The above listed AIs have K_{oc} values less than 1000 indicating that they would be soluble and readily move off-site. These chemicals were applied in almost every section in the site subwatershed making outreach on an individual grower basis difficult.

The Coalition's strategy for eliminating *Ceriodaphnia* toxicity will involve focusing on soluble pesticides, represented by chlorpyrifos (see above section on chlorpyrifos sources). If water soluble constituents can be prevented from entering storm water during the winter rainy season, the Coalition believes that *Ceriodaphnia* toxicity can also be reduced or eliminated.

Selenastrum capricornutum toxicity

Selenastrum toxicity and diuron and copper management are closely tied as two of the four *Selenastrum* toxicity events occurring in February and March 2007 were associated with exceedances of either or both constituents (Table I-3). There were numerous applications of other herbicides in the month prior to the February and March 2007 exceedances including simazine, flumoxazin, oryzalin, norflurazon, MCPA dimethylamine salt, and napropamide. All have K_{oc} values less than 1000 indicating that they would be soluble and move off-site. These chemicals were applied in a large number of sections in the site subwatershed making outreach on an individual grower basis difficult.

The Coalition's strategy for eliminating *Selenastrum* toxicity will involve focusing on copper and diuron with individual contacts if possible, and targeting all growers with information on retaining storm water runoff rather than discharging to drainage canals and creeks. If the two primary constituents can be prevented from entering storm water during the winter rainy season, the Coalition believes that Selenastrum toxicity can also be reduced or eliminated. If the Coalition finds that diuron and copper exceedances are eliminated and *Selenastrum* toxicity persists, the additional herbicides will be targeted for outreach and management.

Priority E Constituents

The following priority E constituents are listed under the Dry Creek @ Wellsford Rd management plan: DO, *E. coli,* cadmium, pH and color.

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, April and July 2007 monitoring events (Table I-17). None of the samples collected from Dry Creek @ Wellsford Rd contained measurable amounts of BOD, and only two of the DO measurements were below 7 mg/L and those were only slightly below. At this point, the cause of the low DO at this site is unknown. When DO becomes elevated in priority, the Coalition will attempt to understand the causes of DO variation in Dry Creek.

Table I-17. Dry Creek @ Wellsford Rd. BOD, pH and DO results for September 2006-February 2007 sampling events.

Station Name	Sample Date	pH	Oxygen, Dissolved mg/L	BOD mg/L
Dry Creek @ Wellsford Rd	14/Sep/2006	7.15	7.08	ND
Dry Creek @ Wellsford Rd	11/Feb/2007	6.56	6.17	ND
Dry Creek @ Wellsford Rd	28/Feb/2007	7	9.55	ND
Dry Creek @ Wellsford Rd	17/Apr/2007	7.18	8.56	ND
Dry Creek @ Wellsford Rd	17/Jul/2007	7.45	6.64	ND

E. coli

The Coalition performed a pilot study to understand the sources of *E. coli* in the site subwatershed. Molecular markers were used to distinguish human, bovine, and avian sources. Upstream sampling was conducted and the results indicated that there was no relationship between the amount of coliform bacteria in the system and the presence of human or bovine bacteria. Human, bovine, and avian molecular markers were found in the watershed indicating active inputs from all three species (Table I-18). Because this study was performed at a single time of the year with a limited set of potential hosts, an additional study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table I-18. Values of E. coli, fecal coliform, and total coliform in MPN/100mL., and the average thermal cycle (C_T) value for all bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station code	Sample Date	Sample Time	Sample Type	*E. coli*	Fecal Coliform	Total Coliform	Avg All Bac	Avg Human	Avg Bovine	Avg Chicken
535XDCAWR	8/29/2006	7:00	Grab	110	220	1100	33.78	30.63	40	40
535XDCWF	8/29/2006	7:40	Grab	130	700	1400	25.445	26.975	36.765	39.505

Cadmium

Cadmium is a heavy metal that is not applied by agriculture except as a by-product of fertilizer applications. Cadmium may be a minor constituent of some phosphate-based fertilizers and may be found in manure and biosolids. The Coalition will provide information about nutrient/manure management to growers in an attempt to reduce cadmium inputs to surface waters. Since the time of this exceedance, the WQTL for cadmium has increased to 5 µg/L and the exceedances listed above are therefore no longer considered an exceedance. As a result, the Coalition will not develop a strategy to manage cadmium.

Color and pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Upstream Monitoring

As outlined in the introduction, upstream sampling may be implemented to facilitate source identification for discharges of chlorpyrifos, copper, and diuron. Sampling locations of the Dry Creek subwatershed are provided in Table I-19 and Figure I-12. The month and analyte used for the 2008 Upstream Management Plan sampling for the Dry Creek @ Wellsford Rd site are provided in Table I-20. The upstream monitoring site location at Dry Creek @ Waterford Rd was selected based on a review of PUR data indicating likely upstream sources. The upstream monitoring site was selected to cut the watershed into smaller areas which will allow an analysis of the contribution of each portion of the watershed to the load measured at the Dry Creek @ Wellsford Road site. The Coalition is not currently conducting Management Plan monitoring during the storm seasons.

Table I-19. Sampling locations within the Dry Creek site subwatershed.

Station Name	Station Code	Target Latitude	Target Longitude
Dry Creek @ Waterford[U]	535XDCAWF	37.65876	-120.77887
Dry Creek @ Wellsford Rd*	535XDCAWR	37.6602	-120.8743

*Original ESJWQC sampling site
[U]Upstream sites

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Figure I-12. Site subwatershed map of land use for the Dry Creek @ Waterford Rd upstream sample site. "B" = Dry Creek @ Wellsford Rd site location.

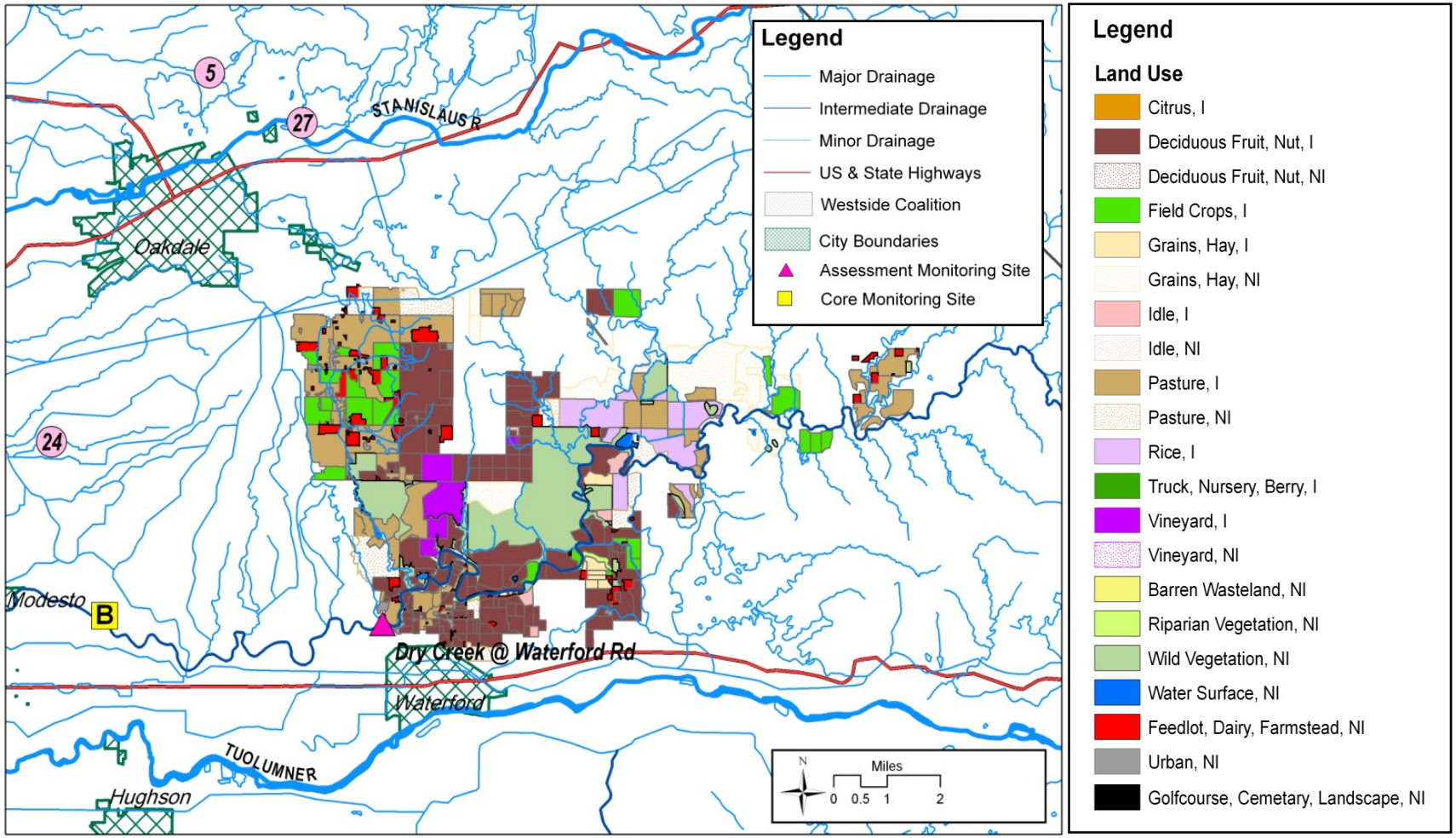


Table I-20. Dry Creek @ Wellsford Rd 2008 Management Plan sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	*Ceriodaphnia dubia*
Dry Creek @ Waterford Rd	July	U	x	
Dry Creek @ Waterford Rd	August	U	x	
Dry Creek @ Waterford Rd	September	U	x	x

To gain additional information in regards to potential discharge sources into the Dry Creek @ Wellsford Rd site subwatershed, the local Agricultural Commissioner's staff walked the waterway in November 2007 and documented all visual drains using GPS and digital photos. The Coalition notified persons owning the parcels where the drains were found and conducted a meeting jointly with the Stanislaus County Agriculture Commissioner in June 2008. The Coalition has mapped the drains and is using this information to further assess possible sources of water quality impairments.

Outreach

The Coalition conducts numerous types of outreach to its membership:

- General grower meetings on a county level,
- Subwatershed specific grower meetings,
- Crop specific grower meetings (may be specified by crop, chemical use or seasonal practices i.e. dormant season orchard),
- Individual contacts,
- Mailings of crop specific BMP literature.

The Coalition outreach for Dry Creek Subwatershed will include grower meetings, individual contacts and mailing/distribution of information. All activities performed during the irrigation season of 2007 are summarized in the Summary of Coalition Outreach Activities section of the Management Plan.

Growers identified as having potential direct discharges into the Dry Creek @ Wellsford site subwatershed were notified in May, 2008, about the creek walk findings and invited to attend a grower meeting in June. Creek walk data was presented to growers on June 18, 2008 at the Stanislaus Farm Bureau by the Agricultural Commissioner. At this meeting the Coalition discussed with growers alternatives to draining into the creek and practices to reduce discharges.

The Coalition anticipates conducting grower meetings in the various Coalition counties between October 2008 and January 2009 focusing on dormant spray practices and presenting Coalition data from the previous year of monitoring. Additional meetings will be scheduled prior to the irrigation season 2009 to address irrigation water quality concerns and management practices. At growers meetings held in May and June 2008, water quality exceedances of chlorpyrifos,

copper, and herbicides within the Dry Creek subwatershed were discussed and crop specific management practices were presented. Discussions with growers after the meeting allowed Coalition representatives to gain additional information about local application practices and will use this information to focus future outreach.

Evaluation

This subwatershed is one of the three priority subwatersheds within the ESJWQC and therefore the Coalition is focusing its resources on identifying the sources of agricultural discharge within this subwatershed that could lead to water quality impairments, extending outreach to individual Coalition members and setting evaluation goals.

One approach for evaluating the success of management practice implementation in the subwatershed is through evaluating information on management practices used on farm properties adjacent to Dry Creek.

The Coalition sent general management practice surveys to members with properties adjacent to Dry Creek several times over the last two years. The last mailing occurred during the 2008 membership renewal and remaining a member in good standing required the completion of the survey. This survey was intended to collect baseline information from growers to understand current management practices conducted and implemented within the subwatershed area. The Coalition plans to build upon the baseline survey results by making individual contacts with growers and filling out more detailed checklists that can be used to gain parcel-specific information in regards to agricultural discharge and management practices currently implemented on the properties adjacent to Dry Creek or where discharges are identified. During the individual grower visits the Coalition will offer resources (i.e. management practice handbooks, information to obtain NRCS-EQIP funds) to aid them in implementing additional management practices if it is determined that additional practices are needed. The Coalition will return in a year to interview the grower and determine which management practices were used.

The Coalition anticipates contacting individual member growers in the Dry Creek subwatershed. Using information gathered from creek walks upstream of the sampling sites, the Coalition has identified potential discharge points into Dry Creek. Landowners with potential discharge points who are Coalition members will be contacted first to discuss options for mitigating any farm runoff. The Coalition anticipates contacting individual member growers during winter of 2008/2009 and returning with follow-up interviews in 2009/2010. Names of non members who are identified in the creek walk with discharges will be forwarded to the Regional Water Board.

In addition the Coalition will conduct a grower subwatershed group meeting in the winter of 2008/2009 to address dormant sprays and applications of herbicides. Additional meetings will be held during the spring prior to the irrigation season. The Coalition will use this information to determine if individual contacts of members who did not attend will be necessary. The Coalition will record the number of attendees at the meeting and the number of checklists filled out to evaluate the effectiveness of this grower group meeting.

The Coalition will continue to conduct its annual member meetings by county, the next scheduled in December 2008, to inform all growers of current water quality impairments and Coalition activities. The Coalition will record the number of attendees at the meeting to evaluate the effectiveness of these outreach meetings.

II. DUCK SLOUGH @ HIGHWAY 99

Management Plan Constituents

Priority A

- Chlorpyrifos

Priority C

- Copper

Priority E

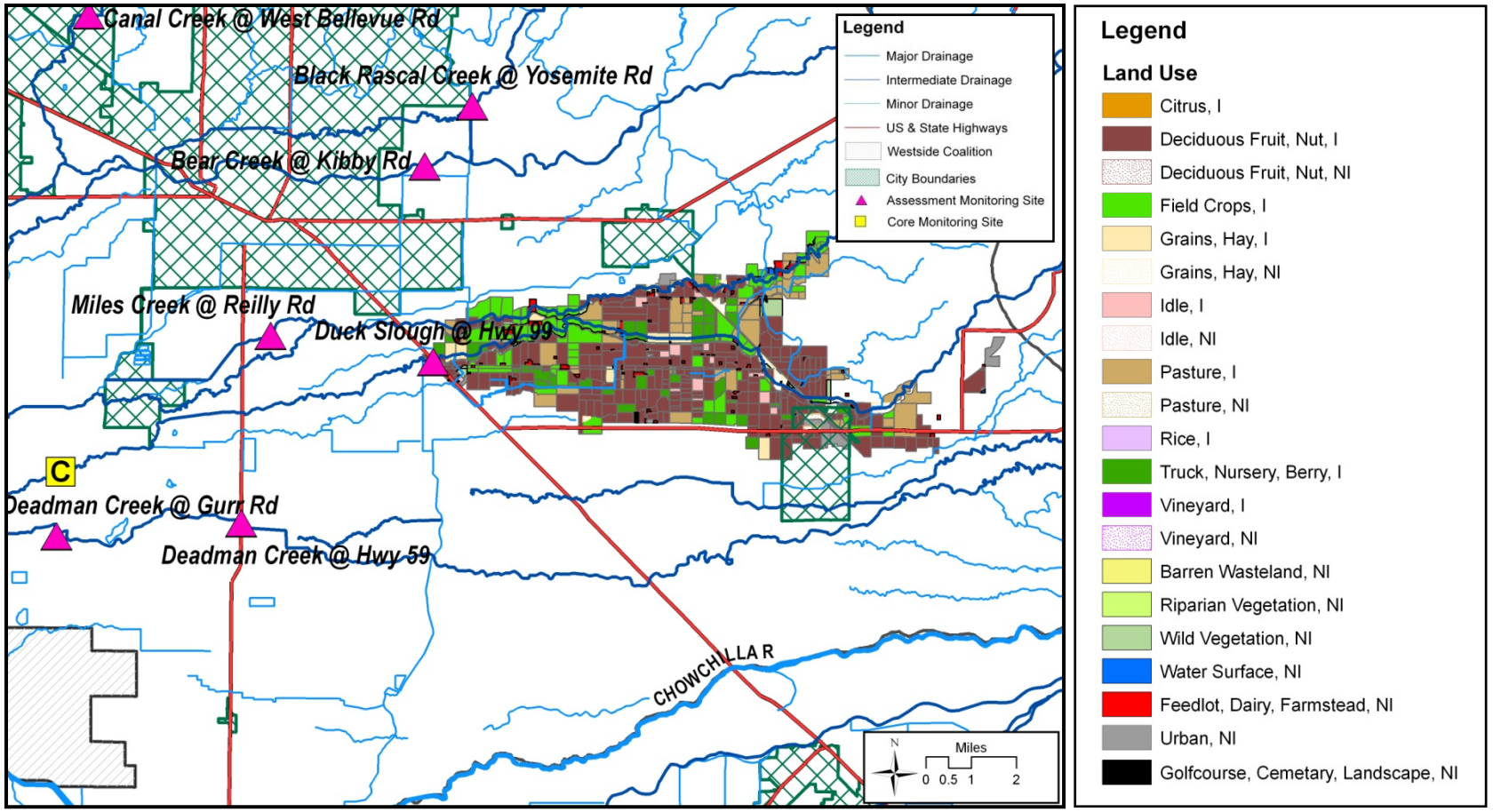
- *E. coli*
- pH
- Lead
- Nickel
- Cadmium
- Color

Description of Duck Slough @ Hwy 99 Site Subwatershed

Duck Slough @ Hwy 99 (15,622 irrigated acres) is located upstream of the Duck Slough @ Gurr Road site and was selected to determine relative contribution of water quality impairments in the upstream portion of the Duck Slough subwatershed. Duck Slough originates in the Sierra foothills and flows west eventually joining with Deadman Creek in the western portion of the coalition region. The monitoring site is located just east of Highway 99 south of Planada and Merced. Irrigated agriculture in this site subwatershed is primarily deciduous orchards, with truck crops and irrigated pasture the next most common land uses (Figure II-1).

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Figure II-1. Site subwatershed map of land use for the Duck Slough @ Hwy 99 Rd sample site.



Subwatershed Monitoring History

Duck Slough @ Hwy 99 was first monitored during the storm season of 2005 (Table II-1). The constituents that have been sampled at this location from 2005-2007 are listed in Table II-2. Duck Slough is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Table II-1. Duck Slough @ Gurr Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	2	6
Events Not Sampled	NA	0	0	0	0	0	0
Total	NA	2	5	2	5	2	6

NA indicates that this site was not sampled during this season/year.

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Table II-2. Number of analyses performed per analyte in each sampling season and year for the Duck Slough @ Hwy 99 sample site. Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5	2	6
EPA 160.1	Dissolved Solids	2	5	2	5	2	6
EPA 180.1	Turbidity	2	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6
SM 9223	E. coli	2	5	2	5	2	6
NA	Dissolved Oxygen	2	6	3	6	3	10
NA	Specific Conductivity	2	6	3	6	3	10
NA	pH	2	6	3	6	3	10
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD(p,p')				5	2	6
EPA 8081A	DDE(p,p')				5	2	6
EPA 8081A	DDT(p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	7
EPA 8141A	Chlorpyrifos	2	5	2	5	2	7
EPA 8141A	Diazinon	2	5	2	5	2	7
EPA 8141A	Dimethoate				5	2	7
EPA 8141A	Disulfoton				5	2	7
EPA 8141A	Malathion				5	2	7
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	7
EPA 8141A	Molinate				5	2	7
EPA 8141A	Parathion, Methyl				5	2	7
EPA 8141A	Phorate				5	2	7
EPA 8141A	Phosmet				5	2	7
EPA 8141A	Thiobencarb				5	2	7

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Pyrethroids							
EPA 8081A	Bifenthrin			2	5	2	6
EPA 8081A	Cyfluthrin, total			2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6
EPA 8081A	Permethrin, total	2	5	2	5	2	6
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	8
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	6
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	8
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	2	6	2	7
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5	2	7
EPA 821/R-02-013	***Selenastrum capricornutum***	**2**	**7**	**2**	**5**	**2**	**7**
EPA 600/R-99-064	*Hyalella azteca*			1	1	1	1

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Exceedance History

Sampling at Duck Slough @ Hwy 99 has resulted in exceedances of field and physical parameters, *E. coli,* and metals, as well as five pesticides including bifenthrin, chlorpyrifos, lambda cyhalothrin, esfenvalerate/fenvalerate, and thiobencarb. Toxicity in the water column to *Ceriodaphnia dubia* and *Selenastrum capricornutum* and in the sediment to *Hyalella azteca* has occurred at one or both of the monitoring sites (Table II-3).

During ambient water monitoring of Duck Slough @ Hwy 99, exceedances of numerous field, physical, inorganic and organic parameters have occurred including DO (1), pH (2), color (21), and *E. coli* (9) (Table II-3). Three exceedances of the chlorpyrifos WQTL occurred, once per year in the first half of the irrigation sampling season (Table II-3). The analysis of metals was initiated during the 2006 irrigation season sampling and nine exceedances of the copper WQTL and two of both the cadmium and nickel WQTLs occurred in the site subwatershed. Eight of the ten metals exceedances occurred during the same sampling events. Samples taken from Duck Slough have also resulted in water column toxicity to *Ceriodaphnia* and *Selenastrum* once (Table II-3).

Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Dry Creek @ Wellsford site subwatershed, the constituents receiving the highest priorities were chlorpyrifos (A) and copper (C).

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Table II-3. All exceedances experienced in samples collected from the Duck Slough @ Highway 99 Coalition monitoring site between July 2004 and September 2007.

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	E. coli, MPN/100 mL	Cadmium, µg/L	Copper[1], µg/L	Lead[1], µg/L	Nickel, µg/L	Chlorpyrifos, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Duck Slough @ Hwy 99	Irrigation	10/May/2005			50	1600							
Duck Slough @ Hwy 99	Irrigation	14/Jun/2005			50								
Duck Slough @ Hwy 99	Irrigation	12/Jul/2005			25						0.026		1320000
Duck Slough @ Hwy 99	Irrigation	16/Aug/2005			60								
Duck Slough @ Hwy 99	Irrigation	20/Sep/2005			75								
Duck Slough @ Hwy 99	Irrigation	17/May/2006		8.57	90	280			5.2 (3.02)		0.27	0	
Duck Slough @ Hwy 99	Irrigation	14/Jun/2006			34	260							
Duck Slough @ Hwy 99	Irrigation	12/Jul/2006			45								
Duck Slough @ Hwy 99	Irrigation	08/Aug/2006			24			3.4 (2.4)	2.3 (0.41)				
Duck Slough @ Hwy 99	Irrigation	13/Sep/2006	6.72		100	340	0.1	19 (5)	24 (1.25)	22			
Duck Slough @ Hwy 99	Irrigation	24/Apr/2007			30			4.1 (3.7)	1.5 (0.81)				
Duck Slough @ Hwy 99	Irrigation	26/Jun/2007			25			3 (2.4)	0.68 (0.41)				
Duck Slough @ Hwy 99	Irrigation	24/Jul/2007			25			3.5 (3)	0.64 (0.57)				
Duck Slough @ Hwy 99	Irrigation	31/Jul/2007		8.8							0.042		
Duck Slough @ Hwy 99	Irrigation	21/Aug/2007			24			5.5 (3.3)	1.1 (0.69)				
Duck Slough @ Hwy 99	Irrigation	28/Aug/2007						3.1 (2.4)					
Duck Slough @ Hwy 99	Irrigation	18/Sep/2007			22	610		6.9 (2.8)	1.8 (0.52)				
Duck Slough @ Hwy 99	Storm	16/Feb/2005			200								
Duck Slough @ Hwy 99	Storm	21/Mar/2005			75	1600							
Duck Slough @ Hwy 99	Storm	28/Feb/2006			25								
Duck Slough @ Hwy 99	Storm	15/Mar/2006			100	900							
Duck Slough @ Hwy 99	Storm	12/Feb/2007			450	2400	0.2	31 (10.1)	15 (3.59)	41			
Duck Slough @ Hwy 99	Storm	28/Feb/2007			120	2400							
Priorities			**NP[2]**	**E**	**E**	**E**	**E**	**C**	**E**	**E**	**A**	**NP[2]**	**NP[2]**

[1] Water quality trigger for each sample is based on hardness and is shown in parenthesis

[2] NP – Not prioritized. Fewer than two exceedances for this constituent at this site within three years

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2007 Management Plan Monitoring Results

A draft site subwatershed Management Plan was submitted for Duck Slough @ Gurr Rd and Hwy 99 on November 17, 2006 and revised on April 2, 2007. Under this draft management plan, the Coalition performed additional sampling at this location for chlorpyrifos and copper (Table II-4). Chlorpyrifos was detected in samples collected during normal July monitoring (0.011 µg/L) below the WQTL, however samples collected one week later on July 31, 2007 exceeded the WQTL (0.42 µg/L) (Table II-5). Copper exceedances occurred in samples collected in 2007 during all months sampled from February – September including all additional samples collected (Table II-5).

Table II-4. Duck Slough @ Hwy 99. Management Plan monitoring schedule for chlorpyrifos and copper. X = indicates the site, month, and analyte sampled.

Sample site	Month	Chlorpyrifos	Copper
Duck Slough @ Hwy 99	May	x	
Duck Slough @ Hwy 99	July	x	
Duck Slough @ Hwy 99	August		x
Duck Slough @ Hwy 99	September		x

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Table II-5. Duck Slough @ Hwy 99 Normal Monitoring (NM) and Management Plan Monitoring (MPM) results for chlorpyrifos and copper from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	NM	NM	NM	NM	MPM	NM	MPM	NM	MPM
	2/12/07	2/28/07	4/24/07	5/29/07	6/26/07	7/24/07	7/31/07	8/21/07	8/28/07	9/18/07	9/25/07
Chlorpyrifos (ug/L)	<0.00259	<0.00259	<0.00259	<0.00259	<0.00259	0.011	**0.42**	<0.003	NA	<0.003	NA
Copper (µg/L)	**31**	**7.9**	**4.1**	**2.1**	**3**	**3.5**	NA	**5.5**	**3.1**	**6.9**	**2.5**

NA - not applicable; no MPM was conducted for this constituent on this date.

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Load Calculations

Loads were calculated for the copper detections (Table II-6) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values presented for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Very few discharge measurements have been taken at the Duck Slough @ Hwy 99 site since it is usually too deep to wade.

Table II-6. Duck Slough @ Hwy 99. Instantaneous load calculations for copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Duck Slough @ Hwy 99	Copper	12/Jul/2006	58.3	2.7	4457.37

Source Identification

Priority A Constituents

The Coalition uses a combination of monitoring data and evaluation of PUR data to identify possible sources. All PUR data associated with exceedances have been submitted in previous SAMRs and are summarized in the following section.

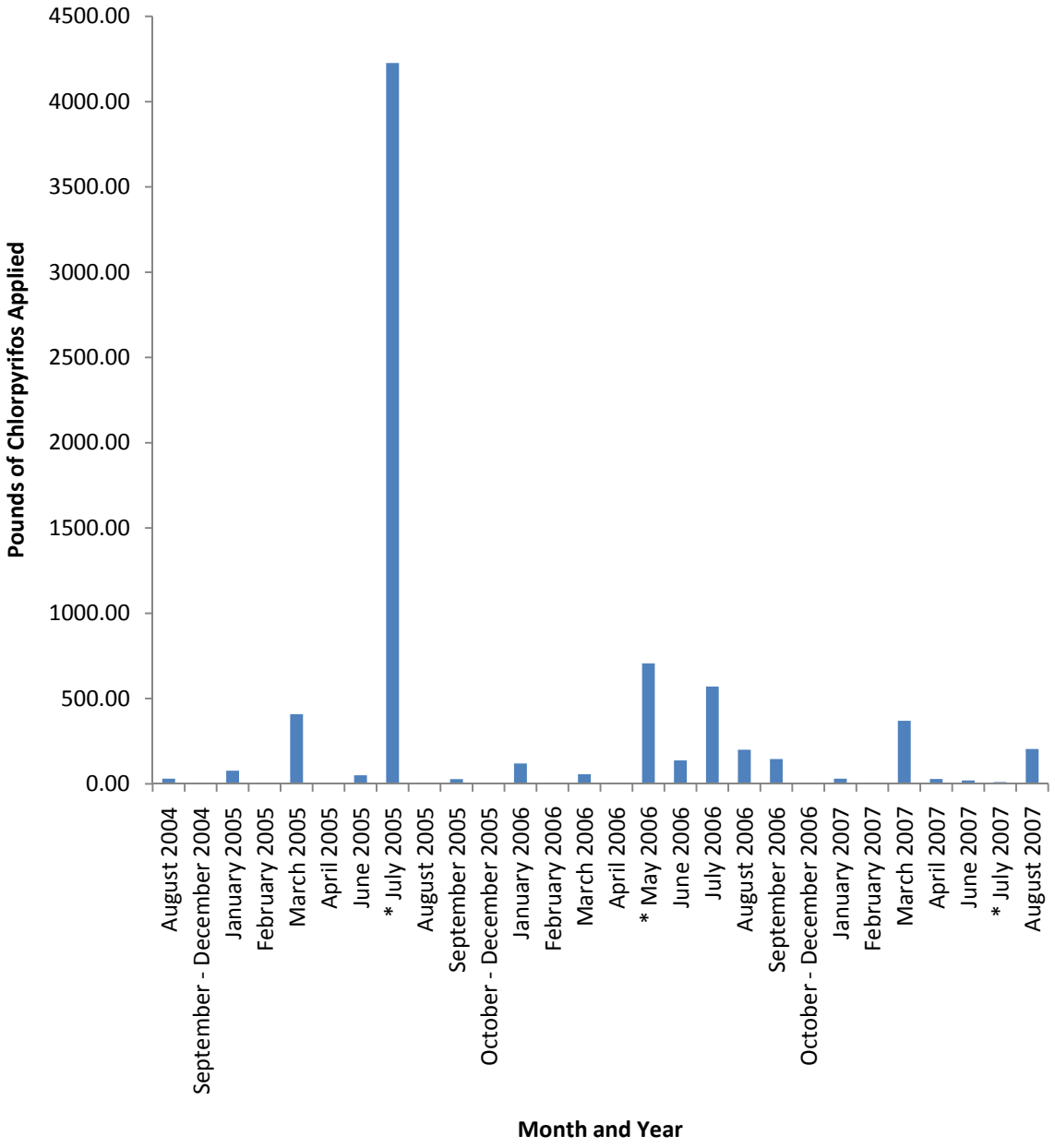
Chlorpyrifos

The amount of AI chlorpyrifos applied, the number of applications and the number of acres treated is summarized in Table II-7 by year and month. Pounds of chlorpyrifos applied by month and year are provided in Figure II-2.

Table II-7. Number of chlorpyrifos applications, total pounds applied, and total acres treated by month for August 2004 through July 2007 in the Duck Slough @ Hwy 99 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
August 2004	1	29.91	20
January 2005	4	76.88	38.1
March 2005	14	408.74	695
June 2005	2	49.97	30
July 2005	17	4226.83	812
September 2005	1	28.01	14
January 2006	6	119.73	59
March 2006	3	56.07	151
May 2006	13	706.45	433
June 2006	1	137.58	69
July 2006	5	570.15	508
August 2006	5	199.89	136
September 2006	2	145.63	80
January 2007	2	29.91	15
March 2007	15	370.02	433.81
April 2007	3	28.75	57.42
June 2007	1	19.94	10
July 2007	1	10.17	10
August 2007	4	203.97	261.33
Summaries by Year			
2004 Total	1	29.91	20
2005 Total	38	4790.43	1589.1
2006 Total	35	1935.50	1436
2007 Total	26	662.76	787.56
Total	100	7418.59	3832.66

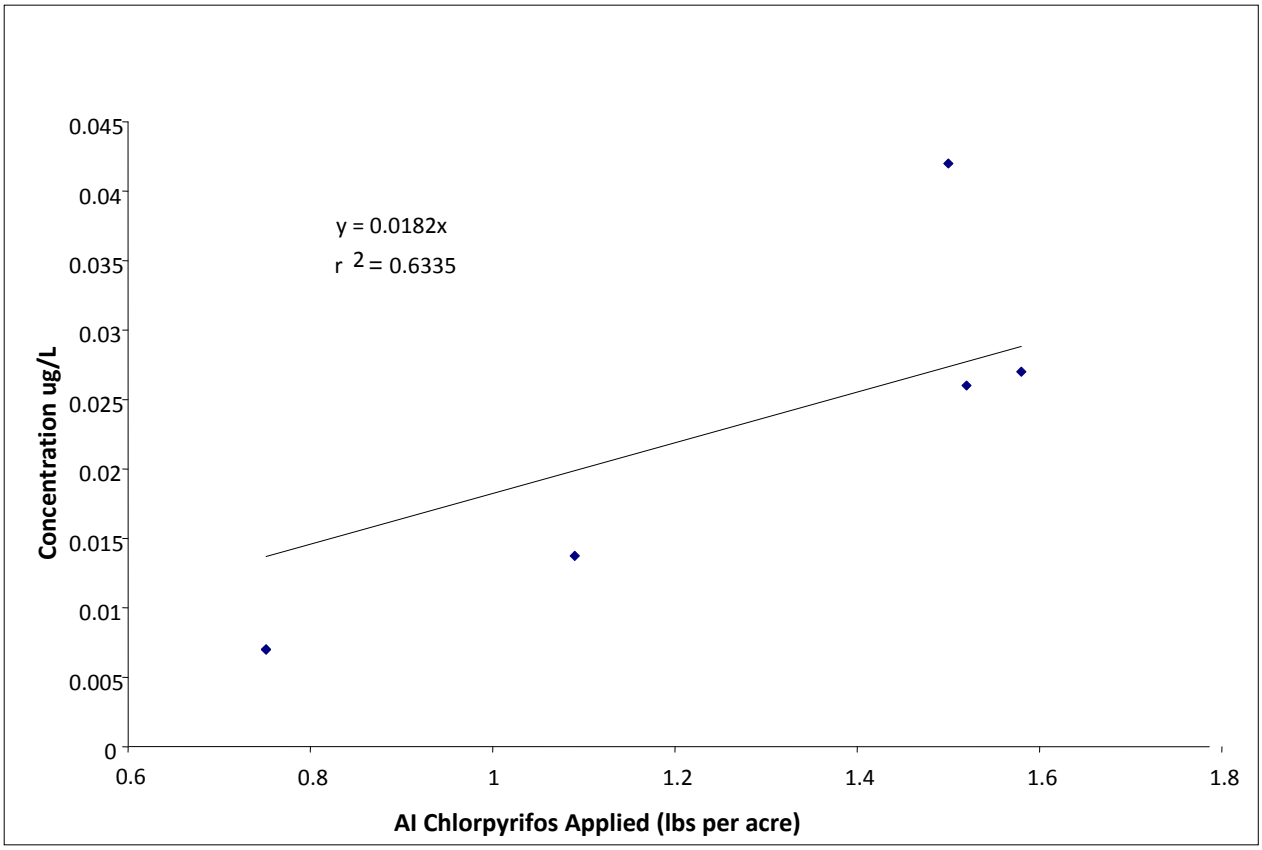
Figure II-2. Pounds of chlorpyrifos applied within the Duck Slough @ Hwy 99 site subwatershed by month for 2004-2007. Asterisk (*) denotes months with exceedances.



The Coalition developed hypotheses to guide the search for sources within the watershed. If the amount of chlorpyrifos (either concentration or load) detected in the sample water was positively associated with amount of chlorpyrifos applied, then the exceedance would most likely be a result of accumulated runoff from numerous parcels. Alternatively, if there was no relationship between the amount applied across the watershed and the amount found in the water, the exceedance would be a result of one or a few parcels with poorly managed discharge. In order to develop an outreach strategy based on PUR data and the above hypothesis, the Coalition assumes that all applications have been reported and that each application has been reported accurately. The outreach strategy of the Coalition varies depending on which hypothesis is correct. The hypotheses are not mutually exclusive as some parcels could always contribute to exceedances, although the magnitude of the exceedance would be determined by the amount of product applied.

Consequently, the Coalition performed an analysis of chlorpyrifos applications within the last four to eight weeks and concentrations and loads of chlorpyrifos in the water (all detections). Detections from the Duck Slough @ Gurr Road site were added to the analysis to increase the sample size. A linear regression analysis was performed to establish the relationship between application in pounds per acre for those acres on which applications were made (not averaged across the entire watershed) and concentration and load (Figure II-3). To associate PUR data (pounds AI per acre) with a single exceedance, the pounds AI was summed and divided by the summed acreage. The small sample size precluded a rigorous statistical treatment but sample sizes are sufficiently large to allow the two hypotheses to be distinguished. The intercept for all analyses was set at zero as there should be no chlorpyrifos in the water if there are no applications. However, this assumes that applications more than four weeks prior to sampling would not contribute chlorpyrifos to the water body.

Figure II-3. Chlorpyrifos loads and application rates for the Duck Slough @ Hwy 99 site subwatershed for applications within four weeks of sampling.



The regression of concentration on pounds applied (AI) per acre indicated a significant positive relationship with 63% of the variation in concentration accounted for by the application rate (Figure II-3). Maximum application rates are set by the label and vary by crop. The average application rate of chlorpyrifos for the Duck Slough subwatershed from 2004-2007 is 1.94 lbs AI/acre (Table II-8). The highest application rates are associated with alfalfa, almond and peach orchard sprays.

Table II-8. Average pounds AI per acre for chlorpyrifos based on PUR data from 2004-2007 within the Duck Slough @ Hwy 99 subwatershed.

Chemical Name	Commodity	Product Name	Average lbs AI/acre
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	0.5
		LORSBAN 4E	0.69
		LORSBAN 4E-HF	0.6
	ALMOND	CHLORPYRIFOS 4E AG	0.32
		GOVERN 4E INSECTICIDE	2.02
		LORSBAN 4E	6.272
		LORSBAN 4E-HF	1.58
		WHIRLWIND	2.02
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	0.71
		LORSBAN 15G GRANULAR INSECTICIDE	1.05
		NUFOS 4E	1.02
	PEACH	CHLORPYRIFOS 4E AG	2.02
		LORSBAN 4E-HF	2.03
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN 4E	1.96
		LORSBAN 4E-HF	1.99
Average pounds applied chlorpyrifos per acre (2004-2007)			**1.94**

The slope of the regression line indicates that for each pound AI per acre that is not applied the concentration would decrease by 0.018 µg/L, more than the amount of the WQTL (0.015 µg/L). Based on the regression equation in Figure II-3, the maximum concentration that is predicted to be in the water is approximately 0.030 µg/L. However, the maximum concentration at this site was 0.042 µg/L, approximately 25% greater than predicted based on the regression line. This event was associated with two June and July applications to almonds and corn. The elevated concentration suggests that the exceedance is not associated with spray drift but rather irrigation tail water runoff containing chlorpyrifos. The point with the lowest concentration relative to the line (i.e. the greatest negative residual) was associated with two applications to corn and a single application to almonds in July of 2007. Application rates associated with the latter exceedance were half those associated with the largest exceedance. These results suggest that neither the number of applications nor the specific crop are critical, while the average pounds applied per acre is important in determining the concentration of chlorpyrifos in the water.

The alternative hypothesis is that specific parcels contribute disproportionately to the load in the creek. To determine if there were specific parcels associated with exceedances on a continuing basis, the Coalition examined the sections (TRS) associated with each exceedance in the Duck Slough @ Highway 99 watershed (Tables II-9, II-10 and Figures II-4, II-5). There were 10 sections associated with exceedances, each section had between 1 and 4 applications in the period prior to sampling. Generally, these applications were associated with different parcels

within the section. Sections were associated with up to two exceedances, and no section was associated with all exceedances (Table II-9). By comparing parcel size and application rate, it appears that individual parcels were associated with only one exceedance over the years, although these conclusions are speculative until the parcels and applications are compared individually. These comparisons will take the Coalition several weeks. The results indicate that while specific parcels may be responsible for an exceedance, it is the relative amount applied across the watershed that determines the concentration in the water. This implies that management practices should be implemented across the watershed.

Table II-9. Duck Slough @ Hwy 99. TRS' with chlorpyrifos applications in the month prior to each exceedance date. Includes pounds applied and acres treated.

TRS*	Exceedance Date								
	7/12/2005			5/17/2006			7/31/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
7S15E34				5/16/06	32.89	33			
8S14E14							7/15/07	10.16	10
8S15E10	7/7/05	19.99	10	5/15/06	9.969	10			
8S15E11	7/9/05	119.98	63	5/15/06	119.63	60			
8S15E12				5/16/06 5/14/06 5/16/06	80.04 36.02 20.00	40 18 10			
8S15E13				5/12/06	149.54	75			
8S15E15	7/7/05 7/10/05 7/10/05 7/10/05	129.97 9.99 39.99 59.99	60 5 20 30	5/15/06 5/16/06 5/16/06 5/17/06	40.02 19.94 34.89 59.82	20 20 35 60			
8S15E24	7/10/05	27.01	12						
8S15E6	6/23/05	10.08	10						
8S15E9	7/5/05 7/7/05 7/8/05	2973.4 278.75 289.91	160 150 156						

*Bolded TRS are members of the Coalition

Table II-10. All TRS that had more than one application associated with an exceedance for chlorpyrifos in 2005 and 2006. Table summarizes the number of applications associated with an exceedance per date and TRS.

TRS*	Chlorpyrifos Applications per Date of Exceedances	
	5/17/2006	7/12/2005
8S15E10	1	1
8S15E11	1	1
8S15E12	3	
8S15E15	4	4
8S15E9		3

*Bolded TRS are members of the Coalition

Figure II-4. Duck Slough @ Hwy 99. TRS' that have had applications co-occurring with a chlorpyrifos exceedance.

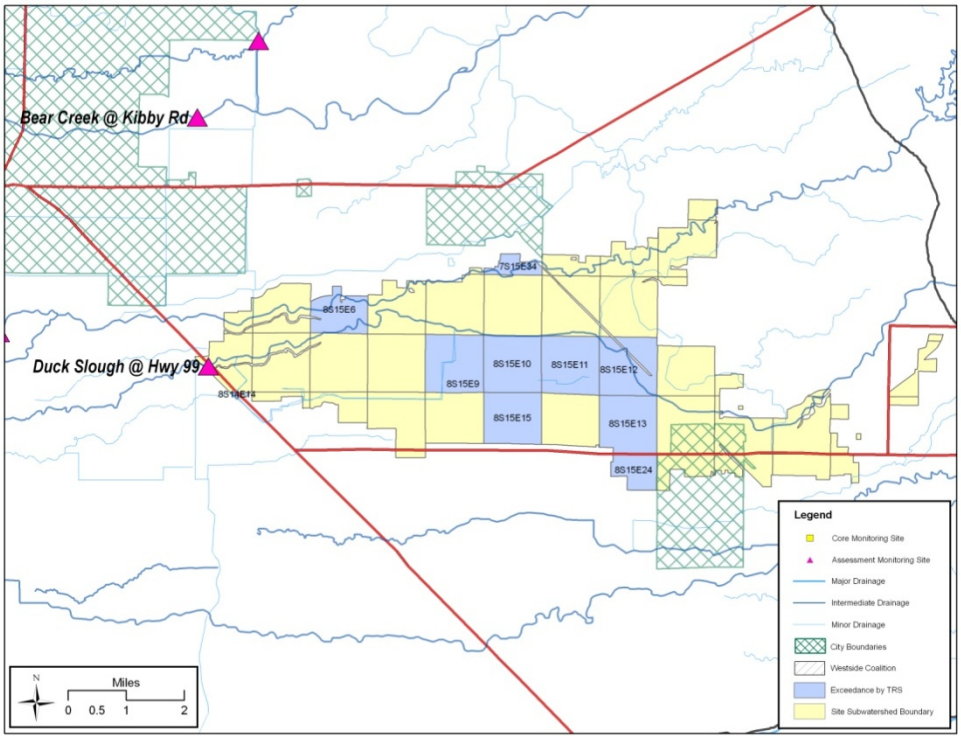
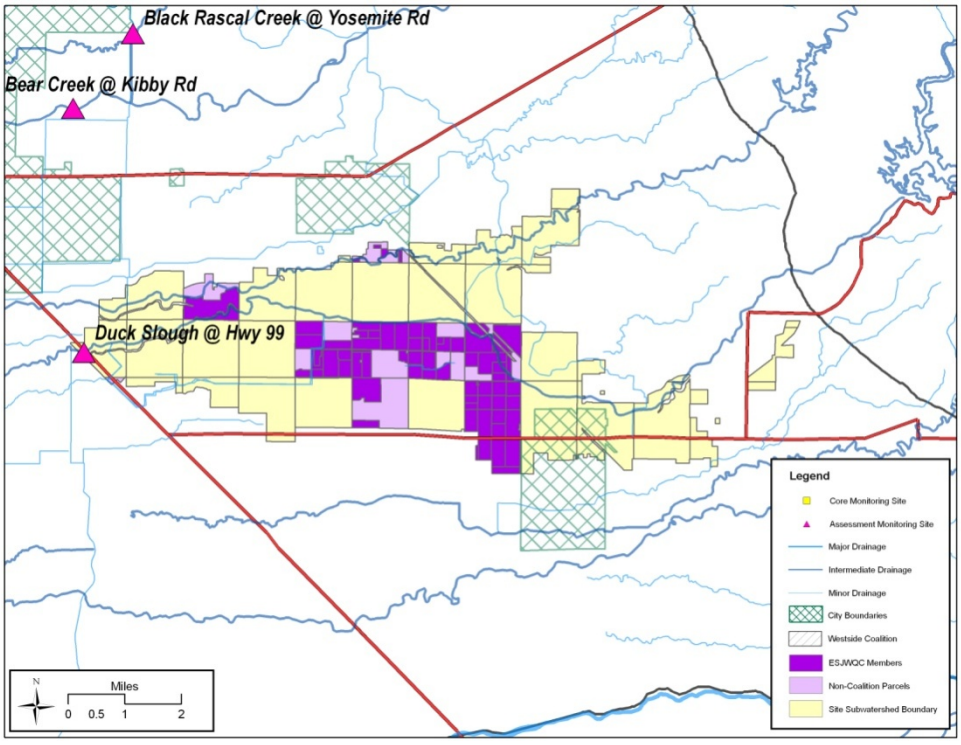


Figure II-5. Duck Slough @ Hwy 99. Member APNs relative to TRS' with applications co-occurring with chlorpyrifos exceedances.



The analyses conducted by the Coalition suggest that management of chlorpyrifos in this watershed should focus on providing information on a targeted basis to growers to encourage the proper management of irrigation tail water. Almond and alfalfa growers should be targeted for outreach especially prior to the irrigation season. Also, those TRS' adjacent to the creek appear to be primarily associated with the exceedances. It is unknown how many of the orchards are on drip or microspray but these irrigation practices could lower runoff and reduce the amount of chlorpyrifos reaching the creek. The map of members and nonmembers (Figure 5) suggests that a large portion of the watershed consists of members, particularly near the creek itself.

Analysis of the management practices surveys for this watershed indicates that a large number of growers claim there is no discharge from their property. Growers of approximately 31% of the parcels for which surveys were filled out claim no runoff; which applies to approximately 33% of acreage within the Duck Slough @ Hwy 99 site subwatershed for which surveys were filled out. Approximately 21% of parcels (approximately 12% of member acreage) for which surveys were filled out discharge directly to a waterway (local drainage system or directly to the waterway). Approximately 35% of parcels (approximately 28% of member acreage) use recirculation (tail water return system), approximately 15% of parcels (approximately 15% of member acreage) use micro/drip irrigation, approximately 14% of parcels (approximately 19% of member acreage) utilize sediment settling ditches and approximately 19% of parcels (approximately 22% of member acreage) utilize holding basins to reduce runoff. A large number of growers use grass waterways or vegetated filter strips (approximately 46% of parcels, approximately 55% of member acreage) suggesting that there is a mix of management practice intensity in the watershed. According to the surveys filled out, a little over a quarter of the member acreage in the Duck Slough @ Hwy 99 site subwatershed discharges directly into a local drainage system or waterway, however a majority of member acreage utilizes one or more management practices to reduce discharge. Together, these results indicate that there is a substantial amount of management of irrigation tail water. The Coalition has linked survey results to parcels within this site subwatershed and will use this information to identify where within the watershed management practices could be improved. Outreach could focus on the several sections on which applications were made prior to exceedances. Outreach would focus on management of irrigation tail water. This targeted outreach represents a significant effort as each section may contain numerous parcels.

Priority C Constituents

Copper

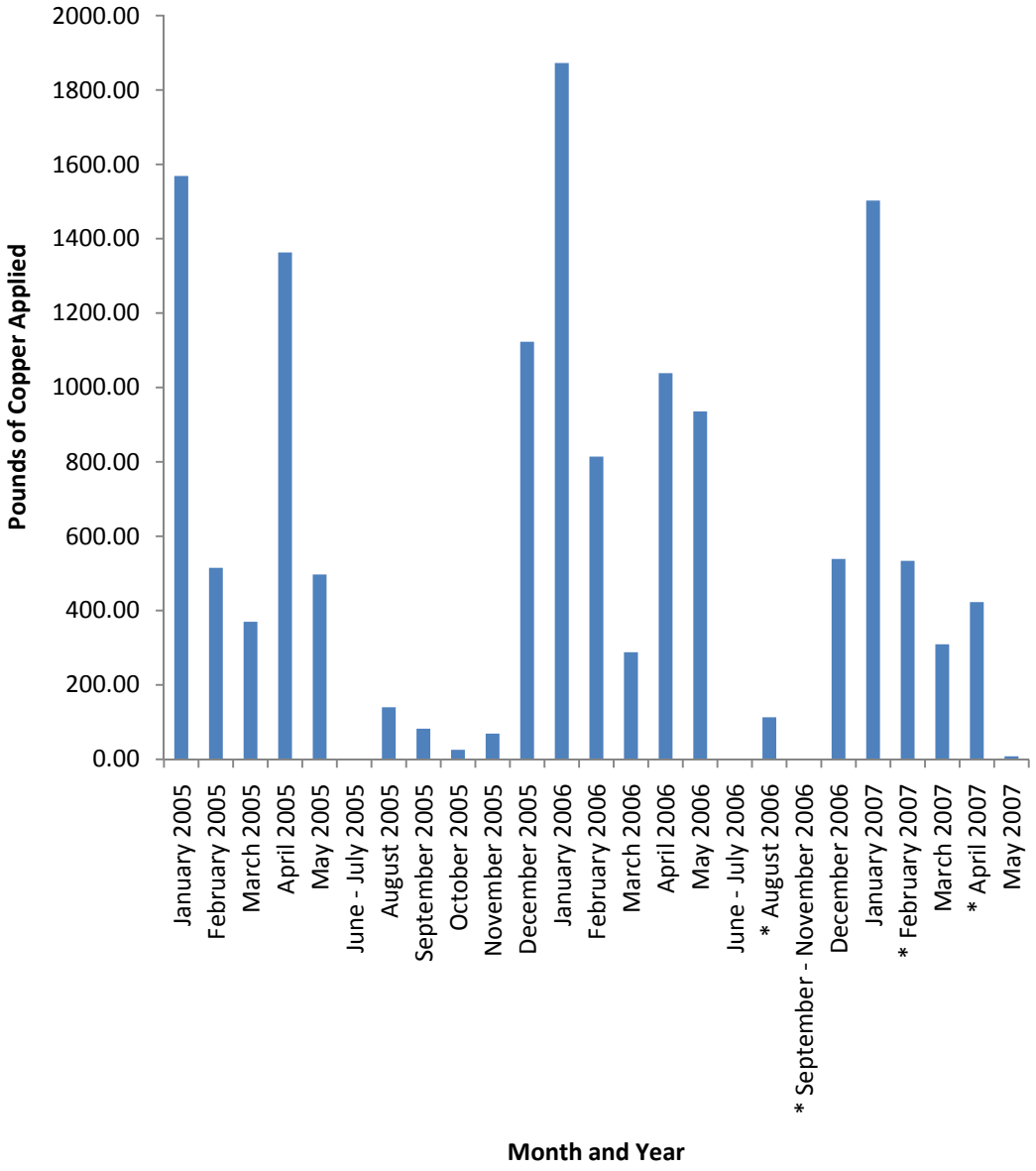
Numerous exceedances of copper have occurred since monitoring for metals was initiated. Copper has been applied in every month except June and July with a peak of applications in December and January and a smaller peak in April. Generally, there are fewer applications into the summer through the fall, (Table II-11, Figure II-6). Copper was applied over approximately half of the watershed on both member and nonmember parcels (Figures II-7, II-8).

Table II-11. Number of copper applications, total pounds applied and total acres treated by month for January 2005-May 2007 in the Duck Slough @ Hwy 99 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2005	12	1568.73	376.1
February 2005	5	514.83	159.7
March 2005	3	369.89	81
April 2005	26	1363.19	483.25
May 2005	10	497.09	214.5
August 2005	3	139.80	127.8
September 2005	2	82.41	74.7
October 2005	1	25.79	21
November 2005	1	69.08	45
December 2005	5	1122.84	153
January 2006	12	1872.35	321
February 2006	9	813.99	251
March 2006	4	287.97	360
April 2006	12	1038.27	263.5
May 2006	9	935.42	367
August 2006	1	113.04	103
December 2006	2	539.00	70
January 2007	9	1502.74	223
February 2007	8	533.72	280
March 2007	3	309.23	115
April 2007	10	422.87	147.5
May 2007	1	8.25	33
Summaries by Year			
2005 Total	68	5753.64	1736.05
2006 Total	49	5600.04	1735.5
2007 Total	31	2776.81	798.5
Total	148	14130.48	4270.05

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Figure II-6. Pounds of copper applied within the Duck Slough @ Hwy 99 site subwatershed by month for 2005-May 2007. No PUR data available after May 2007. Asterisk (*) denotes months with exceedances.



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Figure II-7. Duck Slough @ Hwy 99. TRS that have had applications co-occurring with a copper exceedance.

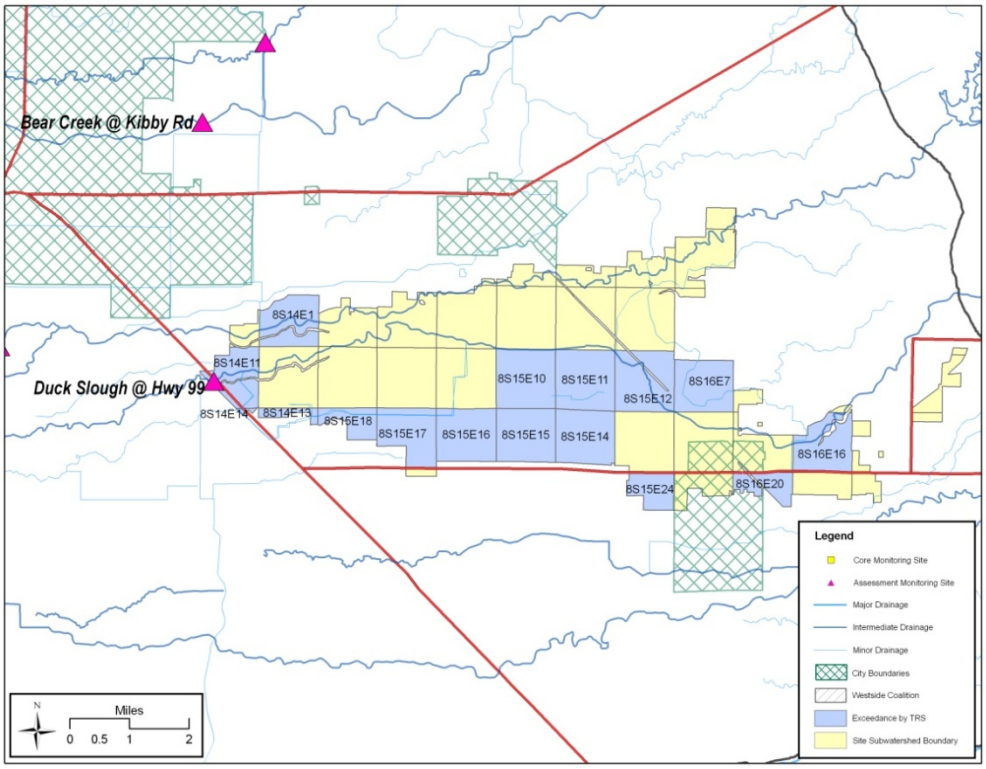
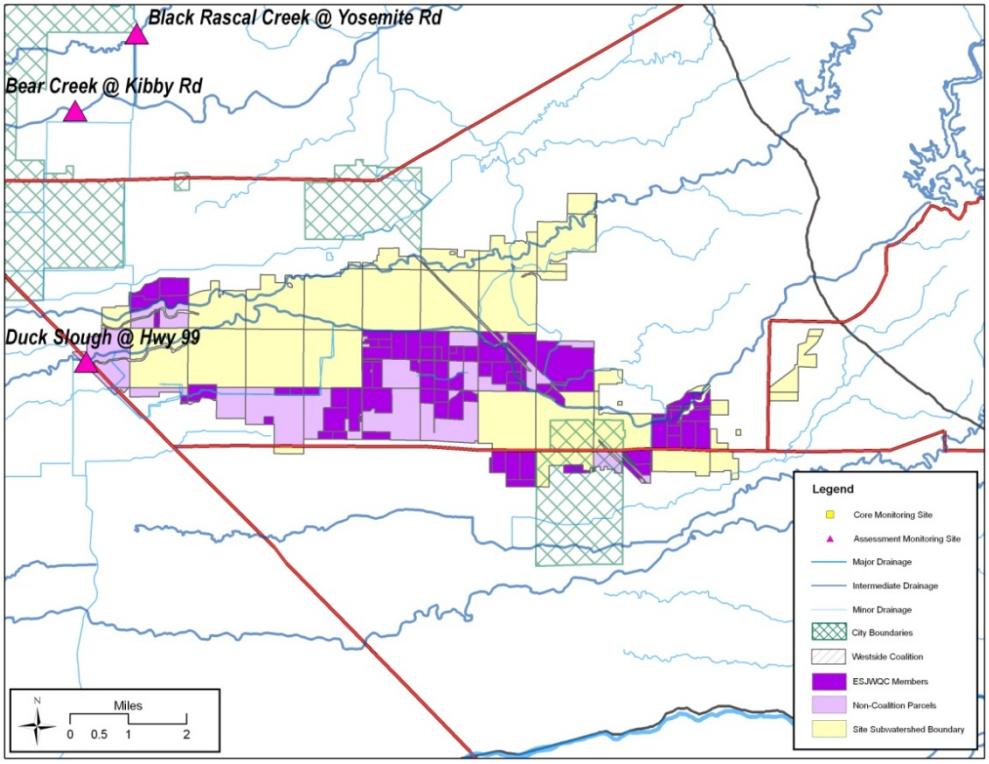
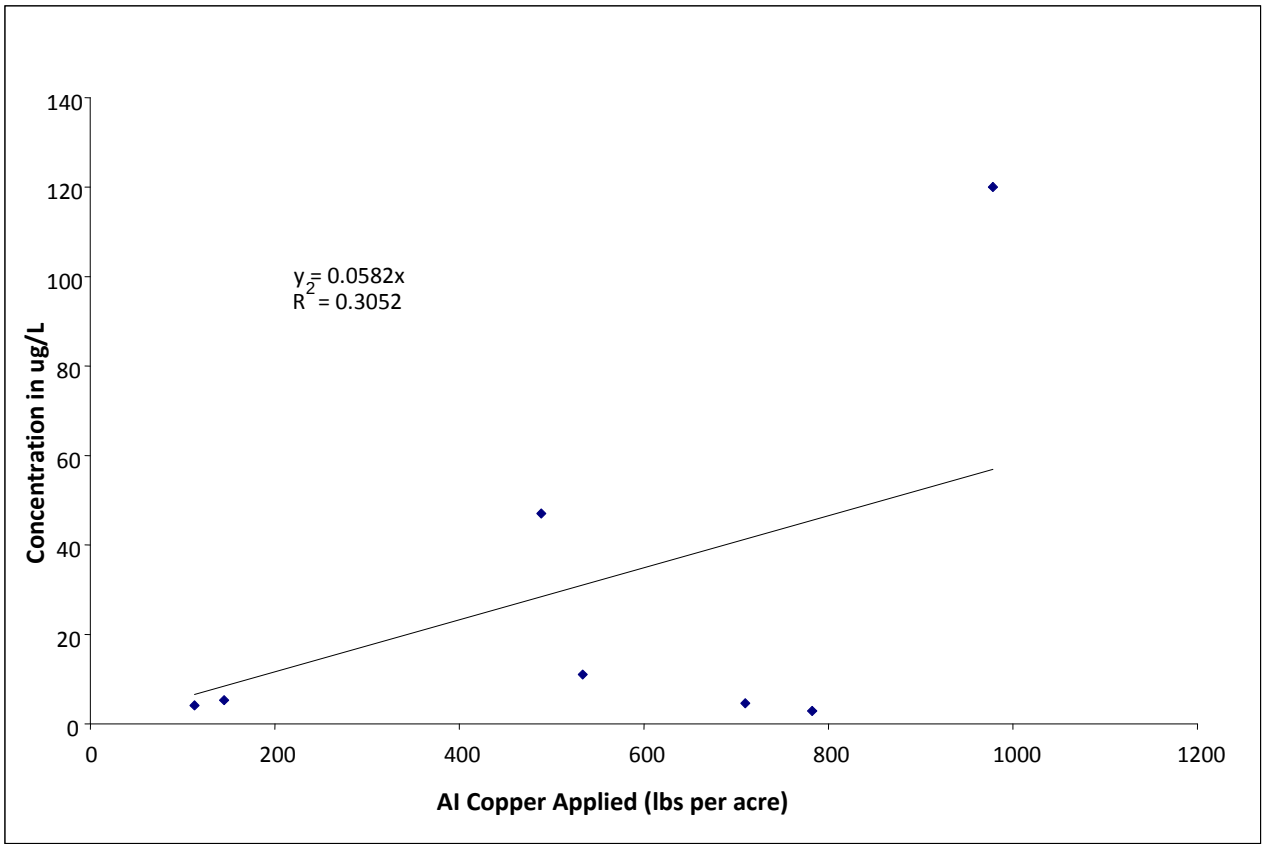


Figure II-8. Duck Slough @ Hwy 99. Member APNs relative to TRS with applications co-occurring with copper exceedances.



Nine exceedances occurred in the site subwatershed and it was possible to perform a regression analysis for copper as was performed for chlorpyrifos. The original regression analysis had a negative intercept indicating that at low levels of applications, copper would be removed from the creek. Because this was physically impossible, the intercept was fixed at 0 and the analysis redone. There was a significant positive relationship between concentration and pounds AI per acre with 32% of the variation in concentration explained by application rate (Figure II-9). The largest exceedance was 120 µg/L, approximately twice that predicted by the regression line. This exceedance was the result of applications to tomatoes, walnuts, and rice.

Figure II-9. Copper loads and application rates for the Duck Slough @ Hwy 99 site subwatershed for applications within four weeks of sampling.



In the few months prior to the each exceedance, there were between 9 and 20 applications of copper to parcels in 13 different sections; 2006 Exceedances listed in Table II-12 and 2007 Exceedances listed in Table II-13. Applications were made to variety of crops including almonds, tomatoes, peaches, plums, apricots, nectarines, walnuts, alfalfa, and pistachios. The average application rate was 3.2 pounds AI per acre.

To determine if there were specific parcels associated with exceedances on a continuing basis, the Coalition examined the sections associated with each exceedance (Tables II-12, II-13, II-14). Sections were associated with from one to three exceedances; no section was associated with

all exceedances. Each TRS had between one and five applications prior to the exceedances. It appears that applications were made to different parcels prior to the first exceedance relative to the second exceedance as almonds received the first application and walnuts the second. The application method was specified as ground.

Table II-12. Duck Slough @ Hwy 99. TRS with copper applications in the three months prior to each 2006 exceedance date. Includes pounds applied and acres treated.

Exceedance Date	8/8/2006			9/13/2006		
TRS*	**Application Date**	**Pounds Applied**	**Acres Treated**	**Application Date**	**Pounds Applied**	**Acres Treated**
8S14E1				8/25/06	113.04	103
8S14E14	5/23/06 5/23/06	36.58 40.88	34 38			
8S15E12	5/23/06 5/23/06	72.63 161.4	18 40			
8S15E15	5/23/06 5/23/06	80.7 100.8	20 25			
8S15E17	5/10/06	221.76	36			
8S15E18						
8S15E24	5/19/06 5/29/06	59.18 161.4	55 101			

*Bolded TRS are members of the Coalition

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Table II-13. Duck Slough @ Hwy 99. TRS' with copper applications in the three months prior to each 2007 exceedance date. Includes pounds applied and acres treated. No PUR data available after 5/10/2007.

TRS*	Exceedance Date											
	2/12/2007			4/24/2007			6/26/2007			7/24/2007		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
8S14E11	2/3/07	273.74	77	2/3/07	273.74	77						
8S14E13	1/9/07	172.16	32									
8S15E10	12/6/06 1/5/07 1/5/07 2/7/07	385 196 490 2.02	50 20 50 50	2/7/07	2.02	50						
8S15E11	12/6/06 2/5/07 2/6/07	154 80.7 20	20 20 10	2/5/07 2/6/07	80.7 40.35	20 10						
8S15E12				4/10/07 4/10/07 4/19/07 4/19/07 4/19/07	29.05 64.56 29.05 58.10 64.56	9 20 9 18 20	4/10/07 4/10/07 4/19/07 4/19/07 4/19/07	29.05 64.56 29.05 58.10 64.56	9 20 9 18 20			
8S15E14	1/22/07 1/22/07	24.56 67.54	4 11	4/11/07	8.07	10	4/11/07	8.07	10			
8S15E15	1/2/07 1/4/07 1/5/07	58.8 98 196	6 10 20	4/11/07 4/18/07 4/20/07	32.28 40.35 32.28	10 12.5 10						
8S15E16				4/10/07	64.56	29	4/10/07	64.56	29			
8S15E17				2/21/07 2/26/07 2/28/07 3/6/07 3/30/07	15.4 30.8 46.2 22.17 22.17	15 20 30 36 36	3/30/07	22.17	36			
8S15E18							5/10/07	8.25	33	5/10/07	8.25	33
8S16E16	1/6/07	199.68	70									
8S16E20				2/22/07	44.52	58						
8S16E7				3/30/07	264.88	43	3/30/07	264.88	43			

*Bolded TRS are members of the Coalition

Table II-14. All TRS that had more than one application associated with an exceedance for copper in 2006 and 2007. Table summarizes the number of applications associated with an exceedance for a given date and TRS. No PUR data available after 5/10/2007.

TRS*	Copper Applications per Date of Exceedances					
	8/8/2006	9/13/2006	2/12/2007	4/24/2007	6/26/2007	7/24/2007
8S14E11			1	1		
8S14E14	2					
8S15E10			4	1		
8S15E11			3	2		
8S15E12	2			5	5	5
8S15E14			2	1	1	1
8S15E15	2		3	3	3	3
8S15E16				1	1	1
8S15E17	1			5	1	1
8S15E18					1	1
8S15E24	2					
8S16E7				1	1	1

*Bolded TRS are members of the Coalition

The analyses conducted by the Coalition suggest that management of copper in this watershed should focus on providing information on a watershed wide basis to growers to encourage the retention of water and sediment on the fields, especially during the dormant season. Copper is measured as total copper and it is unknown which fraction represents the majority of the detectable copper. The Coalition will begin measuring total and dissolved metals this upcoming monitoring season and will be able to more accurately assess which management practices will be effective for copper. Copper is found naturally in soils in the region and consequently, managing copper will take a great deal of effort as only very small amounts of copper applied to crops can move to surface waters without causing an exceedance. Almond and walnut growers should be targeted for outreach especially prior to the dormant spray season. The exceedances are associated with a large number of sections and parcels indicating that it will be difficult to target individual parcels/growers and make a large difference in copper concentrations in Duck Slough.

Priority E Constituents

E. coli

The Coalition performed a pilot study to understand the sources of *E. coli* in the site subwatershed. Molecular markers were used to distinguish human, bovine, and avian sources. Upstream sampling was conducted and the results indicated that there was no relationship between the amount of coliform bacteria in the system and the presence of human or bovine bacteria. Human and avian molecular markers were found in the watershed indicating active inputs from two of the three species (Tables II-15, II-16). Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table II-15. Results of Bacteroides analysis. The Duck Slough subwatershed sites were sampled only once. A + indicates the DNA was detected but at too low of a concentration to estimate a percentage.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
535XDSAHN	8/30/06	8:20	Grab	50	0	25
535XDSABA	8/30/06	7:10	Grab	50	0	+

Table II-16. Values of E. coli, fecal coliform, and total coliform in MPN/100mL., and the average thermal cycle (C_T) value for all bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station code	Sample date	Sample time	Sample type	*E. coli*	Fecal Coliform	Total coliform	Avg All bac	Avg Human	Avg Bovine	Avg Chicken
535XDSABA	8/30/2006	7:10:00	Grab	220	1300	1700	28.275	29.675	39.595	26.61
535XDSAHN	8/30/2006	8:20:00	Grab	330	54000	92000	27.79	28.355	40	28.62

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991 prior to the initiation of the Pesticide Use Reporting system. Consequently, it is not possible to identify where past applications of lead-based pesticide occurred. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal of lead paint in the vicinity, burial of old building materials with lead paint, or leaching lead from lead arsenate deposition could all be

contributors to lead detections. The particular sources of this metal are unknown, and the Coalition will address the lead exceedances when they become a priority.

Nickel

Nickel is a naturally occurring metal that is found in native soils within the Coalition region. It is also applied by agriculture as a foliar nutrient on crops such as cotton and pecans to improve nitrogen utilization when nitrogen is applied as urea. The amount of nickel applied in the Coalition region is unknown. Nickel is also a constituent in fertilizers originating with wastes from industry and sewage treatment plants. It can also be released into the environment from the disposal of nickel-cadmium batteries. Metals associated with sediments may be found in the water column and due to the fact that the samples were not filtered, the concentration of metals in the sample water may have been elevated. The particular sources of these metals are unknown, and the Coalition will address the nickel exceedances when they become a priority.

Cadmium

Elevated concentrations of cadmium in a water body may be a result of agricultural application of sludge fertilizer, but also may arise from the erosion of soils and bedrock, atmospheric deposition, discharge from industrial operations or leakage from landfills and contaminated sites. Cadmium has a high tendency to adsorb to sediments (high K_{oc}) and persists indefinitely in the environment. Data recorded at Duck Creek @ Hwy 4 indicate that the creek was experiencing low flow on the date of sampling (5.48 cfs) and that the water in the creek was brown and murky. It is likely that re-suspended, contaminated sediment in the creek was the source of cadmium detected in these samples. The Coalition will provide information about nutrient/manure management to growers in an attempt to reduce cadmium inputs to surface waters. However, at this time, the Coalition will not focus on cadmium as a high priority constituent.

pH

Understanding pH dynamics in the system is as difficult as understanding DO dynamics. The Coalition used monitoring data to conduct a simple analysis in an attempt to associate pH with manageable constituents. A multiple regression was performed using DO and TOC as the predictor variables and pH as the response variable. The regression model was not significant ($F = 0.76$, $p = 0.48$, $df = 2, 21$) indicating that pH is not a function of either dissolved oxygen or organic carbon. These results suggest that photosynthetic activity is not a driving factor in pH and DO dynamics and it is not known what determines pH variation in Duck Creek. As with DO, the Coalition will not actively manage for pH at this time. If future studies are conducted that allow the Coalition to understand pH dynamics, the Coalition will re-evaluate the management options.

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

Upstream Monitoring

As outlined in the introduction, upstream sampling may be implemented to facilitate source identification for discharges of chlorpyrifos and copper. The month and analyte for the 2008 management plan upstream sampling are provided in Table II-17. Sampling locations for 2008 within the Duck Slough subwatershed are provided in Table II-18 and Figure II-10. These locations were based on a review of PUR data indicating likely upstream sources. The upstream monitoring sites were selected to divide the watershed into smaller areas which will allow an analysis of the contribution of each portion of the watershed to the load measured at the Duck Slough @ Whealen Rd site. The Coalition is not currently conducting management plan monitoring during the storm seasons.

Table II-17. Duck Slough @ Hwy 99. 2008 Management Plan sampling. U = upstream sampling. X = site, month and analyte sampled.

Station Name	Month	Type	Chlorpyrifos	Copper
Duck Slough @ Whealan Rd	April	U		x
Duck Slough @ Whealan Rd	May	U	x	
Duck Slough @ Whealan Rd	June	U		x
Duck Slough @ Whealan Rd	July	U	x	x
Duck Slough @ Whealan Rd	August	U		x
Duck Slough @ Whealan Rd	September	U		x

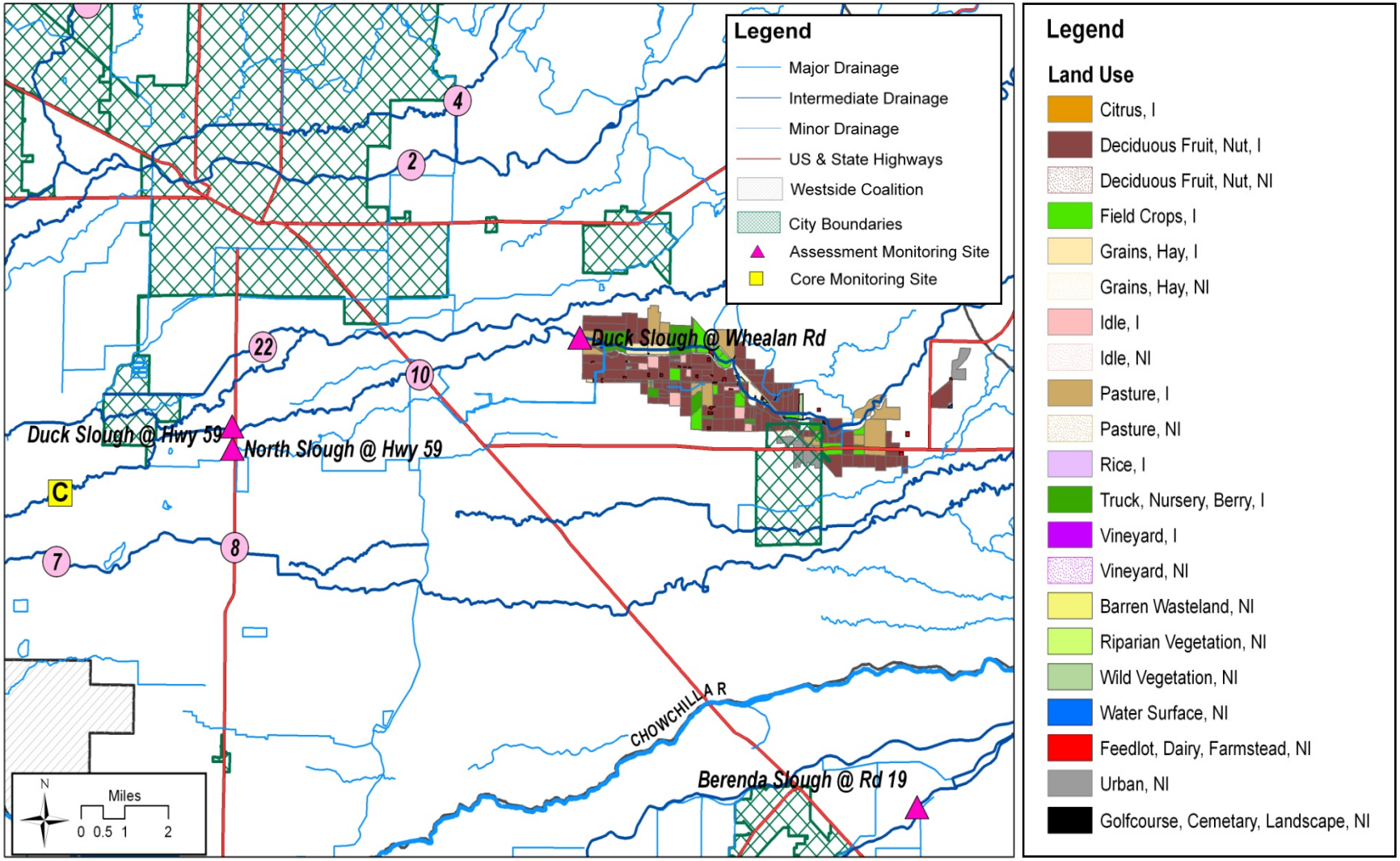
Table II-18. Sampling sites within the Duck Slough @ Hwy 99 site subwatershed.

Station Name	Station Code	Target Latitude	Target Longitude
Duck Slough @ Hwy 99*	535XDSAHN	37.2501	-120.4100
Duck Slough @ Whealan Rd [U]	535XDSAWH	37.26149	-120.34325

*Original ESJWQC sampling site
[U] Upstream sites

The Coalition is in the process of finalizing a contract with Merced County Agricultural Commissioner to conduct creek walks similar to those conducted in Stanislaus County. Work is anticipated to begin in Fall/Winter 2008. Once the results have been evaluated, the Coalition anticipates contacting individual member growers in the Duck Slough subwatershed identified as having potential discharge points into Duck Slough. Landowners with potential discharge points who are Coalition members will be contacted first to discuss options for mitigating any farm runoff. The Coalition anticipates contacting individual member growers during Spring 2009 and returning with follow-up interviews in Spring 2010. Names of non members who are identified in the creek walk with discharges will be forwarded to the Regional Water Board.

Figure II-10. Site subwatershed map of land use for the Duck Slough @ Whealan Rd upstream sample site.



Outreach

The Coalition conducts numerous types of outreach to its membership:

- General grower meetings on a county level,
- Subwatershed specific grower meetings,
- Crop specific grower meetings (may be specified by crop, chemical use or seasonal practices i.e. dormant season orchard),
- Individual contacts,
- Mailings of crop specific BMP literature.

The Coalition outreach for Duck Creek @ Hwy 99 site subwatershed will include grower meetings, individual contacts and mailing/distribution of information.

The Coalition also anticipates conducting grower meetings in the watershed to present irrigation water quality monitoring results and management practices information. There will be subwatershed specific meetings between October and December 2008 focusing on dormant spray practices and presenting Coalition data from the previous year of monitoring. Water quality exceedances of chlorpyrifos, copper, and herbicides within the Duck Slough subwatershed will be discussed and crop specific management practices will be presented.

Evaluation

The Duck Slough site subwatershed is one of three high priority subwatersheds within the ESJWQC. Therefore the Coalition is focusing its resources on identifying the sources of agricultural discharge within this subwatershed that could lead to water quality impairments, extending outreach to individual Coalition members and setting evaluation goals.
One approach for evaluating the success of management practice implementation in the subwatershed is through gathering of information on management practices used on farm properties adjacent to Duck Slough.

The Coalition requires that each member with properties adjacent to Duck Slough to fill out and return a general management practice survey. The surveys were sent to members and nonmembers in October/November 2006 and again in August/September 2007 to members that did not respond to the first round of surveys. This survey was intended as a baseline survey to understand current management practices conducted and implemented on properties adjacent to Duck Slough.

The Coalition plans to build upon the baseline survey results by conducting individual contacts with growers and fill out more detailed checklists that can be used to gain parcel-specific information in regards to agricultural discharge and management practices currently implemented on the properties adjacent to Dry Creek or where discharges are identified. In the individual grower visits the Coalition will offer resources (i.e. management practice handbooks, information to obtain NRCS-EQIP funds) to aid them in implementing additional management practices if it is determined that additional practices are needed. The Coalition will return in a year to interview the grower and determine which management practices were used.

The Coalition's strategy for the Duck Slough subwatershed is to first conduct a grower group meeting in spring 2009 and have growers fill out parcel specific checklists with the aid of Coalition representatives. The Coalition will use this information to determine if individual contacts of members who did not attend will be necessary. The Coalition will record the number of attendees at the meeting and the number of checklists filled out to evaluate the effectiveness of this grower group meeting.

III. PRAIRIE FLOWER DRAIN

Management Plan Constituents

Priority A

- Chlorpyrifos

Priority D

- Cadmium
- Nitrate
- *Ceriodaphnia dubia* water column toxicity
- *Pimephales promelas* water column toxicity
- *Hyalella azteca* sediment toxicity

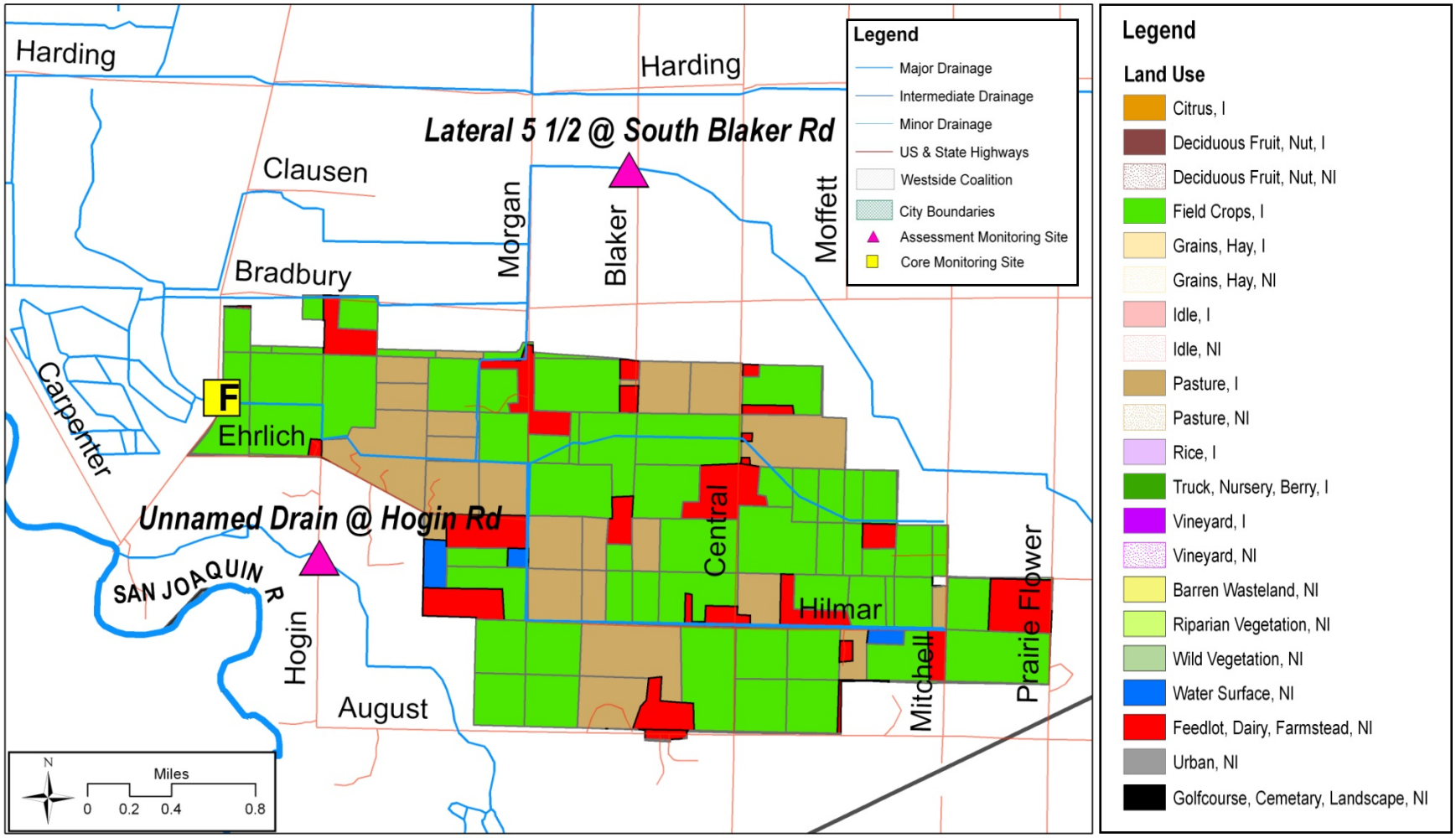
Priority E

- Dissolved Oxygen
- pH
- Specific conductivity
- Color
- Total Dissolved Solids
- *E. coli*

Description of Prairie Flower Drain @ Crows Landing Road Site Subwatershed

Prairie Flower Drain @ Crows Landing Rd (4,080 irrigated acres) is located in the eastern part of the Coalition region in Stanislaus County, just east of the San Joaquin River. Relative to other drains in the western portion of the Coalition region, Prairie Flower Drain is longer and appears to drain mostly irrigated agriculture. Dairies and feedlots are ubiquitous in this part of the Coalition region and this drain may receive runoff from several dairies immediately upstream. In addition to pasture and dairy, upstream land use consists of field crops (Figure III -1). Many of the drains in the eastern part of the Coalition region, including Prairie Flower Drain, were constructed to intercept shallow ground water and lower the water table sufficiently to allow agriculture. Consequently, agriculture in the watershed tends to be dominated by shallow rooted field crops.

Figure III-1. Site subwatershed map of land use for the Prairie Flower Drain @ Crows Landing Rd sample site (F).



Subwatershed Monitoring History

Monitoring was initiated at the Prairie Flower Drain monitoring site during the storm season of 2005 and the site has been monitored through the irrigation season of 2007 (Table III-1). Samples were collected from this site for field parameters and the analysis of water chemistry and toxicity. Specific information on the analysis conducted across each of the monitoring seasons is provided below (Table III-2).

Prairie Flower Drain is not considered impaired under the current Basin Plan, however the section of the San Joaquin River which receives water from Prairie Flower Drain, is listed as impaired for boron, chlorpyrifos, DDT, diazinon, electrical conductivity, Group A pesticides, mercury and unknown toxicity.

Prairie Flower Drain @ Crows Landing Rd will be a Core Monitoring location under the new Monitoring Reporting Program Plan (MRPP). However, the Coalition will continue to monitor for management plan constituents as outlined in this section as well as Group A pesticides.

Table III-1. Prairie Flower Drain @ Crows Landing Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	2	6
Events Not Sampled	NA	0	0	0	0	0	0
Total	NA	2	5	2	5	2	6

NA indicates that this site was not sampled during this season/year.

Table III-2. Number of analyses performed per analyte in each sampling season and year for the Prairie Flower Drain sample site. Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5	3	6
EPA 160.1	Dissolved Solids	2	5	2	5	2	6
EPA 180.1	Turbidity	2	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6
SM 9223	E. coli	2	5	2	5	2	6
NA	Dissolved Oxygen	2	5	4	6	3	13
NA	Specific Conductivity	2	5	4	6	3	13
NA	pH	2	5	4	6	3	13

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD(p,p')				5	2	6
EPA 8081A	DDE(p,p')				5	2	6
EPA 8081A	DDT(p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	6
EPA 8141A	Chlorpyrifos	2	5	2	5	2	8
EPA 8141A	Diazinon	2	5	2	5	2	6
EPA 8141A	Dimethoate				5	2	6
EPA 8141A	Disulfoton				5	2	6
EPA 8141A	Malathion				5	2	6
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	6
EPA 8141A	Molinate				5	2	6
EPA 8141A	Parathion, Methyl				5	2	6
EPA 8141A	Phorate				5	2	6
EPA 8141A	Phosmet				5	2	6
EPA 8141A	Thiobencarb				5	2	6
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5	2	6
EPA 8081A	Cyfluthrin, total		1	2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6
EPA 8081A	Permethrin, total	2	5	2	5	2	6
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	6
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	6
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	6
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	3	5	2	8
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	6	2	8
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	5	2	8
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	3

Exceedance History

During Coalition monitoring, exceedances of WQTLs for field and physical parameters, *E. coli,* nutrients, metals, pesticides, and water column and sediment toxicity have occurred at this site (Table III-3). During the irrigation season of 2007, exceedances detected at the site included arsenic (1), cadmium (3), nitrate (5), chlorpyrifos (1), color (6), total dissolved solids (6), dissolved oxygen (4), pH (1), *E. coli* (3), and specific conductance (11). Two sediment samples tested toxic to *Hyalella azteca*. Water samples tested toxic once to *Ceriodaphnia dubia* and once to *Selenastrum capricornutum*. Samples collected over the entire three years of monitoring at the Prairie Flower Drain sample site resulted in exceedances including ten of DO, five of pH, 31 of EC, 22 of TDS, 17 of *E. coli*, ten of nitrate, one of nitrite, one of ammonia, three of chlorpyrifos, one of arsenic and seven of cadmium. Toxicity has occurred twice to *Ceriodaphnia dubia,* once to *Selenastrum capricornutum* and twice to *Pimephales promelas*. Sediment toxicity to *Hyalella azteca* has occurred four times. All exceedances are listed in Table III-3 by season and date and are based on water quality trigger limits (WQTL) listed in the introduction to the ESJWQC Management Plan. The priority (A-E) level assigned to each constituent is listed in the bottom row of Table III-3 for those analytes with two or more exceedances over the last three years.

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Table III-3. All exceedances experienced in samples collected from the Prairie Flower Drain @ Crows Landing Rd Coalition monitoring site between February 2005 and September 2007.

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	*E. coli*, MPN/100 mL	Cadmium, µg/L	Ammonia as N, mg/L	Nitrate as N, mg/L	Nitrite as N, mg/L	Arsenic, µg/L	Chlorpyrifos, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Hyalella azteca*, Survival (%)	*Pimephales promelas*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Prairie Flower Drain @ Crows Landing Rd	Irrigation	11/May/2005			3168	60	1600	500										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	15/Jun/2005			1705	50	1300	300										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	13/Jul/2005	3.2		1723	50	1100	1600										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	17/Aug/2005			1779	200	990	1600						0.029				
Prairie Flower Drain @ Crows Landing Rd	Irrigation	21/Sep/2005	5.22		791	200	460	500						0.018		83.8		
Prairie Flower Drain @ Crows Landing Rd	Irrigation	18/May/2006			2958	90	1700	550	0.07									
Prairie Flower Drain @ Crows Landing Rd	Irrigation	15/Jun/2006			2660	68	1700	1300			21							
Prairie Flower Drain @ Crows Landing Rd	Irrigation	13/Jul/2006	5.45	8.85	1560	90	720	790	0.05	18							8	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	20/Jul/2006	6.41		1950												70	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	10/Aug/2006			2302	760	1800	820			17	1.1						
Prairie Flower Drain @ Crows Landing Rd	Irrigation	14/Sep/2006	6.01		1276	140	760	2400			11							
Prairie Flower Drain @ Crows Landing Rd	Irrigation	17/Apr/2007			2127	54	1700				25							
Prairie Flower Drain @ Crows Landing Rd	Irrigation	15/May/2007	5.59		2473	56	1500	920			32							1071154
Prairie Flower Drain @ Crows Landing Rd	Irrigation	23/May/2007			2390													
Prairie Flower Drain @ Crows Landing Rd	Irrigation	19/Jun/2007		8.54	2304	80	1500		0.05		41		12					
Prairie Flower Drain @ Crows Landing Rd	Irrigation	17/Jul/2007	4.3		1067	90	730				13							
Prairie Flower Drain @ Crows Landing Rd	Irrigation	14/Aug/2007			1126	44	700	260	0.08		16							
Prairie Flower Drain @ Crows Landing Rd	Irrigation	16/Aug/2007			2562											58		
Prairie Flower Drain @ Crows Landing Rd	Irrigation	28/Aug/2007	3.64		1015									0.094				
Prairie Flower Drain @ Crows Landing Rd	Irrigation	11/Sep/2007	7.86		1097	160	540	2400	0.09						0	16		
Prairie Flower Drain @ Crows Landing Rd	Irrigation	18/Sep/2007			2262													
Prairie Flower Drain @ Crows Landing Rd	Irrigation	25/Sep/2007			2489													
Prairie Flower Drain @ Crows Landing Rd	Storm	15/Feb/2005			2561	150	1600											
Prairie Flower Drain @ Crows Landing Rd	Storm	22/Mar/2005	6.5		2568	70	1600	1600										
Prairie Flower Drain @ Crows Landing Rd	Storm	01/Mar/2006			2419	150	1600	900										
Prairie Flower Drain @ Crows Landing Rd	Storm	16/Mar/2006		8.77	2728	75	1600	300							75			
Prairie Flower Drain @ Crows Landing Rd	Storm	24/Mar/2006			2782													
Prairie Flower Drain @ Crows Landing Rd	Storm	02/May/2006			2724											88.75		
Prairie Flower Drain @ Crows Landing Rd	Storm	11/Feb/2007		6.12	2659	20	1600	2400	0.07		24							
Prairie Flower Drain @ Crows Landing Rd	Storm	01/Mar/2007		8.57	2592	56	1500		0.05		42							
Prairie Flower Drain @ Crows Landing Rd	Storm	07/Mar/2007			4798													
Priorities			**E**	**E**	**E**	**E**	**E**	**E**	**D**	**NP**	**D**	**NP**	**NP**	**A**	**D**	**D**	**D**	**NP**

NP – Not prioritized. Fewer than two exceedances for this constituent at this site within three years

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2007 Management Plan Monitoring Results

- In 2007, Management Plan monitoring was implemented at the Prairie Flower Drain monitoring site for chlorpyrifos and *Pimephales* sp. toxicity. Additional monitoring occurred during the months in which exceedances of priority constituents or toxicity were detected during the previous year at this site. This additional monitoring was designed to increase the temporal coverage of monitoring during the months when exceedances had occurred in the past, in particular as they co-occurred with applications of relevant pesticides in the site subwatershed. Management Plan sampling occurred for *Pimephales* toxicity in July and for chlorpyrifos in August and September of 2007. Table III-4 provides monitoring results for chlorpyrifos and *Pimephales* toxicity from all sampling events during the 2007 irrigation season. Chlorpyrifos was detected in samples collected in July and August. The normal monitoring sample in July contained 0.009 µg/L of chlorpyrifos; no Management Plan monitoring (MPM) was conducted during this month. In August, the normal monitoring sample did not contain chlorpyrifos above the detection limit however the MPM sample (collected two weeks later) contained 0.094 µg/L of chlorpyrifos. There were no other detections of chlorpyrifos at this site in 2007. There was no *Pimephales* toxicity detected in any of the samples collected in 2007.

Table III-4. Prairie Flower Drain @ Crows Landing Rd Normal Monitoring (NM) and Management Plan Monitoring (MPM) results for chlorpyrifos and *Pimephales* toxicity from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	NM	NM	MPM	NM	MPM	NM	MPM
	4/17/07	5/15/07	6/19/07	7/17/07	7/31/07	8/14/07	8/28/07	9/11/07	9/25/07
Chlorpyrifos (µg/L)	<0.00259	<0.00259	<0.00259	0.009	NA	<0.003	**0.094**	<0.003	<0.003
Pimephales toxicity (% survival)	97.5	100	100	97.5	100	100	NA	100	NA

NA- Not applicable; no MPM was conducted for this constituent on this date.

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed (Table III-5) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table III-5. Chlorpyrifos loads calculated from concentration and discharge measured on each sample date for the Prairie Flower Drain @ Crows Landing Rd monitoring site (includes all detections).

Sample Date	Discharge	Concentration µg/L	Loading Rate µg/sec
17/Aug/2005	No flow	0.029	0
21/Sep/2005	No flow	0.018	0
13/Jul/2006	No flow	0.014	0
17/Jul/2007	2.32	0.009	0.59
28/Aug/2007	NR	0.094	NR

NR - Not Recorded: miscommunication occurred and field samplers did not take discharge.

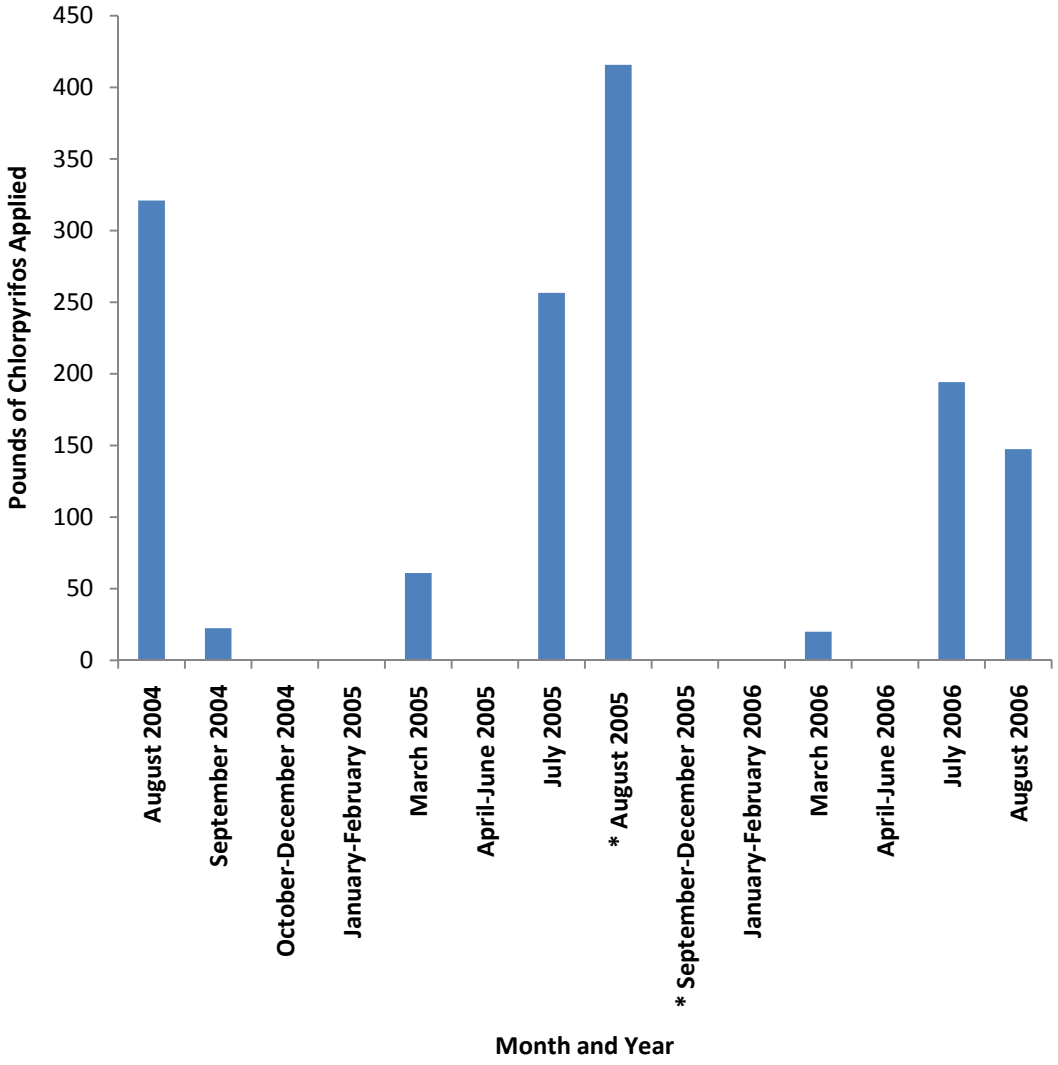
Source Identification

Priority A Constituents

Chlorpyrifos

Chlorpyrifos is the only priority A constituent to be managed within the Prairie Flower Drain @ Crows Landing Rd site subwatershed. The WQTL for chlorpyrifos (0.015 µg/L) has been exceeded at this site during the months of March (2005, 2006), July (2005, 2006), August (2004, 2005 and 2006) and September (2004) (Table III-3). To identify potential sources of chlorpyrifos, the Coalition uses Pesticide Use Reports (PURs) to examine the amount and timing of pesticide applications and the types of crops to which the active ingredients are applied relative to exceedance dates. Township, range and section (TRS) in which chlorpyrifos was applied within one month of the exceedance date are identified. In the years 2004-2006, July and August appear to be the peak application months with a total of 672 pounds of product applied in these two months in 2005, and 341 pounds applied in these two months in 2006, which for both years accounts for over 90% of the total pounds applied in the entire year (Figure III-2). There was no reported use of chlorpyrifos in 2007. It should be noted that chlorpyrifos use decreased significantly from 2005 to 2006 with less than half the number of applications and pounds applied in 2006 as compared to 2005 (Tables III-6, III-7). One chlorpyrifos exceedance occurred in a sample collected on August 28, 2007. There was no reported use of chlorpyrifos in 2007, and the source of this exceedance is unknown.

Figure III-2. Pounds of chlorpyrifos added to TRS within the Prairie Flower Drain site subwatershed by month for 2004-2006. Asterisk (*) denotes months with exceedances. No use of chlorpyrifos was reported for 2007.



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Table III-6. Number of applications, total pounds applied and total acres treated by month for August 2004 through August 2006 in the Prairie Flower Drain @ Crows Landing Road site subwatershed. If a month is not included in the table, no applications were made.

Months/Year*	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
August 2004	5	321.00	321
September 2004	1	22.45	30
March 2005	1	61.01	120
July 2005	5	256.58	312
August 2005	8	415.73	485
March 2006	1	19.94	40
July 2006	4	194.20	191
August 2006	3	147.40	207
Summaries by Year			
2004 Total	6	343.45	351
2005 Total	14	733.32	917
2006 Total	8	361.54	438
TOTAL	28	1438.30	1706

*No applications of chlorpyrifos reported for 2007.

Table III-7. Average pound active ingredient (AI) per acre for chlorpyrifos based on PUR data from 2004-2006 within the Prairie Flower Drain @ Crows Landing Rd subwatershed.

Chemical Name	Commodity	Product Name	Average Lbs AI/Acre
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	0.5
		LORSBAN 4E-HF	0.49
		NUFOS 4E	0.51
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	0.94
		LORSBAN 4E	1.04
		LORSBAN 4E-HF	0.75
		NUFOS 4E	1.02
Average pounds applied chlorpyrifos per acre (2004-2006)			**0.75**

The Coalition uses a combination of monitoring data and evaluation of PUR data to identify possible sources. The Coalition developed hypotheses to guide the search for sources within the watershed. If the amount of chlorpyrifos (either concentration or load) detected in the sample water was positively associated with amount of chlorpyrifos, then the exceedance would most likely be a result of accumulated runoff from numerous parcels. Alternatively, if there was no relationship between the amount applied across the watershed and the amount found in the water, the exceedance would be a result of one or a few parcels with poorly managed discharge. The outreach strategy of the Coalition varies depending on which hypothesis is correct. The hypotheses are not mutually exclusive as some parcels could always

contribute to exceedances, although the magnitude of the exceedance would be determined by the amount of product applied.

There were only two exceedances in 2005 (Table III-8) where PUR data were available making the regression approach unavailable. The two exceedances differed in the application rates and concentration of chlorpyrifos in the water. The lowest application rate was associated with the highest concentration although there was only one application associated with the lowest concentration and six applications associated with the highest concentration (Table III-8). In this watershed, it appears that the larger the number of applications, the greater the chance of experiencing an exceedance although with a sample size of two, this relationship is tenuous at best.

Table III-8. Prairie Flower Drain @ Crows Landing Rd. TRS' with chlorpyrifos applications in the month prior to each exceedance date. Includes pounds applied and acres treated.

TRS[1]	Exceedance Date								
	8/17/2005			9/21/2005			8/28/2007[2]		
	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated	Application Date	Pounds Applied	Acres Treated
6S9E10	7/22/05	60.09	120						
6S9E4	8/4/05	17.53	35						
6S9E12	8/5/05 8/5/05 8/5/05	35.59 40.67 40	35 40 78						
6S9E9	8/9/05	57.58	115						
6S9E11				8/29/05	73.21	72			

[1] Bolded TRS are members of the Coalition.
[2] There were no reported applications of chlorpyrifos in the site subwatershed within one year prior to the exceedance date.

To determine if there were specific parcels associated with exceedances on a continuing basis, the Coalition examined the sections (TRS) associated with each exceedance (Table III-9). There were six sections associated with exceedances, each section had between one and three applications in the month prior to sampling. A single section was not associated with more than one exceedance. Applications were made to both corn and alfalfa for the August 2005 exceedance and a single application was made to corn prior to the September 2005 exceedance. Both aerial and ground applications were made prior to the August exceedance and the corn application was made by ground prior to the September exceedance.

Table III-9. Prairie Flower Drain @ Crows Landing Rd. All TRS' that had more than one application associated with an exceedance of chlorpyrifos in 2005 and 2007. Table summarizes the number of applications associated with an exceedance for a given date and TRS. Bolded TRS' are members of the Coalition.

TRS[1]	Chlorpyrifos Applications per Date of Exceedance		
	8/17/2005	9/21/2005	8/28/2007[2]
6S9E10	1		
6S9E11		1	
6S9E12	3		
6S9E4	1		
6S9E9	1		

[1] Bolded TRS are members of the Coalition
[2] No chlorpyrifos was reported for 2007.

Of the five sections associated with exceedances, none of the land in 6E9S9 and 6E9S12 are owned by Coalition members and in sections 6E9S10 and 6E9S11 Coalition members own only a small portion of the acreage (Figures III-3, III-4). Coalition members own a majority of the land in 6E9S4, the remaining section associated with exceedances. This pattern of ownership suggests that it will be difficult to improve water quality in this site subwatershed. It is unknown if the lack of Coalition membership is associated with enrollment in the dairy program. It is difficult to receive cooperation from nonmembers as well as track implementation of management practices on nonmember land, if any are implemented.

Figure III-3. Prairie Flower Drain @ Crows Landing Rd. TRS' that have had applications co-occurring with a chlorpyrifos exceedance.

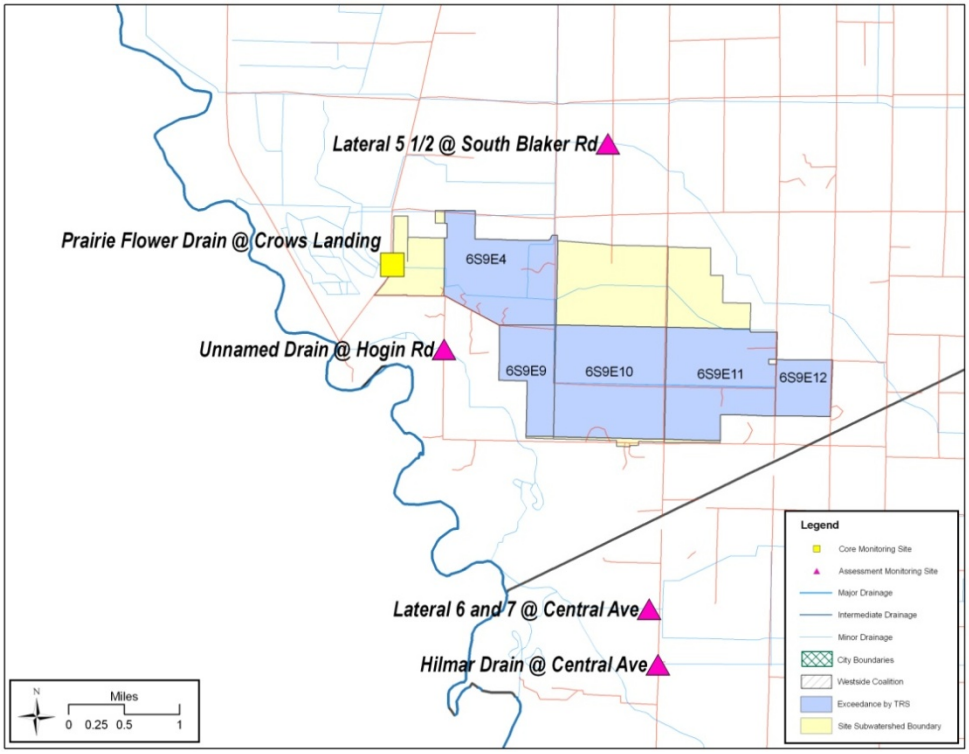
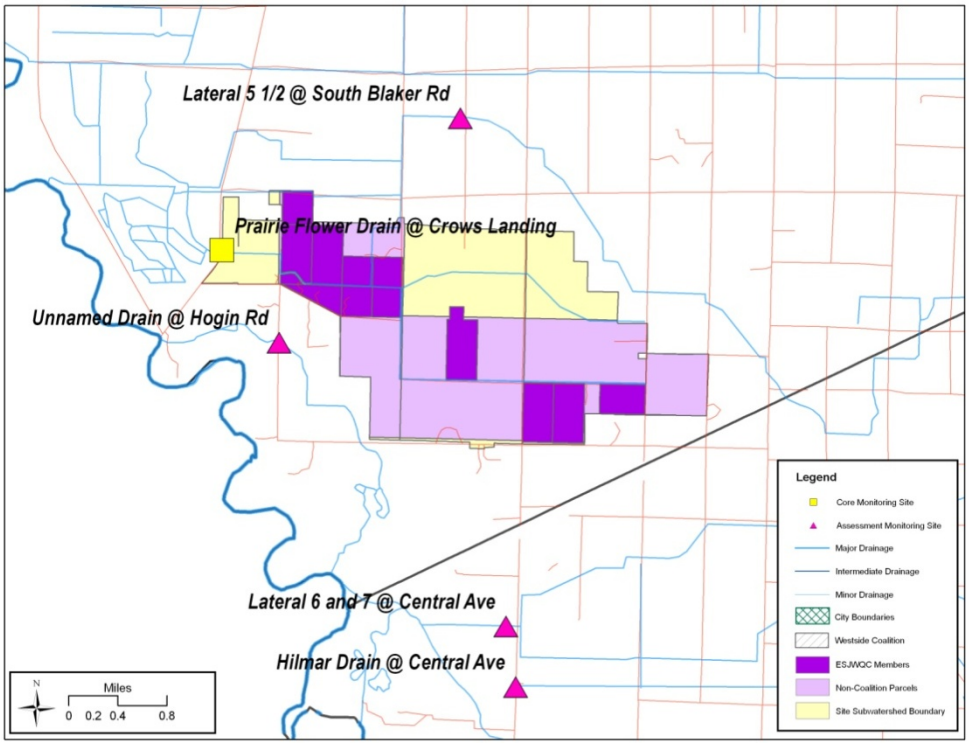


Figure III-4. Prairie Flower Drain @ Crows Landing Rd. Member APNs relative to TRS' with applications co-occurring with chlorpyrifos exceedances.



Analysis of the management practices surveys for this watershed indicates that a small number of growers claim there is no discharge from their property. The growers of approximately 4% of the parcels, for which surveys were filled out, claim no runoff; which applies to approximately 6% of acreage within the Prairie Flower Drain subwatershed. The growers of approximately 41% of parcels (approximately 52% of member acreage), for which surveys were filled out, discharge directly to a waterway (local drainage system or directly to the waterway). Approximately 27% of parcels (approximately 20% of member acreage) use recirculation (tail water return system), approximately 8% of parcels (approximately 4% of member acreage) utilize sediment settling ditches and approximately 19% of parcels (approximately 17% of member acreage) utilize holding basins to reduce runoff. A small number of growers use grass waterways or vegetated filter strips (approximately 11% of parcels, approximately 6% of member acreage). However, when asked whether vegetation is allowed to grow in and along a field, approximately 33% of the parcels said yes (approximately 46% of member acreage) and approximately 50% said some growth in winter (approximately 50% of member acreage). When asked why management practices are not applied, four members said that it was due to cost of implementation, four members said that they did not believe that it was applicable for their property, one member said that they do not feel that the science is valid or proven to give a definite solution and one member said that they didn't believe that anything they did would satisfy the environmentalists. Due to the high risk of ground water intrusion which contains high levels of salts, the management practices that could be recommended include a reduction in application rates and the use of vegetated filter strips. The Coalition has linked survey results

to parcels within this site subwatershed and will use this information to identify where within the watershed management practices could be improved.

Priority D Constituents

Prairie Flower Drain is listed for the following priority D constituents: cadmium, nitrate, water column toxicity to *Pimephales promelas* and *Ceriodaphnia dubia* and sediment toxicity to *Hyalella azteca*.

Cadmium

Cadmium sources have been described in the Management Plan introduction. All exceedances of the WQTL for cadmium were between 0.05 and 0.09 µg/L. Exceedances occurred in May and July of 2006, February, March, June, August, and September of 2007 (sampling for cadmium did not occur until the irrigation season of 2006). The Coalition has insufficient information to determine if agriculture (as a by-product of the applications biosolids) is a contributing source to cadmium exceedances. The Coalition will provide information about nutrient/manure management to growers in an attempt to reduce cadmium inputs to surface waters. However, at this time, the Coalition will not focus on cadmium as a high priority constituent and management plan monitoring will not be conducted for this constituent.

Nitrate

There have been 10 exceedances of the nitrate WQTL in the Prairie Flower Drain site subwatershed since monitoring occurred for nutrients in May 2006. Sources of nitrate are discussed in the introduction of the ESJWQC Management Plan and include fertilizer applications and dairy manure waste. Prairie Flower Drain subwatershed contains approximately 443 acres of confined animal operations most of which are dairies. Based on surveys filled out by growers in this subwatershed, both members and nonmembers applied dairy waste to corn, oats, alfalfa, almonds, Sudan grass and sorghum (a total of 1,413 member acres). The Coalition does not have the capabilities to track fertilizer applications and therefore cannot determine the exact source of the nitrate exceedances although it is likely that dairy manure is a contributing source. The exceedances have occurred most of the months of the year including February, March, May, June, July, August, and September. Out of the 13 detections of nitrate, eight of those were in water that also had detections of ammonia (one of which was an exceedance). This association indicates that animal manure is a likely source of the nitrate water quality exceedances.

Pimephales promelas toxicity

Management Plan Monitoring was conducted for *Pimephales* toxicity during July, 2007 however there was no toxicity in any samples collected during 2007. The two toxic samples to *Pimephales* were collected during July 2006. The first sample (July 13, 2006) was toxic with 8% survival. The second sample (July 20, 2006) was collected seven days after the first as a resample to evaluate toxicity persistence and resulted in 70% survival. The PUR data associated with these exceedances was included in the December 30, 2006 SAMR. During the same monitoring event, water collected for chemistry analysis contained 18 mg/L of ammonia. The

toxicity to *Pimephales* has been attributed to this high level of ammonia that most likely originated from an upstream animal confinement facility. There has been no toxicity to *Pimephales* in samples collected from this site for the past two years. The Coalition will continue to conduct monitoring for *Pimephales* toxicity at this location during normal monitoring events but no additional management plan monitoring will occur. Ammonia will also be analyzed in samples collected during normal monitoring events.

Ceriodaphnia dubia toxicity

There have been two samples that have resulted in toxicity to *Ceriodaphnia.* The first toxic sample to *Ceriodaphnia* was collected during the storm season in March 2006 resulting in 75% survival. According to PURs, the only applications that occurred three months prior to the exceedance were for trifluralin (an herbicide) on February 16, 2006. The second toxic sample was collected in the irrigation season of 2007 (September 11, 2007). Resamples collected for both events were not toxic. The September 11, 2007 sample was collected two weeks after a chlorpyrifos exceedance occurred at the same location; no pesticides were detected in samples collected at the same time. Toxicity Identification Evaluation (TIE) results suggest that the toxicity was due to an organophosphate however the only organophosphate applied within the three months prior to sampling was dimethoate; it is unknown at what level dimethoate is toxic to *Ceriodaphnia*. It is most likely a combination of factors that lead to toxicity during both sampling events. The Coalition will sample at an upstream location in 2008 for *Ceriodaphnia* toxicity as well as for chlorpyrifos.

Hyalella azteca sediment toxicity

Hyalella sediment toxicity has occurred in four samples; September 21, 2005 (83.8% survival), May 2, 2006 (88.75% survival), August 14, 2007 (58% survival) and September 11, 2007 (16% survival). The Coalition will not conduct management plan sampling for sediment toxicities due to the dynamics of sediment fate and transport from upstream to downstream. For example, sediment tends to be mobilized and moved downstream only when flows are sufficient to create shear stress. These flows generally occur periodically in Coalition waterbodies. Consequently, sampling more than twice (once during irrigation flows and once during storm flows) in a year is unlikely to provide additional information about sediment quality and sources. Associated PUR data has been provided in previous SAMRs and all TRS within this site subwatershed have had one or more applications of chemicals that could potentially lead to *Hyalella* toxicity. Under the new MRPP (submitted on August 25, 2008) the Coalition will begin to test for total organic carbon and grain size in all sediments and pyrethroids and chlorpyrifos in sediment that exhibits toxicity.

Priority E Constituents

The following priority E constituents are listed under the Prairie Flower Drain management plan: dissolved oxygen, pH, specific conductance, color, dissolved solids and *E. coli*.

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, April and July 2007 monitoring events. Two of the five samples collected at Prairie Flower Drain @ Crows Landing Rd contained measurable amounts of BOD (Table III-10).

Table III-10. Prairie Flower Drain @ Crows Landing Rd. BOD, pH and dissolved oxygen results for September 2006-February 2007 sampling events.

Station Name	Sample Date	pH	Oxygen, Dissolved, mg/L	BOD, mg/L
Prairie Flower Drain @ Crows Landing Rd	14/Sep/2006	7.39	6.01	13
Prairie Flower Drain @ Crows Landing Rd	11/Feb/2007	6.12	14.12	8
Prairie Flower Drain @ Crows Landing Rd	01/Mar/2007	8.57	25.2	ND
Prairie Flower Drain @ Crows Landing Rd	17/Apr/2007	7.62	11.34	ND
Prairie Flower Drain @ Crows Landing Rd	17/Jul/2007	7.99	4.3	ND

ND – Not detected

E. coli

The Coalition performed a pilot study to understand the sources of *E. coli* in the site subwatershed. Molecular markers were used to distinguish human, bovine, and avian sources. Upstream sampling was conducted and the results indicated that there was no relationship between the amount of coliform bacteria in the system and the presence of human or bovine bacteria. Human, bovine, and avian molecular markers were found in the watershed indicating active inputs from all three species (Tables III-11, III-12). Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table III-11. Results of Bacteroides analysis. The baseline site, Prairie Flower Drain @ Crows Landing Rd, was sampled three times daily for three consecutive days, and its upstream site, Prairie Flower Drain @ Morgan Rd, was sampled only once.

Station Name	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
Prairie Flower Drain @ Crows Landing Rd	8/22/06	7:00	Grab	25	0.1	0
Prairie Flower Drain @ Crows Landing Rd	8/22/06	12:40	Grab	25	0.02	0
Prairie Flower Drain @ Crows Landing Rd	8/22/06	17:20	Grab	25	0.78	0
Prairie Flower Drain @ Crows Landing Rd	8/23/06	6:00	Grab	25	0.2	0
Prairie Flower Drain @ Crows Landing Rd	8/23/06	10:40	Grab	25	0.2	0
Prairie Flower Drain @ Crows Landing Rd	8/23/06	15:20	Grab	25	0.39	0
Prairie Flower Drain @ Crows Landing Rd	8/24/06	6:00	Grab	25	1.56	0
Prairie Flower Drain @ Crows Landing Rd	8/24/06	10:50	Grab	12.5	1.56	0
Prairie Flower Drain @ Crows Landing Rd	8/24/06	15:50	Grab	50	1.56	0
Prairie Flower Drain @ Morgan Rd	8/29/06	10:20	Grab	25	0.05	0.05

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Table III-12. Values of *E. coli*, fecal coliform, and total coliform in MPN/100mL., and the average thermal cycle (C_T) value for all bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station code	Sample Date	Sample Time	Sample Type	*E. coli*	Fecal Coliform	Total Coliform	Avg All bac	Avg Human	Avg Bovine	Avg Chicken
535XPFDMR	8/29/06	10:20	Grab	7000	17000	92000	20.55	24.195	33.08	33.46
535XPFDCL	8/22/06	7:00	Grab		2400	35000	24.8	27.44	35.49	35.465
535XPFDCL	8/23/06	6:00	Grab		9200	54000	24.645	26.52	36.3	23.9
535XPFDCL	8/24/06	6:00	Grab		11000	92000	21.55	24.145	28.66	22.65

Specific Conductance and Total Dissolved Solids

Specific conductivity (EC) and Total Dissolved Solids (TDS) are measures of salt and are often found as exceedances together. EC and TDS exceedances are common in site subwatersheds on the western edge of the Coalition region where shallow salty ground water commonly intrudes into surface waters. Many of the drains in the region were originally constructed to drain shallow salty surface water allowing agriculture. Consequently, it is not known if the water in the drain is discharged from agriculture or if shallow ground water intruding into the drain is responsible for the elevated EC and TDS. The Coalition recognizes that EC and TDS exceedances need to be to be managed on a regional basis and will work with the Regional Board to develop a management plan when EC/TDS become a priority.

pH

Understanding pH dynamics in the system is as difficult as understanding DO dynamics. The Coalition used monitoring data to conduct a simple analysis in an attempt to associate pH with manageable constituents. A multiple regression was performed using DO and TOC as the predictor variables and pH as the response variable. The regression model was not significant ($F = 0.435$, $p = 0.065$, $df = 2, 22$) indicating that pH is not a function of either dissolved oxygen or organic carbon. These results suggest that photosynthetic activity is not a driving factor in pH and DO dynamics and it is not known what determines pH variation in Duck Creek. As with DO, the Coalition will not actively manage for pH at this time. If future studies are conducted that allow the Coalition to understand pH dynamics, the Coalition will re-evaluate management options.

Color

Color is a non-conserved indicator of biological and physical inputs to the system and it is not possible to manage unless the determinants are known. The Coalition will not attempt to manage color.

Upstream Monitoring

In 2007 the Coalition conducted additional sampling for chlorpyrifos which resulted in an exceedance. Therefore, the Coalition will conduct upstream monitoring in this subwatershed at Prairie Flower Drain @ Morgan Rd (37.43788, -120.9760) for nitrate, chlorpyrifos and water column toxicity (*Ceriodaphnia* sp. and *Pimephales* sp.) during the irrigation season of 2008 (Tables III-13, III-14) (Figure III-5). Upstream monitoring results will be used to narrow down possible sources of these exceedances including animal confinement operations and specific TRS' (Figure III-6).

Table III-13. Prairie Flower Drain @ Morgan Rd. 2008 Management Plan sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Nitrate	*Ceriodaphnia dubia*	*Pimephales promelas*
Prairie Flower @ Morgan Rd	April	U		x		
Prairie Flower @ Morgan Rd	May	U		x		
Prairie Flower @ Morgan Rd	June	U		x		
Prairie Flower @ Morgan Rd	July	U		x		x
Prairie Flower @ Morgan Rd	August	U	x	x		
Prairie Flower @ Morgan Rd	September	U	x	x	x	

Table III-14. Sampling locations within the Prairie Flower Drain site subwatershed.

Station Name	Station Code	Target Latitude	Target Longitude
Prairie Flower Drain @ Crows Landing Road*	535XPFDCL	37.4422	-121.00236
Prairie Flower Drain @ Morgan Rd[U]	535XPFDMR	37.437875	-120.97566

* Original ESJWQC sampling site
[U] Upstream sites

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Figure III-5. Site subwatershed map of land use for the Prairie Flower Drain @ Morgan Rd upstream sample site (F = Prairie Flower Drain @ Crows Landing Rd).

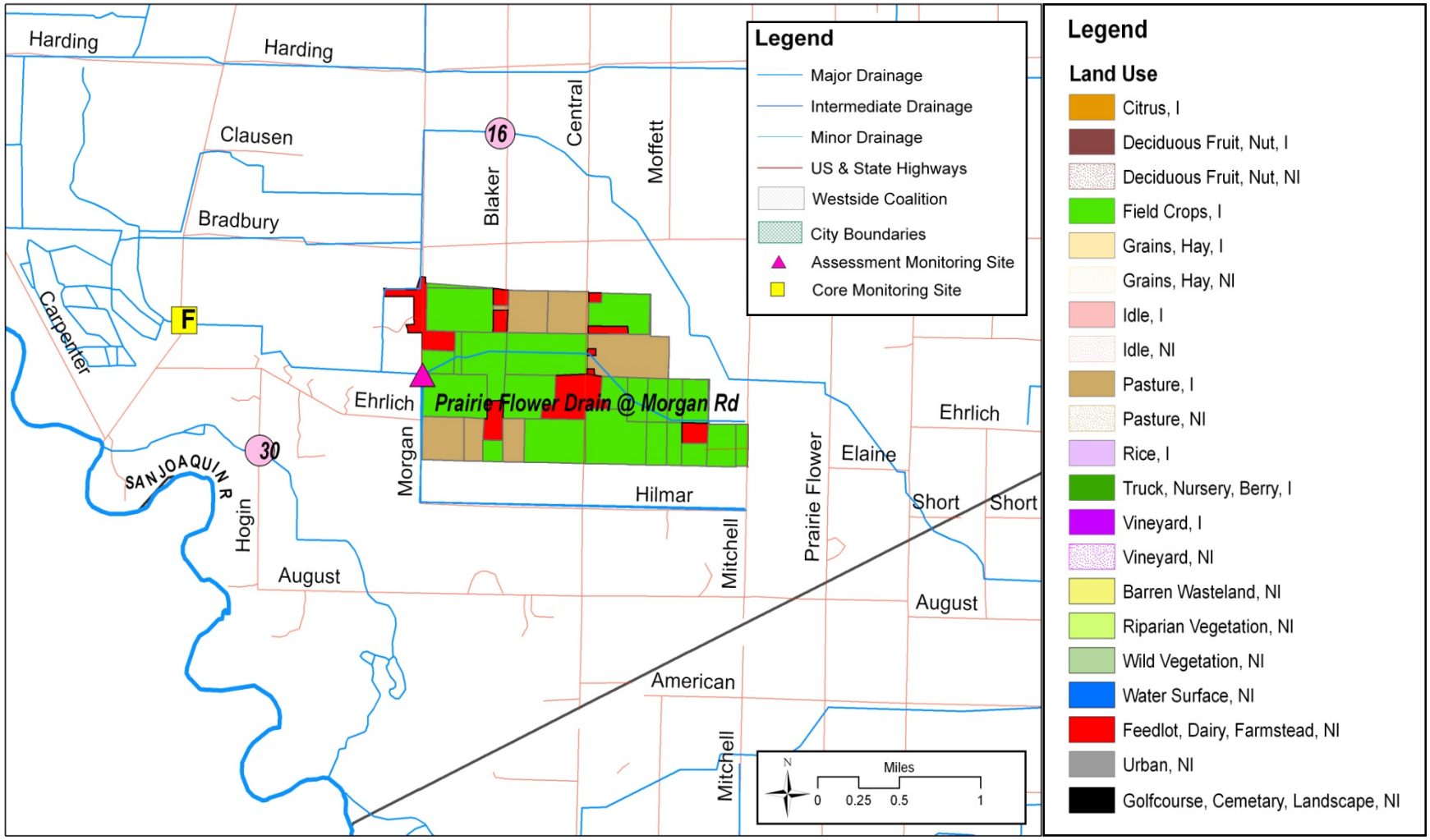
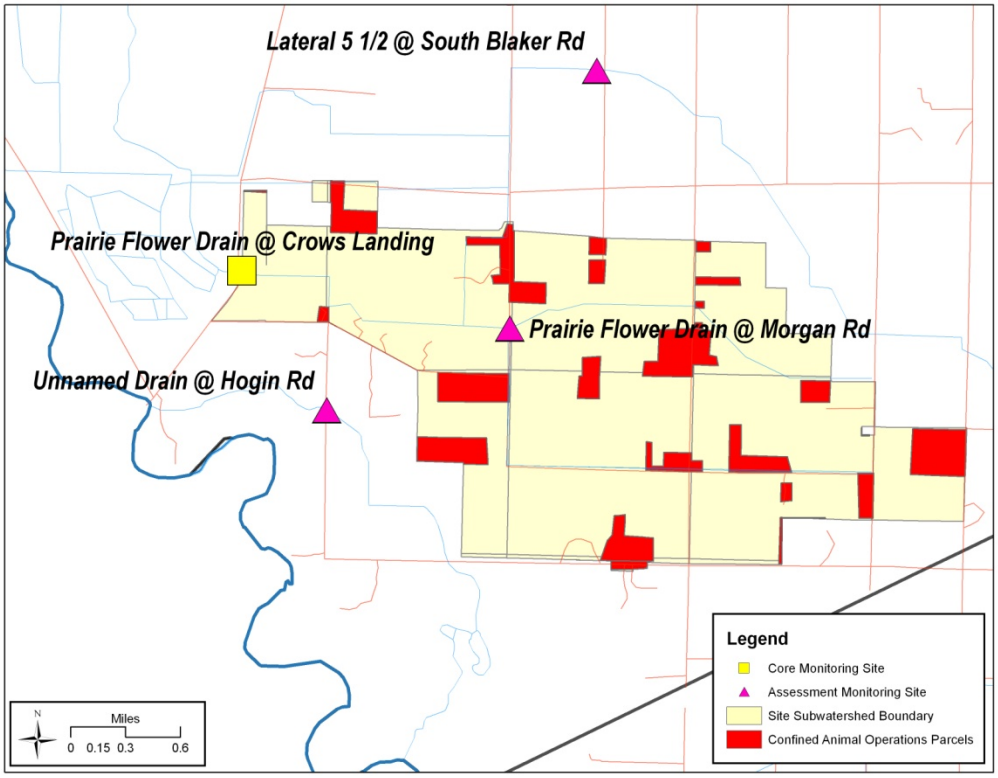


Figure III-6. Prairie Flower Drain site subwatershed including the upstream sampling location, TRS, and confined animal operation parcels.



To gain additional information in regards to potential discharge sources into the Prairie Flower Drain subwatershed, the local Agricultural Commissioner's staff walked the waterway in December 2007 and documented all visual drains using GPS and digital photos. The Coalition notified persons owning the parcels where the drains were found and conducted a meeting jointly with the Stanislaus County Agriculture Commissioner in June 2008. The Coalition has mapped the drains and is using this information to further assess possible sources of water quality impairments.

Outreach

The Coalition conducts numerous types of outreach to its membership:

- General grower meetings on a county level,
- Subwatershed specific grower meetings,
- Crop specific grower meetings (may be specified by crop, chemical use or seasonal practices i.e. dormant season orchard),
- Individual contacts,
- Mailings of crop specific BMP literature.

All Coalition outreach activities performed during 2007 are summarized in the Summary of Coalition Outreach Activities of the Management Plan. General grower meetings were held for Coalition members in the Prairie Flower Drain subwatershed in April and December, 2007 and

in June 2008. The Coalition anticipates conducting grower meetings in the various Coalition counties prior to the irrigation season to address irrigation water quality concerns and management practices and again between November and December focusing on dormant spray practices and presenting Coalition data from the previous year of monitoring.

Growers identified as having potential direct discharges into the Prairie Flower Drain were notified in May, 2008, about the creek walk findings and invited to attend a grower meeting in June. Creek walk data was presented to growers on June 18, 2008 at the Stanislaus Farm Bureau by the Agricultural Commissioner. At this meeting the Coalition discussed with growers alternatives to draining into the creek and practices to reduce discharges.

Since this area is a small subwatershed the Coalition will hold a site subwatershed group meeting in early spring of 2009. The meeting will focus on sources of chlorpyrifos and nitrate water quality impairments. Details are still being developed however the Coalition plans to invite representatives of the Regional Board Dairy Program to attend.

Evaluation

The Prairie Flower Drain site subwatershed is one of three high priority subwatersheds within the ESJWQC. Therefore the Coalition is focusing its resources on identifying the sources of agricultural discharge within this subwatershed that could lead to water quality impairments, extending outreach to individual Coalition members and setting evaluation goals.

Evaluating the success of BMP implementation in the subwatershed will be through gathering of information on management practices used on farm properties adjacent to Prairie Flower Drain.

The Coalition requires that each member with properties adjacent to Prairie Flower Drain fill out and return a general management practice survey. The surveys were sent to members and nonmembers in October/November 2006 and again in August/September 2007 to members that did not respond to the first round of surveys. This survey was intended as a baseline survey to understand current management practices conducted and implemented within properties adjacent to Prairie Flower Drain.

The Coalition plans to build upon the baseline survey results by making individual contacts with growers and filling out detailed checklists that can be used to gain information about individual parcels and the management practices currently being implemented. The Coalition will offer resources (i.e. management practice handbooks, information to obtain NRCS-EQIP funds) to the grower to aid them in implementing additional management practices. The Coalition will return in a year to interview the grower again and determine if any additional management practices were used.

The Coalition's strategy for the Prairie Flower Drain subwatershed is to first conduct a grower group meeting in spring and have growers fill out parcel specific checklists with the aid of Coalition representatives. The Coalition will use this information to determine if individual

contacts of those who did attend will be necessary in 2009. . The Coalition will record the number of attendees at the meeting and the number of checklists filled out to evaluate the effectiveness of this grower group meeting.

Exceedances in the low priority site subwatersheds receive a reduced level of analysis, outreach, and evaluation compared to the high priority site subwatersheds. Because the reduced level of analysis precludes identifying specific applications or parcels for focused outreach, the outreach is broadly targeted to a wider audience. Evaluation of management practice effectiveness will be less rigorous in low priority site subwatersheds. The Coalition outreach and evaluation strategies are the same for all lower priority site subwatersheds and are summarized below.

General Outreach

The Coalition conducts numerous types of outreach to its membership in low priority site subwatersheds:

- General grower meetings on a county level,
- Subwatershed specific grower meetings,
- Crop specific grower meetings (may be specified by crop, chemical use or seasonal practices i.e. dormant season orchard),
- Mailings of crop specific BMP literature.

The focus of outreach activities is on categories of constituents that share the same mode of transport. For exceedances of constituents with high K_{oc} values, such as pyrethroid pesticides and copper which bind readily to sediment, growers will be provided with information on management practices that prevent the movement of sediment to surface waters. For exceedances of low K_{oc} constituents, growers will be provided with information on management practices that prevent the movement of storm water or irrigation tail water to surface waters. Manure and nutrient management will continue to be outreach topics at grower meetings.

General grower meetings were held for Stanislaus County most recently in May 2008 and June 2008. The Coalition anticipates conducting grower meetings in the various Coalition counties between October 2008 and January 2009 focusing on dormant spray practices and presenting Coalition data from the previous year of monitoring. Additional meetings will be scheduled prior to the irrigation season 2009 to address irrigation water quality concerns and management practices.

During October 2008 the Coalition will mail out Best Management Practice (BMP) Handbooks developed by the Center for Urban/Rural Environmental Stewardship (CURES) to all members. The handbooks were originally designed for the Westside Coalition and contain information on farming practices such as sediment basins, polyacrylamide (PAM), enzyme treatments, tail water return systems, vegetative ditches, irrigation scheduling and others. These documents are summaries of technical reports developed by the California Water Institute, Ducks Unlimited, California Department of Pesticide Regulation and others (see Attachment I).

General Evaluation

Evaluation of management practice effectiveness relies primarily on self reporting by members attending meetings and comparisons to the baseline surveys completed over the last two years. The last general survey mailing occurred during membership renewal. To remain a member in good standing growers were required to complete and return the general survey. This survey was intended to collect baseline information from growers to understand current management practices conducted and implemented within the subwatershed area. During the grower meetings the Coalition will offer resources (i.e. management practice handbooks, information to obtain NRCS-EQIP funds) to aid them in implementing additional management practices if it is determined that additional practices are needed. The Coalition will work with individual growers from low priority site subwatersheds if they request information or individual consultation.

The Coalition anticipates conducting creek walks in selected site subwatersheds over the next several months. Using information gathered from creek walks upstream of the sampling sites, the Coalition will identify potential discharge points into Coalition surface waters. Landowners with potential discharge points who are Coalition members will be contacted to attend meetings discussing alternatives to direct discharge to surface waters. Names of nonmembers who are identified in the creek walk with discharges will be forwarded to the Regional Water Board.

In addition the Coalition will conduct a grower subwatershed group meeting in the winter of 2008/2009 to address dormant sprays and applications of herbicides. Additional meetings will be held during the spring prior to the irrigation season. At both meetings, the Coalition will ask growers to fill out parcel specific checklists with the aid of Coalition representatives. The Coalition will record the number of attendees at the meeting and the number of checklists filled out to evaluate the effectiveness of this grower group meeting.

The Coalition will continue to conduct its annual member meetings by county, the next scheduled in December 2008, to inform all growers of current water quality impairments and Coalition activities. The Coalition will record the number of attendees at the meeting to evaluate the effectiveness of these outreach meetings.

IV. ASH SLOUGH

Management Plan Constituents

Priority B

- Chlorpyrifos

Priority C

- Copper

Priority E

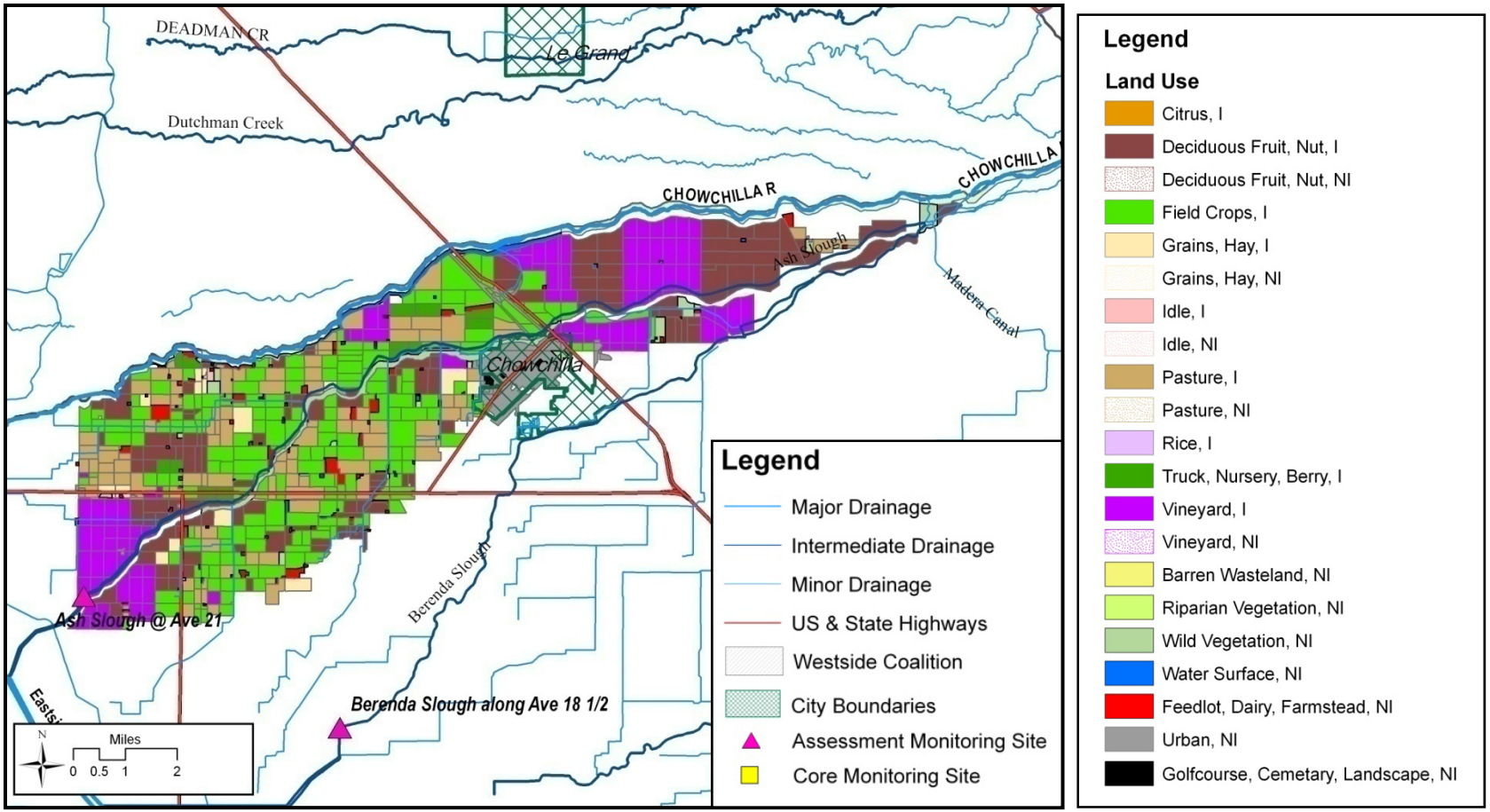
- Color
- *E. coli*
- Lead

Description of Ash Slough @ Avenue 21 Site Subwatershed

Ash Slough @ Avenue 21 (27,704 irrigated acres) appears to originate from the H. V. Eastman Reservoir in the foothills east of Chowchilla. Agriculture in the upstream reaches includes vineyards, field crops, and deciduous orchards (Figure IV-1). Ash Slough flows just north of Chowchilla but there appears to be a buffer of agricultural land between Ash Slough and Chowchilla. Dairies are located upstream.

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Figure IV-1. Site subwatershed map of land use for the Ash Slough @ Ave 21 sample site.



Subwatershed Monitoring History

Ambient water monitoring at Ash Slough was initiated in the irrigation season of 2005. Water from Ash Slough has experienced exceedances in *E. coli,* metals, chlorpyrifos, and toxicity in the water column to *Selenastrum capricornutum.* Included in this section is a summary and discussion of these exceedances (Table IV-1). Ash Slough is not considered impaired and is not on the current Central Valley Basin Plan 303d list.

Table IV-1. Ash Slough @ Avenue 21 sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	3	2	5	0	0
Events Not Sampled	NA	NA	0	0	0	2	6
Total	NA	NA	3	2	5	2	6

No samples were collected during the 2007 storm and irrigation seasons due to Ash Slough being consistently dry (Table IV-1, IV-2).

Table IV-2. Number of analyses performed per analyte in each sampling season and year for the Ash Slough sample site. One environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters						
EPA 110.2	Color	3	2	5		
EPA 160.1	Dissolved Solids	3	2	5		
EPA 180.1	Turbidity	3	2	5		
EPA 405.1	BOD			1		
EPA 415.1	Total Organic Carbon	3	2	5		
SM 9223	E. coli	3	2	5		
NA	Dissolved Oxygen	3	3	5		
NA	Specific Conductivity	3	3	5		
NA	pH	3	3	5		
Carbamates						
EPA 8321A	Aldicarb			5		
EPA 8321A	Carbaryl			5		
EPA 8321A	Carbofuran			5		
EPA 8321A	Diuron			5		
EPA 8321A	Linuron			5		
EPA 8321A	Methiocarb			5		
EPA 8321A	Methomyl			5		
EPA 8321A	Oxamyl			5		
Organochlorines						
EPA 8081A	DDD(p,p')			5		

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Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	DDE(p,p')			5		
EPA 8081A	DDT(p,p')			5		
EPA 8081A	Dicofol			5		
EPA 8081A	Dieldrin			5		
EPA 8081A	Endrin			5		
EPA 8081A	Methoxychlor			5		
Organophosphates						
EPA 8141A	Azinphos methyl			5		
EPA 8141A	Chlorpyrifos	3	2	5		
EPA 8141A	Diazinon	3	2	5		
EPA 8141A	Dimethoate			5		
EPA 8141A	Disulfoton			5		
EPA 8141A	Malathion			5		
EPA 8141A	Methamidophos			5		
EPA 8141A	Methidathion			5		
EPA 8141A	Molinate			5		
EPA 8141A	Parathion, Methyl			5		
EPA 8141A	Phorate			5		
EPA 8141A	Phosmet			5		
EPA 8141A	Thiobencarb			5		
Pyrethroids						
EPA 8081A	Bifenthrin		2	5		
EPA 8081A	Cyfluthrin, total		2	5		
EPA 8081A	Cyhalothrin, lambda, total	3	2	5		
EPA 8081A	Cypermethrin, total	3	2	5		
EPA 8081A	Esfenvalerate/ Fenvalerate, total	3	2	5		
EPA 8081A	Permethrin, total	3	2	5		
Triazines						
EPA 547M	Glyphosate			5		
EPA 549.2M	Paraquat dichloride			5		
EPA 619	Atrazine			5		
EPA 619	Cyanazine			5		
EPA 619	Simazine			5		
Metals						
EPA 200.8	Arsenic			5		
EPA 200.8	Boron			5		
EPA 200.8	Cadmium			5		
EPA 200.8	Copper			5		
EPA 200.8	Lead			5		
EPA 200.8	Nickel			5		
EPA 200.8	Selenium			5		
EPA 200.8	Zinc			5		
Nutrients						
EPA 130.2	Hardness as CaCO3			5		
EPA 300.0	Nitrate as N			5		

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 350.2	Ammonia as N			5		
EPA 351.3	Nitrogen, Total Kjeldahl			5		
EPA 354.1	Nitrite as N			5		
EPA 365.2	OrthoPhosphate as P			5		
EPA 365.2	Phosphate as P			5		
Toxicity						
EPA 821/R-02-012	*Ceriodaphnia dubia*	3	2	5		
EPA 821/R-02-012	*Pimephales promelas*	3	2	5		
EPA 821/R-02-013	*Selenastrum capricornutum*	3	2	5		
EPA 600/R-99-064	*Hyalella azteca*	2	1	1		

Exceedance History

Exceedances of WQTLs have occurred including three *E. coli*, four chlorpyrifos, and one toxicity to *Selenastrum* (Table IV-3). The analysis of metals was initiated in 2006 for the irrigation season sampling and exceedances of WQTLs were experienced five times for copper and twice for lead.

Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Ash Slough @ Ave 21 site subwatershed, the constituents receiving the highest priorities were chlorpyrifos (B) and copper (C).

Table IV-3. All exceedances experienced in samples collected from the Ash Slough @ Ave 21 Coalition monitoring site between May 2005 and September 2007.

Station Name	Season	Sample Date	Color, color units	*E. coli*, MPN/100 mL	Copper[1], µg/L	Lead[1], µg/L	Chlorpyrifos, µg/L	*Selenastrum capricornutum*, Total Cell Count
Ash Slough @ Ave 21	Irrigation	14/Jun/2005	60					
Ash Slough @ Ave 21	Irrigation	12/Jul/2005	30	500			0.018	
Ash Slough @ Ave 21	Irrigation	16/Aug/2005	50				0.046	
Ash Slough @ Ave 21	Irrigation	16/May/2006	45		4.8 (2.6)	0.68 (0.46)		
Ash Slough @ Ave 21	Irrigation	13/Jun/2006		770	17 (3.3)	1.6 (0.69)		
Ash Slough @ Ave 21	Irrigation	11/Jul/2006	24		6.7 (4.1)			
Ash Slough @ Ave 21	Irrigation	08/Aug/2006	30		6.3 (3.1)			
Ash Slough @ Ave 21	Irrigation	12/Sep/2006	26		9.3 (3.3)			
Ash Slough @ Ave 21	Storm	28/Feb/2006	60	500			0.016	1197250
Ash Slough @ Ave 21	Storm	15/Mar/2006	60				0.029	
Priorities			**E**	**E**	**C**	**E**	**B**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

The Coalition scheduled additional Management Plan monitoring at Ash Slough in July and August for chlorpyrifos and June – September for copper (Table IV-4). Ash Slough was dry in 2007 and therefore no sampling was conducted.

Table IV-4. Ash Slough @ Ave 21. 2007 Management plan monitoring schedule for chlorpyrifos and copper. X = indicates the site, month, and analyte sampled.

Sample Site	Sample Month	Chlorpyrifos	Copper
Ash Slough @ Ave 21	June		**x**
Ash Slough @ Ave 21	July	**x**	**x**
Ash Slough @ Ave 21	August	**x**	**x**
Ash Slough @ Ave 21	September		**x**

Load Calculations

Table IV-5. Ash Slough @ Ave 21. Instantaneous load calculations for chlorpyrifos and copper (sorted by date and analyte).

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Ash Slough @ Ave 21	Chlorpyrifos	16/Aug/2005	16.81	0.046	21.8964
Ash Slough @ Ave 21	Chlorpyrifos	28/Feb/2006	5.93	0.016	2.686717
Ash Slough @ Ave 21	Chlorpyrifos	15/Mar/2006	11.24	0.029	9.230209
Ash Slough @ Ave 21	Copper	13/Jun/2006	66.65	17	32084.58
Ash Slough @ Ave 21	Copper	11/Jul/2006	9.51	6.7	1804.274
Ash Slough @ Ave 21	Copper	08/Aug/2006	5.28	6.3	941.9367
Ash Slough @ Ave 21	Copper	12/Sep/2006	9.07	9.3	2388.567

Source Identification

Priority B Constituents

Chlorpyrifos

Exceedances of chlorpyrifos were associated with both the winter dormant spray season and the irrigation season (Table IV-3). The exceedance in July 2005 was slightly over the WQTL and the lack of a load calculation indicates that there was no or very limited flow in Ash Slough around this date (Table IV-5). There were very few applications in the month of July prior to sampling and the acreage treated was relatively small. The exceedance the following month was nearly three times larger and accompanied by substantial flows. In the period between the July and August exceedances, there were a large number of applications and a large amount of active ingredient used. These results suggest that the first exceedance could have been associated with drift while the second exceedance was more likely a result of tail water transporting chlorpyrifos to the slough.

The exceedances in February and March 2006 were both associated with samples collected after storm events. The first storm was smaller and the flows during sampling about half the flows during the second sampling event (Table IV-6). The concentration in the February sample was slightly above the WQTL and about half the concentration of the sample collected approximately two weeks later. Because water was moving downstream due to the rain events, it is unlikely that either of the exceedances was the result of drift. Drift would be expected to have moved downstream unless applications were being made directly upstream of the sample location at the time of sampling. It is far more likely that these exceedances are due to storm water transporting dormant sprays residues to the slough. Grapes, corn, almonds and alfalfa are all potential crops generating runoff (Table IV-7).

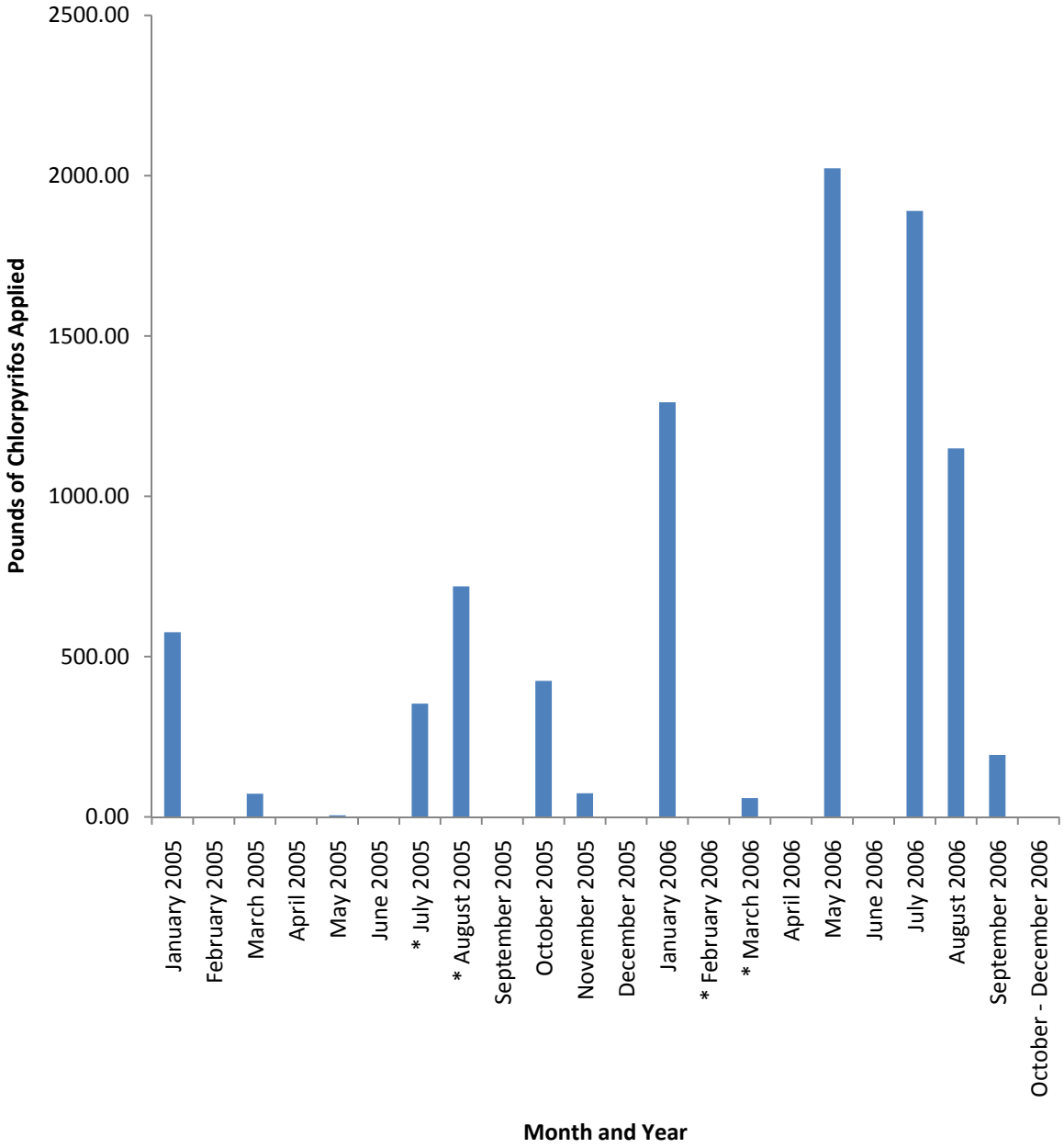
Ash Slough @ Ave 21 was dry for the storm and irrigation seasons of 2007, therefore no 2007 PUR data are available for analysis.

Table IV-6. Number of chlorpyrifos applications, total pounds applied, and total acres treated by month for 2005 through 2006 in the Ash Slough @ Ave 21 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2005	3	576.29	288
March 2005	4	72.24	154
May 2005	1	4.98	10
July 2005	6	353.14	275
August 2005	24	718.90	1187
October 2005	2	424.29	212.8
November 2005	1	73.57	36.9
January 2006	17	1293.41	633.5
March 2006	4	58.74	157
May 2006	9	2022.81	1015.24
July 2006	13	1889.93	954
August 2006	14	1149.45	699
September 2006	12	193.42	338.1
2005 Total	41	2223.41	2163.7
2006 Total	69	6607.76	3796.84
Total	**110**	**8831.18**	**5960.54**

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Figure IV-2. Pounds of chlorpyrifos applied within the Ash Slough @ Ave 21 site subwatershed by month for 2005-2006. Asterisk (*) denotes months with exceedances.



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Table IV-7. Average pounds active ingredient (AI) per acre for chlorpyrifos based on PUR data from 2005-2006 within the Ash Slough @ Ave 21 subwatershed.

Chemical Name	Commodity	Product Name	Average lbs AI/acre
Chlorpyrifos	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	0.46
		LOCK-ON INSECTICIDE	0.51
		LORSBAN 4E-HF	0.42
	ALMOND	CHLORPYRIFOS 4E AG	0.85
		GOVERN 4E INSECTICIDE	2.01
		LORSBAN 4E-HF	1.76
		LORSBAN-4E	1.92
	CORN (FORAGE - FODDER)	LORSBAN 4E-HF	0.99
	GRAPES, WINE	LORSBAN 4E-HF	1.99
	SUGARBEET, GENERAL	LORSBAN 4E-HF	0.76

Priority C Constituents

Copper

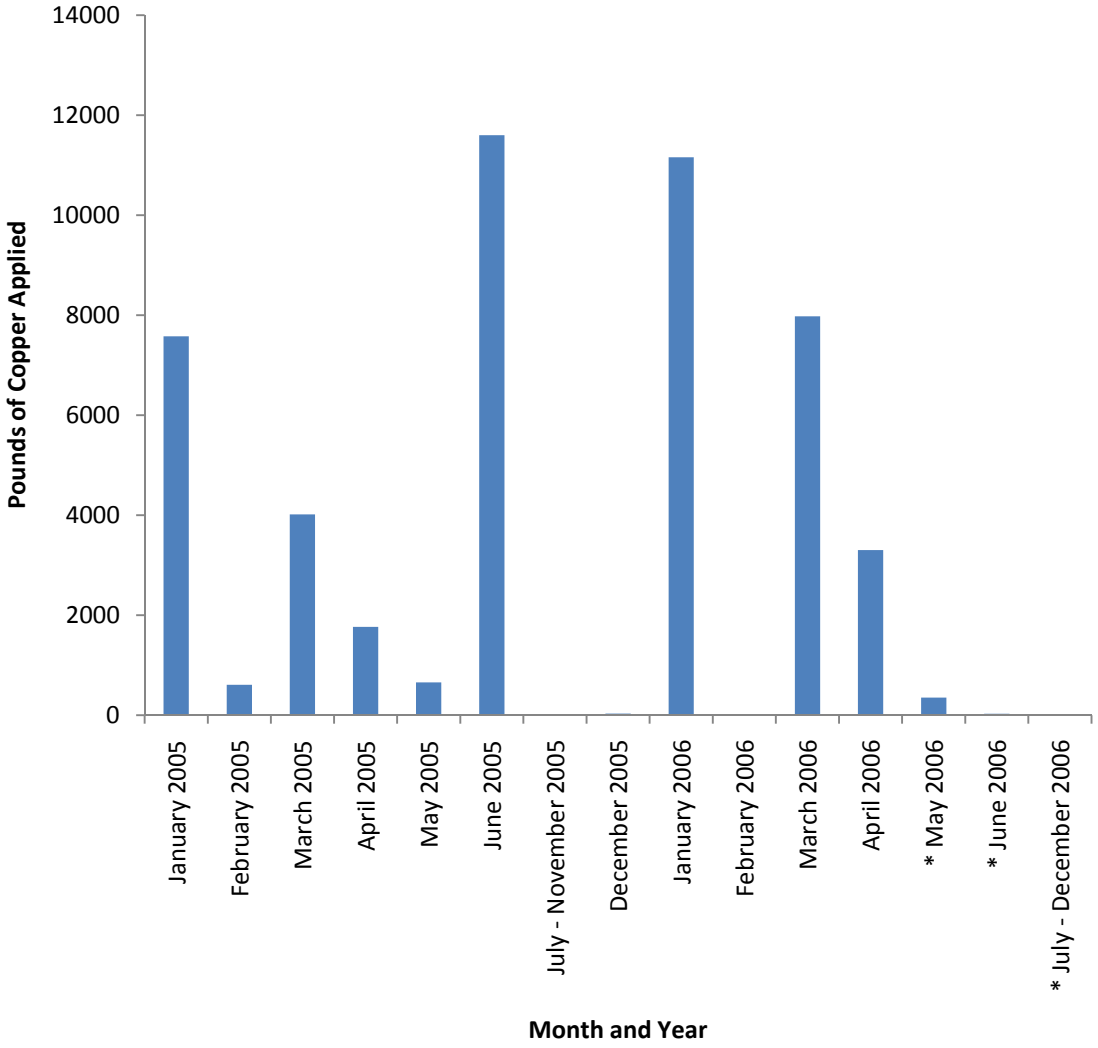
Copper was detected in exceedance of the WQTL in samples collected from May through September 2006. Irrigation 2006 was the first season that samples were collected for total metals analysis. Since September 2006, no water has flowed through Ash Slough. The exceedances were associated with a period of relatively low application rates with 11 applications in May and June and no applications from July through September (Table IV-8, Figure IV-3). There were a large number of applications in the months of January, March, and April and, since copper does not degrade, copper applied during the winter may be available for transport to surface waters later in the irrigation season. Additionally, there are a large number of copper mines in the Sierra Nevada Mountains which may contribute to the copper load. The Coalition has recently obtained maps of all mines in the areas above Ash Slough and will sample upstream of agriculture if there is ever significant flow in the slough. Because copper tends to be sediment bound, it is probable that copper was mobilized with the sediment during irrigation and transported to surface waters.

Table IV-8. Number of copper applications, total pounds applied and total acres treated by month for 2005 through 2006 in the Ash Slough @ Ave 21 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year*	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January 2005	33	7576.1	1630.1
February 2005	3	609.264	273
March 2005	25	4016.2	5344.2
April 2005	39	1767.7	2390.7
May 2005	5	655.257	385.5
June 2005	6	11599.9	1733.5
December 2005	1	32.23696	14
January 2006	38	11157.59	2437.7
March 2006	19	7977.229	4869.46
April 2006	23	3302.5	3327.7
May 2006	4	351.055	233
June 2006	1	28.5	9.5
2005 Total	112	26256.66	11771
2006 Total	85	22816.88	10877.36
Total	**197**	**49073.54**	**22648.36**

*No 2007 data is shown due to Ash Slough being dry for both storm and irrigation seasons.

Figure IV-3. Pounds of copper applied within the Ash Slough @ Ave 21 site subwatershed by month for 2005 and 2006. Asterisk (*) denotes months with exceedances.



Priority E Constituents

E. coli

E. coli exceedances occurred three times in 2005 and 2006. As a result, Ash Slough @ Vista Ave, upstream of Ash Slough @ Ave 21, was sampled for the presence of *E. coli* and Bacteroides in August 2006. Ash Slough @ Ave 21 and Ash Slough @ Ave 23 ½ were dry during each scheduled sampling event. At the upstream Ash Slough @ Vista Ave location, the *E. coli* levels were below the WQTL of 235, but lack of downstream measurements does not allow any conclusions. If flow occurs at the site in the future, the Coalition may try to include this site in a larger study.

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991 prior to the initiation of the Pesticide Use Reporting system. Consequently, it is not possible to identify where past applications of lead-based pesticide occurred. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal of lead paint in the vicinity, burial of old building materials with lead paint, or leaching lead from lead arsenate deposition could all be contributors to lead detections. The particular sources of this metal are unknown, and the Coalition will address the lead exceedances when they become a priority.

2008 Management Plan Monitoring

The Coalition plans to conduct Management Plan monitoring at Ash Slough @ Ave 21 for the same months and for the same constituents as the 2007 Management Plan monitoring (Table IV-9).

Table IV-9. Ash Slough @ Ave 21. 2008 Management Plan sampling. A = assessment sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Copper
Ash Slough @ Ave 21	May	A		x
Ash Slough @ Ave 21	June	A		x
Ash Slough @ Ave 21	July	A	x	x
Ash Slough @ Ave 21	August	A	x	x
Ash Slough @ Ave 21	September	A		x

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V. BEAR CREEK

Management Plan Constituents

Priority B

- Chlorpyrifos
- *Ceriodaphnia dubia* water column toxicity

Priority E

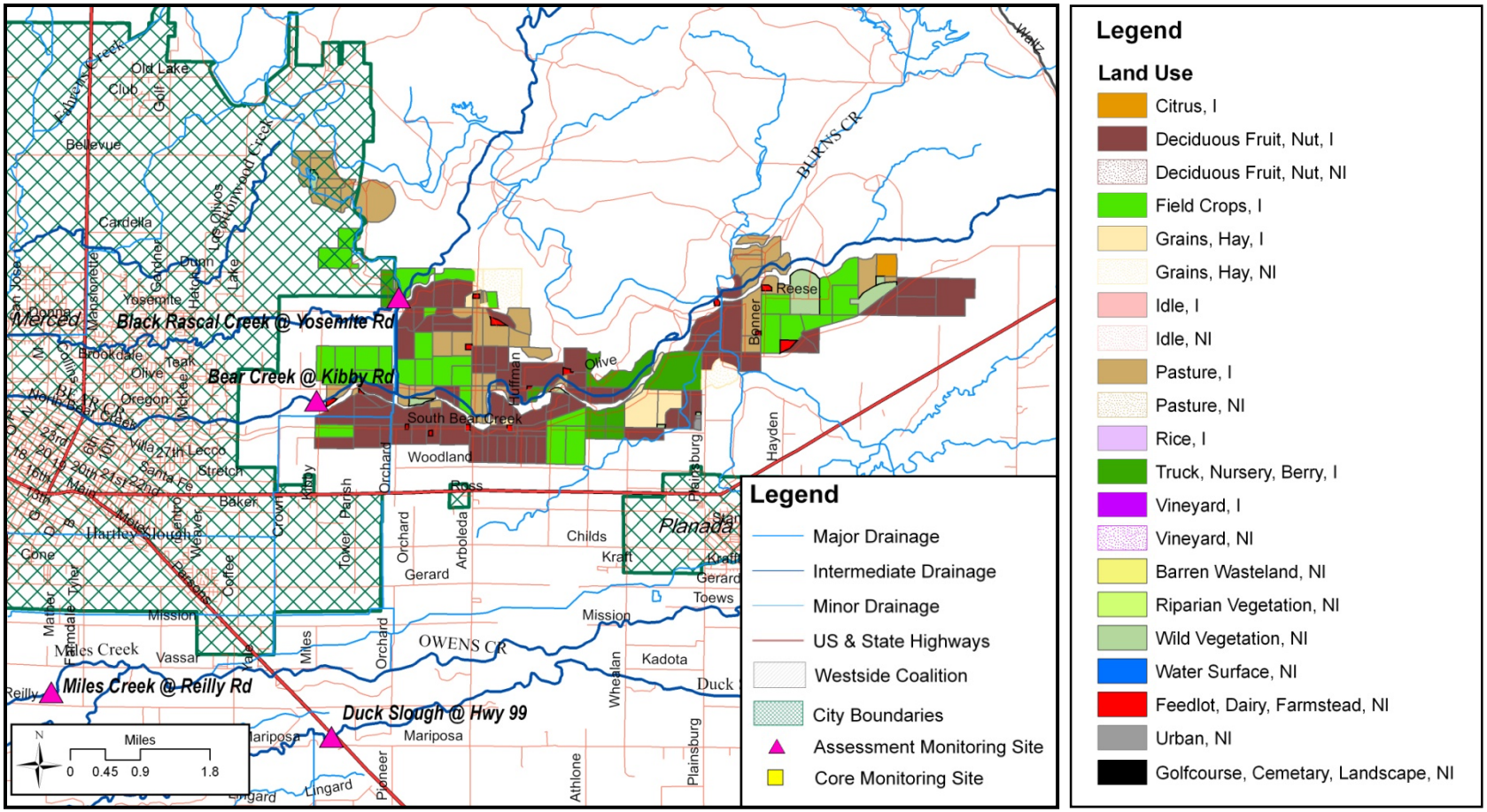
- DO
- pH
- Color
- *E. coli*

Description of Bear Creek @ Kibby Road Site Subwatershed

Bear Creek @ Kibby Road (6,715 irrigated acres) drains an eastern portion of the Coalition region in Merced County. Bear Creek originates in the foothills of the Sierra's with Burns Creek as one of the major tributaries. The Creek drains to the east just north of the town of Planada, and flows through Merced and eventually to the San Joaquin River. The primary irrigated agriculture in the subwatershed includes deciduous nuts, field crops, truck crops, and irrigated pasture (Figure V-1).

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Figure V-1. Site subwatershed map of land use for the Bear Creek @ Kibby Rd sample site.



Subwatershed Monitoring History

Bear Creek @ Kibby Road is located just east of the city of Merced and drains through the city to the San Joaquin River. Bear Creek is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list. The Bear Creek monitoring site has experienced exceedances of field parameters, *E. coli,* chlorpyrifos and water column toxicity to *Ceriodaphnia dubia*. Included in this section is a summary and discussion of these exceedances (Table V-1).

Table V-1. Bear Creek @ Kibby Rd events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	1	5	2	5	2	6

Table V-2. Number of analyses run per analyte in each sampling season and year for the Bear Creek sample site. Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	1	5	2	5	2	6
EPA 160.1	Dissolved Solids	1	5	2	5	2	6
EPA 180.1	Turbidity	1	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	1	5	2	5	2	6
SM 9223	E. coli	1	5	2	5	2	6
NA	Dissolved Oxygen	1	6	3	6	3	7
NA	Specific Conductivity	1	6	3	6	3	7
NA	pH	1	6	3	6	3	7
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD (p,p')				5	2	6
EPA 8081A	DDE (p,p')				5	2	6

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Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	DDT (p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	6
EPA 8141A	Chlorpyrifos	1	5	2	5	2	6
EPA 8141A	Diazinon				5	2	6
EPA 8141A	Dimethoate				5	2	6
EPA 8141A	Disulfoton				5	2	6
EPA 8141A	Malathion				5	2	6
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	6
EPA 8141A	Molinate				5	2	6
EPA 8141A	Parathion, Methyl				5	2	6
EPA 8141A	Phorate				5	2	6
EPA 8141A	Phosmet				5	2	6
EPA 8141A	Thiobencarb				5	2	6
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5	2	6
EPA 8081A	Cyfluthrin, total		1	2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	1	5	2	5	2	6
EPA 8081A	Cypermethrin, total	1	5	2	5	2	6
EPA 8081A	Esfenvalerate/ Fenvalerate, total	1	5	2	5	2	6
EPA 8081A	Permethrin, total	1	5	2	5	2	6
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	6
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	6
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	6
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	1	6	2	6	2	8
EPA 821/R-02-012	*Pimephales promelas*	1	6	2	5	2	7
EPA 821/R-02-013	*Selenastrum capricornutum*	1	6	2	5	2	7
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	1

Exceedance History

Ambient water monitoring at Bear Creek was initiated in the storm season of 2005. Since that time, two dissolved oxygen (DO) exceedances, two pH exceedances, 14 color exceedances, and five *E. coli* exceedances have been recorded. Metals analysis was initiated during the irrigation season of 2006 and since then Bear Creek has experienced one exceedance each of cadmium, copper, and lead. Pesticide exceedances include one of DDT and two of the chlorpyrifos WQTL. Water column toxicity to *Ceriodaphnia dubia* occurred three times. Although all exceedances are listed in Table V-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Bear Creek sites, the constituent receiving the highest priority was chlorpyrifos (B).

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Table V-3. Exceedances experienced in samples collected from the Bear Creek @ Kibby Rd monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Cadmium, µg/L	Lead, µg/L	Copper, µg/L	Chlorpyrifos, µg/L	DDT(p,p'), µg/L	*Ceriodaphnia dubia*, Survival (%)
Bear Creek @ Kibby Rd	Storm	21/Mar/2005	4.4		180	1600						
Bear Creek @ Kibby Rd	Irrigation	10/May/2005			30	280						5
Bear Creek @ Kibby Rd	Irrigation	14/Jun/2005			30							
Bear Creek @ Kibby Rd	Irrigation	16/Aug/2005			45							
Bear Creek @ Kibby Rd	Irrigation	20/Sep/2005			25							
Bear Creek @ Kibby Rd	Storm	28/Feb/2006			20							
Bear Creek @ Kibby Rd	Storm	15/Mar/2006			100	1600						
Bear Creek @ Kibby Rd	Irrigation	17/May/2006			20					0.52		0
Bear Creek @ Kibby Rd	Irrigation	13/Jun/2006	6.99	8.69	18							
Bear Creek @ Kibby Rd	Irrigation	12/Jul/2006			19							
Bear Creek @ Kibby Rd	Irrigation	12/Sep/2006			26							
Bear Creek @ Kibby Rd	Storm	12/Feb/2007			180	2400	0.05	2.4	12 (9.3)		0.0091	
Bear Creek @ Kibby Rd	Storm	01/Mar/2007			100	1300						
Bear Creek @ Kibby Rd	Irrigation	24/Jul/2007								0.049		0
Bear Creek @ Kibby Rd	Irrigation	21/Aug/2007		8.69								
Bear Creek @ Kibby Rd	Irrigation	18/Sep/2007			17							
Priorities			**E**	**E**	**E**	**E**				**B**		**D**

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

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2007 Management Plan Monitoring Results

Bear Creek @ Kibby was scheduled to be monitored once in May for chlorpyrifos, but management plan monitoring was not initiated until June 2007. Therefore irrigation season of 2008 will be the first time that Management Plan monitoring will occur at Bear Creek.

Load Calculations

No load data available due to unsafe conditions to take discharge (too deep and wide).

Source Identification

Priority B Constituents

Chlorpyrifos

Exceedances of chlorpyrifos occurred in the irrigation season (Table V-3). The exceedance in May 2006 was approximately 30 times the WQTL. The month of May had the highest number of applications, and the highest pounds AI applied over the largest acreage of any month before or since (Table V-4, Figure V-2). The exceedance in July 2007 was three times larger than the WQTL. Applications in July 2007 prior to sampling had the second highest pounds AI and acreage (Table V-4). The July exceedance was likely associated with hull-split applications to almonds while the May exceedances were likely associated with earlier applications to corn and alfalfa. These results suggest that the both exceedances could have been the result of tail water transporting chlorpyrifos to the creek.

Table V-4. Number of chlorpyrifos applications, total pounds applied and total acres treated by month for January 2005 through July 2007 in the Bear Creek @ Kibby Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
March 2005	1	39.63	99
May 2005	5	346.97	178
June 2005	2	49.91	25
July 2005	2	70.02	35
August 2005	1	55.75	30
September 2005	1	18.76	10
May 2006	11	980.60	520
June 2006	4	154.89	78
July 2006	3	403.62	200
August 2006	1	111.39	61
May 2007	9	363.34	196
June 2007	1	29.91	15

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
July 2007	5	518.75	264
2005 Total	12	581.04	377
2006 Total	19	1650.50	859
2007 Total	15	912.00	475
Total	46	3143.54	1711

Figure V-2. Pounds of chlorpyrifos applied within the Bear Creek @ Kibby site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

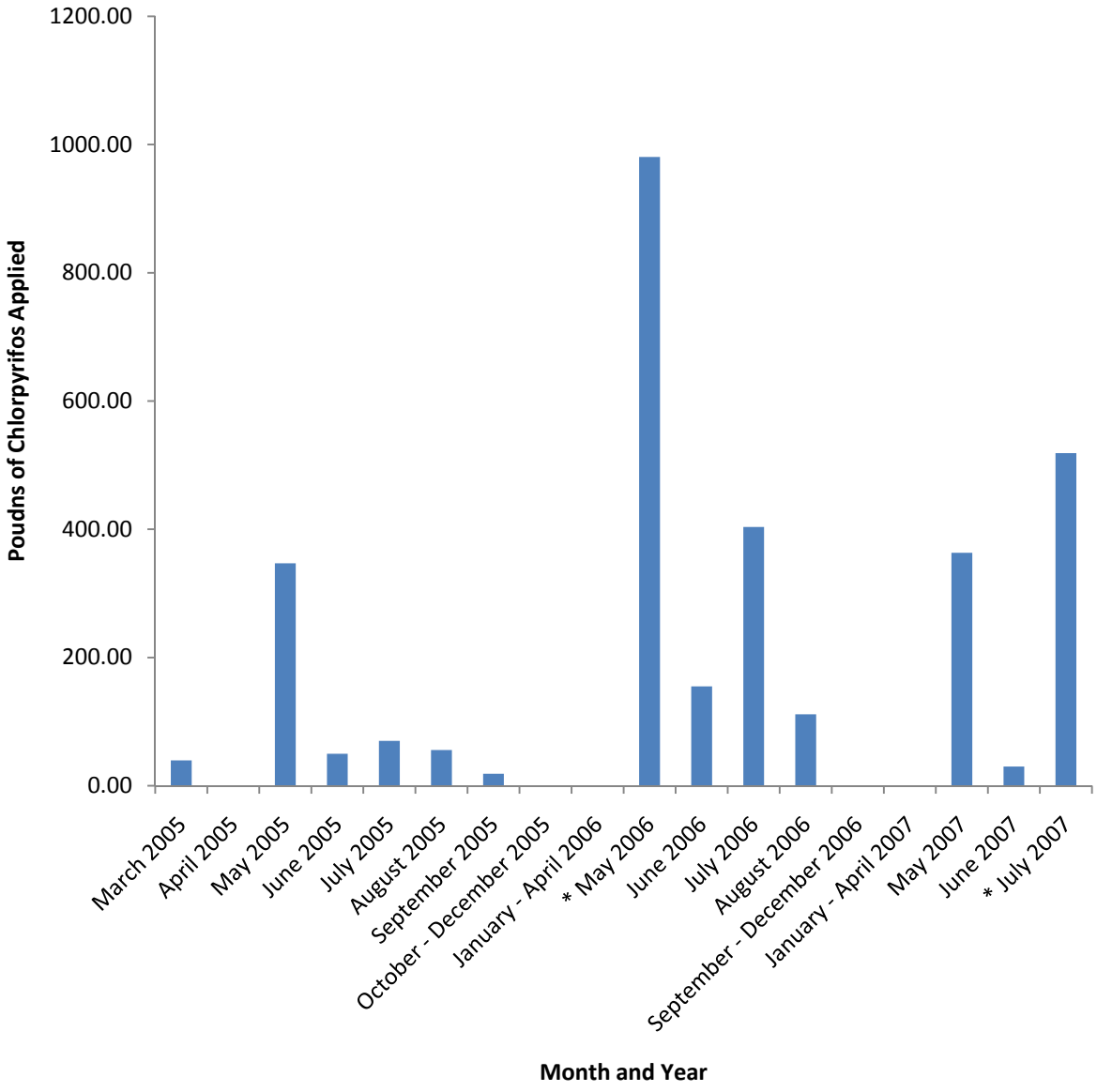


Table V-5. Average pound active ingredient (AI) per acre for chlorpyrifos based on PUR data from 2005-2007 within the Bear Creek @ Kibby Rd subwatershed.

Chemical Name	Commodity	Product Name	Average Lbs AI/Acre
Chlorpyrifos	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	0.4
	ALMOND	GOVERN 4E	2.02
		LORSBAN 4E	1.81
		LORSBAN 4E-HF	1.97
	CORN (FORAGE - FODDER)	LORSBAN 4E-HF	1.49
		NUFOS 4E	1.28
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CHLORPYRIFOS 4E AG	1.69
		LORSBAN 4E	1.86
		LORSBAN 4E-HF	1.99

Priority E Constituents

Ceriodaphnia dubia

Two of the three *Ceriodaphnia* exceedances were associated with the exceedances of chlorpyrifos (Table V-3) and the TIEs indicated organophosphate pesticides as the likely source of the toxicity. The third toxicity exceedance occurred in May of 2005, another month with high applications of chlorpyrifos, although no exceedance of chlorpyrifos occurred. The TIE for this sample was inconclusive and the cause of the toxicity cannot be positively attributed to chlorpyrifos. It is likely however that eliminating chlorpyrifos in the water will eliminate the *Ceriodaphnia* toxicity at this site.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. None of the samples collected at Bear Creek @ Kibby Rd contained measurable amounts of BOD however none of the samples experienced an exceedance of the DO WQTL. These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

E. coli

E. coli exceedances occurred five times between March 2005 and March 2007. Exceedances occurred during the winter and spring months with four exceedances associated with storm events and one exceedance in the irrigation season. No common occurrence links these

exceedances. Bear Creek @ Kibby Road and an upstream site, Bear Creek @ Bear Creek Drive were sampled during the ESJWQC *E. coli* study. The upstream site had approximately one-third the *E. coli* of the downstream site although it is difficult to determine the significance of this result. Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

The 2008 irrigation season will be the first year that this site will have Management Plan monitoring. Therefore additional monitoring will occur in May and July for both chlorpyrifos and *Ceriodaphnia* (TableV-6).

Table V-6. Bear Creek @ Kibby Rd. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	*Ceriodaphnia dubia*
Bear Creek @ Kibby Rd	May	A	**x**	**x**
Bear Creek @ Kibby Rd	July	A	**x**	**x**

VI. BERENDA SLOUGH

Management Plan Constituents

Priority B

- Chlorpyrifos
- *Selenastrum capricornutum* water column toxicity

Priority E

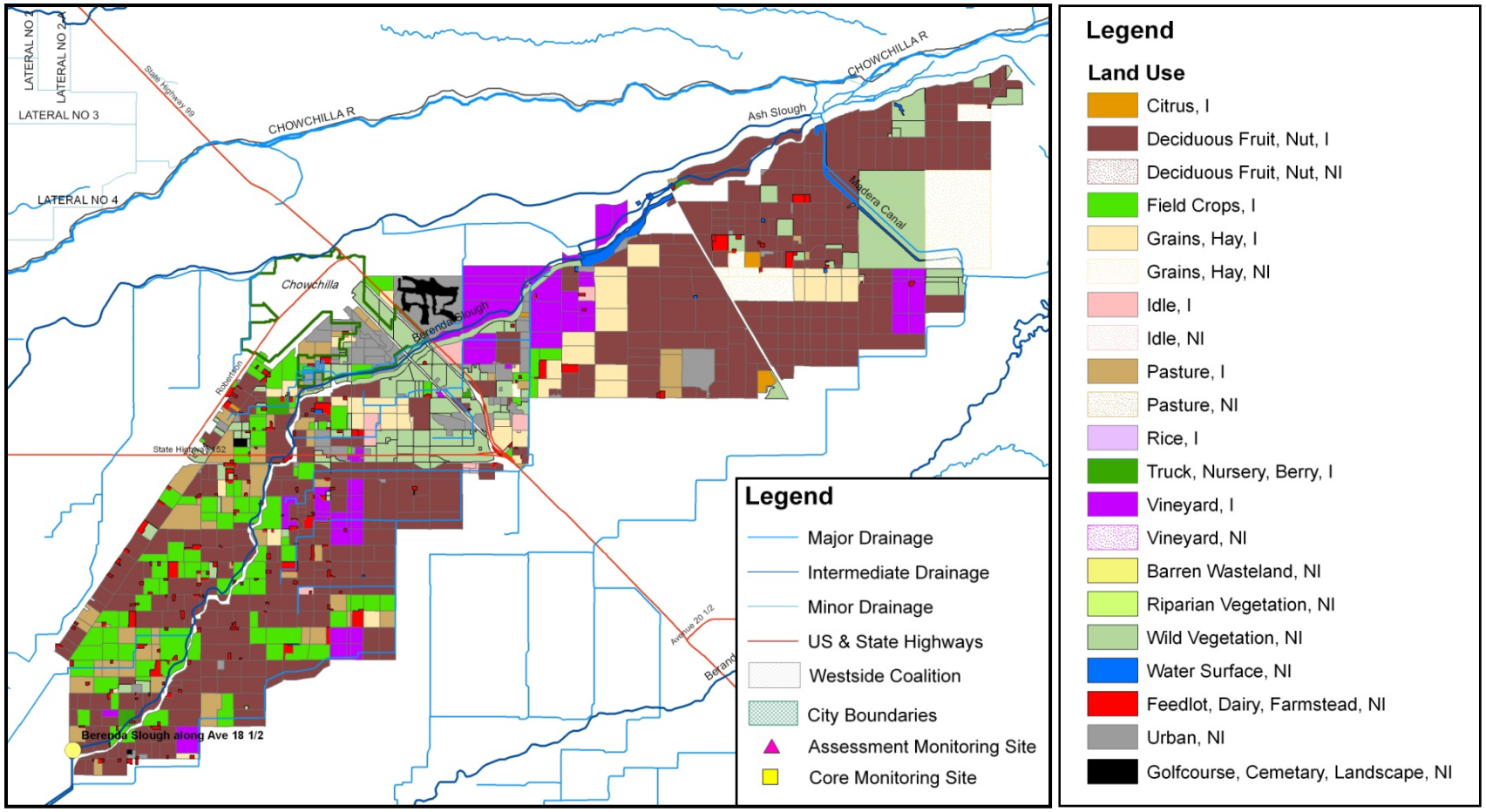
- DO
- *E. coli*
- Color

Description of Berenda Slough along Avenue 18 ½ Site Subwatershed

Berenda Slough along Avenue 18 ½ (25,006 irrigated acres) flows from Berenda Reservoir south and west through northern Madera County and when flows are sufficient, empties into the Eastside Bypass. Generally Berenda Slough does not connect with the Bypass due to insufficient flow. The sampling site is located directly south of the city of Chowchilla. The primary agriculture in the site subwatershed is orchards and vineyards with small amounts of pasture and field crops (Figure VI-1).

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Figure VI-1. Site subwatershed map of land use for the Berenda Slough along Ave 18 ½ sample site.



Subwatershed Monitoring History

Monitoring at Berenda Slough first began in May 2006 (Table VI-1). Both 2007 storm events and two 2007 irrigation events were unable to be sampled due to lack of flow (Table VI-1, VI-2).

Table VI-1. Berenda Slough along Ave 18 1/2 sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	5	0	4
Events Not Sampled	NA	NA	NA	NA	0	2	2
Total	NA	NA	NA	NA	5	2	6

Table VI-2. Berenda Slough along Ave 18 1/2. Number of analyses run per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	5		4
EPA 160.1	Dissolved Solids	5		4
EPA 180.1	Turbidity	5		4
EPA 405.1	BOD	1		1
EPA 415.1	Total Organic Carbon	5		4
SM 9223	E. coli	5		4
NA	Dissolved Oxygen	5		7
NA	Specific Conductivity	5		7
NA	pH	5		7
Carbamates				
EPA 8321A	Aldicarb	5		4
EPA 8321A	Carbaryl	5		4
EPA 8321A	Carbofuran	5		4
EPA 8321A	Diuron	5		4
EPA 8321A	Linuron	5		4
EPA 8321A	Methiocarb	5		4
EPA 8321A	Methomyl	5		4
EPA 8321A	Oxamyl	5		4
Organochlorines				
EPA 8081A	DDD(p,p')	5		4
EPA 8081A	DDE(p,p')	5		4
EPA 8081A	DDT(p,p')	5		4
EPA 8081A	Dicofol	5		4
EPA 8081A	Dieldrin	5		4

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 8081A	Endrin	5		4
EPA 8081A	Methoxychlor	5		4
	Organophosphates			
EPA 8141A	Azinphos methyl	5		5
EPA 8141A	Chlorpyrifos	5		5
EPA 8141A	Diazinon	5		5
EPA 8141A	Dimethoate	5		5
EPA 8141A	Disulfoton	5		5
EPA 8141A	Malathion	5		5
EPA 8141A	Methamidophos	5		4
EPA 8141A	Methidathion	5		5
EPA 8141A	Molinate	5		5
EPA 8141A	Parathion, Methyl	5		5
EPA 8141A	Phorate	5		5
EPA 8141A	Phosmet	5		5
EPA 8141A	Thiobencarb	5		5
	Pyrethroids			
EPA 8081A	Bifenthrin	5		4
EPA 8081A	Cyfluthrin, total	5		4
EPA 8081A	Cyhalothrin, lambda, total	5		4
EPA 8081A	Cypermethrin, total	5		4
EPA 8081A	Esfenvalerate/Fenvalerate, total	5		4
EPA 8081A	Permethrin, total	5		4
	Triazines			
EPA 547M	Glyphosate	5		4
EPA 549.2M	Paraquat dichloride	5		4
EPA 619	Atrazine	5		4
EPA 619	Cyanazine	5		4
EPA 619	Simazine	5		4
	Metals			
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
	Nutrients			
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N			
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N			
EPA 365.2	OrthoPhosphate as P			
EPA 365.2	Phosphate as P			

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Toxicity				
EPA 821/R-02-012	*Ceriodaphnia dubia*	6		4
EPA 821/R-02-012	*Pimephales promelas*	5		4
EPA 821/R-02-013	*Selenastrum capricornutum*	5		6
EPA 600/R-99-064	*Hyalella azteca*	1		1

Exceedance History

Exceedances of WQTLs include eight dissolved oxygen (DO), two *E. coli*, nine color, three chlorpyrifos, one diuron, and one sample toxic to *Ceriodaphnia*. Samples collected were toxic to *Selenastrum* three times. Berenda Slough is not considered impaired and is not on the current Central Valley Basin Plan 303d list.

Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Berenda Slough along Ave 18 ½ site subwatershed, the constituent receiving the highest priority was chlorpyrifos (B).

Table VI-3. Exceedances experienced in samples collected from the Berenda Slough along Ave 18 ½ Coalition monitoring site between May 2006 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Color, color units	*E. coli*, MPN/100 mL	Chlorpyrifos, µg/L	Diuron, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Berenda Slough along Ave 18 1/2	Irrigation	16/May/2006		48					
Berenda Slough along Ave 18 1/2	Irrigation	13/Jun/2006	5.49	25	460				
Berenda Slough along Ave 18 1/2	Irrigation	11/Jul/2006	6.54	34		0.043			
Berenda Slough along Ave 18 1/2	Irrigation	08/Aug/2006		40					
Berenda Slough along Ave 18 1/2	Irrigation	12/Sep/2006		26		0.14		40	
Berenda Slough along Ave 18 1/2	Irrigation	29/May/2007	1.75	56			3.4		413341
Berenda Slough along Ave 18 1/2	Irrigation	05/Jun/2007	3.07						
Berenda Slough along Ave 18 1/2	Irrigation	26/Jun/2007	5.2	38	390				
Berenda Slough along Ave 18 1/2	Irrigation	24/Jul/2007	6.37	28		0.028			55126
Berenda Slough along Ave 18 1/2	Irrigation	31/Jul/2007	4.72						416597
Berenda Slough along Ave 18 1/2	Irrigation	21/Aug/2007	6.13	18					
Priorities			**E**	**E**	**E**	**B**			**D**

2007 Management Plan Monitoring Results

Additional Management Plan monitoring (MPM) was conducted in July and September, 2007, for chlorpyrifos (Table VI-4). The July MPM results were below the minimum detection limit and the September samples were not collected since the site was dry (Table VI-5). One week prior to the July MPM monitoring, an exceedance occurred on July 24 for chlorpyrifos (Table VI-5).

Table VI-4. Berenda Slough along Ave 18 1/2 . 2007 Management plan monitoring schedule for chlorpyrifos. X = indicates the site, month, and analyte sampled.

Sample Site	Sample Month	Chlorpyrifos
Berenda Slough along Ave 18 ½	July	**x**
Berenda Slough along Ave 18 ½	September	**x**

Table VI-5. Berenda Slough along Ave 18 ½. Normal Monitoring (NM) and Management Plan Monitoring (MPM) results for chlorpyrifos from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	NM	NM	MPM	NM	NM	MPM
	4/17/2007	5/29/2007	6/26/2007	7/24/2007	7/31/2007	8/21/2007	9/18/2007	9/25/2007
Chlorpyrifos (µg/L)	Site dry	<0.00259	<0.00259	**0.028**	<0.003	<0.003	Site dry	Site dry

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table VI-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table VI-6. Berenda Slough along Ave 18 1/2 . Instantaneous load calculations for chlorpyrifos (sorted by date and analyte).

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Berenda Slough along Ave 18 1/2	Chlorpyrifos	11/Jul/2006	No flow	0.043	0
Berenda Slough along Ave 18 1/2	Chlorpyrifos	12/Sep/2006	18.54	0.14	73.49961
Berenda Slough along Ave 18 1/2	Chlorpyrifos	24/Jul/2007	No flow	0.028	0

Source Identification

Priority B Constituents

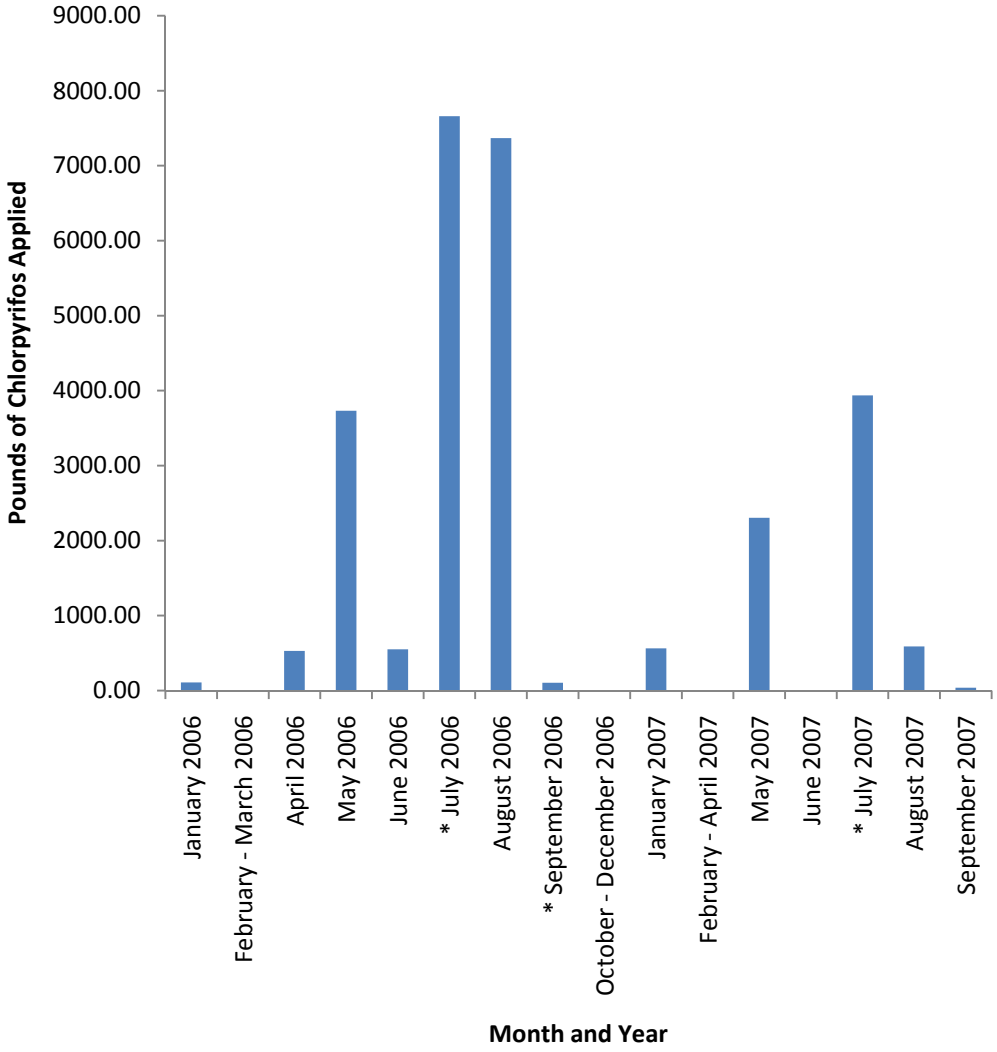
Chlorpyrifos

Exceedances of chlorpyrifos were associated with the irrigation seasons of 2006 and 2007 (Table VI-3). The highest concentration was at the September 2006 exceedance which was associated with the only *Ceriodaphnia* toxicity. TIE results indicated the cause of toxicity was a metabolically activated pesticide. No dilution series was performed and no toxic units (TUs) were calculated. The other two exceedances were well above the WQTL and it is unlikely they were the result of spray drift. There were large numbers of applications and large amounts of chlorpyrifos applied in July of 2006 and 2007, and August 2006 (Table VI-7, Figure VI-2). Applications were made throughout the site subwatershed (Table VI-8). These results suggest that the exceedances most likely are the result of tail water transporting chlorpyrifos to the creek.

Table VI-7. Number of chlorpyrifos applications, total pounds applied, and total acres treated by month for 2006 through 2007 in the Berenda Slough along Ave 18 ½ site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2006	1	109.66	55
April 2006	4	529.67	290
May 2006	19	3731.51	2213.5
June 2006	9	550.92	307.5
July 2006	63	7660.07	3943
August 2006	20	7366.98	2453
September 2006	3	104.88	105
January 2007	1	562.90	320
May 2007	9	2305.06	1144
July 2007	31	3937.39	2053
August 2007	3	589.02	298
September 2007	1	38.38	38
2006 Total	119	20053.70	9367
2007 Total	45	7432.75	3853
Total	**164**	**27486.45**	**13220**

Figure VI-2. Pounds of chlorpyrifos applied within the Berenda Slough along Ave 18 ½ site subwatershed by month for 2006-2007. Asterisk (*) denotes months with exceedances.



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Table VI-8. Berenda Slough along Ave 18 ½. All TRS that had more than one application associated with an exceedance for chlorpyrifos in 2006 and 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS.

TRS	Date of Associated Exceedance		
	7/11/2006	7/24/2007	9/12/2006
10S15E21	1	3	1
10S15E22	1	3	
10S15E23			2
10S16E1	3	2	
10S16E10	1	1	
10S16E11	1	1	
10S16E6		2	
10S16E8	1	1	
10S17E5			2
9S16E24	2		
9S17E19	3		
9S17E21		8	
9S17E28			2
9S17E29			2
9S17E33			4

Selenastrum capricornutum toxicity

Selenastrum toxicity was experienced three times in the 2007 irrigation season; once in May and twice in July. The second toxicity in July was from the resample following the July normal monitoring sample collected one week earlier. An exceedance of diuron was associated with the May 2007 toxicity event, but there were no exceedances of diuron associated with the July toxicity events. There were no exceedances of copper associated with any of the toxicity events. No TIEs were performed for any of the exceedances. It is clear that the cause of the toxicity is associated with a soluble constituent(s) and preventing irrigation return flows would be effective in reducing or eliminating *Selenastrum* toxicity. At the time when this site becomes a priority, the Coalition will carefully review the PURs to determine which high solubility constituents should be targeted for focused outreach and management.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. Samples were able to be collected in September 2006 and July 2007. Neither of the samples contained measurable amounts of BOD however neither of the samples experienced an exceedance of the DO WQTL (Table VI-9). These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition

will not attempt to further explore causes of low DO or manage for low DO until such time as it becomes a higher priority.

Table VI-9. Berenda Slough along Ave 18 ½ BOD, pH and dissolved oxygen results for September 2006 and July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Berenda Slough along Ave 18 ½	9/12/2006	7.48	7.59	ND
Berenda Slough along Ave 18 ½	7/24/2007	7.73	6.37	ND

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

E. coli

Two exceedances of the *E. coli* WQTL occurred; one in June 2006 and one in July 2007. Berenda Slough site subwatershed was not sampled during the 2006 *E. coli* study, so potential sources are not known. *E. coli* appears to be an intermittent problem and the Coalition will address it when it becomes a priority.

2008 Management Plan Monitoring

Management Plan monitoring occurred in 2007 for chlorpyrifos and additional exceedances occurred. Therefore the Coalition will conduct upstream Management Plan monitoring to determine geographic sources of chlorpyrifos exceedances by splitting up the site subwatershed area (Figure VI-3, Table VI-11). In July and September 2008 the Coalition will sample for chlorpyrifos at Berenda Slough @ Rd 19 (Table VI-10). In addition, the Coalition will also sample for *Selenastrum* toxicity in May and July at this upstream location.

Figure VI-3. Site subwatershed map of land use for the upstream site Berenda Slough @ Rd 19.

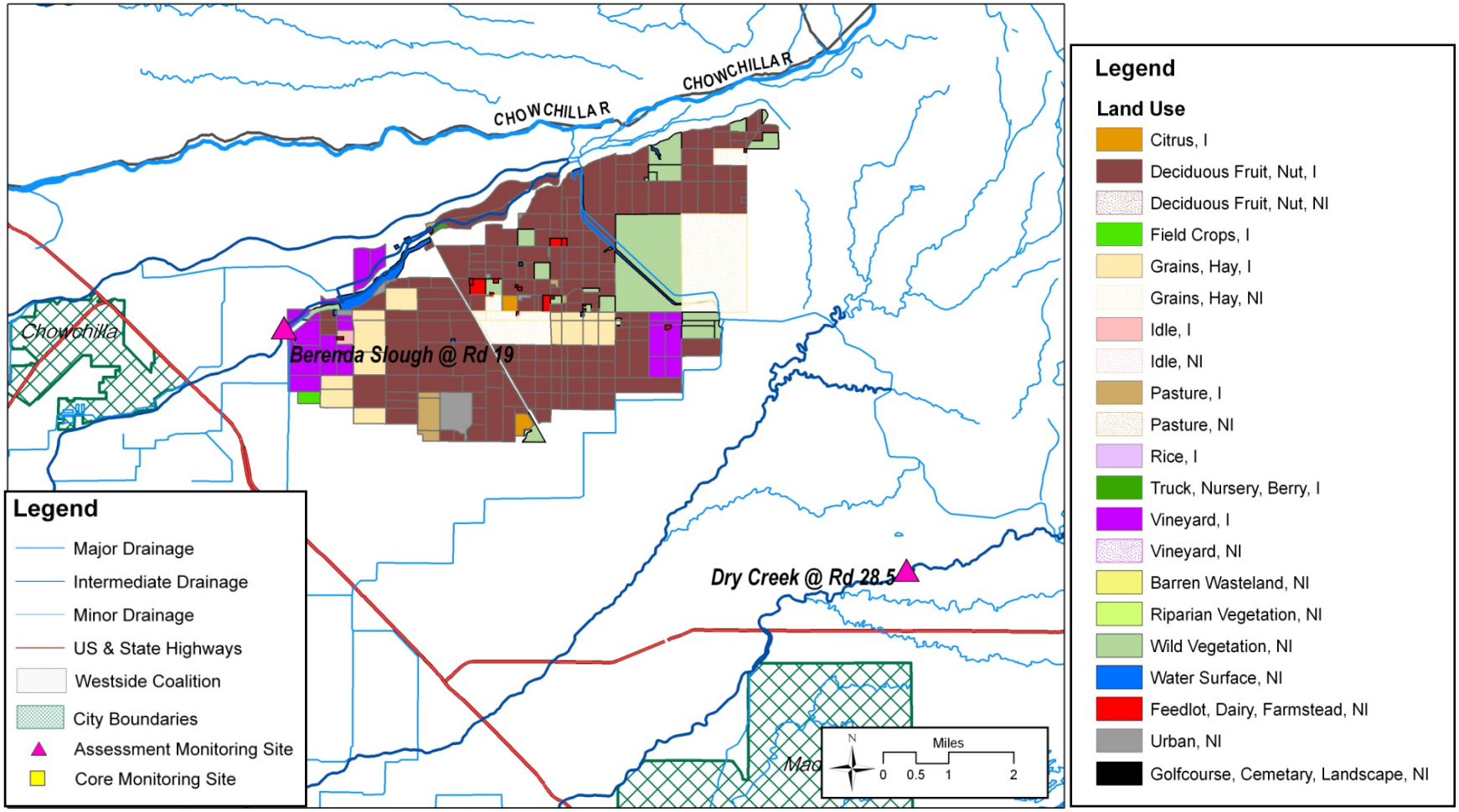


Table VI-10. Berenda Slough @ Rd 19. 2008 Management Plan sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	*Selenastrum capricornutum*
Berenda Slough at Rd 19	May	U		**x**
Berenda Slough at Rd 19	July	U	**x**	**x**
Berenda Slough at Rd 19	September	U	**x**	

Table VI-11. Sampling locations within the Berenda Slough site subwatershed.

Station Name	Station Code	Target Lat	Target Long
Berenda Slough along Ave 18 1/2*	545XBSAAE	37.0182	-120.3265
Berenda Slough at Rd 19[U]	545XBSARN	37.1214	-120.20206

*Original ESJWQC sampling site
[U]Upstream sites

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VII. BLACK RASCAL CREEK

Management Plan Constituents

Priority B

- Chlorpyrifos
- *Ceriodaphnia dubia* water column toxicity

Priority E

- DO
- *E. coli*
- Color

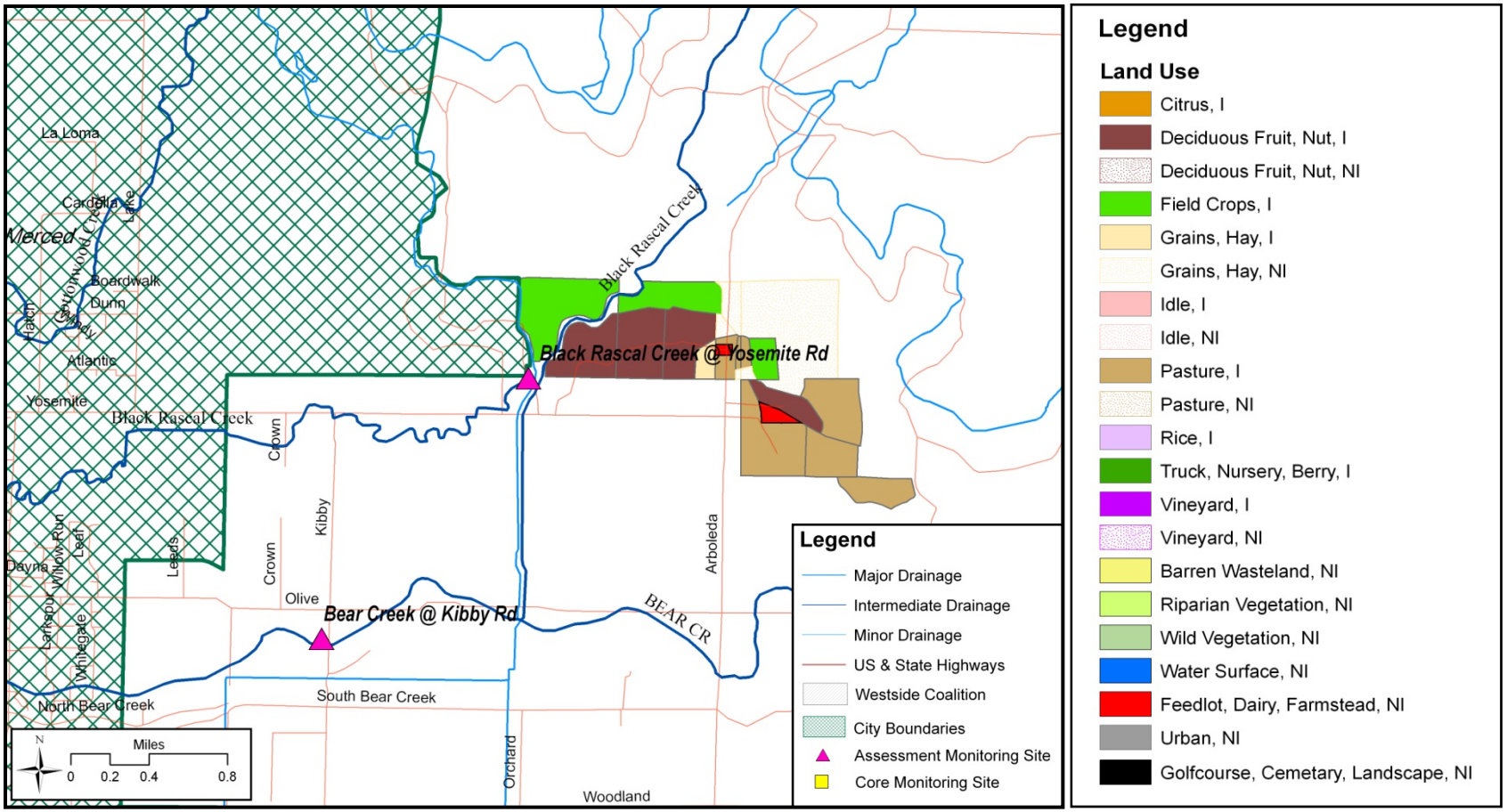
Description of Black Rascal Creek @ Yosemite Road Site Subwatershed

Black Rascal Creek @ Yosemite Road (744 irrigated acres) is located just to the north of the Bear Creek site subwatershed and to the east of the city of Merced. The headwaters of Black Rascal Creek are located in the Sierra foothills. Orchards, pasture, and field crops make up the majority of the agriculture in the site subwatershed (Figure VII-1).

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Figure VII-1. Site subwatershed map of land use for the Black Rascal Creek @ Yosemite Rd sample site.

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Subwatershed Monitoring History

Ambient water monitoring at Black Rascal Creek was initiated in the irrigation season of 2006 and has been monitored since that time (Table VII-1). A list of constituents that have been sampled in each year/season is included in Table VII-2.

Table VII-1. Black Rascal Creek @ Yosemite Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	5	2	6
Events Not Sampled	NA	NA	NA	NA	0	0	0
Total	NA	NA	NA	NA	5	2	6

NA indicates that the site was not sampled during this year/season.

Table VII-2. Black Rascal Creek @ Yosemite Rd. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	5	2	6
EPA 160.1	Dissolved Solids	5	2	6
EPA 180.1	Turbidity	5	2	6
EPA 405.1	BOD	1	2	2
EPA 415.1	Total Organic Carbon	5	2	6
SM 9223	E. coli	5	2	6
NA	Dissolved Oxygen	5	3	9
NA	Specific Conductivity	5	3	9
NA	pH	5	3	9
Carbamates				
EPA 8321A	Aldicarb	5	2	6
EPA 8321A	Carbaryl	5	2	6
EPA 8321A	Carbofuran	5	2	6
EPA 8321A	Diuron	5	2	6
EPA 8321A	Linuron	5	2	6
EPA 8321A	Methiocarb	5	2	6
EPA 8321A	Methomyl	5	2	6
EPA 8321A	Oxamyl	5	2	6
Organochlorines				
EPA 8081A	DDD(p,p')	5	2	6
EPA 8081A	DDE(p,p')	5	2	6
EPA 8081A	DDT(p,p')	5	2	6
EPA 8081A	Dicofol	5	2	6
EPA 8081A	Dieldrin	5	2	6
EPA 8081A	Endrin	5	2	6
EPA 8081A	Methoxychlor	5	2	6
Organophosphates				

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 8141A	Azinphos methyl	5	2	6
EPA 8141A	Chlorpyrifos	5	2	6
EPA 8141A	Diazinon	5	2	6
EPA 8141A	Dimethoate	5	2	6
EPA 8141A	Disulfoton	5	2	6
EPA 8141A	Malathion	5	2	6
EPA 8141A	Methamidophos	5	2	6
EPA 8141A	Methidathion	5	2	6
EPA 8141A	Molinate	5	2	6
EPA 8141A	Parathion, Methyl	5	2	6
EPA 8141A	Phorate	5	2	6
EPA 8141A	Phosmet	5	2	6
EPA 8141A	Thiobencarb	5	2	6
	Pyrethroids			
EPA 8081A	Bifenthrin	5	2	6
EPA 8081A	Cyfluthrin, total	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	5	2	6
EPA 8081A	Cypermethrin, total	5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	5	2	6
EPA 8081A	Permethrin, total	5	2	6
	Triazines			
EPA 547M	Glyphosate	5	2	6
EPA 549.2M	Paraquat dichloride	5	2	6
EPA 619	Atrazine	5	2	6
EPA 619	Cyanazine	5	2	6
EPA 619	Simazine	5	2	6
	Metals			
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
	Nutrients			
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N		1	
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N		1	
EPA 365.2	OrthoPhosphate as P		1	
EPA 365.2	Phosphate as P			
	Toxicity			
EPA 821/R-02-012	*Ceriodaphnia dubia*	5	2	9
EPA 821/R-02-012	*Pimephales promelas*	5	2	6
EPA 821/R-02-013	*Selenastrum capricornutum*	5	2	6

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Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 600/R-99-064	*Hyalella azteca*	1	1	1

Exceedance History

Exceedances of WQTLs include nine dissolved oxygen (DO), six *E. coli*, 13 color, and four chlorpyrifos (Table VII-3). *Ceriodaphnia* also experienced toxicity five times (Table VII-3). Black Rascal Creek is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Black Rascal Creek site subwatershed, the constituent receiving the highest priority was chlorpyrifos (B) which is associated with *Ceriodaphnia* toxicity in two of the five samples exhibiting toxicity.

Table VII-3. Exceedances experienced in samples collected from the Black Rascal Creek @ Yosemite Rd Coalition monitoring site between May 2006 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Color, color units	*E. coli*, MPN/100 mL	Chlorpyrifos, µg/L	*Ceriodaphnia dubia*, Survival (%)
Black Rascal Creek @ Yosemite Rd	Irrigation	18/May/2006	5.41	280	2400	0.033	
Black Rascal Creek @ Yosemite Rd	Irrigation	14/Jun/2006		90	490		
Black Rascal Creek @ Yosemite Rd	Irrigation	12/Jul/2006	5.53	90			
Black Rascal Creek @ Yosemite Rd	Irrigation	09/Aug/2006	5.65	44			
Black Rascal Creek @ Yosemite Rd	Irrigation	12/Sep/2006	5.56	100			
Black Rascal Creek @ Yosemite Rd	Irrigation	17/Apr/2007		22			
Black Rascal Creek @ Yosemite Rd	Irrigation	29/May/2007	3.93	65	770		20
Black Rascal Creek @ Yosemite Rd	Irrigation	26/Jun/2007	6.95	120			
Black Rascal Creek @ Yosemite Rd	Irrigation	24/Jul/2007		56	580	3.7	0
Black Rascal Creek @ Yosemite Rd	Irrigation	31/Jul/2007					0
Black Rascal Creek @ Yosemite Rd	Irrigation	21/Aug/2007	6.42	65		0.12	0
Black Rascal Creek @ Yosemite Rd	Irrigation	23/Aug/2007	5.69				
Black Rascal Creek @ Yosemite Rd	Irrigation	28/Aug/2007	6.18				0
Black Rascal Creek @ Yosemite Rd	Irrigation	18/Sep/2007		140		0.031	
Black Rascal Creek @ Yosemite Rd	Storm	12/Feb/2007		110	2400		
Black Rascal Creek @ Yosemite Rd	Storm	01/Mar/2007		180	2400		
Priorities			**E**	**E**	**E**	**B**	**D**

2007 Management Plan Monitoring Results

No Management Plan samples were taken in the Black Rascal Creek @ Yosemite Rd site subwatershed in 2007. The second exceedance for chlorpyrifos did not occur until July 2007 and therefore this is the first year that chlorpyrifos is under a Management Plan. All of the *Ceriodaphnia* toxicities occurred during the 2007 irrigation season and therefore this is the first year that *Ceriodaphnia* requires a Management Plan.

Load Calculations

No load estimates were able to be made as there was no flow recorded at the time of the chlorpyrifos exceedances.

Source Identification

Priority B Constituents

Chlorpyrifos

Exceedances of chlorpyrifos were associated with the irrigation season in 2006 and 2007 (Table VII-3). The number of chlorpyrifos applications including the total pounds applied and total acres treated is included in Table VII-4 and Figure VII-2.

The exceedances were all well above the WQTL and the August 2007 exceedance was approximately 200 times the WQTL. This exceedance was associated discharge that entered Black Rascal Creek after a hull-split application of chlorpyrifos. At that time, the creek was dammed by a beaver and flow was essentially nonexistent. All of the chlorpyrifos entering the creek remained in solution and was not moved downstream. The exceedance prompted a visit to the grower by Coalition representatives during which time discussions occurred about management practices that could prevent future movement of chlorpyrifos to the creek.

Two of the chlorpyrifos exceedances were associated with *Ceriodaphnia* toxicity and TIE results indicated that a metabolically activated pesticide was the source of the toxicity. These results suggest that all exceedances are the result of irrigation tail water transporting chlorpyrifos to the creek.

Table VII-4. Number of chlorpyrifos applications, total pounds applied, and total acres treated by month for 2006 through 2007 in the Black Rascal Creek @ Yosemite Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
May 2006	2	173.31	91
May 2007	6	266.60	142
July 2007	4	351.49	174
2006 Total	2	173.31	91
2007 Total	10	618.09	316
Total	**12**	**791.40**	**407**

Figure VII-2. Pounds of chlorpyrifos applied within the Black Rascal Creek @ Yosemite Rd site subwatershed by month for 2006-2007. Asterisk (*) denotes months with exceedances.

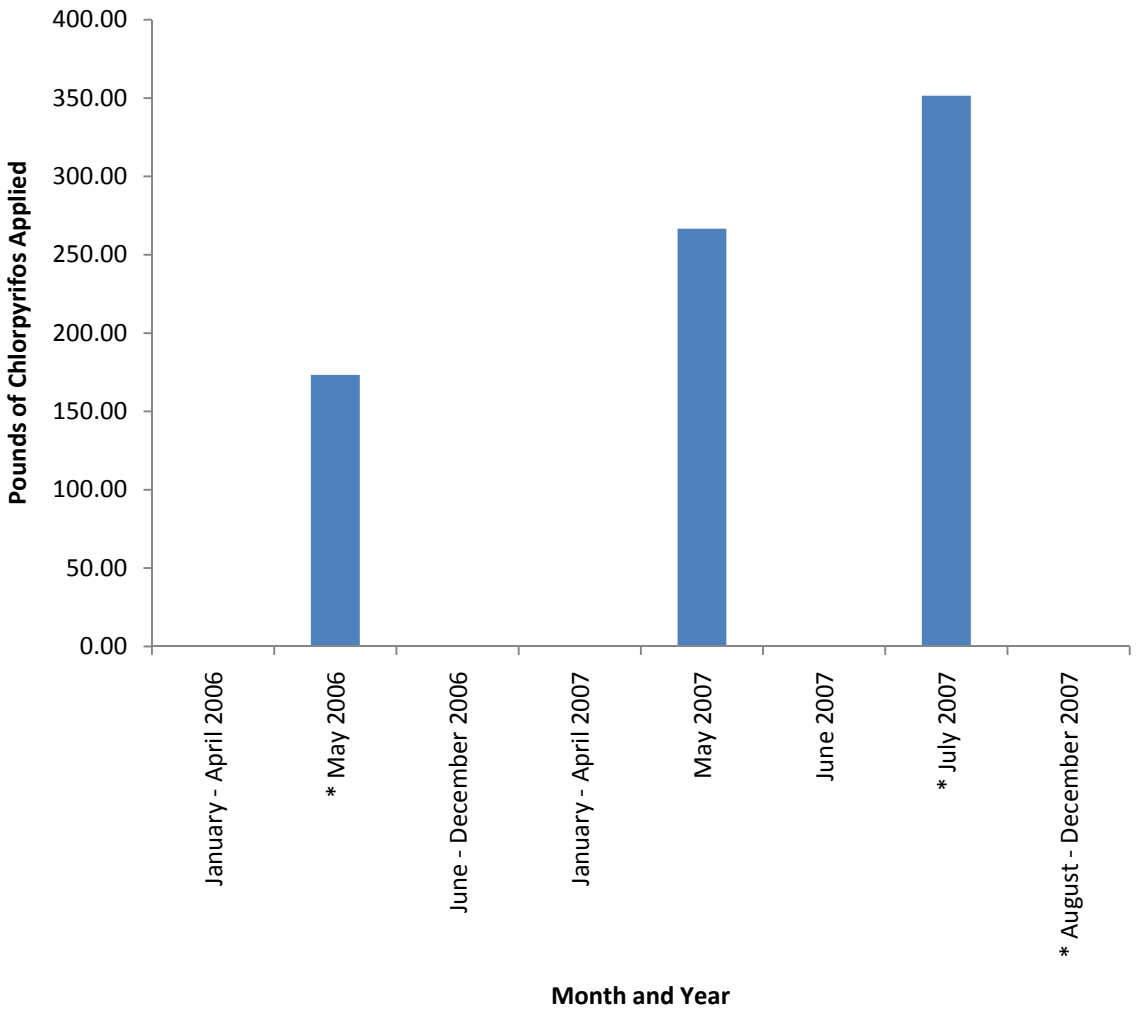


Table VII-5. Black Rascal Creekl @ Yosemite Rd. All TRS that had more than one application associated with an exceedance for chlorpyrifos in 2006 and 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS. No PUR applications were reported within a month of the 8/21/07 and 9/18/07 exceedance dates.

TRS	Date of Associated Exceedance			
	5/18/2006	7/24/2007	8/21/2007	9/18/2007
7S14E12		4		
7S14E13	2			

Ceriodaphnia dubia toxicity

There were five occurrences of Ceriodaphnia toxicity, three from normal monitoring and two as follow-up resampling. TIEs were performed only on the samples collected during normal

monitoring. Two of the three *Ceriodaphnia* exceedances were associated with the exceedances of chlorpyrifos and the TIEs indicated organophosphate pesticides as the likely source of the toxicity in two of those tests. Pyrethroids plus a non-polar organic were the cause of toxicity in the third *Ceriodaphnia* toxicity event. No pyrethroid was detected in the sample at this time. It appears that both sediment-bound and soluble constituents were responsible for the toxicity and therefore management of both tail water and sediment are important in this watershed.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events (Table VII-6). Two of the samples contained measurable amounts of BOD however only one of the samples experienced an exceedance of the DO WQTL and this sample did not contain any measureable BOD. This particular DO exceedance was only slightly below the WQTL of 7 mg/L. These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table VII-6. Black Rascal Creek @ Yosemite Rd. BOD, pH and dissolved oxygen results for September 2006-July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Black Rascal Creek @ Yosemite Rd	9/12/2006	7.41	5.56	ND
Black Rascal Creek @ Yosemite Rd	2/12/2007	8.45	9.09	10
Black Rascal Creek @ Yosemite Rd	3/1/2007	7.45	7.8	ND
Black Rascal Creek @ Yosemite Rd	4/17/2007	6.82	7.32	ND
Black Rascal Creek @ Yosemite Rd	7/24/2007	7.33	7.87	4

E. coli

E. coli exceedances occurred six times between May 2006 and March 2007 and were associated with both the storm and irrigation seasons. No common occurrence links these exceedances. Black Rascal Creek @ Yosemite Rd was not sampled for the 2006 *E. coli* study and it is unclear what the source of the *E. coli* might be. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options. Until that time, the Coalition will not actively manage for *E. coli*.

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring will be conducted at Black Rascal Creek @ Yosemite Rd in May, July, August and September for chlorpyrifos and in May, July and August for *Ceriodaphnia* toxicity during the 2008 irrigation season.

Table VII-7. Black Rascal Creek @ Yosemite Rd. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Ceriodaphnia dubia
Black Rascal Creek @ Yosemite Rd	May	A	**x**	**x**
Black Rascal Creek @ Yosemite Rd	July	A	**x**	**x**
Black Rascal Creek @ Yosemite Rd	August	A	**x**	**x**
Black Rascal Creek @ Yosemite Rd	September	A	**x**	

VIII. COTTONWOOD CREEK

Management Plan Constituents

Priority C

- Copper

Priority E

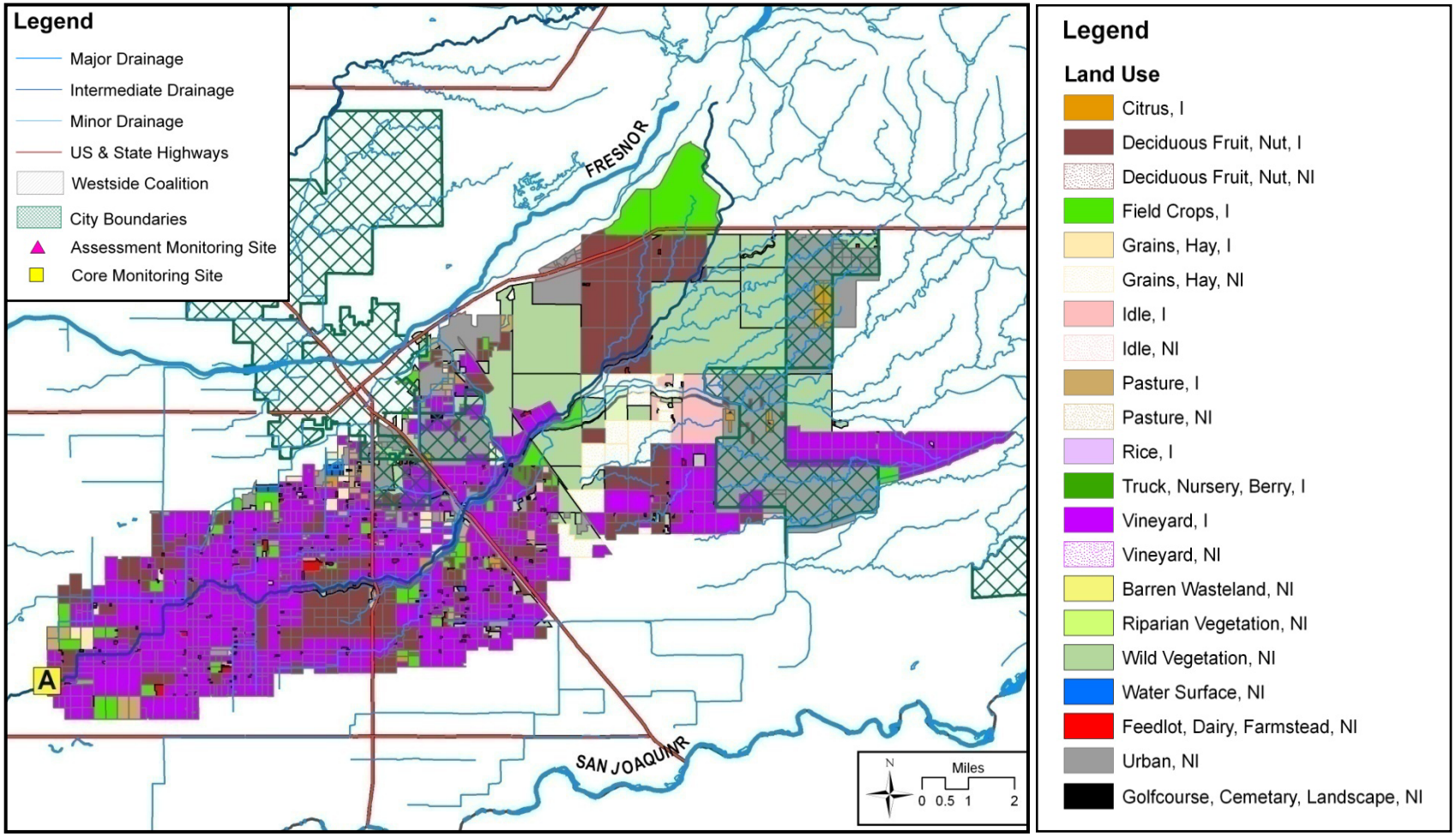
- DO
- Color
- *E. coli*

Description of Cottonwood Creek @ Road 20 Site Subwatershed

Cottonwood Creek @ Road 20 (40,699 irrigated acres) is at the very southern edge of the Coalition region in Madera County and drains into the Eastside Bypass when flows are sufficient. Generally, flows are not sufficient and Cottonwood Creek does not connect to the Bypass. The immediate upstream agriculture is vineyards and there are deciduous orchards farther to the east. There are only a few dairies in the Cottonwood Creek site subwatershed (Figure VIII-1).

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Figure VIII-1. Site subwatershed map of land use for the Cottonwood Creek @ Rd 20 sample site.



Subwatershed Monitoring History

Ambient water monitoring at Cottonwood Creek was initiated in the storm season of 2005. This site has been dry twice during the 2007 storm season and once during the 2007 irrigation season (Table VIII-1). Table VIII-2 lists the constituents sampled each year/season.

Table VIII-1. Cottonwood Creek @ Rd 20 sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	0	5
Events Not Sampled	NA	0	0	0	0	2	1
Total	NA	2	5	2	5	2	6

The two storm events in 2007 were unable to be sampled due to Cottonwood Creek first being dry, and then containing isolated pools of stagnant water during the second sampling event. Cottonwood Creek was also dry during the final irrigation sampling event of 2007.

Table VIII-2. Cottonwood Creek @ Rd 20. Number of analyses performed per analyte in each sampling (only environmental samples are listed).

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5		5
EPA 160.1	Dissolved Solids	2	5	2	5		5
EPA 180.1	Turbidity	2	5	2	5		5
EPA 405.1	BOD				1		2
EPA 415.1	Total Organic Carbon	2	5	2	5		5
SM 9223	E. coli	2	5	2	6		5
NA	Dissolved Oxygen	2	5	3	5		7
NA	Specific Conductivity	2	5	3	5		7
NA	pH	2	5	3	5		7
Carbamates							
EPA 8321A	Aldicarb				5		5
EPA 8321A	Carbaryl				5		5
EPA 8321A	Carbofuran				5		5
EPA 8321A	Diuron				5		5
EPA 8321A	Linuron				5		5
EPA 8321A	Methiocarb				5		5
EPA 8321A	Methomyl				5		5
EPA 8321A	Oxamyl				5		5
Organochlorines							
EPA 8081A	DDD(p,p')				5		5
EPA 8081A	DDE(p,p')				5		5
EPA 8081A	DDT(p,p')				5		5
EPA 8081A	Dicofol				5		5
EPA 8081A	Dieldrin				5		5
EPA 8081A	Endrin				5		5
EPA 8081A	Methoxychlor				5		5
Organophosphates							
EPA 8141A	Azinphos methyl				5		5
EPA 8141A	Chlorpyrifos	2	5	2	5		5
EPA 8141A	Diazinon	2	5	2	5		5
EPA 8141A	Dimethoate				5		5
EPA 8141A	Disulfoton				5		5
EPA 8141A	Malathion				5		5
EPA 8141A	Methamidophos				5		5
EPA 8141A	Methidathion				5		5
EPA 8141A	Molinate				5		5
EPA 8141A	Parathion, Methyl				5		5
EPA 8141A	Phorate				5		5
EPA 8141A	Phosmet				5		5
EPA 8141A	Thiobencarb				5		5
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5		5
EPA 8081A	Cyfluthrin, total		1	2	5		5

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Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5		5
EPA 8081A	Cypermethrin, total	2	5	2	5		5
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5		5
EPA 8081A	Permethrin, total	2	5	2	5		5
Triazines							
EPA 547M	Glyphosate				5		5
EPA 549.2M	Paraquat dichloride				5		5
EPA 619	Atrazine				5		5
EPA 619	Cyanazine				5		5
EPA 619	Simazine				5		5
Metals							
EPA 200.8	Arsenic				5		5
EPA 200.8	Boron				5		5
EPA 200.8	Cadmium				5		5
EPA 200.8	Copper				5		6
EPA 200.8	Lead				5		5
EPA 200.8	Nickel				5		5
EPA 200.8	Selenium				5		2
EPA 200.8	Zinc				5		5
Nutrients							
EPA 130.2	Hardness as CaCO3				5		6
EPA 300.0	Nitrate as N				5		5
EPA 350.2	Ammonia as N				5		5
EPA 351.3	Nitrogen, Total Kjeldahl				5		5
EPA 354.1	Nitrite as N				5		5
EPA 365.2	OrthoPhosphate as P				5		5
EPA 365.2	Phosphate as P				5		5
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	2	5		6
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5		6
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	5		6
EPA 600/R-99-064	*Hyalella azteca*		5	1	1		1

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Exceedance History

Since 2006, exceedances of WQTLs have occurred including 12 dissolved oxygen (DO), 18 color, one pH, six *E. coli*, eight copper, and one lead. Although all exceedances are listed in the following Table VIII-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Cottonwood Creek is not considered impaired and is not on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Cottonwood Creek @ Rd 20 site subwatershed, the constituent receiving the highest priority was copper (C).

Table VIII-3. Exceedances experienced in samples collected from the Cottonwood Creek @ Rd 20 Coalition monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Copper, µg/L	Lead, µg/L
Cottonwood Creek @ Rd 20	Irrigation	10/May/2005			50	540		
Cottonwood Creek @ Rd 20	Irrigation	14/Jun/2005	5.7		80			
Cottonwood Creek @ Rd 20	Irrigation	12/Jul/2005	5.17		40			
Cottonwood Creek @ Rd 20	Irrigation	16/Aug/2005			60	300		
Cottonwood Creek @ Rd 20	Irrigation	20/Sep/2005	6.5		30			
Cottonwood Creek @ Rd 20	Irrigation	16/May/2006	5.71		36		4.4 (3.5)	
Cottonwood Creek @ Rd 20	Irrigation	13/Jun/2006	6.9		40		8 (3.1)	0.73 (0.63)
Cottonwood Creek @ Rd 20	Irrigation	11/Jul/2006	6.51		37			
Cottonwood Creek @ Rd 20	Irrigation	08/Aug/2006	6.95		40			
Cottonwood Creek @ Rd 20	Irrigation	12/Sep/2006	6.11		44		5.5 (4.4)	
Cottonwood Creek @ Rd 20	Irrigation	24/Apr/2007			17			
Cottonwood Creek @ Rd 20	Irrigation	29/May/2007	6.55		24		6.7 (5.5)	
Cottonwood Creek @ Rd 20	Irrigation	19/Jun/2007					6.7 (4.4)	
Cottonwood Creek @ Rd 20	Irrigation	26/Jun/2007			17		4.3 (4.1)	
Cottonwood Creek @ Rd 20	Irrigation	24/Jul/2007		9.04	24		5.4 (4.6)	
Cottonwood Creek @ Rd 20	Irrigation	21/Aug/2007	6.81				5.2 (4.6)	
Cottonwood Creek @ Rd 20	Irrigation	23/Aug/2007	3.95					
Cottonwood Creek @ Rd 20	Storm	16/Feb/2005			200	1600		
Cottonwood Creek @ Rd 20	Storm	21/Mar/2005	5.6		120	1600		
Cottonwood Creek @ Rd 20	Storm	28/Feb/2006			30	300		
Cottonwood Creek @ Rd 20	Storm	15/Mar/2006			350	1600		
Priorities			**E**		**E**	**E**	**C**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

Additional Management Plan monitoring (MPM) was conducted at Cottonwood Creek @ Rd 20 in June and September 20007 for copper (Table VIII-4). The copper WQTL was exceeded in

samples collected from March to August including the MPM conducted on June 19, 2007 (Table VIII-5). The April sample had detectable amounts of copper (3.9 µg/L) however it was not an exceedance. Cottonwood Creek was dry in September and therefore there are no results for normal monitoring (NM) or MPM (Table VIII-5).

Table VIII-4. Cottonwood Creek @ Rd 20. 2007 Management Plan monitoring schedule for copper. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Copper
Cottonwood Creek @ Rd 20	June	**x**
Cottonwood Creek @ Rd 20	September	**x**

Table VIII-5. Cottonwood Creek @ Rd 20. Normal Monitoring (NM) and Management Plan Monitoring (MPM) results for copper from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	MPM	NM	NM	NM	NM	MPM
	4/24/07	5/29/07	6/19/07	6/26/07	7/24/07	8/21/07	9/18/07	9/25/07
Copper (µg/L)	3.9	**6.7**	**6.7**	**4.3**	**5.4**	**5.2**	Site dry	Site dry

Load Calculations

Loads have been calculated for all copper detections in the site subwatershed based on the following formula (TableVIII-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table VIII-6. Cottonwood Creek @ Rd 20. Instantaneous load calculations for copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Cottonwood Creek @ Rd 20	Copper	16/May/2006	2.33	4.4	290.31
Cottonwood Creek @ Rd 20	Copper	13/Jun/2006	2.66	8	602.59
Cottonwood Creek @ Rd 20	Copper	11/Jul/2006	1.96	5.3	294.16
Cottonwood Creek @ Rd 20	Copper	08/Aug/2006	12.92	4.1	1500.01
Cottonwood Creek @ Rd 20	Copper	12/Sep/2006	38.2	5.5	5949.40
Cottonwood Creek @ Rd 20	Copper	24/Apr/2007	28.24	3.9	3118.72
Cottonwood Creek @ Rd 20	Copper	19/Jun/2007	0.59	6.7	111.94
Cottonwood Creek @ Rd 20	Copper	24/Jul/2007	No flow	5.4	0.00

Source Identification

Priority C Constituents

Copper

Eight exceedances of the copper WQTL occurred in the Cottonwood Creek site subwatershed across all summer months in 2006 and 2007. None of the exceedances was associated with toxicity to *Selenastrum*. Copper is applied primarily during the winter and spring months but appears to be mobilized during the summer (Table VIII-7, Figure VIII-2). Copper is heavily used in the watershed with several applications being made across numerous sections (Table VIII-8).

Table VIII-7. Number of copper applications, total pounds applied and total acres treated by month for January 2005 through October 2007 in the Cottonwood Creek @ Rd 20 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2005	21	3147.43	704.3
February 2005	17	2121.75	391
March 2005	78	5544.14	4534.66
April 2005	111	6509.60	5140.24
May 2005	8	133.57	142
June 2005	10	710.24	561
August 2005	9	1473.68	487
September 2005	3	705.00	235
October 2005	8	1464.94	278
November 2005	21	1645.29	420.7
December 2005	1	276.30	60
January 2006	48	8582.86	2205.8
February 2006	24	1357.59	307.2
March 2006	16	1144.05	993.6
April 2006	237	12968.36	13377.61
May 2006	45	2657.94	2294.1
June 2006	9	640.25	450
July 2006	3	281.58	107
August 2006	3	393.78	190
September 2006	1	108.00	36
October 2006	9	1567.05	380.8
November 2006	14	1212.73	478.25
December 2006	5	677.21	183.5
January 2007	23	2444.02	829.71
February 2007	7	715.23	363

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
March 2007	77	3404.82	3981.36
April 2007	49	2094.06	2428.06
May 2007	8	120.77	138.8
July 2007	9	1017.00	684.21
August 2007	2	82.50	30
September 2007	6	590.10	266
October 2007	1	94.08	16
2005 Total	287	23731.94	12953.9
2006 Total	414	31591.39	21003.86
2007 Total	182	10562.57	8737.14
Total	**883**	**65885.90**	**42694.9**

Figure VIII-2. Pounds of copper applied within the Cottonwood Creek @ Rd 20 site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

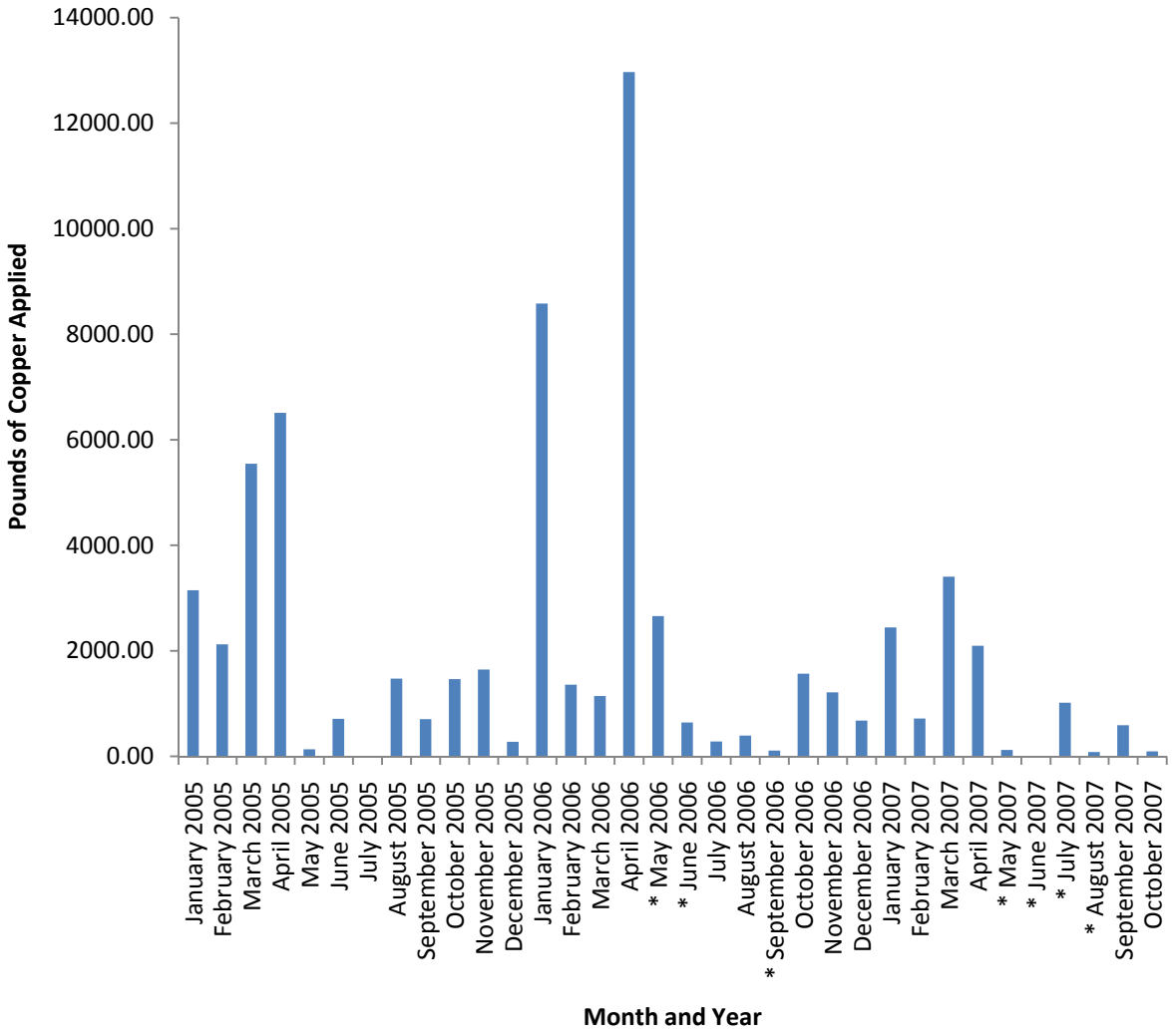


Table VIII-8. Cottonwood Creek @ Rd 20. All TRS that had more than one application associated with an exceedance for copper in 2006 and 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS.

TRS	Date of Associated Exceedance							
	5/16/06	6/13/06	9/12/06	5/29/07	6/19/07	6/26/07	7/24/07	8/21/07
11S17E35	7	7		7	7	6	7	
11S17E36	8	8		6	6	4	4	
11S18E16	1	1						
11S18E19	1	1						
11S18E20	3	3						
11S18E27	3	3						
11S18E28	2	2						
11S18E29	2	2						
11S18E30	1	1						
11S18E32	2	2						
11S18E33	5	5		2	2	1	2	
11S18E34	1	2		1	1	1	1	
11S19E25	1	1						
11S19E26	2	2		1	1	1	1	
11S19E27	1	1		1	1	1	1	
11S19E31			2					1
11S19E36	1	1		1				
12S16E12	3	3		2	1	1	1	
12S16E13	1	1						
12S16E23	4	4						
12S16E24	1	1						
12S16E25	1	1						
12S17E1	4	4		4	3	1	1	
12S17E10	14	14						
12S17E11	6	5		4	4	3	3	
12S17E12	1	1						
12S17E13	1	1		2	1			
12S17E14	3	3		1	1			
12S17E15	12	15		8	8	8	8	
12S17E16	11	13	2	9	9	4	6	2
12S17E17							6	6
12S17E18				4	2		3	3
12S17E19	19	19		4	4		1	
12S17E2	4	4		3	1	1	1	
12S17E20				1	1	1	1	
12S17E21	7	17	2	5	5	4	5	
12S17E22	8	8		4	4	4	4	

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TRS	Date of Associated Exceedance							
	5/16/06	6/13/06	9/12/06	5/29/07	6/19/07	6/26/07	7/24/07	8/21/07
12S17E23	4	4		1	1	1	1	
12S17E24	2	2	1	3	1	1	1	
12S17E27	11	11						
12S17E28	6	6		1	1	1	1	
12S17E3	5	4		2	1		1	
12S17E4	5	5		8	8	4	5	
12S17E5	3	3		3	3	2	2	
12S17E7	10	10		2	2	2	2	
12S17E8	2	2		2	2	2	2	
12S17E9	7	7		8	8	8	8	
12S18E1				1	1	1	1	
12S18E10	11	10		3	3	2	2	
12S18E12	2	2		2	1	1	1	
12S18E15	2	3		2	2	2	2	
12S18E16	3	1		1				
12S18E17	11	11		3	3	2	3	1
12S18E19	3	3		2	2	2	2	
12S18E2	1	1						
12S18E20	7	7		4	4	4	4	
12S18E21	10	10		5	5	4	4	
12S18E22	1	1		4	4	4	4	
12S18E3	10	10		2	2	2	2	
12S18E4	3	3	1	3	3	2	2	
12S18E5	4	4		2	2		2	
12S18E6	7	7		4	4	4	4	
12S18E7	2	2						
12S18E8	6	7						
12S18E9	4	4		1	1			
12S19E5	4	4		2	2	1	2	
12S19E6	2	2						

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. None of the samples contained measurable amounts of BOD however only one of the samples experienced an exceedance of the DO WQTL (Table VIII-9). These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site

is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table VIII-9. Cottonwood Creek @ Rd 20 BOD, pH and DO results for September 2006 through July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Cottonwood Creek @ Rd 20	9/12/2006	7.71	6.11	ND
Cottonwood Creek @ Rd 20	4/24/2007	8.04	10.96	ND
Cottonwood Creek @ Rd 20	7/24/2007	9.04	8.35	ND

E. coli

E. coli exceedances occurred six times between February 2005 and March 2006. Exceedances occurred during the winter and irrigation seasons with four exceedances associated with storm events and two exceedances in the irrigation season. No common occurrence links these exceedances. Cottonwood Creek @ Road 20 and upstream sites, Cottonwood Creek @ Highway 145 and Cottonwood Creek @ Avenue 15 were sampled during the ESJWQC *E. coli* study. Results indicated that the contamination was a result of human fecal inputs. Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table VIII-10. Results of Bacteroides analysis For Cottonwood Creek. Cottonwood Creek @ Rd 20 was sampled three times daily for three consecutive days, and its upstream sites, Cottonwood Creek @ Hwy 145 and Cottonwood Creek @ Ave 15, were sampled only once. A + indicates the DNA was detected but at too low of a concentration to estimate a percentage.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
545XCCART	8/22/06	10:30	Grab	12.5	0	+
545XCCART	8/22/06	15:50	Grab	25	0	50
545XCCART	8/22/06	19:50	Grab	50	0	50
545XCCART	8/23/06	8:50	Grab	50	0	0
545XCCART	8/23/06	13:40	Grab	25	0	0
545XCCART	8/23/06	18:00	Grab	25	0	0
545XCCART	8/24/06	8:50	Grab	50	0	+
545XCCART	8/24/06	14:10	Grab	50	0	0
545XCCART	8/24/06	18:20	Grab	50	0	+
545XCCAAF	8/29/06	15:00	Grab	50	0	0
545XCCAHO	8/29/06	13:50	Grab	6.25	0	0

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring occurred at Cottonwood Creek @ Hwy 145 during the 2007 irrigation season. Sampling during the 2007 irrigation season resulted in exceedances and therefore the Coalition will conduct upstream Management Plan monitoring in this site subwatershed during the 2008 irrigation season (Figure VII-3). Cottonwood Creek @ Hwy 145 will be sampled every month from May to September for copper (Table VIII-11).

Figure VIII-3. Site subwatershed map of land use for the Cottonwood Creek @ Hwy 145 upstream sample site.

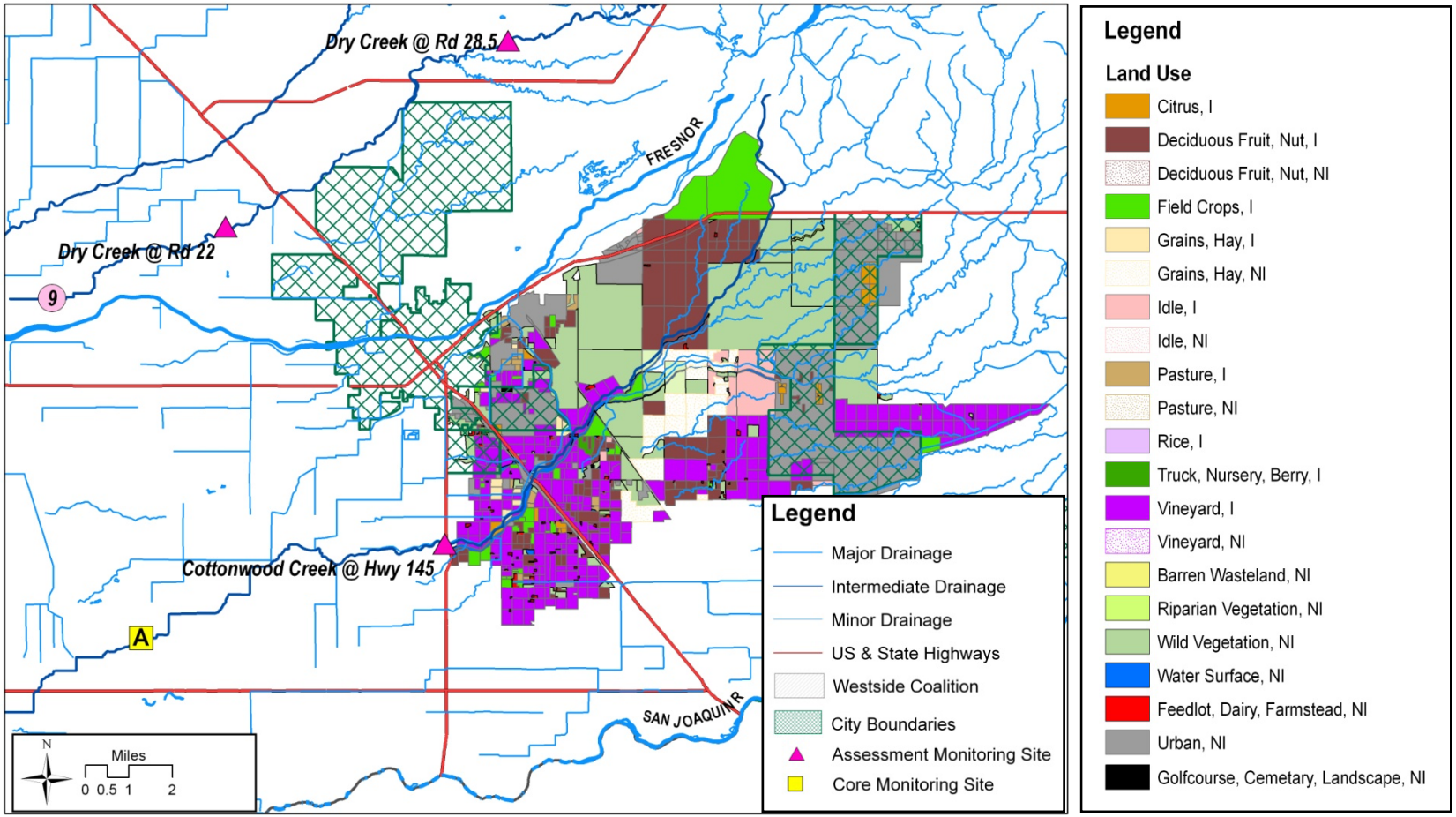


Table VIII-11. Cottonwood Creek @ Hwy 145. 2008 Management Plan sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Copper
Cottonwood Creek @ Hwy 145	May	U	x
Cottonwood Creek @ Hwy 145	June	U	x
Cottonwood Creek @ Hwy 145	July	U	x
Cottonwood Creek @ Hwy 145	August	U	x
Cottonwood Creek @ Hwy 145	September	U	x

Table VIII-12. Sampling locations within the Cottonwood Creek site subwatershed.

Station Name	Station Code	Target Latitude	Target Longitude
Cottonwood Creek @ Road 20*	545XCCART	36.8686	-120.1818
Cottonwood Creek @ Hwy 145[U]	545XCCAHO	36.9002	-120.05545

*Original ESJWQC sampling site
[U]Upstream sites

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IX. DEADMAN CREEK @ GURR ROAD

Management Plan Constituents

Priority C

- Copper

Priority D

- *Pimephales promelas* water column toxicity

Priority E

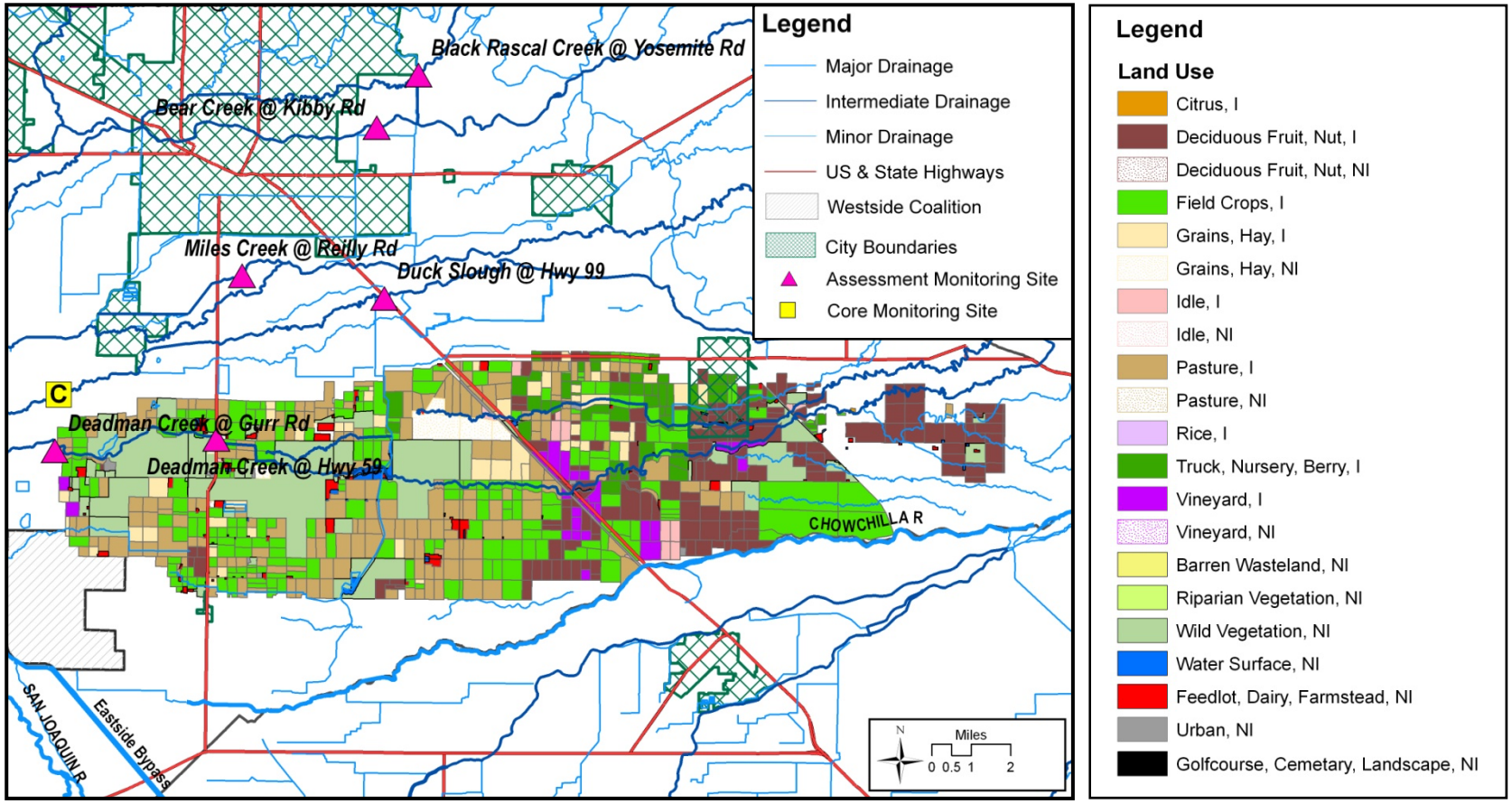
- *E. coli*
- Arsenic
- Cadmium

Description of Deadman Creek @ Gurr Road Site Subwatershed

Deadman Creek @ Gurr Rd (52,091 irrigated acres) is downstream from Deadman Creek @ Hwy 59) and is also referred to as Dutchman Creek. The primary agriculture in the site subwatershed is orchards and row crops with some irrigated pasture upstream (Figure IX-1).

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Figure IX-1. Site subwatershed map of land use for the Deadman Creek @ Gurr Rd sample site.



Subwatershed Monitoring History

Monitoring was initiated at this site in the 2004 irrigation season. Sampling was discontinued in 2005 and the 2006 storm season, and resumed in the 2006 irrigation season (Table IX-1). Table IX-2 includes the constituents sampled at Deadman Creek @ Gurr Rd by year/season.

Table IX-1. Deadman Creek @ Gurr Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling. NA indicates no sampling took place.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	3	NA	NA	NA	5	2	6

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Table IX-2. Deadman Creek @ Gurr Rd. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters								
EPA 110.2	Color	3				5	2	6
EPA 160.1	Dissolved Solids	3				5	2	6
EPA 180.1	Turbidity	3				5	2	6
EPA 405.1	BOD					1	1	2
EPA 415.1	Total Organic Carbon	4				5	2	6
SM 9223	E. coli	3				5	2	6
NA	Dissolved Oxygen	3				6	3	9
NA	Specific Conductivity	3				6	3	9
NA	pH	3				6	3	9
Carbamates								
EPA 8321A	Aldicarb					5	2	6
EPA 8321A	Carbaryl					5	2	6
EPA 8321A	Carbofuran					5	2	6
EPA 8321A	Diuron					5	2	6
EPA 8321A	Linuron					5	2	6
EPA 8321A	Methiocarb					5	2	6
EPA 8321A	Methomyl					5	2	6
EPA 8321A	Oxamyl					5	2	6
Organochlorines								
EPA 8081A	DDD(p,p')					5	2	6
EPA 8081A	DDE(p,p')					5	2	6
EPA 8081A	DDT(p,p')					5	2	6
EPA 8081A	Dicofol					5	2	6
EPA 8081A	Dieldrin					5	2	6
EPA 8081A	Endrin					5	2	6
EPA 8081A	Methoxychlor					5	2	6
Oranophosphates								
EPA 8141A	Azinphos methyl						2	6
EPA 8141A	Chlorpyrifos	3				5	2	6
EPA 8141A	Diazinon	3				5	2	6
EPA 8141A	Dimethoate	1				5	2	6
EPA 8141A	Disulfoton	1				5	2	6
EPA 8141A	Malathion	1				5	2	6
EPA 8141A	Methamidophos					5	2	6
EPA 8141A	Methidathion					5	2	6
EPA 8141A	Molinate					5	2	6
EPA 8141A	Parathion, Methyl	1				5	2	6
EPA 8141A	Phorate	1				5	2	6
EPA 8141A	Phosmet					5	2	6
EPA 8141A	Thiobencarb					5	2	6
Pyrethroids								

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Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	Bifenthrin					5	2	6
EPA 8081A	Cyfluthrin, total					5	2	6
EPA 8081A	Cyhalothrin, lambda, total	3				5	2	6
EPA 8081A	Cypermethrin, total	3				5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	3				5	2	6
EPA 8081A	Permethrin, total	3				5	2	6
Triazines								
EPA 547M	Glyphosate					5	2	6
EPA 549.2M	Paraquat dichloride					5	2	6
EPA 619	Atrazine					5	2	6
EPA 619	Cyanazine					5	2	6
EPA 619	Simazine					5	2	6
Metals								
EPA 200.8	Arsenic					5	2	6
EPA 200.8	Boron					5	2	6
EPA 200.8	Cadmium					5	2	6
EPA 200.8	Copper					5	2	6
EPA 200.8	Lead					5	2	6
EPA 200.8	Nickel					5	2	6
EPA 200.8	Selenium					5	2	2
EPA 200.8	Zinc					5	2	6
Nutrients								
EPA 130.2	Hardness as CaCO3					5	2	6
EPA 300.0	Nitrate as N					5	2	6
EPA 350.2	Ammonia as N					5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl					5	2	6
EPA 354.1	Nitrite as N					5	2	6
EPA 365.2	OrthoPhosphate as P					5	2	6
EPA 365.2	Phosphate as P					5	2	6
Toxicity								
EPA 821/R-02-012	*Ceriodaphnia dubia*	3				5	2	7
EPA 821/R-02-012	*Pimephales promelas*	3				6	2	8
EPA 821/R-02-013	*Selenastrum capricornutum*	3				5	2	8
EPA 600/R-99-064	*Hyalella azteca*	2				1	1	1

Exceedance History

Numerous WQTLs have been exceeded in samples collected from Deadman Creek @ Gurr Rd including nine DO, 13 *E. coli*, 16 color, one chlorpyrifos, one exceedance each of malathion, lead, and nickel, and two exceedances each of arsenic and cadmium WQTLs. Samples have been toxic to *Pimephales promelas* twice and *Selenastrum* once. Although all exceedances are listed in Table IX-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Deadman Creek is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Deadman Creek @ Gurr Rd site subwatershed, the constituent receiving the highest priority was copper (C).

Table IX-3. Exceedances experienced in samples collected from the Deadman Creek @ Gurr Rd Coalition monitoring site between July 2004 and September 2007 (sorted by season and date). Monitoring did not occur at Deadman Creek between September 2004 and May 2006.

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Color, color units	E. coli, MPN/100 mL	Arsenic, µg/L	Cadmium, µg/L	Copper, µg/L	Lead, µg/L	Nickel, µg/L	Chlorpyrifos, µg/L	Malathion, µg/L	Pimephales promelas, Survival (%)	Selenastrum capricornutum, Total Cell Count
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	31/Jul/2004	6.85	150	1600									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	31/Aug/2004		50	1600									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	29/Sep/2004	6.7	100	500									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	17/May/2006		65	1200									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	13/Jun/2006	5.01	40	310								88	
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	11/Jul/2006	6.5	70	490									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	08/Aug/2006	6.96	100	390							0.19		
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	12/Sep/2006	6.08	40	2400						0.027			
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	24/Apr/2007		40				9.2 (7.7)						
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	29/May/2007	5.11	40	1400			8.8 (7.5)					85	
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	26/Jun/2007		50	460									
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	24/Jul/2007	5.38	70			0.06							234233
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	21/Aug/2007		25										
Deadman Creek (Dutchman) @ Gurr Rd	Irrigation	18/Sep/2007	5.88	30	820									
Deadman Creek (Dutchman) @ Gurr Rd	Storm	11/Feb/2007		200	2400	14	0.07	16 (15.4)	3.1	16				
Deadman Creek (Dutchman) @ Gurr Rd	Storm	28/Feb/2007		60	1000	14								
Priorities					**E**	**E**	**E**	**C**					**D**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

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2007 Management Plan Monitoring Results

No Management Plan Monitoring was conducted at the Deadman Creek @ Gurr Rd site during 2007. The second copper and *Pimephales* toxicity occurred during the irrigation season of 2007 and therefore the Coalition will conduct additional Management Plan monitoring during the irrigation season of 2008.

Load Calculations

Loads have been calculated for all copper detections in the site subwatershed based on the following formula (Table IX-4):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table IX-4. Deadman Creek @ Gurr Rd. Instantaneous load calculations for copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek @ Gurr Rd	Copper	17/May/2006	9.95	7.5	2113.16
Deadman Creek @ Gurr Rd	Copper	13/Jun/2006	13.7	4.6	1784.54
Deadman Creek @ Gurr Rd	Copper	11/Jul/2006	1.44	9.1	371.07
Deadman Creek @ Gurr Rd	Copper	08/Aug/2006	8.45	6.9	1651.02
Deadman Creek @ Gurr Rd	Copper	12/Sep/2006	34.18	7.7	7452.64
Deadman Creek @ Gurr Rd	Copper	11/Feb/2007	4.77	16	2161.15
Deadman Creek @ Gurr Rd	Copper	28/Feb/2007	0.87	9.7	238.97
Deadman Creek @ Gurr Rd	Copper	24/Apr/2007	15.15	9.2	3946.82
Deadman Creek @ Gurr Rd	Copper	26/Jun/2007	10.21	7.5	2168.37
Deadman Creek @ Gurr Rd	Copper	24/Jul/2007	7.81	9.2	2034.63
Deadman Creek @ Gurr Rd	Copper	21/Aug/2007	No flow	4.2	0.00

Source Identification

Priority C Constituent

Copper

Three exceedances of the copper WQTL occurred in the Deadman Creek @ Gurr Rd site subwatershed; February 2007, April 2007, and May 2007 (Table IX-3). None were associated

with *Selenastrum* toxicity. Large amounts of copper were applied during the three months in which exceedances occurred although the January-February applications in 2007 were low relative to other years (Table IX-5, Figure IX-2).

Applications were made in multiple TRS' across the watershed prior to all exceedances (Table IX-6) and it appears that management of both storm water and irrigation tail water will be necessary to prevent the movement of copper to Deadman Creek.

Table IX-5. Number of copper applications, total pounds applied and total acres treated by month for September 2004-December 2004, and January 2006 through May 2007 in the Deadman Creek @ Gurr Rd site subwatershed. If a month is not included, no applications were made. Deadman Creek @ Gurr Rd was not sampled in 2005.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
September 2004	3	399.10	280
October 2004	3	478.92	230
November 2004	6	1446.60	327
December 2004	3	862.40	112
January 2006	10	1239.16	190.4
February 2006	5	170.44	120
March 2006	3	357.29	253
April 2006	26	3243.18	2660.3
May 2006	14	1269.93	780
November 2006	14	2433.20	316
December 2006	4	587.40	132
January 2007	8	454.58	110.4
February 2007	5	195.02	141
March 2007	7	560.84	654.5
April 2007	18	1828.80	1554.3
May 2007	1	9.21	10
2004 Total	15	3187.02	949
2006 Total	76	9300.60	4451.7
2007 Total	39	3048.46	2470.2
Total	**130**	**15536.07**	**7870.9**

Figure IX-2. Pounds of copper applied within the Deadman Creek @ Gurr Rd site subwatershed by month for 2004 and 2006-2007. Asterisk (*) denotes months with exceedances.

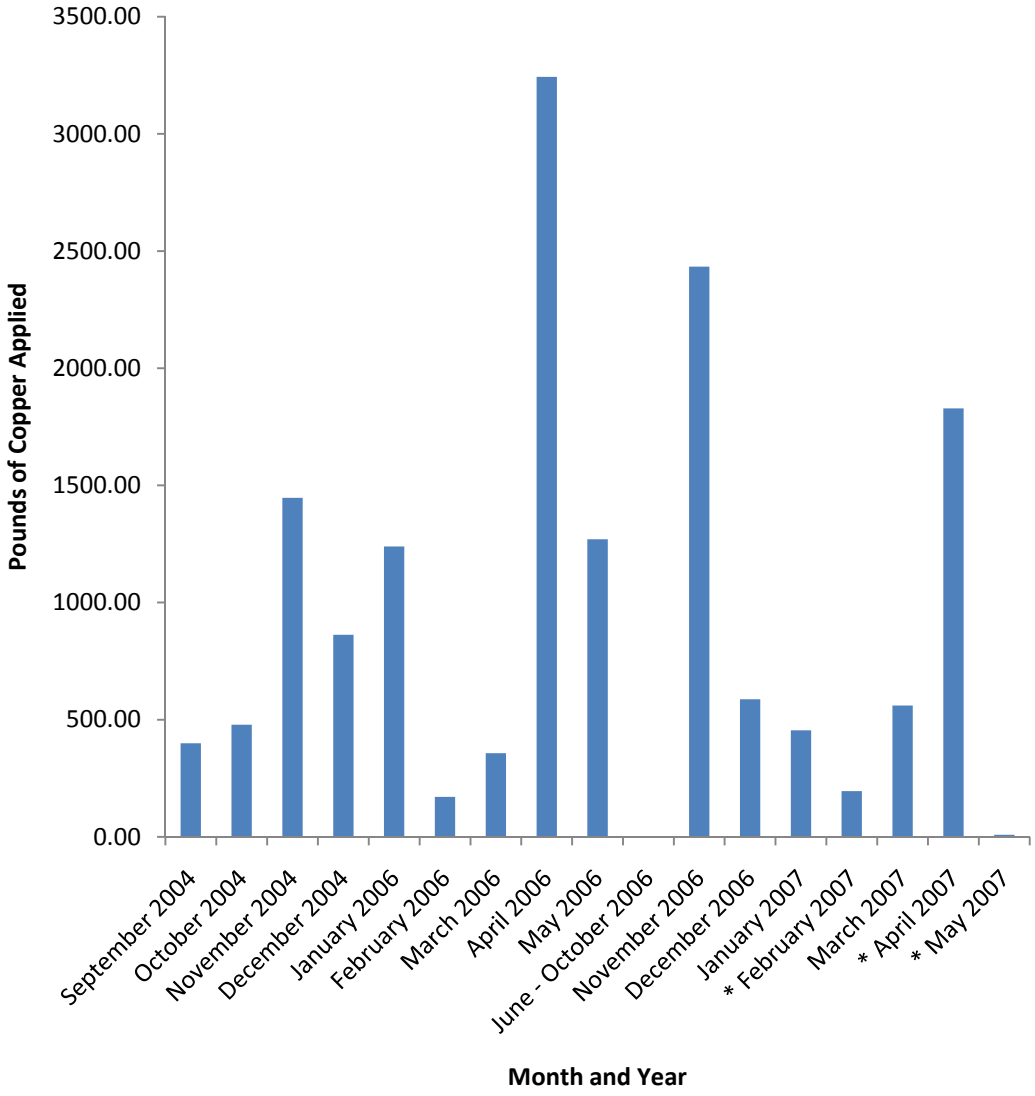


Table IX-6. Deadman Creek @ Gurr Rd. All TRS that had more than one application associated with an exceedance for copper in 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS.

TRS	Date of Associated Exceedance		
	2/11/2007	4/24/2007	5/29/2007
8S15E14	2	1	1
8S15E15	3	3	3
8S15E16		1	1
8S15E17		5	3
8S15E21	1		1
8S15E26		1	1
8S15E29		1	1
8S16E28	1	1	
8S16E31		3	3
8S16E32		5	5
9S13E14	4		
9S15E12		2	2
9S15E16		4	4
9S15E21	3		
9S15E3		1	1
9S16E12	2		

Priority D Constituent

Pimephales promelas toxicity

Samples collected from Deadman Creek @ Gurr Rd were toxic to *Pimephales promelas* twice during Coalition monitoring; June 2006 and May 2007. The level of toxicity experienced was quite small and no TIEs were performed (both samples had greater than 80% survival). The December 2006 SAMR analysis stated that there were no detections of any chemical including ammonia and provided several potential chemicals that could have caused toxicity to *Pimephales*. However, there was no toxicity to *Ceriodaphnia* which is generally more sensitive to the chemicals than *Pimephales*. At this time the cause of the toxicity to *Pimephales* is unknown, but managing irrigation tail water should eliminate the source of toxicity.

Priority E Constituents

E. coli

Exceedances of the *E. coli* WQTL occurred in nearly every month of sampling, and across the years of monitoring, every month has experienced an exceedance. This site subwatershed is large and has numerous dairies which could have contributed fecal material to the drain. During the *E. coli*/Bacteroides study, Deadman Creek was one of the few locations where

bovine Bacteroides was detected indicating very recent contamination by cows (Table XI-7). Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table IX-7. Results of Bacteroides analysis. Deadman Creek @ Gurr Rd was sampled three times daily for three consecutive days, and its upstream sites, Dutchman Creek along Sandy Mush Rd and Dutchman Creek @ Minturn, were sampled only once. A + indicates the DNA was detected but at too low of a concentration to estimate a percentage.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
535XDCAGR	8/22/06	14:20	Grab	50	0	0
535XDCAGR	8/22/06	14:20	Grab	50	0	+
535XDCAGR	8/22/06	18:40	Grab	25	0	0
535XDCAGR	8/23/06	7:40	Grab	50	0	0
535XDCAGR	8/23/06	12:20	Grab	50	0	0
535XDCAGR	8/23/06	16:50	Grab	6.25	0.001953	0
535XDCAGR	8/24/06	7:40	Grab	12.5	0.015625	0
535XDCAGR	8/24/06	12:30	Grab	50	0	0
535XDCAGR	8/24/06	17:20	Grab	32	0.001	0
535XDCASM	8/29/06	17:50	Grab	100	0	0
535XDCAMR	8/30/06	7:40	Grab	25	0	0

Arsenic

Arsenic exceedances occurred in the February 2007 storm events. Arsenic is found in sodium cacodylate which can be applied by agriculture for broadleaf weed control and as a cotton defoliant. The registrations on many products with this active ingredient have been cancelled. However, there are four products currently registered for use on citrus, for weed control around ditches, for use on ornamental plants, for nonagricultural weed control, and for weed control around buildings, driveways, sidewalks, rights-of-way, and fencerows. Several products are available for use by homeowners and nonagricultural users (e.g. county road maintenance) (http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC34358&Chem_Name=Sodium%20cacodylate&PC_Code=012502) and the product may have been purchased for use by local homeowners for use on their property. California Department of Pesticide Regulation records indicate no use of sodium cacodylate across the Coalition region between 1998 and 2007 for agricultural use.

At this point the source of arsenic is unclear although native soils can contain elevated concentrations of arsenic. The Coalition will work with the Regional Board to determine if it is

feasible to obtain the necessary data to establish background levels when arsenic becomes a priority.

Cadmium

Since the time of this exceedance, the WQTL for cadmium has increased to 5 µg/L and the exceedances listed above are therefore no longer considered an exceedance. As a result, the Coalition will not develop a strategy to manage cadmium.

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. Only one of the samples collected at Deadman Creek @ Gurr Rd contained measurable amounts of BOD but the sample was not associated with the exceedance of DO in September 2006 (6.08 mg/L). All other samples were collected at times when there were no DO exceedances (Table IX-8). Deadman Creek @ Hwy 59 which is upstream of Gurr Rd also had no detectable levels of BOD. These results do not eliminate BOD as a cause of low DO and it is unknown what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table IX-8. Deadman Creek @ Gurr Rd. BOD, pH and dissolved oxygen results for September 2006 through July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	Oxygen, Dissolved	pH	BOD, mg/L
Deadman Creek (Dutchman) @ Gurr Rd	12-Sep-06	6.08	6.57	ND
Deadman Creek (Dutchman) @ Gurr Rd	11-Feb-07	7.68	8.18	7
Deadman Creek (Dutchman) @ Gurr Rd	28-Feb-07	9.4	8.46	ND
Deadman Creek (Dutchman) @ Gurr Rd	24-Apr-07	8.77	7.43	ND

2008 Management Plan Monitoring

Additional Management Plan monitoring will be conducted for the first time at Deadman Creek @ Gurr Rd in April and May for copper and May and June for *Pimephales* (Table IX-8).

Table IX-9. Deadman Creek @ Gurr Rd. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Copper	*Pimephales promelas*
Deadmans Creek @ Gurr Rd	April	A	**x**	
Deadmans Creek @ Gurr Rd	May	A	**x**	**x**
Deadmans Creek @ Gurr Rd	June	A		**x**

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X. DEADMAN CREEK @ HIGHWAY 59

Management Plan Constituents

Priority B

- Chlorpyrifos

Priority E

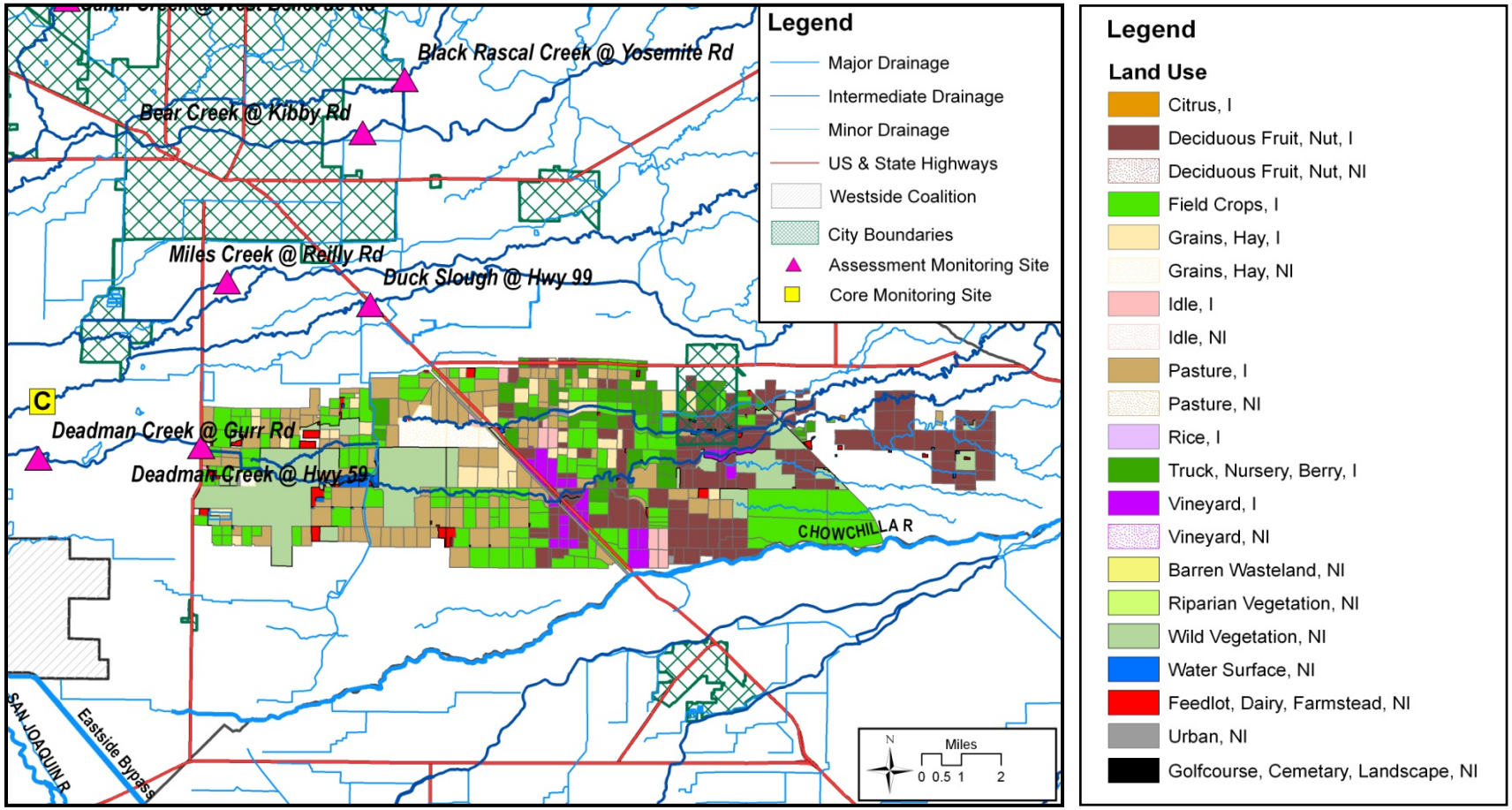
- DO
- Color
- *E. coli*

Description of Deadman Creek @ Highway 59 Site Subwatershed

Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59. Deadman Creek @ Highway 59 (38,231 irrigated acres) primary agriculture is orchards and row crops with some irrigated pasture upstream (Figure X-1).

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Figure X-1. Site subwatershed map of land use for the Deadman Creek @ Hwy 59 sample site.



Subwatershed Monitoring History

Monitoring was initiated at this site in the 2006 irrigation season (Tables X-1). This location has not been dry during any of the monitoring events and samples have been collected during every event. Table X-2 lists the constituents which have been sampled for by year and season.

Table X-1. Deadman Creek @ Hwy 59 sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	5	2	6

NA indicates that a site was not sampled for that year/season.

Table X-2. Deadman Creek @ Hwy 59. Number of analyses performed per analyte in each sampling season (only environmental samples are listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	5	2	6
EPA 160.1	Dissolved Solids	5	2	6
EPA 180.1	Turbidity	5	2	6
EPA 405.1	BOD	1	2	2
EPA 415.1	Total Organic Carbon	5	2	6
SM 9223	E. coli	5	2	6
NA	Dissolved Oxygen	5	3	7
NA	Specific Conductivity	5	3	7
NA	pH	5	3	7
Carbamates				
EPA 8321A	Aldicarb	5	2	6
EPA 8321A	Carbaryl	5	2	6
EPA 8321A	Carbofuran	5	2	6
EPA 8321A	Diuron	5	2	6
EPA 8321A	Linuron	5	2	6
EPA 8321A	Methiocarb	5	2	6
EPA 8321A	Methomyl	5	2	6
EPA 8321A	Oxamyl	5	2	6
Organochlorines				
EPA 8081A	DDD(p,p')	5	2	6
EPA 8081A	DDE(p,p')	5	2	6
EPA 8081A	DDT(p,p')	5	2	6
EPA 8081A	Dicofol	5	2	6
EPA 8081A	Dieldrin	5	2	6
EPA 8081A	Endrin	5	2	6
EPA 8081A	Methoxychlor	5	2	6

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Organophosphates				
EPA 8141A	Azinphos methyl	5	2	6
EPA 8141A	Chlorpyrifos	5	2	6
EPA 8141A	Diazinon	5	2	6
EPA 8141A	Dimethoate	5	2	6
EPA 8141A	Disulfoton	5	2	6
EPA 8141A	Malathion	5	2	6
EPA 8141A	Methamidophos	5	2	6
EPA 8141A	Methidathion	5	2	6
EPA 8141A	Molinate	5	2	6
EPA 8141A	Parathion, Methyl	5	2	6
EPA 8141A	Phorate	5	2	6
EPA 8141A	Phosmet	5	2	6
EPA 8141A	Thiobencarb	5	2	6
Pyrethroids				
EPA 8081A	Bifenthrin	5	2	6
EPA 8081A	Cyfluthrin, total	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	5	2	6
EPA 8081A	Cypermethrin, total	5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	5	2	6
EPA 8081A	Permethrin, total	5	2	6
Triazines				
EPA 547M	Glyphosate	5	2	6
EPA 549.2M	Paraquat dichloride	5	2	6
EPA 619	Atrazine	5	2	6
EPA 619	Cyanazine	5	2	6
EPA 619	Simazine	5	2	6
Metals				
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
Nutrients				
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N			
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N			
EPA 365.2	OrthoPhosphate as P			
EPA 365.2	Phosphate as P			
Toxicity				
EPA 821/R-02-012	*Ceriodaphnia dubia*	5	2	6

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 821/R-02-012	*Pimephales promelas*	5	2	6
EPA 821/R-02-013	*Selenastrum capricornutum*	5	2	6
EPA 600/R-99-064	*Hyalella azteca*	1	1	1

Exceedance History

Since 2006 exceedances of WQTLs have occurred including nine DO, six *E. coli*, 12 color, two chlorpyrifos, and one exceedance each of DDT and DDD. Although all exceedances are listed in Table X-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Deadman Creek is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction (Figure 1), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Deadman Creek @ Hwy 59 subwatershed, the constituent receiving the highest priority was chlorpyrifos (B).

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Table X-3. Exceedances experienced in samples collected from the Deadman Creek @ Hwy 59 Coalition monitoring site between May 2006 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Color, color units	*E. coli*, MPN/100 mL	Chlorpyrifos, µg/L	DDD(p,p'), µg/L	DDT(p,p'), µg/L
Deadman Creek @ Hwy 59	Irrigation	17/May/2006		85				
Deadman Creek @ Hwy 59	Irrigation	13/Jun/2006	5.65	45			0.0053	0.05
Deadman Creek @ Hwy 59	Irrigation	11/Jul/2006		34				
Deadman Creek @ Hwy 59	Irrigation	08/Aug/2006	6.55	60				
Deadman Creek @ Hwy 59	Irrigation	12/Sep/2006	6.53	36		0.059		
Deadman Creek @ Hwy 59	Irrigation	24/Apr/2007		35	310			
Deadman Creek @ Hwy 59	Irrigation	29/May/2007	6.13	40	490			
Deadman Creek @ Hwy 59	Irrigation	26/Jun/2007	6.78	30	610			
Deadman Creek @ Hwy 59	Irrigation	24/Jul/2007	4.31	34				
Deadman Creek @ Hwy 59	Irrigation	21/Aug/2007	4.47	24		0.038		
Deadman Creek @ Hwy 59	Irrigation	23/Aug/2007	2.65					
Deadman Creek @ Hwy 59	Irrigation	18/Sep/2007	5.43		330			
Deadman Creek @ Hwy 59	Storm	11/Feb/2007		100	400			
Deadman Creek @ Hwy 59	Storm	28/Feb/2007		120	490			
Priorities			**E**	**E**	**E**	**B**		

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

No Management Plan Monitoring was conducted at the Deadman Creek @ Hwy 59 site subwatershed during 2007. The second chlorpyrifos exceedance occurred during the 2007 irrigation season and therefore additional Management Plan monitoring will occur during the irrigation season of 2008.

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table X-4):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a

normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table X-4. Deadman Creek @ Hwy 59. Instantaneous load calculations for chlorpyrifos.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek @ Hwy 59	Chlorpyrifos	12/Sep/2006	3.06	0.059	5.11
Deadman Creek @ Hwy 59	Chlorpyrifos	21/Aug/2007	5.96	0.038	6.41

Source Identification

Priority B Constituent

Chlorpyrifos

Exceedances of chlorpyrifos occurred in September 2006 and August 2007 (Table X-3). Neither exceedance was associated with *Ceriodaphnia* toxicity. There were a large number of applications and a large amount of chlorpyrifos applied in September of 2006 prior to the exceedance, no reported applications in August 2007 (Table X-5, Figure X-2), and four reported applications in July 2007. Applications were made to four sections within the site subwatershed (Table X-6). These results suggest that the exceedances most likely are the result of tail water transporting chlorpyrifos to the creek.

Table X-5. Number of chlorpyrifos applications, total pounds applied and total acres treated by month for January 2006 through July 2007 in the Deadman Creek @ Hwy 59 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2006	5	91.72	45
March 2006	4	133.60	356.67
April 2006	1	3.99	29
May 2006	12	894.39	483
July 2006	12	2202.80	1097
August 2006	6	218.63	319.67
September 2006	18	650.63	1367.2
October 2006	1	723.37	362.8
January 2007	2	29.91	15
March 2007	22	491.23	1533.7
July 2007	4	258.50	434
2006 Total	59	4919.11	4060.34
2007 Total	28	779.63	1982.7
Total	**87**	**5698.74**	**6043.04**

Figure X-2. Pounds of chlorpyrifos applied within the Deadman Creek @ Hwy 59 site subwatershed by month for 2006-2007. Asterisk (*) denotes months with exceedances.

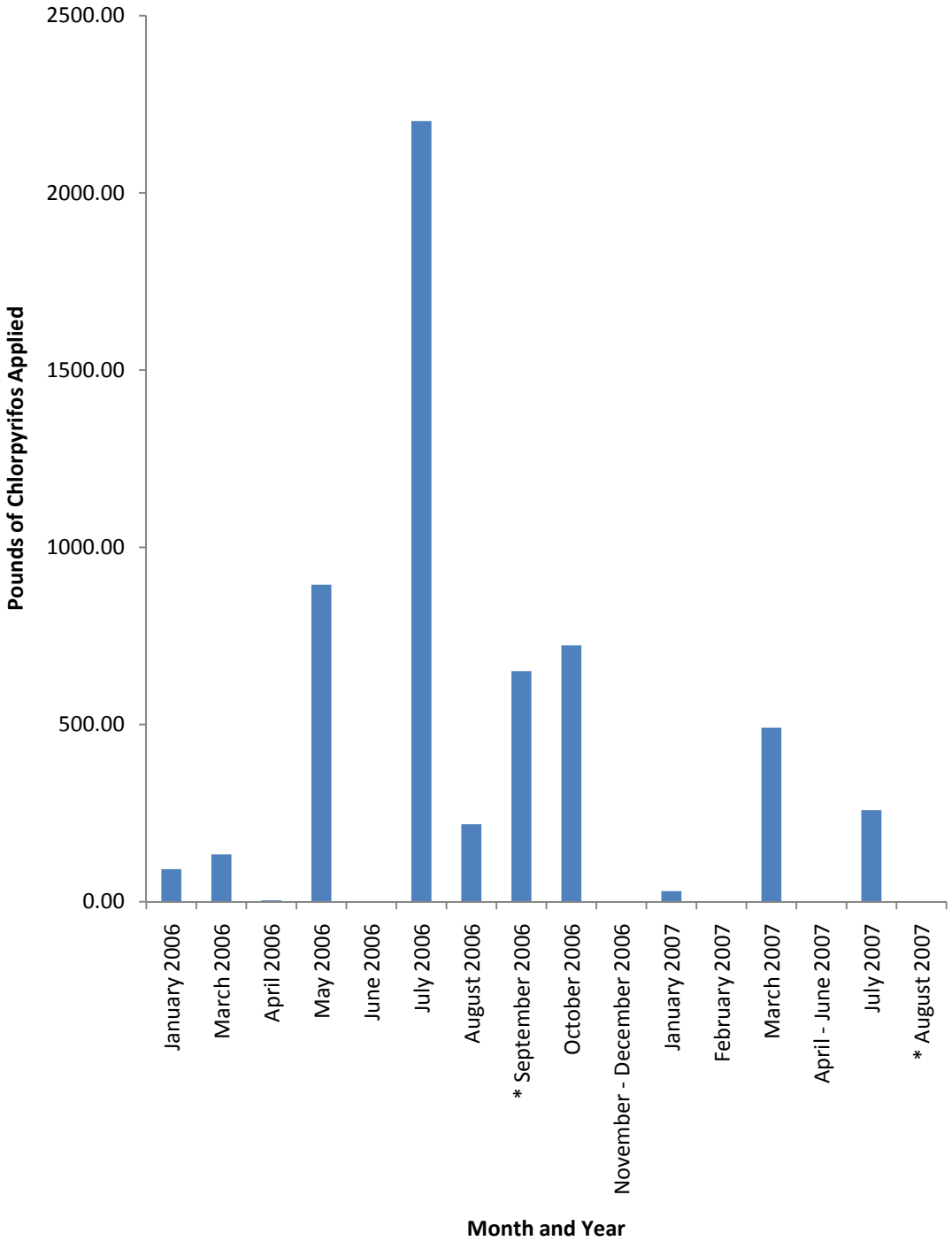


Table X-6. Deadman Creek @ Hwy 59. All TRS' that had an application associated with an exceedance of chlorpyrifos in 2006 and 2007. Table indicates the application with which the exceedance was associated.

TRS	Date of Associated Exceedance	
	9/12/2006	8/21/07
8S14E22	1	1
8S14E29	2	1
9S15E4	2	
9S15E5	5	

Priority E Constituents

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. None of the samples collected at Deadman Creek @ Hwy 59 contained measurable amounts of BOD although one of the samples experienced an exceedance of the DO WQTL (September 12, 2006) (Table X-7). These results do not eliminate BOD as a cause of low DO and it is unknown what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table X-7. Deadman Creek @ Hwy 59. BOD, pH and dissolved oxygen results for September 2006 through July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Deadman Creek @ Hwy 59	9/12/2006	6.63	6.53	ND
Deadman Creek @ Hwy 59	2/11/2007	8.42	9.6	ND
Deadman Creek @ Hwy 59	2/28/2007	8.48	11.1	ND
Deadman Creek @ Hwy 59	4/24/2007	8.35	10.8	ND
Deadman Creek @ Hwy 59	7/24/2007	7.44	4.31	ND

E. coli

Exceedances of the *E. coli* WQTL occurred six times including both the storm and irrigation seasons. This site subwatershed is large and has numerous dairies which could have contributed fecal material to the drain. Deadman Creek @ Hwy 59 was not sampled for the 2006 *E. coli* study however the Deadman Creek @ Gurr Road site was sampled. In the upstream watershed (Dutchman Creek along Sandy Mush Road and Dutchman Creek @ Minturn), bovine Bacteroides was detected indicating very recent contamination by cows (see Table IX-7).

Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

2008 Management Plan Sampling

Additional Management Plan sampling will be conducted at Deadman Creek @ Hwy 59 for chlorpyrifos in August and September of 2008 (Table X-8).

Table X-8. Deadman Creek @ Hwy 59. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos
Deadman Creek @ Hwy 59	August	A	**x**
Deadman Creek @ Hwy 59	September	A	**x**

XI. DRY CREEK AT ROAD 18

Management Plan Constituents

Priority B

- Chlorpyrifos

Priority C

- Copper

Priority E

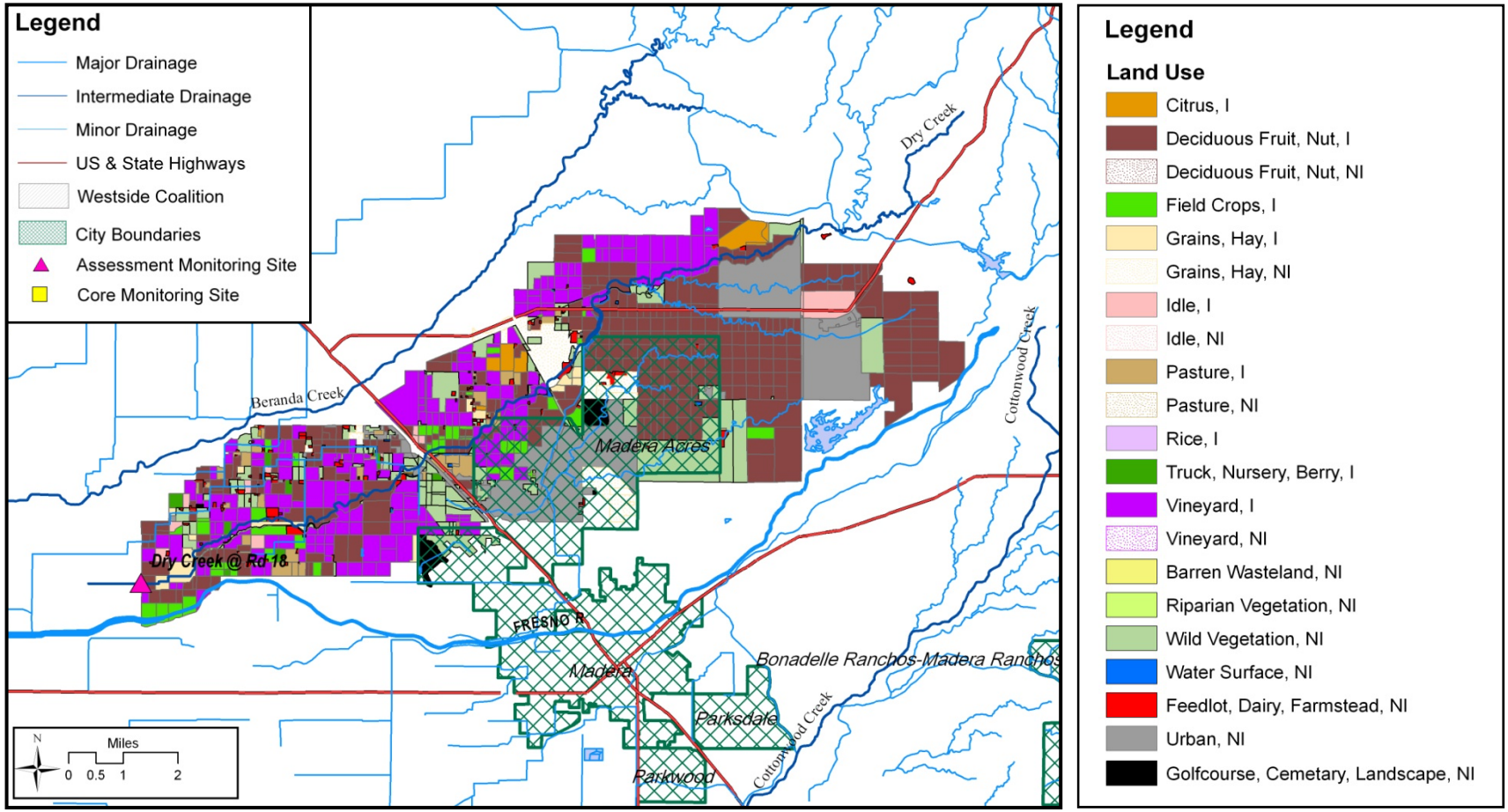
- *E. coli*
- pH
- Color
- Lead

Description of Dry Creek at Road 18 Site Subwatershed

Dry Creek @ Road 18 (23,299 irrigated acres) originates in the Sierra foothills and flows to the north of the city of Madera eventually draining into the San Joaquin River through various channels and irrigation ditches. Deciduous orchards are the primary irrigated agriculture in the upper portion of the site subwatershed whereas vineyards predominate in the lower portions (Figure XI-1). There are field crops scattered throughout the site subwatershed (Figure XI-1).

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Figure XI-1. Site subwatershed map of land use for the Dry Creek @ Rd 18 sample site.



Subwatershed Monitoring History

Dry Creek @ Rd 18 sampling commenced during the irrigation season of 2005. One 2006 storm season sample was not collected due to an insufficient flow at the site and one storm event in 2007 was unable to be sampled due to Dry Creek containing shallow, isolated pools of stagnant water. The site was dry during the final irrigation sampling event of 2007 (Table XI-1). Table XI-2 lists all of the constituents sampled by year/season. During the 2007 storm sampling event, sediment was not collected due to the site being dry (Table XI-2).

Table XI-1. Dry Creek @ Rd 18 sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	2	1	5	1	5
Events Not Sampled	NA	NA	0	1	0	1	1
Total	NA	NA	2	2	5	2	6

Table XI-2. Dry Creek @ Rd 18. Number of analyses run per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters						
EPA 110.2	Color	2		5	1	5
EPA 160.1	Dissolved Solids	2		5	1	5
EPA 180.1	Turbidity	2		5	1	5
EPA 405.1	BOD			1	1	2
EPA 415.1	Total Organic Carbon	2		5	1	5
SM 9223	E. coli	2		6	1	5
NA	Dissolved Oxygen	2	1	6	1	9
NA	Specific Conductivity	2	1	6	1	9
NA	pH	2	1	6	1	9
Carbamates						
EPA 8321A	Aldicarb			5	1	5
EPA 8321A	Carbaryl			5	1	5
EPA 8321A	Carbofuran			5	1	5
EPA 8321A	Diuron			5	1	5
EPA 8321A	Linuron			5	1	5
EPA 8321A	Methiocarb			5	1	5
EPA 8321A	Methomyl			5	1	5
EPA 8321A	Oxamyl			5	1	5
Organochlorines						

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	DDD(p,p')			5	1	5
EPA 8081A	DDE(p,p')			5	1	5
EPA 8081A	DDT(p,p')			5	1	5
EPA 8081A	Dicofol			5	1	5
EPA 8081A	Dieldrin			5	1	5
EPA 8081A	Endrin			5	1	5
EPA 8081A	Methoxychlor			5	1	5
Organophosphates						
EPA 8141A	Azinphos methyl			5	1	5
EPA 8141A	Chlorpyrifos	2		5	1	5
EPA 8141A	Diazinon	2		5	1	5
EPA 8141A	Dimethoate			5	1	5
EPA 8141A	Disulfoton			5	1	5
EPA 8141A	Malathion			5	1	5
EPA 8141A	Methamidophos			5	1	5
EPA 8141A	Methidathion			5	1	5
EPA 8141A	Molinate			5	1	5
EPA 8141A	Parathion, Methyl			5	1	5
EPA 8141A	Phorate			5	1	5
EPA 8141A	Phosmet			5	1	5
EPA 8141A	Thiobencarb			5	1	5
Pyrethroids						
EPA 8081A	Bifenthrin	1		5	1	5
EPA 8081A	Cyfluthrin, total	1		5	1	5
EPA 8081A	Cyhalothrin, lambda, total	2		5	1	5
EPA 8081A	Cypermethrin, total	2		5	1	5
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2		5	1	5
EPA 8081A	Permethrin, total	2		5	1	5
Triazines						
EPA 547M	Glyphosate			5	1	5
EPA 549.2M	Paraquat dichloride			5	1	5
EPA 619	Atrazine			5	1	5
EPA 619	Cyanazine			5	1	5
EPA 619	Simazine			5	1	5
Metals						
EPA 200.8	Arsenic			5	1	5
EPA 200.8	Boron			5	1	5
EPA 200.8	Cadmium			5	1	5
EPA 200.8	Copper			5	1	8
EPA 200.8	Lead			5	1	5
EPA 200.8	Nickel			5	1	5
EPA 200.8	Selenium			5	1	2
EPA 200.8	Zinc			5	1	6
Nutrients						
EPA 130.2	Hardness as CaCO3			5	1	8

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 300.0	Nitrate as N			5	1	5
EPA 350.2	Ammonia as N			5	1	5
EPA 351.3	Nitrogen, Total Kjeldahl			5	1	5
EPA 354.1	Nitrite as N			5	1	5
EPA 365.2	OrthoPhosphate as P			5	1	5
EPA 365.2	Phosphate as P			5	1	5
Toxicity						
EPA 821/R-02-012	*Ceriodaphnia dubia*	2		6	1	6
EPA 821/R-02-012	*Pimephales promelas*	2		5	1	6
EPA 821/R-02-013	*Selenastrum capricornutum*	2		5	1	7
EPA 600/R-99-064	*Hyalella azteca*	1	1	1		2

Exceedance History

Exceedances of WQTLs in samples collected from Dry Creek @ Rd 18 include one dissolved oxygen (DO), two pH, 11 color, and three *E. coli* (Table XI-3). Pesticide exceedances include two chlorpyrifos, and one diazinon (Table XI-3). In 2006 the analysis of water samples for metals was initiated and since then exceedances include one each of cadmium and zinc, four lead and 14 copper (Table XI-3). Sample water was toxic to *Ceriodaphnia dubia* and *Selenastrum capricornutum* once each and sediment was toxic to *Hyalella azteca* once. Although all exceedances are listed in Table XI-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Dry Creek is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Dry Creek @ Rd 18 subwatershed, the constituents receiving the highest priorities were chlorpyrifos (B) and copper (C).

Table XI-3. Exceedances experienced in samples collected from the Dry Creek @ Rd 18 Coalition monitoring site between August 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Cadmium, µg/L	Copper[1], µg/L	Lead[1], µg/L	Zinc[1], µg/L	Chlorpyrifos, µg/L	Diazinon, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Hyalella azteca*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Dry Creek @ Rd 18	Irrigation	16/Aug/2005		6.48	30										
Dry Creek @ Rd 18	Irrigation	20/Sep/2005			20	500									
Dry Creek @ Rd 18	Irrigation	16/May/2006			24	1600		4.3 (1.9)	0.36 (0.31)						
Dry Creek @ Rd 18	Irrigation	13/Jun/2006			22			6.3 (1.5)	0.27 (0.21)				80		
Dry Creek @ Rd 18	Irrigation	11/Jul/2006			22			4.1 (2.4)			0.077				
Dry Creek @ Rd 18	Irrigation	08/Aug/2006			20			4.6 (2.2)							
Dry Creek @ Rd 18	Irrigation	12/Sep/2006	5.61		22			6.1 (1.1)	0.31 (0.13)	18 (14.1)					
Dry Creek @ Rd 18	Irrigation	24/Apr/2007			76	1400		17 (15.4)			0.017				
Dry Creek @ Rd 18	Irrigation	29/May/2007			17			4.7 (2.4)							338441
Dry Creek @ Rd 18	Irrigation	19/Jun/2007						4.9 (1.5)							
Dry Creek @ Rd 18	Irrigation	26/Jun/2007						3.6 (1.9)							
Dry Creek @ Rd 18	Irrigation	24/Jul/2007						5.6 (2.2)							
Dry Creek @ Rd 18	Irrigation	31/Jul/2007						4.5 (1.5)							
Dry Creek @ Rd 18	Irrigation	21/Aug/2007			16			5.5 (1.9)	0.34 (0.31)						
Dry Creek @ Rd 18	Irrigation	28/Aug/2007		8.53				4.3 (1.9)							
Dry Creek @ Rd 18	Storm	03/May/2006												81.25	
Dry Creek @ Rd 18	Storm	11/Feb/2007			35		0.05	14 (3.9)				0.13			
Priorities				**E**	**E**	**E**		**C**	**E**		**B**				

2007 Management Plan Monitoring Results

Additional Management Plan monitoring (MPM) was conducted in June, July, August and September 2007 for copper (Table XI-4). The second chlorpyrifos exceedance did not occur till the irrigation season of 2007 and therefore no additional sampling was conducted for chlorpyrifos. The WQTL for copper was exceeded in samples collected from Dry Creek @ Rd 18 during every month of the irrigation season including MPM in June, July, August and September (Table XI-5).

Table XI-4. Dry Creek @ Rd 18. 2007 Management plan monitoring schedule for copper. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Copper
Dry Creek @ Rd 18	June	**x**
Dry Creek @ Rd 18	July	**x**
Dry Creek @ Rd 18	August	**x**
Dry Creek @ Rd 18	September	**x**

Table XI-5. Dry Creek @ Rd 18. Normal monitoring (NM) and management plan monitoring (MPM) results for copper from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	MPM	NM	NM	MPM	NM	MPM	NM	MPM
	4/24/07	5/29/07	6/19/07	6/26/07	7/24/07	7/31/07	8/21/07	8/28/07	9/18/07	9/25/07
Copper (µg/L)	**17**	**4.7**	**4.9**	**3.6**	**5.6**	**4.5**	**5.5**	**4.3**	Site dry	Site dry

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table XI-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XI-6. Dry Creek @ Rd 18. Instantaneous load calculations for chlorpyrifos and copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Rd 18	Chlorpyrifos	11/Jul/2006	11.77	0.077	25.66
Dry Creek @ Rd 18	Chlorpyrifos	24/Apr/2007	No flow	0.017	0.00

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Rd 18	Chlorpyrifos	24/Jul/2007	13.39	0.008	3.03
Dry Creek @ Rd 18	Copper	16/May/2006	5.35	4.3	651.43
Dry Creek @ Rd 18	Copper	13/Jun/2006	4.02	6.3	717.16
Dry Creek @ Rd 18	Copper	11/Jul/2006	11.77	4.1	1366.49
Dry Creek @ Rd 18	Copper	08/Aug/2006	18.85	4.6	2455.37
Dry Creek @ Rd 18	Copper	12/Sep/2006	14.97	6.1	2585.82
Dry Creek @ Rd 18	Copper	24/Apr/2007	No flow	17	0.00
Dry Creek @ Rd 18	Copper	29/May/2007	12.51	4.7	1664.95
Dry Creek @ Rd 18	Copper	19/Jun/2007	7.33	4.9	1017.06
Dry Creek @ Rd 18	Copper	26/Jun/2007	19.06	3.6	1943.00
Dry Creek @ Rd 18	Copper	24/Jul/2007	13.39	5.6	2123.32
Dry Creek @ Rd 18	Copper	31/Jul/2007	5.29	4.5	674.09
Dry Creek @ Rd 18	Copper	21/Aug/2007	4.7	5.5	731.99
Dry Creek @ Rd 18	Copper	28/Aug/2007	2.66	4.3	323.89

Source Identification

Priority B Constituents

Chlorpyrifos

Exceedances of the chlorpyrifos WQTL occurred in the irrigation season in both 2006 and 2007 (Table XI-3). The exceedance in April 2007 was slightly over the WQTL and the lack of a load calculation indicates that there was no or very limited flow in Dry Creek around this date (Table XI-6). However, there were no reported applications in March or April prior to sampling indicating that drift was not the source of the chlorpyrifos (Table XI-7). The exceedance may have been the result of irrigation runoff in March or April mobilizing a small amount of chlorpyrifos and transporting it to the creek. No flow could have maintained the small amount of chlorpyrifos until sampling. The July 2006 exceedance occurred in the months following the second largest number of applications and the second largest amount of chlorpyrifos applied (Table XI-7, Figure XI-2). These results suggest that the exceedances were likely associated with tail water transporting chlorpyrifos to the slough and control of irrigation tail water would eliminate the exceedances.

Table XI-7. Number of chlorpyrifos applications, total pounds applied and total acres treated by month for January 2005 – August 2007 in the Dry Creek @ Rd 18 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2005	4	175.09	92
March 2005	3	124.06	62
May 2005	8	68.07	268
June 2005	3	67.11	67.05
July 2005	11	870.47	505
August 2005	8	213.31	151.7
January 2006	1	78.04	52
May 2006	5	726.42	391
June 2006	5	160.19	226.8
July 2006	16	2301.22	1168
August 2006	5	220.79	244.3
September 2006	2	57.98	58.11
December 2006	2	0.98	1.13
January 2007	1	74.34	40
February 2007	2	61.41	30.78
May 2007	1	37.17	20
June 2007	1	65.80	33
July 2007	23	3319.76	1659.24
August 2007	4	79.75	144
2005 Total	37	1518.11	1145.75
2006 Total	36	3545.62	2141.34
2007 total	32	3638.23	1927.02
Total	**105**	**8701.95**	**5214.11**

Figure XI-2. Pounds of chlorpyrifos applied within the Dry Creek @ Rd 18 site subwatershed by month for 2005 - 2007. Asterisk (*) denotes months with exceedances.

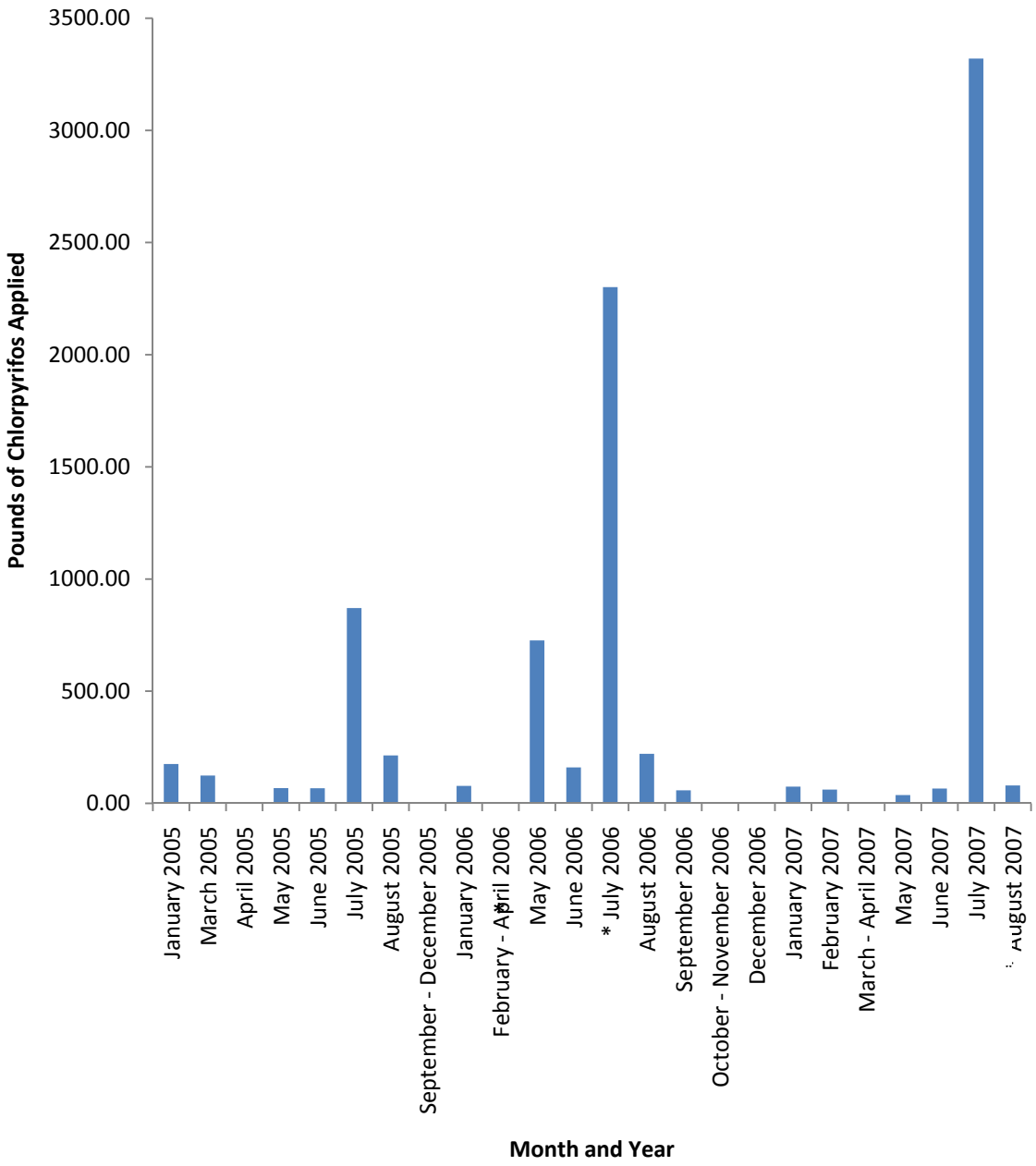


Table XI-8. Dry Creek @ Rd 18. All TRS' that had an application associated with an exceedance of chlorpyrifos in 2006 and 2007. Table indicates the application with which the exceedance was associated. No chlorpyrifos applications were reported one month prior to the 4/24/07 exceedance.

TRS	Date of Associated Exceedance	
	7/11/2006	4/24/2007
11S16E10	1	
11S16E15	1	
11S17E8	1	

Priority C Constituents

Copper

Copper was detected in exceedance of the WQTL in every sample event from the initiation of sampling for metals. As is true across the Coalition region, there were a large number of applications in the months of January, March, and April and because copper does not degrade, copper applied during the winter may be available for transport to surface waters during he irrigation season (Table XI-9, Figure XI-3). Table XI-10 and Table XI-11 list the sections within the site subwatershed that have had more than one application of copper in 2006 and 2007.

Additionally, there are a large number of copper mines in the Sierra Nevada Mountains which may contribute to the copper load. The Coalition has recently obtained maps of all mines in the areas above Dry Creek and will sample upstream of agriculture if there is ever significant flow in the slough. Because copper tends to be sediment bound, it is probable that copper was mobilized with the sediment during irrigation and transported to surface waters.

Table XI-9. Number of copper applications, total pounds applied and total acres treated by month for January 2005 through September 2007 in the Dry Creek @ Rd 18 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January 2005	29	3989.71	1268.35
February 2005	8	742.16	122.24
March 2005	24	2345.04	2151.24
April 2005	35	4068.44	3144.15
May 2005	1	0.13	0.2
June 2005	1	0.24	37
July 2005	2	32.05	36
August 2005	1	22.50	10
September 2005	4	532.50	180
October 2005	10	2120.88	366.8
November 2005	1	122.80	40
December 2005	12	2097.20	472.26

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January 2006	26	4664.15	1427.01
February 2006	7	733.01	127
March 2006	8	38.07	22.08
April 2006	88	6882.61	5747.5
May 2006	6	201.26	249.92
June 2006	3	0.56	0.89
August 2006	1	0.15	0.21
September 2006	4	1039.63	465.2
October 2006	18	2212.91	1171.5
November 2006	4	742.75	155.53
December 2006	11	2748.74	660.1
January 2007	26	4733.62	1549.92
February 2007	10	765.63	553.13
March 2007	12	356.05	384.04
April 2007	21	1637.02	1456.04
May 2007	18	802.04	1302.72
June 2007	6	312.56	531.3
July 2007	6	634.88	643
September 2007	5	163.14	99.7
2005 Total	128	16073.64	7828.24
2006 Total	176	19263.84	10026.94
2007 Total	104	9404.95	6519.85
Total	**408**	**44742.42**	**24375.03**

Figure XI-3. Pounds of copper applied within the Dry Creek @ Rd 18 site subwatershed by month for 2005-2007. Asterisk (*) denotes month with exceedances.

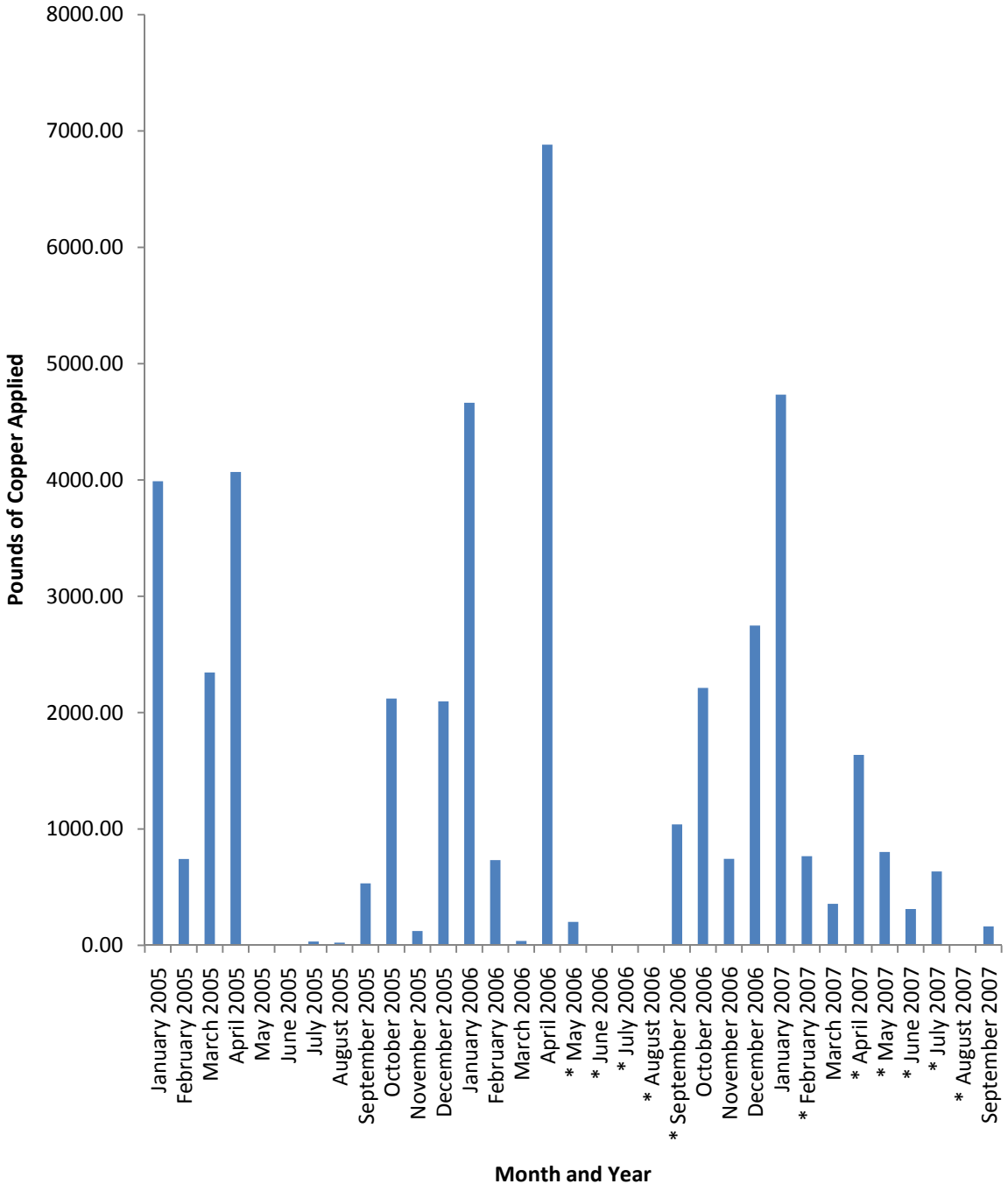


Table XI-10. Dry Creek @ Rd 18. All TRS' that had more than one application associated with an exceedance of copper in 2006. Table indicates the application with which the exceedance was associated.

TRS	Date of Associated Exceedance				
	5/16/06	6/13/06	7/11/06	8/8/06	9/12/06
10S16E34	1	1			
10S16E35	2	2	2		
10S16E36	16	15	10	5	6
10S17E12	1	1	1		
10S17E14	6	6	6		
10S17E15	5	5	5		
10S17E28	5	3	3		
10S17E29	6	6	6		
10S17E31	7	7	3		
10S17E32	1	1	1		
10S17E34	1	1	1		
10S17E35	1	1			
10S18E17	1	1	1		
10S18E18	1	1	1		
10S18E7	2	2	2		
10S18E8	1	1	1		
11S16E10	4	4	3		
11S16E11	2	2			
11S16E12	6	6	3		
11S16E14	6	6	4		
11S16E15	1	1	1		
11S17E4	3	3	2		
11S17E6	10	10	10		
11S17E8	16	16	16		

Table XI-11. Dry Creek @ Rd 18. All TRS' that had more than one application associated with an exceedance of copper in 2007. Table indicates the application with which the exceedance was associated.

TRS	Date of Associated Exceedance								
	2/11/07	4/24/07	5/29/07	6/19/07	6/26/07	7/24/07	7/31/07	8/21/07	8/28/07
10S16E34		1	1	1	1				
10S16E35		2	2	2	2				
10S16E36	7	12	13	10	10	9	8	6	5
10S17E11			4	4	4	4	4		
10S17E12	2	2	2	2	2	5	5	4	4
10S17E15	1								
10S17E22	3								
10S17E26	1	1							

TRS	Date of Associated Exceedance								
	2/11/07	4/24/07	5/29/07	6/19/07	6/26/07	7/24/07	7/31/07	8/21/07	8/28/07
10S17E28	3	4	3	3					
10S17E29		1	1	1	1				
10S17E31	1	1	1	1	1				
10S17E32			1	1	1	1	1		
10S18E18		1	1	1	1				
10S18E23	3	2	6	10	10	10	10	5	4
10S18E24	2	1	1	1	1	1	1		
10S18E25	1	1	1	1	1	1	1		
10S18E7		2	2	2	2				
10S18E8		1	1	1	1				
11S16E10	2	1	1	1					
11S16E11	4	4	2	2					
11S16E12	1	3	3	3	3				
11S16E15	2								
11S16E16	4								
11S16E3		1	1	1	1				
11S17E7	6								
11S17E8		8	8	8	8				

Priority E Constituents

E. coli

E. coli exceedances occurred three times between September 2005 and April 2007. Exceedances occurred during the irrigation season. Dry Creek @ Road 18 and three upstream sites, Dry Creek @ Rd 22, Dry Creek @ Ave 18 1/2 and Dry Creek @ Ave 21were sampled during the ESJWQC *E. coli* study. All upstream sites had approximately an order of magnitude less *E. coli* than the downstream site although it is difficult to determine the significance of this result (Table XI-12). Also, this site subwatershed was one of the few to have indicators of human, bovine, and chicken fecal inputs to the creek (Table XI-13). Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table XI-12. Values of E. coli, fecal coliform, and total coliform in MPN/100mL., and the average C_T value for the All bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station Code	Sample Date	Sample Time	Sample Type	*E. coli*	Fecal Coliform	Total Coliform	Avg All bac	Avg Human	Avg Bovine	Avg Chicken
545XDCAAE	8/29/06	16:00	Grab	700	2800	2800	25.305	26.295	36.61	35.95
545XDCAAT	8/29/06	15:40	Grab	79	240	240	32.8	38.665	39.115	39.06
545XDCARE	8/29/06	13:20	Grab	33	630	940	24.27	25.595	36.105	36.1
545XDCART	8/29/06	12:40	Grab	33	240	240	23.37	26.84	34.205	39.12

Table XI-13. Results of Bacteroides analysis. Dry Creek @ Rd 18 and its upstream sites, Dry Creek @ Rd 22, Dry Creek @ Ave 18 1/2 and Dry Creek @ Ave 21, were sampled only once.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
545XDCAAT	8/29/06	15:40	Grab	1.6	0	0
545XDCAAE	8/29/06	16:00	Grab	50	0.05	0.05
545XDCART	8/29/06	12:40	Grab	6.25	0.05	0
545XDCARE	8/29/06	13:20	Grab	50	0.2	0.03

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Lead

Exceedances of the lead WQTL were found three times in 2006 and once in 2007. All occurred during the irrigation season. Lead is no longer applied by agriculture but residues of past applications may still be present in stream beds. It is unlikely that after fields are plowed and cultivated that significant lead residues are present in agricultural fields, but it is unknown if this is true. There are numerous additional sources of lead including residues from leaded gasoline, industrial processes, lead-based paints, lead pipes, and lead components and solder from electronic equipment. When lead enters the environment, it becomes bound to particulate matter and is transported to surface waters in sediment particles and organic matter. It is deposited in the stream bed and periodically remobilized. The source of lead can be determined by lead isotopic analysis, but this process is expensive and the Coalition will not attempt to perform these analyses until lead becomes a priority constituent.

2008 Management Plan Monitoring

Copper exceedances have continued to occur during the 2007 irrigation season and therefore the Coalition will conduct upstream monitoring for copper to help determine possible agricultural sources. The Coalition will sample Dry Creek @ Rd 22, which divides the Dry Creek @ Rd 18 subwatershed in half, during all irrigation months for copper (April – September, 2008) (Figure XI-4, Table XI-14, Table XI-15). In addition, to determine if copper is coming from copper mines in the Sierra Nevada foothills, Dry Creek @ Rd 28 ½ will be sampled in July and September, 2008 (Figure XI-5, Table XI-14, Table XI-15).

Since the Coalition will already be monitoring for copper upstream of Dry Creek @ Rd 18, samples will also be collected for chlorpyrifos analysis in months in which past exceedances occurred (April and July) (Table XI-14).

Figure XI-4. Site subwatershed map of land use for the Dry Creek @ Rd 22 upstream sample site.

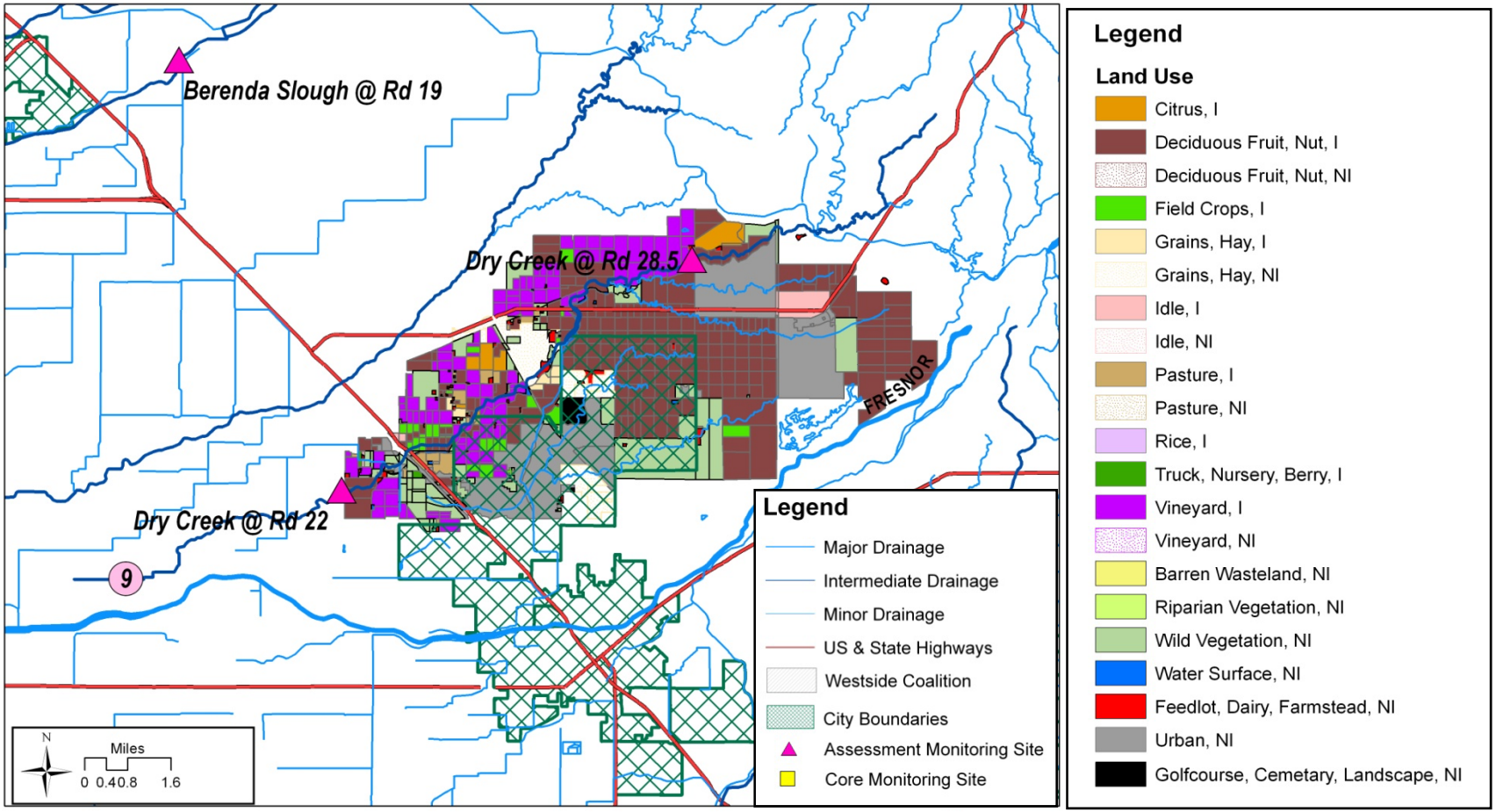
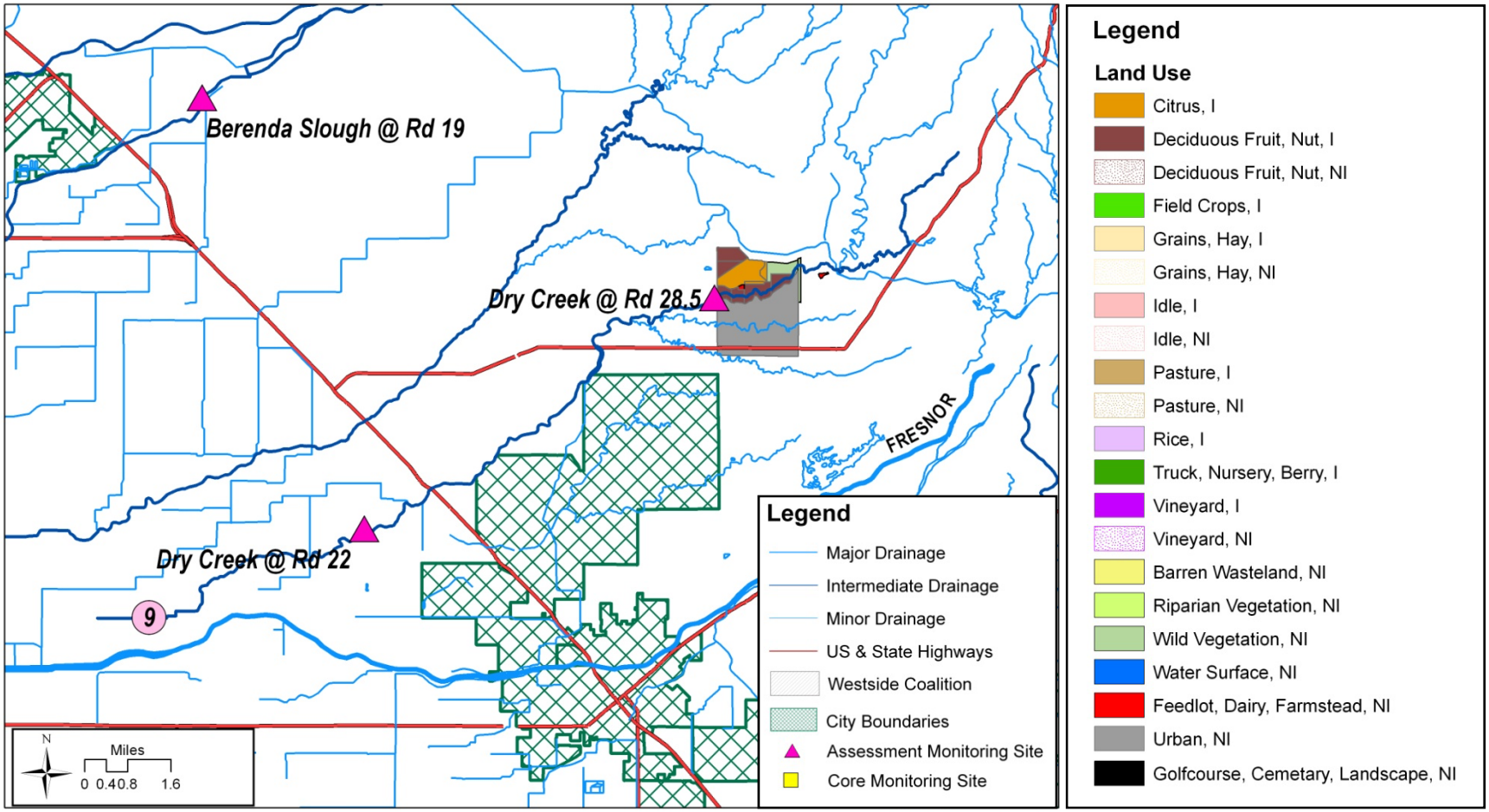


Figure XI-5. Site subwatershed map of land use for the Dry Creek @ Rd 28 ½ upstream sample site.



Dry Creek @ Rd 28 ½, located upstream of all agricultural land, has been added as a 2008 management plan monitoring site in order to determine if upstream mining might be the cause of the re-occurring copper detections downstream.

Table XI-14. Dry Creek @ Rd 22 and Dry Creek @ Rd 28 1/2 . 2008 Management Plan sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Copper
Dry Creek @ Rd 22	April	U	x	x
Dry Creek @ Rd 22	May	U		x
Dry Creek @ Rd 22	June	U		x
Dry Creek @ Rd 22	July	U	x	x
Dry Creek @ Rd 28 ½	July	U		x
Dry Creek @ Rd 22	August	U		x
Dry Creek @ Rd 22	September	U		x
Dry Creek @ Rd 28 ½	September	U		x

Table XI-15. Sampling locations within the Dry Creek site subwatershed.

Station Name	Station Code	Target Lat	Target Long
Dry Creek at Rd 18*	545XDCARE	36.9818	-120.22056
Dry Creek @ Rd 22[U]	545XDCART	37.00574	-120.14706
Dry Creek @ Rd 28 1/2 [U]	545XDCATE	37.06785	-120.0292

*Original ESJWQC sampling site
[U]Upstream sites

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XII. DUCK SLOUGH @ GURR ROAD

Management Plan Constituents

Priority C

- Copper
- *Ceriodaphnia dubia* water column toxicity
- *Selenastrum capricornutum* water column toxicity

Priority D

- Thiobencarb
- *Hyalella azteca* sediment toxicity

Priority E

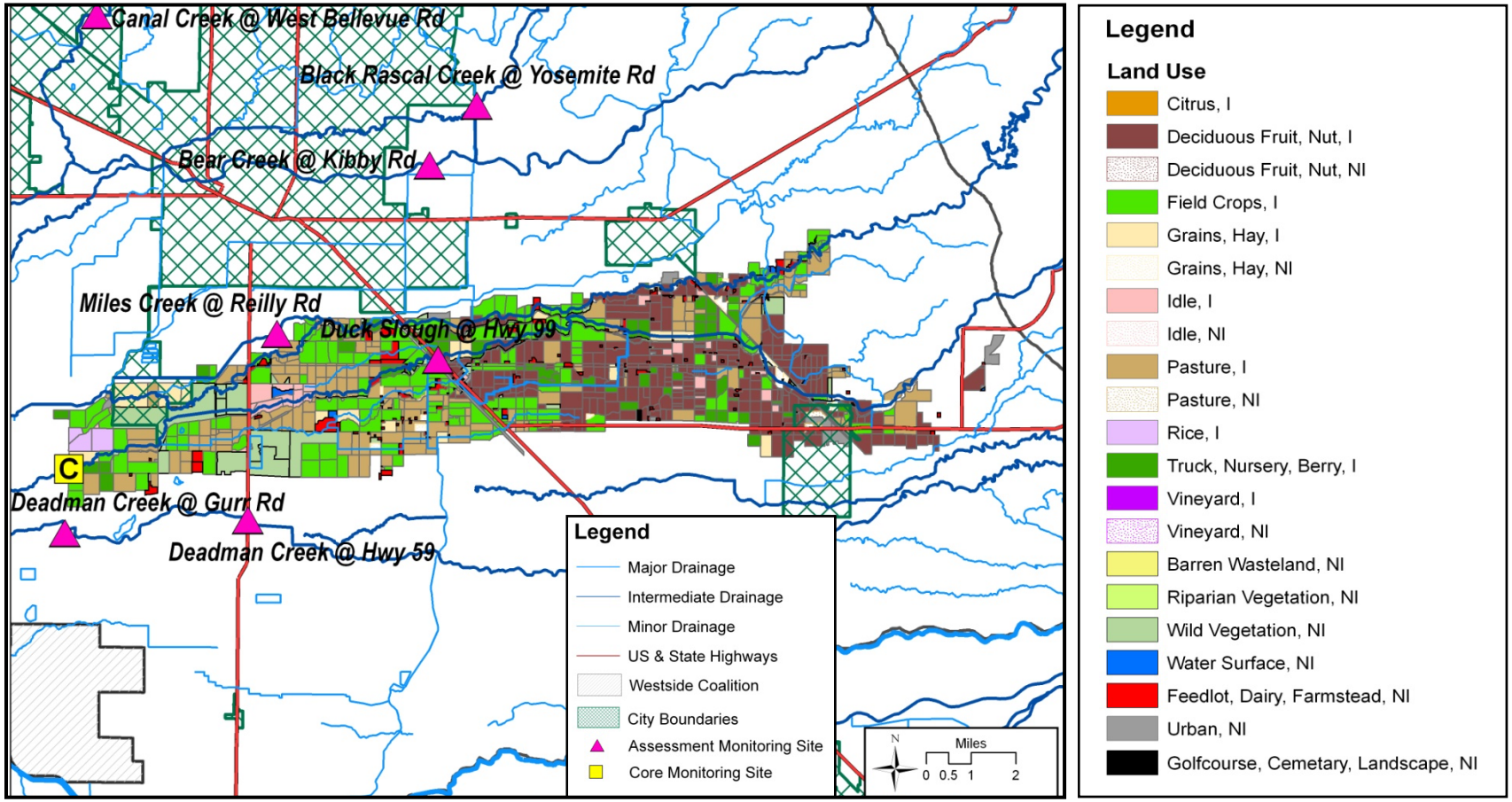
- DO
- *E. coli*
- pH
- Nickel
- Lead
- Specific conductivity
- Color
- Total Dissolved Solids

Description of Duck Slough @ Gurr Road Site Subwatershed

Duck Slough @ Gurr Road (28,712 irrigated acres) is located downstream from Duck Slough @ Hwy 99. Located to the south and west of Merced, this site drains field crops immediately upstream and deciduous orchards further upstream as well as some irrigated pasture (Figure XII-1). The city of Merced delivers treated water to Duck Slough a few miles upstream of the Gurr Road site. Duck Slough flows west eventually becoming Deadman Creek in the western portion of the Coalition region. The slough eventually flows into the San Joaquin River via Deadman Creek and Deep Slough (Figure XII-1).

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Figure XII-1. Site subwatershed map of land use for the Duck Slough @ Gurr Rd sample site (C).



Subwatershed Monitoring History

Ambient water quality monitoring was initiated at Duck Slough @ Gurr Rd in 2004. For each year between 2005 and 2007 full storm and irrigation seasons have been sampled (Table XII-1). Table XII-2 includes the constituents analyzed by year and season.

Table XII-1. Duck Slough @ Gurr Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	3	2	5	2	5	2	6

Table XII-2. Duck Slough @ Gurr Rd. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters								
EPA 110.2	Color	3	2	5	2	6	3	6
EPA 160.1	Dissolved Solids	3	2	5	2	6	3	6
EPA 180.1	Turbidity	3	2	5	2	6	3	6
EPA 405.1	BOD					2	3	2
EPA 415.1	Total Organic Carbon	2	2	5	1	6	3	6
SM 9223	E. coli	3	2	5	2	6	3	6
NA	Dissolved Oxygen	3	2	5	5	5	3	10
NA	Specific Conductivity	3	2	5	5	5	3	10
NA	pH	3	2	5	5	5	3	10
Carbamates								
EPA 8321A	Aldicarb					5	2	6
EPA 8321A	Carbaryl					5	2	6
EPA 8321A	Carbofuran					5	2	6
EPA 8321A	Diuron					5	2	6
EPA 8321A	Linuron					5	2	6
EPA 8321A	Methiocarb					5	2	6
EPA 8321A	Methomyl					5	2	6
EPA 8321A	Oxamyl					5	2	6
Organochlorines								
EPA 8081A	DDD(p,p')					5	2	6
EPA 8081A	DDE(p,p')					5	2	6
EPA 8081A	DDT(p,p')					5	2	6
EPA 8081A	Dicofol					5	2	6
EPA 8081A	Dieldrin					5	2	6
EPA 8081A	Endrin					5	2	6
EPA 8081A	Methoxychlor					5	2	6
Organophosphates								
EPA 8141A	Azinphos methyl					5	2	7

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Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8141A	Chlorpyrifos	3	2	5	2	5	2	7
EPA 8141A	Diazinon	3	2	5	2	5	2	7
EPA 8141A	Dimethoate	1				5	2	7
EPA 8141A	Disulfoton	1				5	2	7
EPA 8141A	Malathion	1				5	2	7
EPA 8141A	Methamidophos					5	2	6
EPA 8141A	Methidathion					5	2	7
EPA 8141A	Molinate					5	2	7
EPA 8141A	Parathion, Methyl	1				5	2	7
EPA 8141A	Phorate	1				5	2	7
EPA 8141A	Phosmet					5	2	7
EPA 8141A	Thiobencarb					5	2	9
Pyrethroids								
EPA 8081A	Bifenthrin			1	2	5	2	9
EPA 8081A	Cyfluthrin, total			1	2	5	2	7
EPA 8081A	Cyhalothrin, lambda, total	3	2	5	2	5	2	7
EPA 8081A	Cypermethrin, total	3	2	5	2	5	2	7
EPA 8081A	Esfenvalerate/Fenvalerate, total	3	2	5	2	5	2	7
EPA 8081A	Permethrin, total	3	2	5	2	5	2	7
Triazines								
EPA 547M	Glyphosate					5	2	6
EPA 549.2M	Paraquat dichloride					5	2	6
EPA 619	Atrazine					5	2	6
EPA 619	Cyanazine					5	2	6
EPA 619	Simazine					5	2	6
Metals								
EPA 200.8	Arsenic					6	3	6
EPA 200.8	Boron					6	3	6
EPA 200.8	Cadmium					6	3	6
EPA 200.8	Copper					6	3	9
EPA 200.8	Lead					6	3	6
EPA 200.8	Nickel					6	3	6
EPA 200.8	Selenium					6	3	2
EPA 200.8	Zinc					6	3	7
Nutrients								
EPA 130.2	Hardness as CaCO3					6	3	9
EPA 300.0	Nitrate as N					6	3	6
EPA 350.2	Ammonia as N					6	3	6
EPA 351.3	Nitrogen, Total Kjeldahl					6	3	6
EPA 354.1	Nitrite as N					6	3	6
EPA 365.2	OrthoPhosphate as P					6	3	6
EPA 365.2	Phosphate as P					6	3	6
Toxicity								
EPA 821/R-02-012	*Ceriodaphnia dubia*	3	2	5	4	5	3	7
EPA 821/R-02-012	*Pimephales promelas*	3	2	5	2	5	3	7

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Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 821/R-02-013	*Selenastrum capricornutum*	3	2	5	2	5	3	8
EPA 600/R-99-064	*Hyalella azteca*	2		5	1	1	1	1

Exceedance History

During ambient water monitoring of Duck Slough @ Gurr Rd, exceedances of numerous field, physical, inorganic and organic parameters have occurred including three dissolved oxygen (DO), two pH, one specific conductivity (EC) and TDS (in the same event), 25 color, and 14 *E. coli*. One exceedance of the chlorpyrifos WQTL, and two of the thiobencarb WQTL occurred. The analysis of metals was initiated in 2006 for irrigation season sampling and six exceedances of the copper, four of the lead, and three of the nickel WQTLs occurred. Samples taken from Duck Slough caused toxicity to *Ceriodaphnia* three times and *Selenastrum* twice, and sediment samples were toxic to *Hyalella* three times. Although all exceedances are listed in the following table (Table XII-3), only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Duck Slough is not considered impaired and is not on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Duck Slough @ Gurr Rd site subwatershed, the constituents receiving the highest priorities were copper (C), *Ceriodaphnia* (C) and *Selenastrum* (C).

Table XII-3. Exceedances experienced in samples collected from Duck Slough @ Gurr Rd between July 2004 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Cadmium, µg/L	Copper, µg/L	Lead, µg/L	Nickel, µg/L	Chlorpyrifos, µg/L	Thiobencarb, µg/L	Ceriodaphnia dubia, Survival (%)	Hyalella azteca, Survival (%)	Selenastrum capricornutum, Total Cell Count
Duck Slough @ Gurr Rd	Irrigation	31/Jul/2004				200		350					0.045				
Duck Slough @ Gurr Rd	Irrigation	31/Aug/2004				70										33.75	
Duck Slough @ Gurr Rd	Irrigation	29/Sep/2004			701	150	540										1220000
Duck Slough @ Gurr Rd	Irrigation	10/May/2005				50		1600									
Duck Slough @ Gurr Rd	Irrigation	14/Jun/2005				120		300									
Duck Slough @ Gurr Rd	Irrigation	12/Jul/2005				50		300								58.8	
Duck Slough @ Gurr Rd	Irrigation	16/Aug/2005				100		240									
Duck Slough @ Gurr Rd	Irrigation	20/Sep/2005				100										3.8	
Duck Slough @ Gurr Rd	Irrigation	17/May/2006		8.6		37		2000									
Duck Slough @ Gurr Rd	Irrigation	14/Jun/2006				80		690		120 (10.9)				5.8			
Duck Slough @ Gurr Rd	Irrigation	12/Jul/2006	6.18			85				14 (9.3)	2.7	17		0.29			
Duck Slough @ Gurr Rd	Irrigation	08/Aug/2006				40											
Duck Slough @ Gurr Rd	Irrigation	13/Sep/2006	5.53			44											
Duck Slough @ Gurr Rd	Irrigation	24/Apr/2007				35											
Duck Slough @ Gurr Rd	Irrigation	29/May/2007				35		820									
Duck Slough @ Gurr Rd	Irrigation	19/Jun/2007	5.85							5.4 (3)							
Duck Slough @ Gurr Rd	Irrigation	26/Jun/2007				30				4.6 (3.7)	1 (0.81)						
Duck Slough @ Gurr Rd	Irrigation	24/Jul/2007				30											413341
Duck Slough @ Gurr Rd	Irrigation	21/Aug/2007				30											
Duck Slough @ Gurr Rd	Irrigation	18/Sep/2007				40		370									
Duck Slough @ Gurr Rd	Storm	16/Feb/2005				300		1600									
Duck Slough @ Gurr Rd	Storm	21/Mar/2005				100		1600									
Duck Slough @ Gurr Rd	Storm	28/Feb/2006				25									35		
Duck Slough @ Gurr Rd	Storm	10/Mar/2006													35		
Duck Slough @ Gurr Rd	Storm	15/Mar/2006				100		300							40		
Duck Slough @ Gurr Rd	Storm	12/Feb/2007				550		2400	0.02	47 (12.4)	13 (4.88)	54					
Duck Slough @ Gurr Rd	Storm	28/Feb/2007				170		2000		11 (8.8)	2.4	13					
Duck Slough @ Gurr Rd	Storm	07/Mar/2007		9.17													
Priorities			**E**	**E**	**E**	**E**	**E**	**E**	**E**	**C**	**E**	**E**		**NP**	**C**	**D**	**C**

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.
NP- not prioritized; thiobencarb is only applied to rice and therefore is managed under the Rice Coalition.

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2007 Management Plan Monitoring Results

Additional Management Plan monitoring (MPM) was conducted in 2007 at Duck Slough @ Gurr Road in June for thiobencarb and copper and for chlorpyrifos in July (Table XI-4). At this time thiobencarb was being managed by the Coalition. Duck Slough @ Gurr Road was sampled both upstream and downstream of the bridge on Gurr Road on June 19, 2007. The water upstream of the bridge was dammed and was not flowing downstream although a pipe was discharging water into the pool. Just downstream of this dam is Dean Drain which inputs water from the north. Sampling at Duck Slough @ Gurr Road always occurs downstream of Dean Drain. On this date, samples were taken at both locations to determine if there was a difference in water quality between the two water bodies.

There were no exceedances of chlorpyrifos during the irrigation season however there were three detections; two in July including the MPM and one in September (Table XII-5). Copper was detected in all samples collected during the irrigation season. The amounts detected were exceedances of the copper WQTL in the MPM and the normal monitoring (NM) samples collected in June (Table XII-5). The copper WQTL is based on hardness and therefore even though the sample collected at the normal collection location contained 5.4 µg/L of copper and the upstream sample contained 15 µg/L of copper, due to the level of hardness in the samples only the 5.4 µg/L sample was an exceedance. Thiobencarb was not detected in any of the samples collected during the irrigation season.

Table XII-4. Duck Slough @ Gurr Rd. 2007 Management Plan monitoring schedule for chlorpyrifos, bifenthrin, thiobencarb and copper. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Chlorpyrifos	Thiobencarb	Copper
Duck Slough @ Gurr Rd	June		x	x
Duck Slough @ Gurr Rd	July	x	x	x

Table XII-5. Duck Slough @ Gurr Rd. Normal monitoring (NM) and management plan monitoring (MPM) results for chlorpyrifos, copper and thiobencarb from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	MPM		NM	NM	MPM	NM	NM
	4/24/07	5/29/07	6/19/07	6/19/07[U]	6/26/07	7/24/07	7/31/07	8/21/07	9/18/07
Chlorpyrifos (µg/L)	<0.00259	<0.00259	NA	NA	<0.00259	0.007	0.007	<0.003	0.009
Copper (µg/L)	4.6	5.3	**5.4**	15	**4.6**	4	8.6	4.8	5.5
Thiobencarb (µg/L)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06

[U]Upstream of bridge on Gurr Rd
NA – no MPM sampling for this constituent.

Load Calculations

Table XII-6. Duck Slough @ Gurr Rd. Instantaneous load calculations for copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Duck Slough @ Gurr Rd	Copper	17/May/2006	2.29	2.9	188.05
Duck Slough @ Gurr Rd	Copper	14/Jun/2006	1.61	120	5470.84
Duck Slough @ Gurr Rd	Copper	12/Jul/2006	10.93	14	4333.07
Duck Slough @ Gurr Rd	Copper	08/Aug/2006	6.62	3.8	712.34
Duck Slough @ Gurr Rd	Copper	13/Sep/2006	0.96	4.1	111.46
Duck Slough @ Gurr Rd	Copper	12/Feb/2007	298.79	47	397659.31
Duck Slough @ Gurr Rd	Copper	28/Feb/2007	321.45	11	100127.50
Duck Slough @ Gurr Rd	Copper	24/Apr/2007	1.88	4.6	244.89
Duck Slough @ Gurr Rd	Copper	29/May/2007	1.02	5.3	153.08
Duck Slough @ Gurr Rd	Copper	19/Jun/2007	0.99	5.4	151.38
Duck Slough @ Gurr Rd	Copper	19/Jun/2007	No flow	15	0.00
Duck Slough @ Gurr Rd	Copper	26/Jun/2007	1.12	4.6	145.89
Duck Slough @ Gurr Rd	Copper	24/Jul/2007	1.78	4	201.62
Duck Slough @ Gurr Rd	Copper	31/Jul/2007	3.25	8.6	791.46
Duck Slough @ Gurr Rd	Copper	21/Aug/2007	1.38	4.8	187.57
Duck Slough @ Gurr Rd	Copper	18/Sep/2007	5.2	5.5	809.87

Source Identification

Priority C Constituents

Copper

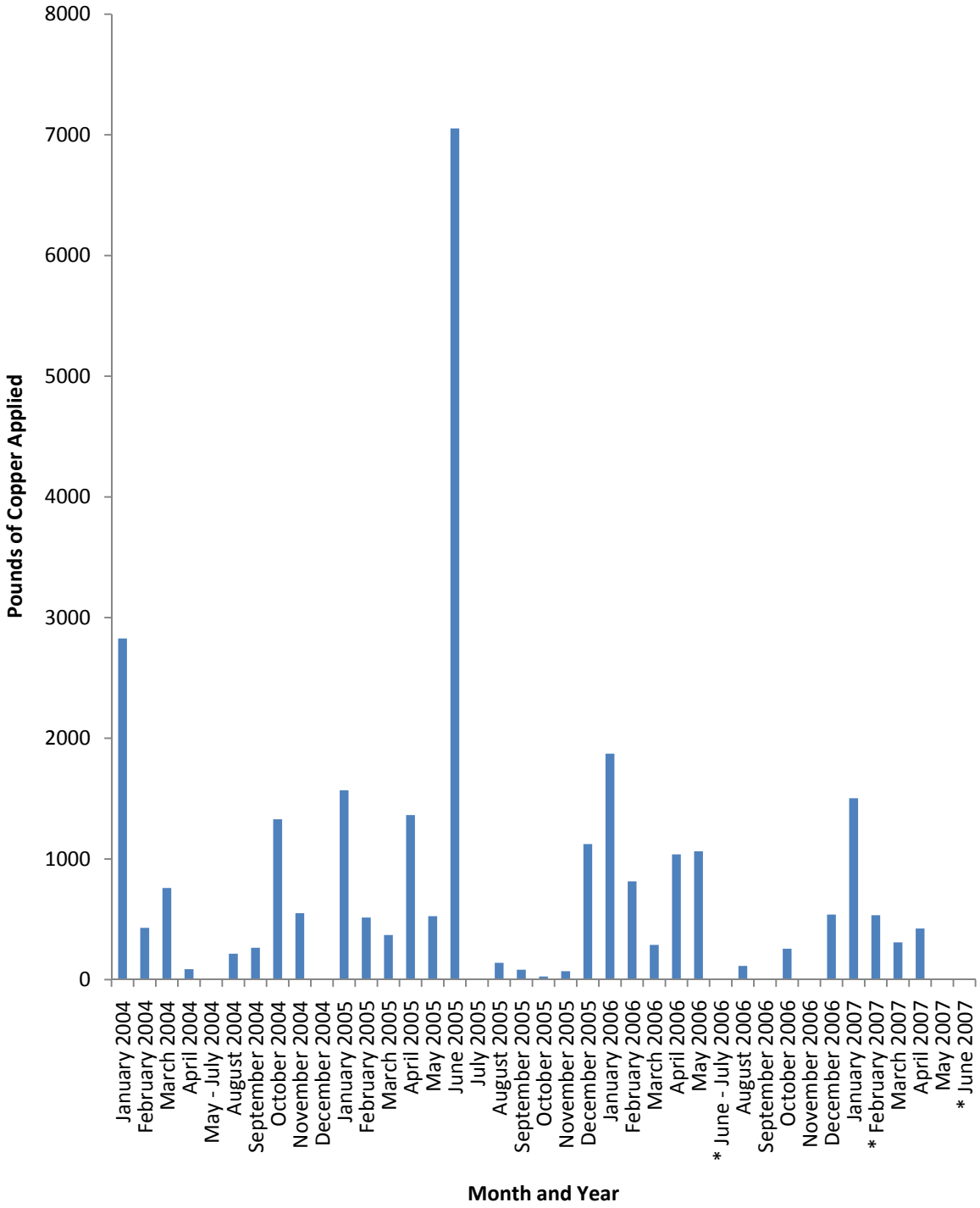
Six exceedances of the copper WQTL occurred in the Duck Slough site subwatershed across summer months in 2006 and 2007 and the winter of 2007. None of the exceedances was associated with toxicity to *Selenastrum*. Copper is applied primarily during the winter and spring months but smaller amounts are applied throughout the summer. Copper appears to be mobilized during both the winter and summer (Table XII-7, Figure XII-2) by storm water and irrigation tail water respectively. Copper is heavily used in the watershed with several applications being made across numerous sections (Table XII-8).

Table XII-7. Number of copper applications, total pounds applied and total acres treated by month for January 2004 through May 2007 in the Duck Slough @ Gurr Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2004	21	2826.72	707.6

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
February 2004	6	428.83	194
March 2004	3	758.72	135
April 2004	4	86.05	37.25
August 2004	3	214.25	191.2
September 2004	1	263.41	143
October 2004	4	1328.25	575
November 2004	2	550.14	224
January 2005	12	1568.73	376.1
February 2005	5	514.83	159.7
March 2005	3	369.89	81
April 2005	26	1363.19	483.25
May 2005	11	526.14	304.5
June 2005	10	7053.75	475
August 2005	3	139.80	127.8
September 2005	2	82.41	74.7
October 2005	1	25.79	21
November 2005	1	69.08	45
December 2005	5	1122.84	153
January 2006	12	1872.35	321
February 2006	9	813.99	251
March 2006	4	287.97	360
April 2006	12	1038.27	263.5
May 2006	11	1063.46	486
August 2006	1	113.04	103
October 2006	2	255.64	166
December 2006	2	539.00	70
January 2007	9	1502.74	223
February 2007	8	533.72	280
March 2007	3	309.23	115
April 2007	10	422.87	147.5
May 2007	1	8.25	33
2004 Total	44	6456.38	2207.05
2005 Total	79	12836.44	2301.05
2006 Total	53	5983.72	2020.5
2007 Total	31	2776.81	798.5
Total	207	28053.35	7327.1

Figure XII-2. Pounds of copper applied within the Duck Slough @ Gurr Rd site subwatershed by month for 2004-2007. Asterisk (*) denotes months with exceedances.



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Table XII-8. Duck Slough @ Gurr Rd. All TRS that had more than one application associated with an exceedance for copperin 2006 and 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS.

TRS	Date of Associated Exceedance					
	2/12/2007	2/28/2007	6/14/2006	7/12/2006	6/19/2007	6/26/2007
8S13E21			4	4	1	1
8S14E10			1	1		
8S14E11	1	1	1			
8S14E13	1	1				
8S14E14			2	2		
8S14E23			1	1		
8S15E10	4	4				
8S15E11	3	3				
8S15E12			5	5	5	5
8S15E14	2	2	1	1	1	1
8S15E15	3	3	4	4	3	3
8S15E16			1	1	1	1
8S15E17		3	2	1	1	1
8S15E18			1	1	1	1
8S15E24			5	4		
8S16E16	1	1				
8S16E7			1		1	1

Ceriodaphnia dubia toxicity

Three samples were toxic to Ceriodaphnia in the 2006 winter storm season; two normal monitoring and a resample. TIEs were performed on the two normal monitoring samples but the toxicity was not persistent and the test was inconclusive. None of the three *Ceriodaphnia* exceedances were associated with exceedances of any chemical. The cause of the *Ceriodaphnia* toxicity at this site is unknown but the Coalition will continue to monitor in an attempt to identify the causes and sources.

Selenastrum capricornutum toxicity

Selenastrum toxicity was experienced twice; September 2004 and July 2007 (Table XII-3). There were no exceedances of copper or herbicides associated with either of the toxicity events. No TIEs were performed. It is clear that the cause of the toxicity is associated with a soluble constituent(s) and preventing irrigation return flows would be effective in reducing or eliminating *Selenastrum* toxicity. At the time when this site becomes a priority, the Coalition will carefully review the PURs to determine which high solubility constituents should be targeted for focused outreach and management.

Priority D Constituents

Thiobencarb

Thiobencarb is applied only to rice and the exceedances are the responsibility of the Rice Coalition. The Coalition will not develop management plan sampling or actively manage for thiobencarb.

Hyalella azteca sediment toxicity

Hyalella toxicity occurred in August 2004, July and September 2005. *Hyalella* toxicity is most often associated with sediment bound chemicals such as pyrethroids. No chemical analyses were performed on the sediment so the cause of the toxicity is unknown. All three *Hyalella* toxicities were less than 80% survival and therefore are considered ecologically significant. Future *Hyalella* toxicity will be accompanied by sediment chemistry analyses and the Coalition will be in a position to determine the causes and sources of toxicity.

Priority D Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the 2006 and 2007 monitoring seasons. Only one sample had measureable BOD but the water was not in exceedance of the WQTL. A sample for which an exceedance occurred had no measureable BOD (Table XII-9). These results do not indicate that BOD was not the cause of the low DO and the cause is unknown. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XII-9. Duck Slough @ Gurr Rd. BOD, pH and dissolved oxygen results for September 2006 – July 2007.

StationName	SampleDate	pH	Oxygen, Dissolved	BOD, mg/L
Duck Slough @ Gurr Rd	9/13/2006	7.3	5.53	ND
Duck Slough @ Gurr Rd	2/12/2007	7.7	10.3	9
Duck Slough @ Gurr Rd	2/28/2007	7.91	9.7	ND
Duck Slough @ Gurr Rd	4/24/2007	8.15	8.62	ND
Duck Slough @ Gurr Rd	7/24/2007	7.82	8.66	ND

E. coli

Exceedances of the *E. coli* WQTL occurred 14 times across almost all months in the winter and summer monitoring seasons. This site subwatershed is small and has dairies upstream which could have contributed fecal material to the drain however the Coalition's *E. coli*/Bacteroides study did not detect any bovine signal in the water suggesting dairies were not discharging to the stream at that time (Tables XIII-10, XII-11). However, the study was conducted at only one point in time and the Coalition may work with the Regional Board to expand the study. When

dynamics of *E. coli* deposition are understood, the Coalition will re-evaluate its management options.

Table XII-10. Results of Bacteroides analysis. Duck Slough @ Gurr Rd was sampled three times a day for three consecutive days. A + indicates the DNA was detected but at too low a concentration to estimate a percentage.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
535XDSAGR	8/22/06	9:00	Grab	50	0	0
535XDSAGR	8/22/06	14:00	Grab	50	0	0
535XDSAGR	8/22/06	18:20	Grab	50	0	+
535XDSAGR	8/23/06	7:20	Grab	50	0	+
535XDSAGR	8/23/06	11:50	Grab	50	0	0
535XDSAGR	8/23/06	16:30	Grab	50	0	0
535XDSAGR	8/24/06	7:20	Grab	50	0	+
535XDSAGR	8/24/06	12:10	Grab	50	0	0.39
535XDSAGR	8/24/06	17:00	Grab	50	0	+

Table XII-11. Values of *E. coli*, fecal coliform, and total coliform in MPN/100mL, and the average C_T value for the All bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station Code	Sample Date	Sample Time	Sample Type	*E. coli*	Fecal Coliform	Total Coliform	Avg All bac	Avg Human	Avg Bovine	Avg Chicken
535XDSAGR	8/22/06	9:00	Grab		920	9200	28.235	29.2	39.765	39.285
535XDSAGR	8/23/06	7:20	Grab		2200	16000	26.845	27.385	39.58	30.775
535XDSAGR	8/24/06	7:20	Grab		1700	24000	27.065	27.515	39.66	29.615

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991 prior to the initiation of the Pesticide Use Reporting system. Consequently, it is not possible to identify where past applications of lead-based pesticide occurred. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils

may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal of lead paint in the vicinity, burial of old building materials with lead paint, or leaching from lead arsenate deposition could all be contributors to lead detections. The particular sources of this metal are unknown, and the Coalition will address the lead exceedances when they become a priority.

Nickel

Nickel is a naturally occurring metal that is found in native soils within the Coalition region. It is also applied by agriculture as a foliar nutrient on crops such as cotton and pecans to improve nitrogen utilization when nitrogen is applied as urea. The amount of nickel applied in the Coalition region is unknown. Nickel is also a constituent in fertilizers originating with wastes from industry and sewage treatment plants. It can also be released into the environment from the disposal of nickel-cadmium batteries. Metals associated with sediments may be found in the water column and due to the fact that the samples were not filtered, the concentration of metals in the sample water may have been elevated. The particular sources of these metals are unknown, and the Coalition will address the nickel exceedances when they become a priority.

2008 Management Plan Monitoring

Upstream Management Plan monitoring will occur in the Duck Slough watershed during the 2008 irrigation season at Duck Slough @ Hwy 59 and North Slough @ Hwy 59 (Figure XII-3, XII-4). The Duck Slough @ Hwy 59 sampling location is downstream of Highway 99 and divides the stretch of Duck Slough between Gurr Road and Highway 99 approximately in half (Figure XII-3). North Slough runs parallel to Duck Slough, joining with Duck Slough just east of Gurr Road (Figure XII-4). The target latitude and longitude for both sites are listed in Table XII-13. Sampling both of these locations will allow the Coalition to determine the contribution of both of these site subwatersheds to the water quality impairments experienced at Duck Slough @ Gurr Road.

Duck Slough @ Hwy 59 will be monitored for copper in June and July 2008 and for *Selenastrum* toxicity in July and September 2008 (Table XII-12). North Slough @ Hwy 59 will be monitored for copper in July and *Selenastrum* toxicity in September (Table XII-12).

Figure XII-3. Site subwatershed map of land use for the Duck Slough @ Hwy 59 upstream sample site.

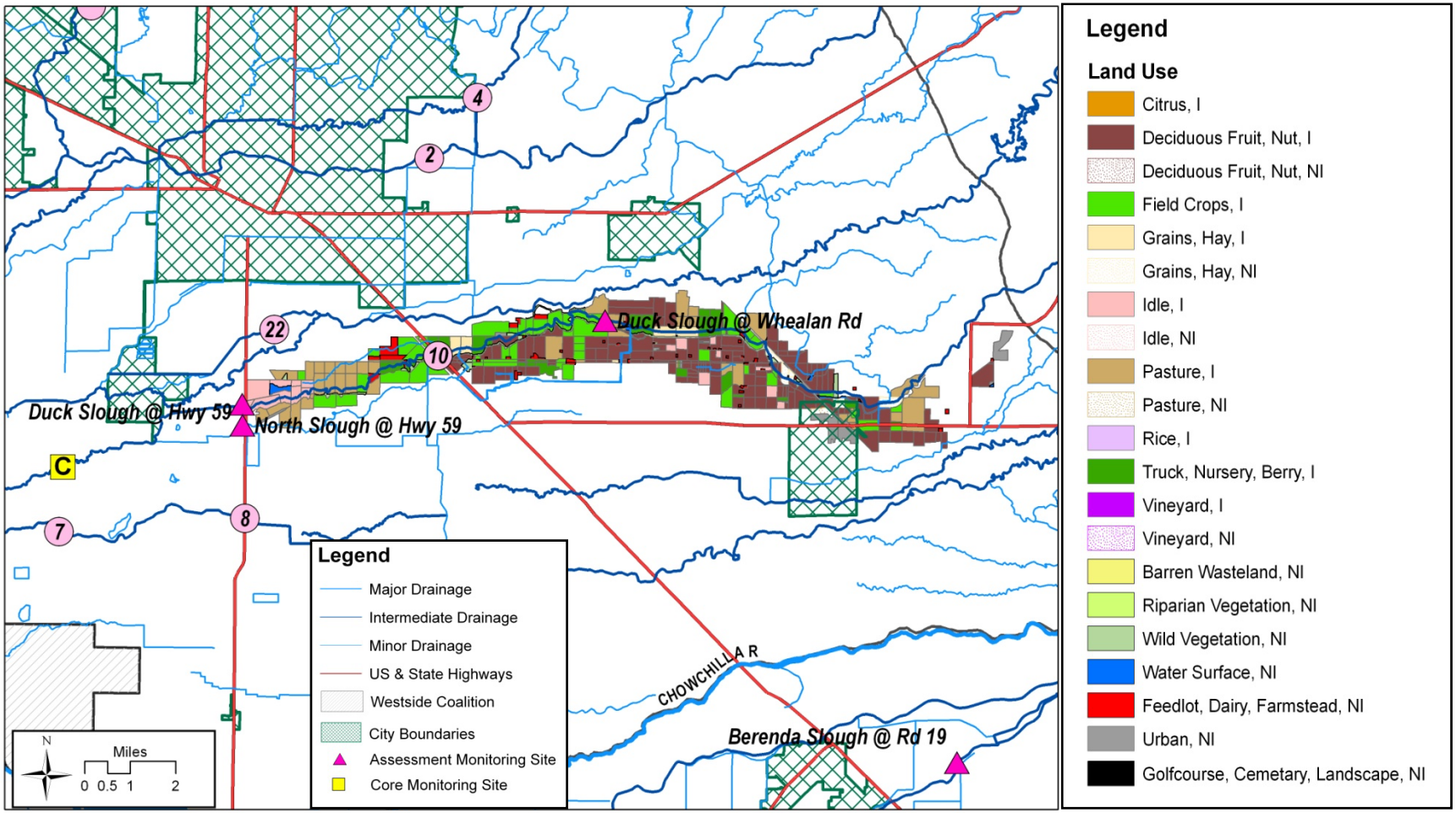


Figure XII-4. Site subwatershed map of land use for the North Slough @ Hwy 59 upstream sample site.

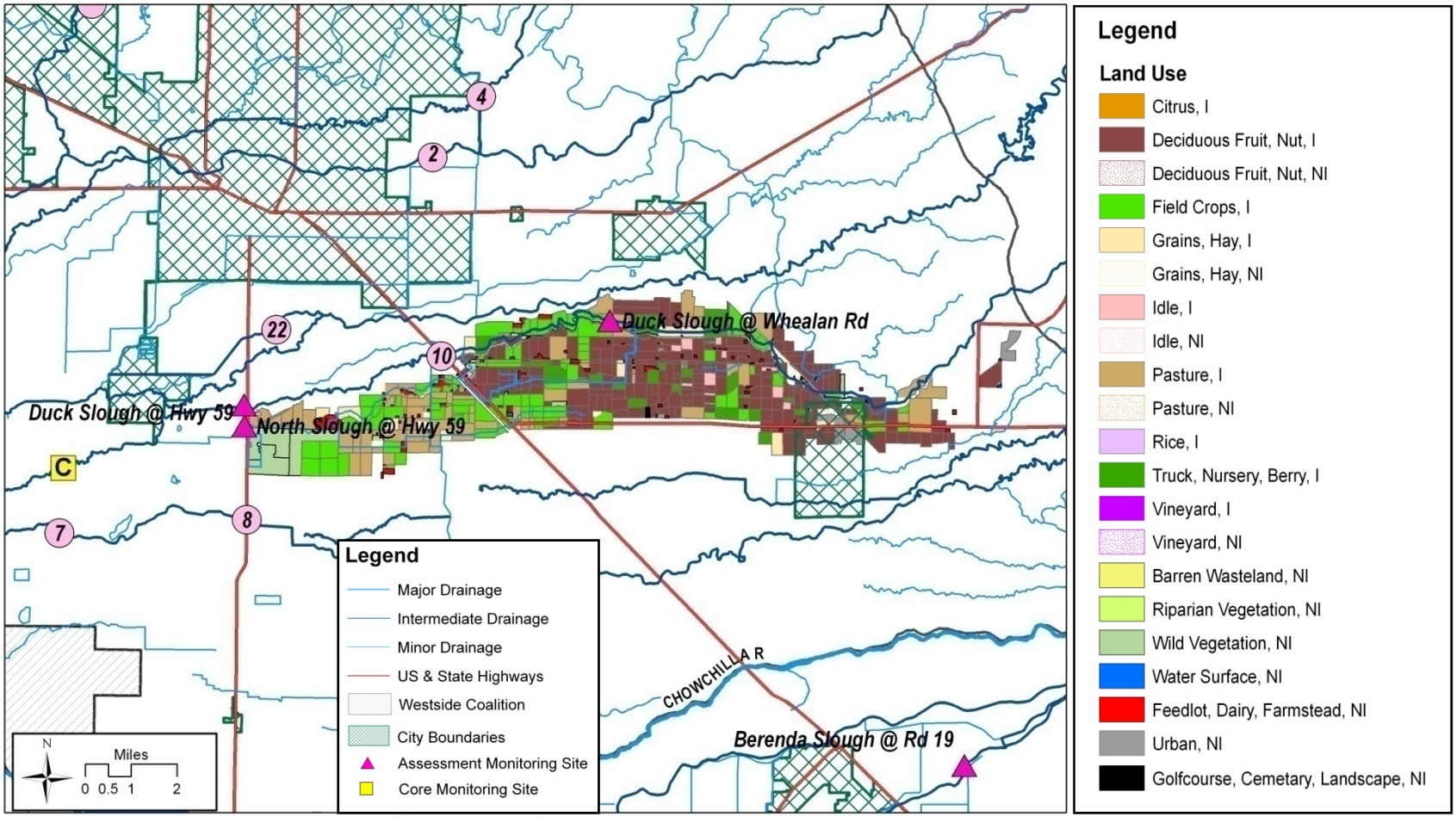


Table XII-12. Duck Slough @ Hwy 59 and North Slough @ Hwy 59. 2008 Management Plan sampling. U = upstream sampling.

Sample Site	Month	Type	Copper	*Selenastrum capricornutum*
Duck Slough @ Hwy 59	June	U	x	
Duck Slough @ Hwy 59	July	U	x	x
North Slough @ Hwy 59	July	U	x	x
Duck Slough @ Hwy 59	September	U		x
North Slough @ Hwy 59	September	U		x

Table XII-13. Sampling locations within the Duck Slough subwatershed.

Station Name	Station Code	Target Lat	Target Long
Duck Slough @ Gurr Rd*	535XDSAGR	37.2142	-120.5596
Duck Slough @ Hwy 59[U]	535XDSHFN	37.23447	-120.48810
North Slough @ Hwy 59[U]	535XNSHFN	37.22771	-120.48800

*Original ESJWQC sampling site
[U]Upstream sites

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XIII. HATCH DRAIN

Management Plan Constituents

Priority E

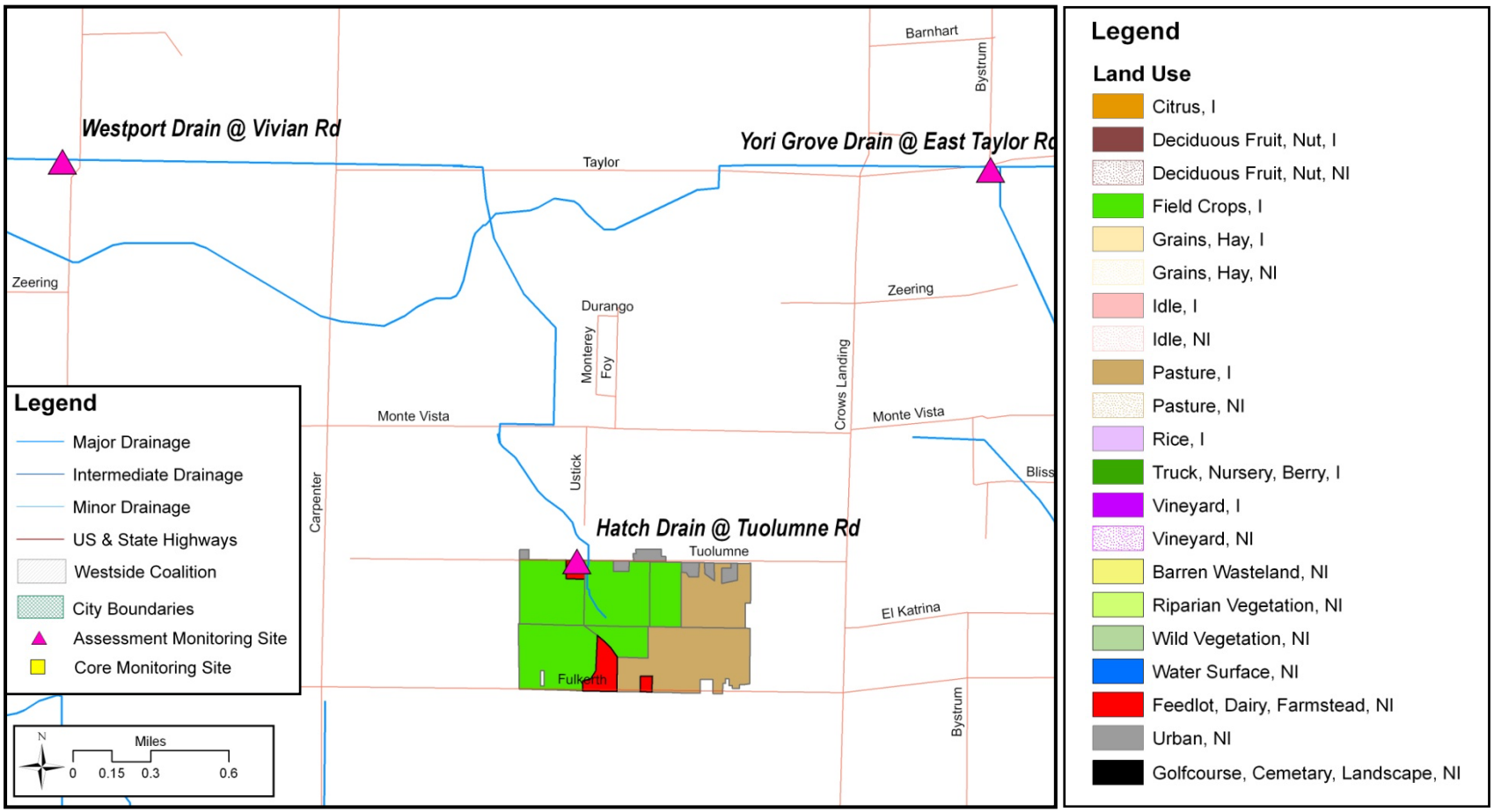
- DO
- Specific Conductivity
- Color
- Total Dissolved Solids
- Arsenic
- Cadmium
- Nitrate
- *Hyalella azteca* sediment toxicity

Description of Hatch Drain @ Tuolumne Rd Site Subwatershed

Hatch Drain @ Tuolumne Rd (553 irrigated acres) is a small site subwatershed located in the western portion of the Coalition region in Stanislaus County. The two major crops are irrigated pasture and field crops (Figure XIII-1).

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Figure XIII-1. Site subwatershed map of land use for the Hatch Drain @ Tuolumne Rd sample site.



Subwatershed Monitoring History

Hatch Drain @ Tuolumne Rd has been sampled since the irrigation season of 2007 (Table XIII-1). It has been sampled for the complete list of constituents in Table XIII-2 each sampling event.

Table XIII-1. Hatch Drain @ Tuolumne Rd sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	NA	NA	5

NA indicates that the site was not sampled this year/season.

Table XIII-2. Hatch Drain @ Tuolumne Rd. Number of analyses performed per analyte in each sampling season (only environmental samples are listed).

Method	Analyte	2007
		Irrigation
Field and Physical Parameters		
EPA 110.2	Color	5
EPA 160.1	Dissolved Solids	5
EPA 180.1	Turbidity	5
EPA 405.1	BOD	1
EPA 415.1	Total Organic Carbon	5
SM 9223	E. coli	5
NA	Dissolved Oxygen	7
NA	Specific Conductivity	7
NA	pH	7
Carbamates		
EPA 8321A	Aldicarb	5
EPA 8321A	Carbaryl	5
EPA 8321A	Carbofuran	5
EPA 8321A	Diuron	5
EPA 8321A	Linuron	5
EPA 8321A	Methiocarb	5
EPA 8321A	Methomyl	5
EPA 8321A	Oxamyl	5
Organochlorines		
EPA 8081A	DDD(p,p')	5
EPA 8081A	DDE(p,p')	5
EPA 8081A	DDT(p,p')	5
EPA 8081A	Dicofol	5
EPA 8081A	Dieldrin	5
EPA 8081A	Endrin	5
EPA 8081A	Methoxychlor	5
Organophosphates		

Method	Analyte	2007
		Irrigation
EPA 8141A	Azinphos methyl	5
EPA 8141A	Chlorpyrifos	5
EPA 8141A	Diazinon	5
EPA 8141A	Dimethoate	5
EPA 8141A	Disulfoton	5
EPA 8141A	Malathion	5
EPA 8141A	Methamidophos	5
EPA 8141A	Methidathion	5
EPA 8141A	Molinate	5
EPA 8141A	Parathion, Methyl	5
EPA 8141A	Phorate	5
EPA 8141A	Phosmet	5
EPA 8141A	Thiobencarb	5
Pyrethroids		
EPA 8081A	Bifenthrin	5
EPA 8081A	Cyfluthrin, total	5
EPA 8081A	Cyhalothrin, lambda, total	5
EPA 8081A	Cypermethrin, total	5
EPA 8081A	Esfenvalerate/Fenvalerate, total	5
EPA 8081A	Permethrin, total	5
Triazines		
EPA 547M	Glyphosate	5
EPA 549.2M	Paraquat dichloride	5
EPA 619	Atrazine	5
EPA 619	Cyanazine	5
EPA 619	Simazine	5
Metals		
EPA 200.8	Arsenic	5
EPA 200.8	Boron	5
EPA 200.8	Cadmium	5
EPA 200.8	Copper	5
EPA 200.8	Lead	5
EPA 200.8	Nickel	5
EPA 200.8	Selenium	1
EPA 200.8	Zinc	5
Nutrients		
EPA 130.2	Hardness as CaCO3	5
EPA 300.0	Nitrate as N	5
EPA 350.2	Ammonia as N	5
EPA 351.3	Nitrogen, Total Kjeldahl	5
EPA 354.1	Nitrite as N	5
EPA 365.2	OrthoPhosphate as P	5
EPA 365.2	Phosphate as P	5
Toxicity		
EPA 821/R-02-012	*Ceriodaphnia dubia*	5
EPA 821/R-02-012	*Pimephales promelas*	5

Method	Analyte	2007
		Irrigation
EPA 821/R-02-013	*Selenastrum capricornutum*	5
EPA 600/R-99-064	*Hyalella azteca*	2

Exceedance History

During irrigation 2007 sampling, exceedances of WQTLs included dissolved oxygen (6), specific conductivity and color (5), and total dissolved solids (4). There were exceedances of the WQTL for nitrate (5) and nitrite and ammonia (1 each). Exceedances of WQTL occurred for metals including arsenic (4) and cadmium (2). Dimethoate and methoxyclor pesticide exceedances of WQTLs each occurred once. Sediment samples also tested toxic to *Hyalella azteca* twice.

Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Hatch Drain @ Tuolumne Rd site subwatershed, all of the constituents experiencing more than one exceedance received a priority rating of (E).

Table XIII-3. Exceedances experienced in samples collected from the Hatch Drain @ Tuolumne Rd Coalition monitoring site between May 2007 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Ammonia as N, mg/L	Nitrate as N, mg/L	Nitrite as N, mg/L	Arsenic, µg/L	Cadmium, µg/L	Dimethoate, µg/L	Methoxychlor, µg/L	Hyalella azteca, Survival (%)
Hatch Drain @ Tuolumne Rd	Irrigation	5/15/07	6.46	1105	70	700	2400		13	2.2	12	0.05			
Hatch Drain @ Tuolumne Rd	Irrigation	6/19/07	5.54	1014	40	800	770		23		29	0.05			
Hatch Drain @ Tuolumne Rd	Irrigation	7/17/07	3.05	1111	76	720	260		44		18				
Hatch Drain @ Tuolumne Rd	Irrigation	8/14/07	4.22		64		2400	4.7	18				2.1		
Hatch Drain @ Tuolumne Rd	Irrigation	8/16/07	5.85	1280											0
Hatch Drain @ Tuolumne Rd	Irrigation	9/11/07	3.53	1817	70	1300	1600		24		18			0.035	0
Priorities			**E**	**E**	**E**	**E**	**E**		**E**		**E**	**E**			**E**

2007 Management Plan Monitoring

All exceedances occurred during the 2007 irrigation season and therefore this is the first time that Hatch Drain has required a Management Plan. Additional Management Plan monitoring will be conducted during the irrigation season of 2008.

Source Identification

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the July 2007 monitoring event. The water at the site had low DO but there was no BOD present in the sample. This result indicates that for this sample, BOD was not the cause of the low DO (Table XIII-4) and the cause is unknown. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XIII-4. Hatch Drain @ Tuolumne Rd. BOD, pH and dissolved oxygen results for -July 2007 sampling event.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Hatch Drain @ Tuolumne Rd	7/17/2007	7.32	3.05	ND

E. coli

Exceedances of the *E. coli* WQTL occurred in July and September of 2007. This site subwatershed is small and has two dairies directly upstream which could have contributed fecal material to the drain. Persistent exceedances of the nitrate WQTL with elevated concentrations further point to dairies as a likely source of *E. coli* exceedances. *E. coli* appears to be a consistent problem and the Coalition will address it when it becomes a priority.

Specific Conductivity/ Total Dissolved Solids

Specific conductivity (EC) and Total Dissolved Solids (TDS) are measures of salt and are often found as exceedances together. EC and TDS exceedances are common in site subwatersheds on the western edge of the Coalition region where shallow salty ground water commonly intrudes into surface waters. Many of the drains in the region were originally constructed to drain shallow salty surface water allowing agriculture. Consequently, it is not known if the water in the drain is discharged from agriculture or if shallow ground water intruding into the drain is responsible for the elevated EC and TDS. The Coalition recognizes that EC and TDS exceedances need to be to be managed on a regional basis and will work with the Regional Board to develop a management plan when EC/TDS become a priority.

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

Arsenic

Arsenic is found in sodium cacodylate which is applied by agriculture for broadleaf weed control and as a cotton defoliant. The registrations on many products with this active ingredient have been cancelled. However, there are four products currently registered for use on citrus, for weed control around ditches, for use on ornamental plants, for nonagricultural weed control, and for weed control around buildings, driveways, sidewalks, rights-of-way, and fencerows. Several products are available for use by homeowners and nonagricultural users (e.g. county road maintenance) (http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC34358&Chem_Name=Sodium%20cacodylate&PC_Code=012502) and the product may have been purchased for use by local homeowners for use on their property. California Department of Pesticide Regulation records indicate no use of sodium cacodylate across the Coalition region between 1998 and 2006 for agricultural use.

At this point the source of arsenic is unclear although native soils can contain elevated concentrations of arsenic. The Coalition will work with the Regional Board to determine if it is feasible to obtain the necessary data to establish background levels when arsenic becomes a priority.

Cadmium

Since the time of this exceedance, the WQTL for cadmium has increased to 5 µg/L and the exceedances listed in Table XIII-3 are therefore no longer considered an exceedance. As a result, the Coalition will not develop a strategy to manage cadmium.

Nitrate

Potential sources of nitrates in surface waters include runoff of fertilizers or organic matter from irrigated pasture, leaking septic systems, waste-treatment facility effluent, and inputs from dairies. These sources can move to surface waters through above ground runoff or shallow subsurface flows.

Animal waste that enters surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a drain include dairies, chicken operations, pasture and/or wildlife. Hatch Drain has two dairies upstream and dairy waste and/or applied manure could be the source of nitrate in the drain.

Hyalella azteca sediment toxicity

Hyalella toxicity is most often associated with sediment bound chemicals such as pyrethroids. No chemical analysis was performed on the sediment so the cause of the toxicity is unknown. Samples collected on August 16 were toxic to *Hyalella* with 0% survival as was the resample on September 11, 2007. These are the only two exceedances for *Hyalella* at this time and they are considered a single event. Therefore the Coalition will not develop management plan actions for *Hyalella* toxicity at this time.

2008 Management Plan Monitoring

Currently all exceedances in Hatch Drain are priority E and therefore no Management Plan monitoring will be conducted.

XIV. HIGHLINE CANAL @ HIGHWAY 99

Management Plan Constituents

Priority A

- Chlorpyrifos

Priority C

- Copper
- *Ceriodaphnia dubia* water column toxicity

Priority D

- *Hyalella azteca* sediment toxicity

Priority E

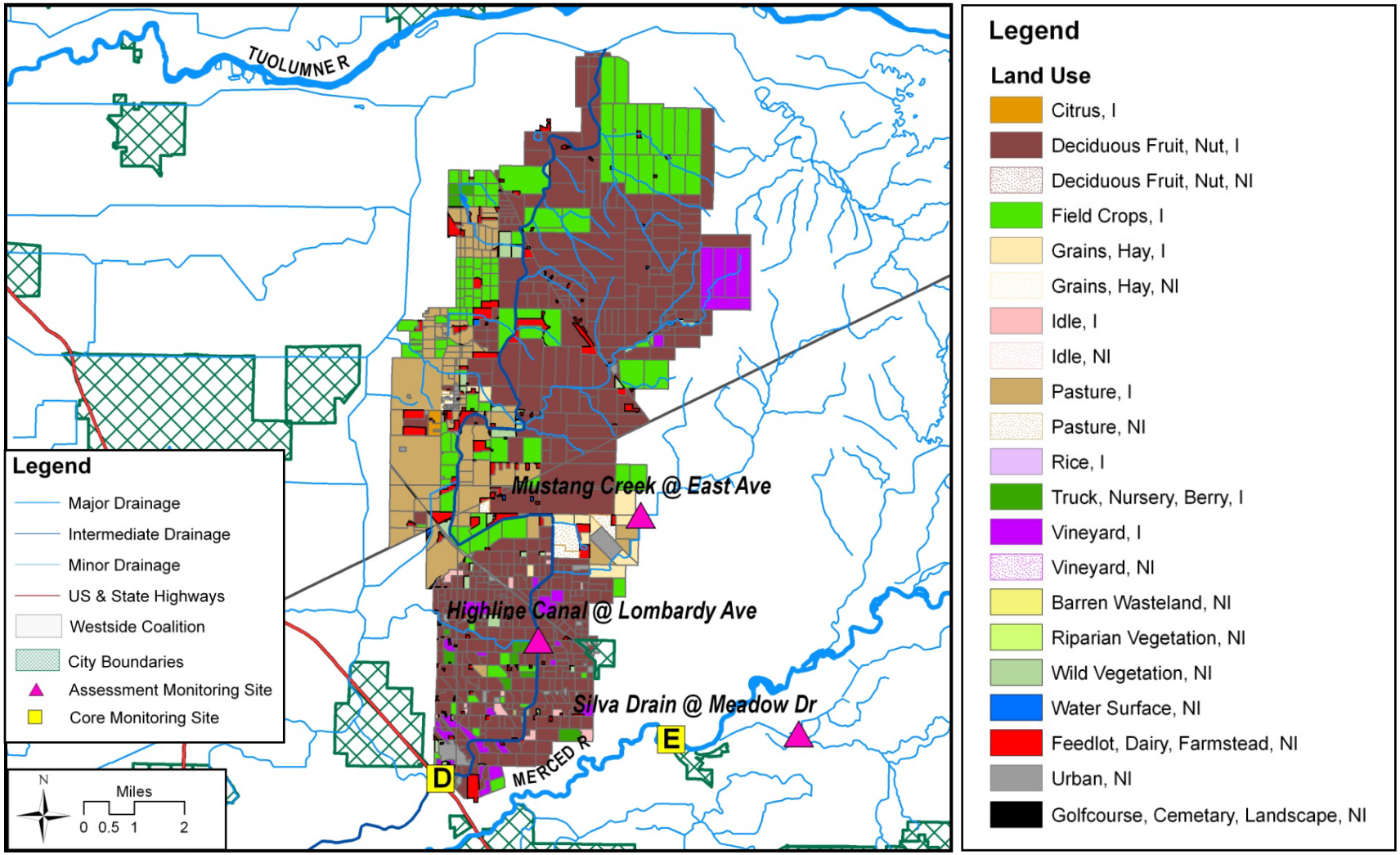
- *E. coli*
- pH
- Lead
- Color

Description of Highline Canal @ Hwy 99 Site Subwatershed

Highline Canal @ Highway 99 (35,003 irrigated acres) subwatershed is part of the Highline Canal which is a conveyance of the Turlock Irrigation District. The canal carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. This site was selected as a downstream companion site to the Highline Canal @ Lombardy Road site. These two sites in the Highline Canal subwatershed are monitored to determine the relative contribution of the upstream and downstream site subwatersheds to water quality impairments. The sampling site is located just south of Delhi as the canal crosses the highway. The irrigated agriculture is primarily deciduous orchards, and these are located at the lower end of the site subwatershed (Figure XIV-1). A small number of vineyards are also present (Figure XIV-1).

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Figure XIV-1. Site subwatershed map of land use for the Highline Canal @ Hwy 99 sample site.



Subwatershed Monitoring History

Monitoring at the Highline Canal @ Highway 99 site was initiated in the 2005 irrigation season. A single storm event was not sampled in 2007 because only one storm occurred that met the sampling trigger (Tables XIV-1 and XIV-2).

Table XIV-1. Highline Canal @ Hwy 99 sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	5	2	5	1	6
Events Not Sampled	NA	NA	0	0	0	1	0
Total	NA	NA	5	2	5	2	6

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Table XIV-2. Highline Canal @ Hwy 99. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters						
EPA 110.2	Color	5	2	5	1	6
EPA 160.1	Dissolved Solids	5	2	5	1	6
EPA 180.1	Turbidity	5	2	5	1	6
EPA 405.1	BOD			1	1	2
EPA 415.1	Total Organic Carbon	5	2	5	1	6
SM 9223	E. coli	5	2	5	1	6
NA	Dissolved Oxygen	6	5	5	1	8
NA	Specific Conductivity	6	5	5	1	8
NA	pH	6	5	5	1	8
Carbamates						
EPA 8321A	Aldicarb			5	1	6
EPA 8321A	Carbaryl			5	1	6
EPA 8321A	Carbofuran			5	1	6
EPA 8321A	Diuron			5	1	6
EPA 8321A	Linuron			5	1	6
EPA 8321A	Methiocarb			5	1	6
EPA 8321A	Methomyl			5	1	6
EPA 8321A	Oxamyl			5	1	6
Organochlorines						
EPA 8081A	DDD(p,p')			5	1	6
EPA 8081A	DDE(p,p')			5	1	6
EPA 8081A	DDT(p,p')			5	1	6
EPA 8081A	Dicofol			5	1	6
EPA 8081A	Dieldrin			5	1	6
EPA 8081A	Endrin			5	1	6
EPA 8081A	Methoxychlor			5	1	6
Organophosphates						
EPA 8141A	Azinphos methyl			5	1	6
EPA 8141A	Chlorpyrifos	5	2	5	1	6
EPA 8141A	Diazinon	5	2	5	1	6
EPA 8141A	Dimethoate			5	1	6
EPA 8141A	Disulfoton			5	1	6
EPA 8141A	Malathion			5	1	6
EPA 8141A	Methamidophos			5	1	6
EPA 8141A	Methidathion			5	1	6
EPA 8141A	Molinate			5	1	6
EPA 8141A	Parathion, Methyl			5	1	6
EPA 8141A	Phorate			5	1	6
EPA 8141A	Phosmet			5	1	6
EPA 8141A	Thiobencarb			5	1	6
Pyrethroids						
EPA 8081A	Bifenthrin	1	2	5	1	6

Method	Analyte	2005	2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	Cyfluthrin, total	1	2	5	1	6
EPA 8081A	Cyhalothrin, lambda, total	5	2	5	1	6
EPA 8081A	Cypermethrin, total	5	2	5	1	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	5	2	5	1	6
EPA 8081A	Permethrin, total	5	2	5	1	6
Triazines						
EPA 547M	Glyphosate			5	1	6
EPA 549.2M	Paraquat dichloride			5	1	6
EPA 619	Atrazine			5	1	6
EPA 619	Cyanazine			5	1	6
EPA 619	Simazine			5	1	6
Metals						
EPA 200.8	Arsenic			5	1	6
EPA 200.8	Boron			5	1	6
EPA 200.8	Cadmium			5	1	6
EPA 200.8	Copper			5	1	6
EPA 200.8	Lead			5	1	6
EPA 200.8	Nickel			5	1	6
EPA 200.8	Selenium			5	1	2
EPA 200.8	Zinc			5	1	6
Nutrients						
EPA 130.2	Hardness as CaCO3			5	1	6
EPA 300.0	Nitrate as N			5	1	6
EPA 350.2	Ammonia as N			5	1	6
EPA 351.3	Nitrogen, Total Kjeldahl			5	1	6
EPA 354.1	Nitrite as N			5	1	6
EPA 365.2	OrthoPhosphate as P			5	1	6
EPA 365.2	Phosphate as P			5	1	6
Toxicity						
EPA 0821/R-02-012	*Ceriodaphnia dubia*	6	3	6	1	8
EPA 0821/R-02-012	*Pimephales promelas*	5	2	5	1	7
EPA 0821/R-02-013	*Selenastrum capricornutum*	5	3	5	1	7
EPA 600/R-99-064	*Hyalella azteca*	5	1	2		1

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Exceedance History

Ambient water monitoring at Highline Canal was initiated in the storm season of 2004 at the Lombardy Road site and in the irrigation season of 2005 the downstream site, Highline Canal @ Hwy 99, was added. Since then exceedances of several WQTLs have occurred at the Highline Canal @ Hwy 99 Coalition sampling site including DO (1), pH (4), color (11), and *E. coli* (4) (Table XIV-3). Two exceedances of the chlorpyrifos WQTL, and one diuron exceedance also occurred (Table XIV-3). The analysis of metals was initiated in 2006 for irrigation season sampling and five exceedances of the copper WQTL, seven lead exceedances and one of the cadmium WQTL have occurred (Table XIV-3). Samples taken from Highline Canal @ Hwy 99 have also caused toxicity to *Ceriodaphnia* four times and *Selenastrum* one time, and sediment samples caused toxicity to *Hyalella* three times (Table XIV-3). Although all exceedances are listed in Table XIV-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions.

Highline Canal is not considered impaired and it is not listed on the current Central Valley Basin Plan 303d list, nor is Mustang Creek which is the canal's major tributary. However, the Merced River, which is the receiving water body of Highline Canal, is listed as impaired for a number of constituents including chlorpyrifos, diazinon, Group A pesticides, and mercury.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Highline Canal @ Hwy 99 site subwatershed, the constituents that received the highest priorities were chlorpyrifos (A) and copper (C).

Table XIV-3. Exceedances experienced in samples collected from the Highline Canal @ Highway 99 Coalition monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	E. coli, MPN/100 mL	Cadmium, µg/L	Copper, µg/L	Lead, µg/L	Chlorpyrifos, µg/L	Diuron, µg/L	Ceriodaphnia dubia, Survival (%)	Hyalella azteca, Survival (%)	Selenastrum capricornutum, Total Cell Count
Highline Canal @ Hwy 99	Irrigation	10/May/2005			30							45		
Highline Canal @ Hwy 99	Irrigation	19/May/2005										0		
Highline Canal @ Hwy 99	Irrigation	15/Jun/2005			40									
Highline Canal @ Hwy 99	Irrigation	17/Aug/2005			40									
Highline Canal @ Hwy 99	Irrigation	20/Sep/2005			20								87.5	
Highline Canal @ Hwy 99	Irrigation	17/May/2006			23				0.42 (0.36)					
Highline Canal @ Hwy 99	Irrigation	14/Jun/2006			18									
Highline Canal @ Hwy 99	Irrigation	12/Jul/2006			19									
Highline Canal @ Hwy 99	Irrigation	09/Aug/2006							0.39 (0.31)				88.75	
Highline Canal @ Hwy 99	Irrigation	05/Sep/2006											80	
Highline Canal @ Hwy 99	Irrigation	13/Sep/2006										60		
Highline Canal @ Hwy 99	Irrigation	17/Apr/2007			16		0.08	11 (10.1)	5.1 (3.59)					
Highline Canal @ Hwy 99	Irrigation	15/May/2007		8.56		250								
Highline Canal @ Hwy 99	Irrigation	19/Jun/2007				320		2.4 (1.9)	0.5 (0.31)					
Highline Canal @ Hwy 99	Irrigation	17/Jul/2007			25	440		3.2 (2.2)	1 (0.36)	0.017				
Highline Canal @ Hwy 99	Irrigation	14/Aug/2007		8.62				1.9 (1.7)	0.44 (0.26)					
Highline Canal @ Hwy 99	Irrigation	25/Sep/2007		8.73										
Highline Canal @ Hwy 99	Storm	01/Mar/2006	5.6		50					0.021				12750
Highline Canal @ Hwy 99	Storm	16/Mar/2006				300						0		
Highline Canal @ Hwy 99	Storm	02/May/2006		8.73										
Highline Canal @ Hwy 99	Storm	11/Feb/2007			20			3 (2.2)	0.52 (0.36)		25			
Priorities				**E**	**E**	**E**		**C**	**E**	**A**		**D**	**D**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

Additional Management Plan monitoring was conducted for *Ceriodaphnia* in September 2007 (Table XIV-4). There was no toxicity in any of the samples collected during the 2007 irrigation season including the MPM sample collected on September 25, 2007 (Table XIV-5). The second exceedance for chlorpyrifos occurred in 2007 and all copper exceedances occurred in 2007 and therefore Management Plan monitoring will begin for these constituents during the 2008 irrigation season.

Table XIV-4. Highline Canal @ Hwy 99. Management Plan monitoring schedule for *Ceriodaphnia.* X = indicates the site, month, and analyte sampled.

Sample Site	Month	*Ceriodaphnia dubia*
Highline Canal @ Hwy 99	September	x

Table XIV-5. Highline Canal @ Hwy 99. Normal monitoring (NM) and management plan monitoring (MPM) results for *Ceriodaphnia* from the 2007 irrigation season. Exceedance values are in bold.

Management Plan Constituent	NM	NM	NM	NM	NM	NM	MPM
	4/17/2007	5/15/2007	6/19/2007	7/17/2007	8/14/2007	9/11/2007	9/25/2007
Ceriodaphnia dubia (% survival)	90	100	100	95	100	100	100

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table XIV-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XIV-6. Highline Canal @ Hwy 99. Instantaneous load calculations for chlorpyrifos and copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Highline Canal @ Hwy 99	Chlorpyrifos	01/Mar/2006	No flow	0.021	0.00
Highline Canal @ Hwy 99	Chlorpyrifos	12/Jul/2006	111.81	0.012	37.99
Highline Canal @ Hwy 99	Chlorpyrifos	17/Jul/2007	56.81	0.017	27.35
Highline Canal @ Hwy 99	Copper	17/May/2006	82.45	1.8	4202.53
Highline Canal @ Hwy 99	Copper	14/Jun/2006	90.82	1.7	4371.97

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Highline Canal @ Hwy 99	Copper	12/Jul/2006	111.81	1.6	5065.80
Highline Canal @ Hwy 99	Copper	09/Aug/2006	162.04	1.3	5965.03
Highline Canal @ Hwy 99	Copper	13/Sep/2006	72.64	1.3	2674.03
Highline Canal @ Hwy 99	Copper	11/Feb/2007	55.43	3	4708.83
Highline Canal @ Hwy 99	Copper	17/Apr/2007	22.54	11	7020.92
Highline Canal @ Hwy 99	Copper	15/May/2007	60.6	1.4	2402.41
Highline Canal @ Hwy 99	Copper	19/Jun/2007	84.28	2.4	5727.74
Highline Canal @ Hwy 99	Copper	17/Jul/2007	56.81	3.2	5147.80
Highline Canal @ Hwy 99	Copper	14/Aug/2007	81.98	1.9	4410.71
Highline Canal @ Hwy 99	Copper	11/Sep/2007	33.38	1.5	1417.83

Source Identification

Priority A Constituents

Chlorpyrifos

Exceedances of the chlorpyrifos WQTL occurred during the storm season in 2006 and the irrigation season of 2007 (Table XIV-3). The exceedance in March 2006 was slightly over the WQTL and the lack of a load calculation indicates that there was no or very limited flow around this date (Table XIV-6). The exceedance in July 2007 was slightly greater that the WQTL and occurred during the month with the highest number of applications in that year and the highest pounds AI applied (Table XIV-7, Figure XIV-2). The July exceedance was likely associated with hull-split applications to almonds while the March exceedances were likely associated with dormant spray applications to almonds. Although there is no reported application of chlorpyrifos during February 2006 there were applications during January which may have resulted in runoff during the next storm event. These results suggest that the first exceedance could have been the result of storm water transporting chlorpyrifos to the creek. Turlock Irrigation District reports that there are no inputs to Highline Canal during the irrigation season and the low concentration of chlorpyrifos in the sample further suggests drift from nearby orchards during hull-split applications as the source. Numerous applications across five sections were made prior to sampling (Table XIV-8).

Table XIV-7. Number of chlorpyrifos applications, total pounds applied and acres treated by month for January 2005 through August 2007 in the Highline Canal @ Hwy 99 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2005	14	768.32	549.2
March 2005	5	231.91	492.2
April 2005	2	360.18	360

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
May 2005	17	6208.71	1686
June 2005	19	1313.77	778
July 2005	42	3632.32	2094
August 2005	20	2815.73	2271
September 2005	2	33.90	17
November 2005	4	1444.75	724.6
January 2006	7	2041.14	1035
May 2006	13	2535.36	2007
June 2006	11	1753.57	1538.9
July 2006	28	6231.24	3615.2
August 2006	30	2606.08	2461.5
September 2006	2	85.12	42
March 2007	1	110.62	217.4
April 2007	1	6.20	20
May 2007	15	1835.61	1621
June 2007	8	3971.90	1435
July 2007	34	8965.38	5372.3
August 2007	3	298.07	386.4
2005 Total	125	16809.58	8972
2006 Total	91	15252.51	10699.6
2007 Total	62	15187.79	9052.1
Total	278	47249.89	28723.7

Figure XIV-2. Pounds of chlorpyrifos applied within the Highline Canal @ hwy 99 site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

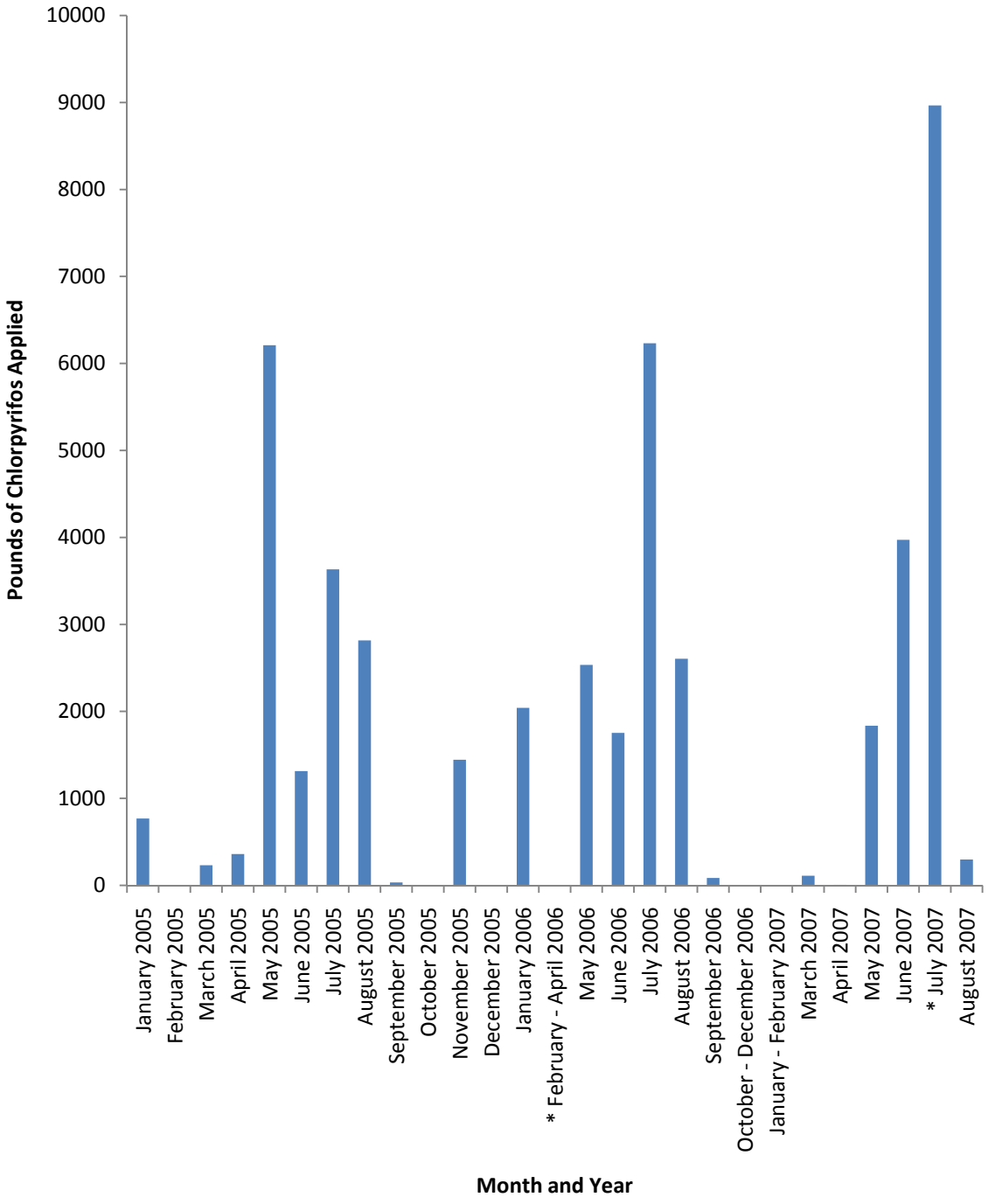


Table XIV-8. Highline Canal @ Hwy 99. All TRS' that had more than one application associated with an exceedance of chlorpyrifos in 2006 and 2007. Table indicates the application with which the exceedance was associated. No chlorpyrifos applications were reported in the month prior to the 3/1/06 exceedance.

TRS	Date of Associated Exceedance	
	3/1/2006	7/17/2007
3S11E36		3
4S11E1		2
4S11E28		2
4S12E8		2
5S11E26		3

Priority C Constituents

Copper

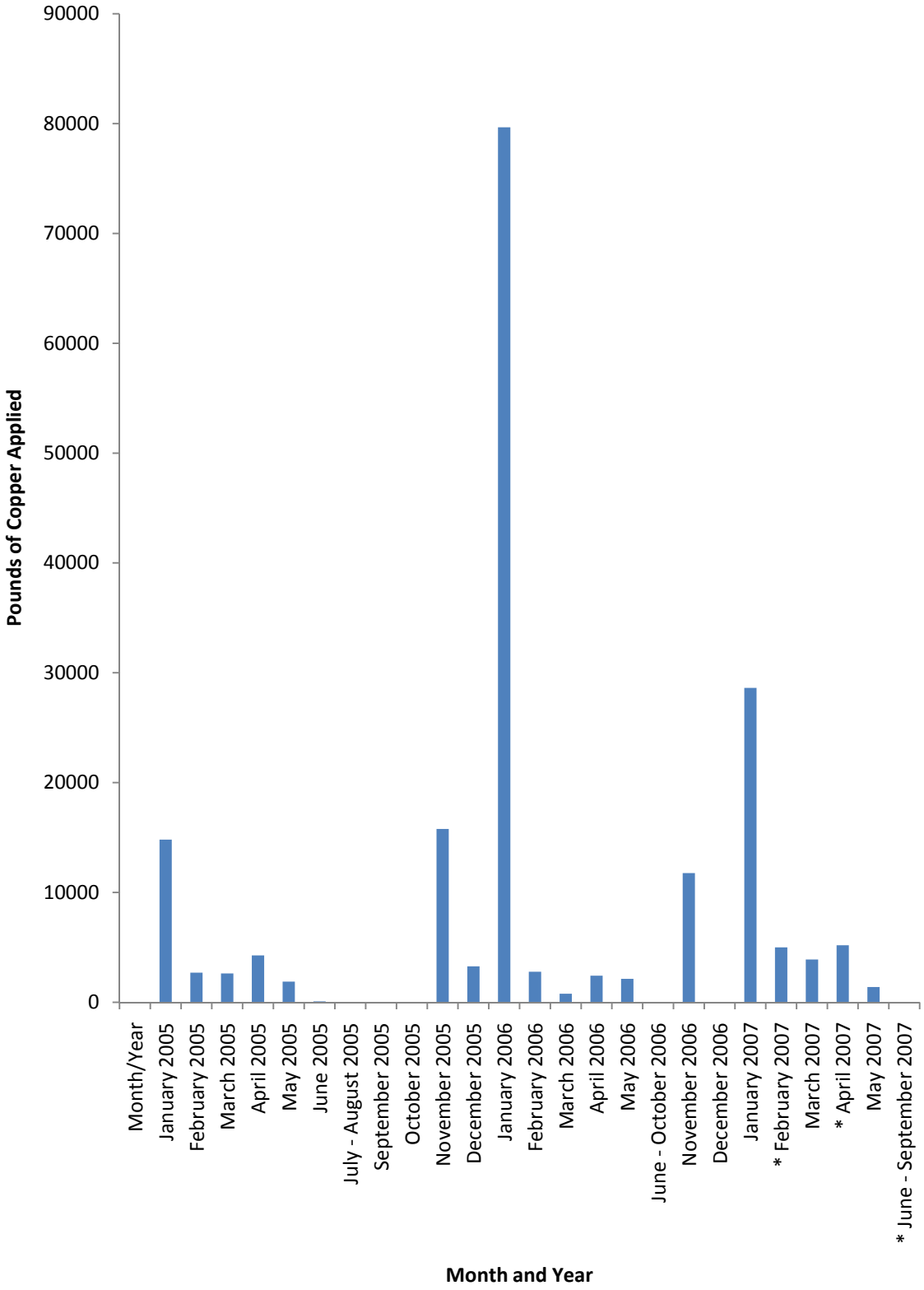
Five exceedances of the copper WQTL occurred; February 2007, April, June, August, and September 2007 (Table XIV-3). None were associated with *Selenastrum* toxicity. Large amounts of copper were applied during the months prior to the exceedances although the May applications in 2007 were low (Table XIV-9, Figure XIV-3). Applications were made in multiple sections across the watershed prior to all exceedances (Table XIV -10). Despite the claim that there are no inputs to the Highline Canal in the irrigation season, it appears that management of irrigation tail water will be necessary to prevent the movement of copper to Highline Canal. The only other possible explanation is the use of copper by TID to maintain their canals.

Table XIV-9. Number of copper applications, total pounds applied and total acres treated by month for January 2005 through May 2007 in the Highline Canal @ Hwy 99 site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2005	32	14811.36	4290
February 2005	27	2692.85	3018
March 2005	22	2628.95	1096
April 2005	27	4270.99	2055.7
May 2005	16	1874.05	598
June 2005	1	77.00	40
September 2005	1	8.61	4
October 2005	2	9.15	8
November 2005	16	15776.37	3979
December 2005	11	3267.86	827
January 2006	40	79663.63	11133
February 2006	22	2774.03	3515
March 2006	12	770.46	1045
April 2006	19	2420.86	605

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
May 2006	14	2136.98	1432.4
November 2006	6	11760.00	3000
January 2007	71	28619.68	5279.75
February 2007	50	4993.02	2280.93
March 2007	55	3895.00	2407.83
April 2007	49	5184.60	1172
May 2007	10	1388.19	310.1
2005 Total	155	45417.18	15915.7
2006 Total	113	99525.96	20730.4
2007 Total	235	44080.49	11450.61
Total	503	189023.63	48096.71

Figure XIV-3. Pounds of copper applied within the Highline Canal @ Hwy 99 site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.



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Table XIV-10. Highline Canal @ Hwy 99. All TRS that had more than one application associated with an exceedance for copper in 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS.

TRS	Date of Associated Exceedance				
	2/11/2007	4/17/2007	6/19/2007	7/17/2007	8/17/2007
3S11E36		13	20	9	
3S12E31		3	4	1	
4S11E16	1	2			
4S11E23	1	2			
4S11E25	1	4			
4S11E28		5	3	2	
4S11E33	1	3	4	2	
4S11E36	2				
4S12E22	1	1			
4S12E29		2			
4S12E30		8	14	8	2
4S12E31	3	7	6	1	
4S12E32	3	2			
4S12E33		2			
4S12E5		2			
5S11E1	8				
5S11E17		1	1		
5S11E25	2	9			
5S11E26	3	2	1		
5S11E27	2	13	16	5	
5S11E28	4	4			
5S11E3		2			
5S11E34	9	10			
5S11E35	4	5	1		
5S11E36	12	12			
5S11E5		1	1		
5S12E30	1	1			
5S12E31	2	2	1	1	
5S12E5	1	1			
6S11E1	5	7			
6S11E10	1	1			
6S11E11	5	3			
6S11E12	3	2			
6S11E13	4	4			
6S11E14	3	1			
6S11E15	1	1			
6S11E2	7	4			

TRS	Date of Associated Exceedance				
	2/11/2007	4/17/2007	6/19/2007	7/17/2007	8/17/2007
6S11E3	7	8	2	2	
6S12E6	2	12	1	1	
6S12E7	2	3			

Priority D Constituents

Ceriodaphnia dubia toxicity

There were four occurrences of *Ceriodaphnia* toxicity, three from normal monitoring and one as follow-up resampling (Table XIV-3). TIEs were performed only on the samples collected during normal monitoring. During the TIE for the May 10, 2005 and March 16, 2006 samples, the toxicity was not persistent and therefore the TIEs were inconclusive. None of the *Ceriodaphnia* exceedances were associated with the exceedances of chlorpyrifos. The source of the 2005/2006 *Cerodaphnia* toxicity is unknown and no toxicity occurred for *Ceriodaphnia* in 2007.

Hyalella azteca toxicity

Hyalella toxicity is most often associated with sediment bound chemicals such as pyrethroids. No chemical analyses were performed on the sediment so the cause of the toxicity is unknown. Two *Hyalella* exceedances were from normal monitoring and one as a follow-up sample to test for toxicity persistence (Table XIV-3). All three *Hyalella* toxicities were greater than 80% survival and therefore may not be ecologically significant. *Hyalella* samples collected in 2007 did not cause significant mortality.

Priority E Constituents

E. coli

Exceedances of the *E. coli* WQTL occurred four times including both the storm and irrigation seasons. This site subwatershed is large and has numerous dairies which could have contributed fecal material to the drain during the storm season. Also, during the storm season, storm water from Turlock is released to Highline Canal and can be a source of fecal coliforms. Highline Canal @ Hwy 99 was not sampled during the 2006 *E. coli* study however the upstream site, Highline Canal @ Lombardy Avenue was sampled. All Bacteroides was attributed to human sources suggesting that inputs to the system during the summer may come from urban sources. Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991 prior to the initiation of the Pesticide Use Reporting system. Consequently, it is not possible to identify where past applications of lead-based pesticide occurred. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal of lead paint in the vicinity, burial of old building materials with lead paint, or leaching lead from lead arsenate deposition could all be contributors to lead detections. The particular sources of this metal are unknown, and the Coalition will address the lead exceedances when they become a priority.

2008 Management Plan Monitoring

Additional sampling was conducted in 2007 during September for *Ceriodaphnia* toxicity. None of the samples collected during the 2007 irrigation sampling were toxic to *Ceriodaphnia.* Therefore, additional Management Plan monitoring will occur in July for chlorpyrifos, April, June, July and August for copper, and May and September for *Ceriodaphnia* (Table XIV-11).

Table XIV-11. Highline Canal @ Hwy 99. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Copper	*Ceriodaphnia dubia*
Highline Canal @ Hwy 99	April	A		**x**	
Highline Canal @ Hwy 99	May	A			**x**
Highline Canal @ Hwy 99	June	A		**x**	
Highline Canal @ Hwy 99	July	A	**x**	**x**	
Highline Canal @ Hwy 99	August	A		**x**	
Highline Canal @ Hwy 99	September	A			**x**

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XV. HIGHLINE CANAL @ LOMBARDY AVE

Management Plan Constituents

Priority A

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Ceriodaphnia dubia* water column toxicity
- *Selenastrum capricornutum* water column toxicity

Priority E

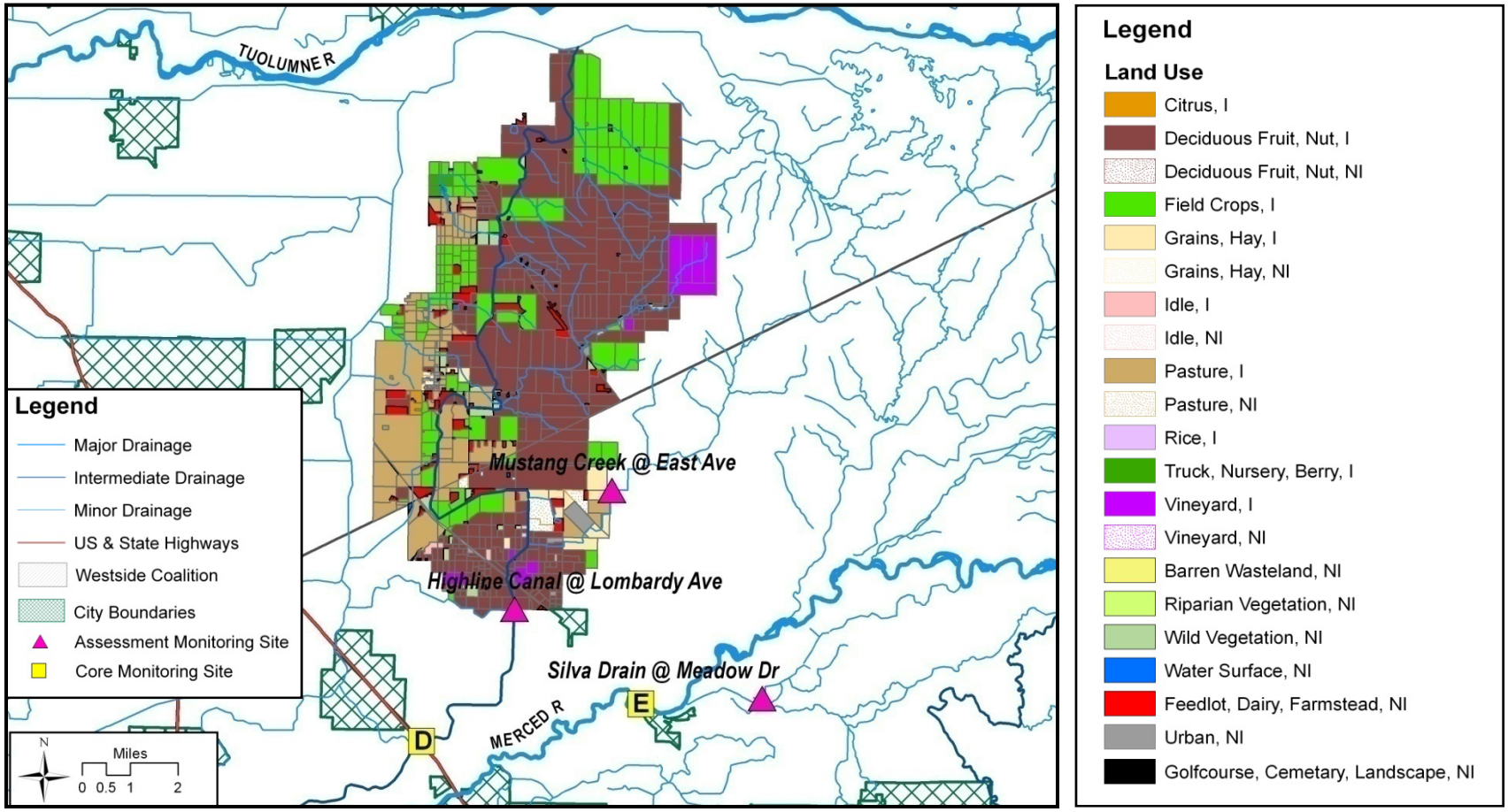
- *E. coli*
- pH
- Lead
- Color

Description of Highline Canal @ Lombardy Ave Site Subwatershed

The Highline Canal is a conveyance of the Turlock Irrigation District and carries both clean irrigation water and irrigation return flow during the summer and storm water runoff during the winter. Highline Canal @ Lombardy Road (29,941 irrigated acres) flows west and eventually drains into the Merced River. Dairies are present upstream and Mustang Creek, a major tributary during the dormant season, passes immediately to the southeast of the Turlock Airport. The main agricultural crop upstream is deciduous orchards (Figure XV-1).

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Figure XV-1. Site subwatershed map of land use for the Highline Canal @ Lombardy Ave sample site.



Subwatershed Monitoring History

Monitoring was initiated at this site in the irrigation season of 2005 (Tables XV-1 and XV-2). All events have been monitored successfully (Table XV-1).

Table XV-1. Highline Canal @ Lombardy Ave sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	2	6

Table XV-2. Highline Canal @ Lombardy Ave. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5	2	6
EPA 160.1	Dissolved Solids	2	5	2	5	4	6
EPA 180.1	Turbidity	2	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6
SM 9223	E. coli	2	5	2	6	2	6
NA	Dissolved Oxygen	2	6	4	6	3	10
NA	Specific Conductivity	2	6	4	6	3	10
NA	pH	2	6	4	6	2	10
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD(p,p')				5	2	6
EPA 8081A	DDE(p,p')				5	2	6
EPA 8081A	DDT(p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	6

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8141A	Chlorpyrifos	2	5	2	5	2	6
EPA 8141A	Diazinon	2	5	2	5	2	6
EPA 8141A	Dimethoate				5	2	6
EPA 8141A	Disulfoton				5	2	6
EPA 8141A	Malathion				5	2	6
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	6
EPA 8141A	Molinate				5	2	6
EPA 8141A	Parathion, Methyl				5	2	6
EPA 8141A	Phorate				5	2	6
EPA 8141A	Phosmet				5	2	6
EPA 8141A	Thiobencarb				5	2	6
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5	2	6
EPA 8081A	Cyfluthrin, total		1	2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6
EPA 8081A	Permethrin, total	2	5	2	5	2	6
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	6
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	7
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	6
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	2	7	3	9

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Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5	2	7
EPA 821/R-02-013	*Selenastrum capricornutum*	2	8	3	5	3	8
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	2

Exceedance History

Exceedances of WQTLs include pH (2), *E. coli* (2), color (12), chlorpyrifos (3), diuron (1), copper (2), lead (7), and zinc (1). Samples taken from Highline Canal have caused toxicity to *Ceriodaphnia* four times, *Selenastrum* three times, and toxicity to *Hyalella* four times.

Highline Canal is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list, nor is Mustang Creek which is the canal's major tributary. However, Merced River, which is the receiving water body of Highline Canal, is listed as impaired for a number of constituents including chlorpyrifos, diazinon, Group A pesticides, and mercury.

Although all exceedances are listed in the Table XV-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Highline Canal @ Lombardy Ave site subwatershed, the constituents receiving the highest priorities were chlorpyrifos (A) and copper (C).

Table XV-3. Exceedances experienced in samples collected from the Highline Canal @ Lombardy Ave Coalition monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	pH, none	Color, color units	E. coli, MPN/100 mL	Copper, µg/L	Lead, µg/L	Zinc, µg/L	Chlorpyrifos, µg/L	Diuron, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Hyalella azteca*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Highline Canal @ Lombardy Ave	Irrigation	10/May/2005		30	240							71.25	
Highline Canal @ Lombardy Ave	Irrigation	14/Jun/2005		30									
Highline Canal @ Lombardy Ave	Irrigation	17/Aug/2005	6.46	30									797000
Highline Canal @ Lombardy Ave	Irrigation	17/May/2006		22			0.49 (0.46)						
Highline Canal @ Lombardy Ave	Irrigation	14/Jun/2006		18			0.55 (0.52)				65		
Highline Canal @ Lombardy Ave	Irrigation	12/Jul/2006		17									
Highline Canal @ Lombardy Ave	Irrigation	09/Aug/2006					0.34 (0.31)						
Highline Canal @ Lombardy Ave	Irrigation	13/Sep/2006					0.29 (0.21)	23 (19.9)			35		
Highline Canal @ Lombardy Ave	Irrigation	15/May/2007				2.2 (1.9)	0.49 (0.31)						
Highline Canal @ Lombardy Ave	Irrigation	19/Jun/2007					0.49 (0.31)						
Highline Canal @ Lombardy Ave	Irrigation	17/Jul/2007							0.017				
Highline Canal @ Lombardy Ave	Irrigation	16/Aug/2007										90	
Highline Canal @ Lombardy Ave	Irrigation	11/Sep/2007										52	
Highline Canal @ Lombardy Ave	Storm	15/Feb/2005		75									
Highline Canal @ Lombardy Ave	Storm	21/Mar/2005	8.56	80									
Highline Canal @ Lombardy Ave	Storm	01/Mar/2006		60					0.027				
Highline Canal @ Lombardy Ave	Storm	16/Mar/2006		600	900				0.018				434000
Highline Canal @ Lombardy Ave	Storm	02/May/2006										45	
Highline Canal @ Lombardy Ave	Storm	11/Feb/2007		25		2.5 (2.2)	0.45 (0.36)						
Highline Canal @ Lombardy Ave	Storm	28/Feb/2007		25						3.2	50		643000
Highline Canal @ Lombardy Ave	Storm	07/Mar/2007									0		
Priorities			**E**	**E**	**E**	**C**	**E**		**A**		**D**		**D**

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

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2007 Management Plan Monitoring Results

Additional Management Plan monitoring (MPM) was conducted in June and September for *Ceriodaphnia* toxicity and August for *Selenastrum* toxicity (Table XV-4). None of the samples collected during the 2007 irrigation season were toxic to either *Ceriodaphnia* or *Selenastrum* including the MPM samples (Table XV-5). Both chlorpyrifos exceedances that occurred in 2006 were in storm samples and therefore additional monitoring was not performed. The second copper exceedance occurred during the irrigation season of 2007 and therefore 2008 will the first year that copper will be under a management plan for this site.

Table XV-4. Management Plan monitoring schedule for Ceriodaphnia and Selenastrum. X = indicates the site, month, and analyte sampled.

Sample Site	Month	*Ceriodaphnia dubia*	*Selenastrum capricornutum*
Highline Canal @ Lombardy Ave	June	**x**	
Highline Canal @ Lombardy Ave	August		**x**
Highline Canal @ Lombardy Ave	September	**x**	

Table XV-5. Highline Canal @ Lombardy Ave. Normal monitoring (NM) and management plan monitoring (MPM) results for zinc, *Ceriodaphnia* and *Selenastrum* from the 2007 irrigation season. Exceedance values are in bold.

Monitoring Type	NM	NM	NM	MPM	NM	NM	MPM	NM	MPM
Date	4/17/07	5/15/07	6/19/07	6/26/07	7/17/07	8/14/07	8/28/07	9/11/07	9/25/07
Ceriodaphnia dubia (% survival compared to the control)	100	95	100	100	100	100		95	100
Selenastrum capricornutum (% growth compared to the control)	251.6	95.9	238.2		188	100.5	347	210.9	

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table XV-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XV-6. Highline Canal @ Lombardy Ave. Instantaneous load calculations for chlorpyrifos and copper (sorted by analyte and date).

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Highline Canal @ Lombardy Rd	Chlorpyrifos	01/Mar/2006	No flow	0.027	0.00
Highline Canal @ Lombardy Rd	Chlorpyrifos	16/Mar/2006	62.19	0.018	31.70
Highline Canal @ Lombardy Rd	Chlorpyrifos	17/Jul/2007	Too deep	0.017	NA
Highline Canal @ Lombardy Rd	Chlorpyrifos	24/Jan/2008	54.02	0.028	42.83
Highline Canal @ Lombardy Rd	Chlorpyrifos	26/Feb/2008	4.79	0.015	2.03
Highline Canal @ Lombardy Rd	Copper	17/May/2006	149.8	2.1	8907.96
Highline Canal @ Lombardy Rd	Copper	14/Jun/2006	204.66	1.9	11011.18
Highline Canal @ Lombardy Rd	Copper	12/Jul/2006	265.79	1.1	8279.01
Highline Canal @ Lombardy Rd	Copper	09/Aug/2006	229.97	1	6512.06
Highline Canal @ Lombardy Rd	Copper	13/Sep/2006	153.47	1.2	5214.97
Highline Canal @ Lombardy Rd	Copper	11/Feb/2007	68.25	2.5	4831.59
Highline Canal @ Lombardy Rd	Copper	17/Apr/2007	43.54	1.7	2095.97
Highline Canal @ Lombardy Rd	Copper	15/May/2007	93.41	2.2	5819.20
Highline Canal @ Lombardy Rd	Copper	24/Jan/2008	54.02	28	42831.16
Highline Canal @ Lombardy Rd	Copper	26/Feb/2008	4.79	32	4340.43

Source Identification

Priority A Constituents

Chlorpyrifos

Exceedances of the chlorpyrifos WQTL occurred twice during the storm season in 2006 and once in the irrigation season of 2007 (Table XV-3). The second exceedance in March 2006 and the July 2007 exceedance were slightly over the WQTL. Flow was present during both sampling events indicating that drift was unlikely to be the source. The exceedance in July 2007 occurred during the month with the highest number of applications and the greatest number of pounds AI applied (Table XV-7, Figure XV-2). The July exceedance was likely associated with hull-split applications to almonds while the March exceedances were likely associated with dormant spray applications to almonds. These results suggest that the first March exceedance could have been the result of storm water transporting chlorpyrifos to the canal. Turlock Irrigation District reports that there are no inputs to Highline Canal during the irrigation season although it is unlikely that the concentration of chlorpyrifos measured in the sample was a result of drift and it is likely that all exceedances are the result of either storm water runoff or irrigation return flows. Numerous applications across five sections were made prior to July sampling (Table XV-8) and a limited number of applications were made in January prior to the March sampling (Table XV-7).

Table XV-7. Number of chlorpyrifos applications, total pounds applied and total acres treated by month for January 2005 through August 2007 within the Highline Canal @ Lombardy Ave site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds AI Applied	Acres Treated
January 2005	7	611.83	442.3
March 2005	5	231.91	492.2
April 2005	2	360.18	360
May 2005	17	6208.71	1686
June 2005	18	1224.05	733
July 2005	29	2626.11	1502
August 2005	15	2603.77	2062
September 2005	2	33.90	17
November 2005	2	722.37	362.3
January 2006	5	1971.94	985
May 2006	10	2442.86	1860
June 2006	9	1557.88	1404
July 2006	25	6141.97	3535.2
August 2006	25	2433.59	2312.5
September 2006	2	85.12	42
March 2007	1	110.62	217.4
April 2007	1	6.20	20
May 2007	14	1819.41	1613
June 2007	8	3971.90	1435
July 2007	31	8904.99	5309.3
August 2007	3	298.07	386.4
2005 Total	97	14622.83	7656.8
2006 Total	76	14633.37	10138.7
2007 Total	58	15111.19	8981.1
Total	**231**	**44367.40**	**26776.6**

Figure XV-2. Pounds of chlorpyrifos applied within the Highline Canal @ Lombardy Ave site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

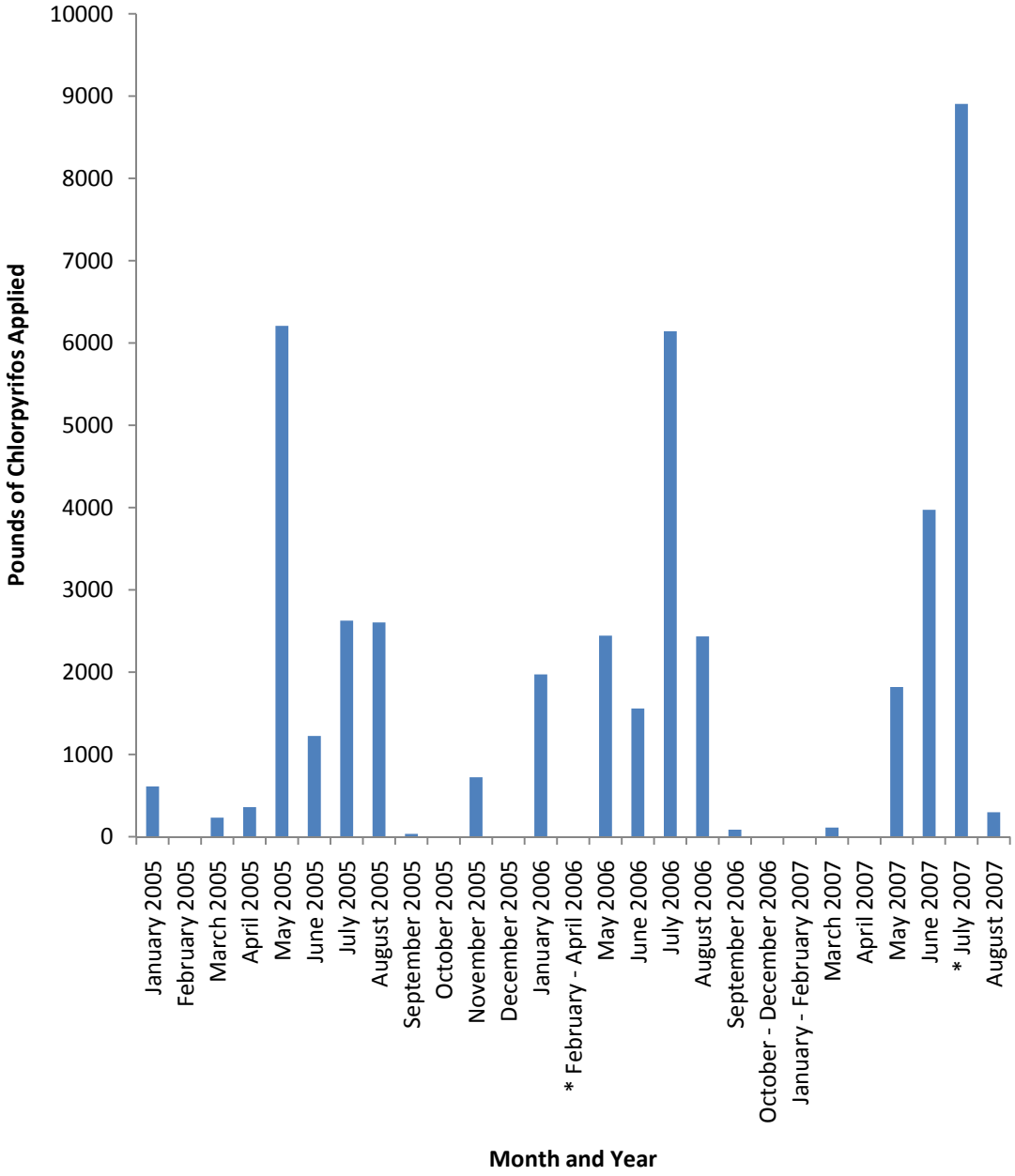


Table XV-8. Highline Canal @ Lombardy Ave. All TRS' that had more than one application associated with an exceedance of chlorpyrifos in 2006 and 2007. Table indicates the application with which the exceedance was associated. No chlorpyrifos applications were reported in the month prior to the 3/1/06 and 3/16/06 exceedances.

TRS	Date of Associated Exceedance		
	3/1/2006	3/16/2006	7/17/2007
3S11E36			3
4S11E1			2
4S11E28			2
4S12E8			2
5S11E26			3

Priority C Constituents

Copper

Two exceedances of the copper WQTL occurred; February 2007 and May 2007 (Table XV-3). Neither was associated with *Selenastrum* toxicity. A copper exceedance occurred at the downstream site (Highline Canal @ Hwy 99) in February but no exceedance was experienced downstream in May. There may be some measurement error associated with one or both the copper concentrations or discharge measurements because the downstream flow measurements and load are smaller than the upstream measurements. The alternative explanation is that the storm hydrograph changed and a larger amount of water was passing the upstream site, i.e. the same bolus of water was not sampled at both the upstream and downstream sites. This result illustrates the difficulty in using upstream and downstream sites as a method of partitioning loads. Unless sampling is performed using a LaGrangian design, loads can not be portioned because the same water is not sampled. Regardless, comparisons of upstream and downstream measurements at this site do not provide any information about sourcing. Large amounts of copper were applied during the months of November through May (Table XV-9, Figure XV-3). Applications were made in multiple TRS' across the watershed prior to all exceedances (Table XV-10) and despite the claim that there are no inputs to the Highline Canal in the irrigation season, it appears that management of irrigation tail water will be necessary to prevent the movement of copper to Highline Canal. The only other possible explanation is the use of copper by TID to maintain their canals.

Table XV-9. Number of copper applications, total pounds applied and total acres treated by month for January 2005 through May 2007 in the Highline Canal @ Lombardy Ave site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2005	45	17549.62	4523.9
February 2005	63	3773.57	3669.6
March 2005	27	2904.85	1301

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
April 2005	38	5022.72	2231.7
May 2005	17	1897.15	603
June 2005	2	100.10	45
September 2005	1	8.61	4
October 2005	2	9.15	8
November 2005	12	5791.35	1393.08
December 2005	38	10388.37	1046.72
January 2006	55	63887.64	9881
February 2006	59	7329.40	4503.79
March 2006	15	921.17	1279
April 2006	25	2544.15	665
May 2006	20	2451.76	1507.4
November 2006	6	4152.46	1023.71
December 2006	11	1958.52	207
January 2007	40	22197.55	4444.26
February 2007	36	4053.35	2045.71
March 2007	42	3250.35	2202.97
April 2007	48	4880.80	1141
May 2007	8	997.23	252.1
2005 Total	245	47445.49	14826
2006 Total	191	83245.10	19066.9
2007 Total	174	35379.27	10086.04
Total	610	166069.86	43978.94

Figure XV-3. Pounds of copper applied within the Highline Canal @ Lombardy Ave site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

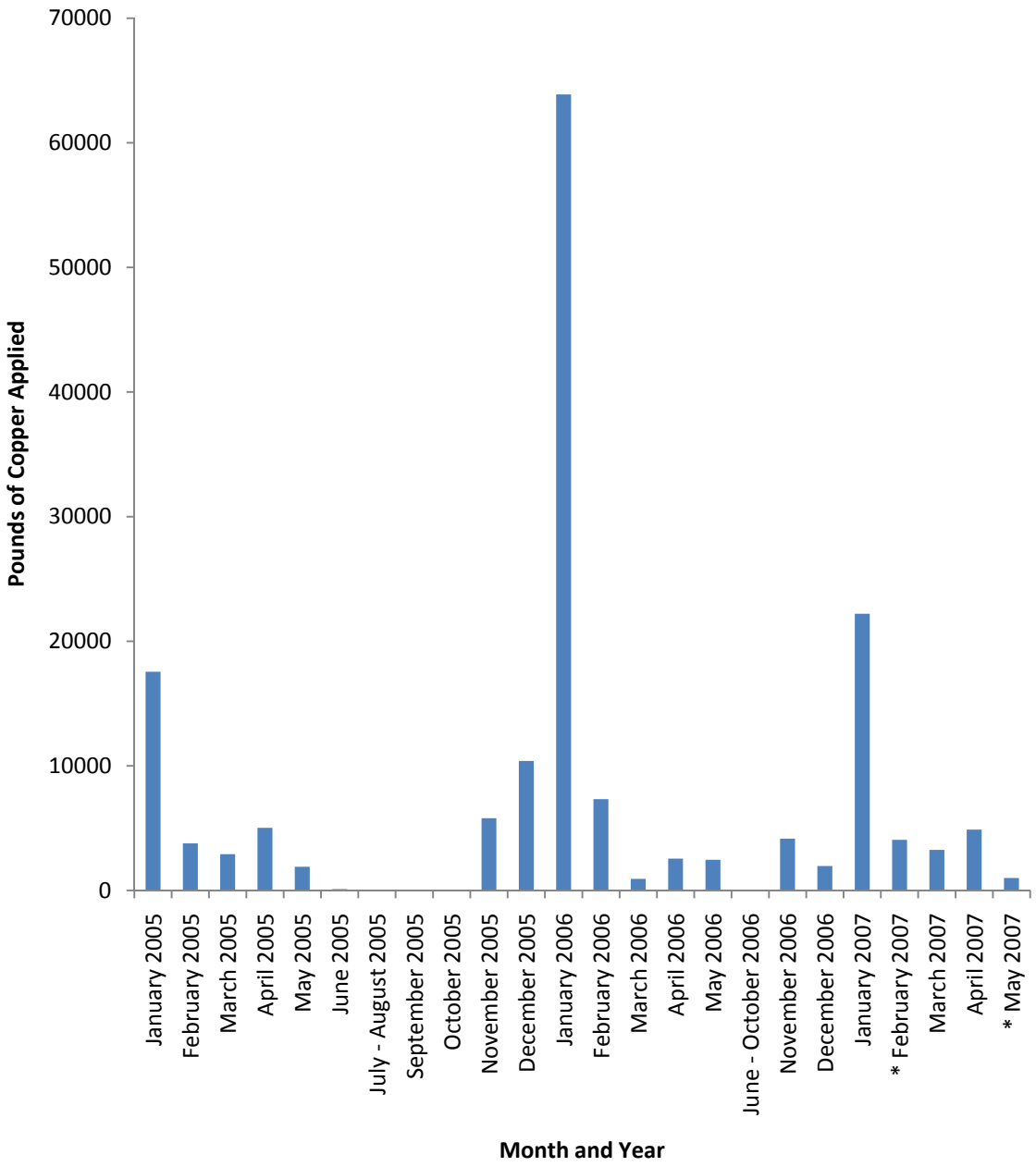


Table XV-10. Highline Canal @ Lombardy Ave. All TRS' that had more than one application associated with an exceedance of copper in 2007. Table indicates the application with which the exceedance was associated.

TRS	Date of Associated Exceedance	
	2/11/2007	5/15/2007
3S11E36		22
3S12E31		4
4S11E16	1	1
4S11E23	1	1
4S11E25	1	3
4S11E28		6
4S11E33	1	4
4S11E36	2	
4S12E22	1	1
4S12E29		2
4S12E30		12
4S12E31	3	8
4S12E32	3	
4S12E33		2
4S12E5		2
5S11E1	4	
5S11E25	2	7
5S11E26	3	2
5S11E27	2	16
5S11E28	4	2
5S11E3		2
5S11E34	9	7
5S11E35	4	4
5S11E36	12	11
5S12E30	1	1
5S12E31	2	2

Priority D Constituents

Ceriodaphnia dubia toxicity

Toxicity to *Ceriodaphnia* occurred in three normal monitoring samples and one resample. Two of the toxic samples were collected during the irrigation season of 2006 and one of the samples (and the toxic resample) were collected during the storm season of 2007 (Table XV-3). At the downstream Highline Canal site (Highline Canal @ Hwy 99) the only toxic sample that occurred during the same monitoring event was the sample collected in September 2006. In addition, the downstream location samples were toxic to *Ceriodaphnia* during two other sampling events (May 2005 and March 2006). Two of the toxic samples collected at Highline Canal @ Lombardy Avenue required TIEs (September 2006 and February 2007)(Table XV-3). The TIE results for

both samples indicate that the toxicity was not persistent and therefore the source of the original toxicity cannot be identified. Relative PUR data has previously been reviewed and submitted with past SAMRs.

Selenastrum capricornutum toxicity

Selenastrum toxicity occurred during three normal monitoring events in August 2005, March 2006 and February 2007 (Table XV-3). None of the resamples were toxic indicating that the algae toxicity was not persistent. The February 2007 sample also contained diuron (3.2 µg/L) which is likely to have contributed to the toxicity. Relative PUR data for all toxicities have previously been reviewed and submitted with past SAMRs.

Priority E Constituents

E. coli

Exceedances of the *E. coli* WQTL occurred twice including once each in the storm and irrigation seasons. This site subwatershed is large and has numerous dairies which could have contributed fecal material to the drain during the storm season. Also, during the storm season, storm water from Turlock is released to Highline Canal and can be a source of fecal coliforms. Highline Canal @ Lombardy Road was sampled during the 2006 *E. coli* study. All Bacteroides was attributed to human sources or chickens suggesting that inputs to the system during the summer may come from urban sources or a poultry operation upstream (Table XV-11, Table XV-12). Because this study was performed at a single time of the year with a limited set of potential hosts, a further study may be initiated to more fully understand bacterial contamination in the watershed. Until such time as the study is completed, the Coalition will not actively manage for *E. coli*. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Table XV-11. Results of Bacteroides analysis. Highline Canal @ Lombardy Ave and its two upstream sites, Highline Canal @ East Ave and Highline Canal along Santa Fe, were sampled only once.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
535XHCALR	8/29/06	9:40	Grab	50	0	0
535XHCAEA	8/29/06	9:00	Grab	50	0	50
535XHCASF	8/29/06	9:20	Grab	25	0	0

Table XV-12. Values of E. coli, fecal coliform, and total coliform in MPN/100mL., and the average C_T value for the All bacteria, human Bacteroides, bovine Bacteroides, and chicken Bacteroides. C_T values are not comparable across samples and are not absolute measures of the quantity of DNA in the sample.

Station Code	Sample Date	Sample Time	Sample Type	*E. coli*	Fecal Coliform	Total Coliform	Avg All bac	Avg Human	Avg Bovine	Avg Chicken
535XHCAEA	8/29/06	9:00	Grab	13	1300	2300	29.805	31.165	40	29.82
535XHCALR	8/29/06	9:40	Grab	23	330	330	27.02	27.47	39.21	39.1

535XHCASF	8/29/06	9:20	Grab	4	140	700	27.5	30.195	39.285	39.58

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991 prior to the initiation of the Pesticide Use Reporting system. Consequently, it is not possible to identify where past applications of lead-based pesticide occurred. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, or the deposition of automobile exhaust along roadways. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during storm events. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into the waterways. In addition, disposal of lead paint in the vicinity, burial of old building materials with lead paint, or leaching lead from lead arsenate deposition could all be contributors to lead detections. The particular sources of this metal are unknown, and the Coalition will address the lead exceedances when they become a priority.

2008 Management Plan Monitoring

No *Ceriodaphnia* or *Selenastrum* toxicity occurred during additional Management Plan monitoring conducted in 2007. Therefore Highline Canal @ Lombardy Avenue will have additional Management Plan sampling conducted for chlorpyrifos in July, copper in May, *Ceriodaphnia* toxicity in June and September and *Selenastrum* toxicity in August, 2008.

Table XV-13. Highline Canal @ Lombardy Ave. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos	Copper	*Ceriodaphnia dubia*	*Selenastrum capricornutum*
Highline Canal @ Lombardy Ave	May	A		x		
Highline Canal @ Lombardy Ave	June	A			x	
Highline Canal @ Lombardy Ave	July	A	x			
Highline Canal @ Lombardy Ave	August	A				x
Highline Canal @ Lombardy Ave	September	A			x	

XVI. HILMAR DRAIN

Management Plan Constituents

Priority C

- Copper
- Diuron

Priority D

- Ammonia
- Cadmium
- Nitrate
- *Selenastrum capricornutum* water column toxicity

Priority E

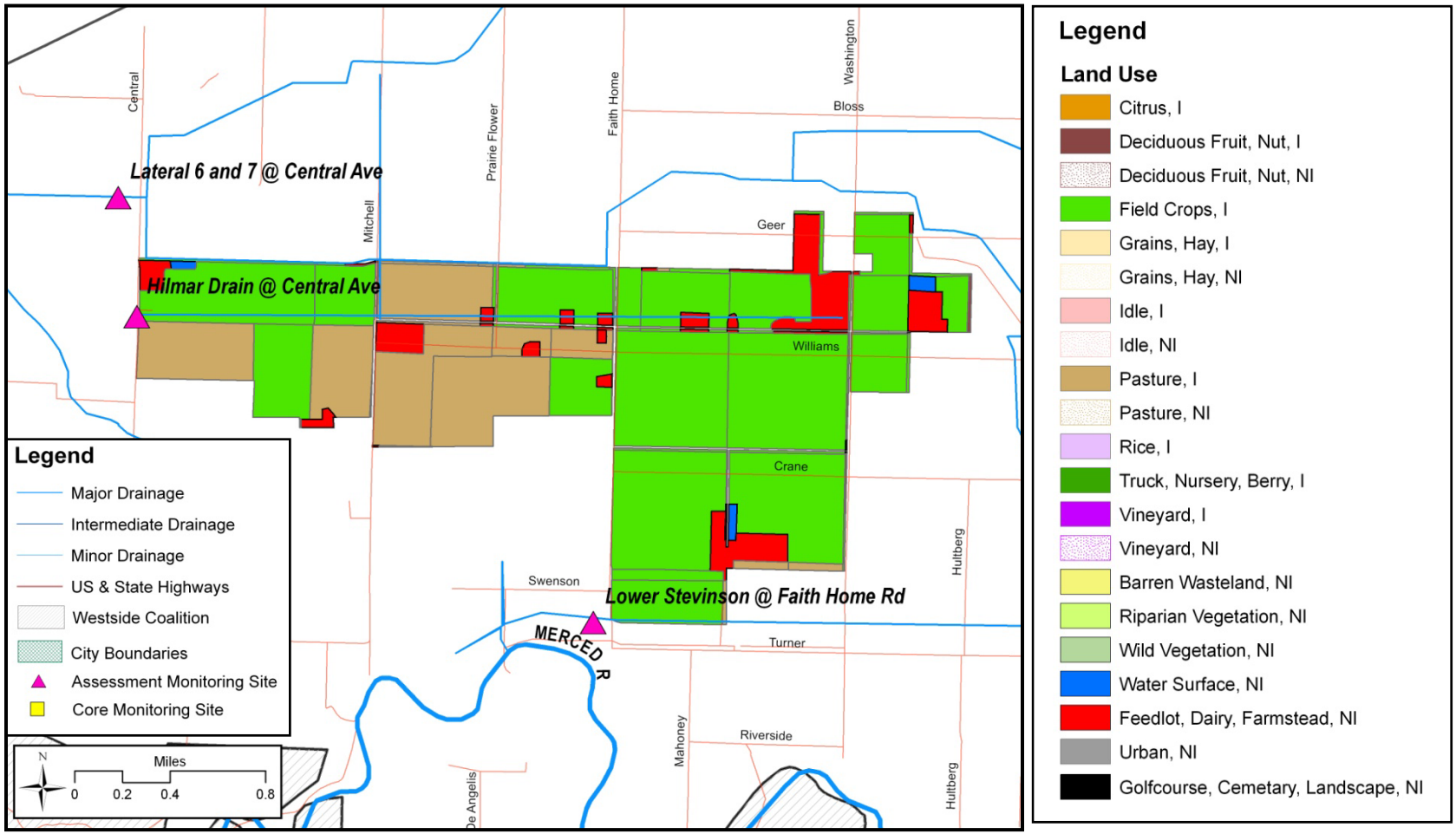
- Dissolved Oxygen
- *E. coli*
- pH
- Specific conductivity
- Color
- Total Dissolved Solids

Description of Hilmar Drain @ Central Ave Site Subwatershed

Hilmar Drain @ Central Ave (2,106 irrigated acres) is located toward the western edge of the Coalition region near the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture. Hilmar Drain originates at Williams Ave and Washington Road and eventually drains into the San Joaquin River (Figure XVI-1).

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Figure XVI-1. Site subwatershed map of land use for the Hilmar Drain @ Central Ave sample site.



Subwatershed Monitoring History

Monitoring at Hilmar Drain @ Central Ave began during the storm season of 2005. All events have been sampled successfully (Table XVI-1). Table XVI-2 includes the constituents that have been sampled during each monitoring year and season.

Table XVI-1. Hilmar Drain @ Central Ave sampling events per season and year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	2	5	2	5	2	6

Table XVI-2. Hilmar Drain @ Central Ave. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters							
EPA 110.2	Color	2	5	2	5	2	6
EPA 160.1	Dissolved Solids	2	5	2	5	2	6
EPA 180.1	Turbidity	2	5	2	5	2	6
EPA 405.1	BOD				1	2	2
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6
SM 9223	E. coli	2	5	2	5	2	6
NA	Dissolved Oxygen	2	6	4	6	3	8
NA	Specific Conductivity	2	6	4	6	3	8
NA	pH	2	6	4	6	3	8
Carbamates							
EPA 8321A	Aldicarb				5	2	6
EPA 8321A	Carbaryl				5	2	6
EPA 8321A	Carbofuran				5	2	6
EPA 8321A	Diuron				5	2	6
EPA 8321A	Linuron				5	2	6
EPA 8321A	Methiocarb				5	2	6
EPA 8321A	Methomyl				5	2	6
EPA 8321A	Oxamyl				5	2	6
Organochlorines							
EPA 8081A	DDD(p,p')				5	2	6
EPA 8081A	DDE(p,p')				5	2	6
EPA 8081A	DDT(p,p')				5	2	6
EPA 8081A	Dicofol				5	2	6
EPA 8081A	Dieldrin				5	2	6
EPA 8081A	Endrin				5	2	6
EPA 8081A	Methoxychlor				5	2	6
Organophosphates							
EPA 8141A	Azinphos methyl				5	2	6
EPA 8141A	Chlorpyrifos	2	5	2	5	2	6
EPA 8141A	Diazinon	2	5	2	5	2	6
EPA 8141A	Dimethoate				5	2	6
EPA 8141A	Disulfoton				5	2	6
EPA 8141A	Malathion				5	2	6
EPA 8141A	Methamidophos				5	2	6
EPA 8141A	Methidathion				5	2	6
EPA 8141A	Molinate				5	2	6
EPA 8141A	Parathion, Methyl				5	2	6
EPA 8141A	Phorate				5	2	6
EPA 8141A	Phosmet				5	2	6
EPA 8141A	Thiobencarb				5	2	6
Pyrethroids							
EPA 8081A	Bifenthrin		1	2	5	2	6
EPA 8081A	Cyfluthrin, total		1	2	5	2	6

Method	Analyte	2005		2006		2007	
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	2	5	2	5	2	6
EPA 8081A	Permethrin, total	2	5	2	5	2	6
Triazines							
EPA 547M	Glyphosate				5	2	6
EPA 549.2M	Paraquat dichloride				5	2	6
EPA 619	Atrazine				5	2	6
EPA 619	Cyanazine				5	2	6
EPA 619	Simazine				5	2	6
Metals							
EPA 200.8	Arsenic				5	2	6
EPA 200.8	Boron				5	2	6
EPA 200.8	Cadmium				5	2	6
EPA 200.8	Copper				5	2	6
EPA 200.8	Lead				5	2	6
EPA 200.8	Nickel				5	2	6
EPA 200.8	Selenium				5	2	2
EPA 200.8	Zinc				5	2	6
Nutrients							
EPA 130.2	Hardness as CaCO3				5	2	6
EPA 300.0	Nitrate as N				5	2	6
EPA 350.2	Ammonia as N				5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6
EPA 354.1	Nitrite as N				5	2	6
EPA 365.2	OrthoPhosphate as P				5	2	6
EPA 365.2	Phosphate as P				5	2	6
Toxicity							
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	6	3	5	2	7
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5	2	7
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	6	2	8
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	1

Exceedance History

WQTLs have been exceeded at Hilmar Drain @ Central Ave three times for dissolved oxygen (DO) and pH, 21 times for specific conductivity, 22 times for color, 18 times for total dissolved solids, 16 times for *E. coli*, nine times for nitrate and twice for ammonia. Exceedances of WQTLs for pesticides have occurred once each for chlorpyrifos and DDD, twice for diuron, and samples were toxic once to *Ceriodaphnia dubia,* twice to *Selenastrum capricornutum,* and twice to *Hyalella azteca*. In 2006, the analysis of water samples for metals was initiated, and over the course of the irrigation season two samples exceeded the WQTL for copper, and seven exceeded the WQTL for cadmium. Although all exceedances are listed in the following table, only those that have occurred at the site more than once in a three year period will be subject to management plan actions.

Hilmar Drain is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list, however the section of the San Joaquin River which receives water from Hilmar Drain, is listed as impaired for boron, DDT, electrical conductivity, Group A pesticides, mercury and unknown toxicity.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Hilmar Drain @ Central Ave site subwatershed, the constituents receiving the highest priorities were copper (C) and diuron (C).

Table XVI-3. Exceedances experienced in samples collected from the Hilmar Drain @ Central Ave Coalition monitoring site between February 2005 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Ammonia as N, mg/L	Nitrate as N, mg/L	Cadmium, µg/L	Copper, µg/L	Chlorpyrifos, µg/L	DDD(p,p'), µg/L	Diuron, µg/L	Ceriodaphnia dubia, Survival (%)	Hyalella azteca, Survival (%)	Selenastrum capricornutum, Total Cell Count
Hilmar Drain @ Central Ave	Irrigation	11/May/2005			1354	25	740	1600								70		
Hilmar Drain @ Central Ave	Irrigation	19/May/2005			1214													
Hilmar Drain @ Central Ave	Irrigation	15/Jun/2005			855	20	720	500										
Hilmar Drain @ Central Ave	Irrigation	13/Jul/2005	6.45		826	25	600	1600										
Hilmar Drain @ Central Ave	Irrigation	16/Aug/2005			788	50	500	1600										
Hilmar Drain @ Central Ave	Irrigation	21/Sep/2005				30	690	430									31.2	
Hilmar Drain @ Central Ave	Irrigation	18/May/2006	6.28			60		2400			0.06							
Hilmar Drain @ Central Ave	Irrigation	15/Jun/2006	6.8			25				12								
Hilmar Drain @ Central Ave	Irrigation	13/Jul/2006			1096	100	610	2400	3.8	11	0.05	31 (19)	0.016					242000
Hilmar Drain @ Central Ave	Irrigation	10/Aug/2006				25		1000		13				0.003				
Hilmar Drain @ Central Ave	Irrigation	14/Sep/2006			773	28	510			20								
Hilmar Drain @ Central Ave	Irrigation	17/Apr/2007			1106	100	700	1100			0.07				3.3			325415
Hilmar Drain @ Central Ave	Irrigation	15/May/2007			1030	17	640	440		22								
Hilmar Drain @ Central Ave	Irrigation	19/Jun/2007			869	60	600	1700		21	0.06				6.6			
Hilmar Drain @ Central Ave	Irrigation	17/Jul/2007			717	75	460	340		15	0.05							
Hilmar Drain @ Central Ave	Irrigation	21/Aug/2007			793	54	520			18								
Hilmar Drain @ Central Ave	Irrigation	11/Sep/2007			703	56	460	2400		18								
Hilmar Drain @ Central Ave	Storm	15/Feb/2005			1102	30	740	240										
Hilmar Drain @ Central Ave	Storm	22/Mar/2005			1157	30	760	900										
Hilmar Drain @ Central Ave	Storm	01/Mar/2006		9.55	1058	120	670											
Hilmar Drain @ Central Ave	Storm	16/Mar/2006			1215	100	710											
Hilmar Drain @ Central Ave	Storm	24/Mar/2006			1400													
Hilmar Drain @ Central Ave	Storm	02/May/2006		8.58	794													
Hilmar Drain @ Central Ave	Storm	11/Feb/2007				250		2400	13		0.08	84 (10.1)						
Hilmar Drain @ Central Ave	Storm	01/Mar/2007			1396	35	790				0.05							
Hilmar Drain @ Central Ave	Storm	07/Mar/2007		8.79	1633													
Priorities			**E**	**E**	**E**	**E**	**E**	**E**	**D**	**D**	**D**	**C**			**C**			**D**

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

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2007 Management Plan Monitoring Results

No Management Plan sampling was conducted at the Hilmar Drain @ Central Ave site subwatershed in 2007. The second exceedance of chlorpyrifos occurred during the 2007 irrigation season as well as both diuron exceedances.

Load Calculations

Loads have been calculated for all copper and diuron detections in the site subwatershed based on the following formula (Table XVI-4):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XVI-4. Hilmar Drain @ Central Ave. Instantaneous load calculations for copper and diuron (sorted by analyte and date).

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Hilmar Drain @ Central Ave	Copper	18/May/2006	1.22	5.8	200.37
Hilmar Drain @ Central Ave	Copper	15/Jun/2006	31.75	4.4	3955.88
Hilmar Drain @ Central Ave	Copper	13/Jul/2006	0.73	31	640.81
Hilmar Drain @ Central Ave	Copper	10/Aug/2006	25.87	4.1	3003.50
Hilmar Drain @ Central Ave	Copper	14/Sep/2006	14.18	6.8	2730.44
Hilmar Drain @ Central Ave	Copper	11/Feb/2007	22.5	84	53519.13
Hilmar Drain @ Central Ave	Copper	17/Apr/2007	1.33	8.5	320.12
Hilmar Drain @ Central Ave	Copper	15/May/2007	3.98	5.5	619.86
Hilmar Drain @ Central Ave	Copper	19/Jun/2007	5.27	13	1940.00
Hilmar Drain @ Central Ave	Copper	19/Jun/2007	5.27	11	1641.54
Hilmar Drain @ Central Ave	Copper	17/Jul/2007	3.54	9.1	912.20
Hilmar Drain @ Central Ave	Copper	21/Aug/2007	8.34	5	1180.82
Hilmar Drain @ Central Ave	Copper	11/Sep/2007	13.12	4.4	1634.68
Hilmar Drain @ Central Ave	Diuron	17/Apr/2007	1.33	3.3	124.28
Hilmar Drain @ Central Ave	Diuron	19/Jun/2007	5.27	3.2	477.54
Hilmar Drain @ Central Ave	Diuron	19/Jun/2007	5.27	6.6	984.92

Source Identification

Priority C Constituents

Copper

Two exceedances of the copper WQTL occurred in the Hilmar Drain site subwatershed; one in July 2006 and one in February 2007 (Table XVI-3). The July 2006 exceedance was associated with toxicity to *Selenastrum*. Copper is applied primarily during the winter and spring months, but copper is also heavily used by dairies (Table XVI-5, Figure XVI-2). A single TRS was the apparent source of both exceedances (Table XVI-6).

Table XVI-5. Number of copper applications, total pounds applied and total acres treated by month for January 2005 through July 2007 in the Hilmar Drain @ Central Ave site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2005	2	441.958	64
February 2005	3	103.95	95
January 2006	2	508.2	70
February 2006	3	99.9047	79
March 2006	3	87.78	114
April 2006	1	38.5	50
January 2007	2	420.76	70
February 2007	2	76.0825	64
March 2007	1	8.596	14
2005 Total	5	545.908	159
2006 Total	9	734.3847	313
2007 Total	5	505.4385	148
Total	19	1785.731	620

Figure XVI-2. Pounds of copper applied within the Hilmar Drain @ Central Ave site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

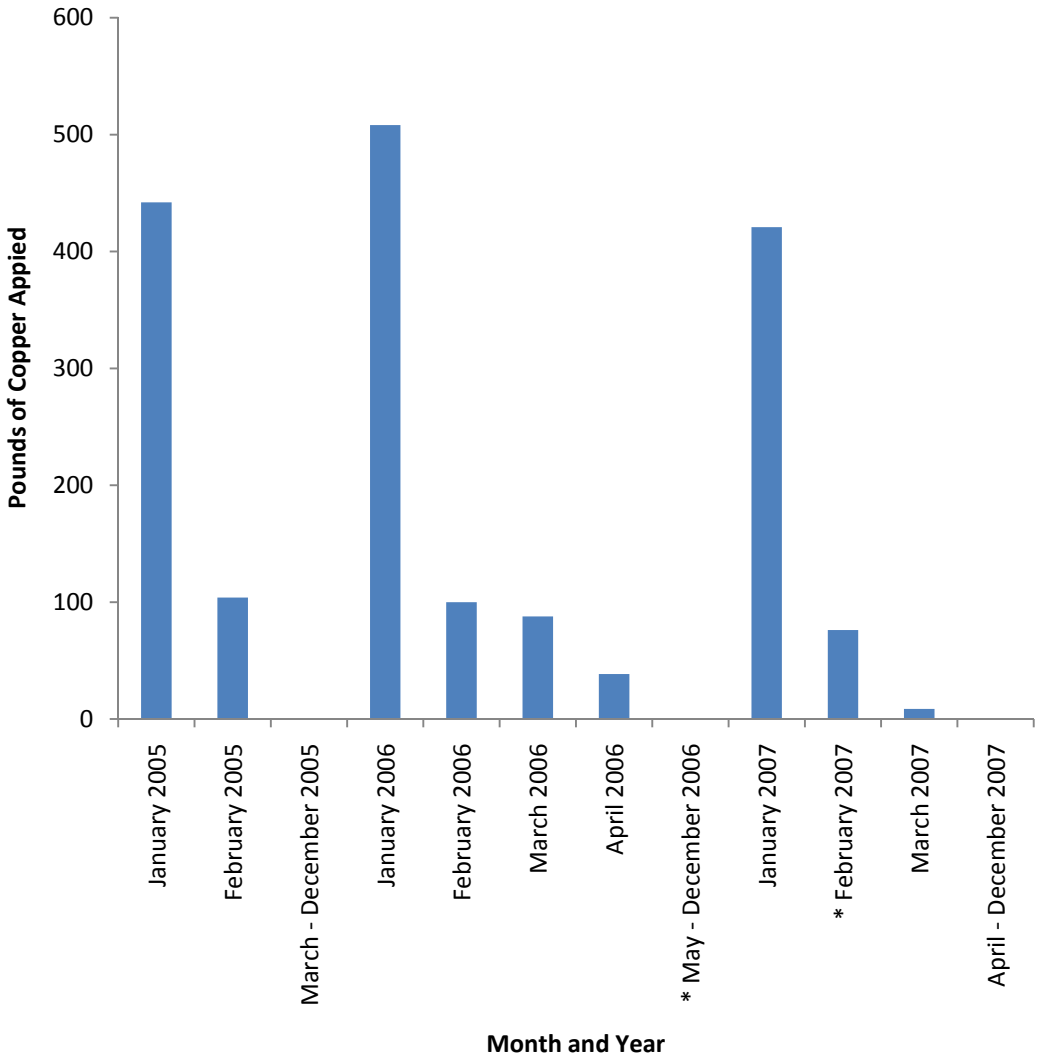


Table XVI-6. Hilmar Drain @ Central Ave. All TRS' that had more than one application associated with an exceedance of copper in 2006 and 2007. Table indicates the application with which the exceedance was associated.

TRS	Date of associated exceedance	
	7/13/2006	2/11/2007
6S10E20	2	1

Diuron

Exceedances of the diuron WQTL occurred in April and June 2007, and the April exceedance was associated with toxicity to *Selenastrum* (Table XVI-3). No applications were reported between March and June 2007 and only one application was made in June (Table XVI-7, Figure XVI-2). Diuron is persistent and soluble and it is possible that the product was mobilized and moved to the drain several weeks after application. Interestingly, there were no exceedances immediately after the months with the greatest number of applications, December and January (Table XVI-7, Figure XVI-2). Only one TRS had an application in the month prior to the June 2007 exceedance but it is unknown if the parcel belongs to a member of the Coalition (Table XVI-8).

Table XVI-7. Number of diuron applications, total pounds applied and total acres treated by month for 2005 through 2007 in the Hilmar Drain @ Central Ave site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds AI Applied	Acres Treated
December 2005	2	292.38	200
January 2006	4	196.80	123
July 2006	1	0.30	8
December 2006	4	329.42	184
January 2007	2	252.93	173
February 2007	1	1.60	4
June 2007	1	0.67	18
2005 Total	2	292.38	200
2006 Total	9	526.52	315
2007 Total	4	255.20	195
Total	15	1074.10	710

Figure XVI-3. Pounds of diuron applied within the Hilmar Drain @ Central Ave site subwatershed by month for 2005-2007. Asterisk (*) denotes months with exceedances.

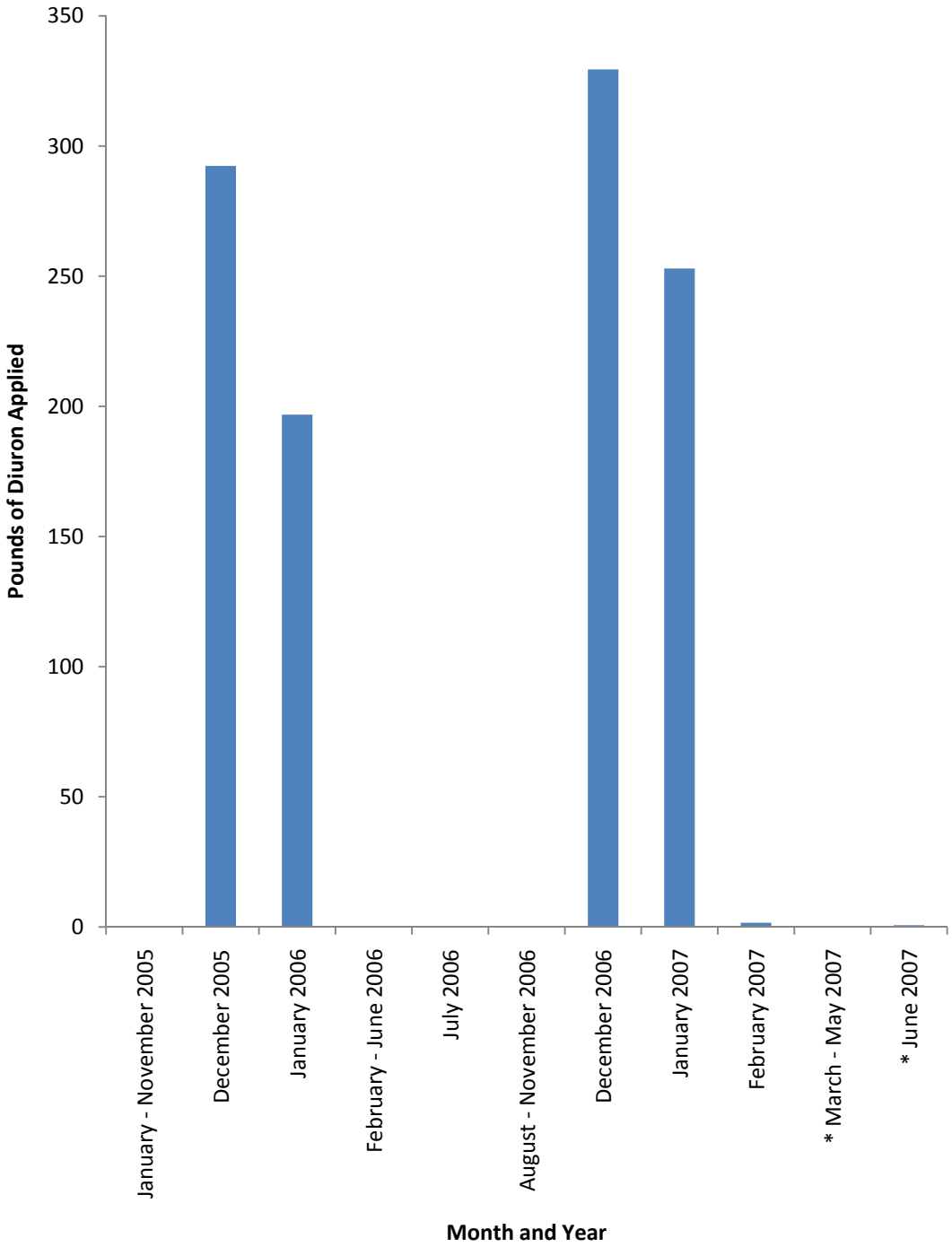


Table XVI-8. Hilmar Drain @ Central Ave. All TRS' that had an application associated with an exceedance of diuron in 2007. Table indicates the application with which the exceedance was associated. No diuron applications were reported one month prior to the 4/14/07 exceedance.

TRS	Date of associated exceedance	
	4/14/2007	6/19/2007
6S9E24		1

Priority D Constituents

Selenastrum capricornutum toxicity

Selenastrum toxicity was experienced in July 2006 and April 2007. The April 2007 toxicity was associated with an exceedance of diuron and the July 2006 exceedance was associated with an exceedance of the copper WQTL. No TIEs were performed for any of the exceedances. It is clear that the cause of the toxicity is associated with a soluble constituent(s) and preventing irrigation return flows would be effective in reducing or eliminating *Selenastrum* toxicity. At the time when this site becomes a priority, the Coalition will carefully review the PURs to determine which high solubility constituents should be targeted for focused outreach and management.

Cadmium

Since the time of this exceedance, the WQTL for cadmium has increased to 5 µg/L and the exceedances listed above are therefore no longer considered an exceedance. As a result, the Coalition will not develop a strategy to manage cadmium.

Ammonia

Exceedances of the ammonia WQTL occurred twice; once in February 2007and once in July 2006 (Table XVI-3). The most probable source of ammonia is dairies, and there are numerous dairies in the site subwatershed. Large amounts of *E. coli* and nitrates also suggest the source of ammonia is dairies. The Coalition will not manage for ammonia at this time.

Nitrate

Potential sources of nitrates in surface waters include runoff of fertilizers or organic matter from irrigated pasture, leaking septic systems, waste-treatment facility effluent, and inputs from dairies. These sources can move to surface waters through above ground runoff or shallow subsurface flows.

Animal waste that enters surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a drain include dairies, chicken lots, pasture and/or wildlife. The Hilmar Drain site drains a large number of dairies and a pasture is located just adjacent to the sample site. Runoff from the pasture and/or shallow ground water intrusion containing elevated concentrations of nitrate could be the sources of nitrate in the drain.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. BOD was detectable in only two of the samples, but none of the samples experienced an exceedance of the 7.0 mg/L DO WQTL. These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XVI-9. Hilmar Drain @ Central Ave. BOD, pH and dissolved oxygen results for September 2006-July 2007 sampling events. ND = Not Detected.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Hilmar Drain @ Central Ave	9/14/2006	7.86	8.45	ND
Hilmar Drain @ Central Ave	2/11/2007	7.61	9.96	58
Hilmar Drain @ Central Ave	3/1/2007	7.88	11.2	ND
Hilmar Drain @ Central Ave	4/17/2007	7.44	7.97	10
Hilmar Drain @ Central Ave	7/17/2007	7.64	9.65	4

E. coli

Exceedances of the *E. coli* WQTL occurred in every month of sampling in the irrigation season of 2007. This site subwatershed is small and has numerous dairies which could have contributed fecal material to the drain. Hilmar Drain was one of the few locations where bovine Bacteroides was detected indicating very recent contamination by cows (Table III-10). Persistent exceedances of the nitrate WQTL and occasional exceedances of the ammonia WQTL further point to dairies as a source of the *E. coli* exceedances. *E. coli* appears to be a consistent problem and the Coalition will address it when it becomes a priority.

Table XVI-10. Results of Bacteroides analysis. Hilmar Drain @ Central Ave was sampled only once.

Station Code	Sample Date	Sample Time	Sample Type	% Human	% Bovine	% Chicken
535XHDACA	8/29/2006	10:50	Grab	25	0.1	0

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

Specific Conductance/Total Dissolved Solids

Specific conductivity (EC) and Total Dissolved Solids (TDS) are measures of salt and are often found as exceedances together. EC and TDS exceedances are common in site subwatersheds on the western edge of the Coalition region where shallow salty ground water commonly intrudes into surface waters. Many of the drains in the region were originally constructed to drain shallow salty ground water allowing agriculture. Consequently, it is not known if the water in the drain is discharged from agriculture or if shallow ground water intruding into the drain is responsible for the elevated EC and TDS. The Coalition recognizes that EC and TDS need to be managed on a regional basis and will work with the Regional Board to develop a management plan when EC/TDS become a priority.

2008 Management Plan Monitoring

To help determine sources of ammonia, nitrate, copper exceedances and *Selenastrum* toxicity, the Coalition will conduct upstream Management Plan monitoring at Hilmar Drain @ Mitchell Road and Reclamation Drain @ Williams Ave in July 2008 (Table XVI-11 and XVI-22). Hilmar Drain goes underground at Mitchell Road to the east of Central Avenue (Figure XVI-4). The Reclamation Drain runs parallel with Mitchell Road and drains into the Hilmar Drain from the north at the same intersection where Hilmar Drain goes underground (Figure XVI-4 and XVI-5). Therefore the Coalition will sample both locations to determine which parcels are contributing to the algae toxicity, copper exceedances and ammonia/nitrate exceedances.

Additional Management Plan monitoring will be conducted for diuron at Hilmar Drain @ Central Ave in April and June 2008 (TableXVI-11).

Figure XVI-4. Site subwatershed map of land use for the upsteam Hilmar Drain @ Mitchell Rd sample site.

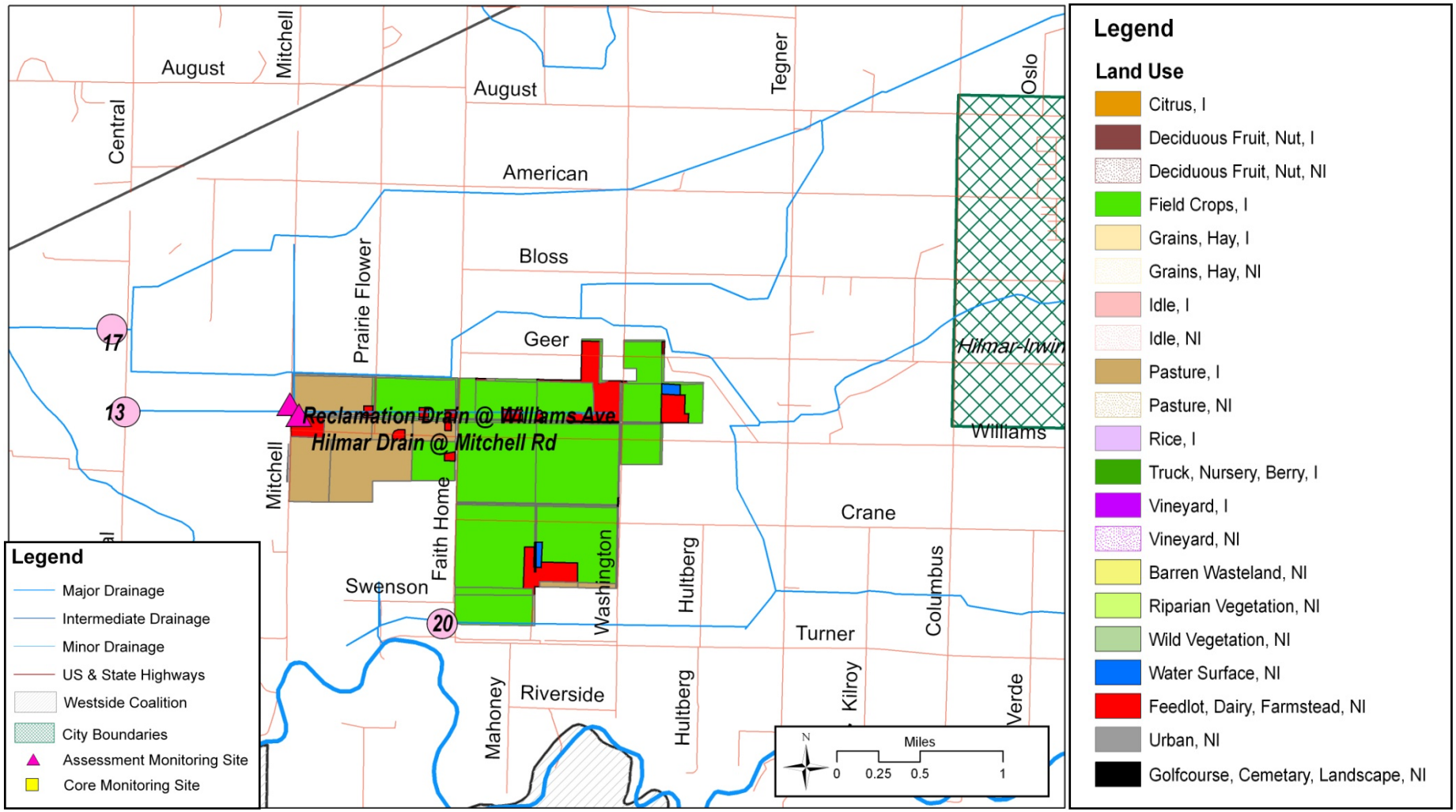


Figure XVI-5. Site subwatershed map of land use for the upstream Reclamation Drain @ Williams Ave sample site.

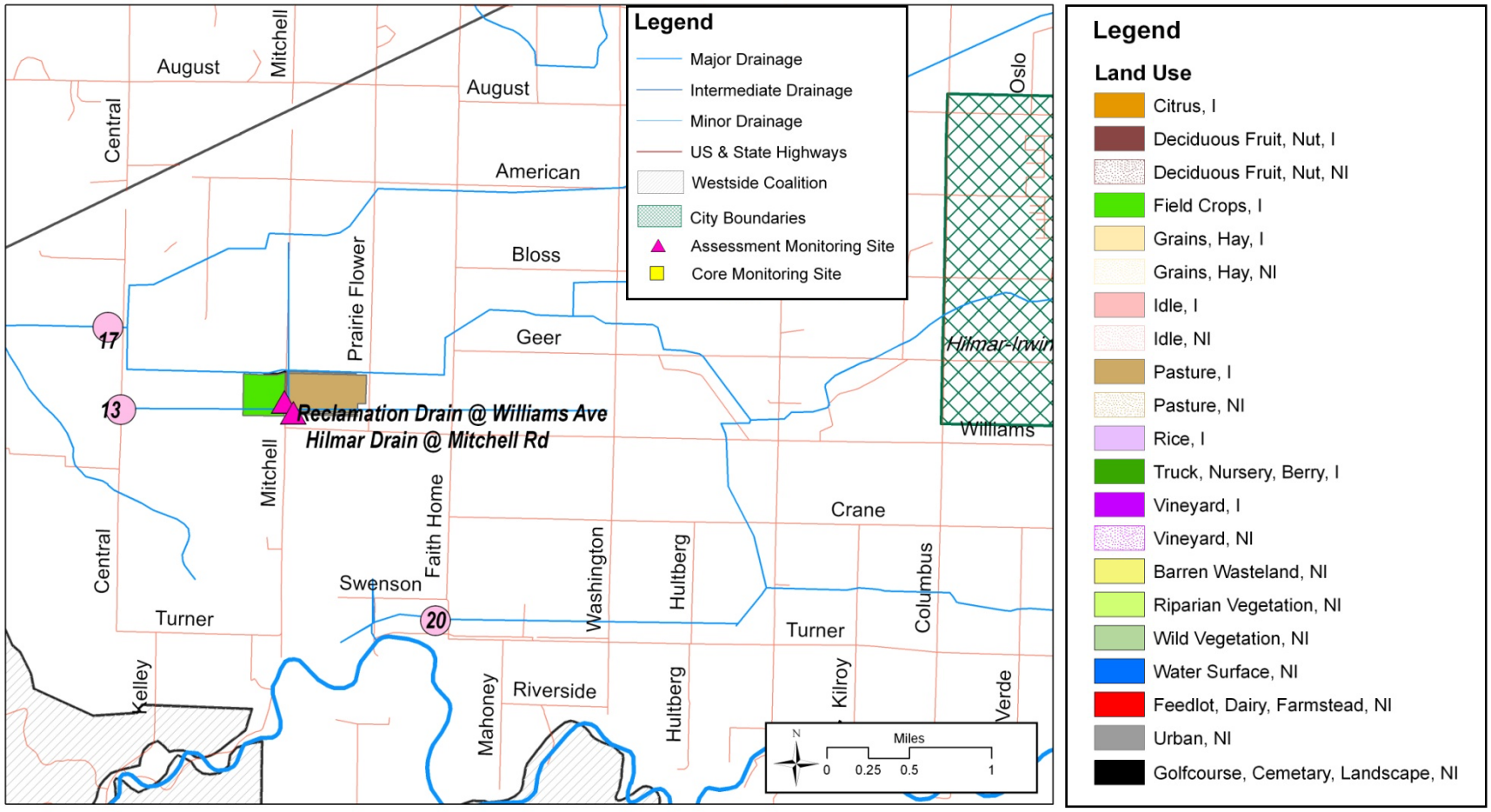


Table XVI-11. Hilmar Drain @ Central Ave site subwatershed. 2008 Management Plan sampling. A = additional sampling. U = upstream sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Diuron	Ammonia	Nitrate	Copper	*Selenastrum capricornutum*
Hilmar Drain @ Central Ave	April	A	x				
Hilmar Drain @ Central Ave	June	A	x				
Hilmar Drain @ Mitchell Rd	July	U		x	x	x	x
Reclamation Drain @ Williams Ave	July	U		x	x	x	x

Table XVI-12. Sampling locations within the Hilmar Drain site subwatershed.

Station Name	Station Code	Target Lat	Target Long
Hilmar Drain @ Central Ave*	535XHDACA	37.3906	-120.9582
Hilmar Drain @ Mitchell Rd[U]	535XHDAMR	37.39068	-120.94087
Reclamation Drain @ Williams Ave	535XRDAWA	37.390578	-120.94100

*Original ESJWQC sampling site
[U]Upstream sites

XVII. LIVINGSTON DRAIN @ ROBIN AVENUE

Management Plan Constituents

Priority C

- Copper

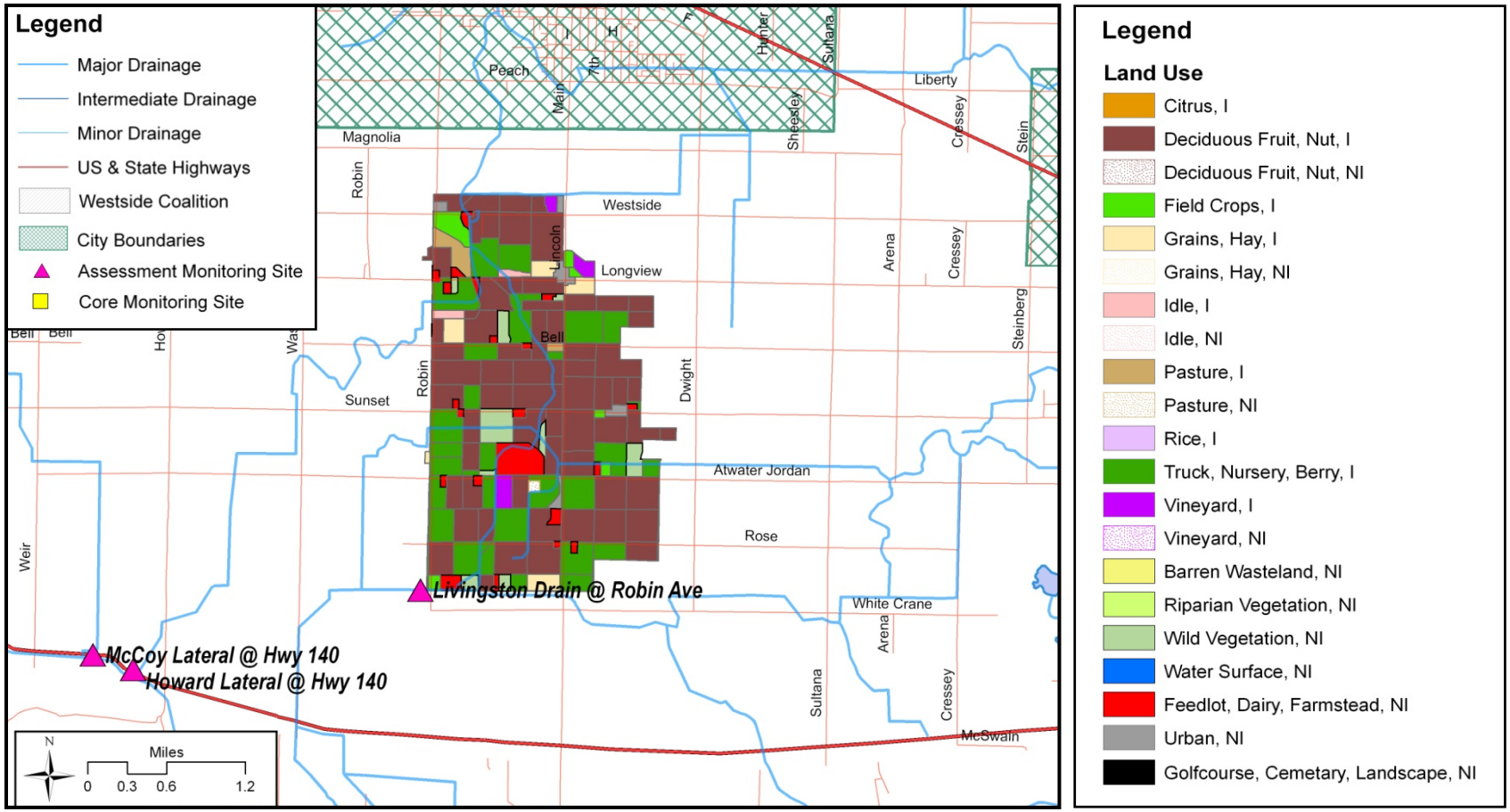
Priority E

- pH
- Color

Description of Livingston Drain @ Robin Avenue Site Subwatershed

Livingston Drain @ Robin Ave (3,656 irrigated acres) is located in the west central portion of the Coalition region in Merced County. It is located west of Atwater and Livingston. The agriculture is almost entirely orchards (FigureXVII-1) and several dairies are present in the watershed.

Figure XVII-1. Site subwatershed map of land use for the Livingston Drain @ Robin Ave sample site



Subwatershed Monitoring History

Monitoring at the Livingston Drain @ Robin Ave site subwatershed began with the 2007 irrigation season and the site was not monitored during the storm season. All five irrigation sampling events were sampled successfully (Table XVII-1). A list of constituents sampled is included in Table XVII-2.

Table XVII-1. Livingston Drain @ Robin Avenue sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	NA	NA	5

Table XVII-2. Livingston Drain @ Robin Ave. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2007
		Irrigation
Field and Physical Parameters		
EPA 110.2	Color	5
EPA 160.1	Dissolved Solids	5
EPA 180.1	Turbidity	5
EPA 405.1	BOD	1
EPA 415.1	Total Organic Carbon	5
SM 9223	E. coli	5
NA	Dissolved Oxygen	6
NA	Specific Conductivity	6
NA	pH	6
Carbamates		
EPA 8321A	Aldicarb	5
EPA 8321A	Carbaryl	5
EPA 8321A	Carbofuran	5
EPA 8321A	Diuron	5
EPA 8321A	Linuron	5
EPA 8321A	Methiocarb	5
EPA 8321A	Methomyl	5
EPA 8321A	Oxamyl	5
Organochlorines		
EPA 8081A	DDD(p,p')	5
EPA 8081A	DDE(p,p')	5
EPA 8081A	DDT(p,p')	5
EPA 8081A	Dicofol	5
EPA 8081A	Dieldrin	5
EPA 8081A	Endrin	5
EPA 8081A	Methoxychlor	5
Organophosphates		

Method	Analyte	2007
		Irrigation
EPA 8141A	Azinphos methyl	5
EPA 8141A	Chlorpyrifos	5
EPA 8141A	Diazinon	5
EPA 8141A	Dimethoate	5
EPA 8141A	Disulfoton	5
EPA 8141A	Malathion	5
EPA 8141A	Methamidophos	5
EPA 8141A	Methidathion	5
EPA 8141A	Molinate	5
EPA 8141A	Parathion, Methyl	5
EPA 8141A	Phorate	5
EPA 8141A	Phosmet	5
EPA 8141A	Thiobencarb	5
Pyrethroids		
EPA 8081A	Bifenthrin	5
EPA 8081A	Cyfluthrin, total	5
EPA 8081A	Cyhalothrin, lambda, total	5
EPA 8081A	Cypermethrin, total	5
EPA 8081A	Esfenvalerate/Fenvalerate, total	5
EPA 8081A	Permethrin, total	5
Triazines		
EPA 547M	Glyphosate	5
EPA 549.2M	Paraquat dichloride	5
EPA 619	Atrazine	5
EPA 619	Cyanazine	5
EPA 619	Simazine	5
Metals		
EPA 200.8	Arsenic	5
EPA 200.8	Boron	5
EPA 200.8	Cadmium	5
EPA 200.8	Copper	5
EPA 200.8	Lead	5
EPA 200.8	Nickel	5
EPA 200.8	Selenium	1
EPA 200.8	Zinc	5
Nutrients		
EPA 130.2	Hardness as CaCO3	5
EPA 300.0	Nitrate as N	5
EPA 350.2	Ammonia as N	5
EPA 351.3	Nitrogen, Total Kjeldahl	5
EPA 354.1	Nitrite as N	5
EPA 365.2	OrthoPhosphate as P	5
EPA 365.2	Phosphate as P	5
Toxicity		
EPA 821/R-02-012	*Ceriodaphnia dubia*	5
EPA 821/R-02-012	*Pimephales promelas*	5
EPA 821/R-02-013	*Selenastrum capricornutum*	5

Method	Analyte	2007
		Irrigation
EPA 600/R-99-064	*Hyalella azteca*	1

Exceedance History

During that first irrigation season the Coalition monitoring site experienced exceedances of WQTLs including three pH exceedances, two color exceedances, one exceedance of the chlorpyrifos limit, and four copper exceedances. Although all exceedances are listed in Table XVII-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Livingston Drain is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Livingston Drain @ Robin Ave site subwatershed, the constituent receiving the highest priority was copper (C).

Table XVII-3. Exceedances experienced in samples collected from Livingston Drain @ Robin Ave for 2007 (sorted by season and date).

Station Name	Season	Sample Date	pH, none	Color, color units	Copper[1], µg/L	Chlorpyrifos, µg/L
Livingston Drain @ Robin Ave	Irrigation	15/May/2007	8.95	16	18 (13.2)	
Livingston Drain @ Robin Ave	Irrigation	19/Jun/2007		16	16 (4.4)	
Livingston Drain @ Robin Ave	Irrigation	17/Jul/2007	8.82		7.8 (5.3)	
Livingston Drain @ Robin Ave	Irrigation	14/Aug/2007				0.016
Livingston Drain @ Robin Ave	Irrigation	11/Sep/2007	8.57		14 (6.4)	
Priorities			**E**	**E**	**C**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

Sampling began at the Livingston Drain @ Robin Ave site during the 2007 irrigation season; therefore no management plan sampling was conducted in 2007.

Load Calculations

Loads have been calculated for all copper detections in the site subwatershed based on the following formula (Table XVII-4):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XVII-4. Livingston Drain @ Robin Ave. Instantaneous load calculations for copper (sorted by analyte and date).

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Livingston Drain @ Robin Ave	Copper	15/May/2007	8.94	18	4556.77
Livingston Drain @ Robin Ave	Copper	19/Jun/2007	2.25	16	1019.41
Livingston Drain @ Robin Ave	Copper	17/Jul/2007	1.4	7.8	309.22
Livingston Drain @ Robin Ave	Copper	14/Aug/2007	7.64	7	1514.39
Livingston Drain @ Robin Ave	Copper	11/Sep/2007	5.11	14	2025.80
Livingston Drain @ Robin Ave	Copper	24/Jan/2008	7.13	6.7	1352.73
Livingston Drain @ Robin Ave	Copper	26/Feb/2008	0.19	15	80.70
Livingston Drain @ Robin Ave	Copper	26/Feb/2008	0.19	18	96.84

Source Identification

Priority C Constituent

Copper

Four exceedances of the copper WQTL occurred in the Livingston Drain site subwatershed during the summer 2007 irrigation season (Table XVII-3). The only month during that did not experience an exceedance was August. No exceedances were associated with *Selenastrum* toxicity. Copper is applied primarily during the winter and spring months, but copper is also heavily used by dairies and there are numerous dairies in the watershed (Table XVII-5, Figure XVII-2). Four sections applied copper more than once in the months prior to copper exceedances (Table XVII-6).

Table XVII-5. Number of copper applications, total pounds applied and total acres treated by month for 2007 in the Livingston Drain @ Robin Ave site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2007	20	4067.50	1143
February 2007	8	196.82	239
March 2007	2	51.12	58
May 2007	1	17.62	3
2007 Total	31	4333.07	1443

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Figure XVII-2. Pounds of copper applied within the Livingston Drain @ Robin Ave site subwatershed by month for 2007. Asterisk (*) denotes months with exceedances.

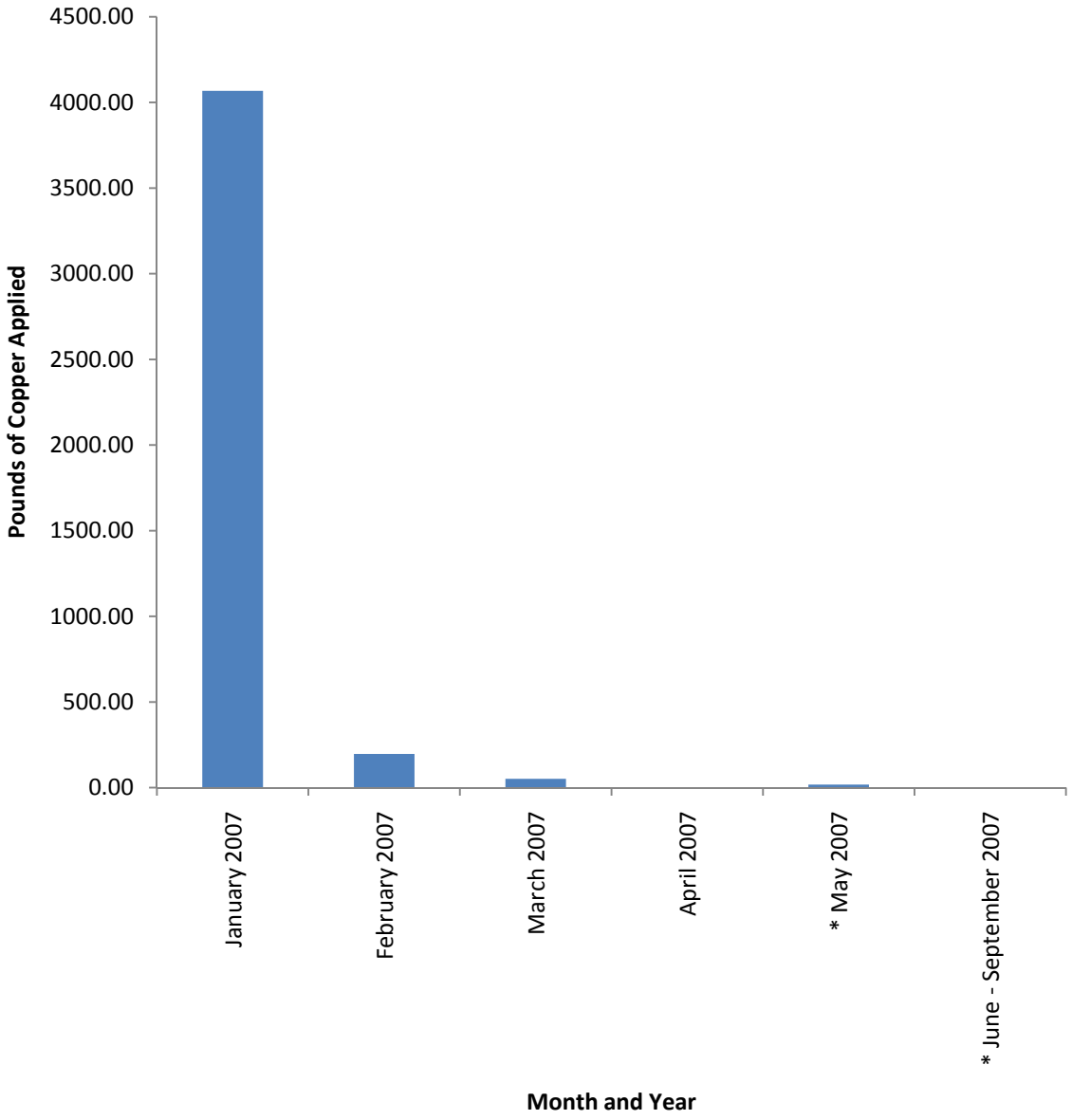


Table XVII-6. Livingston Drain @ Robin Ave. All TRS' that had more than one application associated with an exceedance of copper in 2007. Table indicates the application with which the exceedance was associated. No copper applications were reported in the three month period prior to the 9/11/07 exceedance.

TRS	Date of associated exceedance			
	5/15/2007	6/19/2007	7/17/2007	9/11/2007
6S11E34	3			
7S11E1	1	1		
7S11E10		1	1	
7S11E14	2	1		

Priority E Constituents

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring will occur at Livingston Drain @ Robin Ave in May, June, July and September 2008 for copper.

Table XVII-7. Livingston Drain @ Robin Ave site subwatershed. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Copper
Livingston Drain @ Robin Ave	May	A	**x**
Livingston Drain @ Robin Ave	June	A	**x**
Livingston Drain @ Robin Ave	July	A	**x**
Livingston Drain @ Robin Ave	September	A	**x**

XVIII. MERCED RIVER @ SANTA FE

Monitoring Plan Constituents

Priority D

- *Ceriodaphnia dubia* water column toxicity

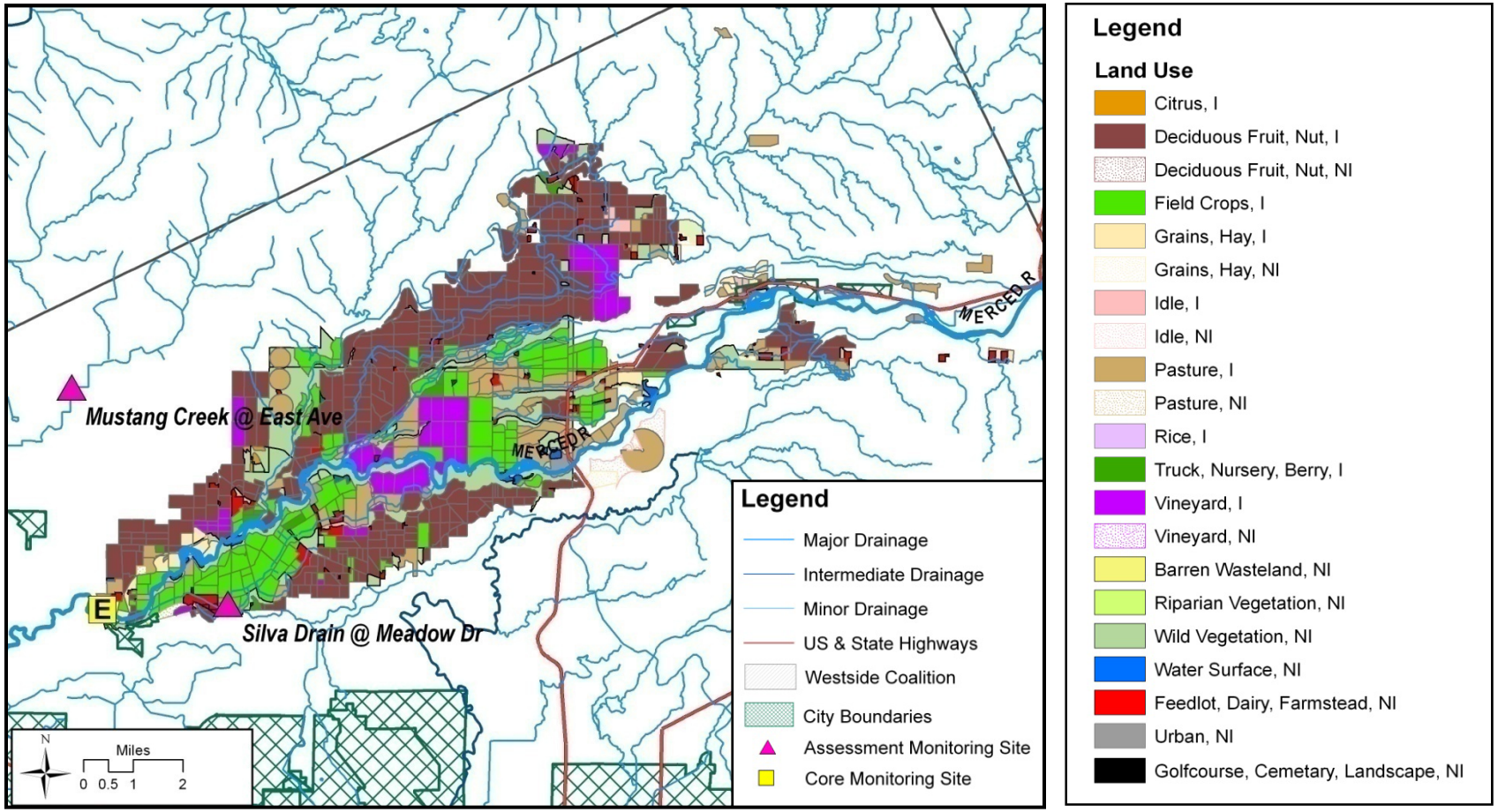
Priority E

- Color

Description of Merced River @ Santa Fe Drive Site Subwatershed

The Merced River is designated as a major water body and is 303d listed. Merced River @ Santa Fe Drive (27,796 irrigated acres) was selected as an integrator site for several of the drains and tributaries in the vicinity. The Merced River originates in the high Sierra encountering several dams and impoundments as it flows west. The Merced River eventually drains into the San Joaquin River near Hatfield State Park. Upstream agriculture includes some field crops in the immediate vicinity of the river and deciduous orchards, primarily almonds (Figure XVIII-1).

Figure XVIII-1. Site subwatershed map of land use for the Merced River @ Santa Fe Dr sample site.



Subwatershed Monitoring History

The Merced River monitoring site has been sampled since the 2004 irrigation season (Table XVIII-1). Each event has been successfully sampled and a list of constituents that have been analyzed for by year and season is included in Table XVIII-2.

Table XVIII-1. Merced River @ Santa Fe Drive sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	3	2	5	2	5	2	6

Table XVIII-2. Merced River @ Santa Fe Drive. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Field and Physical Parameters								
EPA 110.2	Color	3	2	5	2	5	2	6
EPA 160.1	Dissolved Solids	3	2	5	2	5	2	6
EPA 180.1	Turbidity	3	2	5	2	5	2	6
EPA 405.1	BOD					1	2	2
EPA 415.1	Total Organic Carbon	3	2	5	2	5	2	6
SM 9223	E. coli	3	2	5	2			
NA	Dissolved Oxygen	4	2	5	4	5	2	6
NA	Specific Conductivity	4	2	5	4	5	2	6
NA	pH	4	2	5	4	5	1	6
Carbamates								
EPA 8321A	Aldicarb					5	2	6
EPA 8321A	Carbaryl					5	2	6
EPA 8321A	Carbofuran					5	2	6
EPA 8321A	Diuron					5	2	6
EPA 8321A	Linuron					5	2	6
EPA 8321A	Methiocarb					5	2	6
EPA 8321A	Methomyl					5	2	6
EPA 8321A	Oxamyl					5	2	6
Organochlorines								
EPA 8081A	DDD(p,p')					5	2	6
EPA 8081A	DDE(p,p')					5	2	6
EPA 8081A	DDT(p,p')					5	2	6
EPA 8081A	Dicofol					5	2	6
EPA 8081A	Dieldrin					5	2	6
EPA 8081A	Endrin					5	2	6
EPA 8081A	Methoxychlor					5	2	6
Organophosphates								

Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
EPA 8141A	Azinphos methyl					5	2	6
EPA 8141A	Chlorpyrifos	3	2	5	2	5	2	6
EPA 8141A	Diazinon	3	2	5	2	5	2	6
EPA 8141A	Dimethoate	1				5	2	6
EPA 8141A	Disulfoton	1				5	2	6
EPA 8141A	Malathion	1				5	2	6
EPA 8141A	Methamidophos					5	2	6
EPA 8141A	Methidathion					5	2	6
EPA 8141A	Molinate					5	2	6
EPA 8141A	Parathion, Methyl	1				5	2	6
EPA 8141A	Phorate	1				5	2	6
EPA 8141A	Phosmet					5	2	6
EPA 8141A	Thiobencarb					5	2	6
	Pyrethroids							
EPA 8081A	Bifenthrin			1	2	5	2	6
EPA 8081A	Cyfluthrin, total			1	2	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	3	2	5	2	5	2	6
EPA 8081A	Cypermethrin, total	3	2	5	2	5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	3	2	5	2	5	2	6
EPA 8081A	Permethrin, total	3	2	5	2	5	2	6
	Triazines							
EPA 547M	Glyphosate					5	2	6
EPA 549.2M	Paraquat dichloride					5	2	6
EPA 619	Atrazine					5	2	6
EPA 619	Cyanazine					5	2	6
EPA 619	Simazine					5	2	6
	Metals							
EPA 200.8	Arsenic					5	2	6
EPA 200.8	Boron					5	2	6
EPA 200.8	Cadmium					5	2	6
EPA 200.8	Copper					4	2	6
EPA 200.8	Lead					5	2	6
EPA 200.8	Nickel					5	2	6
EPA 200.8	Selenium					5	2	2
EPA 200.8	Zinc					5	2	6
	Nutrients							
EPA 130.2	Hardness as CaCO3					5	2	6
EPA 300.0	Nitrate as N					5	2	6
EPA 350.2	Ammonia as N					5	2	6
EPA 351.3	Nitrogen, Total Kjeldahl					5	2	6
EPA 354.1	Nitrite as N					5	2	6
EPA 365.2	OrthoPhosphate as P					5	2	6
EPA 365.2	Phosphate as P					5	2	6
	Toxicity							
821/R-02-012	*Ceriodaphnia dubia*	4	2	5	3	5	2	6
821/R-02-012	*Pimephales promelas*	3	2	5	2	5	2	6

Method	Analyte	2004	2005		2006		2007	
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
821/R-02-013	*Selenastrum capricornutum*	3	3	5	2	5	2	6
600/R-99-064	*Hyalella azteca*	2		5	1	1		

Exceedance History

Ambient water monitoring at Merced River was initiated at the commencement of the Coalition monitoring program in the irrigation season of 2004. Since that time, one dissolved oxygen (DO) exceedance, one pH exceedance, 16 color exceedances, one *E. coli* exceedance, one chlorpyrifos exceedance, one lead exceedance, three instances of toxicity to *Ceriodaphnia dubia* and one instance of toxicity to *Selenastrum capricornutum* have occurred. Although all exceedances are listed in the following tables, only those that have occurred at a site more than once in a three year period will be subject to management plan actions.

The Merced River (downstream of McSwain Reservoir) is listed as impaired and is included on the current Central Valley Basin Plan 303d list for chlorpyrifos, diazinon, group A pesticides, and mercury.

Using the priority flow chart outlined in the Management Plan introduction (Figure 3), priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Merced River @ Santa Fe Drive site subwatershed, the constituent receiving the highest priority was *Ceriodaphnia* (D).

Table XVIII-3. Exceedances experienced in samples collected from Merced River @ Santa Fe Drive between August 2004 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Lead, µg/L	Chlorpyrifos, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Merced River @ Santa Fe	Irrigation	31/Jul/2004			25				75	
Merced River @ Santa Fe	Irrigation	31/Aug/2004			20				40	
Merced River @ Santa Fe	Irrigation	11/May/2005			30					
Merced River @ Santa Fe	Irrigation	15/Jun/2005			25					
Merced River @ Santa Fe	Irrigation	17/Aug/2005		6.38	20					
Merced River @ Santa Fe	Irrigation	21/Sep/2005			25					
Merced River @ Santa Fe	Irrigation	16/May/2006			20					
Merced River @ Santa Fe	Irrigation	14/Jun/2006	6.4		16					
Merced River @ Santa Fe	Irrigation	12/Jul/2006			17					
Merced River @ Santa Fe	Irrigation	13/Sep/2006			16					
Merced River @ Santa Fe	Irrigation	17/Jul/2007						0.018		
Merced River @ Santa Fe	Storm	16/Feb/2005			30					
Merced River @ Santa Fe	Storm	21/Mar/2005			20					1260000
Merced River @ Santa Fe	Storm	01/Mar/2006			75	1600				
Merced River @ Santa Fe	Storm	16/Mar/2006			30				35	
Merced River @ Santa Fe	Storm	12/Feb/2007			45		0.82 (0.63)			
Merced River @ Santa Fe	Storm	28/Feb/2007			60					
Priorities					**E**				**D**	

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

Irrigation 2004 was the last irrigation season that had samples toxic to *Ceriodaphnia*. Therefore the Coalition did not conduct additional monitoring for *Ceriodaphnia* toxicity.

Load Calculations

No load calculations are necessary for the Merced River @ Santa Fe site subwatershed.

Source Identification

Priority D Constituent

Ceriodaphnia dubia toxicity

There were three sampling events during which there was toxicity to *Ceriodaphnia dubia* (Table XVIII-3). Two of these toxicities occurred during the irrigation season of 2004, and one additional instance of toxicity occurred in March 2006. Toxicity Identification Evaluations occurred for two of these toxicities due to greater than 50% mortality compared to control, however the toxicity in the samples were not persistent and the cause of toxicity remains unknown. Management of irrigation tail water is likely to eliminate the toxicity.

Priority E Constituent

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring will be conducted at the Merced River @ Santa Fe site for *Ceriodaphnia* in July and August 2008 (Table XVIII-4). This sampling will determine if *Ceriodaphnia* toxicity is still a concern during the irrigation season.

Table XVIII-4. Merced River @ Santa Fe Drive. 2008 Management Plan sampling. A = additional monitoring. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	*Ceriodaphnia dubia*
Merced River @ Santa Fe	July	A	**x**
Merced River @ Santa Fe	August	A	**x**

XIX. MILES CREEK @ REILLY ROAD

Management Plan Constituents

Priority C

- Copper

Priority E

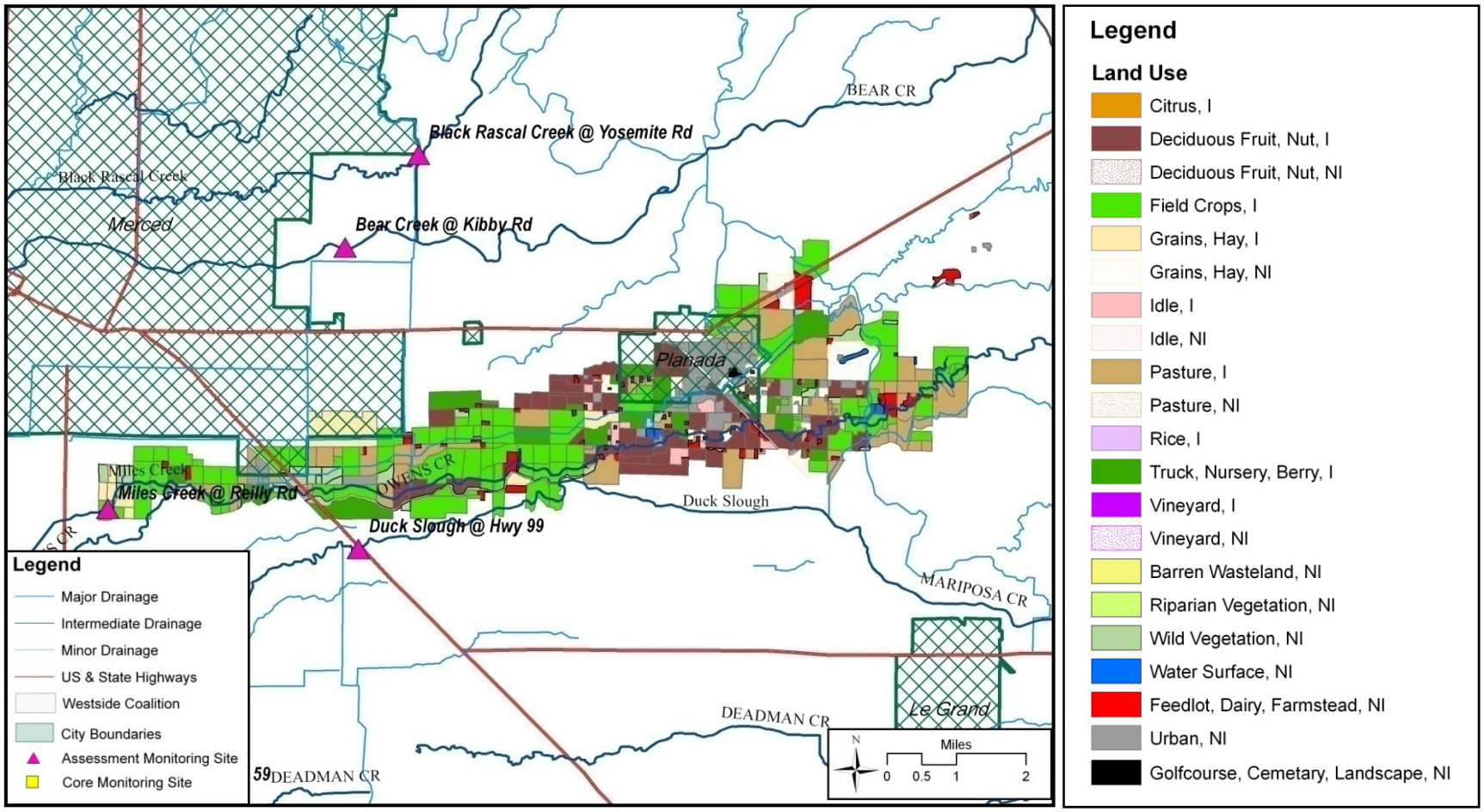
- *E. coli*
- Color

Description of the Miles Creek @ Reilly Road Site Subwatershed

Miles Creek @ Reilly Rd. (9,664 irrigated acres) is located just north of Duck Slough and drains into Owens Creek. The primary agriculture includes field crops, deciduous orchards, pasture and truck, nursery and berry. Within the subwatershed are dairies, hay and pasture lands, and drainage from the City of Merced (Figure XIX-1).

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Figure XIX-1. Site subwatershed map of land use for the Miles Creek @ Reilly Rd sample site.



Subwatershed Monitoring History

The Coalition monitoring program was initiated at the Miles Creek @ Reilly Rd site subwatershed in May of 2007. All five irrigation events have been sampled successfully (Table XIX-1). Table XIX-2 includes the constituents that have been analyzed for by year and season.

Table XIX-1. Miles Creek @ Reilly Rd sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	NA	NA	5

Table XIX-2. Miles Creek @ Reilly Rd. Number of analyses performed per constituent in each sampling season (only environmental samples listed).

Method	Analyte	2007
		Irrigation
Field and Physical Parameters		
EPA 110.2	Color	5
EPA 160.1	Dissolved Solids	5
EPA 180.1	Turbidity	5
EPA 405.1	BOD	1
EPA 415.1	Total Organic Carbon	5
SM 9223	E. coli	5
NA	Dissolved Oxygen	7
NA	Specific Conductivity	7
NA	pH	7
Carbamates		
EPA 8321A	Aldicarb	5
EPA 8321A	Carbaryl	5
EPA 8321A	Carbofuran	5
EPA 8321A	Diuron	5
EPA 8321A	Linuron	5
EPA 8321A	Methiocarb	5
EPA 8321A	Methomyl	5
EPA 8321A	Oxamyl	5
Organochlorines		
EPA 8081A	DDD(p,p')	5
EPA 8081A	DDE(p,p')	5
EPA 8081A	DDT(p,p')	5
EPA 8081A	Dicofol	5
EPA 8081A	Dieldrin	5
EPA 8081A	Endrin	5
EPA 8081A	Methoxychlor	5
Organophosphates		
EPA 8141A	Azinphos methyl	5
EPA 8141A	Chlorpyrifos	5
EPA 8141A	Diazinon	5

Method	Analyte	2007 Irrigation
EPA 8141A	Dimethoate	5
EPA 8141A	Disulfoton	5
EPA 8141A	Malathion	5
EPA 8141A	Methamidophos	5
EPA 8141A	Methidathion	5
EPA 8141A	Molinate	5
EPA 8141A	Parathion, Methyl	5
EPA 8141A	Phorate	5
EPA 8141A	Phosmet	5
EPA 8141A	Thiobencarb	5
Pyrethroids		
EPA 8081A	Bifenthrin	5
EPA 8081A	Cyfluthrin, total	5
EPA 8081A	Cyhalothrin, lambda, total	5
EPA 8081A	Cypermethrin, total	5
EPA 8081A	Esfenvalerate/Fenvalerate, total	5
EPA 8081A	Permethrin, total	5
Triazines		
EPA 547M	Glyphosate	5
EPA 549.2M	Paraquat dichloride	5
EPA 619	Atrazine	5
EPA 619	Cyanazine	5
EPA 619	Simazine	5
Metals		
EPA 200.8	Arsenic	5
EPA 200.8	Boron	5
EPA 200.8	Cadmium	5
EPA 200.8	Copper	5
EPA 200.8	Lead	5
EPA 200.8	Nickel	5
EPA 200.8	Selenium	1
EPA 200.8	Zinc	5
Nutrients		
EPA 130.2	Hardness as CaCO3	5
EPA 300.0	Nitrate as N	5
EPA 350.2	Ammonia as N	5
EPA 351.3	Nitrogen, Total Kjeldahl	5
EPA 354.1	Nitrite as N	5
EPA 365.2	OrthoPhosphate as P	5
EPA 365.2	Phosphate as P	5
Toxicity		
EPA 821/R-02-012	*Ceriodaphnia dubia*	7
EPA 821/R-02-012	*Pimephales promelas*	6
EPA 821/R-02-013	*Selenastrum capricornutum*	7
EPA 600/R-99-064	*Hyalella azteca*	2

Exceedance History

During the first irrigation season the site experienced five color exceedances, three *E. coli* exceedances and one aldicarb and one chlorpyrifos exceedances of the WQTLs. Metals exceedances included three copper and one lead. *Ceriodaphnia* and *Selenastrum* experienced water column toxicity once each, sediment toxicity to *Hyalella* has occurred once. Although all exceedances are listed in Table XIX-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Miles Creek @ Reilly Rd site, the constituent receiving the highest priority was copper (C).

Table XIX-3. Exceedances experienced in samples collected from Miles Creek @ Reilly Rd between May 2007 and September 2007.

Station Name	Season	Sample Date	Color, color units	*E. coli*, MPN/100 mL	Aldicarb, µg/L	Chlorpyrifos, µg/L	Copper[1], µg/L	Lead[1], µg/L	*Ceriodaphnia dubia*, Survival (%)	*Hyalella azteca*, Survival (%)	*Selenastrum capricornutum*, Total Cell Count
Miles Creek @ Reilly Rd	Irrigation	29/May/07	30	290			4.3 (3.5)				
Miles Creek @ Reilly Rd	Irrigation	26/Jun/07	35	310	5.4		5.8 (4.3)	1 (0.99)			475214
Miles Creek @ Reilly Rd	Irrigation	24/Jul/07	35	340							
Miles Creek @ Reilly Rd	Irrigation	21/Aug/07	35				5.2 (4.4)				
Miles Creek @ Reilly Rd	Irrigation	23/Aug/07								93	
Miles Creek @ Reilly Rd	Irrigation	18/Sep/07	25			0.03			60		
Priorities			**E**	**E**			**C**				

[1]Water quality trigger for each sample is based on hardness and is shown in parenthesis.

2007 Management Plan Monitoring Results

No management plan monitoring was conducted at the Miles Creek @ Reilly Rd site in 2007.

Load Calculations

Loads have been calculated for all copper detections in the site subwatershed based on the following formula (Table XIX-4):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XIX-4. Miles Creek @ Reilly Rd. Instantaneous load calculations for copper.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Miles Creek @ Reilly Rd	Copper	29/May/2007	7.15	4.3	870.61
Miles Creek @ Reilly Rd	Copper	26/Jun/2007	19.2	5.8	3153.38
Miles Creek @ Reilly Rd	Copper	24/Jul/2007	29.92	4.6	3897.33
Miles Creek @ Reilly Rd	Copper	21/Aug/2007	7.32	5.2	1077.86
Miles Creek @ Reilly Rd	Copper	18/Sep/2007	15.67	4.5	1996.77

Source Identification

Priority C Constituent

Copper

Copper was detected in exceedance of the WQTL in three of the six samples collected during the 2007 irrigation season. Unlike most areas in the Coalition region, there were a relatively small number of applications in 2007, the majority of which occurred in January (Table XIX-5, Figure XIX-2). A single TRS appears to be the source of agriculturally derived copper, but it is not clear that copper from agriculture is the sole source (Table XIX-6). For the copper that originates with agriculture, it is probable that copper was mobilized with sediment during irrigation and transported to surface waters.

Table XIX-5. Number of copper applications, total pounds applied and total acres treated by month for January 2007 through September 2007 in the Miles Creek @ Reilly Rd site subwatershed. If a month is not included in the table, no applications were made.

Month/Year	Number of Copper Applications	Pounds AI Applied	Acres Treated
January 2007	3	1087.00	245
February 2007	1	273.74	77
March 2007	1	123.20	20
April 2007	1	123.20	20
2007 Total	6	1607.14	362

Figure XIX-2. Pounds of copper applied within the Miles Creek @ Reilly Rd site subwatershed by month for 2007. Asterisk (*) denotes months with exceedances.

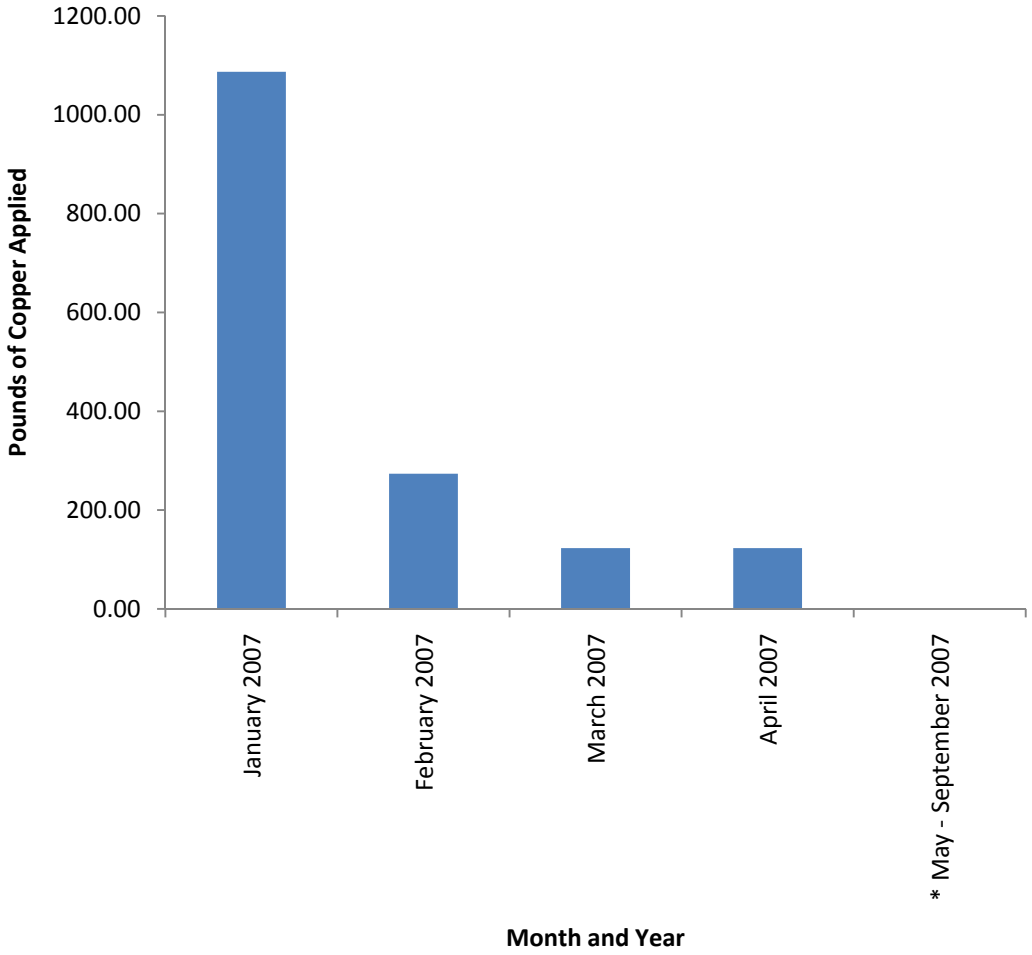


Table XIX-6. Miles Creek @ Reilly Rd. All TRS that had more than one application associated with an exceedance for copper in 2007. Table shows which exceedance the application was associated with and number of applications associated with an exceedance for a given TRS. No PUR applications were reported within three months of the 8/21/07 exceedance date.

TRS	Date of Associated Exceedance		
	5/29/2007	6/26/2007	8/21/07
7S15E25	1	1	

Priority E Constituents

E. coli

E. coli exceedances occurred in May, June, and July 2007 although the exceedances were only slightly over the 235 MPN/100mL standard. There are only a few small dairies upstream and it is unlikely that they are contributing to the *E. coli* load. Miles Creek was not part of the *E. coli*/Bacteroides study. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Color

Color is a non-conserved indicator of biological and physical inputs to the system and is not possible to manage unless the causes are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring will be conducted at Miles Creek @ Reilly Rd in May, June and August 2008 for copper (Table XIX-7).

Table XIX-7. Miles Creek @ Reilly Rd. 2008 Management Plan sampling. A = additional sampling. X = = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Copper
Miles Creek @ Reilly Rd	May	A	**x**
Miles Creek @ Reilly Rd	June	A	**x**
Miles Creek @ Reilly Rd	August	A	**x**

XX. MUSTANG CREEK @ EAST AVE

Management Plan Constituents

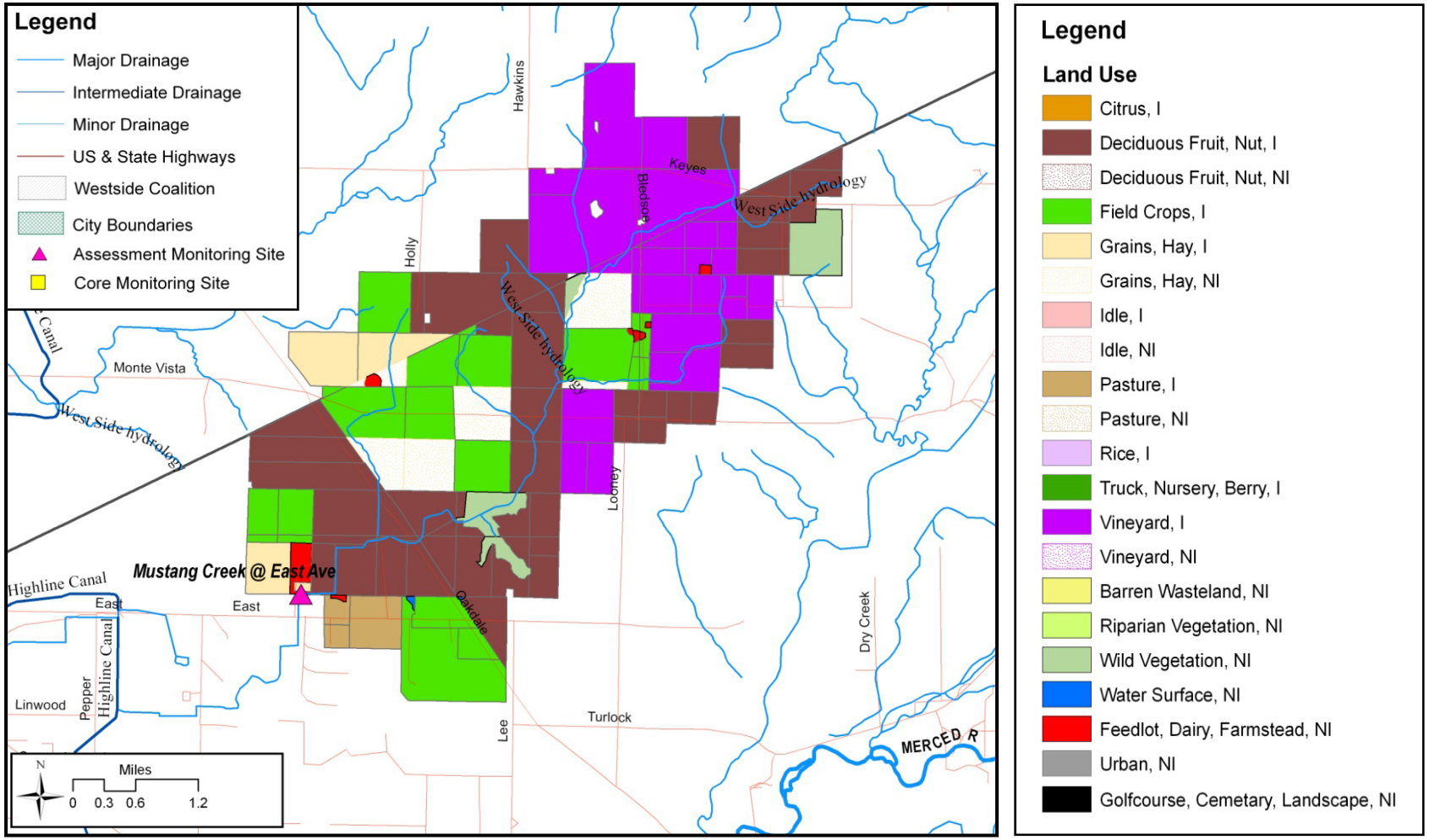
Priority E

- DO
- *E. coli*
- DDE
- Color

Description of Mustang Creek @ East Avenue Site Subwatershed

Mustang Creek @ East Ave (12,400 irrigated acres) originates in the foothills of the Sierra Nevada and flows into the upper portion of the Highline Canal. Mustang Creek is ephemeral with flow found primarily during winter runoff events. Orchards in the watershed are primarily irrigated with microspray. Summer flows are intermittent and flow is rarely seen during the summer. Deciduous orchards and vineyards are the main agriculture with smaller amounts of field crops and grains and hay (Figure XX-1).

Figure XX-1. Site subwatershed map of land use for the Mustang Creek @ East Ave sample site.



Subwatershed Monitoring History

Monitoring on Mustang Creek was initiated in the irrigation season of 2006 and the site has been sampled since that time (Table XX-1). Samples are rarely collected in the summer due to lack of flow (Table XX-1). Two 2006 irrigation events and four 2007 irrigation events were not sampled due to the site being dry. Table XX-2 lists the constituents analyzed for in samples collected from Mustang Creek by year and season.

Table XX-1. Mustang Creek @ East Avenue sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	3	2	2
Events Not Sampled	NA	NA	NA	NA	2	0	4
Total	NA	NA	NA	NA	5	2	6

NA indicates that this site was not sampled during this year and season.

Table XX-2. Mustang Creek @ East Ave. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	3	2	2
EPA 160.1	Dissolved Solids	3	2	2
EPA 180.1	Turbidity	3	2	2
EPA 405.1	BOD		2	
EPA 415.1	Total Organic Carbon	3	2	2
SM 9223	E. coli	3	2	2
NA	Dissolved Oxygen	4	3	2
NA	Specific Conductivity	4	3	2
NA	pH	4	2	2
Carbamates				
EPA 8321A	Aldicarb	3	2	2
EPA 8321A	Carbaryl	3	2	2
EPA 8321A	Carbofuran	3	2	2
EPA 8321A	Diuron	3	2	2
EPA 8321A	Linuron	3	2	2
EPA 8321A	Methiocarb	3	2	2
EPA 8321A	Methomyl	3	2	2
EPA 8321A	Oxamyl	3	2	2
Organochlorines				
EPA 8081A	DDD(p,p')	3	2	2
EPA 8081A	DDE(p,p')	3	2	2
EPA 8081A	DDT(p,p')	3	2	2

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 8081A	Dicofol	3	2	2
EPA 8081A	Dieldrin	3	2	2
EPA 8081A	Endrin	3	2	2
EPA 8081A	Methoxychlor	3	2	2
Organophosphates				
EPA 8141A	Azinphos methyl	3	2	2
EPA 8141A	Chlorpyrifos	3	2	2
EPA 8141A	Diazinon	3	2	2
EPA 8141A	Dimethoate	3	2	2
EPA 8141A	Disulfoton	3	2	2
EPA 8141A	Malathion	3	2	2
EPA 8141A	Methamidophos	3	2	2
EPA 8141A	Methidathion	3	2	2
EPA 8141A	Molinate	3	2	2
EPA 8141A	Parathion, Methyl	3	2	2
EPA 8141A	Phorate	3	2	2
EPA 8141A	Phosmet	3	2	2
EPA 8141A	Thiobencarb	3	2	2
Pyrethroids				
EPA 8081A	Bifenthrin	3	2	2
EPA 8081A	Cyfluthrin, total	3	2	2
EPA 8081A	Cyhalothrin, lambda, total	3	2	2
EPA 8081A	Cypermethrin, total	3	2	2
EPA 8081A	Esfenvalerate/Fenvalerate, total	3	2	2
EPA 8081A	Permethrin, total	3	2	2
Triazines				
EPA 547M	Glyphosate	3	2	2
EPA 549.2M	Paraquat dichloride	3	2	2
EPA 619	Atrazine	3	2	2
EPA 619	Cyanazine	3	2	2
EPA 619	Simazine	3	2	2
Metals				
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
Nutrients				
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N			1
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N			1

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 365.2	OrthoPhosphate as P			1
EPA 365.2	Phosphate as P			
Toxicity				
EPA 821/R-02-012	*Ceriodaphnia dubia*	3	2	2
EPA 821/R-02-012	*Pimephales promelas*	3	2	2
EPA 821/R-02-013	*Selenastrum capricornutum*	3	2	2
EPA 600/R-99-064	*Hyalella azteca*	1	1	

Exceedance History

Exceedances of WQTLs include DO (5), *E. coli* (5), color (7), specific conductance (1), and DDE (1). Although all exceedances are listed in the following table (Table III-3), only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Mustang Creek is not considered impaired under the current Central Valley Basin Plan 303d list, although the Merced River, the downstream waterbody is listed.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at Mustang Creek @ East Ave site subwatershed, DO, color, *E. coli* and DDE all received a priority of (E).

Table XX-3. Exceedances experienced in samples collected from Mustang Creek @ East Ave Coalition monitoring site between May 2006 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	*E. coli*, MPN/100 mL	DDE(p,p'), µg/L
Mustang Creek @ East Ave	Irrigation	18/May/2006	5.82		180		2400	
Mustang Creek @ East Ave	Irrigation	15/Jun/2006	5		110		2400	
Mustang Creek @ East Ave	Irrigation	10/Aug/2006	2.61		120		980	
Mustang Creek @ East Ave	Irrigation	15/May/2007	1.16		120		1600	
Mustang Creek @ East Ave	Irrigation	19/Jun/2007	4.3		190		410	0.0073
Mustang Creek @ East Ave	Storm	12/Feb/2007			140			
Mustang Creek @ East Ave	Storm	28/Feb/2007		760	70	460		0.0064
Priorities			**E**		**E**		**E**	**E**

2007 Management Plan Monitoring Results

No management plan monitoring was conducted in 2007 at the Mustang Creek @ East Ave sample site.

Load Calculations

No load calculations were needed.

Source Identification

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. Neither of the samples collected at Mustang Creek @ East Ave contained measurable amounts of BOD however neither of the samples experienced an exceedance of the DO WQTL (Table XX-4). These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XX-4. Mustang Creek @ East Ave. BOD, pH and dissolved oxygen results for February 2007.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Mustang Creek @ East Ave	2/12/2007	7.78	14.2	ND
Mustang Creek @ East Ave	2/28/2007	7.28	8.85	ND

E. coli

Exceedances of the *E. coli* WQTL occurred five times during the irrigation season. Every irrigation sample collected resulted in an exceedance of the *E. coli* WQTL. This site subwatershed is small and has some dairies including a dairy immediately upstream of the sample site which could have contributed fecal material to the creek. Mustang Creek @ East Ave was not sampled for the 2006 *E. coli* study. Once a better understanding of *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

DDE

DDE is a breakdown product of DDT and indicates that DDT was applied several decades prior to sampling. DDE is found primarily bound to sediments and was likely included in the water sample due to bottom sediments that were mobilized by storm flows or the samplers themselves. The Coalition will not manage for DDE.

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

No upstream or additional monitoring will be conducted at Mustang Creek @ East Ave in 2008.

XXI. SILVA DRAIN @ MEADOW DR

Management Plan Constituents

Priority B

- Chlorpyrifos

Priority D

- *Hyalella azteca* sediment toxicity

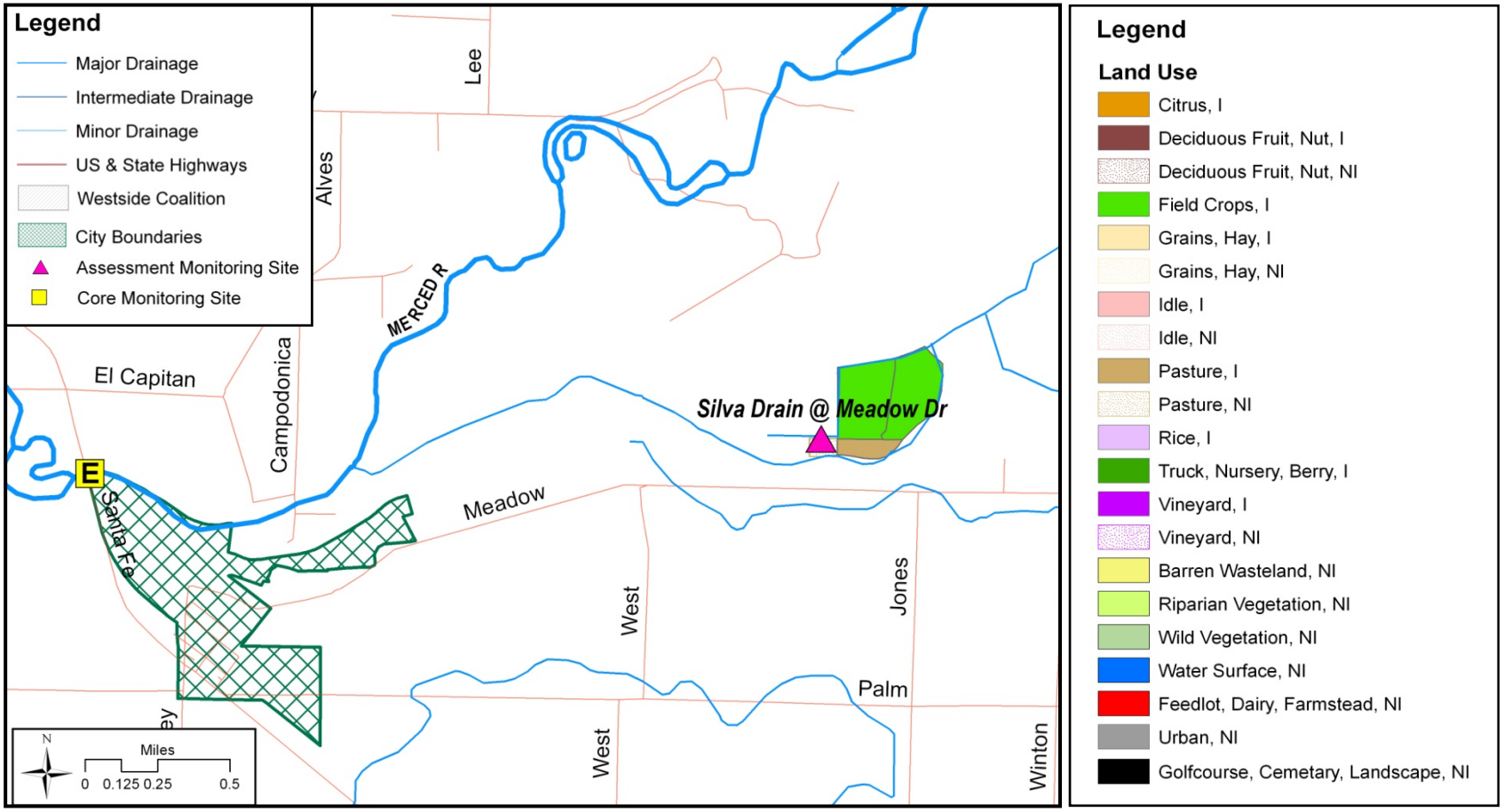
Priority E

- DO
- *E. coli*
- Color

Description of Silva Drain @ Meadow Drive Site Subwatershed

Silva Drain @ Meadow Drive (69 irrigated acres) is a very small site subwatershed that joins with Jones Drain just upstream of the confluence of Jones Drain with the Merced River. The primary agriculture is field crops and irrigated pasture. Large dairies are found in the site subwatershed (Figure XXI-1).

Figure XXI-1. Site subwatershed map of land use for the Silva Drain @ Meadow Dr sample site.



Subwatershed Monitoring History

Ambient water monitoring at Silva Drain was initiated in the irrigation season of 2006. All events have been successfully sampled during two irrigation and one storm events (Table XXI-1). Table XXI-2 lists the constituents analyzed for by year and season.

Table XXI-1. Silva Drain @ Meadow Drive sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	5	2	6

Table XXI-2. Silva Drain @ Meadow Drive. Number of analyses performed per constituent in each sampling season (only environmental samples are listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	5	2	6
EPA 160.1	Dissolved Solids	5	2	6
EPA 180.1	Turbidity	5	2	6
EPA 405.1	BOD	1	2	2
EPA 415.1	Total Organic Carbon	5	2	6
SM 9223	E. coli	5	2	6
NA	Dissolved Oxygen	5	3	9
NA	Specific Conductivity	5	3	9
NA	pH	5	2	9
Carbamates				
EPA 8321A	Aldicarb	5	2	6
EPA 8321A	Carbaryl	5	2	6
EPA 8321A	Carbofuran	5	2	6
EPA 8321A	Diuron	5	2	6
EPA 8321A	Linuron	5	2	6
EPA 8321A	Methiocarb	5	2	6
EPA 8321A	Methomyl	5	2	6
EPA 8321A	Oxamyl	5	2	6
Organochlorines				
EPA 8081A	DDD(p,p')	5	2	6
EPA 8081A	DDE(p,p')	5	2	6
EPA 8081A	DDT(p,p')	5	2	6
EPA 8081A	Dicofol	5	2	6
EPA 8081A	Dieldrin	5	2	6
EPA 8081A	Endrin	5	2	6
EPA 8081A	Methoxychlor	5	2	6
Organophosphates				
EPA 8141A	Azinphos methyl	5	2	7
EPA 8141A	Chlorpyrifos	5	2	8

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 8141A	Diazinon	5	2	7
EPA 8141A	Dimethoate	5	2	7
EPA 8141A	Disulfoton	5	2	7
EPA 8141A	Malathion	5	2	7
EPA 8141A	Methamidophos	5	2	6
EPA 8141A	Methidathion	5	2	7
EPA 8141A	Molinate	5	2	7
EPA 8141A	Parathion, Methyl	5	2	7
EPA 8141A	Phorate	5	2	7
EPA 8141A	Phosmet	5	2	7
EPA 8141A	Thiobencarb	5	2	7
Pyrethroids				
EPA 8081A	Bifenthrin	5	2	6
EPA 8081A	Cyfluthrin, total	5	2	6
EPA 8081A	Cyhalothrin, lambda, total	5	2	6
EPA 8081A	Cypermethrin, total	5	2	6
EPA 8081A	Esfenvalerate/Fenvalerate, total	5	2	6
EPA 8081A	Permethrin, total	5	2	6
Triazines				
EPA 547M	Glyphosate	5	2	6
EPA 549.2M	Paraquat dichloride	5	2	6
EPA 619	Atrazine	5	2	6
EPA 619	Cyanazine	5	2	6
EPA 619	Simazine	5	2	6
Metals				
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
Nutrients				
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N	1		1
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N	1		1
EPA 365.2	OrthoPhosphate as P	1		1
EPA 365.2	Phosphate as P			
Toxicity				
EPA 821/R-02-012	*Ceriodaphnia dubia*	6	2	6
EPA 821/R-02-012	*Pimephales promelas*	5	2	6
EPA 821/R-02-013	*Selenastrum capricornutum*	5	2	6
EPA 600/R-99-064	*Hyalella azteca*	2	1	1

Exceedance History

Ambient water monitoring at Silva Drain was initiated in the irrigation season of 2006. Since that time, exceedances of WQTL have occurred at the Coalition sampling site including seven dissolved oxygen (DO), 13 color, nine *E. coli,* and three chlorpyrifos. Silva Drain has also experienced *Hyalella* sediment toxicity twice. Silva Drain is not considered impaired and is not listed on the current Central Valley Basin Plan 303d list. However, downstream from the drain, Merced River is listed as impaired for a number of constituents including chlorpyrifos, diazinon, Group A pesticides, and mercury.

Although all exceedances are listed in the following table (Table XXI-3), only those that have occurred at a site more than once in a three year period will be subject to management plan actions. Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Silva Drain @ Meadow Drive site subwatershed, the constituent receiving the highest priority was chlorpyrifos (B).

Table XXI-3. Exceedances experienced in samples collected from the Silva Drain @ Meadow Dr Coalition monitoring site between May 2006 and September 2007 (sorted by season and date).

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	Color, color units	*E. coli*, MPN/100 mL	Chlorpyrifos, µg/L	*Ceriodaphnia dubia*, Survival (%)	*Hyalella azteca*, Survival (%)
Silva Drain @ Meadow Dr	Irrigation	18/May/2006		45	1300			
Silva Drain @ Meadow Dr	Irrigation	14/Jun/2006		28				
Silva Drain @ Meadow Dr	Irrigation	13/Jul/2006	5.75	90	690			
Silva Drain @ Meadow Dr	Irrigation	09/Aug/2006		50	460	0.14	0	61.25
Silva Drain @ Meadow Dr	Irrigation	05/Sep/2006						91.25
Silva Drain @ Meadow Dr	Irrigation	13/Sep/2006	5.99	70	320			
Silva Drain @ Meadow Dr	Irrigation	17/Apr/2007		40	420			
Silva Drain @ Meadow Dr	Irrigation	15/May/2007		65	1400			
Silva Drain @ Meadow Dr	Irrigation	19/Jun/2007	4.2	75	1000			
Silva Drain @ Meadow Dr	Irrigation	17/Jul/2007	4.71	55	520	0.031		
Silva Drain @ Meadow Dr	Irrigation	31/Jul/2007	6.1					
Silva Drain @ Meadow Dr	Irrigation	14/Aug/2007		85	410			
Silva Drain @ Meadow Dr	Irrigation	16/Aug/2007	6.43					
Silva Drain @ Meadow Dr	Irrigation	28/Aug/2007				0.055		
Silva Drain @ Meadow Dr	Irrigation	11/Sep/2007	6.12	140				
Silva Drain @ Meadow Dr	Storm	12/Feb/2007		65				
Silva Drain @ Meadow Dr	Storm	28/Feb/2007		70				
Priorities			**E**	**E**	**E**	**B**		**D**

2007 Management Plan Monitoring Results

Additional Management Plan sampling (MPM) was conducted in July and August 2007 for chlorpyrifos (Table XXI-4). Samples collected during normal monitoring (NM) in July exceeded the WQTL for chlorpyrifos (the MPM sample collected a week later was half of the WQTL) and during MPM in August (the NM sample a week earlier was less than the minimum detection limit) (Table XXI-5).

Table XXI-4. Silva Drain @ Meadow Drive. Management Plan monitoring schedule for chlorpyrifos. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Chlorpyrifos
Silva Drain @ Meadow Dr	July	**x**
Silva Drain @ Meadow Dr	August	**x**

Table XXI-5. Silva Drain @ Meadow Drive. Normal monitoring (NM) and management plan monitoring (MPM) results for chlorpyrifos from the 2007 irrigation season. Exceedance values are in bold.

Monitoring Type	NM	NM	NM	NM	MPM	NM	MPM	NM
Date	4/17/07	5/15/07	6/19/07	7/17/07	7/31/07	8/14/07	8/28/07	9/11/07
Chlorpyrifos (ug/L)	<0.00259	<0.00259	<0.00259	**0.031**	0.006	<0.003	**0.055**	<0.003

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table XXI-6):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (milligram/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected. None of the sampling events had any detectible discharge.

Table XXI-6. Silva Drain @ Meadow Drive. Instantaneous load calculations for chlorpyrifos.

Station	Analyte	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Silva Drain @ Meadow Dr	Chlorpyrifos	13/Jul/2006	No flow	0.015	0
Silva Drain @ Meadow Dr	Chlorpyrifos	09/Aug/2006	No flow	0.14	0
Silva Drain @ Meadow Dr	Chlorpyrifos	13/Sep/2006	No flow	0.013	0
Silva Drain @ Meadow Dr	Chlorpyrifos	31/Jul/2007	No flow	0.006	0
Silva Drain @ Meadow Dr	Chlorpyrifos	28/Aug/2007	No flow	0.055	0

Source Identification

Priority B Constituent

Chlorpyrifos

Three chlorpyrifos exceedances were detected in the Silva Drain, one in the irrigation season of 2006 and two in 2007. The Coalition's strategy for identifying potential sources of pesticide exceedances is through the use of PURs. However, no applications of chlorpyrifos were reported in the site subwatershed at any time during 2004 - 2007. The first exceedance of the chlorpyrifos WQTL occurred in August 2006 and was associated with a *Ceriodaphnia* toxicity exceedance. A dilution series test and a TIE were performed on the sample. The TIE results indicated the cause of toxicity was a metabolically activated pesticide, and the dilution series results indicated that the sample contained 2.6 TUs. The concentration of chlorpyrifos in the sample accounted for essentially all of the 2.6 TUs. At this point, it is clear that the sample contained chlorpyrifos and it is unlikely that the chlorpyrifos detected in the additional two exceedances is in error. Either there is unreported use in the site subwatershed or the boundaries of the site subwatershed are different from what the Coalition has mapped. Field crews report that they believe the watershed is larger than currently mapped. The Coalition will determine the location of the closest reported use of chlorpyrifos and determine if that location could drain to Silva Drain. The watershed is so small that no upstream sampling can occur.

Priority D Constituent

Hyalella azteca toxicity

Hyalella toxicity is most often associated with sediment bound chemicals such as pyrethroids. No chemical analysis was performed on the sediment so the cause of the toxicity is unknown. One *Hyalella* exceedance was from normal monitoring and one as a follow-up sample to test for persistence of toxicity (Table XXI-3) and therefore is considered a single exceedance event. Sediment samples collected in 2007 were not toxic. The Coalition will not include *Hyalella* toxicity as part of the management plan sampling.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events (Table XXI-9). Only one of the samples collected at Bear Creek @ Kibby Rd contained measurable amounts of BOD and that sample experienced an exceedance of the DO WQTL. These results do not indicate or eliminate BOD as a cause of low DO and it is not clear

what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XXI-7. Silva Drain @ Meadow Drive. BOD, pH and dissolved oxygen results for September 2006-July 2007 sampling events.

Station Name	Sample Date	pH	Oxygen, Dissolved	BOD, mg/L
Silva Drain @ Meadow Dr	9/13/2006	7.83	5.99	6
Silva Drain @ Meadow Dr	2/12/2007	7.75	10.6	ND
Silva Drain @ Meadow Dr	2/28/2007	7.44	9.21	ND
Silva Drain @ Meadow Dr	4/17/2007	7.95	7.4	ND
Silva Drain @ Meadow Dr	7/17/2007	7.37	4.71	ND

E. coli

Exceedances of the *E. coli* WQTL occurred in a majority of the sampling events in the irrigation seasons of 2006 and 2007. This site subwatershed is small and has dairies which could have contributed fecal material to the drain however, there are no exceedances of the nitrate or ammonia WQTLs so it is not known if dairies are the source of the *E. coli*. Silva Drain was not sampled during the ESJWQC *E. coli*/Bacteroides study. *E. coli* appears to be a consistent problem and the Coalition will address it when it becomes a priority.

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

Additional Management Plan monitoring will be conducted at Silva Drain @ Meadow Rd in July and August 2008 for chlorpyrifos.

Table XXI-8. Silva Drain @ Meadow Dr. 2008 Management Plan sampling. A = additional sampling. X = indicates the site, month, and analyte sampled.

Sample Site	Month	Type	Chlorpyrifos
Silva Drain @ Meadow Dr	July	A	**x**
Silva Drain @ Meadow Dr	August	A	**x**

XXII. SOUTH SLOUGH @ QUINLEY RD

Management Plan Constituents

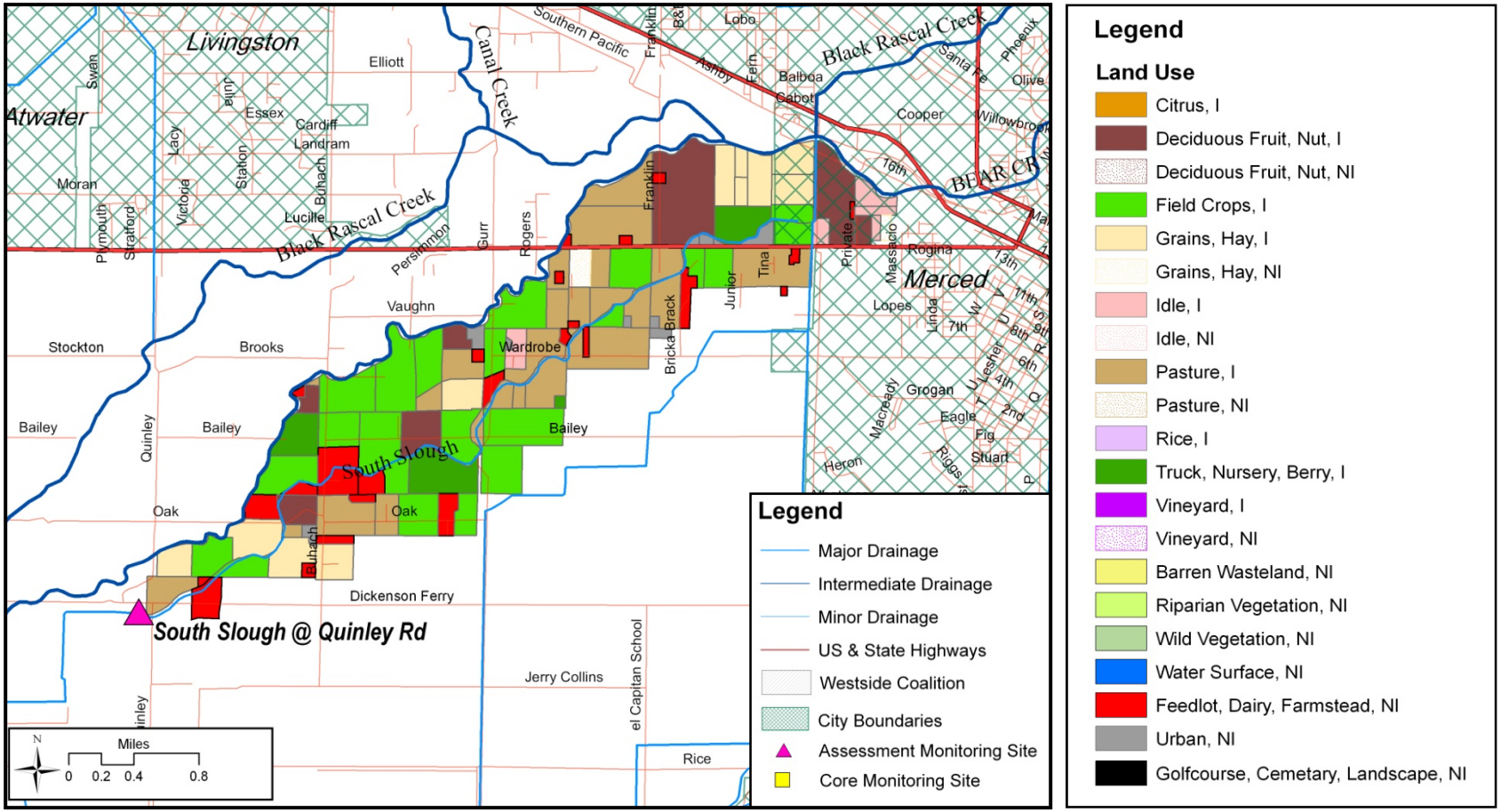
Priority E

- DO
- E. coli
- pH
- Color

Description of South Slough @ Quinley Road Site Subwatershed

South Slough @ Quinley Road (1,137 irrigated acres) begins just west of Merced and eventually flows into Bear Creek. Pasture, deciduous orchards, and irrigated pasture are the primary crops in the site watershed (Figure XXII-1).

Figure XXII-1. Site subwatershed map of land use for the South Slough @ Quinley Rd sample site.



Subwatershed Monitoring History

Monitoring was initiated at this site in the 2006 irrigation season. One 2006 irrigation event and both 2007 storm events were not sampled due to the site being dry (Table XXII-1). Table XXII-2 includes the constituents analyzed for by year and season.

Table XXII-1. South Slough @ Quinley Rd sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	2	0	4
Events Not Sampled	NA	NA	NA	NA	1	2	2
Total	NA	NA	NA	NA	3	2	6

Table XXII-2. South Slough @ Quinley Rd. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
Field and Physical Parameters				
EPA 110.2	Color	2		4
EPA 160.1	Dissolved Solids	2		4
EPA 180.1	Turbidity	2		4
EPA 405.1	BOD			1
EPA 415.1	Total Organic Carbon	2		4
SM 9223	E. coli	2		4
NA	Dissolved Oxygen	2		5
NA	Specific Conductivity	2		5
NA	pH	2		5
Carbamates				
EPA 8321A	Aldicarb	2		4
EPA 8321A	Carbaryl	2		4
EPA 8321A	Carbofuran	2		4
EPA 8321A	Diuron	2		4
EPA 8321A	Linuron	2		4
EPA 8321A	Methiocarb	2		4
EPA 8321A	Methomyl	2		4
EPA 8321A	Oxamyl	2		4
Organochlorines				
EPA 8081A	DDD(p,p')	2		4
EPA 8081A	DDE(p,p')	2		4
EPA 8081A	DDT(p,p')	2		4

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 8081A	Dicofol	2		4
EPA 8081A	Dieldrin	2		5
EPA 8081A	Endrin	2		5
EPA 8081A	Methoxychlor	2		5
Organophosphates				
EPA 8141A	Azinphos methyl	2		4
EPA 8141A	Chlorpyrifos	2		4
EPA 8141A	Diazinon	2		4
EPA 8141A	Dimethoate	2		4
EPA 8141A	Disulfoton	2		4
EPA 8141A	Malathion	2		4
EPA 8141A	Methamidophos	2		4
EPA 8141A	Methidathion	2		4
EPA 8141A	Molinate	2		4
EPA 8141A	Parathion, Methyl	2		4
EPA 8141A	Phorate	2		4
EPA 8141A	Phosmet	2		4
EPA 8141A	Thiobencarb	2		4
Pyrethroids				
EPA 8081A	Bifenthrin	2		4
EPA 8081A	Cyfluthrin, total	2		4
EPA 8081A	Cyhalothrin, lambda, total	2		4
EPA 8081A	Cypermethrin, total	2		4
EPA 8081A	Esfenvalerate/Fenvalerate, total	2		4
EPA 8081A	Permethrin, total	2		4
Triazines				
EPA 547M	Glyphosate	2		4
EPA 549.2M	Paraquat dichloride	2		4
EPA 619	Atrazine	2		4
EPA 619	Cyanazine	2		4
EPA 619	Simazine	2		4
Metals				
EPA 200.8	Arsenic			
EPA 200.8	Boron			
EPA 200.8	Cadmium			
EPA 200.8	Copper			
EPA 200.8	Lead			
EPA 200.8	Nickel			
EPA 200.8	Selenium			
EPA 200.8	Zinc			
Nutrients				
EPA 130.2	Hardness as CaCO3			
EPA 300.0	Nitrate as N			
EPA 350.2	Ammonia as N			
EPA 351.3	Nitrogen, Total Kjeldahl			
EPA 354.1	Nitrite as N			

Method	Analyte	2006	2007	
		Irrigation	Storm	Irrigation
EPA 365.2	OrthoPhosphate as P			
EPA 365.2	Phosphate as P			
Toxicity				
EPA 821/R-02-012	*Ceriodaphnia dubia*	2		4
EPA 821/R-02-012	*Pimephales promelas*	2		4
EPA 821/R-02-013	*Selenastrum capricornutum*	2		4
EPA 600/R-99-064	*Hyalella azteca*	1		1

Exceedance History

Ambient water monitoring at South Slough was initiated in the irrigation season of 2006. Since that time, two *E. coli* exceedances, three DO exceedances, two pH exceedances, six color exceedances and one dieldrin exceedance have occurred (Table XXII-3). Although all exceedances are listed in the Table XXII-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions. South Slough is not considered impaired and is not included on the current Central Valley Basin Plan 303d list.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the South Slough @ Quinley Rd site, DO, *E. coli*, pH, and color all received a priority of (E).

Table XXII-3. Exceedances experienced in samples collected from the South Slough @ Quinley Rd Coalition monitoring site between May 2006 and September 2007.

Station Name	Season	Sample Date	Oxygen, Dissolved, mg/L	pH, none	Color, color units	*E. coli*, MPN/100 mL	Dieldrin, µg/L
South Slough @ Quinley Rd	Irrigation	11/Jul/2006			36	1200	
South Slough @ Quinley Rd	Irrigation	09/Aug/2006			35	580	
South Slough @ Quinley Rd	Irrigation	29/May/2007	2.51		60		
South Slough @ Quinley Rd	Irrigation	26/Jun/2007			30		
South Slough @ Quinley Rd	Irrigation	24/Jul/2007	6.39		35		
South Slough @ Quinley Rd	Irrigation	21/Aug/2007		9.29	25		0.011
South Slough @ Quinley Rd	Irrigation	23/Aug/2007	5.3	8.87			
Priorities			**E**	**E**	**E**	**E**	

2007 Management Plan Monitoring Results

No Management Plan samples were collected in 2007 at South Slough @ Quinley Rd.

Load Calculations

No load calculations needed.

Source Identification

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. A single sample was collected in July 2007. The sample did not contain measurable amounts of BOD although the sample experienced an exceedance of the DO WQTL (Table XXII-4). However, the exceedance was slightly below the 7.0 mg/L WQTL and a large part of the exceedance can be accounted for by elevated water temperature. These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO or manage for low DO until such time as it becomes a higher priority.

Table XXII-4. South Slough @ Quinley Rd. BOD, pH and dissolved oxygen results for September 2006 through July 2007 sampling events. ND = Not Detected.

StationName	SampleDate	pH	Oxygen, Dissolved	BOD, mg/L
South Slough @ Quinley Rd	7/24/2007	8	6.39	ND

E. coli

Exceedances of the *E. coli* WQTL occurred July and August of 2006 but were not repeated in 2007. This site subwatershed is small and has numerous dairies which could have contributed fecal material to the drain. South Slough @ Quinley Rd was not sampled for the 2006 *E. coli* study. It is not clear where the source of the *E. coli* is located. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options.

Color/pH

Color and pH are non-conserved indicators of biological and physical inputs to the system and are not possible to manage unless the causes are known. Determining the causes of color or changes in pH is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

No upstream or additional monitoring is scheduled for 2008 for the South Slough @ Quinley Rd site subwatershed.

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XXIII. WESTPORT DRAIN @ VIVIAN RD

Management Plan Constituents

Priority D

- Nitrate

Priority E

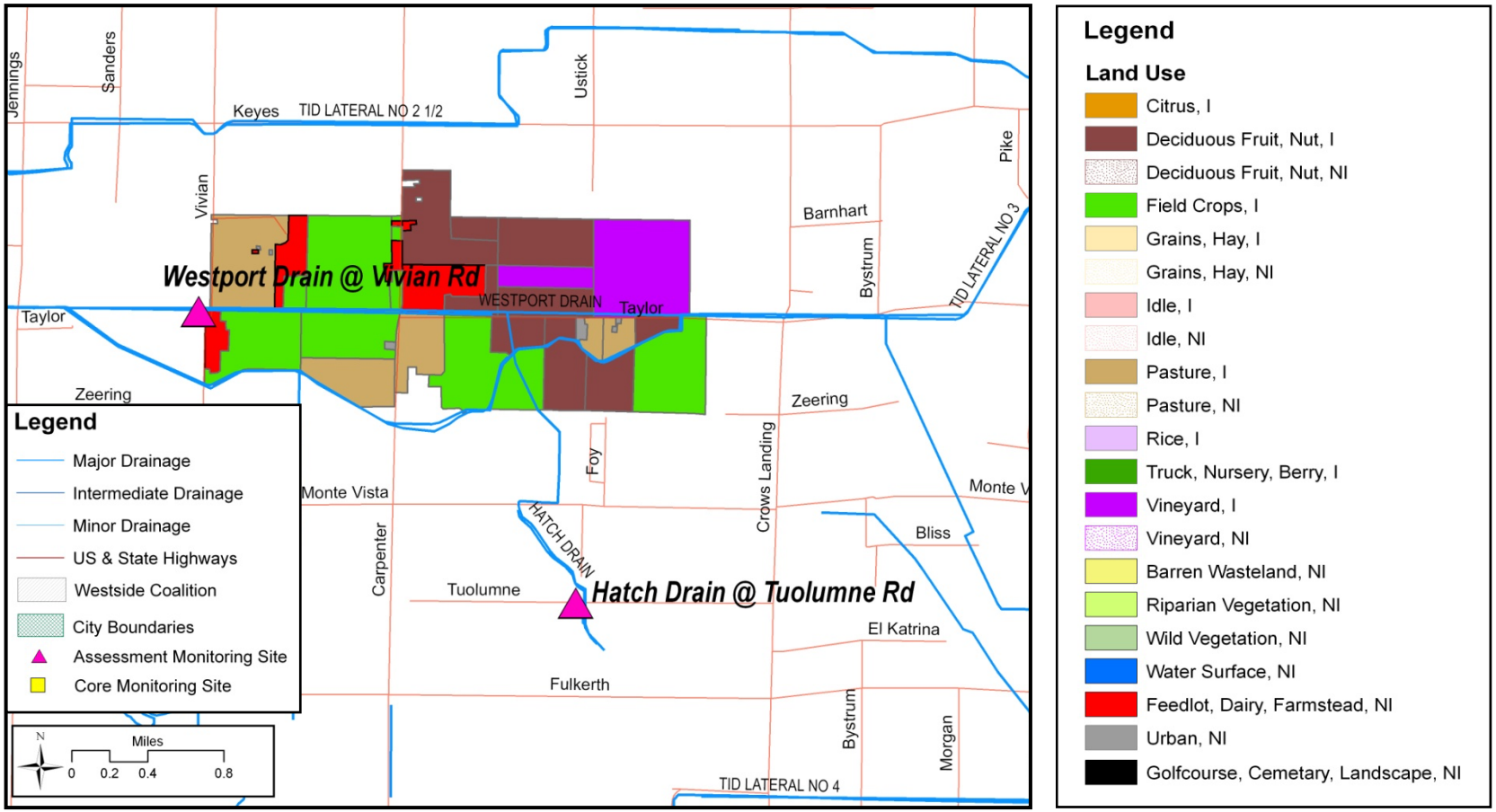
- DO
- *E. coli*
- Specific Conductance
- Color

Description of Westport Drain @ Vivian Rd Site Subwatershed

Westport Drain @ Vivian Road (1,474 irrigated acres) is located adjacent to the Hatch Drain subwatershed in the western portion of the Coalition region. The primary agriculture in this site subwatershed is deciduous orchards, vineyards, pasture, and field crops. Large dairies are located in this subwatershed (Figure XXIII-1).

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Figure XXIII-1. Site subwatershed map of land use for the Westport Drain @ Vivian Rd sample site.



Subwatershed Monitoring History

Monitoring was initiated at this site only in the 2007 irrigation season. All five events have been sampled successfully (Tables XXIII-1). All constituents analyzed for are listed in Table XXIII-2 by year and season.

Table XXIII-1. Westport Drain @ Vivian Rd sampling events per season per year. An irrigation season sampling event encompasses normal monitoring and any associated resampling, management plan monitoring, and sediment sampling. A storm event encompasses normal monitoring and any associated resampling.

	2004	2005		2006		2007	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Events Sampled	NA	NA	NA	NA	NA	NA	5

Table XXIII-2. Westport Drain @ Vivian Rd. Number of analyses performed per analyte in each sampling season (only environmental samples listed).

Method	Analyte	2007
		Irrigation
	Field and Physical Parameters	
EPA 110.2	Color	5
EPA 160.1	Dissolved Solids	5
EPA 180.1	Turbidity	5
EPA 405.1	BOD	1
EPA 415.1	Total Organic Carbon	5
SM 9223	E. coli	5
NA	Dissolved, Oxygen	7
NA	Specific Conductivity	7
NA	pH	7
	Carbamates	
EPA 8321A	Aldicarb	5
EPA 8321A	Carbaryl	5
EPA 8321A	Carbofuran	5
EPA 8321A	Diuron	5
EPA 8321A	Linuron	5
EPA 8321A	Methiocarb	5
EPA 8321A	Methomyl	5
EPA 8321A	Oxamyl	5
	Organochlorines	
EPA 8081A	DDD(p,p')	5
EPA 8081A	DDE(p,p')	5
EPA 8081A	DDT(p,p')	5
EPA 8081A	Dicofol	5
EPA 8081A	Dieldrin	5
EPA 8081A	Endrin	5
EPA 8081A	Methoxychlor	5
	Organophosphates	
EPA 8141A	Azinphos methyl	5
EPA 8141A	Chlorpyrifos	5

Method	Analyte	2007 Irrigation
EPA 8141A	Diazinon	5
EPA 8141A	Dimethoate	5
EPA 8141A	Disulfoton	5
EPA 8141A	Malathion	5
EPA 8141A	Methamidophos	5
EPA 8141A	Methidathion	5
EPA 8141A	Molinate	5
EPA 8141A	Parathion, Methyl	5
EPA 8141A	Phorate	5
EPA 8141A	Phosmet	5
EPA 8141A	Thiobencarb	5
	Pyrethroids	
EPA 8081A	Bifenthrin	5
EPA 8081A	Cyfluthrin, total	5
EPA 8081A	Cyhalothrin, lambda, total	5
EPA 8081A	Cypermethrin, total	5
EPA 8081A	Esfenvalerate/Fenvalerate, total	5
EPA 8081A	Permethrin, total	5
	Triazines	
EPA 547M	Glyphosate	5
EPA 549.2M	Paraquat dichloride	5
EPA 619	Atrazine	5
EPA 619	Cyanazine	5
EPA 619	Simazine	5
	Metals	
EPA 200.8	Arsenic	5
EPA 200.8	Boron	5
EPA 200.8	Cadmium	5
EPA 200.8	Copper	5
EPA 200.8	Lead	5
EPA 200.8	Nickel	5
EPA 200.8	Selenium	1
EPA 200.8	Zinc	5
	Nutrients	
EPA 130.2	Hardness as CaCO3	5
EPA 300.0	Nitrate as N	5
EPA 350.2	Ammonia as N	5
EPA 351.3	Nitrogen, Total Kjeldahl	5
EPA 354.1	Nitrite as N	5
EPA 365.2	OrthoPhosphate as P	5
EPA 365.2	Phosphate as P	5
	Toxicity	
EPA 821/R-02-012	*Ceriodaphnia dubia*	5
EPA 821/R-02-012	*Pimephales promelas*	5
EPA 821/R-02-013	*Selenastrum capricornutum*	6
EPA 600/R-99-064	*Hyalella azteca*	1

Exceedance History

Exceedances of the WQTLs include nitrate (5), DO (5), specific conductance (7), color (4), and one each of cadmium, chlorpyrifos, and *Selenastrum* water toxicity (Table XXIII-3). Although all exceedances are listed in Table XXIII-3, only those that have occurred at a site more than once in a three year period will be subject to management plan actions.

Using the priority flow chart outlined in the Management Plan introduction, priorities were assigned to the constituents experiencing more than one exceedance. Based on the exceedances at the Westport Drain @ Vivian Rd site subwatershed, the constituent receiving the highest priority was nitrate (D).

Table XXIII-3. Exceedances experienced in samples collected from Westport Drain @ Vivian Rd between May 2007 and September 2007.

Station Name	Season	Sample Date	Specific Conductivity, µS/cm	Color, color units	Dissolved Solids, mg/L	E. coli, MPN/100 mL	Lead, µg/L	Nitrate as N, mg/L	Chlorpyrifos, µg/L	Selenastrum capricornutum, Total Cell Count
Westport Drain @ Vivian Rd	Irrigation	15/May/2007	1054		660		2.3	24		778069
Westport Drain @ Vivian Rd	Irrigation	23/May/2007	1081							
Westport Drain @ Vivian Rd	Irrigation	19/Jun/2007	991	25	660			27		
Westport Drain @ Vivian Rd	Irrigation	17/Jul/2007	1025	17	680	330		68	0.018	
Westport Drain @ Vivian Rd	Irrigation	14/Aug/2007	1129	30	760			32		
Westport Drain @ Vivian Rd	Irrigation	16/Aug/2007	1147							
Westport Drain @ Vivian Rd	Irrigation	11/Sep/2007	1106	17	740	330		30		
Priorities			**E**	**E**	**E**	**E**		**D**		

2007 Management Plan Monitoring Results

No Management Plan monitoring occurred at the Westport Drain @ Vivian Rd site subwatershed during 2007.

Load Calculations

No load calculations needed.

Source Identification

Priority D Constituent

Nitrate

Nitrate exceedances occurred in every month except May, and the concentrations far exceeded the WQTL. Potential sources of nitrates in surface waters include runoff of fertilizers or organic matter from irrigated pasture, leaking septic systems, waste-treatment facility effluent, and inputs from dairies. These sources can move to surface waters through above ground runoff or shallow subsurface flows.

Animal waste that enters surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a drain include dairies, chicken lots, pasture and/or wildlife. The Westport Drain site drains dairies and pasture, and runoff from the pasture could be the source of nitrate in the drain. Because of the shallow ground water at the site, it is also likely that nitrates leached to ground water over the last several decades are contributing to the nitrate signal in the drain.

Priority E Constituents

DO

In an attempt to understand dissolved oxygen dynamics, the Coalition sampled for Biological Oxygen Demand (BOD) during the September 2006, February, March, April and July 2007 monitoring events. Water was available from Westport Drain only for the July 2007 event. No BOD was detected but there was no exceedance of the DO WQTL occurred (Table XXIII-4). In fact, the DO at the site was extremely elevated. These results do not eliminate BOD as a cause of low DO and it is not clear what the cause of low DO at this site is. The Coalition will not attempt to further explore causes of low DO until such time as it becomes a higher priority.

Table XXIII-4. Westport Drain @ Vivian Rd. BOD, pH, and dissolved oxygen results for July 2007.

StationName	SampleDate	pH	Oxygen, Dissolved	BOD, mg/L
Westport Drain @ Vivian Rd	7/17/2007	7.79	16.04	ND

E. coli

E. coli exceedances occurred in July and September 2007. Three large dairies are located upstream, and persistent and greatly elevated concentrations of nitrate and EC in the samples suggest that dairies are a likely source of the *E. coli* at this site. However, Westport Drain @ Vivian Rd was not sampled during the 2006 *E. coli* study and it is unknown what the source of the E. coli might be. Once a better understanding of the *E. coli* dynamics is obtained, the Coalition will re-evaluate management options. Until that time, the Coalition will not actively manage for *E. coli*.

Specific Conductance

Specific conductivity (EC) is a measure of salt. EC exceedances are common in site subwatersheds on the western edge of the Coalition region where shallow salty ground water commonly intrudes into surface waters. Many of the drains in the region were originally constructed to drain shallow salty surface water allowing agriculture. Consequently, it is not known if the water in the drain is discharged from agriculture or if shallow ground water intruding into the drain is responsible for the elevated EC. Interestingly, no TDS exceedances were recorded. The Coalition recognizes that EC exceedances need to be to be managed on a regional basis and will work with the Regional Board to develop a management plan when EC becomes a priority.

Color

Color is non-conserved constituent that is an indicator of biological and physical inputs to the system. Color is not possible to manage unless the causes for color change are known. Determining the causes of color is not a priority and the Coalition will not attempt to manage these constituents.

2008 Management Plan Monitoring

No upstream or additional monitoring is scheduled in 2008 for Westport Drain @ Vivian Rd site subwatershed.