
Central Valley Regional Water Quality Control Board

**CENTRAL VALLEY PYRETHROID PESTICIDES
TOTAL MAXIMUM DAILY LOAD and BASIN PLAN AMENDMENT
Informational Document**

**CEQA Scoping Meeting
30 October 2012**

1 Project Introduction

Staff of the California Regional Water Quality Control Board, Central Valley Region (“Central Valley Water Board” or “Board”) is developing a proposal to amend the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (“Basin Plan”) to establish water quality objectives and a control program, including establishment of total maximum daily loads to control discharges of pyrethroid pesticides.

Pyrethroid insecticides are a class of pesticides that are widely used in agricultural and urban settings, with 25 active ingredients registered in California. Recent monitoring has identified pyrethroids in sediment and water samples from Sacramento and San Joaquin Valley water bodies. The recent monitoring found pyrethroids at levels that would be toxic to aquatic invertebrates, and would therefore exceed narrative water quality objectives for the protection of aquatic life beneficial uses. The exceedances resulted in the addition of 15 water body-pollutant combinations within the Sacramento and San Joaquin River watersheds to the State Water Board’s Clean Water Act Section 303(d) List (the “303(d) List”). The Board is required to establish total maximum daily loads (TMDLs) for water body-pollutant combinations on the 303(d) List. Therefore, the Board’s staff is developing a proposal to amend the Basin Plan to establish water quality objectives, TMDLs, and a program of implementation for the control of pyrethroid pesticide discharges.

This informational document is intended to solicit discussion regarding the proposed pyrethroid pesticides TMDL and Basin Plan amendment, and is intended to help fulfill the Board’s obligation to seek early public consultation in connection with Basin Planning actions. Comments provided to the Board will help guide the Board’s analysis of the significant environmental effects that may result from adoption of the TMDLs and Basin Plan amendment, and will help guide the Board’s consideration of alternatives. In

order to facilitate public comments, Board staff will hold a public scoping meeting to assist in identifying issues relevant to stakeholders. Project scoping pursuant to the California Environmental Quality Act (CEQA) is only an initial step in the Central Valley Water Board's planning process. After comments on this document are submitted to the Board, staff will consider all of the issues that commenters may raise, and will circulate a draft amendment and staff report for further comment. The draft staff report will include a completed CEQA checklist and analysis of the potentially significant adverse environmental effects of the project. In addition, the scientific conclusions of Board staff will be subjected to peer review pursuant to Health and Safety Code section 57004. The Board would like to receive comments regarding the proposed pyrethroid pesticides TMDL and Basin Plan amendment and the possible direct, indirect, and cumulative environmental impacts that could result from its adoption.

2 Regulatory Authority and Mandates for Basin Plan Amendments

The State Water Resources Control Board ("State Water Board") and the nine Regional Water Quality Control Boards (collectively referred to as the "Water Boards") are the state agencies with the primary responsibility for coordination and control of water quality. (Wat. Code, § 13000.) Each of the Water Boards has adopted water quality control plans (referred to as "Basin Plans"), which provide the basis for regulatory actions to protect water quality. (Wat. Code, §13240 et seq.) The Basin Plans designate the beneficial uses of waters of the state (both groundwater and surface water) that are to be protected, establish water quality objectives designed to protect these beneficial uses, and include an implementation program designed to achieve these water quality objectives. (Wat. Code, § 13050(j).) The Central Valley Water Board's *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* applies to surface water and groundwater within the entire Sacramento River and San Joaquin River drainage basin, including the Sacramento-San Joaquin Delta.

The Central Valley Water Board's Basin Planning Program, under which the Board can adopt amendments to the Basin Plan, is an "exempt regulatory program" and is subject to certain specialized CEQA requirements. This does not mean that the Board is exempted from considering the environmental effects that its Basin Planning actions will have on the environment. Rather, the "exempt regulatory program" designation has been applied to the Board's Basin Planning Program because this program includes rigorous environmental analysis; the Secretary of Natural Resources has determined that this analysis may substitute for the traditional analytical process required under CEQA. When amending the Basin Plan, the Board must perform an environmental analysis of the reasonably foreseeable methods of compliance and must prepare

substitute environmental documentation (SED) that fulfills the same informational needs as traditional CEQA documents, and must seek early public consultation.

3 Problem Statement and Project Proposal

Water quality monitoring in the Sacramento River and San Joaquin River Basins has documented pyrethroids in both the water column and in the sediments, and has also detected toxicity, leading to exceedances of narrative water quality objectives for the protection of the aquatic life beneficial use. These exceedances have resulted in the addition of 15 water body-pyrethroid combinations to the 303(d) List. The intent of the proposed project is to develop a Basin Plan amendment that will establish 1) pyrethroids water quality objectives for the protection of aquatic life beneficial uses in all water bodies of the Sacramento River and San Joaquin River Basins with those beneficial uses, or a subset of those water bodies, 2) TMDLs for water bodies on the 303(d) List for pyrethroids in the Sacramento River and San Joaquin River Basins, and 3) a program of implementation.

3.1 Geographic Scope

The project area where the water quality objectives would apply could be all water bodies with an aquatic life beneficial use in the Sacramento River and San Joaquin River drainage basins (Figure 1), or a subset of this area. The Sacramento River and San Joaquin River Basins are described in detail in the Basin Plan.

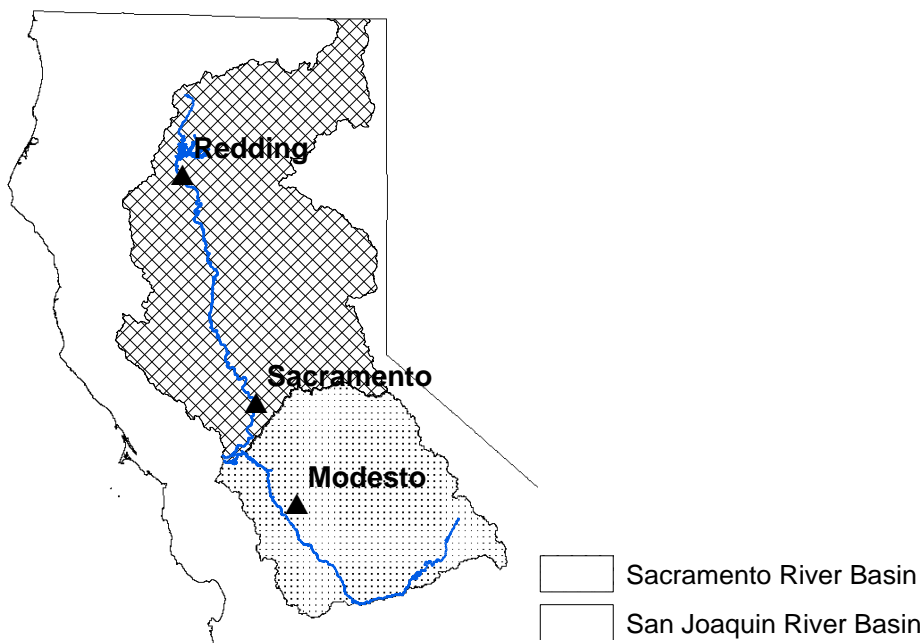


Figure 1 Project Area – the Sacramento River and San Joaquin River Basins

The project area for the TMDLs will include all of the water bodies on the 303(d) List for pyrethroids in the Sacramento River and the San Joaquin River Basins when the amendment is proposed for adoption by the Central Valley Regional Board. Currently, there are 14 water body segments identified on the 303(d) List as being impaired by pyrethroids, they are: Arcade Creek, Chicken Ranch Slough, Curry Creek, Del Puerto Creek, Elder Creek, Hospital Creek, Ingram Creek (Hospital Creek to Highway 33), Ingram Creek (San Joaquin River to Hospital Creek), Kaseberg Creek, Morrison Creek, Pleasant Grove Creek, Pleasant Grove Creek - South Branch, Strong Ranch Slough, and Mustang Creek. Del Puerto Creek accounts for two water body-pyrethroid listings because it is listed for both bifenthrin in the water column and sediment toxicity caused by pyrethroids.

3.2 Beneficial Uses

The Basin Plan designates one or more aquatic life beneficial uses to nearly all of the surface water bodies in the basin, with the exception of the California Aqueduct. Aquatic life beneficial uses include freshwater habitat (WARM or COLD), migration (MIGR), and spawning (SPWN). Aquatic life beneficial uses are anticipated to be the beneficial uses most sensitive to pyrethroid pesticide discharges, and are therefore the focus of this project.

The Board may consider changing beneficial use designations if it is infeasible to attain a designated use or if a more sensitive beneficial use that is not currently designated is identified. The alternatives under consideration for beneficial uses include: 1) no change to the beneficial uses, 2) modification of the beneficial uses, and 3) the addition of beneficial use designations. The first alternative would consider no changes to the current beneficial use designations for the Sacramento River and San Joaquin River Basins. The second alternative could result in creating a sub-category of the designated WARM and COLD uses to account for factors that could make attainment of these uses infeasible. The third alternative would consider the addition of beneficial uses that may apply to some, or all, of the project area water bodies including: Commercial and Sport Fishing (COMM); Preservation of Biological Habitats of Special Significance (BIOL); Rare, Threatened, or Endangered Species (RARE); Shellfish Harvesting (SHELL); and Estuarine Habitat (EST). It should be noted that the aquatic life beneficial uses that are assumed to be the most sensitive to pyrethroid pesticides (WARM and COLD) are widely designated in the project area and there are no indications that attainment of these designations is infeasible.

3.3 Water Quality Objectives

The Porter-Cologne Water Quality Control Act (Porter-Cologne) (Wat. Code, § 13000 et seq.) defines water quality objectives as "...the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." (Wat. Code, § 13050(h).) Porter-Cologne requires each regional water board to establish water quality objectives that will ensure the reasonable protection of beneficial uses and the prevention of nuisance. Porter-Cologne recognizes that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors considered by a regional water board in establishing water quality objectives include, but are not necessarily limited to:

- (a) Past, present, and probable future beneficial uses of water.
- (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
- (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
- (d) Economic considerations.
- (e) The need for developing housing within the region.
- (f) The need to develop and use recycled water.

The narrative water quality objective for pesticides in the Basin Plan states:

- No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.
- Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.
- Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies (see State Water Resources Control Board Resolution No. 68-16 and 40 C.F.R. Section 131.12.).
- Pesticide concentrations shall not exceed the lowest levels technically and economically achievable.

The narrative water quality objective in the Basin Plan for toxicity is also applicable:

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. Compliance with this objective will be determined by analyses of indicator organisms, species

diversity, population density, growth anomalies, and biotoxicity tests of appropriate duration or other methods as specified by the Regional Water Board.

3.3.1 Water Quality Objectives Alternatives

Six priority pyrethroids have been identified thus far, and they are: bifenthrin, cyfluthrin, cypermethrin, esfenvalerate, lambda-cyhalothrin, and permethrin. The water quality objective alternatives under consideration would apply to these six compounds, although the list of priority pyrethroids may change with further review. Water quality objectives could be adopted for aqueous and/or sediment matrices and the possible alternatives are discussed below.

3.3.2 Aqueous Pyrethroids

The alternatives under consideration for water quality objectives for aqueous pyrethroids include: 1) no change to the current narrative water quality objectives, 2) a water quality objective of no detectable aqueous pyrethroids, 3) numeric objectives based on the water quality criteria derived using the UC Davis methodology, 4) numeric objectives based on the water quality criteria derived using the US EPA method for a subset of the priority pyrethroids, and 5) water quality objectives based on cumulative acute and/or chronic toxic units of pyrethroids in the water column.

Under the first alternative, the narrative water quality objectives for pesticides and toxicity would continue to be used. The evaluation guidelines used to interpret narrative objectives can change over time as new information is generated or gathered. The numeric evaluation guidelines used by Board staff to interpret the narrative objective for pesticides for the 2010 update of the 303(d) List are given in Table 1 as an example; only four of the six priority pyrethroids were assessed at that time. The evaluation guidelines used for the 303(d) List for permethrin and cypermethrin were hazard concentrations derived by the California Department of Fish and Game (CDFG) using the US EPA method and their best professional judgment in dealing with insufficient datasets (Siepmann and Holm 2000). The evaluation guidelines for bifenthrin and cis-permethrin were interpreted as one-tenth of the lowest available LC₅₀ (the concentration lethal to 50% of the exposed population), which is based on guidance in the Basin Plan (Implementation section, p. IV-35.00). Water column toxicity tests are typically used to evaluate compliance with the narrative objective for toxicity, which does not allow substances at concentrations that cause toxicity.

The second alternative would establish a water quality objective of no detectable pyrethroids in the water column. In this alternative, the Board would establish a numeric

limit for each pyrethroid below which the compound would be considered as “not detected.”

The third alternative would use the UC Davis acute and/or chronic criteria (Fojut et al. 2012; Table 1). The UC Davis criteria have been peer reviewed and were derived using a transparent and scientific methodology based on high quality toxicity data for multiple species (TenBrook et al. 2010). These criteria were derived with the goal of protecting aquatic life and should therefore be protective of the aquatic life beneficial uses defined in the Basin Plan. The fourth alternative, which is to use the US EPA aquatic life criteria derived by CDFG for permethrin and cypermethrin, is only viable for these two compounds (Table 1). If this alternative was chosen, one of the other alternatives would be proposed for the remaining priority pyrethroids.

Table 1 Numeric water quality objective alternatives 1, 2, 3, and 4 for six priority pyrethroids in the water column; numeric aqueous concentrations in units of ng/L; n/a: not applicable; nd: not detected (i.e., below an established detection limit).

	Alternative 1*	Alternative 2	Alternative 3		Alternative 4
			Acute	Chronic	
Bifenthrin	0.93	nd	4	0.6	n/a
Cyfluthrin	1/10 lowest LC ₅₀	nd	0.3	0.05	n/a
Cypermethrin	2	nd	1	0.2	2
Esfenvalerate	1/10 lowest LC ₅₀	nd	In development		n/a
λ-cyhalothrin	1/10 lowest LC ₅₀	nd	1	0.5	n/a
Permethrin	30	nd	10	2	30

*Values for alternative 1 are given as an example of numeric evaluation guidelines used in the past to interpret the narrative objective for pesticides; these values are subject to change in the future.

The fifth alternative would establish water quality objectives based on cumulative acute and/or chronic toxic units of pyrethroids in the water column. Compliance with this water quality objective would be a sum of toxic units in water equal to or less than one (1), and an exceedance would occur when the sum of toxic units is greater than one (1). Numeric objectives are needed to calculate the toxic units for each detected pyrethroid, and the values from either the first, third or fourth alternatives could be used for calculation of toxic units. This approach for reviewing pesticide monitoring data is described in the Basin Plan (Implementation section, p. IV-35.00). Currently, the Basin Plan states that the Board will consider the cumulative impact if more than one pesticide is present in the water body by initially assuming that toxicities of pesticides are additive; this guidance could be amended to specify that pyrethroid toxicity is additive, and must be considered as such.

3.3.3 Sediment Pyrethroids

The alternatives under consideration for water quality objectives for pyrethroids in sediment include: 1) no change to the current narrative water quality objectives, 2) a water quality objective of no detectable pyrethroids in sediment, 3) numeric objectives based on maximum acceptable toxicant concentrations or sediment quality criteria, and 4) water quality objectives based on cumulative acute and/or chronic toxic units of pyrethroids in sediment.

Under the first alternative, the narrative water quality objectives for pesticides and toxicity would continue to be used. The evaluation guidelines used for interpretation of the narrative objective can change over time as new information is generated or gathered. The numeric evaluation guidelines used by Board staff to interpret the narrative objective for pesticides for the 2010 update of the 303(d) List are given in Table 2 as an example. These values, which are LC₅₀s, were used in a toxic unit approach to assess compliance. Sediment toxicity tests are used to evaluate compliance with the narrative toxicity objective. The numeric evaluation guidelines used by Board staff to determine pyrethroids-related sediment toxicity for the 2010 update to the 303(d) List was a statistically significant difference from control sediment using Dunnett's test in 10-day *Hyalella azteca* sediment toxicity tests. When these toxicity test results were paired with sediment concentrations of pyrethroids that were expected to be toxic (using the toxic unit approach), the cause of toxicity was listed as pyrethroids. In the cases where pyrethroids-related sediment toxicity was listed, but sediment concentrations were not measured, toxicity identification evaluations were conducted that indicated pyrethroids as the likely cause of toxicity. It should be noted that these evaluation guidelines could change in the future if more information becomes available.

The second alternative would establish a water quality objective of no detectable pyrethroids in sediments. In this alternative, the Board would establish limits below which pyrethroids would be considered as “not detected.”

For the third alternative, maximum acceptable toxicant concentrations (MATCs) or sediment quality criteria would be used as water quality objectives for sediment. A MATC is an approximation of a no-effect level for one species, while sediment quality criteria approximate no-effect levels for ecosystems, as they are derived using data for multiple species (TenBrook et al. 2010). A MATC is typically calculated as the geometric mean of the no-observed effect concentration and the lowest-observed effect concentration. MATCs for pyrethroid sediment exposures are available from registrant data submitted to the Department of Pesticide Regulation for the pyrethroid re-

evaluation, and potentially from other peer-reviewed published studies. Board staff has not yet evaluated all of the available MATC data, so these values are not currently known. At this time, there are no existing sediment quality criteria for pyrethroids, but UC Davis is currently working on a project to develop a method for deriving numeric sediment quality criteria. The development of the method is scheduled to be complete in 2013, and following this, numeric criteria could be derived for the priority pyrethroids. When sediment quality criteria for pyrethroids become available, the Pyrethroids TMDL and Basin Plan amendment could be re-opened for modifications to the sediment objectives.

Table 2 Numeric water quality objective alternatives 1 and 2 for six priority pyrethroids in sediment; numeric sediment concentrations in units of $\mu\text{g/g}$ organic carbon; nd: not detected (i.e., below an established detection limit).

	Alternative 1	Alternative 2
Bifenthrin	0.52	nd
Cyfluthrin	1.08	nd
Cypermethrin	0.38	nd
Esfenvalerate	1.54	nd
λ -cyhalothrin	0.45	nd
Permethrin	10.83	nd

The fourth alternative would establish numeric toxicity objectives based on cumulative acute and/or chronic toxic units of pyrethroids in sediment. Compliance with this objective would be a sum of toxic units in sediment equal to or less than one (1), and an exceedance would be a sum of toxic units greater than one (1). Numeric sediment objectives are needed to calculate the toxic units for each detected pyrethroid, and values from either the first or third alternatives could be used to calculate toxic units. This approach is described in the Basin Plan for reviewing pesticide monitoring data (Implementation section, p. IV-35.00). Currently, the Basin Plan states that the Board will consider the cumulative impact if more than one pesticide is present in the water body by initially assuming that toxicities of pesticides are additive, this guidance could be amended to specify that pyrethroid toxicity in sediments is additive and must be considered as such.

3.4 Implementation Program

As specified in Porter-Cologne, an implementation program for achieving water quality objectives shall include, at the minimum:

- (a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private;
- (b) A time schedule for the actions to be taken; and
- (c) A description of surveillance to be undertaken to determine compliance with objectives. (Wat. Code, § 13242.)

Surveillance monitoring establishes baseline conditions, allows for comparison of water quality conditions inside and outside of a project area, measures the effectiveness of actions, and provides a mechanism to trigger additional actions if certain environmental conditions are met. The Basin Plan contains some implementation provisions that address pesticides, but contains no provisions specific to pyrethroids. Some of these provisions may be updated as a part of this amendment.

To the extent practicable, the implementation program will be coordinated through existing Regional Board programs including NPDES permits (point source discharges), the Irrigated Lands Regulatory Program (ILRP), waste discharge requirements (WDRs), and waivers of WDRs. Prohibitions and/or changes to required actions (best management practices, monitoring, reporting requirements, etc.) may be proposed. The implementation program requirements may vary depending on whether the water quality objectives and/or TMDLs apply. A compliance schedule will be proposed that will, to the extent practicable, aim to coordinate with schedules for existing programs and permits.

4 Project Schedule

Milestones	Estimated Schedule
CEQA Scoping Meeting	October 2012
Draft Staff Report for Peer Review	Mid 2013
Draft Staff Report for Public Comment	Late 2013
Stakeholder Workshop(s)	Early 2014
Regional Board Hearing	Mid 2014
State Board Approval	Late 2014
Office of Administrative Law Approval	Early 2015
US EPA Approval	Mid 2015

5 Contact

Written comments regarding the proposed Pyrethroid Pesticides TMDL and Basin Plan Amendment may be submitted by email or mail to the below address.

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For more information, please see:

http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/central_valley_pesticides/pyrethroid_tmdl_bpa/index.shtml

To sign up on our e-mail subscription list, please go to:

http://www.waterboards.ca.gov/resources/email_subscriptions/reg5_subscribe.shtml

(NOTE: Check the box titled “Central Valley Pyrethroids TMDL and Basin Plan Amendment”)

6 References

Fojut TF, Palumbo AJ, Tjeerdema RS. 2012. Aquatic Life Water Quality Criteria Derived via the UC Davis Method: II. Pyrethroid Insecticides. *Rev Environ Contamin Toxicol* 216:51-103.

Siepmann S, Holm S. 2000. Hazard assessment of the synthetic pyrethroid insecticides bifenthrin, cypermethrin, esfenvalerate, and permethrin to aquatic organisms in the Sacramento-San Joaquin River System. California Department of Fish and Game, Rancho Cordova, CA. Administrative report 00-6.

TenBrook PL, Palumbo AJ, Fojut TL, Hann P, Karkoski J, Tjeerdema RS. 2010. The University of California-Davis methodology for deriving aquatic life pesticide water quality criteria. *Rev Environ Contamin Toxicol* 209:1-155.