Public Comment
Central Valley Pyrethroids
Deadline: 11/2/17 by 12 noon

RECEIVED
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SWRCB Clerk

November 2, 2017

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
P.O. Box 100, Sacramento, CA 95812-200

Re: PROPOSED APPROVAL OF AN AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS FOR THE CONTROL OF PYRETHROID PESTICIDE DISCHARGES

The Pacific Coast Federation of Fishermen's Associations and the Institute of Fisheries Resources wish to submit the following comments regarding the Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Pyrethroid Pesticide Discharges. These comments are meant to supplement previous comments from the Institute for Fisheries Resources (IFR), Pacific Coast Federation of Fishermen, the San Francisco Baykeeper, the Environmental Coalition for Water, California Sportfishing Protection Alliance, and the Pesticide Action Network. Between our groups we represent the state's commercial and recreational fishermen, as well as water users and agricultural workers and consumers. We are attaching our previous comments dated March 24th, 2017.

We are concerned that this amendment is not protective of fisheries or water quality and is not scientifically proven or justifiable. IFR represents commercial fishermen who have faced

extremely restrictive salmon seasons many years within the last twenty years, therefore the state of the San Joaquin and Sacramento River are of economic importance to the fishing industry and all the other industries and communities we support. The Sacramento River Fall Chinook ocean abundance projection declined from 652,000 in 2015 to around 300,000 in 2016. The number of salmon-permitted vessels has declined from approximately 5,000 in 1980 to approximately 1,100 today. In 2015, only 585 vessels actually landed salmon in California. Fisheries and fishery-dependent coastal communities are suffering from back-to-back resource crises, with a poor salmon season in 2015 and 2016, loss of half of the crab season, and the prospect of another poor salmon season this year. Sacramento Fall chinook are not overfished. Their abundance declines are due to the deterioration of river productivity which is caused by reduced flows, habitat degradation, the presence of toxic chemical species at mutagenic and lethal concentrations, and many other factors.

Fishermen bear the financial burdens of these impacts, which in many cases occur in contravention of the law, past settlements, and management plans. Pyrethroid discharges are no exception. We are especially concerned with the cumulative impacts of pyrethroid pesticides with other chemicals that are entering the watershed such as diazinon and chlorpyrifos, and with other water quality pollutants such as selenium, nitrates, salts, temperatures, poor pH, and phosphates. We have requested that an analysis of the cumulative effects of introduction of these various chemicals on water quality be included in the basin amendment documents, however this request seems to have been ignored. This is unacceptable.

We thank the board for their effort to control this dangerous toxin, however we are opposed to the adoption of this amendment in it's current form because it is not protective of water quality or fisheries and is not based on sound science. We are asking for several changes to the amendment based on our concerns as well as the concerns of the California Department of Fish and Game and the Environmental Protection Agency. We feel that our voices have not been heard throughout this process. We have provided science and comments supporting a stronger science based approach. The Regional Board has instead ignored significant scientific controversy and numerous studies that contradict their unproven approach. We feel that the Regional Board has ignored comments that do not support their approach, including comments from state and federal scientists and experts on Pyrethroid toxicity and fisheries.

We are most concerned with the issues of sediment toxicity, cumulative impacts with other Pyrethroids and toxins, non-lethal impacts to aquatic species, stormwater and temperature impacts, current receiving water conditions, and lack of assimilative capacity of highly impaired watersheds. These issues were not adequately addressed in the Response to Comments. Furthermore, the Water Board did not provide fisheries science to U.C. Davis during this process which led to the least protective alternative being chosen despite it not being protective of water quality or fisheries. In fact, in instances where there is scientific controversy, doubt, or not enough science to draw conclusions, the board has decided to ignore serious issues and existing science to support the use of less restrictive standards. This is in contrast to their support of using

the unproven bioavailability approach, which ignores 90% of pyrethroid discharges. There is not enough information or scientific consensus to support this hazardous approach.

The best examples to support our claims are the facts that temperature and agricultural stormwater are not addressed at all in this plan even though they are perhaps the most important variables influencing in Pyrethroid discharges and toxicity. Additionally, the non-lethal impacts to aquatic life at different life stages and the cumulative impacts to fisheries are not accounted for.

We find it very troubling that the board has not only adopted the least protective alternative, but it also uses an unproven and highly controversial bioavailability standard that ignores over 90% of the Pyrethroid concentrations. This approach is not supported by any involved agency, and has not been applied anywhere in the country. Surely the Bay Delta and Central Valley watersheds which are suffering an ecological collapse, host over half a dozen aquatic endangered species, and supply water to millions of people are not the proper places to test unproven and non protective approaches to protecting water quality from toxic pesticides.

We are requesting that the State Board deny this proposal because of the flawed and unproven bioavailability approach and orders the Regional Board to deal with whole water concentrations as other regions have done. We also request that the State Board apply a more protective alternative.

Bioavailability approach is unproven and dangerous:
The EPA points out in it's comment letter that:
"*A recent critical review paper which examined 50 studies published over the last 30 years reviewed the influence of particles on bioavailability and toxicity of pesticides in surface water (Knauer et al. in press). Important conclusions from this paper include: "This literature review demonstrates that the bioavailability and toxicity of pesticides to aquatic organisms in the presence of particles cannot simply be predicted by the partitioning of pesticides between water and particles using the Koc. The origin, concentration and properties of particles such as size and OC content have a strong impact on pesticide behavior and bioavailability in aquatic environments. In addition, water quality parameters such as pH may change ionization and thus adsorption of pesticides to particles modifying pesticide bioavailability. Furthermore, the physiology of aquatic organisms, e.g., feeding behavior and digestion, influence both bioaccumulation and toxicity of pesticides. This is also the case for highly lipophilic pesticides, which are generally assumed to be tightly bound particles and therefore not bioavailable." Finally, the route of exposure via ingestion of particle-associated pesticides is not taken into accoun*t (Parry et al. 2015)."

PCFFA has numerous concerns with the Water Board's approach to calculating the toxic fraction of pyrethroids. We do not agree with the use of only the freely dissolved concentration as this approach ignores a significant portion of the pesticide. We additionally do not condone the use of literature value partition coefficients and the planned selection of the 47^{th} – 75^{th} percentile of the partition coefficients.

In the responses to comments the Waterboard defends their consideration of only the freely dissolved fraction of pyrethroids. They cite a study by Knauer as support of this approach: "Knauer et al. (in press) also stated that pyrethroids were the only class of pesticides that did show an reliable decrease in bioavailability due to binding to organic matter, confirming that this approach is reasonable for pyrethroids, although it may not be for other classes of pesticides". While Knauer is correctly quoted in regards to OC, the Water Board conveniently ignores the entirety of the study in favor of their freely dissolved fraction approach. Knauer, referencing other researchers, states:
"*The authors observed that exposure to bifenthrin (log K_{OW} 5.4, log K_{OC} 6.0) increased when bifenthrin-bound particles were ingested, and that mortality was higher than what would be predicted from dissolved concentration alone. The results further indicate that bioavailability and toxicity correlated best to the counts of a specific size of particles of 0.5 to 2 mm…. Overall, the data demonstrated that even strongly lipophilic pesticides like the pyrethroids might be available and toxic to an aquatic organism if they are taken up via particles. We further note that no study showed a clear (factor > 2) and unambiguous decrease in toxicity for SS concentrations that resemble the FOCUS higher- tier scenario assumption of 15 mg SS/L with an organic carbon content of 5% (0.75 mg OC/L)*."

Knauer states that mortality is higher than the freely dissolved concentration suggests when particles are ingested. This is an aspect of exposure routes ignored by the Water Board that causes PCFFA to be concerned with the bioavailability approach. In addition, Knauer addresses the effect of particle size on toxicity. This is ignored by the Regional Board and would not be reflected with the literature value partition coefficients. The Regional r Board selected information from this study that supported their previously determined agenda and ignored the complexity of the science behind the bioavailability of pyrethroids and exposure routes. The science is complicated and the current Water Board approach is clear cherry picking of science in favor of less protective limits.

While the bioavailability method is flawed in itself, the intended execution of this method is lacking scientific basis. The Water Board intends to calculate the bioavailable fraction using partition coefficients. It is stated in the Staff Report that:

"*Site-specific partition coefficients are recommended for these calculations because organic carbon occurring in the environment can vary widely in their binding properties depending on the physicalchemical properties of the organic matter, which primarily develop based on the source and aging of the material. Site-specific partition coefficients may also vary with season and timing of sample collection because aquatic ecosystems are not static and new sources of material may be introduced due to changes in the surrounding environment."*

The Regional board acknowledges the importance of using site-specific partition coefficients. The use of partition coefficients is supported through the citing of a study that "demonstrated that using site-specific partition coefficients were comparable to direct measurement via SPME". The use of site-specific partition coefficients for the intended calculation is comparable to direct measurement of the freely dissolved proportion of pyrethroids. This comparison does not apply to calculations done with literature partition coefficients. But, the Water Board has no intention of using site-specific partition coefficients:

"*It is unlikely that site-specific partition coefficients will be available for most monitoring sites because determining these values is not a standard procedure performed by commercial laboratories…. Because site-specific partition coefficients will likely not be available, default partition coefficients are proposed in order to use Equation 3 to estimate the freely dissolved concentration of a sample*".

They are using estimations for partition coefficients for ambient water and wastewater. This means their bioavailability values are estimations calculated using estimated values.

Despite the stated importance of site-specific partition coefficients there is no intention to use these values. Instead, they intend to use literature values, which clearly cannot capture the range of partition coefficients for varying site types and seasons. Additionally, only one study met their criteria for accepting partition coefficients. While research shows that the bioavailable fraction approach may be valid after more research, the existing research states that literature K values are unacceptable for compliance determination:

"T*o determine compliance by this calculation, site-specific data are necessary, including* K_{OC}, K_{DOC}*, concentration of suspended solids, concentration of DOC, and fraction of OC in the suspended solids. If all of these site-specific data, including the partition coefficients, are not, available, then this equation should not be used for compliance determination. Site-specific data are required because the sorption of pyrethroid to suspended solids and DOM depends on the physical and chemical properties of the suspended solids resulting in a range of* K_{OC} *and* K_{DOC} *values.*" - From Aquatic Life Water Quality Criteria for Selected Pesticides by Ronald S. Tjeerdema

The literature states that the calculation should not be used without site-specific partition coefficients, yet this is exactly what the Regional Board intends to do. The freely dissolved approach to pyrethroid concentration determination is worthless as long as the calculation is being done without all of the required components.

The Regional Board states that the "*proposed amendment allows for the use of site-specific or additional study-based partition coefficients if they become available*". They are currently unavailable and the Regional Board has no intention of collecting these values, making the implementation of this approach unfounded. The calculation could be considered in the future if these values become available. But, they are currently unavailable and the calculation is

worthless without them. The use of literature partition coefficients is unfounded and blatantly goes against the stated requirements for using the freely dissolved fraction calculation.

The selected partition coefficient range shows an additional bias towards the estimation of lower pyrethroid concentrations. The Regional board states that the "partition coefficients used are not extremes". The range they use is the 47^{th} – 75^{th} percentile. While it is true that this is not the extreme, the range is the third highest quartile of partition coefficient values. This means that the values used are towards the higher end of K values. Higher K_{OC} values correlate to less mobile chemicals as they signify that more chemical is adsorbed to organic carbon content. In choosing a range of higher K values, the Regional Board chose a range that assumes more is adsorbed rather than more being bioavailable. Additionally, the Regional board states in the Staff Report that the studies that generated the partition coefficients they intend to use used an analytical method that "may cause partition coefficients to be overestimated", which signifies an additional bias towards larger K values and lower freely dissolved pyrethroid concentrations. Both the calculation of the K values and the selection of K values will create data that would underestimate the bioavailable fraction of pyrethroids.

The justification for using the bioavailability approach is lacking and the scientific basis behind it is minimal. This would be a novel approach. A detrimental monitoring procedure is a risky time to implement an unproven method. The calculation itself would additionally be a novel approach that the existing literature states should not be used for compliance monitoring. The bioavailability approach would be a low estimate of pesticide exposure and the freely dissolved fraction calculation used is clearly biased towards an underestimation of the bioavailable fraction. This approach would lead to an extreme underestimation of the actual exposure, which would be devastating to sensitive fish populations.

We request that the State Board denies the use of the unproven bioavailability approach and direct the regional board to regulate Pyrethroids correctly.

The current alternative is not protective of salmon and aquatic life

IFR and others are very concerned that the beneficial uses most impacted by Pyrethroid discharges are fisheries spawning and reproduction, and cold water fisheries. Despite this, the impacts to salmon are dismissed due to the fact that there are limited studies on impacts to salmon from Pyrethroids. The studies that do exists are peer reviewed and represent the best available science on this issue. We feel the existing studies should have been relied upon, instead they are dismissed. We are especially concerned that the studies were not included or addressed in the U.C. Davis peer review. We feel this is one of the major factors that led to the least protective alternative being chosen and this is unacceptable. More studies exist on impacts to fisheries from Pyrethroids than exist on bioavailability of pyrethroids, yet studies that support more protective approaches have been dismissed outright throughout this process. The following quotes from the California Department of Fish and Wildlife support the need for more protective standards, as do the studies that the Fish and Wildlife Service submitted as part of this processes.

"*The disruption of olfaction in salmonids by other pesticides has been shown to likely increase straying in Chinook salmon (Scholz et al. 2000). A high occurrence of straying of fall-run Chinook salmon occurs between the Sacramento and San Joaquin river basins. The analysis for the protection of endangered and threatened species does not appear to include the cumulative impacts of pyrethroid pesticides, alone and in combination of other stressors, on the chronic long-term direct impacts to endangered species, or the indirect impacts from the reduction of the quantity or quality of food. Predicting the response of different fish species to contaminants requires considering the sensitivity and exposure of different life stages, the energy deficits due to multiple stressors, and the joint effects of temperature on metabolic rate and chemical elimination (Brooks et al. 2012).*"(Response to Comments P. 25)

Brander et al. (2016) demonstrated clear reductions in egg fertilization for 0.5 ng/L bifenthrin exposures (approximately 30% reduction). As well, the study demonstrated that the likely mechanism for the reduced reproductive success, a trend in reduced choriogenin per total protein content, started at fish exposures to 0.5 ng/L bifenthrin. The report is unclear how Staff concluded that effects were not linked to reproduction and not included in the criteria derivation. This study is an additional line of evidence that the 5th percentile criteria goal is not protective of supporting aquatic life beneficial uses.(Response to Comments p. 26)

"*The quantifiable impact of pyrethroids on declines in mysid shrimp populations, fish populations, or reductions in food sources for fish are not available.*" (Response to Comments p. 20)

Cumulative Impacts and Sediments:

We are very concerned that historic sediment pollution, currently occurring pyrethroid sediment pollution, and cumulative impacts have been ignored throughout this process and that sediment standards and sediment discharge prohibitions are not included in this process. Pyrethroids are not the only limiting factor for fisheries and many other water quality issues, life cycle impact how fish react to Pyrethroid toxicity. Fish are exposed to sediments due to sediment mobilization during key life stages and through spawning, and other aquatic life is exposed to sediments through food sources. Pyrethroids are also discharged through sediment mobilization in storm events in agricultural areas, yet this plan does not include stormwater monitoring for agriculture or sediment control measures. Furthermore fish can be severely impacted by acute exposure at very low levels of pyrethroid even if these levels are at less than the allowable detects.

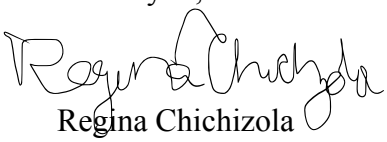
"*There is ample evidence in the literature that supports the concept that pyrethroids as well as other classes of pesticides have the potential to work in conjunction to adversely impact water quality and impair beneficial uses. [The commenter discussed the following references to*

support this statement: Ruby 2013; Gilliom et al. 2006; Orlando 2014; Denton et al. 2003; Westergaard et al. 2012; Scott and Sloman 2004; Scholz et al. 2000; Moore and Waring 2001; Hecht et al. 2007; NMFS 2008; NMFS 2009; Potter and Dare 2003; Scott and Sloman 2004.] The proposed surveillance and monitoring program does not appear to include requirements to assess additive or synergistic effects with other chemicals. The evidence provided suggests that additive toxicity currently occurs in Central Valley waterways." (Response to Comments, Fish and Game p. 23)

The EPA also comments that: *The adopted waste discharge requirements for irrigated agriculture (Order Number R5-2014-0032) currently, do not require chronic water column toxicity testing for invertebrate or fish species. We recommend that these orders include water column toxicity testing with both Ceriodaphnia dubia (for chronic tests) and Hyalella azteca (for acute tests), and sediment toxicity testing with Hyalella azteca. We recommend additional EPA acute test species in EPA-821-R-02-012 for water column and EPA-600-R-99- 064 for sediment.*

These comments just outline our main concerns with this amendment and address the areas where we feel our comments were not taken into account or addressed. We request that the State Board directs the Regional Board to regulate whole water concentrations of Pyrethroids, abandon the controversial and unproven bioavailability approach, adapt standards and monitoring requirements for stormwater and agricultural discharges, and address the issues of Pyrethroid toxicity in sediments. The fate of the Delta and our industries depend on this decision.

Thank you,



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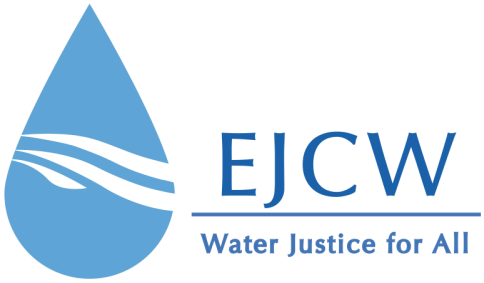

March 24, 1017

Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670

Submitted via email

RE: Proposed Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of pyrethroid Discharge

Thank you for the chance to comment on the Proposed Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Pyrethroid Discharges and for your hard work on this process. These comments are from The Institute for Fisheries Resources (IFR), Pacific Coast Federation of Fishermen, the San Francisco Baykeeper, the Environmental Coalition for Water, California Sportsfishing Protection Alliance, and the Pesticide Action Network. We are all highly concerned about the impacts of pyrethroids to surface water and sediments in the Sacramento and San Joaquin Rivers. Of particular concern is the impacts of pyrethroids to anadromous fisheries, endangered species, water quality, and the food web of the Delta ecosystem.

Pyrethroids are known to have high toxicity and significant impacts to aquatic food chains. We are concerned that nearly all samples taken so far that tested positive for pyrethroids showed major exceedances, which most likely means that fisheries are already being impacted by these highly toxic chemicals. The Basin Plan states that no individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses, and that discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses. It is apparent to us that pyrethroid discharges are resulting in both, in violation of the Plan.

IFR represents commercial fishermen who have faced extremely restrictive salmon seasons many years within the last twenty years, therefore the state the San Joaquin and Sacramento River are of economic importance to our industry and all the other industries and communities we support. The Sacramento River Fall Chinook ocean abundance projection declined from 652,000 in 2015 to around 300,000 in 2016. The number of salmon-permitted vessels has declined from approximately 5000 in 1980 to approximately 1100 today. In 2015, only 585 vessels actually landed salmon in California. Fisheries and fishery-dependent coastal communities are suffering through back-to- back resource crises, with a poor salmon season in 2015, and 2016, loss of half of the crab season, and the prospect of another poor salmon season this year. Sacramento Fall chinook are not overfished. Their abundance declines are due to declines in river productivity, which in turn are caused by reduced flows, habitat degradation, the presence of toxic chemical species at mutagenic and lethal concentrations, and many other factors.

Fishermen bear the financial burdens of these impacts, which in many cases occur in contravention of the law, past settlements, and management plans. Pyrethroid discharges are no exception. We are especially concerned with the cumulative impacts of pyrethroid pesticides

with other chemicals that are entering the watershed such as diazinon and chlorpyrifos, and with other water quality pollutants such as selenium, nitrates, salts, temperatures, poor pH, and phosphates. We have requested that an analysis of the cumulative effects of introduction of these various chemicals on water quality be included in the basin amendment documents, however this request seems to have been ignored. This is unacceptable.

We we have also advocated for a zero allocation of pyrethroids, pyrethroid sediments concentration standards, and a robust sampling and monitoring program as part of this process. We are disappointed with the recommendation of the UC Davis 5th percentile standard, which is not protective of the WARM and COLD beneficials uses. The staff report lays out the reasoning for at least the UC Davis 1st percentile standards for the water column and numeric standards due to the lack of monitoring data in non-listed watersheds, major exceedances where samples have been taken, already occurring bioaccumulation, genetic mutation of Hyalella azteca, and temperature impacts to toxicity. While the issues outlined in the staff report supports the adoption of stringent standards, the staff uses uncertainties to justify less protective alternative and even not regulating the agriculture industry as part of this TMDL.

The proposed concentration goals/targets are above levels of lethality for aquatic organisms such as Hyalella azteca and fail to account for increased toxicity of pyrethroids at low temperatures, and increased toxicity due to the numerous pesticides and other chemicals discharged into the estuary and its tributaries in the Central Valley, along with additive effects from multiple pyrethroids. The proposed concentration targets also allow increased concentrations of pyrethroids by assuming most of them are not "bioavailable", but this assumption is unproven in the field and the factors used to make this calculation are known to vary greatly, increasing the likelihood that there will be toxic impacts allowed by the board under the proposed concentration targets. The use of the bioavailable standard is also not protective of sediments which are likely to be mobilized when pyrethroids are most toxic in cool water months. This is the period when many species are emerging from eggs and larval stages, maximizing somatic growth and preparing for outmigration.

The adoption of basin-wide TMDL standards is the most suitable option for the conservation of fish according to Basin Plan requirements, however the compliance schedule should apply immediately to anything but WWTP. Numeric triggers and management actions could be used. We support Alternative 1 for all water bodies. The WARM and/or COLD beneficial use alternative is not viable as it does not deal with is the WARM and COLD are receiving bodies to the unregulated waters. We do not support the proposed alternative as it allows the board to decide which water bodies can have unregulated discharges using a heretofore undefined rubric.

Given the highly impacted status of the Delta and its fish populations, and given the fact that pyrethroids are identified as a likely cause of that decline, the pyrethroids targets should be well below known toxicity thresholds to ensure pyrethroids are not contributing to the further decline of aquatic life and endangered fish in the Delta and that proposed concentration goals/targets are consistent with the Board's mandates and water quality objectives. The unknowns related to additive and temperature impacts should not be dismissed, but lead the board to choose the most precautionary alternative.

Temperature and Flushing Impacts

The staff report states that the UC Davis 1st percentile is too protective. We strongly disagree with this conclusion. None of the alternatives deal with low temperature impacts, which greatly magnify pyrethroid toxicity and cumulative impacts to marine species. Furthermore, current flow processes aim to make water colder in important winter months to mimic natural spawning conditions. While these cold water flows are greatly needed, known increased cold water pyrethroid toxicity compromise their effectiveness in facilitating salmonid health. Extreme flood events and resulting unpredictable large discharges during winter months will likely occur in the future. Choosing an alternative that is barely protective if known pyrethroid toxicity is ignored will not led to water quality objective attainment.

Impacts to Hyalella azteca and other aquatic species

The impacts of pyrethroids on endangered and commercial salmon species are of grave concern to fishermen, who are dealing with the economic consequences of the ecological decline of the Delta. Pyrethroids have sublethal impacts on salmon and on species that filter water from contaminants that impact salmon. Salmon exposed to sediments and not just the water column including during their most susceptible points of lifecycle.

While the impacts to local salmon are not well documented. Studies of other Delta species, and salmon in other areas give us an indication of ways that salmon are being impacted by high concentrations of pyrethroids in the Sacramento and San Joaquin Rivers.
Some of these studies point to the need to adopt more stringent standards due to the timings of exposure.

Furthermore genetic impacts and stressors in Hyalella azteca bring up some very important questions related to endangered species in the Delta. Studies related to genetically altered salmon have found that genetic disturbance to salmon species have the chance to cause serious decline in already struggling species, however the staff report rarely mentions fisheries impacts let alone genetic and cumulative impacts.

"*The researchers did genetic analysis on the populations to investigate mechanisms of resistance and found multiple genetic mutations in the resistant field populations. These same mutations have also been identified in pesticide-resistant agricultural pests, indicating that the mutated Hyalella azteca were likely exposed to pyrethroids or other similarly acting chemicals over multiple generations. The individuals with the mutations that allow these organisms to tolerate high concentrations of pyrethroids survived and passed on the mutations to the following generations, while those without the mutations did not survive to pass on their genes, potentially reducing the overall genetic and biological diversity of the populations. Weston et al. state that the consequences of these evolutionary changes in Hyalella azteca populations are unknown for the species and for aquatic ecosystems, but reduced genetic diversity can result in populations that do not have genetic variations to tolerate other stressors*." Staff Report P. 65

Another issue that point to the need for stringent standards from pyrethroids is the fact that they are likely traveling and concentrating into estuaries.

"*pyrethroids have been detected in environmental tissue samples in California, but these detections have not been clearly linked to toxic effects. For example, a recent study detected cyfluthrin, bifenthrin and permethrin in embryos of two species of estuarine crabs in Stege Marsh and Bodega Bay* (Smalling et al. 2010). Staff Report p. 14

Water Quality Impacts

We are very concerned that there is little to no discussion of cumulative watershed impacts within this SED despite the fact that studies from Hyalella azteca point to the fact that pyrethroid can cause genetic issues and other impacts that can leave species susceptible to other water quality stressors. There is no one answer to what is killing of the food web and salmon populations in the Bay Delta and its tributaries. This makes a discussion of cumulative impacts, and recommendations based on this discussion especially important. The fact that other highly toxic chemicals such as mercury and organochlorine are also stored in sediments and mobilized by the same events that mobilize pyrethroids also point to the need for a hard look at cumulative impacts in this process. Staff dismissed Cumulative Impacts in this SED and in their recommendations .

"*Environmental characteristics of the water available, such as temperature and dissolved and particulate organic matter may alter the toxic potential or bioavailability of pyrethroids. Many water bodies also contain other pesticides and toxic pollutants that can have additive or synergistic toxicity with pyrethroids. The proposed concentration goals would account for the effect of organic matter on the toxic potential of pyrethroids by allowing the use of freely dissolved concentrations. It was not possible at this time to explicitly include temperature effects*

*or additive and synergistic effects with other pesticides in the development of concentration goals***."** Staff Report p. 97

Additive Impact with other pyrethroids are discussed but not well accounted for and additive impacts with other pesticides, including the same ones that pyrethroids were meant to replace was not addressed. This is a serious issue as one would assume that they would impact the very same waters and sediments.

"*A source identification study undertaken to identify pathways of organophosphate pesticides to WWTPs also concluded that residential sources were the largest contributor to mass loading compared to commercial sources, such as pet grooming facilities (Singhasemanon et al. 1998). This study is relevant because pyrethroids were the primary replacement products when residential uses of organophosphates were phased out early 2000s, and the products have similar residential use patterns (Teerlink 2014"*)**.** Staff Report p. 11

"*pyrethroids also have additive effects with other pesticides and toxicants, such as metals and commonly used pesticides like organophosphates as well as piperonyl butoxide (PBO) a pesticide formulation additive. These effects were considered in criteria derivation, but could not be included in the criteria since the effects could not be quantified across multiple species*." Staff Report p. 79

Algae and Biomass

The fact that pyrethroids are impacting biomass and encouraging alga, which can be harmful to fish and humans needs to be addressed further.

"In controlled experiments mimicking small streams, bifenthrin-contaminated sediments caused reduced abundance and biomass of larval macroinvertebrates, as well as fewer species occurring – meaning a loss of diversity or richness. A trophic cascade occurred that resulted in an increase in algal abundance due to fewer macroinvertebrates feeding on algae. This type of alteration may provide favorable conditions for algal blooms in streams." Staff Report p. 16

Sediments

For many of the reasons outlined above we support a goal of no pyrethroids in sediments and are extremely disappointed that not only is this option dismissed in this SED, but setting numeric standards for sediments is also dismissed. We understand that sediments already have

accumulated pyrethroids, however this only supports the need for no new discharges especially when taken into account that additional toxins are present in sediments.

"Many pyrethroids degrade in soils and water in a few days, but bifenthrin appears to be much more persistent than the other pyrethroids (Casjens 2002, Fecko 1999, He et al. 2008, Imgrund 2003, Jones 1999, Laskowski 2002). Bifenthrin may take as long a year to degrade, indicating that this compound in particular has the potential to accumulate in sediments." Staff report p 58

"Aerobic half-lives for bifenthrin in sediments collected from the environment range from 428 to 483 days (Gan et al. 2005) to stable with no degradation detected (Budd et al. 2011). Anaerobic half-lives for bifenthrin range from 251 to 1,733 days to stable." Staff report p. 60

Issues related to Bioavailability

We have concerns the that staff is suggesting not using actual pyrethroid concentrations in water samples to determine exceedances but instead want to use an undetermined method for accounting for bioavailability. This method involves estimating concentrations, and no evidence that this method is proven or exact is provided in the SED. Furthermore using whole water standards is more protective of sediments. The fact that organisms can be impacted by interaction with sediments, through mobilization in storm events, and through food sources demonstrate that this method will not be as protective of beneficial uses.

"*Over time, pyrethroids may be released from the bound state and become bioavailable to aquatic organisms depending on environmental conditions and the half-life of the specific constituen**t*** **(You et al. 2011).**

"The bioavailable concentration is not directly equivalent to the freely dissolved concentration, because the freely dissolved concentration neglects exposure via ingestion of chemicals bound to food sources, or absorption directly through exterior membranes." Staff Report p. 105

"*In aquatic environments, the amount of suspended solids and other factors that may affect bioavailability may vary greatly by season or when storm or irrigation events occur, and the bioavailability of pyrethroids will also vary with those changes*" Staff Report p. 57

Additive Toxicity

We are very concerned with additive toxicity from multiple pyrethroids. The fact that quantitative limits are not recommended to address additive toxicity, along with the fact that temperature impacts and cumulative impacts are not addressed and sediment numeric standards

are not being adopted point to the fact that the more protective UC Davis 1st percentile standard should be adopted. It seems that anywhere issues that demonstrate the need to greatly protections are dismissed for lack of data, which leads to finding the less protective alternatives would meet water quality standards. However this is a highly toxic chemical that has already could serious water quality impairments.Dismissing such serious issues should lead to the board to air on the side of caution.

"Trimble et al. (2009) concluded that the data in this study indicate that pyrethroid mixture toxicity is likely additive and that the deviations from the concentration addition model reasonably encompass expected intra- and interlaboratory variability". Staff Report p. 103

"*In all of the studies on pyrethroid mixtures, the mixtures were more toxic than a single pyrethroid tested alone*." Staff Report p. 56

"*Fojut et al. (2012) did note that the lack of sufficient data to quantify the mixture effects of pyrethroids and piperonyl butoxide (PBO), a known synergist, was a significant data gap. PBO is often in pesticide formulations with pyrethrins, which are the naturally occurring pesticides from which the synthetic pyrethroids were developed. However, due to the lack of data to quantify impacts, quantitative limits to account for these interactions are not recommended for inclusion in the Basin Plan at this time."*Staff Report p. 56

Agriculture

We do not support the proposal that agricultural discharges be regulated through the Irrigated Lands program instead of a TMDL. This is of concern because often dischargers do not have a responsibility to monitor and report regularly, and there is no monitoring plan laid out in this document.

For instance the general permit for dairy operations do not require monitoring for pesticides and orchards are still allowed to aerial spray pyrethroids, while in municipalities there are regulations on spraying.

"DRs General Order (Order R5-2013-0122). The Order prohibits discharges from milk cow dairies that cause or contribute to an exceedance of any applicable State or federal water quality criteria, or a violation of any applicable State or federal policies or regulations. Monitoring and reporting requirements are specified in an associated MRP. The MRP requires monitoring of storm water runoff from land application areas; however, in the current Order there are no requirements to monitor pesticides." Staff report *p. 126*

"The options for the croplands regulated under the dairy program with the potential to discharge pyrethroids to surface water would be to 1) develop their own management plans and monitoring programs or 2) participate in the management plans, and monitoring programs already established by the coalition groups regulated under the ILRP WDRs."

We suggest that agriculture is regulated through TMDLs and more protective BMPs are required such as riparian buffers of 200 feet from any WARM or COLD waterway and 100 feet of any conveyance. No aerial spraying should be allowed at all. We also suggest that all applicators have to be certified and trained in HazMAt protocol so that pyrethroids are not discharged through cleaning and storing or clothes and equipment.

"The existing WDRs already require a program of implementation and surveillance and monitoring when a water quality objective or water quality trigger limit is exceeded." Staff Report *p. 125*

How exceedance are detected and who is doing the monitoring, and when needs to be laid out for this effort to be effective. Do farmers do their own monitoring? Where are the samples processed Do they monitor in winter? Do they monitor in floods? How are we guaranteed this will happen? Monitoring at the wrong times can lead to lack of detecting exceedances.

Coordination with other agencies

It is stated that municipalities do not have the ability to ban pesticides, yet pesticides with similar toxicity issues have either been banned or categorized in a way where they can only be used in certain situations by certified applicators. We suggest that the Central Valley and State Boards contact the EPA, DPR, and other agencies including wildlife agencies to establish protective regulations such as no application by the general public, riparian buffers, no application in the wet season or when summer storms are expected, application standards, HazMat type protocols for equipment, storage and clothing. If protect standards, prohibitions, and BMP are used than there is no reason to not be able to obtain a zero discharge standard in most water bodies.

"USEPA OPP currently has all the pyrethroids of concern in registration review, during which USEPA will determine whether these pyrethroid pesticides are expected to have unreasonable adverse effects, and if so take steps to mitigate those effects." Staff Report p. 37

Alternatives

We wish to state again that the 5th percentile threshold is not protective enough as it does not account for the up to 3 fold toxicity during cold temperatures, sediment movement, cumulative impacts, uncontrolled discharges in flood events, and additive toxicity. It is only if there important issues are not accounted for that the proposed standard can claim to be protective.

"*Concentration goals based on the 5th percentile UC Davis criteria are just below or at the thresholds of potential toxic effects on the most sensitive aquatic species, H. aztec*a.**"** Staff Report p. 289

"It is less clear if ESGIC values based on the 2.5 or 5th percentile chronic criteria would be protective of aquatic life beneficial uses because for these two alternatives, the values exceeded MATCs for four of the six priority pyrethroids.**"** Staff Report p. 9

We also do not agree with the dropping of the no concentrations in sediments goal**.** Dismissing this goal because it is hard to regulate pyrethroids is not justified as the goal is achievable.

"*Unlike some naturally occurring compounds such as selenium, there are no natural sources of pyrethroids, and there are no natural, or "background" concentrations. If these pesticides were prevented from entering surface waters, then concentrations of pyrethroids in surface waters and sediments would decline in a moderate timeframe***"** State report p. 98

While controlling pyrethroid discharges may be difficult and involve coordination with other agencies it is in fact possible, and the EPA and NOAA fisheries have opportunities, to engage in processes that can help achieve this goal currently. The alternative is feasible under this type of coordination.

"*However, as long as pyrethroids remain registered for widespread use, completely eliminating all detections of pyrethroids in sediment would require cessation or an unfeasible level of treatment of all MS4 and POTW discharges and either cessation or an infeasible level of treatment for agricultural discharges or cessation agricultural pyrethroid uses. Therefore, this alternative does not meet the overall project goal of reasonable protection of beneficial uses, so it will not be further considered.***"** Staff report p. 294

Last we recommend the most protective monitoring program be implemented and that monitoring in areas where pyrethroid use is suspected begin immediately.

Thank you,

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