THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION
628 Northeast Broadway, Suite 200 Portland, Oregon 97232, USA
Telephone 503-232-6639 Toll-free 855-232-6639 Fax 503-233-6794
www.xerces.org

February 14, 2014

Derek Rockett
ShrimpControlPermit@ecy.wa.gov
Washington State Department of Ecology Water Quality Program
Southwest Regional Office
PO Box 47775
Olympia, WA 98504

Dear Mr. Rockett:

Thank you for providing the opportunity to comment on the scope of the upcoming Environmental Impact Statement (EIS) for the use of imidacloprid for the control of the burrowing shrimp (*Neotrypaea californiensis* and *Upogebia pugettensis*) on commercial shellfish beds in Willapa Bay and Grays Harbor.

We understand that two formulations of imidacloprid, “Protector 0.5G” and “Protector 2F,” are under consideration for use in the marine environment. These would be applied by helicopter, backpack sprayer, ground-based vehicle, or “belly grinder,” depending on the formulation and circumstances.

We appreciate the initial research and evaluation of the Plauché & Carr *Risk Assessment for Use of Imidacloprid to Control Burrowing Shrimp in Shellfish Beds of Willapa Bay and Grays Harbor, WA.* However, we are very concerned that the Plauché & Carr Risk Assessment provides inaccurate conclusions which will adversely influence the EIS scoping process.

In these comments the American Bird Conservancy, Beyond Pesticides, Beyond Toxics, the Center for Food Safety, the Endocrine Disruption Exchange, Haereticus Environmental Laboratory, the Institute for Fisheries Resources, the Northwest Center for Alternatives to Pesticides, Pacific Coast Federation of Fishermen’s Associations, Pesticide Action Network North America, Robert Michael Pyle, and the Xerces Society for Invertebrate Conservation highlight the risks of imidacloprid application in Willapa Bay and Grays Harbor; provide input on environmental assessments that we believe are necessary to include in the EIS in order to avoid underestimating risk; and explore the need to include an economically feasible Integrated Pest Management alternative that includes a monitoring plan and an economic threshold that will trigger pesticide use, and that incorporates non-chemical control methods

I. CURRENT RESEARCH EXEMPLIFIES THE SIGNIFICANT RISK IMIDACLOPRID PRESENTS TO AQUATIC INVERTEBRATES AND WATERFOWL

A. Impacts to aquatic invertebrates from imidacloprid use in Willapa Bay and Grays Harbor are potentially significant.

The application of imidacloprid has great potential to damage the rich marine ecosystems of Willapa Bay and Grays Harbor. The pesticide is water soluble and highly toxic to aquatic invertebrates such as insects, shrimp, and other crustaceans. It can kill a large portion of these populations and harm the fish, birds, and other organisms that rely on them for sustenance. Imidacloprid's persistence and its cumulative and largely irreversible mode of action in invertebrates make it particularly dangerous to marine invertebrates. (See Starner and Goh, 2012; Roessink et al. 2013; Mineau and Palmer 2013.)

The projected concentrations of imidacloprid in Willapa Bay and Grays Harbor following application are a cause for concern. In heralding the benefits of dilution and tidal flushing, the Risk Assessment on p. 23 states,

> In the only trial providing adequate time intervals between samples, imidacloprid residues (mean values) in bed sediments were reduced from initial post-application values of 593 ppb to 6 ppb in 28 days. Sediment pore water concentrations declined from a post-application high of 188 ppb to 0.4 ppb by 28 days.

These concentrations do not inspire confidence, as they are within the documented range of toxicity for many non-target organisms. An assessment performed by the American Bird Conservancy concluded that severe impacts to aquatic organisms are expected from short-term (pulse) exposures as low as 0.2 micrograms/liter (ppb) and from chronic exposures to concentrations at least 10 times lower. (See Mineau and Palmer, pp. 42-51. 2013).

The likely water concentrations are well beyond the threshold found to kill many aquatic invertebrates, and may have significant effects on birds and other organisms, due to loss of food.

B. Impacts to waterfowl from imidacloprid use in Willapa Bay and Grays Harbor are potentially significant.

Birds depend heavily on the aquatic systems at the center of the food web. The expected reduction in invertebrate prey base as a result of imidacloprid applications could reduce the health and fitness of birds that rely on them, especially breeding and migrating birds and young hatchlings. Multiple routes of direct exposure are also of concern; in Willapa Bay and Grays Harbor, birds will be exposed to imidacloprid via aerial applications and also through the contamination of insects on which they depend.

An American Bird Conservancy report on imidacloprid and other neonicotinoids found high acute toxicity to birds, comparable to the carbamate pesticide methomyl. Sub-lethal effects at lower doses were also noted; severe signs of debilitation such as ataxia were observed at imidacloprid concentrations an order of magnitude below lethal doses. (See Mineau and Palmer, p 20. 2013). Moreover, the developmental and reproductive toxicity of imidacloprid in birds is very high, a concern that has been voiced in internal EPA reviews for many years despite the lack of an official update to agency protocols.

Since both Grays Harbor and Willapa Bay are critically important for migratory shorebirds, it is expected that huge numbers will be impacted by the imidacloprid applications. The two estuaries are among the most important migratory bird stopover sites on the west coast. Estimates suggest that more than one million birds use Grays Harbor in spring including the Western Sandpiper, which is a declining WatchList species. Grays Harbor is a Western Hemisphere Shorebird Reserve Network site. Willapa, which is very close to Grays Harbor, supports over 100,000 shorebirds during peak periods.

Bird deaths caused by pesticides are within the scope of the Migratory Bird Treaty Act, which makes it illegal to hunt, harm or kill members of more than 800 bird species including those that migrate through Willapa Bay and Grays Harbor. The draft Memorandum of Understanding, issued on 5 February 2014 by the US EPA Office of Pesticide Programs and the Dept. of the Interior Fish and Wildlife Service, makes clear the agencies' renewed interest in protecting migratory birds from pesticides. http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2013-0744-0002 If carried out, the application of imidacloprid in Grays Harbor and Willapa Bay will likely violate the provisions of the Migratory Bird Treaty Act. As usual, federal enforcement will depend on prosecutorial discretion, but the massive scale of the resulting "take" could make it difficult to ignore.

II. THE ENVIRONMENTAL IMPACT STATEMENT MUST INCLUDE A BROAD EVALUATION OF THE RISKS IMIDACLOPRID COULD POSE TO THE FISH AND WILDLIFE OF WILLAPA BAY AND GRAYS HARBOR.

A. Probabilistic risk assessment methods should be used in the EIS. At a minimum, acute risk should include analysis of complete dose-response curves.

Creating risk quotients or concentration ratios to determine acute risk is a very blunt toxicity measurement. In contrast, by evaluating a full dose-response curve, risk assessors acquire a much better understanding of toxicity. If the dose-response slope is steep, small changes in concentration elicit large changes in toxicity. Conversely, if the slope is gradual, much larger concentration changes are needed to elicit a change in toxicity. When there is a gradual slope, the amount of a substance that kills 2 or 3 percent of a population is significantly less than the amount that kills 50 percent of the population.

The Plauché & Carr Risk Assessment does not evaluate full dose response curves. Instead, acute risk is determined by comparing a risk quotient (an equation that divides the estimated environmental concentration by the lethal dose/concentration for 50 percent of the population) to a federally defined Level of Concern. This deterministic method can allow significant mortality. This potential underestimation of risk is unacceptable, especially when evaluating the risk to threatened and endangered species.

A 2013 report released by the National Research Council (NRC) titled *Assessing Risks to Endangered and Threatened Species from Pesticides* underscores the need to move away from deterministic risk assessments. The NRC report recommends the use of probabilistic risk assessment. (See NRC, p. 152. 2013). Probabilistic risk assessment methods integrate uncertainties in the exposure and effects analyses using probability distributions.

It is also concerning that the Plauché & Carr Risk Assessment ignored its own findings. Risk quotients for both Pacific Oysters and Dungeness Crab did exceed determined Levels of Concern, yet mitigation measures were not proposed. (See Plauché and Carr, pp. 43 and 59. 2013). Measures to limit exposure to these invertebrates should be included in mitigation.

B. Greater emphasis on the impact of inert ingredients, tank mixtures, and environmental mixtures must be included in the EIS.

"Inert ingredient" is a definitional term with little meaning except as a compound included in a pesticide formulation other than the active ingredient. However, regulation does not require that these ingredients be biologically, chemically, or toxicologically inert.

According to an analysis performed in 2006 by the Northwest Center for Alternatives to Pesticides (NCAP), approximately 400 inert ingredients were classified as hazardous under environmental laws including the Clean Water Act. (See NCAP, 2006). Furthermore, some inert ingredients may also be registered as active ingredients. A 2006 review of the U.S. Environmental Protection Agency's Substance Registry System, conducted by the NCAP, found that approximately 500 inert ingredients were also registered as active ingredients. While these studies have not been updated recently, the information is included to highlight ongoing concerns with inert ingredients.

Research has also shown that the effects of pesticides can be exacerbated in the presence of some inert ingredients. For example, studies on the freshwater crustacean *Ceriodaphnia dubia* found a more than additive toxicity when imidacloprid and the nonylphenol polyethoxylate, R-11 were combined. (See Chen, 2010). Nonlyphenol and nonlyphenol ethoxylates are approved inert ingredients and are also added after formulation to some imidacloprid products. Ceriodaphnia is commonly used as a proxy for other aquatic crustaceans in toxicity studies, raising concerns about the effects on non-target saltwater crustacean species in the Bay.

The potential synergistic effects of other chemical contaminants that are likely also present in the waters where imidacloprid will be used should also be considered. Knowledge of additional chemicals (pesticides, herbicides, etc.) present in the habitat and their concentrations will give a better understanding of additional stressors and potential synergistic effects. It is already known that the aquatic herbicide imazamox is likely to be used in close proximity. Even if it is not applied at the same time (due to use restrictions), its use could add to or magnify the environmental impacts of imidacloprid use.

Evaluating the effects of chemical mixtures is challenging and still an emerging science, yet it is an important consideration in environmental impact studies.

The 2013 NRC report discusses the importance of evaluating mixtures: "Mixture components that do elicit the relevant response need to be considered in the effects analysis." (See NRC, p. 134. 2013). Furthermore, "In the absence of any data that would support the hypothesis of a synergistic interaction between the pesticide active ingredients and other mixtures components, the effects analysis should proceed on the assumption that the components have additive effects." (See NRC, p. 134. 2013).

The Plauché & Carr Risk Assessment briefly mentions that imidacloprid was not found to have synergistic effects with other pesticides. (See Plauché and Carr pp. 57 and 65. 2013). New research on the effects of R-11 coupled with NRC recommendations demonstrates that the EIS must include evaluation impact of chemical mixtures including environmental mixtures, tank mixtures, and product formulations.

C. Direct effects to juvenile stages of threatened and endangered species must be considered.

The Plauché & Carr Risk Assessment's discussion on direct effects to threatened and endangered species is very limited. (See Plauché and Carr, pp. 48, 53. 2013). For example, special consideration for juvenile fish apparently was not included in the analysis.

It is possible that juvenile salmon and steelhead will be present at times when there will be high levels of the chemicals in and around the treated oyster beds. The direct impact to young fish should be evaluated and any potential risk mitigated.

Clearly this issue is complicated because Willapa Bay and Grays Harbor is not designated critical habitat for all of the threatened and endangered fish species evaluated in the Plauché & Carr Risk Assessment.

D. The analysis of indirect effects to threatened and endangered species from the loss of food resources requires greater analysis.

The EIS will be evaluating the use of imidacloprid on shellfish production, which occurs on 20 percent of Willapa Bay's tidelands (approximately 9,000 acres or 14 square miles) and on three percent (270 acres) of Grays Harbor tidelands. Use can occur annually, but the Plauché & Carr Risk Assessment states that treatment will occur in rotation with beds treated only once every three or four years. (Plauché and Carr, p 7. 2013). Older descriptions of the burrowing shrimp management indicate that no more than 800 acres could be treated annually with carbaryl (Dumbauld, 2006). It is not clear if there is any such use limit being considered for imidacloprid. If not, up to 20,000 acres could be treated annually. This needs to be clarified in the EIS.

The Plauché & Carr Risk Assessment's evaluation of indirect effects to threatened and endangered Chinook, Chum, Sockeye, and Coho salmon, as well as Steelhead and Green sturgeon all reached the same conclusion of a "low likelihood of indirect effects." (See Plauché and Carr, pp. 49, 50, 51, 52. 2013). In each assessment there is language similar to that quoted here for Chinook salmon: "The extent of the potential effects on the total invertebrate food supply will depend on the number of acres of tidal mudflat treated each year, and Chinook salmon use of that area. … Given the huge mudflat areas of both Willapa Bay and Grays Harbor, and the relatively small areas that have been treated with carbaryl in the past, it is very unlikely that there could be a reduction in the available crustaceans and bottom dwelling invertebrate food supply such that it would cause an indirect effect."

This determination provides no analysis and is unfounded. These fish species, as well as numerous waterfowl, feed on the crustaceans and bottom-dwelling invertebrates found in the mudflats. Understanding the amount of acreage being proposed for treatment is critical to a realistic understanding of any risks, including the impact of food source reduction.

Furthermore, the analysis should account for the length of time during which the food source is reduced. It is possible that the entire 20,000-acre (31 square mile) area will have a reduced food supply for multiple years, as it is not known how long it will take for invertebrate populations to recover to pre-treatment levels. The timing of this food source reduction could also be critical if it coincides with a period of intensive food need such as migration or reproduction.

A further limitation of the Plauché & Carr Risk Assessment of indirect effects is that it solely evaluated mortality of the species' immediate food source. This assessment technique fails to consider the cascading impact to higher predators when key food sources are removed from the base of the system. "Bull trout are stated to eat primarily fish. . . . [I]t is unlikely that the use of imidacloprid would result in reductions in fish populations. All RQs are well below the listed species LOC for fish. . . ." As discussed above risk quotients are a very blunt measurement of toxicity. In this example, the impact to bull trout's ability to feed is determined by a risk quotient derived by dividing the estimated environmental concentration by the LD50 for prey fish.

The EIS must expand the scope of work on indirect effects to threatened and endangered species.

E. The EIS should include research into imidacloprid's movement post-treatment.

The Plauché & Carr Risk Assessment points to multiple tidal flushing events to demonstrate that chemical concentrations do not stay high in the treatment area for long periods. (See Plauché and Carr, p. 41. 2013). Still, there appears to be no monitoring to determine where fate of the chemical following tidal flushing. This is a concern because of the long aqueous half-life of imidacloprid, which varies but is at least one year.

While it is possible that these chemicals flush out to the ocean and hopefully are diluted below harmful levels, other scenarios must be considered in scoping. For example, if the application occurs when there is an exceptionally large tidal swing the imidacloprid could move inland above areas where standard tides reach, leaving high levels of stagnant contaminated water. This could lead to increased exposure to wildlife such as waterfowl.

Tides might also push the chemical towards sensitive areas such as river mouths, salt marshes, or estuaries, including wildlife refuge lands or other areas where the chemical could pose a threat to fish and wildlife, including sensitive species.

Willapa Bay and Grays Harbor comprise the current known distribution in Washington of Newcomb's Littorine Snail (*Littorina subrotunda*), a federal species of concern and a Washington State candidate species. Little is known about this snail except that it requires salt marsh habitat, and the species' decline has been attributed to the effects of estuarine habitat loss and pollution. The potential for imidacloprid to enter the habitat could result in additional harm to this species.

An evaluation of imidacloprid's movement post-treatment and possible repercussions to sensitive species should be included in the scope of the EIS.

F. An extensive review of degradates is required.

The Plauché & Carr Risk Assessment mentions there are two major degradates to imidacloprid and that each is less toxic than the parent compound. (See Plauché and Carr, p 19. 2013). "Less toxic" is a relative comparison and does little to explain the impact of degradates, apart from the likelihood that it is less than that associated with the parent compound.

Most neonicotinoid insecticides, including imidacloprid, undergo complex degradation pathways in soil and water. This degradation needs to be taken into account when assessing full toxicity of the active ingredient in the environment, as degradates (even those of lesser toxicity) may prolong the toxicity profile of the parent compound.

Also, the practice of considering only "major degradates" to the exclusion of other potentially harmful metabolites that are a smaller percentage of the parent compound has been challenged by the National Marine Fisheries Service:

> EPA defines major degradates as degradation products of the active ingredient identified in environmental fate studies whose field concentrations exceed 10% of the applied active ingredient. The BE did not identify "minor degradates" (found at concentrations <10% of a.i.). However, other "minor degradates" (found at concentrations <10% of a.i.) may be toxicologically significant. (See BiOp, p 253. 2008).

Greater analysis of imidacloprid degradates is needed in the EIS to ensure that risk is not underestimated.

III. AN INTEGRATED PEST MANAGEMENT ALTERNATIVE, INCLUDING MONITORING, ECONOMIC THRESHOLDS, AND CONTINUED RESEARCH INTO POSSIBLE NON-CHEMICAL OPTIONS, MUST BE INCLUDED IN THE EIS.

The implementation of a verifiable integrated pest management (IPM) plan is feasible. The oyster growers already signed a memorandum of agreement with the state to ensure a transition to an IPM. (Dumbauld, 2006). Furthermore, much of the work to determine what such a plan would entail has already been completed.

Researchers working to help Willapa Bay oyster growers adopt IPM have identified three necessary components that would help reduce insecticide use and streamline shrimp control (Dumbauld, 2006):

1. Develop accurate shrimp population census methods. Dumbauld noted that the burrowing counts performed in the spring were not accurate.
2. Characterize damage. This action allows oyster growers to determine at what pest density there is crop damage. Dumbauld's assessment determined that shrimp caused substantial oyster losses at levels exceeding 20 to 40 shrimp burrows m -2.
3. Develop an objective decision making criteria for use of control tactics. By setting a threshold where pest density causes unacceptable oyster losses, oyster growers have an objective method to determine when treatment is needed and can reduce unnecessary applications.

The alternative should also include further steps to augment these initial IPM efforts. For example, the alternative might consider longer-term, phased in implementation of non-chemical controls.

IV. CONCLUSION

The undersigned organizations are concerned about the potential risk posed by the proposed use of imidacloprid in Willapa Bay and Grays Harbor. Our comments highlight specific environmental assessments that should be included in the scope of the EIS. By conducting a comprehensive review, actual risk will be better understood and Washington can better hone needed mitigation measures. Furthermore, due to the ongoing nature of these insecticide uses, coupled with their potential risk, we urge you to include an IPM alternative in the EIS.

Thank you for considering our comments. We look forward to reviewing the draft EIS. If you have any questions, please do not hesitate to contact us.

Sincerely,

Scott Hoffman Black, Executive Director
Xerces Society for Invertebrate Conservation

American Bird Conservancy,
Beyond Pesticides,
Beyond Toxics,
The Center for Food Safety,
The Endocrine Disruption Exchange,
Haereticus Environmental Laboratory,
The Institute for Fisheries Resources,
The Northwest Center for Alternatives to Pesticides,
The Pacific Coast Federation of Fishermen's Associations,
Pesticide Action Network North America
Robert Michael Pyle (individual)

REFERENCES

Chen, X.D. et al. 2010. Mixture effects of the nonlyphenyl polyethoxylate, R-11 and the insecticide, imidacloprid on population growth rate and other parameters of the crustacean *Ceridaphnia dubia*. *Ecotox and Enviro Safety*. 73 (2010) 132-137.

Dumbauld, B.R. et al. 2006. An integrated pest management program for burrowing shrimp control in oyster aquaculture. *Aquaculture*. 261 (2006) 976-992.

McGaughey, B. et al. 2013. Risk Assessment for Use of Imidacloprid to Control Burrowing Shrimp in Shellfish Beds of Willapa Bay and Grays Harbor, WA. 2013. Plauche & Carr. Compliance Service International. Available at: http://www.ecy.wa.gov/programs/wq/pesticides/imidacloprid/docs/ImidaclopridRiskAssessme nt. pdf

Mineau, P. and Palmer, C. 2013. The Impact of the Nation's Most Widely Used Insecticides on Birds. American Bird Conservancy.

National Marine Fisheries Service. 2008. Endangered Species Act Section 7 Consultation Biological Opinion Environmental Protection Agency Registration of Pesticides Containing Chlorpyrifos Diazinon and Malathion. Available at: http://www.nmfs.noaa.gov/pr/pdfs/pesticide_biop.pdfNational Research Council, *Assessing Risks to Endangered and Threatened Species from Pesticides*. 2013. Available at: http://www.nap.edu/catalog.php?record_id=18344

Northwest Coalition for Alternatives to Pesticides, et al. 2006. Petition to Require Disclosure of

Hazardous Inert Ingredients on Pesticide Product Labels.

Roessink I, et al. 2013.The neonicotinoid imidacloprid shows high chronic toxicity to mayfly nymphs. *Environ Toxicol Chem*. 2013 Apr. 32(5):1096-100. doi: 10.1002/etc.2201

Starner, K. and Goh, K. 2012. Detections of the Neonicotinoid Insecticide Imidacloprid in Surface Waters of Three Agricultural Regions of California, USA 2010-2011. *Bull Environ Contam Toxicol* (2012) 88:316-321.