NORTHWEST CENTER FOR ALTERNATIVES TO PESTICIDES

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Dear Mr. Rockett,

Thank you for the opportunity to provide comments on the Supplemental Environmental Impact Statement (SEIS) examining a new alternative for the use of imidacloprid to battle burrowing shrimp in Willapa Bay and Grays Harbor. These comments are being submitted jointly by the undersigned organizations representing thousands of Washington and Oregon residents and joining Northwest Center for Alternatives to Pesticides (NCAP) in expressing concerns about the proposed pesticide application. We have reviewed the SEIS as well as the Sediment Impact Zone Application (SIZ) that describe the proposed action and preliminary field trials.

SEIS Overview

The Washington Department of Ecology has issued an SEIS to re-examine allowing imidacloprid insecticide application to the waters of Willapa Bay and Grays Harbor. The use of imidacloprid is intended to control two native species of burrowing shrimp: ghost shrimp (*Neotrypaea californiensis*) and mud shrimp (*Upogebia pugettensis*). These shrimp impact the Pacific Coast commercial clam and oyster production by destroying the composition of intertidal soil, which causes oysters and clams to sink and suffocate. Ecology does not identify a preferred alternative, however the SEIS presents a reduced-scale alternative not previously considered - application of imidacloprid on up to 500 acres per year in the two bays, with application to occur from boats or ground equipment, rather than helicopter. The SEIS seems to hold out the possibility that subsurface injectors may be also used during the permit period. The total treatable area over the 5-year term of the permit could range up to 2,500 acres, rather than the previously approved 10,000 acres. While the total area to be treated is reduced, the rate of application is the same (0.5 lb a.i./A) as in the previously permitted alternative.

Members of the Willapa Grays Harbor Oyster Growers Association (WGHOGA) have claimed in the press that the redesigned proposal is now "extremely targeted." One oyster grower describes the proposal as "a protective boundary."

Our Objections

We have identified numerous objections to the newly proposed alternative, as summarized below.

Toxicity to Non-Target Aquatic Invertebrates is Addressed in SEIS, but Evidence for Minimal Impact is Lacking or Contradictory in the SEIS

We cannot agree that the new alternative is "extremely targeted." Nothing has changed about the active ingredient proposed. The pesticide imidacloprid is a broad-spectrum insecticide that kills, at very low concentrations, a very wide range of invertebrates. Imidacloprid labels clearly warn that the chemical is highly toxic to aquatic invertebrates.

Ecology acknowledges (p. 1-8) that high concentrations are expected during the first rising tide with concentrations of up to 1,600 ppb (even though concentrations of up to 4,200 ppb were apparently measured in field studies completed in 2012). Ecology also claims that flushing is expected to dilute dissolved imidacloprid to "undetectable levels" within 2-3 tidal cycles (page 1-8). However, one needs to dig deeper in the document (page 3-5) to find that data from the 2014 field trials show that on half of the sites treated experimentally, concentrations of imidacloprid in sediments or porewater ranged from 6.8-18 ppb fourteen days after the treatment.

The United State Environmental Protection Agency (EPA) in its 2017 preliminary aquatic risk assessment of imidacloprid, finds imidacloprid acutely toxic to aquatic invertebrates at levels ranging from <1 ppb to 85,200 ppb.[1] Seed shrimp (Ostracoda), a widely distributed group of aquatic invertebrates important to both saltwater and freshwater ecosystems, is tagged as the most sensitive group of crustaceans for which data is available, with acute EC50 values of 1–3 ppb, obviously a value thousands of times less than the initial expected concentrations if the 2012 field studies are to serve as a guide. Specific studies on saltwater species are less frequent but blue crab shows a 24-hr LC-50 of 10 ppb. Taken as a whole, the studies cited in the EPA risk assessment suggest that a wide variety of benthic and free-floating aquatic invertebrates will die at—and near— the treatment sites.

On page 1-7 of the document, we find the curious statement: *The more limited studies of imidacloprid in marine environments, including the multiple field trials in Willapa Bay, document that imidacloprid is also toxic to marine invertebrates, but at higher concentrations or longer exposures compared to sensitive freshwater invertebrates.* This seems like a sweeping overreach given that marine studies are rather lacking in number compared to freshwater studies.

Still, despite the limited number of marine studies and despite the information presented on ostracods which are important to saltwater ecosystems, Ecology has chosen (p. 3-20) to adopt the level of 16.5 ppb as its acute toxicity criterion. We believe this adopted level is short-sighted and too high.

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[1] We cite this document several times in our letter but will only reference it once here. The risk assessment is: U.S. Environmental Protection Agency (USEPA). 2017. Preliminary aquatic risk assessment to support the registration review of imidacloprid. PC Code 129099. DP Barcode 429937. USEPA, Office of Chemical Safety and Pollution Prevention, Washington D.C. Prepared by USEPA Office of Pesticide Programs, Environmental Fate and Effects Division, Washington D.C.
https://www.regulations.gov/document?D=EPA-HQ-OPP-2008-0844-1086

Chronic toxicity to freshwater aquatic invertebrates is also discussed in the EPA 2017 risk assessment, with values of 0.01 - 1,800 ppb presented (some are LOAEC values, but not the 0.01 value). Only two studies explore saltwater aquatic invertebrate chronic toxicity values, with the most sensitive value (NOAEC) attributed to mysid shrimp at 0.163 ppb. Mysid shrimp are not just laboratory animals. Mysids are found throughout the world in both shallow and deep marine waters where they can be benthic or pelagic, and they are also important in some freshwater and brackish ecosystems.[2] Mysid shrimp are also documented as occurring in Willapa Bay.[3]

What is not clear in the SEIS is how far lethal effects will extend away from the treatment site and whether concentrations of either imidacloprid, or any of its degradates, will result in longer-term chronic effects to aquatic invertebrates at the treatment site or elsewhere in the estuaries. Ecology claims that flushing is expected to dilute imidacloprid to "undetectable levels" at most a month or two beyond the application date. However, "detectable limits" appear to be the screening values of 6.7 and 0.6 ppb for whole sediment and sediment porewater, respectively and 3.7 ppb for surface water (SIZ application). According to the SIZ description of the methodology, when concentrations at 60m from the treated plots were lower than 3.7 ppb, samples collected at further distance were not analyzed. This methodology left important data gaps in the analysis, especially given that we know that both lethal and chronic impacts can affect aquatic invertebrates at concentrations less than 3.7 ppb.

We are disappointed that these "screening" or detectable levels were set unacceptably high in the field trials, considering other laboratories at this time were using technologies that allow detections at much lower concentrations. Levels of detection can vary widely between laboratories, but three examples show that it is more than feasible to detect dissolved imidacloprid down to the 0.02 ppb level.[4]

Ecology further characterizes impacts to benthic invertebrates as localized and short-term, claiming that field trials showed benthic invertebrate populations recovering quickly within 2-4 weeks after treatment. While the field trials were important precursors to the completion of the SEIS, we are skeptical that these results can be relied upon long-term when large portions of the bays will receive treatment - ten times the area exposed during experimental applications. Most systems can recover from short-term irregular perturbations. It is not so clear that a system like this can recover from a series of perturbations such as would occur with annual imidacloprid applications across much larger geographic footprints than those tested during experimental field trials.

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[2] Wikipedia. Mysidia. https://en.wikipedia.org/wiki/Mysida

[3] Graham, Eileen. 2010. Estuaries and Coasts 33:182-194. https://link.springer.com/article/10.1007/s12237-009-9235-z

[4] For example, Hladik and Kolpin (2015) reporting on US Geological Survey studies of imidacloprid, report their theoretical level of detection (LOD) for imidacloprid as 2 ng/L, while the method detection limits (MDL) ranged from 3.6 to 6.2 ng/L. To contrast, the Department of Environmental Quality laboratory in Hillsboro Oregon has minimum reporting limits of about 21.6 ng/L. The Washington State Department of Agriculture lists its imidacloprid reporting limit as 0.02 ug/L, about in line with the detection limit in Oregon.

Whether the outcome can truly be characterized as localized or short-term is at the heart of our concern. The SEIS (page 1-37) claims that laboratory studies show that sub-lethal effects of imidacloprid are reversed once the chemical is removed. Since this statement is not cited, it is difficult to know which studies are the source of this statement. On the contrary, we are aware that some authors [5,6] note that since neonicotinoids bind virtually irreversibly to the nicotinic-acetylcholine receptors in invertebrate nervous systems, the damage can accumulate, and therefore the toxic effects can be reinforced with chronic exposure—a phenomenon known as time-cumulative toxicity or delayed mortality. This is an important aspect of the property of neonicotinoids that should be taken into account when interpreting the standard tests and endpoints for aquatic invertebrates, since results likely underestimate the true toxic potential of these insecticides. Actual mortality at low concentrations may still be a result, but may occur at a longer time frame than that allowed in the standard laboratory study or those captured in the field trials.

Presence Of Data Gaps Undermines Ecology's Conclusion Of No Significant Adverse Effects
Ecology notes that its literature review notes "some scientific data gaps, including effects of imidacloprid to marine invertebrates from chronic exposure, the long-term persistence of imidacloprid in marine sediments, and indirect effects to species or food chains due to reductions in invertebrate numbers following imidacloprid exposure." These data gaps are mentioned as if they are of passing interest and seem to play no role in Ecology's ultimate conclusion of no significant adverse impacts. Risking these delicate and rare estuarine environments without understanding these critical effects is irresponsible.

Ecology's reasoning in concluding no significant adverse effects and that impacts would be both short-term and localized rests heavily on a few key assumptions:

a) That the area treated represents a small percentage of the overall bay area. This reasoning is significantly undermined by the admission that imidacloprid in the treated areas would soon disperse throughout the bays as a result of tidal action.
b) That tidal flushing will soon dilute dissolved imidacloprid to undetectable levels. While the field studies do show that dilution occurs, concentrations in sediments and sediment porewater appear to remain higher than levels known to be acutely or chronically toxic to aquatic invertebrates for as long as 56 days. Furthermore, limits of detection are not the same as toxicity endpoints.
c) That at the treated sites, concentrations will decline rapidly. It is reported in the SEIS that 2011-2012 field trials found sediment porewater concentration ranging from 8-20 ppb one

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[5] Rondeau, G., Sánchez-Bayo, F., Tennekes, H. A., Decourtye, A., Ramírez- Romero, R., and Desneux, N. (2014). Delayed and time-cumulative toxicity of imidacloprid in bees, ants and termites. *Sci. Rep.* 4:5566. doi: 10.1038/srep05566

[6] Sanchez-Bayo, F. K. Goka, and D. Hayasaka. 2016. Contamination of the aquatic environment with neonicotinoids: its implication for ecosystems. *Front. Environ. Sci. 4:71. doi: 10.3389/fenvs.2016.00071*

day after treatment. Yet it took another 55 days to get concentrations down to 0-0.5 ppb. At 0.5 ppb, we would still expect chronic impacts, based on the studies presented above. Moreover, the SEIS makes clear that sediments with higher levels of organic material seem to degrade imidacloprid more slowly.

d) That off-site impacts are discountable. In fact, the footprint of off-site impacts remain very poorly understood. Ecology reports that "detectable" levels were found as far as 2,316 feet away from experimental plots. This is approximately one half mile. This is a fairly large distance, and we really don't know if the methodology used missed detecting imidacloprid at environmentally relevant concentrations at points more distant. Detectable limits were set higher than levels known to result in impacts to some species, and there seems to not have been an attempt to measure imidacloprid levels at points throughout the bays. Thus, at a minimum, we might expect impacts to half-mile circles around each spray site. This dramatically increases the footprint of impact, but is never presented quantitatively or spatially in this way in the SEIS.

e) That typical atmospheric conditions are of no consequence in dispersing the chemical to much wider areas. Applicators could apply under any wind speed as long as speeds "average" 10 mph or less. No mention is made of gusts that could carry the spray. No quantitative analysis is presented of the distance that drift could carry the pesticide at wind speeds of 10 mph. We are instead presented with a list of drift mitigation measures and left to assume that the drift management mitigations will result in a negligible quantity of drift.

Field Trials Left Many Questions Unanswered

Despite field trials that determined detectable levels were located at a distance of 2,316 feet, Ecology concludes that imidacloprid in water is "expected to have a low to moderate impact to cause ecological impacts in non-target areas." (p. 1-17).

The field studies appear to have a number of deficiencies that make this conclusion—and the reassurance that recovery on treated sites would occur rapidly—questionable. The field studies, as summarized in the SIZ and in Appendix A of the SEIS, contain important information about methodology and results, that do not appear to be adequately taken into account in Ecology's conclusions. For instance,

a) In the 2011-2012, apparently megafauna mortality was only measured up to 150-164 feet away from the treatment site (2011-2012 studies). Had the study measured megafauna mortality more than 150 feet away, what would have been found? In the 2014 study, there appeared to be no attempt to measure megafauna mortality beyond the "edges" of the treatment area.

b) The 2011 study control and treatment plots differed markedly at the start of the experiment, making interpretation of results at the conclusion of the treatment difficult.

c) Ecology reports (p. 1-8) that field trials showed recovery by 28 days post-treatment but apparently the reality is not that simple. In fact, recovery was not seen by this time in the 2011 Cedar River site. In addition, a more detailed summary of the 2014 field trial (page A-

22) notes that "However, as in previous years, variability in benthic abundance collections was high and statistical power was weak."

d) Deep in the report on page A-25 is this curious statement:

Ecology determined that the "effects of imidacloprid cannot be discerned from seasonality and site variation or that relative recovery or recolonization is occurring within the 14-day period between the treatment date and first round of samples" (TCP April 17, 2015 memo). The 2014 benthic monitoring continued trends to date; all but one of the study monitoring locations have occurred in areas of low total organic carbon (less than 1% TOC) or high oceanic flushing. (emphasis added)

We understand that at least some areas with high organic carbon would be included in the treatment areas. Were the study sites selected to be representative of the areas to be sprayed? This statement leaves us with much concern.

In summary, we have concerns over the methodology of the field trials and the use of the conclusions to available evidence is simply not sufficient to conclude that the action would have no significant adverse effect on the ecology of the two bays.

Inadequate Analysis of the Effects to Threatened and Endangered Species

The analysis does a disservice to conservation by mostly limiting its analysis on listed species to an assessment of whether listed species would be directly impacted through toxic effects. Almost nothing is said about the impact to the prey base and ecological food web that supports these important and rare species.

The SEIS cites a study that showed that the green sturgeon diet may seasonally consist of up to 50% burrowing shrimp, but then fails to estimate the impact to its prey base.

No Recognition of Potential Impact to Two Nearby National Wildlife Refuges

Both water bodies host National Wildlife Refuges. The presence of these treasured and important federally-designated conservation sites is not even mentioned in the SEIS, nor is there any analysis of the potential impact to the ability of these Refuges to continue to fulfill their purposes.

Impacts to Dungeness Crab

The SEIS acknowledges that Dungeness crab and its planktonic forms will likely be killed in the areas sprayed, but discounts the likelihood that impacts would extend much beyond the sprayed areas. Dungeness crab is a treasured food resource to Washington residents, supporting both recreational and commercial harvest. According to Washington Department of Fish and Wildlife, Washington's coastal commercial crab grounds extend from the Columbia River to Cape Flattery near Neah Bay and include the estuary of the Columbia River, Grays Harbor, and Willapa Bay.[7] Would the State really risk commercial and recreational crabbing in these bays on the basis of the evidence presented so far?

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[7] See Washington Department of Fish and Wildlife at http://wdfw.wa.gov/fishing/commercial/crab/coastal/

Uncertainty Regarding Important Indirect Effects
The report acknowledges the uncertainty of whether treatment would result in resistance developing in the burrowing shrimp. The report makes no mention of whether Washington's citizens should be concerned about outbreaks of secondary pest/disease issues as a result of the treatment. Such secondary outbreaks are commonly associated with broad-spectrum pesticide use, and if they occurred, could create serious imbalances in the tidal ecology.

Ecology Understates Imidacloprid Properties (Environmental Fate) In Predicting Effects
Imidacloprid is water-soluble. The EPA's recent aquatic risk assessment cites solubility values ranging from 580-610 mg/L, a range classified as high by the widely used Pesticide Properties Database at U. Hertfordshire (although according to the US-based National Pesticide Information Center's system it would classify as moderately soluble). Across the country, imidacloprid is one of the most commonly detected pesticides in our water, detected in 13% of streams sampled by the US Geological Survey[8] —even though in most cases it's applied in terrestrial environments. Applying it directly to water that fluctuates twice daily according to the tides means that imidacloprid will dissolve readily after application and will then spread throughout the bays.

Imidacloprid's persistence is a concern. Ecology acknowledges that studies in the marine or estuarine environment are decidedly fewer than those in terrestrial environments. For example, the EPA risk assessment presents no studies that would help us truly understand the persistence of imidacloprid in the estuarine environment. Furthermore, the 2013 EPA registration that allows this use of imidacloprid in the estuarine environment is conditional, which means that studies to deem the application state are incomplete.

The EPA's preliminary aquatic risk assessment characterizes imidacloprid as "persistent in terrestrial and aquatic environments with the exception of conditions that favor aqueous photolysis." The SEIS claims that hydrolysis is one of the mechanisms that will result in breakdown of imidacloprid, but according to the EPA report, imidacloprid is stable to hydrolysis.

Ecology references field trials conducted in 2012 and 2014 that confirm imidacloprid persistence in sediment after application (Hart Crowser 2013 and 2016). The 2012 results documented detectable concentrations of imidacloprid at 56 days for two of five sampled locations, both of which were "below screening levels." As mentioned previously, we have no confidence in the screening levels selected, given studies referenced in EPA that show both lethal and chronic impacts to some aquatic invertebrates below these levels. Given that in some environments, imidacloprid is known to last for years, we do not believe that the window for time to measure environmentally relevant concentrations has been adequately explored.

Buffers to Protect Against Human Consumption are Inadequate

[8] EPA preliminary aquatic risk assessment, p. 9.

The buffers prohibiting harvest in proximity to treated areas—no harvest 25 feet from treated areas under Alt. 4—are framed as mitigations against the possibility of human consumption of imidacloprid. Once again, these are completely inadequate when we are talking about a highly soluble, persistent chemical that will readily disperse away from treated areas.

Monitoring Required Under The Permit is Inadequately Described

Ecology would (if the permit is issued) require that WGHOGA conduct long-term persistence monitoring of imidacloprid in sediments and monitor the effects of imidacloprid applications on invertebrates, including Dungeness crab. What kind of funding will be allocated to this? Will monitoring design capture all potential impacts?

Ecology Mission

We believe that approving the permit under Alternative 4 of the SEIS would be inconsistent with the mission of the Department of Ecology: "to protect, preserve and enhance Washington's land, air and water for current and future generations."

Our Recommendations

We recognize the importance of the oyster industry to Pacific County and to the state of Washington. Nonetheless, those involved need to go back to the drawing board. It is simply unacceptable to threaten the biological integrity of Washington's tidelands—which are critical to so many species of fish and birds—through the use of a highly toxic, highly soluble, and highly persistent pesticide.

Imidacloprid is on the table as an alternative to carbaryl, which was available in the past for the control of burrowing shrimp populations. We are pleased that reinstating carbaryl is not considered a viable option. Carbaryl is controversial in its own right due to its links to cancer and its risk to salmonids.

We support efforts to improve Integrated Pest Management (IPM) practices, research and demonstration. The SEIS states that commercial shellfish growers have been investigating mechanical means, alternative culture methods, various chemicals, and biocontrols for burrowing shrimp since the 1950s, and claims that only pesticide applications were found to be effective, reliable, and economical on a commercial scale.

The SEIS states that alternative culture techniques, such as long-line and bag culture, "would not support the shucked meat market that is the focus of most oyster culture in Willapa Bay, and would require large changes in the culture, harvest, processing, and marketing from these estuaries." All industries face challenges and constraints that they would prefer go away. While we do not advocate for disruption of any industry, we believe that the preferable position is for this industry to adapt, rather than expecting to contaminate estuaries critical to coastal and marine biodiversity home to numerous rare species, and a location for important fisheries including crabbing.

Timely efforts are needed to expand promising alternatives. Investments should be made in educational, technical, financial, policy, and market support to accelerate adoption of alternatives rather than continuing to rely on highly toxic pesticides. Research and demonstration are needed to determine and improve the most effective alternatives and their respective potential and feasibility for farms of different sizes, locations, shrimp population density, and access to equipment. The state should invest its resources in these efforts prior to and instead of allowing toxic contamination of state estuaries.

Department of Ecology must protect Washington's water, wildlife, public health, and local economies from the harmful impacts of toxic pesticides.

Thank you for the opportunity to comment.

Sincerely,

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