CENTER FOR FOOD SAFETY

November 1, 2017

Derek Rockett, Water Quality Program
Washington State Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504

Re: Comments on Supplemental Environmental Impact Statement for Control of Burrowing Shrimp using Imidacloprid on Commercial Oyster and Clam Beds in Willapa Bay and Grays Harbor, Washington

Introduction

Thank you for the opportunity to comment on the Washington Department of Ecology (Ecology)'s Supplemental Environmental Impact Statement (SEIS) for Control of Burrowing Shrimp using Imidacloprid on Commercial Oyster and Clam Beds in Willapa Bay and Grays Harbor, Washington. These comments are submitted on behalf of Center for Food Safety, Center for Biological Diversity, and the Western Environmental Law Center.

Center for Food Safety (CFS) is a national non-profit organization representing over 900,000 members nationwide and tens of thousands in Washington State. CFS uses education, policy and legislation, and impact litigation to address the negative effects to public health and the environment from harmful food production technologies, and supports ecological food production, like organic and beyond. CFS operates in the Pacific Northwest and is particularly concerned with the increasingly industrial aquaculture and in particular the use of pesticides in shellfish aquaculture.

Center for Biological Diversity is a national non-profit organization with offices in the Northwest and throughout the country, dedicated to the protection of diverse native species and their habitats through science, policy, education, and law. The Center has over 1.3 million members and online activists throughout the United States, including many in Washington State.

The Western Environmental Law Center uses the power of the law to safeguard the public lands, wildlife, and communities of the American West in the face of a changing climate. We envision a thriving, resilient West, abundant with protected public lands and wildlife, powered by clean energy, and defended by communities rooted in an ethic of conservation. As a public interest

NATIONAL HEADQUARTERS
660 Pennsylvania Avenue, SE, Suite 302
Washington, D.C. 20003
T: 202-547-9359 F: 202-547-9429

CALIFORNIA OFFICE
303 Sacramento Street, 2nd Floor
San Francisco, CA 94111
T: 415-826-2770 F: 415-826-0507

PACIFIC NORTHWEST OFFICE
917 SW Oak Street, Suite 300
Portland, OR 97205
T: 971-271-7372 F: 971-271-7374

HAWAI`I OFFICE
1132 Bishop Street, Suite 2107
Honolulu, Hawaii 96813
T: 808-681-7688

office@centerforfoodsafety.org centerforfoodsafety.org

law firm, WELC integrates national policies and regional perspective in partnership with our clients to implement smart and appropriate place-based solutions.

While we applaud Ecology for drafting the SEIS to evaluate the science that has evolved since the Final EIS for imidacloprid use in Willapa Bay and Grays Harbor, we believe the draft SEIS fails to adequately assess all new information and a reasonable range of alternatives, and accordingly Ecology should ***not*** move forward with a Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit or Sediment Impact Zones for imidacloprid use in Washington waters. The SEIS identifies significant unknowns and data gaps, and what we do know about neonicotinoids is extremely disturbing. Imidacloprid is the oldest and most toxic of the neonicotinoid insecticides. Regulators around the world are finally waking up to the pollution of our soils and waterways with this class of insecticides and the extremely harmful consequences[1]—a second Silent Spring[2] according to some experts. Pesticides, more accurately described as "biocides" because they rarely only kill "pests," are designed to kill living things and as such their use in marine and estuarine environments will have negative unintended effects. To continue the toxic legacy of carbaryl with another pesticide will only continue the pesticide treadmill. Not only is imidacloprid not the only option for restoring balance to the Bay, it is unlikely to be effective in achieving long-term ecological balance. More than 50 years of carbaryl use (a likely carcinogen) has not solved the shrimp problem identified by some shellfish growers, and there is no indication that imidacloprid will be any different. Indeed, the efficacy shown through field trials indicates that this plan is ready-made to breed resistant burrowing shrimp. While the poisoning of public waters may provide some limited short-term relief, it is not a long-term solution.

The SEIS, although acknowledging some likely harms and many unknowns, still concludes that there will be no significant unavoidable adverse effects of spraying imidacloprid into the Bay, or that any impacts will be localized and short-term. This conclusion is not supported by the science, and reliance on the unpublished research of Kim Patten is inappropriate, given his ethical violations

---

[1] In response to alarming levels of aquatic contamination and impacts to pollinators, Canada's Pesticide Management Regulatory Agency (PMRA) is currently considering a ban on imidacloprid, https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/consultations/proposed-re-evaluation-decisions/2016/imidacloprid /document.html, (*see also* CFS Comments to Health Canada PMRA on Proposed Re-evalution Decision PRVD2016-20, Imidacloprid, attached as Exhibit A). In Europe, a temporary ban on major neonicotinoids is poised to become a permanent ban. Damian Carrington, *Europe poised for total ban on bee-harming pesticides*, The Guardian (Mar. 23, 2017). France has already imposed a full ban on neonicotinoids. *France says ban on neonicotinoids will go ahead in 2018*, Farming UK (June 28, 2017).

[2] *Silent Spring*, a book by Rachel Carson published in 1962, detailed the detrimental effects of indiscriminate pesticide use—leading to the ban on DDT and inspiring the environmental movement and creation of the Environmental Protection Agency.

showing close ties to the shellfish growers that are the permit proponents.[3] Further, Ecology cannot evaluate the shellfish growers' plan in a vacuum, or as compared only to the old, now abandoned, plan to spray even more acreage. Rather, Ecology must evaluate a range of reasonable alternatives, including more environmentally protective alternatives, to the proposed NPDES permit. Given the massive uncertainties and the known harmful impacts, it is simply not worth the risk to use a dangerous neurotoxin in public waters that provide essential habitat to so many species.

State Environmental Policy Act

The State Environmental Policy Act ("SEPA") is Washington's core environmental policy and review statute. Like its federal counterpart, the National Environmental Policy Act ("NEPA"), SEPA broadly serves two purposes: first, to ensure that government decision-makers are fully apprised of the environmental consequences of their actions and, second, to encourage public participation in the consideration of environmental impacts. *Norway Hill Preservation and Prot. Ass'n v. King Co*, 87 Wn.2d 267, 279 (1976). For decades, SEPA has served these purposes effectively, requiring full environmental reviews for projects with significant environmental impacts.

SEPA was enacted to "encourage productive and enjoyable harmony between humankind and the environment" and to "prevent or eliminate damage to the environment and biosphere." RCW 43.21C.010. Thus in adopting SEPA, the Washington legislature declared the protection of the environment to be a core state priority, "recognize[ing] that each person has a fundamental and inalienable right to a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment." RCW 43.21C.020(3). This policy statement, which is stronger than a similar statement in the federal counterpart of NEPA, "indicates in the strongest possible terms the basic importance of environmental concerns to the people of the state." *Leschi v. Highway Comm'n*, 84 Wn.2d 271, 279–80 (1974).

SEPA is more than a purely "procedural" statute that encourages informed and politically accountable decision-making. SEPA requires agencies to integrate environmental concerns into their decision making processes by studying and explaining environmental consequences before decisions are made. *See Stempel v. Dep't of Water Resources*, 82 Wn.2d 109, 117–18 (1973). In enacting SEPA, the state legislature gave decision-makers the affirmative authority to deny projects where environmental impacts are significant, cannot be mitigated, and collide with local rules or policies. SEPA provides substantive authority for government agencies to condition or even deny proposed actions—even where they meet all other requirements of the law—based on their environmental impacts. RCW 43.21C.060. As one treatise points out, when this premise was challenged by project proponents early in SEPA's history, "the courts consistently and emphatically responded that even if the action previously had been ministerial, it became *environmentally discretionary* with the enactment of SEPA."[4]

[3] Washington State Executive Ethics Board, Investigative Report and Board Determination of Reasonable Cause, No. 2017-012, Kim Patten, Director WSU Pacific County Ext. (July 20, 2017), attached as Exhibit B.
[4] Richard Settle, *SEPA: A Legal and Policy Analysis*, §18.01[2] (2014) (emphasis added).

Discussion

I. Purpose and Objectives

Each EIS must "specify[] the purpose and need to which the proposal is responding . . .." WAC 197-11-440(4). Because the stated purpose and need for an action determines the range of alternatives, it is essential that the agency articulates the project's purpose and need from the agency's perspective rather than simply adopting the project proponent's objectives for the project as its own. As courts have cautioned, "[o]ne obvious way for an agency to slip past the structures of NEPA is to contrive a purpose so slender as to define competing 'reasonable alternatives' out of consideration (and even out of existence.)" *Davis v. Mineta*, 302 F.3d 1104, 1119 (10th Cir. 2002).

Here, Ecology has identified the objectives of the proposed action as "[p]reserve[ing] and maintain[ing] the viability of clams and oysters commercially grown in Willapa Bay and Grays Harbor by controlling populations of two species of burrowing shrimp on commercial shellfish beds," and "[p]reserve[ing] and restor[ing] selected commercial shellfish beds in Willapa Bay and Grays Harbor that are at risk of loss due to sediment destabilization caused by burrowing shrimp." SEIS at 2-1. By adopting the proponent's purpose and need statement for the proposed action, Ecology has unnecessarily limited the range of potential alternatives that could meet the true object—namely, ensuring the viability of clams and oysters commercially grown in Willapa Bay and Grays Harbor. While it is true that the impact of burrowing shrimp on the shellfish beds in the region are the focus of the proposed permit, limiting the scope of analysis to only solutions that will address that one piece of the puzzle is problematic. Indeed, as discussed below, to date, Ecology has failed to identify any "reasonable alternatives," WAC 197-11-440(b)(5), to the proposed action. This indicates that the purpose and need is too narrowly defined.

Ecology's stated purpose and need is myopically focused on "controlling" burrowing shrimp and to ease the impacts on beds "destabliz[ed]" by the shrimp. These limiting clauses swallow the larger goal of the action, protecting the shellfish harvest from these areas. That is, controlling (or extirpating) the native burrowing shrimp cannot, or at least should not be, Ecology's purpose here. Rather, finding a solution that will allow Willapa Bay and Gray Harbor to continue to support viable shellfish operations while maintaining their ecological integrity and vitality should be the goal of this proposal. The purpose and need as stated does not allow the consideration of viable alternatives that could allow this to happen, with less environmental impact than the proposed action.

II. Reasonable Alternatives

SEPA requires that an EIS contain a detailed discussion of alternatives to the proposed action. RCW 43.21C.030(c)(iii). SEPA's regulations provide that an EIS must consider as alternatives those "actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation." WAC § 197–11–440(5)(b). The discussion of alternatives in an EIS need not be exhaustive, but the EIS must present sufficient information for a reasoned choice among alternatives. *Toandos Peninsula Ass'n v. Jefferson Cy.,* 32 Wash. App. 473, 483 (1982).

A. The Alternatives Considered are Not Reasonable Alternatives

Here, Ecology has failed to consider any "reasonable" alternatives. Instead, in addition to the "no action" alternative, Ecology has proposed a single, more environmentally harmful alternative. This, by definition, is not a reasonable alternative. As a result, Ecology has wholly failed to comply with SEPA.

Ecology has identified the proposed action as authorizing an individual NPDES permit to authorize chemical applications of imidacloprid on up 485 acres per year of commercial clam and oyster beds within Willapa Bay, and up to 15 acres per year within Grays Harbor. With this established as the proposal, Ecology must develop, consider and explain the impacts of reasonable alternatives.

Ostensibly, Ecology will claim to have offered four alternatives for consideration: the no action alterative, Alternative 2: Continue Historical Management Practices – Carbaryl Applications with Integrated Pest Management (IPM); Alternative 3: Imidacloprid Applications with IPM on up to 2,000 acres per year in Willapa Bay and Grays Harbor, with aerial applications by helicopter, and Alternative 4: Imidacloprid Applications with IPM on up to 500 acres per year in Willapa Bay and Grays Harbor, with no aerial applications by helicopter. In addition, Ecology summarily dismisses several other alternatives, which according to the agency were considered but eliminated from detailed evaluation. However, Ecology notes that it is no longer considering Alternative 2. This leaves only the "no action" alternative and Alternative 3, against which the environmental impacts of Alternative 4, the proposed action, can be judged. It is unclear why Ecology is still considering Alternative 3, given that the current proposal by the WGHOGA is Alternative 4.

"The Washington Supreme Court has emphasized that the focus of SEPA is environmental impacts, explaining that a reasonable alternative is one that could feasibly attain or approximate a proposal's objectives *at a lower cost to the environment*." *Pub. Util. Dist. No. 1 of Clark Cty. v. Pollution Control Hearings Bd.*, 137 Wash. App. 150, 161–62, 151 P.3d 1067, 1072 (2007) (citing *King County v. Cent. Puget Sound Bd.*, 138 Wash.2d 161, 184–85, 979 P.2d 374 (1999)). Indeed, "[t]he required discussion of alternatives to a proposed project is of major importance, because it provides a basis for a reasoned decision among alternatives having differing environmental impacts." *Weyerhaeuser v. Pierce Cty.*, 124 Wash. 2d 26, 38, 873 P.2d 498, 504 (1994). To ensure this analysis is robust, "[t]here must be a reasonably detailed analysis of a reasonable number and range of alternatives." *Id.*, 124 Wash. 2d at 41 (citing Settle, The Washington State Environmental Policy Act: A Legal and Policy Analysis § 14(b)(ii) (4th ed. 1993)).

Unfortunately, here Ecology has not offered any "reasonable alternatives" for comparison.[5] First, according to Ecology, the "no action" alternative is not a viable alternative. Ecology concludes that under Alternative 1, "it was expected that most productive commercial clam and oyster grounds would decline over the subsequent 4- to 6-year period if no permit was issued to

[5] With respect to Alternative 2, Ecology simply states that the "[u]se of carbaryl for the control of burrowing shrimp populations on Willapa Bay and Grays Harbor commercial shellfish beds is no longer considered by Ecology and other agencies to be a viable alternative," and therefore it will not be considered. SEIS at 2-12. As such, Alternative 2 does not serve as a "reasonable alternative" here.

authorize pesticide applications to treat burrowing shrimp populations." SEIS at 2-12. As a result, if this is true,[6] the no action alternative will not "attain or approximate the proposal's objectives," and thus is not a "reasonable alternative" by definition. Indeed, if this statement is accurate, then Alternative 4 will also fail to meet the purpose and need: if treatment will only take place on 500 acres per year, or a total of 2,500 acres during the life of the permit, then "most" commercial shellfish acreage in Willapa Bay and Grays Harbor will go untreated, as the amount of acreage authorized for shellfish aquaculture in these areas is more than ten times larger.[7] If it is true that "most productive commercial clam and oyster grounds" are subject to decline (on the "order of 60 to 80 percent or more") then even the Alternative 4 proposal will not save the vast majority of oyster and clam grounds in Willapa Bay/Grays Harbor. Ecology should not overstate the nature of the problem here.

Second, according to Ecology, Alternative 3 is *not* less environmentally harmful alternative to the proposed action. In almost every instance, Ecology concludes that the environmental impacts of Alternative 3 will be "[s]imilar to Alternative 4" with respect to various environmental parameters considered, *see* SEIS 1-10–1-33, or worse because it included more acreage and aerial spraying. *See e.g.* SEIS at 2-13 (describing Alternative 4 as a "reduced-impact alternative compared to FEIS Alternative 3 in that the acreage that may be treated under the currently requested permit is approximately two-thirds less"); 2-24 (the "substantive difference" between Alternatives 3 and 4 is the number of acres and the lack of aerial spraying in the currently proposed alternative). As a result, Ecology has failed to demonstrate how Alternative 3 would "attain or approximate a proposal's objectives *at a lower cost to the environment*."

As Alternative 3 was the only "viable" alternative Ecology has presented, it has failed to comply with SEPA. Again, SEPA requires the agency to develop, consider and compare "reasonable alternatives." WAC § 197–11–440(5)(b). Those alternative "*shall include* actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation." *Id.* (emphasis added). Here, this requirement has not been met, and the SEIS is insufficient as a matter of law.

Ecology cannot point to the other alternatives "eliminated from detailed evaluation" to save the SEIS. Although Ecology certainly is permitted to "indicate the main reasons for eliminating alternatives from detailed study," it must nonetheless, "[p]resent a comparison of the environmental impacts of the reasonable alternatives, and include the no action alternative." WAC §§ 197–11–440(5)(b)(v) and (vi). Here, by not providing a more detailed analysis of the other alternatives Ecology has failed to include the required analysis of "reasonable alternative."

---

[6] This claim is made with no citation or corroboration and thus its veracity is seriously questionable.

[7] *See* National Marine Fisheries Service, Endangered Species Act Section 7 Formal Biological Programmatic Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Shellfish Aquaculture Activities in Washington State, 8 (Sept. 2016) (table showing total continuing active and fallow acres of ground-based shellfish activity in Willapa Bay to be 25,965 acres and in Grays Harbor 3,065 acres, based on U.S. Army Corps of Engineers numbers).

If Ecology cannot envision a less environmentally harmful alternative for consideration and analysis, not complying with SEPA is not the correct action. Instead, as discussed above, Ecology likely needs to reevaluate the purpose and object of the proposed action, and broaden the definition to allow the consideration of additional, reasonable measures that could meet the newly defined purpose. Alternatively, Ecology could return the question to the project proponent for them to develop the information necessary for the agency to consider truly reasonable alternatives, which are both viable and cause less environmental harm. Absent taking such a step, Ecology has no choice but to deny the proposed action because it cannot comply with SEPA. RCW 43.21C.060.

B. Reasonable Alternatives Not Considered

Ecology eliminated non-chemical control methods for burrowing shrimp, including mechanical and alternative culture methods, based on unpublished research by Dr. Kim Patten. SEIS at 2-20–2-22. Apparently these methods of shrimp control (which appear variously more and less environmentally destructive, but without more detail it is impossible to know) were eliminated from consideration because they "failed to permanently reduce shrimp populations below the economic threshold (10 burrows/m^2)." SEIS at 2-22. However, given the efficacy of imidacloprid ranging widely from 0% to 97%, (SEIS at A-10, Hart Crowser 2016 at 25), it is unclear why lower efficacy percentages are acceptable as a reasonable alternative when it is imidacloprid, but not when it is a mechanical method.

As explained above, Ecology failed to identify and evaluate a reasonable alternative that is less environmentally harmful, and part of this failure was the unreasonably narrow purpose and need. Stepping back, Ecology must look critically at the *causes* of increased shrimp populations and/or the imbalance of these native invertebrates, before it will find a viable long-term solution. Instead of focusing only on how to kill the shrimp, Ecology should be looking at how to encourage the other elements in the Bay's complex ecology that would bring shrimp into balance.

First, if a loss of predators is part of the problem, than a solution that focuses on restoration of those species' habitat would go a long way to bringing back these needed pieces of the puzzle. Just as in gardening, if aphids are attacking you can spray the whole thing with biocides that will kill off most insects, or you can encourage beneficial insects, like ladybugs, to eat the aphids. The former may seem like a quick and easy solution, but it does not stop pests in the long term. This is the lesson from terrestrial agriculture: industrial farming has been relying on chemical pest control for decades but still has major pest problems, whereas more and more evidence indicates that encouraging a diverse array of insects, many of which are beneficial, will keep pests in check.[8] Thus,

[8] *See e.g.* David W. Crowder et al., *Organic Agriculture Promotes Evenness and Natural Pest Control*, 466 Nature 109 (2010) http://www.nature.com.lawpx.lclark.edu/nature/journal/v466/n7302/full/nature09183.html; Matthew J.W. Cock et al., *Trends in the Classical Biological Control of Insect Pests by Insects: An Update of the BIOCAT Database*, 61 BioControl 349 (2016), https://link.springer.com/article/10.1007%2Fs10526-016-9726-3; Matthias Tschumi et al., *Tailored Flower Strips Promote Natural Enemy Biodiversity and Pest Control in Potato Crops*, 53 J. Applied Ecology 1169 (2016). doi:10.1111/1365-2664.12653; Robin Drieu & Adrien Rusch, *Conserving Species-Rich Predator Assemblages Strengthens Natural Pest Control in a Climate Warming Context*, 19 Ag. Forest Entomology 52 (2016) 10.1111/afe.12180.

an alternative that involves restoration of crucial shrimp-predator habitat could be both viable to control shrimp populations in the long-term and be more environmentally beneficial. It cannot be forgotten that the burrowing shrimp play an important role in the ecology of the Bay.

Second, Ecology failed to examine the interplay between eelgrass and shrimp in the SEIS, beyond noting that burrowing shrimp can inhibit eelgrass growth and density. *See e.g.* SEIS at 1-18. But this relationship runs both ways, as Ecology itself noted in its FEIS for the use of imazamox on Japanese eelgrass: research shows that "eelgrasses can reduce numbers of burrowing shrimp (ghost shrimp and mud shrimp) that are also problem species for shellfish growers. (Feldman et al. 2000; and Harrison 1987 as cited in Fisher Bradley and Patten 2011)."[9] This includes native *z. marina* and *z. japonica* eelgrasses, whose roots impede shrimp burrowing. So this begs the question of whether the loss of eelgrass is contributing to increased shrimp numbers, and whether the intentional killing of eelgrass through chemical means is contributing. Ecology did not evaluate this interplay, but the same shellfish growers who now seek to use imidacloprid to kill shrimp have for years used imazamox to kill eelgrass, under the guise of the Japanese eelgrass being non-native and harmful to clam production. But Japanese eelgrass deters shrimp as well as native eelgrass. Is it possible that killing off eelgrass has allowed the shrimp to flourish? Growers used chemicals to kill off shrimp (carbaryl), possibly allowing Japanese eelgrass to flourish in their place, then growers got a permit to kill the eelgrass through chemical means, and now shrimp numbers are increased, so the growers are back asking to spray different chemicals to kill off the shrimp. It is a never-ending pesticide treadmill, and because some shellfish growers have identified both eelgrass and burrowing shrimp as pests, they seek to use the easiest and cheapest solution to killing them both. But this is not how nature works—you cannot simply remove one element and assume that balance will be restored. Ecology needs to thoroughly evaluate how the removal of eelgrass may have contributed to an increase in shrimp, along with other causes of shrimp increase, before it can identify reasonable solutions. This may include comparing shrimp recruitment and eelgrass removal in the last few years (i.e. is there an overlap of acreage where eelgrass was sprayed and increased shrimp recruitment?).

Once the causes of shrimp imbalance are better understood, a solution that will actually be effective may be found. Several less environmentally harmful alternatives to the current proposal are also immediately identifiable, and were not considered in the SEIS. These include (or some combination of) the following:

- **Mechanical means (w/o pesticides)**: harrowing to expose shrimp and allow predators to consume them, *see* Comments of Erika Buck, FMO Aquaculture.
- **Alternative culture (w/o pesticides)**: use of techniques that protect oysters from sinking into surface of substrate, while evaluating environmental impacts of these techniques (i.e. sediment retention, plastic introduction, etc).
- **Bay restoration**: would be useful in conjunction with all alternatives, focus on habitat for predators of burrowing shrimp and other wildlife or plants that keep shrimp in check.
- **Imidacloprid w/ increased protections**, such as:
    - **No spraying in areas with higher organic carbon material in sediments**, based on increased persistence of imidacloprid in these sediment types (SEIS at 1-22, 1-35,

[9] Ecology, Final Environmental Impact Statement: Management of Zostera japonica on Commercial Clam Beds in Willapa Bay, Washington, 77-78 (2014).

2-24, 2-25). South Willapa Bay was originally excluded from the Sediment Impact Zone (SIZ) in 2015 because studies showed that imidacloprid would bind more readily to sediments with higher organic carbon. *Id.* at 2-6. Ecology provides no good reason why this been changed in the 2016 proposal when nothing in the intervening years indicates that the persistence is less of a concern; indeed the 2014 field studies did not include areas with higher organic carbon sediments, so are useless in refuting this increased persistence concern. Only one field trial was conducted in an area with high organic carbon (2011, Cedar River) and these results showed greater persistence in sediments and greater impacts to benthic organisms. *Id.* at 3-4.

- **Integrated Pest Management that is actually outlined and evaluated**. As noted in the SEIS, the proposed IPM plan that was supposed to be submitted and approved by Ecology in 2001 was never submitted, nor in conjunction with the 2016 WGHOGA plan. Thus, Ecology and the public have no idea what IPM measures will be taken, and how this may contribute to the efficacy of pesticide use, development of shrimp resistance, and impacts to non-target organisms. The purpose of IPM is to use pesticides as a last resort, with the understanding that they are not a panacea. Without knowing even the basics of the IPM plan that would accompany an imidacloprid NPDES permit, it is unclear how environmentally protective any alternative actually is. An IPM plan for instance might require a certain set of circumstances to be in place before chemicals are used, after attempting other non-chemical methods of control.
- **Lower acreage**
- **Requirement not to treat many small plots in a checkerboard pattern or close together** (which would have greater off-plot impacts, SEIS at 2-14), or a requirement to maintain a certain distance between treated plots each year.
- **Work window restrictions**. For salmon, bull trout, and forage fish, U.S. Army Corps approved work windows for Willapa Bay run from **July 16-Oct. 14**. However, the proposed plan would allow spraying from April 15 to December 15, which could allow spraying outside the windows for salmon, bull trout, and Pacific Sand Lance.[10] Ecology acknowledges the overlap with juvenile salmon out-migration, but summarily concludes that "application methods would minimize potential for direct exposure" (SEIS at 3-30) with no details as to *how* this will happen, or evaluation of whether there is potential for exposure after application, through ingestion of contaminated food, or indirect effects from a reduction in food sources.
- **Buffers**. The only buffer offered in the SEIS for any subsequent permit is a 25-foot buffer for shellfish to be harvested within 30 days. This is wholly inadequate to prevent contact between soon-to-be harvested oysters and clams and imidacloprid drift, given the distances at which imidacloprid was detected in the field trials (at 1,640 and 2,400 feet). This chemical will disperse in water, (that is exactly what the proponents rely on to claim impacts will be limited), and any spraying adjacent to oysters will result in their exposure and filtration of that same water. To allow spraying within 25 feet of oysters that might be harvested the *next day* will ensure contamination. Not only are greater buffers needed to prevent contamination of food, they should be imposed to protect adjacent tide beds. These buffers should be

[10] USACE, Approved Work Windows for Fish Protection for All Marine/Estuarine Areas (Aug. 14, 2012).

based on field research and be sufficient to prevent harmful levels of imidacloprid to drift off of plots being sprayed.

III. Scope and Adequacy of Environmental Review

SEPA requires an EIS for any action that has a "probable significant, adverse environmental impact." RCW 43.21C.031(1). Significance means a reasonable likelihood of more than a moderate adverse impact on environmental quality." WAC 197-11-794.

"A proposal's effects include direct and indirect impacts caused by the proposal. Impacts include . . . the likelihood that the present proposal will serve as precedent for future actions." WAC 197-11-060(4)(d). The scope of impacts includes direct, indirect, and cumulative impacts. WAC 197-11-792. "The range of impacts to be analyzed in an EIS (direct, indirect, and cumulative impacts, WAC 197-11-792) may be wider than the impacts for which mitigation measures are required of applicants." WAC 197-11-060(4)(e). It is implicit in SEPA that an "agency cannot close its eyes to the ultimate probable environmental consequences of its current action." *Cheney v. City of Mountlake Terrace*, 87 Wn.2d 338, 344 (1976).

An EIS must evaluate the likely impacts related to the project. WAC 197-11-060(4). Decision makers must provide a "detailed statement" of environmental impacts. RCW 43.21C.030(2)(c). SEPA requires full disclosure and "detailed" consideration of all affected environmental values. At its heart, SEPA is an "environmental full disclosure law." *Norway Hill Preservation and Protection Association v. King Cnty. Council*, 87 Wn.2d 267 (1976). The *Norway Hill* court also highlighted the legislature's intent that "environmental values be given full consideration in government decision making," and its decision to implement this policy through the procedural provisions of SEPA which "specify the nature and extent of the information that must be provided, and which require its consideration, before a decision is made." *Id.* at 277–78.

Environmental reviews under SEPA must identify significant impacts on the natural and built environment. WAC 197-11-440(6)(e). Such reviews must use sufficient information and disclose areas where information is speculative or unknown. WAC 197-11-080(1), (2). Where there is scientific uncertainty, Washington courts have required agencies to disclose responsible opposing views and resolve differences. These requirements feed into the ultimate standard of review for EISs: adequacy is based on a rule of reason. *Cheney v. Mountlake Terrace,* 87 Wn.2d 338, 344 (1976). Courts require reasonably thorough information disclosure and discussion, good data and analysis to support conclusions, and sufficient information to make a reasoned decision. *Klickitat County Citizens Against Imported Waste v. Klickitat County,* 122 Wn.2d 619, 633 (1993). Sufficiency of the data is also assessed under the "rule of reason," which requires a "'reasonably thorough discussion of the significant aspects of the probable environmental consequences' of the agency's decision." *Weyerhaeuser v. Pierce Cnty.,* 124 Wn.2d 26, 38 (1994) (citations omitted).

In making the similar assessment under NEPA, federal courts require agencies to take a "hard look" at environmental impacts. More specifically, for review of the NEPA claims, the Court must "ensure that an agency has taken the requisite hard look at the environmental consequences of its proposed action, carefully reviewing the record to ascertain whether the agency decision is founded on a reasoned evaluation of the relevant factors." *Te-Moak Tribe v. Interior*, 608 F.3d 592, 599 (9th Cir. 2010) (quoting *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1332 (9th Cir. 1992) (internal quotation marks and citations omitted)). This review must be "searching and careful." *Ocean Advocates v. U.S. Army Corps of Engineers*, 402 F.3d 846, 858 (9th Cir. 2005).

Washington Courts have employed the "hard look" doctrine directly or in other cases have required full disclosure and consideration of environmental values. *See Pub. Util. Dist. No. 1 of Clark Cnty. v. Pollution Control Hearings Bd.*, 137 Wash. App. 150, 158, 151 P.3d 1067, 1070 (2007); *Toward Responsible Dev. v. City of Black Diamond*, 179 Wash. App. 1012 review denied, 180 Wash. 2d 1017, 327 P.3d 54 (2014) (unpublished opinion) ("Courts review an EIS as a whole and examine all of the various components of [the] agency's environmental analysis ... to determine, on the whole, whether the agency has conducted the required 'hard look.'"); *see also Coalition for a Sustainable 520 v. U.S. Department of Transportation*, 881 F. Supp. 2d 1243, 1259 (W.D. Wash. 2012) (holding implicitly that "hard look" under NEPA sufficient for SEPA review). Where "hard look" is not discussed or employed directly, courts have required a "reasonably thorough discussion" of environmental impacts. *See Toward Responsible Dev. v. City of Black Diamond*, 179 Wash. App. (2014); *PT Air Watchers v. State, Dep't of Ecology*, 179 Wash. 2d 919, 927, 319 P.3d 23, 27 (2014) (citing *Norway Hill*, 87 Wn.2d at 275) (requiring "full disclosure and consideration of environmental values").

A. Unknown Impacts/Knowledge Gaps

Ecology acknowledges some of the (significant) areas of uncertainty and data gaps. SEIS 1-33–1-38. Some very concerning data gaps exist, and should be filled before Ecology moves forward with a permit. Among these are the lack of research on impacts to marine species, the lack of multi-year studies on the accumulation of imidacloprid in sediments (particularly high organic carbon sediments that are also proposed for spraying), long-term toxicity to benthic and free-swimming invertebrates, and the species that use them as food sources, a method for determining the treatment threshold to ensure efficacy, the possibility of resistance by burrowing shrimp, and whether changes in season will affect impacts and efficacy (as field trials were limited in time and treatment is proposed for April through December), and the effects of imidacloprid degradation products. These uncertainties alone indicate that more research must be completed; otherwise the impacts of this plan will not be known until it is too late.

As to efficacy and the development of resistance, if Ecology allows imidacloprid to be used on oyster and clam beds, this chemical will be sprayed at levels that will kill anywhere from 30 (or lower) to 90 percent of mud shrimp in any given plot. SEIS at 2-23. Not only does this extreme variability call into question whether this proposal will even work for everyone who wants to use it, but it is very troubling from the point of view of invertebrate resistance. Pesticide resistance in land-based agriculture is common and widespread, even with respect to neonicotinoids.[11] It occurs when

[11] Bass, C., I. Denholm, M.S. Williamson, and R. Nauen. 2015. The global status of insect resistance to neonicotinoid insecticides. *Pesticide Biochemistry and Physiology, 121*, pp. 78-87; Elzaki, M.E.A., J. Pu, Y. Zhu, W. Zhang, H. Sun, M. Wu, and Z. Han. 2017. Cross-resistance among common insecticides and its possible mechanism in Laodelphax striatellus Fallén (Hemiptera: Delphacidae). Oriental Insects, pp. 1-14; Perry, T., P. Batterham, and P.J. Daborn. 2011. The biology of insecticidal activity and resistance. Insect Biochemistry and Molecular Biology, 41(7), 411-422; Voudouris, C.C., M.S. Williamson, P.J. Skouras, A.N. Kati, A. J. Sahinoglou, and J.T. Margaritopoulos. 2017. Evolution of imidacloprid resistance in Myzus persicae in Greece and susceptibility data for spirotetramat. Pest Management Science, 73(9), pp. 1804-1812.

plants or insects evolve in response to a chemical stimulus, such that the chemical no longer kills or harms the species that is targeted. If a chemical is highly effective at killing the target species, then resistance develops slowly, as there is less of a chance for resistant populations to develop. However, when a chemical is used at a concentration that will have a moderate effect on the target species' survival, like the proposed use, then resistance can happen very quickly. Given this uncertainty, we not only question whether the proposed use of imidacloprid is safe, but whether the demonstrated efficacy even justifies its use in the first place. These values are highly variable and it is very likely that, if this proposal is granted, some users will not get any benefit at all. This level of efficacy also lends itself to the quick development of resistance in shrimp, which will further decrease efficacy over the five years of the proposed permit. As discussed elsewhere, however, increasing the concentration, application rates, and/or the geographic scope of the applications brings addition *known and unacceptable* environmental risk. Thus, any "benefits" gained in terms of efficacy will be significantly outweighed by the larger harms caused.

As to imidacloprid degradation products, only imidacloprid is analyzed in this study and all of the field trials submitted so far. Ecology states: "Studies have shown that imidacloprid has eight degradation products as a result of hydrolysis, photolysis, and soil and microbial degradation. These degradation products include: imidacloprid-olefin, 5-hydroxy- imidacloprid, imidacloprid-nitrosimine, imidacloprid-guanidine, imidacloprid-urea, 6-chloronicotinic acid, imidacloprid-guanidine-olefin, and acyclic derivative. The toxicity levels of all the degradation products are equal to or lower than the toxicity of the parent compound (SERA 2005)." SEIS at 3-11. These degradation products are not inert or somehow non-toxic. In fact some of their toxicities may be as high as the parent compound itself. Therefore, if the parent compound can no longer be detected, this should not be taken as any indication that there are not degradation products that are still having toxicities to aquatic invertebrates.

Field Study Flaws and Gaps.

The 2014 field studies in Willipa Bay[12] provide the most recent and extensive analysis of the effects of imidacloprid on marine communities in these tidelands. Unfortunately, we have identified many weaknesses in these field trials, some of which could benefit from a new analysis by Ecology and some of which render the analysis relatively uninformative. We have focused our critique to the analysis of imidacloprid concentrations in surface water, sediment and sediment porewater. The surveys of the effects on benthic and epibenthic invertebrates, unfortunately, are highly subjective due to the extreme variability in these regions and should not be used in decision making.

The screening values used in the 2104 field studies are ***not protective*** of saltwater invertebrates. Therefore, these studies can tell you when unsafe concentrations were present but cannot tell you when safe conditions existed. The screening values used were 3.7 µg/L for surface water, 6.7 µg/L for sediment and 0.6 µg/L for sediment porewater.

---

[12] Hart-Crowser. 2014 Field Investigations. Experimental Trials for Imidacloprid Use in Willapa Bay. Willapa Bay, Washington. January 8, 2016. (hereafter 2014 field study)

1. Surface water

For the surface water we believe the authors underestimated the potential for imidacloprid residues to seep from the sediment back into surface water during sequential tides. While the highest concentrations would certainly be immediately after application, there would likely be some amount of imidacloprid moving from the sediment back into tidewater that subsequently comes back into the bay on a regular basis. Since surface water was not measured after 2 hrs post-application,[13] that remains a significant uncertainty in the field trials.

We also disagree with the authors' decision to use the LC_{50} of the mysid shrimp as the acute toxicity criterion. This value was identified in 2012 and ignores the analyses that have been completed since then.[14] It is also extremely troubling that the authors would pick and choose the surrogate species they feel is most relevant (in this case using the mysid shrimp as the most "relevant invertebrate"). There are very few studies done on species that exist in Willapa bay and choosing the one surrogate species that resides in these waters and coming to the conclusion that this accurately represents all invertebrates in the bay in scientifically indefensible.

As an alternative to using the LC_{50} of a single species to identify a safety threshold for acute toxicity, we recommend using one tenth of EPA's acute toxicity criterion for freshwater invertebrates, which is based on a wide variety of species and would be adequately protective of all species in the bay. This value would come to 0.077 μg/L instead of the current 3.7 μg/L. Alternatively, one tenth of the HC_{05} value from the PMRA analysis could be utilized. This value would be 0.137 μg/L instead of the current 3.7 μg/L. The practical quantitation limit for dissolved imidacloprid in water in this field study is below both of these values (0.04 μg/L);[15] therefore, Ecology can take the data from the 2014 field studies and analyze through the lens of a new screening value.

2. Sediment and Sediment Porewater

The screening value for imidacloprid in sediment is the same as the practical quantitation limit. Therefore, this screening value does not identify a safe level of exposure; it is simply a result of the limits of the detection equipment used. That should be more clearly outlined in the draft SEIS, perhaps with the statement: "Undetected imidacloprid in sediment is not an indication that the levels are safe for invertebrates, therefore the sediment data can only be used to identify when levels of imidacloprid are harmful, not when they are safe."

The authors have decided to use a screening value of 0.6 μg/L for sediment porewater based on cherry-picking No Observed Effect Concentrations (NOECs) from species that live in sediments and choosing the lowest one. There was no discussion on what benthic species were used as suitable surrogates and whether these were saltwater or freshwater species, just that "a NOEC screening concentration up to 6 μg/L could be supported."[16] Ecology states: "EPA (2017) includes only two chronic studies of imidacloprid effects on saltwater invertebrates. If a larger database had been

[13] 2014 field study at 9.
[14] *Id.*
[15] *Id.* at 10.
[16] *Id.* at 12.

available, it seems likely lower values for chronic toxicity would have been noted for one or more invertebrate types, especially given the consistent pattern of wide variation in imidacloprid toxicity among species."[17] Since there were only two chronic studies of effects to saltwater invertebrates (one of which was the mysid shrimp, which the authors elected not to use), this suggests to us that the authors used freshwater benthic species as surrogates to identify the screening value of 0.6 µg/L. We are puzzled on why it would be suitable to use a freshwater invertebrate as a surrogate in this instance but nowhere else in the study.

Again we must stress how problematic it is to cherry-pick toxicity data from one or two species to identify screening values for all invertebrates in an entire ecosystem. We understand the desire to only analyze toxicity to creatures that live in the sediments and will be directly exposed to porewater, however many epibenthic species, like mysid shrimp, eat benthic organisms and will likely be exposed to imidacloprid seeping off the sediment and into surface water at the epibenthic zone. Furthermore, just because some invertebrates don't live in sediment does not mean that they should be taken out of the analysis. There are no data whatsoever to indicate that benthic organisms are somehow intrinsically different in their sensitivity to imidacloprid than other invertebrates. Therefore, in the interest of analyzing species with a variety of sensitivities to imidacloprid, the NOEC that EPA has identified for saltwater invertebrates (based on the mysid shrimp) would be the better choice. One tenth of that value would be 0.016 µg/L. This level is below the practical quantitation limit of the study.

Imidacloprid does not volatilize, is highly water soluble, and does not hydrolyze readily. However, it is photosensitive.[18] In the methodology section of the 2014 field study there was no mention of protecting sediment or sediment porewater samples from light. Imidacloprid buried under a layer of sediment would be protected from photolysis and would be expected to be relatively stable and have a much longer half-life. However, once a sample is collected, the chemical may now be exposed to light and begin to photolyse during sample collection and processing. This could ultimately underestimate the amount of chemical that exists in sediment and sediment porewater.

Further, the 2014 field trial failed to collect pre-and post-treatment sediment and porewater samples for control sites (Taylor and Coast treatment areas) or pre-treatment samples at the actual test sites. The study could be missing additive effects if there is any imidacloprid residues already in the water (from upload sources), and at base, without control data the impacts of imidacloprid are presented in a vacuum. The study further indicated that efficacy numbers were not reliable. *Id.* at 12. The study also stated that while benthic and epibenthic invertebrate samples were collected 1 day before treatment, and 14, 28, and 56 days after treatment, the 56 day sample was not processed, but provides no indication as to why, and what data is now missing because of this. *Id.* at 13-14. The field study also failed to include any areas with high organic carbon, despite the higher persistence of imidacloprid in these sediments. *Id.* at 23. Finally, surveys for dead crabs were conducted only along the borders of the spray area, and so are not necessarily indicative of the full amount of injured and dead crabs on the whole treated plot. *Id.* at 24-25.

---

[17] *Id.* at A-5.

[18] EPA. Imidacloprid: Human Health Draft Risk Assessment for Registration Review. June 22, 2017, https://www.regulations.gov/document?D=EPA-HQ-OPP-2008-0844-1235.

B. Direct, Indirect, and Cumulative Impacts

Because the screening values used in the field studies and SEIS are not supported by sound science, the conclusions as to direct impacts to wildlife (invertebrates and vertebrates) are highly questionable. For the reasons described above, the 2014 field studies are of limited utility. As described below, the toxicity values used as the basis of the SEIS analysis are also flawed. Ecology must go back to evaluate impacts based on scientifically defensible levels.

To provide some context, imidacloprid products are not approved for use in water in *any other context*, and to the contrary, labels on most neonicotinoid products strictly prohibit use in water or in places that could drift into water, noting the high toxicity to aquatic invertebrates. Accordingly, most aquatic studies are looking at concentrations that have drifted/run off from terrestrial sources of neonic-use, like in coated crop seeds or liquid drenches of ornamental plants, and not direct use in water. The plan proposes not just to spray imidacloprid in water, but to do so at a rate of 0.5 lb a.i./acre, the highest application rate allowed for imidacloprid on any agriculture crop in the U.S. In fact, this application rate for oyster beds in the state of WA is higher than any other agricultural commodity in this country for application methods other than chemigation.[19] Simply put, this will result in some of the highest concentrations of imidacloprid allowed on *land* in the U.S., but in water (where all other uses are prohibited).

1. Acute toxicity value

Clearly the lack of toxicity studies of imidacloprid's effect on saltwater invertebrates is an enormous uncertainty when trying to estimate ecosystem-wide effects of pesticide spraying in these estuaries. Unfortunately, Ecology has opted to use the EPA's acute toxicity criterion for saltwater invertebrates, which is 16.5 μg a.i./L.[20] This is not a protective threshold value and should be discarded for the following reason:

The 16.5 μg a.i./L value is based off of EPA's antiquated Risk Quotient (RQ) and Level of Concern (LOC) approach for analyzing risk. The National Academies of Sciences issued a scathing indictment of this methodology in the context of endangered species risk assessment in 2013.[21] In this report, the authors state:

- The EPAs "concentration-ratio approach" for its ecological risk assessments "is ad hoc (although commonly used) and has unpredictable performance outcomes."[22]

---

[19] EPA. Imidacloprid: Human Health Draft Risk Assessment for Registration Review. June 22, 2017. Appendix D. Table D.3. Available here: https://www.regulations.gov/document?D=EPA-HQ-OPP-2008-0844-1235.

[20] SEIS at 3-20.

[21] National Academy of Sciences. 2013. *Assessing Risks to Endangered and Threatened Species from Pesticides*, Committee on Ecological Risk Assessment under FIFRA and ESA Board on Environmental Studies and Toxicology Division on Earth and Life Studies National Research Council (April 30, 2013). (hereafter NAS Report).

[22] *Id.* at 149.

- "RQs are not scientifically defensible for assessing the risks to listed species posed by pesticides or indeed for any application in which the desire is to base a decision on the probabilities of various possible outcomes."[23]
- "The RQ approach does not estimate risk…but rather relies on there being a large margin between a point estimate that is derived to maximize a pesticide's environmental concentration and a point estimate that is derived to minimize the concentration at which a specified adverse effect is not expected."[24]

This critique should not be brushed off as being "endangered species specific." One reason it is hard to estimate risk to endangered species is due to unsuitable, or lack of available, surrogate species. Ecology is grappling with the exact same problem here. There are simply not enough studies that have been done on saltwater invertebrates. Ecology states: "For saltwater invertebrates, EPA (2017) found only a limited number of studies covering seven estuarine or marine species, five of which were crustaceans."[25] This is simply not sufficient. Ecology also states that "Within groups (e.g., among aquatic insects), the range of toxicity could vary over four orders of magnitude or more (i.e., the difference between a value of 1 and a value of 10,000)…"[26] With that amount of variability in toxicity, a toxicity threshold based off of studies on seven species is completely meaningless. There is a reason that EPA's acute toxicity criterion is so much higher than PMRA's or any of the other independent analyses that have been done. The RQ/LOC analysis is designed to be used when there is an abundant dataset with a wide variety of species that have been studied. That is not the case here and this methodology should simply not be used to estimate risk to marine invertebrates. There are two ways Ecology could move forward to identify a scientifically defensible acute toxicity criterion. The first would be to use EPA's acute toxicity criterion for freshwater invertebrates and an LOC of 0.5. Unlike saltwater species, there is an abundance of data on freshwater invertebrates representing multitudes of species and this data set could be reasonably assumed to be protective of the many invertebrates in Willapa Bay and Grays Harbor. This would identify a value of 0.39 µg a.i./L. The second would be to use a Species Sensitivity Distribution (SSD) to develop a 5^{th} percentile Hazard Concentration (HC_{05}) value instead of simply using the lowest EC_{50} value. The National Academies of Sciences recommends this approach as a better alternative to using a single species or low number of surrogate species to estimate toxicity.[27] Canada's Pesticide Management Regulatory Agency (PMRA) did do this analysis for estuarine/marine invertebrates and identified an acute toxicity value of 1.37 µg a.i./L. This approach was also used in Morrissey et al. for freshwater invertebrates.[28]

---

[23] *Id.* at 15.
[24] *Id.* at 14.
[25] *Id.*
[26] Ecology draft SEIS. Pg A-4
[27] NAS report. Pgs 128-131.
[28] Morrissey, C. A., P. Mineau, J. H. Devries, F. Sanchez-Bayo, M. Liess, M.C. Cavallaro, and K. Liber. 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: a review. Environment International 74:291-303.

2. Other Impact Issues

Further, several additional studies exist that it does not appear Ecology used in the SEIS. These relate to aquatic impacts of imidacloprid on non-target species, and resistance to neonicotinoids, and are listed in **Appendix A** and will be submitted along with these comments.[29]

Overall, Ecology should not gloss over potential direct, sub-lethal impacts to vertebrate species, given that in the range of toxicity values, some sub-lethal impacts are possible at levels far below what will be on- and off-plot if this plan goes forward.[30] The same goes for indirect impacts to fish and bird species from loss of prey. Ecology repeatedly assumes that because the treatment acreage is smaller in Alternative 4, it will not cause Bay-wide or population wide impacts to these species, but fails to recognize that these impacts will exist in combination with others, and may have cumulative impacts.

SEPA requires consideration of cumulative effects. WAC 197-110060(4)(e); WAC 197-11-330(3)(c) ("Several marginal impacts when considered together may result in a significant adverse impact."); *White v. Kitsap Cnty.*, SHB No. 09-019 at 17 (2009) (cumulative impacts of a proposed action together with the impacts of pending and future actions should be considered when making a threshold determination). While the SEIS contains sections discussing the mitigation measures that might reduce impacts, including the cumulative impact, these sections say essentially nothing about what the actual mitigation measures will be, or how they will reduce or eliminate impacts from imidacloprid spraying. The SEIS cumulative impacts section admits that it is unknown was the cumulative impact on sediments will be, but determines that this can be derived from monitoring once the permit is granted. SEIS at 2-28. This fails to evaluate what the potential cumulative impact on the Bay's resources will be from sediments containing imidacloprid residues for significant amounts of time. As to water quality, reliance on dilution and degradation is not sufficient in place of a cumulative impacts analysis. How will adding imidacloprid to waters already containing other pollutants (i.e. imazamox sprayed onto eelgrass, run-off from terrestrial sources, etc) impact water quality and the organisms that rely on clean water? What about invertebrates? If, as Ecology claims, populations of invertebrates return to sprayed plots within 2 or 4 weeks, then why wouldn't shrimp return just as quickly? SEIS at 2-29. If imidacloprid's impacts are really so limited, then how can it be claimed to be an effective solution to restore balance to burrowing shrimp?

Further, Ecology has failed to adequately evaluate impacts to threatened and endangered speices, somehow concluding that impacts to these species will be minimal or nonexistent. However, Frew (2015) reported an imidacloprid No Effect level for white sturgeon of 700 ppb (as a proxy for green sturgeon). This is lower than on-plot concentrations reported in field trials, so how can Ecology dismiss direct, sub-lethal and/or chronic impacts to green sturgeon? Using the LC50, (meaning a 50% chance of causing death, or "take" in this situation), is unacceptable. Ecology should not be using LC50 as appropriate exposure threshold for threatened and endangered species, whose very survival is already in jeopardy and any additional stress can be magnified in an extinction vortex (i.e. even if something else caused the species' initial decline, like habitat destruction, the final

---

[29] CFS has also submitted comments on EPA's Preliminary Aquatic Risk Assessment in Support of the Registration Review of Imidacloprid, and previously provided these to Ecology. They are also attached here as Exhibit A.

[30] Gibbons et al. 2015, SEIS at 3-23, 3-25, A-12.

descent to extinction is often driven by synergistic processes disconnected from the original cause of decline, including pesticide impacts or a reduction in food sources.[31]

Ecology fails to address additive or synergistic impacts on wildlife from imidacloprid in conjunction with other pesticides or other compounds already found in the water.

Conclusion

Given the significant unknowns, and lack of data, Ecology should not move forward with a permit to spray imidacloprid. The negative impacts are likely higher than Ecology reports in the SEIS, because one of the basic elements of this analysis, the screening levels for toxicity to invertebrates, is flawed. The evidence suggests not only a higher negative impact, but that the imidacloprid spray plan may not be effective in the long term. Ecology failed to assess a reasonable range of alternatives that would address the true purpose, to preserve commercial shellfish harvest while maintaining the health of Willapa Bay and Grays Harbor. As such, Ecology must draft a SEIS that complies with SEPA prior to moving forward with any NPDES permit. Knowing what we now know about neonicotinoids, it is best to end consideration of any imidacloprid spraying into marine or estuarine waters, and instead to focus on habitat restoration, including eelgrass, and sustainable methods of restoring balance to the Bay.

Respectfully submitted,

Amy van Saun
Staff Attorney
Center for Food Safety
917 SW Oak St. Suite 300
Portland, Oregon 97205
(971) 271-7372
avansaun@centerforfoodsafety.org

---

[31] *See* Brook, B. W., N.S. Sodhi, and C.J. Bradshaw, *Synergies among extinction drivers under global change*, Trends in Ecology and Evolution 23:453-460 (2008).

APPENDIX A

Aquatic

Agatz, A., R. Ashauer, and C.D. Brown. 2014. Imidacloprid perturbs feeding of *Gammarus pulex* at environmentally relevant conditions. *Environmental Toxicology and Chemistry, 33*(3), pp. 648-653.

Alexander, A.C., and J.M. Culp. 2013. Predicting the Effects of Insecticide Mixtures on Non-Target Aquatic Communities – Chapter 3 in *Insecticides - Development of Safer and More Effective Technologies.* Ed. S. Trdan. *InTech.*

Alexander, A.C., J.M. Culp, K. Liber, and A.J. Cessna. 2007. Effects of insecticide exposure on feeding inhibition in Mayflies and Oligochaetes. *Environmental Toxicology and Chemistry, 26*(8), pp. 1726-1732.

Archambault, J.M., C.M. Bergeron, W.G. Cope, R.J. Richardson, M.A. Heilman, J.E. Corey III, M.D. Netherland, and R.J. Heise. 2014. Sensitivity of freshwater mussels to hydrilla-targeting herbicides: providing context for invasive aquatic weed control in diverse ecosystems. *Journal of Freshwater Ecology, 30*(3), pp. 335-348.

Beketov, M.A., B.J. Kefford, R.B. Schafer, and M. Liess. 2013. Pesticides reduce regional biodiversity of stream invertebrates. *Proceedings of the National Academy of Sciences of the United States of America, 110*(27), pp. 11039-11043.

Benton, E.P., J.F. Granta, T.C. Mueller, R.J. Webster, and R.J. Nichols. 2016. Consequences of imidacloprid treatments for hemlock woolly adelgid on stream water quality in the southern Appalachians. *Forest Ecology and Management, 360*, pp. 152-158.

Bori, J., C. Ribalta, X. Domene, M.C. Riva, and J.M. Ribo. 2015. Environmental impacts of an imidacloprid-containing formulation: from soils to waters. *Afinidad, 72*(571).

Carvalho, F.P. 2017. Pesticides, environment, and food safety. *Food and Energy Security, 6*(2), pp. 48-60.

Cavallaro, M.C., C.A. Morrissey, J.V. Headley, K.M. Peru, and K. Liber. 2016. Comparative chronic toxicity of imidacloprid, clothianidin, and thiamethoxam to Chironomus dilutus and estimation of toxic equivalency factors. *Environmental Toxicology and Chemistry, 36*(2), pp. 372-382.

Colombo, V., S. Mohr, R. Berghahn, and V.J. Pettigrove. 2013. Structural changes in a macrozoobenthos assemblage after imidacloprid pulses in aquatic field-based microcosms. *Archives of Environmental Contamination and Toxicology, 65*(4), pp. 683-692.

Finnegan, M.C., L.R. Baxter, J.D. Maul, M.L. Hanson, and P.F. Hoekstra. 2017. Comprehensive characterization of the acute and chronic toxicity of the neonicotinoid insecticide thiamethoxam to a suite of aquatic primary producers, invertebrates, and fish. *Environmental Toxicology and Chemistry, 36*(10), pp. 2838-2848.

Goulson, D. 2017. REVIEW: An overview of the environmental risks posed by neonicotinoid insecticides. *Journal of Applied Ecology, 50*(4), pp. 977-987.

Guy, M., L. Singh, and P. Mineau. 2011. Using field data to assess the effects of pesticides on Crustacea in freshwater aquatic ecosystems and verifying the level of protection provided by water quality guidelines. *Integrated Environmental Assessment and Management, 7*(3), pp. 426-436.

Hayasaka, D., K. Suzuki, T. Nomura, M. Nishiyama, T. Nagai, F. Sanchez-Bayo, and K. Goka. 2013. Comparison of acute toxicity of two neonicotinoid insecticides, imidacloprid and clothianidin, to five cladoceran species. *Journal of Pesticide Science, 38*(1), pp. 44-47.

Hayasaka, D., T. Korenaga, K. Suzuki, F. Sanchez-Bayo, and K. Goka. 2012. Differences in susceptibility of five cladoceran species to two systemic insecticides, imidacloprid and fipronil. *Ecotoxicology, 21*(2), pp. 421-427.

Hoyle, S., and A. Code. 2016. Neonicotinoids in California's Surface Waters. *Xerces Society*.

Ieromina, O., W.J.G.M. Peijnenburg, G. de Snoo, J. Muller, T.P. Knepper, and M.G. Vijver. 2014. Impact of imidacloprid on Daphnia magna under different food quality regimes. *Environmental Toxicology and Chemistry, 33*(3), pp. 621-631.

Jemec, A., T. Tisler, D. Drobne, K. Sepcic, D. Fournier, and P. Trebse. 2007. Comparative toxicity of imidacloprid, of its commercial liquid formulation and of diazinon to a non-target arthropod, the microcrustacean Daphnia magna. *Chemosphere, 68*(8), pp. 1408-1418.

Jinguji, H., D.Q. Thuyet, T. Ueda, and H. Watanabe. 2012. Effect of imidacloprid and fipronil pesticide application on Sympetrum infuscatum (Libellulidae: Odonata) larvae and adults. *Paddy and Water Environment, 11*, (1-4), pp. 277-284.

Lukancic, S., U. Zibrat, T. Mezek, A. Jerebic, T. Simcic, and A. Brancelj. 2009. Effects of Exposing Two Non-Target Crustacean Species, Asellus aquaticus L., and Gammarus fossarum Koch., to Atrazine and Imidacloprid. *Bulletin of Environmental Contamination and Toxicology, 84*.

Lu, Z., J.K. Chalis, and C.S. Wong. 2015. Quantum Yields for Direct Photolysis of Neonicotinoid Insecticides in Water: Implications for Exposure to Nontarget Aquatic Organisms. *Environmental Science and Technology Letters, 2*(7), pp. 188-192.

Malev, O., R.S. Klobucar, E. Fabbretti, and P. Trebse. 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae Desmodesmus subspicatus and amphipod Gammarus fossarum. *Pesticide Biochemistry and Physiology, 104*(3), pp. 178-186.

Miles, J. C., J. Hua, M. S. Sepulveda, C. H. Krupke, and J. T. Hoverman. 2017. Effects of clothianidin on aquatic communities: Evaluating the impacts of lethal and sublethal exposure to neonicotinoids. *PLoS ONE, 12*(3).

Mohr, S., R. Berghahn, R. Schmiediche, V. Hubner, S. Loth, M. Feibicke, W. Mailahn, and J. Wogram. 2012. Macroinvertebrate community response to repeated short-term pulses of the insecticide imidacloprid. *Aquatic Toxicology*, 110-111, pp. 25-36.

Moore, D.R.J., C.D. Greer, M. Whitfield-Aslund, L.M. Bowers, S. McGee, and J. Tang. 2016. Derivation of an aquatic benchmark for invertebrates potentially exposed to imidacloprid. *PeerJ Preprints.*

Nyman, A-M., A. Hintermeister, K. Schirmer, and R. Ashauer. 2013. The insecticide imidacloprid causes mortality of the freshwater amphipod Gammarus pulex by interfering with feeding behavior. *PLoS ONE, 8*(5).

Pestana, J.L., S. Loureiro, S., D.J. Baird, and A.M. Soares. 2009. Fear and loathing in the benthos: Responses of aquatic insect larvae to the pesticide imidacloprid in the presence of chemical signals of predation risk. *Aquatic Toxicology, 93*(203), pp. 138-149.

Pisa, L.W., V. Amaral-Rogers, L.P. Belzunces, J.M. Bonmatin. C.A. Downs, D. Goulson, D. P. Kreutzweiser, C. Krupke, M. Liess, M. McField, C. A. Morrissey, D. A. Noome, J. Settele, N. Simon-Delso, J. D. Stark, J. P. Van der Sluijs, H. Van Dyck, and M. Wiemers. 2014. Effects of neonicotinoids and fipronil on non-target invertebrates. *Environmental Science and Pollution Research, 22*(1), pp. 68-102.

Pochini, K.M., and J.T. Hoverman. 2017. Reciprocal effects of pesticides and pathogens on amphibian hosts: The importance of exposure order and timing. *Environmental Pollution, 221*, pp. 359-366.

Roessink, I., L.B. Merga, H.J. Zweers, and P.J. Van den Brink. 2013. The neonicotinoid imidacloprid shows high chronic toxicity to mayfly nymphs. *Environmental Toxicology and Chemistry, 32*(5), pp. 1096-1100.

Sardo, A.M., and A.M.V.M. Soares. 2010. Assessment of the Effects of the Pesticide Imidacloprid on the Behaviour of the Aquatic Oligochaete Lumbriculus variegatus. *Archives of Environmental Contamination and Toxicology, 58*(3), pp. 648-656.

Smit, C.E., C.J.A.M. Posthuma-Doodeman, P.L.A. van Vlaardingen, and F.M.W. de Jong. 2015. Ecotoxicity of imidacloprid to aquatic organisms: Derivation of water quality standard for peak and long-term exposure. *Human and Ecological Risk Assessment: An International Journal, 21*(6).

Stehle, S., and R. Schulz. 2015. Agricultural insecticides threaten surface waters at the global scale. *Proceedings of the National Academy of Sciences of the United States of America, 112*(18), pp. 5750-5755.

Stoughton, S.J., K. Liber, J. Culp, and A. Cessna. 2008. Acute and Chronic Toxicity of Imidacloprid to the Aquatic Invertebrates Chironomus tentans and Hyalella azteca under Constant- and Pulse-Exposure Conditions. *Archives of Environmental Contamination and Toxicology, 54*(4), pp. 662-673.

Struger, J., J. Grabuski, S. Cagampan, E. Sverko, D. McGoldrick, and C.H. Marvin. 2017. Factors influencing the occurrence and distribution of neonicotinoid insecticides in surface waters of southern Ontario, Canada. *Chemosphere, 169*, pp. 516-523.

Tisler, T., A. Jemec, B. Mozetic, and P. Trebse. 2009. Hazard identification of imidacloprid to aquatic environment. *Chemosphere, 76*(7), pp. 907-914.

Tufi, S., J.M. Stel, J. de Boer, M.H. Lamoree, and P.E. Leonards. 2015. Metabolomics to Explore Imidacloprid-Induced Toxicity in the Central Nervous System of the Freshwater Snail Lymnaea stagnalis. *Environmental Science and Technology, 49*(24), pp. 14529-36.

Van Dijk, T.C., M.A. Van Staalduinen, and J.P. Van der Sluijs. 2013. Macro-invertebrate decline in surface water polluted with imidacloprid. *PLoS ONE, 8*(5).

Weston, D.P., D. Chen, and M.J. Lydy. 2015. Stormwater-related transport of the insecticides bifenthrin, fipronil, imidacloprid, and chlorpyrifos into a tidal wetland, San Francisco Bay, California. *The Science of the Total Environment. 527-528*, pp. 18-25.

Whitfield-Aslund, M., M. Winchell, L. Bowers, S. McGee, J. Tang, L. Padilla, C. Greer, L. Knopper, and D.R.J. Moore. 2016. Ecological risk assessment for aquatic invertebrate communities exposed to imidacloprid as a result of labeled agricultural and nonagricultural uses in the United States. *Environmental Toxicology and Chemistry, 36*(5), pp. 1375-1388.

Resistance

Bass, C., I. Denholm, M.S. Williamson, and R. Nauen. 2015. The global status of insect resistance to neonicotinoid insecticides. *Pesticide Biochemistry and Physiology, 121*, pp. 78-87.

Elzaki, M.E.A., J. Pu, Y. Zhu, W. Zhang, H. Sun, M. Wu, and Z. Han. 2017. Cross-resistance among common insecticides and its possible mechanism in *Laodelphax striatellus* Fallén (Hemiptera: Delphacidae). *Oriental Insects*, pp. 1-14.

Perry, T., P. Batterham, and P.J. Daborn. 2011. The biology of insecticidal activity and resistance. *Insect Biochemistry and Molecular Biology, 41*(7), 411-422.

Voudouris, C.C., M.S. Williamson, P.J. Skouras, A.N. Kati, A. J. Sahinoglou, and J.T. Margaritopoulos. 2017. Evolution of imidacloprid resistance in Myzus persicae in Greece and susceptibility data for spirotetramat. *Pest Management Science, 73*(9), pp. 1804-1812.