

From: [McLain, Kelly \(AGR\)](#)
To: [Rockett, Derek \(ECY\)](#)
Subject: Burrowing Shrimp permit comments
Date: Monday, December 08, 2014 3:18:56 PM
Attachments: [WSDAcomments12_08_2014.docx](#)

Derek,

Please find WSDA's comments attached. Let me know if you have any questions.

Sincerely,

Kelly

Kelly McLain
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Office of the Director - Natural Resource Assessment
Washington State Department of Agriculture
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December 8, 2014

Derek Rockett, Permit Manager
Water Quality Program Southwest Regional Office
Washington State Department of Ecology

Dear Mr. Rockett,

The Washington State Department of Agriculture appreciates the opportunity to comment on the draft permit, fact sheet, and environmental impact statement covering the proposed use of imidacloprid to control burrowing shrimp on commercial shellfish beds in Willapa Bay and Grays Harbor. This letter includes comments, questions, and suggested language changes in each of the three documents. Page numbers and sections are referenced on comments to aid in readability. In many places, traditional strikethrough and underlines are used to denote removed and replaced wording. As a general comment, any supporting documentation (i.e. pesticide labels or Safety Data Sheets) used throughout these documents should reference the Grower's registered product and not that of another company under another trade name. In addition, any references to acetylcholinesterase inhibition are applicable to carbaryl but not imidacloprid. Please contact me at kmclain@agr.wa.gov or 360.902.2067 if you have questions.

Sincerely,

Kelly McLain
Sr. Natural Resource Scientist/Western WA Supervisor
Office of the Director – Natural Resource Assessment
Washington State Department of Agriculture
kmclain@agr.wa.gov 360.902.2067

Draft Permit Comments

1. Permit Cover Page – Under “Activity” please replace the word “pesticides” with “insecticides”. Pesticides is a general term that includes insecticides, herbicides, fungicides, etc. This permit is specific to the use of imidacloprid, an insecticide, and should be labeled as such.
2. Page 8, Section E, Item 3 – Have absorbent materials available for cleanup and the spill containment materials recommended in the ~~Material~~-Safety Data Sheet for imidacloprid.
3. Page 8, Section H, Item 3 - Experimental use of ~~chemicals~~ insecticides not listed in this permit may occur on a limited basis in the context of a research and development effort related to the ~~chemical~~ use of pesticides to control of burrowing shrimp.
4. Page 11, S4, sub-heading (Documentation of monitoring activities and results must include (if applicable))
 - a. Bullet 4 – A method reference should be cited whenever possible. If no valid citation is available then a brief description of the techniques/methods/ and equipment used should be included as well as some basis for choosing that particular method.
 - b. Bullet 5 – “The results of such analyses” should also include:
 - i. Raw data in addition to summarized data
 - ii. Detection limits, reporting limits, or sensitivity of the instrumentation used to make the measurement
 - iii. QA/QC parameters
 - iv. Any data qualifiers assigned by the analyst or technician
5. Page 12, S4.B - Changing the sediment monitoring schedule table to say “Sediment Persistence Monitoring, Benthic Invertebrate Monitoring” as opposed to “Benthic, Persistence” would make the table more clear.
6. Page 13, S4.F - Additional benefit may be found when looking at imidacloprid partitioning between sediment and sediment porewater from the same sample by analyzing the imidacloprid residual on the sediment post pore water extraction rather than taking separate samples from the same plot and analyzing in parallel whole sediment (sediment + porewater) and sediment porewater.
7. Page 14, S4.F, last paragraph:
 - a. In addition to “the locations where the samples were taken, time and date the samples were collected, and the measured imidacloprid concentration, or where not detected,

the PQL for the laboratory tests”, the results should also include any data qualifiers assigned by the laboratory analyst or field technician.

- b. The imidacloprid residue data obtained from the environmental laboratory for surface water, sediment, and sediment pore water which are reported to Ecology and incorporated into in the Sediment Data Reports should include both raw data and summarized data.
- c. The imidacloprid residue data reported to Ecology and incorporated into in the Sediment Data Reports should include data from regular samples as well as from any Quality Assurance and Quality Control (QA/QC) samples or parameters including field and laboratory blanks, laboratory control samples, matrix spike samples, replicate samples and internal standards and any other means used to used to assess the reliability and validity of the data.

Fact Sheet Comments

8. Page 23 - ~~Multiple types of~~ Several pesticides have been used to control pest and weed species in Willapa Bay. The ~~pesticide~~ insecticide carbaryl (trade name Sevin brand 4F) has been applied to commercial shellfish beds for the control of burrowing shrimp since 1963. ~~And the~~ The herbicides glyphosate Rodeo (trade ~~name~~ names Accord Concentrate, AquaMaster, AquaNeat, Glypro, and Rodeo Roundup) and imazapyr have been used to eradicate the invasive species smooth cordgrass *Spartina alterniflora* (University of Washington, March 19, 2013). The herbicide imazamox ~~Imazamox~~ has been used to control the non-native eelgrass *Zostera japonica* on commercial clam beds in Willapa Bay beginning in Spring of 2013.
9. Page 30 – The Washington State Department of Agriculture (WSDA) has approved the application for registration of Protector 0.5G (EPA Reg. No. 88867-1) and Protector 2F (EPA Reg. No. 88867-2) in Washington that was submitted by the Willapa Grays Harbor Oyster Growers Association (WGHOGA). This decision was based, in part, on the studies and risk assessments submitted by the WGHOGA, and subsequently reviewed by George Tuttle (WSDA Environmental Toxicologist). These registrations are effective through December 31, 2015, unless they are cancelled by the WGHOGA or the WSDA. Before the registrations can be renewed in 2016, the ~~The WSDA may renew the registration in 2016 provided that~~ WGHOGA must provide the requested information ~~provides requested information to the~~ WSDA, in order to address the concerns and uncertainties identified during the review of the application for registration (WSDA 2014).

10. Page 35 – Water Column Sampling and Analyses: Water column samples were collected within each treatment plot, as well as at 60, 120, 240, and 480 meters (m) (197, 394, 787, and 1,575 feet, respectively) from the plot edge on the upstream and downstream side of the plot. Samples were collected as the first advancing tide moved across the treatment area and onto surrounding areas. When drainage channels were present, samples were taken in the drainage channels at distances mentioned above. Some drainage channel samples were collected from water draining from the treated area soon after treatment. Nuprid Flowable imidacloprid was sprayed on treatment plots that were exposed from an outgoing tide. Mallet-Granular imidacloprid was applied to treatment plots with 0.5 to 3 feet of water on them during an outgoing tide.
11. Page 36 – Concentrations of imidacloprid were generally highest in drainage channels associated with Nuprid flowable imidacloprid, with a maximum observed value of 4,200 ppb at 60 m (197 feet), and 120 ppb at 480 m (1,575 feet). Based on the study design, it was expected that the highest concentrations of Nuprid flowable imidacloprid would be found in the drainage channels. In contrast, Mallet granular imidacloprid concentrations were much lower approximately two hours after application.
12. Page 36 – The results of the water column sampling showed that many offsite locations upslope of the treatment area were found to have at least some concentration of imidacloprid during the first advancing tide that passed over the treated area. Outside of the drainage channels, Nuprid flowable imidacloprid concentrations reached a maximum of 900 ppb, with concentrations as high as 200 ppb at a distance of 480 m (1,575 feet). Mallet Granular imidacloprid concentrations reached 130 ppb at a distance of 60 m (197 feet) and no concentrations above the screening criteria at further distances.
13. Page 36 – The maximum concentration of imidacloprid found in sediment porewater on treatment plots one day post-application was 261 ppb. In general, imidacloprid concentrations were greater on the Nuprid-flowable imidacloprid-treated beds compared to the Mallet granular imidacloprid-treated beds.
14. Page 46 – Washington State Department of Agriculture (WSDA). July 3, 2014. Approval Letter to Willapa Grays Harbor Oyster Growers Association.
15. Page 52 - The Pesticide Management Division of the Washington State Department of Agriculture (WSDA) ensures that applicators use pesticides legally and safely in Washington. WSDA registers pesticides for distribution use in Washington (~~in addition to EPA registration~~); licenses pesticide applicators, dealers and consultants; investigates complaints such as pesticide label violations; maintains a registry of pesticide sensitive

individuals; and administers a waste pesticide collection program. These duties are performed under the authority of the *Washington Pesticide Control Act* (chapter 15.58 RCW), the *Washington Pesticide Application Act* (chapter 17.21 RCW), the General Pesticide Rules (chapter 16-228 WAC), the Worker Protection Standard (chapter 16-233 WAC) and a number of pesticide and/or county specific ~~regulations~~ rules (<http://agr.wa.gov/PestFert/Pesticides/default.htm>).

16. Page 66 - *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)*: The law that provides the basis for Federal regulation of the distribution, sale and use of pesticides in the United States. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. A set of EPA regulations that establishes uniform pesticide product labeling, use restrictions, and review of new pesticides.

Draft EIS Comments

17. Page vii – Washington State Department of Agriculture - State registration of the imidacloprid products Protector 0.5G (granular formulation) and Protector 2F (flowable formulation) under the requirements of the Washington Pesticide Control Act (RCW 15.58). ~~Experimental Use Registrations~~ issued July 3, 2014 through December 31, 2015.
18. Page vii – U.S. Environmental Protection Agency - Federal registration of imidacloprid products Protector 0.5G (granular formulation) and Protector 2F (flowable formulation) under the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Conditional FIFRA registrations issued June 6, 2013; see Draft EIS Appendix A.
19. Page 1-5 - The primary burrowing shrimp management practice used by Willapa Bay and Grays Harbor shellfish growers, between 1963 and 2013, has been chemical treatment with the n-methyl carbamate insecticide carbaryl, applied at a rate of 8 pounds of active ingredient per acre between July 1 and October 31 (Section 2.8.2).
20. Page 2-1 – ³ Neonicotinoids are a class of neuro-active insecticides chemically similar to nicotine. Neonicotinoids were developed in large part because they show reduced toxicity compared to previously used organophosphate and n-methyl carbamate insecticides.
21. Page 2-14 - *Use of Carbaryl*. Shellfish growers in Willapa Bay and Grays Harbor have used the ~~pesticide~~ insecticide carbaryl to control burrowing shrimp as part of oyster aquaculture management operations since 1963.

22. 2-19 - **2.7.4 Washington State Regulatory Requirements for Chemical Pesticide Applications**
23. 2-19 - *Washington State Department of Ecology Requirements for Chemical Pesticide Applications.*
24. 2-20 - *Washington State Department of Agriculture (WSDA) Requirements for Chemical Pesticide Applications. WSDA is ~~Washington's~~ the lead agency for the regulation of pesticides in Washington, ~~and issues private, commercial, and other licenses required for the application of pesticides.~~ WSDA registers pesticides for distribution in Washington; licenses pesticide applicators, dealers and consultants; investigates complaints such as pesticide label violations; maintains a registry of pesticide sensitive individuals; and administers a waste pesticide collection program.*
25. Page 2-21 - Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. § 136 et seq.). **FIFRA** provides the basis for Federal regulation, ~~of the sale,~~ distribution, sale, and use of pesticides in the United States. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment.~~FIFRA authorizes EPA to review and register pesticides for specified uses.~~ WSDA coordinates with EPA is the lead agency for review if an applicant applies for an a state experimental use permit (EUP), Section 24(c) Special Local Need registration, or a Section 18 emergency exemption in Washington.
26. Page 2-26 - The Washington State Environmental Policy Act (SEPA) requires the EIS to evaluate the effects of the No Action Alternative, which is typically defined as maintaining the status quo, or no change from existing conditions. In the case of burrowing shrimp control on commercial shellfish beds in Willapa Bay and Grays Harbor, ~~pesticide~~ insecticide applications using carbaryl (trade name Sevin brand 4F)²⁴ were used from 1963 through 2013.
27. 2-26 - ²⁴ ~~The trade name Sevin expired 12/31/13 with the Section 24(C) Special Local Need Label~~ The FIFRA Section 24(c) Special Local Need registration (SLN Reg. No. WA-120013) for the trade name Sevin brand 4F expired on December 31, 2013 (NovaSource 2012).
28. Page 2-27 - ~~pesticide~~ insecticide (described below under Alternative 2).
29. Page 2-27 - The primary burrowing shrimp management practice used by Willapa Bay and Grays Harbor shellfish growers between 1963 and 2013 has been chemical treatment with the

n-methyl carbamate insecticide carbaryl.

30. Page 2-28 - Beginning in the 1990s, Ecology authorized the application of carbaryl to commercial shellfish beds in Willapa Bay and Grays Harbor to suppress burrowing shrimp via both a Temporary Water Quality Modification Order (TWQMO) and a FIFRA Section 24(c) Special Local Need registration ~~Washington State Local Needs Pesticide Registration (SLN Reg. No. WA-900013) issued by the Washington State Department of Agriculture (WSDA). EPA through WSDA under the authority of Section 24(c) of the Amended Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).~~
31. Page 2-28 - In January 2001, the MOA entered into by WGHOGA, Ecology and other State agencies had as an objective to transition commercial shellfish aquaculture toward a program to manage burrowing shrimp based on the principles and concepts of integrated pest management (IPM). Also in 2001, in response to a decision by the Ninth Circuit Court of Appeals, Ecology required WGHOGA to apply for a NPDES permit to authorize applications of carbaryl to selected areas commercially grown for oysters in Willapa Bay and Grays Harbor. The NPDES permit was issued May 17, 2002. It included several Special Conditions, such as the submission of detailed records describing the time, location, and shrimp population level (e.g., burrow counts)²⁸ on oyster beds proposed for carbaryl treatment; plans for experimental use to begin testing an array of alternative pesticides; a plan to monitor the water column for carbaryl at specific timings and locations pertinent to treatment; a spill clean-up plan; and application-related recordkeeping requirements. The carbaryl NPDES permit was reissued in 2006 for a period of 5 years, with an administrative extension allowing its continued use. ~~The Federal registration~~ The FIFRA Section 24(c) Special Local Need (SLN) registration (SLN Reg. No. WA-120013) for the n-methyl carbamate insecticide carbaryl expired on December 31, 2013 (NovaSource 2012). ~~The Washington FIFRA Section 24(c) Special Local Need (SLN) registration (SLN Reg. No. WA-120013)~~ was voluntarily cancelled by the registrant (NovaSource) on January 15, 2014 (WSDA January 15, 2014).
32. Page 2-30 - If Alternative 2 were selected, it would be necessary for Ecology to continue the administrative extension of NPDES Permit WA0040975, or to modify and reissue the permit. It would also be necessary for WGHOGA (or another registrant) to apply to ~~EPA to renew the Federal registration~~ the WSDA for a new FIFRA Section 24(c) Special Local Need registration for carbaryl.
33. Page 2-31 - Do not apply ~~Sevin brand 4F~~ carbaryl by helicopter within 200 feet of sloughs, channels or oysters that are within one year of harvest; do not apply by hand sprayer within 50 feet of sloughs, channels, or oysters that are within one year of harvest.

34. Page 2-31 - Only certified applicators or persons under the direct supervision of a certified applicator may use or apply ~~Sevin brand 4F carbaryl insecticide~~.
35. Page 2-36 - When applications of Protector 0.5G (i.e., the granular formulation of imidacloprid) are made crosswind, the applicator must compensate for displacement by adjusting the path of the application equipment upwind.
36. Page 2-41 - In addition, treatment and control plots had to be adequately separated to prevent cross contamination (>500 meters). These criteria limited the study sites to two locations within Willapa Bay. The first was located off Rosario Beach on the western side of the Bay Center Peninsula on the eastern shore of the Bay (Bay Center) and the second was located east of the main channel of the Cedar River after it enters the northern part of the bay (Cedar River). At Bay Center, both the granular (Mallet) and flowable (Nuprid) formulations of imidacloprid were used, while at Cedar River only Nuprid flowable imidacloprid was used (Booth 2014). A total of 51.38 acres of commercial shellfish beds were treated with imidacloprid, 29.54 acres with Nuprid flowable imidacloprid and 21.84 with Mallet granular imidacloprid (Patten 2011).
37. Page 2-41 - *Efficacy*. Efficacy across all sites and treatments ranged from 42 to 96 percent burrow reduction, with highest efficacy on sandy sites with no vegetation and lowest on silty sites and vegetated sites. Studies conducted in 2011 also noted that applications to sites heavily vegetated with eelgrass were problematic due to the lack of site drainage in these areas. These results indicated that eelgrass may impair efficacy by limiting ~~chemical~~ imidacloprid access to shrimp burrows, and by preventing burrow collapse following treatment, thus allowing affected shrimp to recover once paralysis has ceased (Patten 2011).
38. Page 2-43 - *Water Column Sampling and Analyses*. Water column samples were collected within each treatment plot, as well as at 60, 120, 240, and 480 meters (m) (197, 394, 787, and 1,575 feet, respectively) from the plot edge on the upstream and downstream side of the plot. Samples were collected as the first advancing tide moved across the treatment area and onto surrounding areas. When drainage channels were present, samples were taken in the drainage channels at distances mentioned above. Some drainage channel samples were collected from water draining from the treated area soon after treatment. Nuprid Flowable imidacloprid was sprayed on treatment plots that were exposed from an outgoing tide. Mallet Granular imidacloprid was applied to treatment plots with 0.5 to 3 feet of water on them during an outgoing tide.
39. Page 2-44 – Concentrations of imidacloprid were generally highest in drainage channels associated with Nuprid flowable imidacloprid, with a maximum observed value of 4,200 ppb at 60 m (197 feet), and 120 ppb at 480 m (1,575 feet). Based on the study design, it was

expected that the highest concentrations of Nuprid flowable imidacloprid would be found in the drainage channels. In contrast, Mallet granular imidacloprid concentrations were much lower approximately two hours after application.

40. Page 2-44 – The results of the water column sampling showed that many offsite locations upslope of the treatment area were found to have at least some concentration of imidacloprid during the first advancing tide that passed over the treated area. Outside of the drainage channels, Nuprid flowable imidacloprid concentrations reached a maximum of 900 ppb, with concentrations as high as 200 ppb at a distance of 480 m (1,575 feet). Mallet Granular imidacloprid concentrations reached 130 ppb at a distance of 60 m (197 feet) and no concentrations above the screening criteria at further distances.
41. Page 2-44 - The maximum concentration of imidacloprid found in sediment porewater on treatment plots one day post-application was 261 ppb. In general, imidacloprid concentrations were greater on the Nuprid flowable imidacloprid-treated beds compared to the Mallet granular imidacloprid-treated beds.
42. Page 2-46 - Field data from imidacloprid trials in Willapa Bay show that ~~the chemical~~ imidacloprid dissipates in surface water and sediment porewater and is usually analytically undetectable within 24 to 48 hours after application.
43. Page 2-47 - During treatment, the handlers and applicators of ~~the chemical~~ imidacloprid would face inherent exposure.
44. Page 2-48 - Considerable work has been conducted on potential alternatives to chemical control of burrowing shrimp. The following subsections describe several of these methods tried as alternatives to the use of the ~~pesticides~~ insecticides carbaryl or imidacloprid.
45. Page 2-50 - for treatment with the ~~pesticide~~ insecticide carbaryl and a density that impairs successful shellfish cultivation).
46. Page 2-54 – *Traditional Insecticides* included Spectrus, Belay (clothianidin), Esteem (pyriproxyfen), Methoprene, Deltaguard (deltamethrin), ~~Bigrade~~ Brigade (bifenthrin), thiacloprid, acetamiprid, and zeta-cypermethrin.
47. Page 2-54 – *Organic Insecticides*. Plant extracts, essential plant oils or “natural” insecticides included crushed chrysanthemums, naturally-extracted pyrethrums, Pyganic, ~~Pyrenone~~ Pyrenone, mustard seed meal, habanero pepper extract, yucca extract, sabadilla, white pepper, ~~geraniol~~ geraniol, citric acid, malic acid, hydrogen peroxide, potassium salts of fatty acids, azadirachtin, vitamin K (Sea Klean), caffeine, clove oil, cinnamon oil, citronella oil,

cedar oil, linseed oil, garlic oil, geranium oil, peppermint oil, rosemary oil, thyme oil, neem oil and spearmint oil.

48. Page 2-54 - *Delivery Systems for Chemical Control*. A major effort was also made to assess new delivery systems for chemical control; specifically, injecting the ~~compound or chemical~~ insecticide below ground, into the substrate where the shrimp live, using shank injection or spike wheel injection. While these methods were successful using traditional chemical control, they did not reduce the rate of ~~chemical~~ insecticide needed for burrowing shrimp control (Booth 2005). Thus, given the extra expense and sediment impacts, they were found to be less favorable than surface application of flowable or granular ~~forms~~ formulations of imidacloprid.
49. Page 2-58 - Both carbaryl and imidacloprid are highly toxic to bees ~~in~~ that are exposed to direct contact or ~~as a residual~~ residues on flowering plants (~~imidacloprid somewhat less so~~).
50. Page 2-59 - Either carbaryl or imidacloprid could affect large vertebrates (such as green sturgeon, marine mammals, or humans) by direct contact or direct ingestion of treated prey items. Impacts are unlikely both due to low ~~chemical~~ insecticide application rates, and because large vertebrates would not be present on tide flats in shallow water or exposed by an outgoing tide when ~~pesticide~~ insecticide applications would be made. Either carbaryl or imidacloprid could potentially affect pesticide handlers, applicators, and to a lesser extent commercial shellfish workers by means of inhalation exposure. Federal regulations and applicable permits require the use of personal protective equipment when working with these ~~chemicals~~ insecticides. The majority of commercial shellfish beds are distant from public access areas, and do not tend to attract persons using the bays for recreation.
51. Page 3-6 - A long-term result of suppressing burrowing shrimp with carbaryl at select locations has been an increase in the diversity of benthic invertebrates, abundance of Dungeness crab, and growth of eelgrass (Doty et al. 1990; Brooks 1995; Dumbauld and Wyllie-Echeverria 1997). Approximately 75 studies focusing on the effects of carbaryl in Willapa Bay demonstrated, in general, that judicious applications of carbaryl were effective and unlikely to result in adverse environmental affects (see Dewitt et al. 1997). For example, while Dungeness crabs are highly susceptible to carbaryl, they recolonized treated oyster beds within two weeks after treatment, and subsequently attained greater densities on treated beds than on comparable untreated beds, as juvenile crab do not normally inhabit grounds heavily populated with burrowing shrimp (Feldman et al. 2000; and Doty et al. 1990). No mammals or endangered species, with the exception of green sturgeon, were present in areas of carbaryl application, and mammals are generally absent during the mid-summer period when carbaryl has been applied. Some birds, primarily gulls, have been seen to feed on dead shrimp shortly after carbaryl application, but no adverse effects on them were observed

(DeWitt 1997; WDF and Ecology 1992). ~~Carbamates~~ N-methyl carbamates do not bioaccumulate in the food chain (WDF and Ecology 1992).

52. Page 3-7 – This page is a duplicate of Page xii and should be deleted.
53. Page 3-11 - The 2012 experimental trials were conducted in Willapa Bay and the study sites were selected with specific criteria in mind. Study site criteria included ownership by a WGHOGA member; adequate densities of burrowing shrimp; adequate distance from previous or planned applications of carbaryl on commercial shellfish beds (>0.5 mile); no previous applications of carbaryl within the past 20 years, if ever (personal communication with Kim Patten, WSU Pacific County Extension Director, May 29, 2104 2014); accessibility; and desirable characteristics of elevation, vegetation, and substrate that are similar to commercial shellfish beds and that were consistent within the study area. In addition, treatment and control plots had to be adequately separated to prevent cross contamination (>500 meters). All treatment and control plots were seven to ten acres in size. Both the granular (~~Protector 0.5G~~) (Mallet) and flowable (~~Protector 2F~~) (Nuprid) formulations of imidacloprid were used in these trials.
54. Page 3-12 - The maximum concentration of imidacloprid found in sediment porewater on treatment plots 1 day post-application was 261 ppb. In general, imidacloprid concentrations were greater on the Nuprid flowable imidacloprid-treated beds compared to the ~~Mallet~~ granular imidacloprid-treated beds.
55. Page 3-18 - The Ruesink Lab describes Willapa Bay as “chemically pristine but biologically transformed.” There are low levels of industrial pollutants, bacterial loads, and nutrient runoff—advantages of a low human population density on the land surrounding the bay combined with high tidal flushing. Sediment runoff from poor logging practices in the early 1900s probably occurred, but the impacts are not well documented. Pesticides ~~and herbicides~~ used by cranberry farmers have been found in runoff, but have not been traced to the bay (University of Washington, March 19, 2013).
56. Page 3-18 - Two types of ~~chemicals~~ pesticides have been used to control pest and weed species in Willapa Bay. The ~~pesticide~~ insecticide carbaryl (trade name Sevin brand 4F) has been applied to commercial shellfish beds for the control of burrowing shrimp since 1963. And the herbicides ~~Rodeo~~ glyphosate (Roundup trade names Accord Concentrate, AquaMaster, AquaNeat, Glypro, and Rodeo) and imazapyr have been used to eradicate the invasive species smooth cordgrass *Spartina alterniflora* (University of Washington, March 19, 2013).

57. Page 3-24 – Study sites for the 2012 commercial-scale experimental trials conducted in Willapa Bay were selected with specific criteria in mind. Study site criteria included ownership by a Willapa-Grays Harbor Oyster Growers Association (WGHOGA) member; adequate densities of burrowing shrimp; adequate distance from previous or planned applications of carbaryl on commercial shellfish beds (>0.5 mile); no previous applications of carbaryl within the past 20 years, if ever (personal communication with Dr. Kim Patten, WSU Pacific County Extension Director, May 29, 2014); accessibility; and desirable characteristics of elevation, vegetation, and substrate that are similar to commercial shellfish beds and that were consistent within the study area. In addition, treatment and control plots had to be adequately separated to prevent cross contamination (>500 meters). All treatment and control plots were 7 to 10 acres in size, and treatments on those plots did not show significant environmental impacts. Treatment on a 10 acre plot provides data that can be extrapolated to larger plots. The 2014 experimental use of imidacloprid occurred on larger plots, thus providing additional data on environmental impacts over larger plot sizes. Both the granular (Mallet) and flowable (Nuprid) formulations of imidacloprid were used in these trials. A screening criteria of 3.7 ppb was used to determine when surface water samples indicated a potential for negative biological effects. ~~Nuprid~~ Flowable imidacloprid was sprayed on treatment plots that were exposed from an outgoing tide. ~~Mallet~~ Granular imidacloprid was applied to treatment plots with 0.5 to 3 feet of water on them during an outgoing tide.
58. Page 3-24 – Maximum concentrations of imidacloprid were detected in drainage channels associated with ~~Nuprid~~ flowable imidacloprid (4,200 ppb at 60 m). These concentrations dissipated to 120 ppb at 480 m. Based on the study design, it was expected that the highest concentrations of ~~Nuprid~~ flowable imidacloprid would be found in the drainage channels. In contrast, ~~Mallet~~ granular imidacloprid concentrations were much lower 2 hours after application.
59. Page 3-24 – The results of the water column sampling showed that many off-site locations upstream of the treatment area were found to have at least some concentration of imidacloprid. Outside of the drainage channels, ~~Nuprid (“flowable” formulation)~~ flowable imidacloprid concentrations reached a maximum of 900 ppb, with concentrations as high as 200 ppb still present at a distance of 480 m. However, other samples showed little imidacloprid in surface water off-site of the plots sprayed with ~~Nuprid~~ flowable imidacloprid. ~~Mallet (granular formulation)~~ Granular imidacloprid concentrations reached a maximum of 130 ppb at a distance of 60 m and no concentrations above the screening criteria at further distances.
60. Page 3-32 - Mitigation measures for Alternative 2 would include limiting carbaryl application areas and timing restrictions. For the purpose of environmental review, the EIS

assumes that current methods for the aerial application of liquid carbaryl under NPDES Permit WA0040975 would likely continue, including limiting these applications to periods of wind less than 10 mph. The carbaryl label describes treatment mitigations to reduce spray drift to avoid potential impacts to off-site, non-target plants. It would be the responsibility of the applicator to select appropriate application equipment and treat only during appropriate environmental conditions (wind speed, temperature, tidal elevation) to avoid off-target dispersion. It would be a violation of the FIFRA-~~Registration~~ Section 24(c) Special Local Need registration and the NPDES individual permit for the applicator to not follow label directions.

61. Page 3-38 – *Pollinators*. Honey bees are not pollinators for submerged aquatic vegetation. Honey bees are protected from pesticide use ~~under~~ by State pesticide laws and rules (RCW 15.60), along with the Plants Services Program and Agricultural Investigations which are enforced by the Pesticide Compliance Program.
62. Page 3-38 – Two beekeepers service the cranberry industry between approximately June 1 and July 8 each year by importing approximately 3,000 colonies of short-tongued ~~bumblebees~~ bumble bees and honey bees (personal communication with Dr. Kim Patten, WSU Pacific County Extension Director).
63. Page 3-38 – ~~Bumblebees~~ Bumble bees are ground nesters, with colonies in wooded areas. In the late winter and spring months, the ~~bumblebees~~ bumble bees are attracted to heathers (*Erica carnea*, *E. x darleyensis*), dewberry, and evergreen huckleberry.
64. Page 3-51 - Carbaryl (Alternative 2) is highly toxic to bees ~~in~~ that are exposed to direct contact or ~~as a residual~~ residues on flowering plants (USEPA 2012), and cannot be ~~administered~~ applied with bees present (NMFS 2009).
65. Page 3-52 - Imidacloprid (Alternative 3) is less highly toxic to bees ~~than carbaryl, requiring a higher concentration for toxicity; however, it is still toxic in~~ that are exposed to direct contact or ~~as a residual~~ residues on flowering plants, and cannot be applied with bees present (USEPA 2013b). Honey bees in lab tests exhibited behavioral responses in short direct exposure doses greater than 12µg/kg, and cumulative effects on mortality after 10 days of continued exposure (Gervais et al. 2010). ~~The proposed application rate of imidacloprid (0.5 pound of active ingredient per acre in either the flowable or granular formulation) would be below concentrations that would impact honey bees (USEPA 2013b).~~
66. Page 3-55 - Mitigation measures for the use of imidacloprid (Alternative 3) would be imposed pursuant to a new NPDES permit as necessary to ensure compliance with all applicable NPDES approval criteria, including Washington State Water Quality Standards

that protect water quality, fish and wildlife. Compliance with these laws would avoid and minimize significant adverse impacts to animals. Specific mitigation measures would likely require imidacloprid to be administered on commercial shellfish beds in a manner consistent with the spray drift management techniques and treatment site requirements specified in the FIFRA Registrations for the flowable and granular formulations of imidacloprid. These state that aerial applications must occur on beds exposed at low tide, and granular applications may be applied to beds under water using a calibrated granular applicator, operating from a floating platform or boat. Aerial dispersal would be limited by spray drift management measures to minimize exposure of imidacloprid to non-target terrestrial species or flowering terrestrial plants, and therefore would be unlikely to adversely affect local honey bee, ~~bumblebee~~ bumble bee, butterfly, fish, mammal, or bird populations.

67. Page 3-58 - Continued use of carbaryl under Alternative 2 would potentially affect only a very small number of people (primarily pesticide handlers and applicators, and to a much lesser extent, commercial shellfish workers). Carbaryl has been used to control burrowing shrimp in Willapa Bay and Grays Harbor from 1963 through 2013 under a FIFRA Section 24(c) Special Local Need Needs (~~FIFRA 24e~~) registration issued by the Washington State Department of Agriculture (WSDA).
68. Page 3-59 – Carbaryl is a reversible inhibitor of the neurotransmitter acetylcholinesterase. A member of the ~~n-methylcarbamate~~ n-methyl carbamate class of pesticides, carbaryl can cause cholinesterase inhibition in humans; that is, it can overstimulate the nervous system causing nausea, dizziness, confusion, and at high exposures, respiratory paralysis, and death.
69. Page 3-61 – If a new or modified NPDES individual permit were issued for continued use of carbaryl under Alternative 2, the following mitigation measures for protection of human health would likely be instituted. These mitigations measures are based on the FIFRA Section 3 registration and FIFRA Section 24(c) Special Local Need registration labels for carbaryl and are based on Federal and State laws that require various measures to be implemented to protect human health.