Legal Barriers to Pesticide and Herbicide Use in Commercial Aquaculture

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I. Introduction

Since ancient times, humans have utilized pesticides[1] to protect their crops from harmful animals and plants. The first known pesticide use occurred around 4,500 years ago, when ancient Sumerians used elemental sulfur dusting to deter pests threatening their harvest.[2] Today, farmers utilize a number of chemicals to prevent insects, weeds, and other pests from invading their fields and eating their crops.

Pesticides and herbicides are also utilized in the context of the commercial aquaculture industry for similar reasons. The use of pesticides in commercial aquaculture is intended to limit populations of harmful organisms and enable farmed shellfish and finfish to grow to maturity, after which they can be harvested and safely sold to consumers. However, when pesticides and herbicides enter aquatic systems, the environmental costs can be high. For example, pesticides can easily spread into the larger environment, causing unintentional fish kills and harming other non-target animal species such as birds of prey that consume contaminated organisms.[3] Herbicides also have the potential to harm non-target plant species, including types of native seagrass. Because of this, some states and municipalities have enacted laws and policies restricting the aquatic use of certain pesticides and herbicides—creating policy tensions between the aquaculture industry and environmental advocates along the way. This report provides a brief overview of the legal framework governing pesticide and herbicide use in the commercial aquaculture industry, with a focus on Washington—the state currently at the epicenter of the policy debate.

II. Pesticide and Herbicide Use in Aquatic Environments

The prospect of utilizing chemical pesticides and herbicides in aquatic environments presents several significant issues. As mentioned above, although pesticides are effective at controlling pests, the wider environmental costs of their application may be high. This is one of the main points of controversy surrounding aquatic use of chemical pesticides and herbicides. Such potential for environmental harm can be quantified through "aquatic toxicology"—the study of the effects of manufactured chemicals and other manmade materials on aquatic organisms at all levels, from subcellular to whole ecosystems.[4] A pesticide's capacity to harm aquatic organisms is largely a function of its: (1) toxicity, (2) exposure time, (3) dose rate, and (4) persistence in the environment. While such harm may be desirable in the context of target species, it becomes a problem when non-target species and the greater aquatic ecosystem are negatively impacted.

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1 According to the EPA, "pesticides" are defined as substances intended to prevent, destroy, repel, or mitigate any pest, and may include herbicides. "Herbicides" are pesticides that are further defined as chemicals that are used to manipulate or control undesirable vegetation. Accordingly, when the term "pesticide" is used in this report, it may be interpreted to include herbicides as well.

2 Ishan Y. Pandya, *Pesticides and Their Applications in Agriculture*, 2 Asian J. of Applied Sci. & Tech. 894 (2018).

3 Louis A. Helfrich et al., *Pesticides and Aquatic Animals: A Guide to Reducing Impacts on Aquatic Systems*, Virginia Tech, https://www.pubs.ext.vt.edu/420/420-013/420-013.html.

4 Samantha J. Jones, Information Resources in Toxicology 203 (2009).

- **Toxicity** of a pesticide refers to how poisonous it is. While some pesticides are extremely toxic, others are relatively nontoxic, as discussed further below.

- **Exposure** refers to the length of time an animal is in contact with a pesticide. While a brief exposure to some chemicals may have little effect on fish, longer exposure may cause harm.

- **Dose rate** refers to the quantity of pesticide to which an animal is subjected. A small dose of a more toxic chemical may be more damaging than a large dose of a less toxic chemical. A lethal dose is the amount of pesticide necessary to cause death. Because not all individual animals of a species will die at the same dosage, a standard toxicity dose measurement, called a Lethal Concentration 50 (LC50) is used to represent the concentration of a pesticide that kills 50% of a test population of animals within a set period of time.[5] Hazard ratings utilize LC50s to distinguish between more and less hazardous forms of pesticides, and can range from "minimal" to "super" toxicity.

- **Persistence** refers to the length of time a pesticide remains in the environment.[6] This is dependent on how quickly a pesticide breaks down, or degrades, which is largely a function of its chemical composition and the environmental conditions in play.[7] Pesticides can be degraded by sunlight, high air or water temperatures, moisture conditions, biological action, and soil conditions.[8]

The type of aquatic environment in which chemical pesticides are dispersed can significantly affect those chemicals' potential impact on the larger environment. This is important due to the various types of aquaculture that are currently practiced across the United States. For example, while recirculating and pond aquaculture take place in land-based facilities with little tie to the nation's navigable waters, riparian and marine aquaculture occur within open freshwater and saltwater environments, respectively. Consequently, there is a lower risk that aquatic pesticides utilized in the context of land-based aquaculture may harm non-target organisms and the greater environment.

There are many species of plants and animals considered undesirable in the context of commercial aquaculture. Which of these undesirable species warrant control, and to what extent, is a source of significant controversy within the aquaculture industry. Some pest species are non-native and invasive,[9] such as certain species of oyster drill—an aquatic snail that attaches itself to the outer shell of mollusks before drilling a small hole through the shell in order to eat the meat inside. Effective control of non-native, invasive "aquatic nuisance species" is typically encouraged, as they can threaten the diversity or abundance of native species, the ecological stability of infested waters, and any commercial, agricultural, aquacultural,

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5 Helfrich, *supra* note 3.

6 *Id.*

7 *Id.*

8 *Id.*

9 It is important to understand the difference between "invasive" and "non-native" species. Non-native species are simply species that are not native to the environment under consideration. Not all non-native species are invasive. Although alien to the environment, they are unable to survive or sustain populations that cause environmental harm. Invasive species, on the other hand, are non-native species that thrive in foreign environments, and are likely to cause harm to native ecosystems, human health, and/or the economy as a result.

or recreational activities dependent on such waters.[10] This can lead to an increased public and private willingness to use control methods such as chemical pesticides to rid the nation's waters of such species.

However, native species can also prove harmful to commercial aquaculture operations. Some species of native burrowing shrimp, for example, may interfere with the bottom-culture of shellfish. Though such species may be undesirable in the context of the commercial aquaculture industry, they provide important ecosystem services. Burrowing shrimps' sediment mixing activity and bioirrigation of their burrows greatly accelerates carbon and nitrogen cycling in estuarian environments—a service important for maintaining a balanced aquatic ecosystem.[11] Furthermore, the shrimp provide food for other aquatic species and can be harvested commercially and recreationally as bait.[12] Because of native species' general importance to their indigenous ecosystems, resistance to controlling such species with the use of chemical pesticides may be greater than that incurred by efforts to control non-native species.

Circumstances such as these fuel related controversy within the aquaculture industry by forcing regulating agencies and farmers to make decisions as to what plants and animals are and are not worthy of conservation. Because most states already have control and eradication programs for invasive species, the use of pesticides to control them within aquaculture operations would be in alignment with broader state conservation policy. Using pesticides to control native species in order to prevent economic harm (i.e., shellfish or finfish morality) raises more challenging policy questions. Does the value to the farm gained by controlling the species outweigh the cost to the wider ecosystem? And even with invasive species, the analysis may not be so clear. The reputations of non-native species can change over time. If those species are viewed by the public as benign or even desirable due to their potential contributions to society (e.g., sport fishing) or conservation objectives (e.g., providing habitat or food for endangered species), similar challenges to control efforts may arise.[13]

Even with the aquatic application of chemical pesticides, it can be difficult to effectively control unwanted plant and animal species. For example, there have been many attempts over the years to control populations of the invasive Atlantic oyster drill in the Pacific northwest region of the United States. The snail is native to the North American Atlantic coast, and its establishment in the Pacific Northwest poses a threat to both native oyster populations and oyster aquaculture operations.[14] The species is especially harmful to oyster spat (juvenile oysters), commonly preys on native oysters, and competes with native mollusks such as the California marine snail.[15] Though there is significant interest in controlling these invasive gastropods, chemical means of management are not often used. One pesticide—tributyl tin (TBT), an antifouling toxin—has been found effective at causing imposex[16] in

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10 *What are ANS?*, Aquatic Nuisance Species Task Force, https://www.anstaskforce.gov/ans.php.

11 T. H. Dewitt et al., *Measuring the contribution of benthic ecosystem engineering species to the ecosystem services of an estuary: A case study of burrowing shrimps in Yaquina Estuary, Oregon*, Environmental Protection Agency (2009), https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=205451.

12 *Id.*

13 Martin A. Schlaepfer et al., *The Potential Conservation Value of Non-Native Species*, 25 Conservation Biology 428 (2011).

14 *Urosalpinx cinerea (mollusc)*, Global Invasive Species Database, http://issg.org/database/species/ecology.asp?si=1383&fr=1&sts=&lang=EN.

15 *Id.*

16 Imposex is a disorder in sea snails caused by the toxic effects of certain marine pollutants. Such pollutants cause female sea snails to develop male sex organs, rendering populations less likely to reproduce effectively.

the snails.[17] However, use of TBT is inadvisable due to its extreme toxicity to non-target crustaceans and mollusks, which has led to the pesticide's ban in some countries.[18] Alternatively, efforts to control Atlantic oyster drill populations are often conducted mechanically, with studded-tile traps having been used successfully in the past.[19] Although the mechanical methods are often more costly and labor-intensive, evidence of their success exemplifies the need for interested parties to consider all possible forms of control before defaulting to the use of chemical pesticides. Chemical pesticides are not necessarily the "silver bullet" answer to eradicating unwanted plants and animals, yet are sometimes promoted as such by some stakeholder groups, fueling policy tensions as a result.

III. Regulatory Framework

a. Federal

On the federal level, pesticides and herbicides are regulated by the Environmental Protection Agency's (EPA) Office of Pesticide Programs (OPP) under authority given to it by Congress under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).[20] Additionally, under the Federal Food, Drug and Cosmetic Act (FFDCA), the EPA establishes "tolerances" (or maximum legally permissible levels) for pesticide residues in food.[21] Such tolerances are important in the context of pesticide use in aquaculture industry, because farmers using chemical pesticides during production must adhere to any applicable tolerances set by the EPA in order to sell their products for human consumption. The Clean Water Act (CWA), too, requires that dischargers of pesticides into the nation's waterways first obtain a valid permit from the EPA. Other indirectly related federal laws, such as the Endangered Species Act and Safe Drinking Water Act may also impact the use of pesticides in the United States but are not the focus of this report.

i. FIFRA

FIFRA governs pesticide distribution, sale, and use by generally requiring that all pesticides distributed or sold in the United States first be registered, or licensed, by the EPA.[22] Under section 3 of FIFRA, no person in any state may distribute or sell any pesticide that has not been registered under the Act. Before the EPA can register a pesticide under FIFRA, the applicant must show, among other things, that using the pesticide according to its specifications "will not generally cause unreasonable adverse effects on the environment."[23] FIFRA defines the term "unreasonable adverse effects on the environment" to mean: "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the [FFDCA]."[24]

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17 *Urosalpinx cinerea (mollusc), supra* note 14.
18 *Id.*
19 *Id.*
20 7 U.S.C. § 136 et seq. (1996).
21 21 U.S.C. § 301 et seq. (2002).
22 *Summary of the Federal Insecticide, Fungicide, and Rodenticide Act*, Environmental Protection Agency, https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act.
23 *Id.*
24 *Id.*

FIFRA also contains labeling provisions that generally require all registered pesticide products to display labels that show statutorily required information (such as an ingredient statement, directions for use, and warnings or precautionary statements) both clearly and prominently.[25] Pesticide labels may include, for example, instructions requiring the wearing of protective clothing, handling instructions, and instructions setting a period before workers may re-enter growing areas after application.[26] Pesticide product labels provide critical information about how to safely and legally handle and use pesticide products. Uses provided for on the product label are typically referred to as "allowed uses," while uses not specifically mentioned on the label are referred to as "off-label uses." Unlike most other types of product labels, pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of Federal law to use this product in a manner inconsistent with its labeling."[27] To violate a pesticide's label by engaging in an off-label use is to violate FIFRA, as courts consider a label to be a legal document. Pesticides and herbicides that are approved for aquatic use will explicitly note such on their product labels.

Additionally, section 12 of FIFRA establishes a number of unlawful acts related to pesticides, which prohibit: (1) distributing or selling unregistered pesticides; (2) operating with a cancelled or suspended pesticide registration; (3) detaching, destroying, or defacing any required labeling; (4) refusing to prepare, maintain, or submit any required records; and (5) refusing to allow entry, inspection, copying of records, or authorized sampling by the EPA.[28]

Other notable sections of FIFRA do things such as set worker protection standards;[29] stipulate certain procedures related to pesticide storage, disposal, transportation, and recall;[30] and define the authority of states to regulate pesticide sale or use.[31]

ii. FFDCA

As briefly noted above, section 408 of the FFDCA authorizes the EPA to set "tolerances," which are maximum limits for pesticide residues found on foods. In the absence of a tolerance, a food containing such a pesticide residue is subject to immediate seizure by the federal government.[32] Once a tolerance is established, commodities are subject to seizure if residues are found above the allowed level.[33] In setting tolerances, the EPA must first make a finding that the tolerance is "safe."[34] If a tolerance is "safe," there is a "reasonable certainty that no harm will result from aggregate exposure to the pesticide residue."[35]

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25 *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities*, Environmental Protection Agency, https://www.epa.gov/enforcement/federal-insecticide-fungicide-and-rodenticide-act-fifra-and-federal-facilities#Summary.

26 *Id.*

27 *Introduction to Pesticide Labels,* Environmental Protection Agency, https://www.epa.gov/pesticide-labels/introduction-pesticide-labels.

28 *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities, supra* note 25.

29 40 C.F.R. 170.

30 7 U.S.C. 136(q).

31 7 U.S.C. 136(v).

32 *Summary of the Federal Food, Drug, and Cosmetic Act*, Environmental Protection Agency, https://www.epa.gov/laws-regulations/summary-federal-food-drug-and-cosmetic-act.

33 *Id.*

34 *Id.*

35 *Id.*

In order to make a safety finding, the EPA considers, among other things: (1) the toxicity of the pesticide and its breakdown products, (2) aggregate exposure to the pesticide in foods and from other sources, and (3) any special risks posed to infants and children.[36] In some instances (such as when pesticide residues do not pose a dietary risk under reasonably foreseeable circumstances), the EPA grants exemptions from the tolerance requirement.[37] For example, diquat dibromide, one of the most commonly utilized aquatic herbicides, is regulated by the EPA under the FFDCA, which assessed its human health and other associated risks and then set 44 tolerances for allowable residues of the herbicide in or on raw agricultural commodities.[38] Of those 44 tolerances, one applies to fish—setting the maximum allowable residue of the herbicide to 2.0 parts per million for fish sold as food commodities. In order to sell fish cultivated in a body of water treated with diquat dibromide for human consumption, an aquaculturist would have to ensure that any residues of the herbicide left on the fish fall within the EPA's applicable tolerance level or risk having their yield federally seized.

iii. CWA

The National Pollutant Discharge Elimination System (NPDES) permitting program administered by the EPA under the CWA regulates discharges from pesticide applications consistent with section 402 of the Act. Those who plan to discharge biological or chemical pesticides that leave a residue from a point source[39] into waters of the United States are required to obtain a permit either from the EPA itself or an authorized state prior to such discharge.[40] The EPA and the states issue programmatic general permits (PGPs) to offer coverage for pesticide operators, and activities not eligible for coverage under the PGP may be eligible for coverage under an individual permit.[41]

The agency that issues a NPDES permit for pesticide applications depends on the location of those applications. Typically, a state's environmental regulatory agency is the NPDES permitting authority and issues NPDES permits for activities in that state. However, the EPA issues the PGP for areas and activities where the states are not authorized. Specifically, the EPA is the NPDES permitting authority for pesticide discharges in: (1) Idaho, Massachusetts, New Hampshire, New Mexico, and Washington D.C.; (2) all U.S. territories except the Virgin Islands; (3) activities associated with oil, gas, or geothermal resources in Texas; (4) federal facilities in Delaware, Vermont, Colorado, and Washington; and (5) all Indian Country except in Maine.[42]

Even if a pesticide's label notes that it is approved for use in aquatic environments, discharges of said pesticide into waters of the United States still require a NPDES permit. The CWA and FIFRA requirements operate independently of each other, and possession of a valid NPDES permit does not negate FIFRA's

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36 *Id.*

37 *Id.*

38 40 C.F.R. 180.226.

39 The term "point source" refers to any discernible, confined, and discrete conveyance from which pollutants are or may be discharged. The term does not include agricultural stormwater discharges and return flows from agriculture.

40 *Pesticide Permitting*, Environmental Protection Agency, https://www.epa.gov/npdes/pesticide-permitting.

41 General permits authorize common activities that cause only minimal individual and cumulative impacts. PGPs are a type of general permit that are based on existing state, local, or other federal programs, and are designed to eliminate redundant efforts between federal agencies and state regulatory programs that provide similar protections. Individual permits are used for projects that do not meet the agency requirements for a general permit.

42 *Pesticide Permitting, supra* note 40.

requirement that applicators use registered pesticides consistent with the product's labeling. However, applications in violation of certain FIFRA requirements could also be a violation of the NPDES permit, and, therefore, a violation of the CWA (for example, exceeding label application rates).[43]

b. State

As noted above, the EPA is the chief federal agency administering the three legal frameworks that chiefly affect aquatic pesticide use and application—FIFRA, the FFDCA, and the CWA. As such, it retains primary authority over those frameworks but cedes certain powers to the states when deemed appropriate. Sometimes, as with FIFRA and the CWA, state authority can be relatively significant. For example, under FIFRA, authorized states can enact additional restrictions on the use of federally-registered pesticides that apply within state borders. However, the EPA chooses to fully retain its authority in some instances. For example, also under FIFRA, states cannot permit the sale or use of a federally prohibited pesticide or impose any requirements for labeling or packaging in addition to, or different from, those imposed by the Act. Additionally, states are unable to set their own pesticide tolerances or make safety determinations under the FFDCA.[44]

i. FIFRA

Under FIFRA, states have the authority to enact their own pesticide-related regulations so long as they as stringent as the EPA's.[45] In particular, section 24 of FIFRA notes that states can regulate the sale or use of any registered pesticide within their borders.[46] States can also require registration of pesticides that are otherwise exempt under FIFRA. Furthermore, section 24(c) of FIFRA authorizes states to add allowable uses to certain pesticides when there is a special local need unless the EPA previously denied, disapproved, or canceled the use.[47] The lead agency for pesticide regulation varies from state to state but is typically a state's department of agriculture.

FIFRA, however, prohibits states from regulating the sale and use of pesticides in a way that permits any sale or use prohibited by FIFRA.[48] Additionally, states cannot impose any requirements for pesticide labeling or packaging that are in addition to or different from those imposed by FIFRA.[49]

Under section 18 of FIFRA, the EPA can allow state and federal agencies to permit the unregistered (off-label) use of a pesticide in a specific geographic area for a limited time if certain emergency pest conditions exist. Federal regulations define the term "emergency condition" as an urgent, non-routine situation that requires the use of a pesticide.[50] Such conditions must jeopardize the production of

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43 *Pesticide Applications Frequent Questions*, ENVIRONMENTAL PROTECTION AGENCY, https://www.epa.gov/npdes/pesticide-applications-1.

44 States have not been given any powers of their own under the FFDCA, so it will not be discussed in this section. However, some U.S. states have adopted the FFDCA as equivalent state law, meaning that any federal changes made to the act will be adopted into state law by default.

45 *State Pesticide Regulation*, NATIONAL PESTICIDE INFORMATION CENTER, http://npic.orst.edu/reg/regstate.html.

46 *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities, supra* note 25.

47 *Id.*

48 *Id.*

49 *Id.*

50 40 C.F.R. 166.

agricultural goods, the environment, or public health in a way that inadequate tools (including pesticide registrations) exist to remedy the situation. Emergency exemption applicants must submit information to the EPA describing the pest emergency and requesting permission for a specific unregistered pesticide use. If granted such permission, the state will issue its own registration for the pesticide in question that will be considered a federal registration in the eyes of the EPA but only for the purposes of distribution and use within the state. However, before authorizing an emergency exemption, the EPA must also determine that use of the pesticide will not cause unreasonable harm to human health or the environment.[51]

Specifically, the EPA can exempt state agencies in four circumstances: (1) specific exemptions; (2) quarantine exemptions; (3) public health exemptions; and (4) crisis exemptions.

- **Specific exemptions** can be authorized when there is a threat of significant economic loss, or there is significant risk to an endangered species, threatened species, beneficial organism, or the environment. These exemptions constitute the majority of exemption requests and can be authorized for up to one year.

- **Quarantine exemptions** can be authorized in order to control the spread of a native or invasive pest. The emergency addressed by quarantine exemptions is based on the need to prevent the introduction or spread of a harmful invasive species—an emergency that may be best addressed by an unregistered use of a pesticide. Quarantine exemptions can be authorized for up to three years.

- **Public health** exemptions can be authorized to control a pest believed to cause a significant risk to public health. Such exemptions can be authorized for up to one year.

- **Crisis exemptions** can be permitted when the time frame between recognition of a threat and the need to act is too short to allow the state agency to obtain one of the other three exemptions. If the EPA concurs with a request for a crisis exemption, the requesting state or federal agency may issue the exemption allowing the unregistered use to proceed for up to 15 days. A crisis exemption may be "stand-alone" or may be allowed in conjunction with a full request for one of the other three exemptions. If such a full request is submitted, use is allowed to continue under the crisis exemption until the EPA makes a decision on the specific, quarantine, or public health request.

States may also require that certain pesticide products be registered under state law as well as under FIFRA as a condition of distribution or use of that product within the state. FIFRA does not affect a state's right under its own law to revoke, suspend, cancel, or otherwise impact such a state-level registration, however, the federal registration cannot be affected by such state action.

States are given primary enforcement authority under FIFRA when the EPA determines that they meet three requirements.[52] First, the state must have pesticide regulations that are at least as stringent as federal

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[51] Pesticide Registration Manual: Chapter 17 – State Regulatory Authority, Environmental Protection Agency, https://www.epa.gov/pesticide-registration/pesticide-registration-manual-chapter-17-state-regulatory-authority#emergency.

[52] 7 U.S.C. § 136w-1.

regulations. Second, the state must have adopted procedures to allow enforcement responsibilities to be carried out. Third, the state must keep adequate records detailing enforcement actions. Enforcement responsibilities include ensuring that users follow label requirements, investigating use complaints, and inspecting users, dealers, and producers. If the EPA determines that a state agency has not carried out its enforcement responsibilities under FIFRA, it can rescind the state's enforcement authority if necessary.[53]

ii. CWA

As noted above, some states have been authorized by the EPA to issue NPDES permits for pesticide-related activities. States can receive authorization for one or more NPDES program components, with the EPA retaining authority over the program components for which a state is not authorized. If authorized, the state assumes NPDES permitting authority from the EPA, meaning that all new permit applications are submitted to the state agency for NPDES permit review and issuance instead of the EPA itself. Furthermore, the EPA allows authorized states to issue administrative compliance orders to take civil judicial action against violators of the CWA, including federal facilities.[54] However, pursuant to U.S. Supreme Court precedent, states cannot recover penalties for past violations against such federal facilities.[55] States can also file criminal actions against federal employees that may result in significant fines and/or prison sentences.

c. Local

Generally, local governments further state and federal objectives by helping enforce state and federal laws. Sometimes local governments are given permission to enact pesticide-related ordinances that are more stringent than those put in place by higher levels of government, though such authority is not explicitly provided for in FIFRA, the FFDCA, or the CWA. Whether a local pesticide-related ordinance can stand depends on what rulemaking authority the parent state in question has chosen to cede to local governments by state laws. In turn, states cannot cede pesticide-related rulemaking authority that has not first been given to them by the federal government. This legal principle is known as "preemption."

Preemption occurs when a higher level of government prohibits laws passed by lower levels of government from conflicting with its own. For example, the federal government can preempt conflicting state laws, and state governments can preempt conflicting local laws. There are three types of preemption that states can choose to utilize: (1) explicit preemption, (2) limited preemption, and (3) no preemption. In the thirty states that enforce explicit preemption, the law outright prohibits localities from adopting legislation that would regulate the use of pesticides if it is stricter than state law.[56] In the thirteen states with limited preemption laws, all state authority to regulate pesticides is delegated to a commissioner or pesticide board.[57] In eight of those states, such delegated authority is exclusive, and localities have no

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53 *Id.*

54 *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities, supra* note 25.

55 Energy v. Ohio, 503 U.S. 607 (1992).

56 Matthew Porter, *State Preemption Law: The battle for local control of democracy*, BEYOND PESTICIDES (2013), https://www.beyondpesticides.org/assets/media/documents/lawn/activist/documents/StatePreemption.pdf.

57 *Id.*

authority to enact pesticide-related rules. However, in five of those thirteen states, localities can petition the commissioner for exemptions to state pesticide regulations in certain instances.[58] The seven remaining U.S. states do not preempt local authorities' ability to restrict the use of pesticides on any land within their jurisdiction.[59] While some of the seven states simply have no laws in place that would preempt local authority, others have enacted specific laws that reaffirm local authority.[60] However, it is important to note that localities in "no preemption" states cannot attempt to lessen the stringency of state or federal law through the enactment of local rules. They may only increase the stringency of such. The following table provides a snapshot of how each U.S. state treats local preemption:

	Explicit Preemption	**Limited Preemption** ***(exclusive authority)***	**Limited Preemption** ***(petition allowed)***	**No Preemption**
Alabama	◆			
Alaska				◆
Arizona	◆			
Arkansas	◆			
California	◆			
Colorado	◆			
Connecticut		◆		
Delaware		◆		
Florida	◆			
Georgia	◆			
Hawaii				◆
Idaho	◆			
Illinois	◆			
Indiana			◆	
Iowa	◆			
Kansas	◆			
Kentucky	◆			
Louisiana			◆	
Maine				◆
Maryland				◆
Massachusetts		◆		
Michigan			◆	

58 *Id.*
59 *Id.*
60 *Id.*

Minnesota	◆			
Mississippi		◆		
Missouri	◆			
Montana	◆			
Nebraska	◆			
Nevada				◆
New Hampshire	◆			
New Jersey			◆	
New Mexico	◆			
New York		◆		
North Carolina	◆			
North Dakota	◆			
Ohio	◆			
Oklahoma	◆			
Oregon	◆			
Pennsylvania	◆			
Rhode Island		◆		
South Carolina		◆		
South Dakota	◆			
Tennessee	◆			
Texas	◆			
Utah				◆
Vermont				◆
Virginia		◆		
Washington			◆	
West Virginia	◆			
Wisconsin	◆			
Wyoming	◆			

Due in large part to preemption, local attempts to restrict pesticides have had varying success depending on the state in which the municipality is located. For example, the city of Takoma Park in Montgomery County, Maryland successfully restricted the use of lawn care pesticides on both public and private property by adopting the Safe Grow Act of 2013.[61] However, additional challenges can arise despite a state's favorable preemption laws. For example, parties wishing to challenge the validity of pesticide-related ordinances they believe are preempted or otherwise improper can file lawsuits alleging such. Such a challenge arose in Montgomery County, Maryland, which, though successful in limiting pesticide

[61] *Safe Grow*, City of Takoma Park, Maryland, http://takomaparkmd.gov/initiatives/safegrow/.

use in 2013, became party to a lawsuit challenging the validity of a more recent law that amends the Montgomery County Code in order to ban certain pesticide use on private and county-owned property.[62] However, the county was again successful when a state appellate court found in May 2019 that Maryland's legislature did not intend to preempt the entire field of pesticide regulation, and, thus, that the county's code amendment was permissible.

IV. Common Provisions in State Pesticide and Herbicide Laws

Although states may adopt regulations related to the use and application of pesticides and herbicides (so long as they are equally or more restrictive than FIFRA), the exact content and applicability of such regulations to commercial aquaculture varies from state to state. State pesticide regulations tend to address the following issues: (1) registration; (2) certification and licensing; (3) liability; and (4) enforcement. Few state pesticide and herbicide laws currently address commercial aquaculture directly. Furthermore, those that do most often involve land-based, not riparian or marine, culture.

As noted above, states' pesticide regulatory offices have the power under FIFRA to require additional, state-level registration of federally registered pesticides before they can be sold or distributed within state borders. Such state-level registration requirements are codified in a state's statutes and/or regulations. For example, Illinois requires that every pesticide distributed, sold, offered for sale within the state, delivered for transportation, or transported in interstate commerce or between points within the state through any point outside the state be registered subject to the provisions of the Illinois Pesticide Act.[63] The Act contains additional provisions related to registration, such as those concerning the length of registration periods, application procedures, and registration renewals.[64] As another example, Florida requires pesticides to be registered with the state Department of Agriculture and Consumer Services prior to use, which may require submission of evidence that the pesticide will not cause an unreasonable adverse effect on public health or the environment prior to application.[65] Registration in Florida also entails verification that the pesticide in question is correctly labeled, that the equipment used to distribute the pesticide does not contaminate the water supply, and that the method of use conforms to federal and state standards.[66]

States can also require that a certain licenses and/or certifications be obtained before pesticide use. Most often, such provisions relate to pesticide application, both commercially and privately.[67] Under the federal Certification of Pesticide Applicators rule, the EPA requires any person who applies or supervises the use of restricted use pesticides (RUPs)[68] to be certified as a private or commercial applicator.[69]

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62 *Montgomery Cty. v. Complete Lawn Care, Inc.*, 240 Md. App. 664, 207 A.3d 695 (2019).

63 415 Ill. Comp. Stat. Ann. 60 / 6.

64 *Id.*

65 Fla. Stat. Ann. § 487.041.

66 *National Aquaculture Legislation Overview, United States of America*, Food and Agriculture Organization of the United Nations, http://www.fao.org/fishery/legalframework/nalo_usa/en.

67 According to the EPA, "private applicators" apply pesticides for the production of an agricultural commodity on land that they or their employer owns or rents, while "commercial applicators" do not meet the description of a private applicator.

68 RUPs have the potential to cause unreasonable adverse effects to the environment and injury to applicators or bystanders without added restrictions. Accordingly, they are not available for purchase or use by the general public.

69 *Federal Certification Standards for Pesticide Applicators*, Environmental Protection Agency, https://www.epa.gov/pesticide-worker-safety/federal-certification-standards-pesticide-applicators.

State, territorial, and tribal authorities certify applicators of RUPs according to EPA standards but may also place additional restrictions on certification. For example, Illinois requires licensed commercial applicators to provide and maintain evidence of financial capability to protect those who may suffer personal injury or property damage as a result of an application.[70] This can be done either by providing documentation of an existing surety bond or a certificate of liability coverage.[71]

States can also require that certain licenses be obtained prior to non-application uses of pesticides. For example, Colorado requires that any person who acts as a pesticide dealer possess a valid pesticide dealer license issued by the state before conducting any sales.[72] This requirement applies not only to dealers in their personal capacity but also to each business location, including branch offices, and each business name associated with such pesticide sales.[73] Because of the varying content and applicability of such certification and licensing requirements, it is important for aquaculture stakeholders to acquaint themselves with the rules that apply in their chosen states.

Some states have also promulgated regulations related to the liability aquaculturists may incur when utilizing pesticides on their farms. However, such regulations are not blanket protections, with each regulation specifying under what circumstances it will apply. For example, Kentucky generally shields those engaged in "farming"[74] who have utilized pesticides from any damages or costs related to the discharge or release of said pesticides into the land, water, air, or other resources of the state, absent proof of negligence or a lack of due care.[75] However, this liability protection is only applicable if: (1) the application or use of the pesticide was in a manner consistent with the pesticide's labeling and in accordance with acceptable management practices and applicable state and federal laws and regulations; (2) the state or federal government has approved, recommended, or permitted the application or use; (3) no conditions to the state or federal government's authorization or warnings regarding the application of the pesticide were violated; (4) the pesticide was licensed by or registered with the state or federal government at the time of application or use; and (5) the pesticide applicator was not aware of any special land conditions that would render the application or use likely to cause pollution.[76]

In lieu of promulgating separate regulations related to pesticide liability, some states have chosen to integrate such protections into right-to-farm legislation.[77] For example, Florida's Right to Farm Act generally shields "farm operations"[78] from liability in nuisance lawsuits so long as they have satisfied certain regulatory conditions (such as having been in operation for one year or more at the time of the nuisance).[79]

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70 415 Ill. Comp. Stat. Ann. 60/10.

71 *Id.*

72 Colo. Rev. Stat. Ann. § 35-9-114 (West).

73 *Id.*

74 For the purposes of this regulation, Kentucky defines "farming" to include the cultivation of land used for the production of aquaculture or aquacultural products.

75 Ky. Rev. Stat. Ann. § 217B.195 (West).

76 *Id.*

77 Generally, right-to-farm legislation provides projection to farmers against certain types of legal actions when certain conditions are satisfied.

78 For the purposes of this regulation, Florida defines "farm operation" to include all activities that occur on a "farm" in connection with, among other things, the application of chemical fertilizers, conditioners, insecticides, pesticides, and herbicides. A "farm" includes the land, buildings, support facilities, machinery, and other appurtenances used in the production of farm or aquaculture products.

79 Fla. Stat. Ann. § 823.14 (West).

However, many right-to-farm laws provide for the removal of liability shields in certain circumstances. For example, Florida considers it evidence of a nuisance if there is found to be: (1) untreated or improperly treated human, animal, or chemical waste that is harmful to human or animal life; (2) improperly built or maintained septic tanks or bathrooms; (3) diseased animals that are dangerous to human health (unless kept in accordance with a current state or federal disease control program; or (4) unsanitary slaughter areas that may give rise to diseases harmful to human or animal life.[80]

As noted above, section 26 of FIFRA gives states primary enforcement responsibilities for pesticide use violations if the EPA determines that the state in question has adopted and is implementing adequate pesticide use laws and regulations, enforcement procedures, and recordkeeping and reporting requirements. States qualify this enforcement authority through the enactment of their own statutes which, like the other state pesticide laws mentioned above, vary from place-to-place. For example, Oregon authorizes its State Department of Agriculture to conduct numerous enforcement activities in order to carry out the provisions of its pesticide control laws, including revoking, suspending, or refusing to issue or renew any license or certificate to a person who has violated such laws.[81] Additional provisions of Oregon's law permit the state to seize evidence, issue "stop sale, use or removal" orders, and establish limitations and procedures deemed necessary for the protection of humans, animals, and the environment, among other things.[82]

States can also promulgate their own penalty-related statutes, but are restricted by the maximum civil and criminal penalty provisions contained in FIFRA. For example, section 14 of FIFRA notes that private pesticide applicators who knowingly violate the act will be guilty of a misdemeanor and, upon conviction, fined no more than $1,000, imprisoned for no more than 30 days, or both. However, Kansas has further qualified the Act's somewhat permissive language by limiting the fine for private applicator violators to no less than $100 but no more than $500.[83]

V. Case Study: Washington

In recent years, Washington State has been at the center of the debate over pesticide and herbicide use in commercial aquaculture. It is currently the only state that generally permits the application of pesticides to commercial shellfish aquaculture beds. State regulators, however, have struggled recently with whether to limit their use. The surrounding communities' reaction to this conflict has been varied, with many members of the commercial aquaculture industry advocating for the increased use of aquatic pesticides and herbicides while many non-governmental organizations and community members call for the opposite. The following case study discusses Washington's recent experience with the regulation of pesticides and herbicides in commercial aquaculture.

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80 *Id.*

81 OR. REV. STAT. ANN. § 634.322 (West).

82 *Id.*

83 KAN. STAT. ANN. § 2-2461 (West).

a. Herbicides

As noted above, FIFRA generally permits private actors to utilize federally registered pesticides for labeled uses, subject to state limiting authority. Washington's Department of Ecology currently permits the direct application of the herbicide imazamox as well as marker dyes on commercial clam beds (excluding geoduck beds) in Willapa Bay in order to control the non-native eelgrass *Zostera japonica*, which the state classifies as a class C noxious weed.[84] *Z. japonica*, or Japanese seagrass, grows densely in shallow, sheltered bays and estuaries around the state, including the sand and mud flats present in Willapa Bay, making it difficult for aquaculturists to grow and harvest clams.[85] Another species of eelgrass, the native *Zostera marina*, which is highly valued and protected, also grows in the same habitat (oftentimes in mixed beds along with *Z. japonica*).[86]

Washington's aquatic herbicide permit is a combined NPDES and State Waste Discharge General Permit, meaning that it is meant to authorize *Z. japonica* control activities causing only minimal and cumulative environmental impacts to water resources within a specific geographic area.[87] The Washington Department of Ecology can require those seeking coverage under the general permit to instead obtain coverage under an individual permit, which involves a more thorough, case-by-case analysis of the socioeconomic and environmental impacts of proposed *Z. japonica* control projects.[88]

Imazamox is a systemic herbicide that moves throughout plant tissue and prevents plants from producing a necessary enzyme, acetolactate synthase, which is not found in animals.[89] Susceptible plants stop growing soon after treatment, and plant death and decomposition occurs over a period of several weeks.[90] Laboratory tests using rainbow trout, bluegill, and water fleas indicate that imazamox is not toxic to such animal species at label rates, and the herbicide is rated practically non-toxic to fish and aquatic invertebrates.[91] Furthermore, imazamox does not bioaccumulate in fish.[92]

The Washington Department of Ecology's issuance of the permit to members of the shellfish aquaculture industry in 2014 garnered criticism from various agencies and non-governmental organizations, including the U.S. Fish and Wildlife Service, based both on potential impacts to *Z. marina* in mixed beds and offsite and the purported ecological benefits of *Z. japonica*.[93] Despite this criticism, Washington doesn't seem to have publicly changed its view on the aquatic use of imazamox for seagrass control, though the permit expired on May 2, 2019, and has not been renewed as of September 2019.[94]

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84 *Zostera japonica management on commercial clam beds in Willapa Bay General Permit*, Washington Department of Ecology, https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Aquatic-pesticide-permits/Zostera-japonica-eelgrass-management.

85 *Id.*

86 *Zostera Japonica Management on Commercial Clam Beds in Willapa Bay NPDES General Permit*, Washington Department of Ecology, 12 (Jan. 2, 2014), https://ecology.wa.gov/DOE/files/69/69b534dd-c414-44d3-baaa-0616f4a3456b.pdf.

87 *Zostera japonica management on commercial clam beds in Willapa Bay General Permit, supra* note 84.

88 *Zostera Japonica Management on Commercial Clam Beds in Willapa Bay NPDES General Permit, supra* note 86 at 1.

89 *Imazamox Chemical Fact Sheet*, Washington Department of Natural Resources (Jan. 2012), https://dnr.wi.gov/lakes/plants/factsheets/ImazamoxFactsheet.pdf.

90 *Id.*

91 *Id.*

92 *Id.*

93 Both *Z. marina* and *Z. japonica* fulfill many of the same food, shelter, and habitat functions, however, the positive effects of *Z. japonica* in its introduced range are not fully known.

94 *Zostera Japonica Management on Commercial Clam Beds in Willapa Bay General Permit*, Washington Department of Ecology (Apr. 2, 2014), https://ecology.wa.gov/DOE/files/3c/3cef2168-017d-44d9-ac10-1ab0c39fc23d.pdf.

b. Pesticides

Pesticide use in Washington's commercial aquaculture industry is a contentious subject for numerous reasons. While aquaculturists in the state argue that application of the chemicals is necessary to adequately conduct business, environmentalists and other users of the state's water resources highlight the negative impacts that such application can yield. As discussed further below, pesticide use in the aquaculture industry has negatively impacted the commercial Dungeness crab fishery in Washington in the past—an industry with an average landed value of approximately $20 million from 1990 – 2002.[95] However, perhaps the best current example of this tension can be seen in the industry's efforts to control native burrowing shrimp populations with pesticides. These crustaceans live in deep holes in tidal flats, the digging of which can destabilize the seabed and result in a quicksand-like muck that causes bottom-cultured oysters to sink and smother as they mature. Consequently, members of the commercial shellfish aquaculture industry who farm on those tidal flats have an interest in eliminating as many burrowing shrimp as possible in order to protect their yield—a task they argue is best accomplished through the use of chemical pesticides. However, as discussed further below, such control efforts can and have been fraught with conflict as industry members and other user groups disagree regarding what specific pesticides, if any, should be utilized and in what instances. These user conflicts can even spur legal challenges—a complication that can force some aquaculturists to completely reevaluate their chosen pest control methods, sometimes in ways that sacrifice effectiveness.

VI. Conclusion

Washington's pesticide and herbicide issues are illustrative of larger policy tensions that the commercial aquaculture industry must work to resolve in coming years. Are chemical pesticides and herbicides appropriate for aquatic use in the commercial aquaculture industry, especially in marine environments where they may more easily dissipate into the larger environment? If so, what specific pesticides and herbicides are best at eradicating unwanted plants and animals while preserving a healthy aquatic environment, and can they be legally approved for aquatic use? If certain pesticides are deemed inappropriate or illegal, what other methods of pest plant and animal removal should be utilized, and how is that best accomplished? What repercussions will such decisions have on both the commercial aquaculture industry as well as the environment itself? Though an arduous task, recognizing and addressing the full breadth of such policy tensions can help aquaculturists, governing bodies, and other user groups strike a balance between the continued success of the United States' commercial aquaculture industry and the wellbeing of its aquatic environments.

[95] *Coastal commercial Dungeness crab fishery*, WASHINGTON DEPARTMENT OF FISH AND WILDLIFE, https://wdfw.wa.gov/fishing/commercial/crab/coastal.