



DEPARTMENT OF
ECOLOGY
State of Washington

Economic Impact Analysis

***Zostera japonica* Management on Commercial Clam Beds in Willapa Bay General Permit**

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Economic Impact Analysis

***Zostera japonica* Management on Commercial Clam Beds in Willapa Bay General Permit**

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for

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1. Overview and Results

The *Zostera japonica* Management on Commercial Clam Beds in Willapa Bay General Permit (general permit) regulates the use of the aquatic herbicide Imazamox and the application of marker dyes to manage *Zostera japonica* (*Z. japonica*) on commercial clam beds (excluding geoduck culture) in Willapa Bay. This general permit covers only the chemical management of *Z. japonica*.

The Department of Ecology (Ecology) proposes to issue this general permit so that dischargers operating under coverage of this general permit will comply with the Federal Clean Water Act (CWA) and with the Washington Water Pollution Act (chapter 90.48.080 RCW). Ecology's Waste Discharge General Permit Program rule (WAC 173-226-120) requires an economic analysis of any wastewater general permit intended to directly cover small businesses. This analysis is required to serve the following purposes:

- A brief description of the compliance requirements of the general permit.
- The estimated costs for complying with the general permit, based on existing data for facilities to be covered under the general permit.
- A comparison, to the greatest extent possible, of the cost of compliance for small businesses, with the cost of compliance for the largest ten percent of businesses to be covered under the general permit.
- Discuss what mitigation the general permit provides to reduce the effect on small businesses (if a disproportionate impact is expected), without compromising the mandated intent of the general permit.

The Regulatory Fairness Act (RCW 19.85.020(3)) defines a small business as any business entity, including a sole proprietorship, corporation, partnership, or other legal entity, that is owned and operated independently from all other businesses, that has fifty or fewer employees. Ecology uses the definition in the Regulatory Fairness Act when conducting economic impact analyses of general permits.

This analysis does not include benefits. This analysis also does not include environmental impacts. This analysis only estimates the additional costs borne by expected permittees resulting from compliance with the requirements of the general permit. If interested in environmental impacts, please see Ecology publication Environmental Impact Statement for the Use of Imazamox to Control *Zostera japonica* on Commercial Clam Beds.¹

1.1 Requirements of the general permit

Since 2001, and based on *Headwaters v. Talent Irrigation District* (No. 99-35373, 2000), Ecology has managed the discharge of pesticides to waters of the state under National Pollutant Discharge Elimination System (NPDES) permits. In 2009, the Sixth Circuit Court ruled in *National Cotton Council et al. v. The Environmental Protection Agency* (EPA) that the discharge of pesticides and their residues to waters of the state requires NPDES coverage. This decision means that NPDES permitting is required for all aquatic pesticide applications throughout the United States.

This general permit covers the discharge of the aquatic herbicide Imazamox and marker dyes to Willapa Bay for the management of *Z. japonica* on commercial clam beds. This general permit helps Ecology:

- Mitigate and condition the aquatic use of the herbicide Imazamox.
- Monitor impacts of Imazamox treatments to non-target organisms.
- Track Imazamox use rates and locations.

¹ Draft and final permit documents will be available at the following webpage:
<http://www.ecy.wa.gov/programs/wq/pesticides/eelgrass.html>.

- Ensure that notifications and postings occur in areas where the public or local residents may access the treated areas.
- Monitor sediment concentrations of Imazamox in treated beds (in the buffer width study).

Ecology proposes to issue this general permit so that dischargers operating under coverage of this permit will comply with the CWA and with the Washington Water Pollution Act.

This general permit is the first issuance of the *Zostera japonica* Management on Commercial Clam Beds in Willapa Bay General Permit - there is currently no general permit for the application of Imazamox to commercial clam beds in Willapa Bay. The relevant baselines (the relevant regulation if this general permit did not exist) include existing federal and state regulations, discussed in more detail in Section 3. We analyze the additional costs resulting from the general permit that are more stringent than those in the federal regulation or other state laws and regulations, comparing the general permit to a baseline of no previous general permit.

1.2 Costs to comply with the general permit

A summary of the costs to comply with the general permit, attributable to Ecology’s discretion, is shown below in Table 1. Discretion refers to the requirements Ecology chose to include in the general permit. This analysis examines the requirements Ecology chose that are more stringent than the baseline. We compare Ecology’s general permit to a baseline of no general permit, as described in Section 3. These costs are categorized by number of employees in Table 2.

Table 1: Summary of additional compliance costs by type of cost

Permit requirements (per permittee)	Per year average (low)	Per year average (high)	5-year total, discounted² (low)	5-year total, discounted (high)
Posting signs	\$249	\$249	\$1245	\$1245
Public newspaper notice	\$51	\$63	\$256	\$317
Monitoring	\$720	\$786	\$3602	\$3930
Buffer width study requirements (total)				
Sediment analysis	\$247	\$396	\$1235	\$1981
Monitoring	\$263	\$884	\$1313	\$4418
Study analysis	\$66	\$203	\$329	\$1017

² Ecology uses a discount rate based on interest that could be earned risk-free on today’s dollars over the relevant time period. Ecology uses the twelve-year average rate of return offered on the US Treasury’s T-Bills (inflation-indexed short-term bonds; US Treasury Department, 2012) as the discount rate, averaging 1.45 percent over the last twelve years.

Table 2: Summary of 5-year compliance costs by permittee size³

	50 employees or fewer ⁴ (low)	50 employees or fewer (high)	Greater than 50 employees (low)	Greater than 50 employees (high)
Average total compliance costs per permittee	\$5366	\$6167	\$5366	\$6167
Average compliance costs per employee	\$469	\$539	\$24	\$27

The general permit may impose disproportionately larger costs on smaller permittees. We estimate that each permittee expected to be covered by the general permit incurs the same constant compliance costs. If there are substantial compliance costs that are a function of tideland area, and larger permittees own larger tidelands in Willapa Bay however, then it is less likely the general permit imposes disproportionately larger costs on smaller permittees.

These costs are over a 5-year period, discounted at an annual rate of 1.45 percent.

Table 3: Expected permitted growers by number of employees

Employees	Number of growers	Average number of employees
Fewer than 50	9	11.44
50 or more	2	224.50

1.3 Mitigation for small businesses

There are currently no exemptions specifically for businesses with fewer than 50 employees. Ecology does include, however, mitigation opportunities for all businesses. We assume larger businesses will have larger total costs, and these cost savings will comprise a smaller relative percentage of those total costs. Therefore these components will likely reduce small business costs by a larger percentage than for large business costs.

These mitigation opportunities include:

- Permittees are allowed to share the costs of monitoring and laboratory analysis associated with the buffer width study. Ecology does not expect each permittee to do his or her own buffer width study. The buffer width study requirements are described in Section 3.
- Permittees are only required to monitor for impacts of Imazamox on *Zostera spp.* if treatment occurs up to the 10 meter property line buffer.
- Permittees who have contiguous clam beds that agree to combine treatment efforts are not required to monitor or maintain the 10 meter property line buffer on the connecting parcel boundaries.

³ Recall the buffer width study costs are the total costs of the study. For the costs per permittee, we assume the study cost burden will be evenly divided between 11 expected permittees (see Table 3).

⁴ We note that we have defined our demarcation at “fewer than fifty employees”, while the definition of “small business” in WAC 19.85.020 is inclusive of fifty employees (fifty or fewer). Our definition is different than the definition of “small business” in rule (fifty or fewer) due to data limitations – our data is only defined by employment size categories, such as firms with 50-99 employees and firms with 20-49 employees. We therefore cannot tell how many firms in the category 50-99 have only fifty employees, and how many have more than fifty. Because of these data limitations, if any of our sampled firms have exactly fifty employees, we will have mistakenly categorized them as a “large business” when they should in fact be a “small business”.

- Permittees are allowed to use elements of the associated Environmental Impact Statement to substitute for applicable elements of their discharge management plans.
- Permittees are allowed to share the costs of creating the buffer width study. The buffer width study is not required to comply with the general permit. Based on the study results, Ecology may modify the permit to remove restrictions on discharge after the third year. We estimate for a range of potential outcomes (assuming permittees undertake the study).

2. Background

The Federal Clean Water Act (CWA) sets water quality goals for navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the CWA is the National Pollutant Discharge Elimination System (NPDES) permits, which the United States Environmental Protection Agency (EPA) administers. The EPA has delegated responsibility for administering the NPDES permit program in the state of Washington to the state (Ecology). The delegation of authority is based on chapter 90.48 RCW, which defines Ecology's authority and obligations in administering the NPDES permit program. Ecology also directly implements the federal regulations when developing state NPDES permits.

This is the first issuance of the Eelgrass Management on Commercial Clam Beds in Willapa Bay General Permit. All permittees covered under a general permit receive the same permit conditions. This reduces the overall workload associated with writing and administering general permits.

This analysis does not include benefits to the people of Washington State (such as environmental or economic benefits). This analysis also does not include environmental impacts. This analysis only estimates the costs borne by expected permittees resulting from compliance with requirements of the general permit. If interested in environmental impacts, please see Ecology publication Environmental Impact Statement for the Use of Imazamox to Control *Zostera japonica* on Commercial Clam Beds.

In 1991 the Washington State Legislature directed Ecology to issue or approve water quality permits for use by federal, state, and local government agencies and licensed applicators, for the purpose of using, herbicides and surfactants registered under state or federal pesticide control laws, for aquatic noxious weed control. An aquatic noxious weed is one listed on the state noxious weed list. The issuance of these permits must comply with federal and state pesticide label requirements; Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements; the Washington Pesticide Control Act; the Washington Pesticide Application Act; and the State Environmental Policy Act.

In January 2013, the Washington State Noxious Weed Control Board (WSNWCB) listed *Z. japonica* as a Class C noxious weed. A Class C noxious weed is a non-native plant already widespread in Washington.

There are two species of eelgrass found in Washington; a highly valued and protected *Z. marina* (*Zostera marina*), and the aforementioned *Z. japonica* (*Zostera japonica*). In Willapa Bay, Fisher et al. report a *Z. japonica* presence from the mid 1950's. *Z. japonica* typically occurs in the high tidal zone, while a mix of *Z. japonica* and *Z. marina* typically appears in the mid tidal zone, and *Z. marina* typically appears in the low tidal zone.

The ecological effect of *Z. japonica* is disputed. *Z. japonica* can facilitate the migration and establishment of *Z. marina* into higher intertidal zones than it normally occupies.⁵ *Z. japonica* may also inhibit the

⁵ Fisher, Bradley, and Patten (2011).

establishment of *Z. marina* in restoration zones.⁶ *Z. japonica* may provide many of the same food, shelter, and habitat functions as *Z. marina*.⁷ A study pertaining to juvenile salmon specifically concluded juvenile salmon preferred *Z. marina*.⁸ This analysis does not include an analysis of environmental impacts. This analysis only estimates the costs borne by expected permittees resulting from compliance with requirements of the general permit. If interested in environmental impacts, please see Ecology publication Environmental Impact Statement for the Use of Imazamox to Control *Zostera japonica* on Commercial Clam Beds.

Some Washington shellfish growers, predominantly those farming in Willapa Bay, reported that *Z. japonica* was interfering with shellfish production (particularly Manila clam culture). The presence of *Z. japonica* was associated with fewer clams and reduced clam weight and quality.⁹ *Z. japonica* was removed from the Washington Department of Fish and Wildlife (WDFW) Priority Species and Habitat list in 2011, eliminating it as a priority for conservation and management. This general permit regulates the use of the aquatic herbicide Imazamox and the application of marker dyes to manage *Z. japonica* on commercial clam beds in Willapa Bay.

3. Compliance Requirements

WAC 173-226-120 describes the costs that Ecology is required to examine in this economic impact analysis. However, there are certain requirements that Ecology does not include in the analysis.

The baseline used for the analysis is the regulatory context in the absence of the proposed general permit. When adopting a general permit, at a minimum Ecology must meet federal requirements. Ecology must also meet any state regulations. This is the first issuance of the *Zostera japonica* general permit. The baseline is therefore one of no permit – we will compare the additional compliance costs as a result of requirements of the general permit to a state of the world where the general permit does not exist.

In the absence of a general permit, permittees are still required to comply with federal and state regulations. If the general permit requirements are not more stringent than the federal requirements or other state laws and regulations, they are not considered as additional costs in this economic impact analysis because the cost of complying with federal or state law would be incurred regardless. This general permit, then, is not responsible for those costs.

As such, this economic impact analysis will only analyze the additional costs resulting from the general permit that are more stringent than those in the federal regulation or other state laws and regulations relative to the baseline. Pertinent standards already set in state and federal law and rules include:

- Water Quality Standards for Surface Waters of the State of Washington (chapter 173-201A WAC).
- Ground Water Quality Standards (chapter 173-200 WAC).
- Sediment Management Standards (chapter 173-204 WAC).
- Whole Effluent Toxicity Testing and Limits (chapter 173-205 WAC).
- Human health based criteria in the National Toxics Rule (40 CR 131.36).
- National Primary Drinking Water Regulations (40 CFR chapter 1, Part 141).

⁶ Merrill (1995).

⁷ Mach et al. (2010).

⁸ Semmens, (2008).

⁹ Fisher, Bradley, and Patten (2011).

- Group A Public Drinking Water Supplies Source Water Protection and Maximum Contaminant Levels (WACs 246-290-135 and 246-290-310).
- Federal Insecticide, Fungicide, and Rodenticide Act laws and labels (7 U.S.C. 136-136y).
- The Washington Pesticide Control Act (chapter 15.58 RCW).
- The Washington Pesticide Application Act (chapter 17.21 RCW).
- SEPA rules (State Environmental Policy Act) (chapter 197-11 WAC).

Discharges not in compliance with the above standards are not authorized, regardless of whether or not the proposed general permit exists.

3.1 Permit coverage

This general permit regulates the use of Imazamox and marker dyes for the management of the state-listed noxious weed *Z. japonica* on commercial clam beds in Willapa Bay.

The permit expands the universe of herbicides and areas permittees are allowed to apply. Although the general permit could have included other herbicides, compared to the baseline of no herbicides, the universe of allowable herbicides has strictly increased. We therefore estimate no additional compliance costs as a result of this limitation. We note that Imazamox was specifically requested by the shellfish industry in conversations with Ecology, as opposed to alternatives such as Imazapir or Glyphosate.

We also note the general permit restricts coverage to the geographic location of Willapa Bay. Although the general permit could have included a larger geographic area, the universe of permitted area has strictly increased compared to the baseline of no area permitted for application. We therefore estimate no additional compliance costs as a result of this limitation. A discussion of geographic areas not covered under this iteration of the general permit can be found in section 4.1.

This version of the general permit also restricts the application to commercial clam beds (and not for example, geoducks, or oysters). Although the general permit could have included additional species, the universe of permitted species has strictly increased compared to the baseline of no species permitted for application. We therefore estimate no additional compliance costs as a result of this limitation. A discussion of geographic areas with additional species not covered under this general permit can be found in section 4.1. We note that clam beds are among the most affected by eelgrass because clam beds grow higher on the intertidal zone, the same as *Z. japonica*.

We also note that the duration of the permit is 5 years, with a restriction on discharge of Imazamox after the third year. The restriction is dependent on the completion of the buffer width study (described in section 3.9). After the third year Ecology will use the buffer study to modify the permit based on the study results. There could be a change of buffer width or some other restriction based on the study results. If the study is not completed then Ecology would not modify the permit to allow Imazamox application after the third year. The buffer width study is not required. The duration of permitted unrestricted discharge of Imazamox will therefore will range from 3 to 5 years. We note that regardless of whether the buffer width study is completed, the duration of permitted discharge has strictly increased compared to the baseline. We therefore estimate no additional compliance costs as a result of this limitation.

This discharge of aquatic herbicides is significantly different from a traditional pollutant discharge where the business owner must comply with permit requirements and implement discharge treatment or control methods at their own cost. Imazamox, on the other hand, will be intentionally discharged for the specific purpose of managing *Z. japonica*, and permittees will not need to implement traditional discharge

treatment and control methods to comply with the general permit. The permittee can discharge anywhere from zero to the permitted maximum quantity of Imazamox, and costs of using Imazamox (such as purchase and labor spent on application) are not direct compliance costs resulting from the general permit. The permittee does not incur these costs as a result of complying with the general permit.

Baseline: No use of herbicides allowed for management of *Z. japonica* on commercial clam beds in WA State.

Change: Allow the use of Imazamox for the management of *Z. japonica* on commercial clam beds in Willapa Bay.

Cost: None.

3.2 Application for coverage

The general permit requires applicants to submit a complete application for permit coverage to Ecology a minimum of 60 days before applying Imazamox. Ecology also allows public comment 30 days after publication of the second public notice (see Section 3.5 for costs associated with public notice), and may issue permit coverage by the 61st day following receipt of the complete application. The permit will expire after 5 years, and the permittee will also incur an annual permit fee.

RCW 90.48.170 requires applicants to submit an application a minimum of 60 days before performing the activity covered by a permit. WAC 173-226-130(3)(b) provides that Ecology must allow for a public comment period during the 30 days after publication of the second public notice. WAC 173-226-190 provides that the public has the right to appeal any permit coverage decision made by Ecology.

WAC 173-226-220 specifies general permits shall be issued for fixed terms not exceeding five years from the effective date, and WAC 173-224-040 specifies the permit fee schedule by category, in dollars per year.

Baseline: Existing rules require applicants submit their complete application a minimum of 60 days before applying the Imazamox, a period of public comment, and expiration of the permit after 5 years. Existing rules also specify both the requirement and quantity of the annual permit fee.

Change: None.

Cost: None.

3.3 Discharge limits

The permittee must develop and implement a Discharge Management Plan (DMP). The application of Imazamox must not cause or contribute to a violation of the:

- Water Quality Standards for Surface Waters of the State of Washington (chapter 173-201A WAC).
- Ground Water Quality Standards (chapter 173-200 WAC).
- Sediment Management Standards (chapter 173-204 WAC).
- Human health based criteria in the National Toxics Rule (40 CR 131.36).
- Federal Insecticide, Fungicide, and Rodenticide Act laws and labels.
- The Washington Pesticide Control Act (chapter 15.58 RCW).

Permittees must also comply with all other applicable federal and state laws. Only Washington-licensed applicators with a Washington State Department of Agriculture aquatic pesticide applicator license or applicators under direct supervision of a licensed applicator may apply herbicides to water. Requirements for discharge limits are mandated by existing federal and state regulations.

Baseline: The EPA requires the development of a DMP in its NPDES permit for aquatic pesticide application and state permits must not be less stringent than federal permits. Permittees must comply with applicable federal and state laws. Only Washington-licensed applicators with an aquatic endorsement or applicators under direct supervision of a licensed applicator may apply pesticides to water.

Change: None.

Cost: None.

3.4 The application of products

The general permit allows the use of the herbicide Imazamox and marker dyes. The permittee must maintain a 10 meter buffer parcel boundary (property line) where treatment will not occur. The general permit also requires that a state-licensed applicator or an applicator under the direct supervision of a state-licensed applicator conduct the herbicide application.

The permit expands the universe of herbicides and areas permittees are allowed to apply. Although the general permit could have included other herbicides, the universe of permitted herbicides has strictly increased compared to the baseline of no herbicides permitted for application (we discuss geographic areas due to buffer creation not covered under this general permit in section 4.2). The goal of buffer creation is to protect against chemical trespass and the protection of off-site *Z. marina*. Based on data from the buffer width, Ecology may modify the general permit to increase, decrease or eliminate buffer distances from parcel boundaries.

WAC 16-228-1231 specifies that aquatic herbicides are a restricted use in Washington, and only aquatic licensed applicators may purchase and apply them.

Baseline: No use of herbicides and marker dyes is permitted. Only Washington-licensed applicators with an aquatic endorsement or applicators under direct supervision of a licensed applicator may apply herbicides to water.

Change: The use of the herbicide Imazamox and marker dyes for the management of *Z. japonica* on commercial clam beds in Willapa Bay is permitted.

Cost: None.

3.5 Notification and posting requirements

There is a requirement of public posting in the proposed general permit. Permittees must post a sign at all corners of the treatment site and publish public notice in the local newspaper when they first apply for permit coverage, twice, one week apart, for two consecutive weeks. This only occurs when they first apply for permit coverage, and would not be an annual cost.

The costs associated with these requirements are estimated below (see section 4.3).

Baseline: No requirement for public posting.

Change: Require public posting at all corners of the treatment site, and publishing a public notice in the local newspaper twice, one week apart, as part of the permit application process.

Cost: Cost of public notice in newspaper and public posting at corners of treatment site.¹⁰

3.6 Monitoring requirements

Monitoring consists of recording the date treatment occurred, amount of active ingredient applied, and the number of acres and location(s) of acreage treated.

If treatment occurs up to the 10 meter property line buffer, monitoring includes (in addition to the above) measuring the distance in to the buffer that *Zostera spp.* plants are affected by treatment. Permittees must measure the width of dead eelgrass in the buffer, and the number of measurements will depend on the size of the commercial clam bed treated. Photographs must be taken at all measured location, and labeled by placing a card with the date, Global Positioning System (GPS) coordinates, sample site, and permit number within the photographed area.

Baseline: No requirement for monitoring.

Change: Require monitoring, and additional compliance requirements if treatment occurs up to the 10 meter property line buffer.

Cost: Cost of monitoring to document impacts to *Zostera spp.*

3.7 Reporting and recordkeeping

Permittees must submit their annual treatment report and annual pre-treatment plan to Ecology by December 31 of each year. The annual report summarizes the amount of Imazamox (in pounds of active ingredient) used during the course of each treatment season, location, and results of monitoring (see section 3.6). Applicators must keep all records and documents required for this permit for five years.

Ecology is moving to online permit application and report submittal. When it becomes available for this permit, Ecology will modify this permit to require electronic submittal of the reports.

WAC 173-226-090 requires periodic submission of reports. Ecology believes annual reporting is a periodic report. There is potentially a cost savings in submitting reports less often. Ecology believes this cost savings is minimal at best (and would be comprised of less postage over a five-year period). This cost would be negated with online permit application and report submittal. Costs associated with recording the date treatment occurred, amount of active ingredient applied, and the number of acres and location(s) of acreage treated, as well as monitoring, are describe in section 4.4 (monitoring).

WAC 173-226-090(2)(c) requires applicators to keep all records and documents for five years.

Baseline: Permittees must meet part of their reporting requirements through periodic reporting. Permittees must keep all records and documents required by this permit for five years. Costs

¹⁰ Estimated in section 4.

associated with recording the date treatment occurred, amount of active ingredient applied, the number of acres and location(s) of acreage treated, and monitoring, are described in Section 4.4.

Change: None.

Cost: None.

3.8 Spill prevention and control

The permittee must be prepared to mitigate for any potential spills and in the event of a spill, perform the necessary cleanup and notify the appropriate Ecology regional office.

WAC 173-226-070 allows Ecology to place permit conditions to prevent or control pollutant discharges from runoff, spillage or leaks, sludge or waste disposal, or handling or storage of materials. RCW 90.48.080 prohibits discharge of polluting matters in waters, such as unintentional discharge of aquatic pesticides.

Baseline: The permittee must be prepared to mitigate for any potential spills and in the event of a spill, perform the necessary cleanup and notify the Ecology regional office. The proposed general permit does not impose more specific requirements than what is already in existing statute.

Change: None.

Cost: None.

3.9 Buffer Width Study

The duration of the permit is 5 years, with a restriction on discharge of Imazamox after the third year. The restriction is dependent on the completion of the buffer width study. Based on the study results, Ecology may modify the permit to remove restrictions on discharge after the third year. The buffer width study is not required. Permittees are allowed to share the costs of monitoring and laboratory analysis associated with the buffer width study. Ecology does not expect each permittee to do his or her own buffer width study.

The buffer width study includes monitoring to document impacts of Imazamox treatment, particularly on *Z. marina* beds. The permittee must collect sediment cores from three treated sites. If the Imazamox residue concentration is above 50 micrograms per kilogram, a second composite sample must be taken approximately 30 days post application. The number of samples will therefore range from three to six. Permittees will send the samples to an accredited laboratory for analysis of percent moisture and total Imazamox.

Permittees must also categorize the sediment type (for example, sandy, gravelly, loamy, etc.), from the location sampled. The samples will be from three treated sites and three reference sites, and will only occur once (they do not need to categorize the sediment type again if permittees need to collect sediment cores a second time; the samples must be from the same location regardless).

To monitor and document impacts of Imazamox treatment, the permittee must identify three treated sites and three reference sites, and conduct pre- and post-herbicide treatment surveys (six total sites). For each site the permittee must align six transects, divided into 15 quadrats per transect. Permittees will then count stems of *Z. marina*, estimate the percent coverage of *Z. marina* in each quadrat, and make note of any apparent characteristics associated with herbicide damage. On 20 percent of the quadrats, selected at

random, the permittee will take an overhead photograph. The permittee must conduct two sampling events for each year of the study.

The annual study report is required only for as long as it takes to complete the study. The study would only occur in more than one year if permittees choose to study multiple buffer widths (say 10, 20, and 30 meters). Permittees are not required to do so. Permittees are also allowed to study multiple buffer widths in the same year. Ecology expects that they will do so, if they choose to study multiple buffer widths. The costs associated with these requirements are estimated below.

Baseline: No requirement for monitoring.

Change: Require monitoring to document impacts of Imazamox treatment, as well as sediment analysis to determine Imazamox sediment concentrations.

Cost: Cost of monitoring to document impacts and sediment analysis.¹¹

4. Estimated Costs of Compliance

This Economic Impact Analysis (EIA) estimates the costs of complying with the general permit for application of Imazamox on commercial clam beds in Willapa Bay. It also compares the costs of complying with the general permit for small businesses to the costs of compliance for large businesses, to determine whether the requirements of the general permit disproportionately impact small businesses.

The scope of the analysis includes only the direct compliance costs imposed by the general permit to the expected permitted growers. Ecology is not required to evaluate benefits in an EIA and does not do so in this document.

The Regulatory Fairness Act (RCW 19.85.020(3)) defines a small business as any business entity, including a sole proprietorship, corporation, partnership, or other legal entity, that is owned and operated independently from all other businesses, and that has fifty or fewer employees. There are both small and large shellfish growers in Willapa Bay. The following table shows data on the expected number of permitted growers in Willapa Bay with fewer than fifty employees, and with fifty or more employees. Our sample is comprised by members of the Pacific Coast Shellfish Growers Association who operate in Willapa Bay. It is likely not a comprehensive sample, but attempts to ascertain the distribution of small versus large growers in Willapa Bay that we expect to be permitted. To find employment sizes we use data from the website Manta as well as the Washington State Employment Security Department (WSESD).¹²

Table 4: Expected permitted growers by number of employees

Employees	Number of Growers	Average number of employees
Fewer than 50	9	11.44
50 or more	2	224.50

We note that we have defined our demarcation at fewer than fifty employees, while the definition of “small business” is inclusive of fifty employees (fifty or fewer). Our definition is different than the

¹¹ Estimated in Section 4.

¹² See Works Cited section for a reference to the WSESD Workforce Explorer database.

definition of “small business” in rule (fifty or fewer) due to data limitations - the WSESD data is only defined by employment size categories, such as firms with 50-99 employees and firms with 20-49 employees. We therefore cannot tell how many firms in the category 50-99 have exactly fifty employees, and how many have more than fifty. Because of these data limitations, if any of our currently permitted firms have exactly fifty employees, we will have mistakenly categorized them as a “large business” when they should in fact be a “small business”.

We are working with a relatively small sample size. The above estimates represent our best expectations of future permitted growers that will apply in Willapa Bay.

4.1 Permit coverage

The permit expands the universe of herbicides and areas permittees are allowed to apply. Although the general permit could have included other herbicides and areas, compared to the baseline of no herbicides and no areas permitted, the universe of allowable herbicides and areas permitted has strictly increased. We therefore estimate no additional compliance costs as a result of this limitation.

We discuss geographic areas and species not covered under this iteration of the general permit below for informational purposes. We note that *Z. japonica* generally resides on a higher intertidal as opposed to *Z. marina*. We also note that clam beds generally reside on a higher intertidal as opposed to oysters and geoducks. In Appendix A and Appendix B, we have included maps of the relative distribution of clam beds and oyster/geoducks, and *Z. marina/japonica*.

We note these are rough approximations – the distribution of eelgrass changes significantly over time, and we have data limitations in assessing relative distributions. Accurate data of the distribution of *Z. japonica* as opposed to *Z. marina* is not common, especially outside of Willapa Bay. The two are furthermore often intermixed, and listed together such that the data does not specify which eelgrass is *Z. japonica* and which eelgrass is *Z. marina*. Areas with eelgrass also vary in density (such as patchy versus continuous).

Using the WA Department of Natural Resources (DNR) ShoreZone data we look at areas of WA state that have eelgrass – we note this includes both *Z. japonica* and *Z. marina* – the ShoreZone data does not distinguish between the two. *Z. marina* is not listed as a noxious weed. As a rough approximation, for informational purposes, oysters and geoducks (as defined in Appendix A) in approved commercial areas that intersect with eelgrass of any kind amount to approximately 20,000 acres, in all of WA State.

We highlight again the inaccuracy in our data, and that *Z. japonica* and *Z. marina* are not distinguished separately in our data. Because *Z. marina* resides on a lower intertidal, along with oysters and geoducks, we suspect a significant portion of the acreage estimated above intersects with *Z. marina*, which is not listed as a noxious weed. Ecology does not currently have more accurate data to fully ascertain the area affected, however.

Clams (as defined in Appendix A) in approved commercial areas are in large part covered by the general permit, however. Clams in approved commercial areas that intersect with eelgrass of any kind, outside of Willapa Bay, amount to only approximately 167 acres (primarily in Gray’s Harbor).

To the extent that this land will not be used due to *Z. japonica*, we note Fisher, Bradley, and Patten estimate losses of \$4,000 per acre per year in areas affected by *Z. japonica*.¹³ This is a result of a fewer number of clams, decreased clam weight, and decreased clam quality on beds with *Z. japonica*.

4.2 Application of products

WAC 16-228-1231 specifies that aquatic pesticides are restricted use in Washington, and only aquatic licensed applicators may purchase and apply them. The permit expands the universe of herbicides and areas permittees are allowed to apply. Although the general permit could have included other herbicides, compared to the baseline of no herbicides, the universe of allowable herbicides has strictly increased, and therefore we estimate no compliance costs.

The permit also requires creating a 10-meter buffer along property boundaries. Although this decreases the available area to apply Imazamox, the universe of permitted area has strictly increased compared to the baseline of no area permitted for application.

We provide a map of relative distribution of *Z. marina* and *japonica* in Appendix B. We also estimate that if permittees created a 10-meter buffer around all property lines that intersect with clam beds in approved commercial areas and eelgrass of any kind (*japonica* and *marina*), permittees would forgo approximately 307 acres. Visually inspecting the distribution of *Z. japonica* in Appendix B, in comparison to the location of clam beds in Willapa Bay, permittees will likely forgo an area smaller than what we have estimated (this approximates an upper bound of forgone acreage due to buffer creation), but we are unable to accurately ascertain this acreage due to data limitations at this time. We also recall this is likely an overestimate because where multiple permittees and sponsors who have contiguous clam beds agree to combine treatment efforts, a buffer is not required on the connecting parcel boundaries. We include all parcel boundaries where a buffer intersects both eelgrass and commercial clams.

The goal of buffer creation is to protect against chemical trespass and the protection of off-site *Z. marina*. Based on data from the buffer width study, Ecology may increase, decrease, or eliminate buffer distances from parcel boundaries.

4.3 Notification and posting requirements

In order to comply with the general permit, permittees must post a sign at all corners of the treatment site and publish public notice in the local newspaper when they first apply for permit coverage, twice, one week apart, for two consecutive weeks.

We look at the Parcels Working Group Parcel Database¹⁴ to find aquatic parcels that contain eelgrass (where application of Imazamox may occur) and commercial clam beds (where application of Imazamox may be permitted). We overestimate the universe of potential parcels that will apply for this permit, by assuming all parcels that contain eelgrass and commercial clam beds will apply; we then find the number of corners of all parcels estimated, for the expected number of signs that will be required.

We assume each sign is 7 x 5 inches and costs \$0.55 each, and a 1 x 1 x 36 inch bundle of 50 grading stakes costs \$25 dollars a bundle. The cost of posting one sign at one corner is estimated to be \$2. Given an estimate of 130 corners per permittee (assuming all parcels identified will need signs, and all permittees own the same number of parcels)¹⁵, the average cost per expected permittee is \$249 per year,

¹³ Fisher, Bradley, and Patten (2011).

¹⁴ See Works Cited section for a reference to the Parcels Working Group Parcel Database.

¹⁵ We did not include parcels owned by the United States of America in our parcel data.

and approximately \$1245 over the 5-year period, discounted, assuming they post signs in all 5 years. If businesses with fewer employees own fewer parcels, compliance costs will be less burdensome for smaller businesses.

The permittee must also publish a public notice at the time of application for two consecutive weeks. This results in 2 total public notices over the 5-year period. Permittees need only publish a public notice at the time of application for the general permit. Using the sample public notice in Appendix B of the general permit, we obtained estimates for the cost of public notice from a local and regional newspaper,¹⁶ of \$161 and \$130 per notice. This implies an additional compliance cost of approximately \$256 to \$317 over the five-year period, discounted.

4.4 Monitoring requirements

Using Washington Department of Fish and Wildlife's (WDFW's) Shellfish Summary, and WDFW's Commercial Shellfish Areas data, we find the parcels that intersect approved, commercial shellfish areas, and our definitions for clams (hardshell clams, manila clams, razor clams, subtidal hardshell clams).

We overestimate the universe of potential parcels that will apply for this permit, by assuming that growers will apply for all parcels that contain eelgrass and commercial clam beds; we then find the expected size of the parcels in question. We find 47 percent are up to 5 acres, 11 percent are 5.1 to 10 acres, 9 percent are 10.1 to 20 acres, and 33 percent are greater than 20 acres. Given the number of measurements required per parcel edge, we expect 5.98 measurements per parcel edge. We then find how many sides of each parcel where a 10 meter buffer will intersect both clams and eelgrass, to find the expected number of measurements. We find there are 1090 parcel edges where a 10 meter buffer intersects both eelgrass and commercial clams. We recall this is likely an overestimate: where multiple permittees and sponsors who have contiguous clam beds agree to combine treatment efforts, a buffer is not required on the connecting parcel boundaries. We include all parcel boundaries where a buffer intersects both eelgrass and commercial clams.

Monitoring consists of recording the date treatment occurred, amount of active ingredient applied, and the number of acres and location(s) of acreage treated.

If treatment occurs up to the 10 meter property line buffer, monitoring includes (in addition to the above) measuring the distance in to the buffer that *Zostera spp.* plants are affected by treatment. Permittees must measure the width of dead eelgrass in the buffer, and the number of measurements will depend on the size of the commercial clam bed treated. Photographs must be taken at all measured location, and labeled by placing a card with the date, Global Positioning System (GPS) coordinates, sample site, and permit number within the photographed area.

We look at a recent report¹⁷ from the University of Washington (UW) that summarizes the average time needed to determine percent cover and shoot density of *Z. marina* per quadrat, ranging from 3 minutes and 40 seconds to 4 minutes per quadrat. We note that the requirements for monitoring under the permit are less restrictive than the monitoring estimated for in the UW study. It is likely that the monitoring requirements described here will take less time, and we are overestimating costs by assuming the monitoring time per parcel edge measurement in the permit is equal to the monitoring time per quadrat in the buffer width study.

¹⁶ The Chinook Observer and the Aberdeen Daily World, respectively.

¹⁷ "Evaluation of Sampling Design for Monitoring Impacts of the Control of Exotic Eelgrass on Native Eelgrass in Willapa Bay, Washington"

Given our estimate of 593 measurements per permittee, we assume based on program experience the permittee would need to hire the equivalent of an Environmental Specialist 3¹⁸ for 36 to 40 hours per year at an hourly rate of \$20.77. We estimate an average per-year cost of \$720 to \$786, and a total cost of \$3602 to \$3930 over the five-year period, discounted.

4.5 Buffer Width Study

The duration of the permit is 5 years, with a restriction on discharge of Imazamox after the third year. The restriction is dependent on the completion of the buffer width study. Based on the study results, Ecology may modify the permit to remove the restriction on discharge after the third year. The buffer width study is not required. Permittees are allowed to share the costs of monitoring and laboratory analysis associated with the buffer width study. Ecology does not expect each permittee to do his or her own buffer width study.

The buffer width study includes monitoring to document impacts of Imazamox treatment, particularly on *Z. marina* beds. The permittee must collect sediment cores from three treated sites. If the Imazamox residue concentration is above 50 micrograms per kilogram, a second composite sample must be taken approximately 30 days post application. The number of samples will therefore range from three to six. Permittees will send the samples to an accredited laboratory for analysis of percent moisture and total Imazamox.

Permittees must also categorize the sediment type (for example, sandy, gravelly, loamy, etc.), from the location sampled. The samples will be from three treated sites and three reference sites, and will only occur once (they do not need to categorize the sediment type again if permittees need to collect sediment cores a second time; the samples must be from the same location regardless).

We estimate that each sediment analysis will cost \$240 per sample, based on previous sediment analyses done for trial runs of Imazamox treatment in Willapa Bay. We also estimate that each sediment characterization of type will cost \$95, from the budget of the UW Evaluation of Sampling Design study. The discounted total cost of the study will then range from \$963 to \$1700 over the 5-year period (we assume the buffer width study will be completed in one year).

To monitor and document impacts of Imazamox treatment, the permittee(s) must identify three treated sites and three reference sites, and conduct pre- and post-herbicide treatment surveys (six total sites). For each site the permittee(s) must align six transects, divided into 15 quadrats per transect. Permittees will then count stems of *Z. marina*, estimate the percent coverage of *Z. marina* in each quadrat, and make note of any apparent characteristics associated with herbicide damage. On 20 percent of the quadrats, selected at random, the permittee(s) will take an overhead photograph. The permittee(s) must conduct two sampling events for each year of the study. This implies they will sample 1080 quadrats per buffer width for the buffer width study.

The annual study report is required only for as long as it takes to complete the study. The study would only occur in more than one year if permittees choose to study multiple buffer widths (say 10, 20, and 30 meters). Permittees are not required to do so. Permittees are also allowed to study multiple buffer widths in the same year. Ecology assumes that they will do so, if they choose to study multiple buffer widths.

¹⁸ State of Washington job classification ES3, range 49 step F. We make this assumption based on program experience.

We assume the buffer width study will be completed in one year. We estimate for a range of costs such that the permittees study 1 to 3 different buffer widths, in the same year. The number of quadrats they will sample will then range from 1080 to 3240 quadrats. We look at a recent report¹⁹ from the University of Washington (UW) that summarizes the average time needed to determine percent cover and shoot density of *Z. marina* per quadrat, ranging from 3 minutes and 40 seconds to 4 minutes per quadrat. The estimated time of monitoring required then ranges from 66 to 216 hours. We assume based on program experience the permittee would need to hire the equivalent of an Environmental Specialist²⁰ for 66 to 216 hours per year at an hourly rate of \$20.77. The cost of monitoring for the buffer width study then ranges from \$1313 to \$4418, depending on if they conduct the study in the first or third year of the permit (assuming the buffer width study is completed in one year).

Based on Ecology conversations with an author of the UW study, we assume the amount of time needed for analysis and write-up would be 8 hours per buffer width studied. We also assume that the analysis and write-up requires the equivalent of a Research Scientist/Engineer²¹, at an average monthly salary of \$6815, or approximately \$43 per hour. We therefore estimate the total cost of analysis and write-up of the report ranges from \$329 to \$1017 depending on if they conduct the study in the first or third year of the permit (and if they study one or three buffer widths). These costs will be conceivably divided amongst the growers that are expected to apply for permit coverage. Permittees are allowed to share the costs of monitoring and laboratory analysis associated with the buffer width study. Ecology does not expect each permittee to do his or her own buffer width study. We assume that the cost per permittee will be evenly distributed among the 11 expected permittees.

5. Conclusion of Estimated Costs

This EIA compares the costs of compliance for small and large businesses to determine if the general permit disproportionately impacts small businesses. Ecology compares costs by looking at the cost per employee, where businesses with fewer than 50 employees are considered small businesses. We also show the total impact to permittees by compliance costs below.

Table 5: Summary of additional compliance costs by type of cost

Permit requirements (per permittee)	Per year average (low)	Per year average (high)	5-year total, discounted²² (low)	5-year total, discounted (high)
Posting signs	\$249	\$249	\$1245	\$1245
Public newspaper notice	\$51	\$63	\$256	\$317
Monitoring	\$720	\$786	\$3602	\$3930
Buffer width study requirements (total)				

¹⁹ “Evaluation of Sampling Design for Monitoring Impacts of the Control of Exotic Eelgrass on Native Eelgrass in Willapa Bay, Washington”

²⁰ State of Washington job classification ES3, range 49 step F. We make this assumption based on program experience.

²¹ Job code 1494, Grade 8. Please see “Appendix B - Professional Staff Salaries” in the Works Cited section.

²² Ecology uses a discount rate based on interest that could be earned risk-free on today’s dollars over the relevant time period. Ecology uses the twelve-year average rate of return offered on the US Treasury’s T-Bills (inflation-indexed short-term bonds; US Treasury Department, 2012) as the discount rate, averaging 1.45 percent over the last twelve years.

Sediment analysis	\$247	\$396	\$1235	\$1981
Monitoring	\$263	\$884	\$1313	\$4418
Study analysis	\$66	\$203	\$329	\$1017

The general permit may impose disproportionately larger costs on smaller permittees. The compliance costs we estimate do not vary by permittee size. Each grower expected to be covered by the general permit incurs the same constant compliance costs. If there are substantial compliance costs that are a function of tideland area, and larger permittees own larger tidelands in Willapa Bay, then it is less likely the general permit imposes disproportionately larger costs on smaller permittees.

Table 6: Summary of 5-year compliance costs by permittee size

	50 employees or fewer ²³ (low)	50 employees or fewer (high)	Greater than 50 employees (low)	Greater than 50 employees (high)
Average total compliance costs per permittee	\$5366	\$6167	\$5366	\$6167
Average compliance costs per employee	\$469	\$539	\$24	\$27

Below we illustrate mitigation of these costs on small businesses where it was both legal and feasible to do so. If a proposed mitigation measure violates federal or state regulations, it cannot be undertaken. There are currently no exemptions for businesses with fewer than 50 employees. There are included, however, mitigation opportunities for all businesses. We assume larger businesses will have larger total costs, and these cost savings will comprise a smaller relative percentage of those total costs. Therefore these components will likely reduce small business costs by a larger percentage than for large business costs.

These mitigation opportunities include:

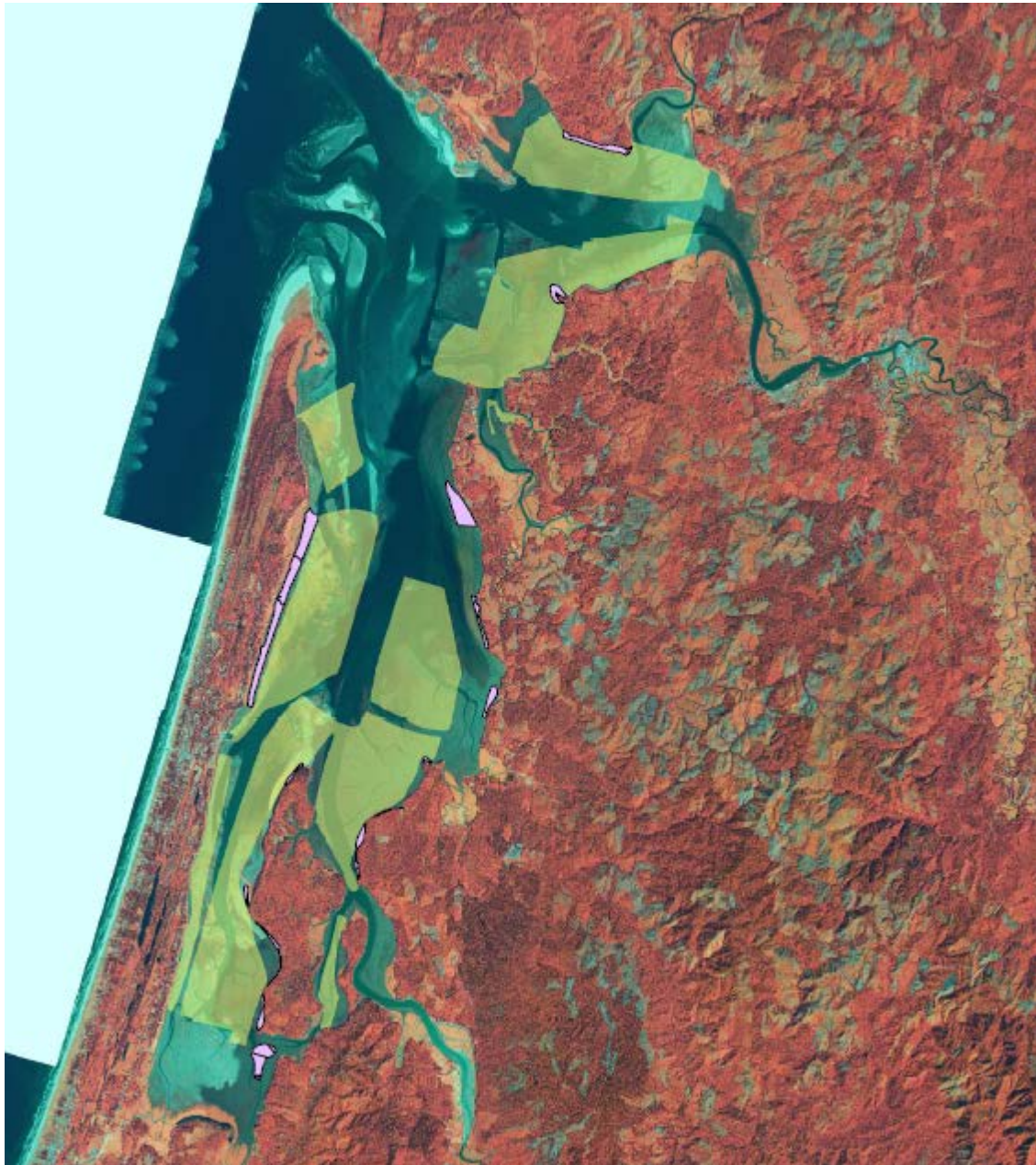
- Permittees are allowed to share the costs of monitoring and laboratory analysis associated with the buffer width study. Ecology does not expect each permittee to do his or her own buffer width study.
- Permittees are only required to monitor for impacts of Imazamox if treatment occurs up to the 10 meter property line buffer.
- Permittees who have contiguous clam beds that agree to combine treatment efforts are not required to monitor or maintain the 10 meter property line buffer on the connecting parcel boundaries.
- Permittees are allowed to use elements of the associated Environmental Impact Statement to substitute for applicable elements of their discharge management plans.
- Permittees are allowed to share the costs of creating (write-up and analysis for) the buffer width study. The buffer width study is not required to comply with the general permit.

²³ We note that we have defined our demarcation at “fewer than fifty employees”, while the definition of “small business” in WAC 19.85.020 is inclusive of fifty employees (fifty or fewer). Our definition is different than the definition of “small business” in rule (fifty or fewer) due to data limitations – our data is only defined by employment size categories, such as firms with 50-99 employees and firms with 20-49 employees. We therefore cannot tell how many firms in the category 50-99 have only fifty employees, and how many have more than fifty. Because of these data limitations, if any of our sampled firms have exactly fifty employees, we will have mistakenly categorized them as a “large business” when they should in fact be a “small business”.

Works Cited

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Appendix A: Commercial clams, geoducks, and oysters



The yellow areas represent approved, commercial oysters and geoducks.

The pink areas represent approved, commercial clams.

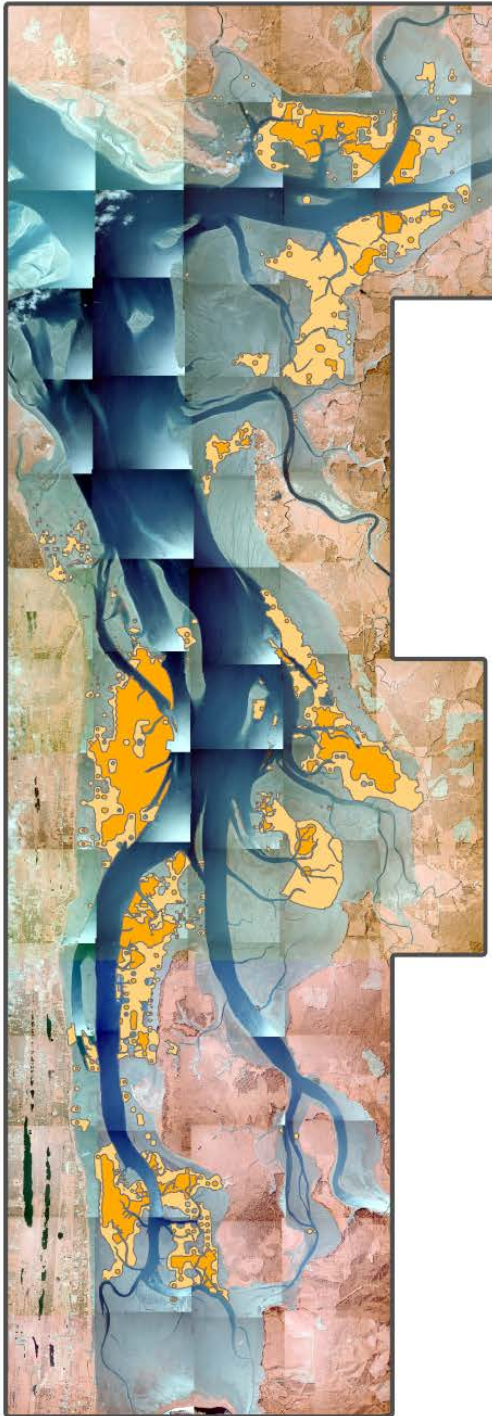
The textured area represents land.

The map was created using Washington Department of Fish and Wildlife's (WDFW's) Shellfish Summary, and WDFW's Commercial Shellfish Areas data. The areas above are the intersection of approved,

commercial shellfish areas, and our definitions for oysters and geoducks (geoducks, native oysters, oyster beds), and clams (hardshell clams, manila clams, razor clams, subtidal hardshell clams).

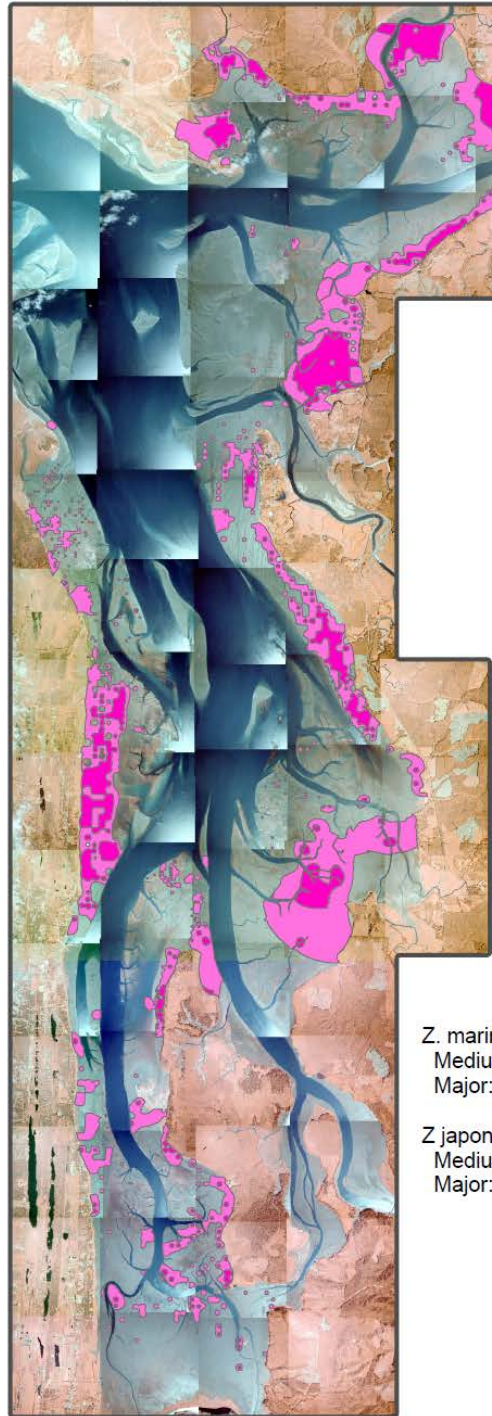
Appendix B: *Zostera marina* and *Zostera japonica*

Zostera marina



Present - Medium
 Present - Major

Zostera japonica



Present - Medium
 Present - Major

Z. marina
 Medium: 8774 Acres
 Major: 4988 Acres

Z. japonica
 Medium: 8944 Acres
 Major: 3239 Acres

Interpolated *Zostera marina* & *Zostera japonica* density and distribution from 2006/2007 grid survey by USDA of 4238 points throughout Willapa Bay, WA.

2006/2007 grid survey by USDA-ARS, Newport, OR