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Comments from Olympic Environmental Coalition on renewal of general permit to allow using an herbicide (imazamox) to control the *Zostera japonica* on commercial clam beds

Who We Are

We are a 501c3 organization in Washington State that is concerned with protection and preservation of natural systems. We serve as an umbrella organization for other organizations and groups dedicated to defending natural systems. Historically, we have been active in this arena for over 25 years since the dawn of GMA process and have had to appeal several bad agency decisions. This costs everyone a bunch of time and money. Way better policy to start with good decisions.

The Big Picture

Your agency has plenty of information to understand many of the serious problems that your eelgrass defoliation project has created since it was begun in the wake of the apparent success of the Spartina eradication project that you clearly have chosen to ignore. Given the state's long-standing support for our non-native and invasive shellfish industry, the permit language can only be interpreted as further capitulation to the demands of this damaging industry, and another blow to the already severely damaged estuarine coastal ecosystem of Willapa Bay.

This underlying support began at statehood, when the pioneer legislators felt they had a full bank account of natural resources to give away. This is simply no longer the case. Our natural resources have been exploited, damaged, sold, converted to cash, and degraded to the point that even our most iconic species are going extinct before our eyes, in large part due to habitat losses like this permit would insure.

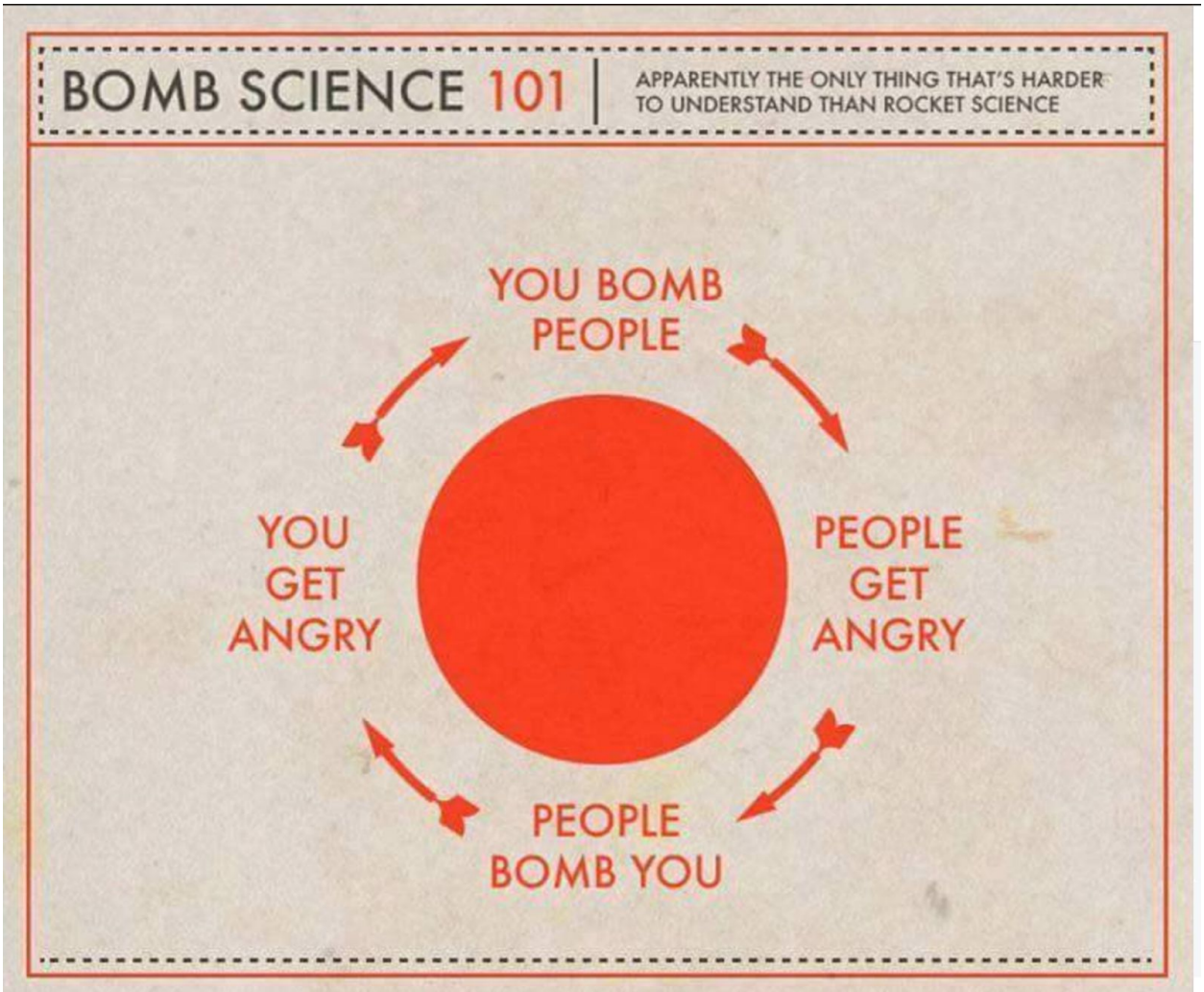
Let's be clear: the target of this indiscriminate herbicide is critical Chinook Salmon Habitat. And there is no scientific doubt that *zostera japonica* is vital habitat for over 55 species seeking refuge, as a nursery, and forage, including for endangered salmon. Not only does Imazamox kill *zostera japonica,* it also kills *zostera marina,* a plant that is aggressively protected in any other place than Willapa Bay, an estuary largely infected with a non-native and invasive shellfish industry, at the expense of native species and their habitat.

What was a pristine estuarine ecosystem with upwards of 12,000 extremely productive acres barely 120 years ago has been transformed into a completely unstable mess, due to attempts to operate non-native shellfish operations as though they were upland wheat farms, with nearly a century of dredging, harrowing, and filling, and the results of these efforts have been so catastrophic that they have "required" the growers to use neurotoxic pesticides over 55 years of to control the unintended consequences of their misguided attempts to "control nature".

The lack of meaningful monitoring or even any state oversight for the first 5 years of this herbicide spraying is unconscionable and creates serious problems. Because we have learned from others Willapa Bay who have been impacted by the Imazamox treatments that there has been significant loss of eelgrass in areas much larger than you have characterized. And as far as we can tell, monitoring from which such impacts can be reviewed has not been done.

This presents a very serious problem. Absent such data, it is impossible for your agency to state that there has been no net loss of habitat. Or that the adverse impacts of permitting have been or can be mitigated.

Due to the long residence time of this herbicide (and the lack of a surfactant) many eelgrass beds at great distances from the sprayed sites have been replaced with lug worms and burrowing shrimp. This is doubly ironic given that you have allowed this industry to spray carbaryl & imidacloprid onto the native burrowing shrimp for almost 60 years and in the wake of the Imidacloprid decision, they are clamoring for more pesticides. Spraying eelgrass beds with Imazamox will create prime burrowing shrimp habitat that will then have to be poisoned. The only winners here are toxic chemical manufacturers, their sales-people, and the applicators.



Impacts to Endangered Orca

Governor Inslee's 2018 Orca Taskforce came up with four "overarching goals". The proposed eelgrass eradication permit violates three of those recommendations. 1. It reduces the available Chinook salmon, 2. it increases the pollution loads on Orcas and their prey, and 3. it provides almost zero accountability.

Impacts beyond Orcas and Salmon

This permit would result in a large number of extremely serious adverse impacts on a wide range of species, including several priority species, some of which are listed as threatened or endangered (T&E) under the Endangered Species Act (ESA). Ironically, those adversely impacted include the shellfish growers themselves. The facts of the matter appear fairly easy to understand:

BEGINNING WITH THE OUTCOMES:

1) There has been a drastic and precipitous falloff of each of the species that rely on either of the eelgrass species for structure, for cover, and/or for food, following defoliation with Imazamox. And this fall-off has had measurable impacts on all the food chains, and on all the species that depend on them. This is absolutely at odds with the goal of NO NET LOSS of ecological functions or habitat.

Kneer et al got it almost down to words of one syllable a few years ago:
Kneer, D., Asmus, H., & Jompa, J. (2013). Do burrowing callianassid shrimp control the lower boundary of tropical seagrass beds? Journal of Experimental Marine Biology and Ecology, 446, 262–272.
“Many species subduce sediment from the surface at intake openings (funnels) and reject it at nearby outtake openings (mounds) (Griffis and Suchanek, 1991). This behavior (“conveyor-belt deposit feeding”) provides a steady supply of surface sediment from which microalgal mats etc. are separated by the shrimp (Abed-Navandi and Dworschak, 2005), which is thereby accessing surface-derived food without the risk of predation associated with actually foraging on the surface. At high shrimp densities, and/or if shrimp of large size are involved, prodigious quantities of sediment can be processed (Rowden and Jones, 1993). Therefore callianassid shrimp are important bioturbators (Rowden and Jones, 1993), and also ecosystem engineers (Berkenbusch et al., 2007; Siebert and Branch, 2006). Seagrasses, on the other hand, have been shown to stabilize sediments with their rhizomes and roots (Hemminga and Duarte, 2000). This renders them exactly antagonistic to callianassid shrimp in areas where both occur, and their distribution is usually mutually exclusive”

We can see a struggling balancing act in Willapa Bay between 4 classes of aggressive ecosystem engineers: Seagrasses, burrowing shrimp, oysters and a newcomer: shellfish companies - basically private corporations that claim to be “people” which is a newer form of ecosystem engineer - powerful invaders that they can alter and overpower an existing ecosystem to their benefit, but the invasive corporations have created problem after problem that they were either unable to solve or barely able to solve, and the solutions have involved methods that created other, often even more serious problems. Because the "people" insist on ignoring ecosystem dynamic processes and constraints and refusing to exist within the community of organisms constrained by natural processes, and instead attempt to create a dramatically simplified landscape that is demonstrably entirely unstable. Meaning that if they leave it alone for more than a year or two, it will start to revert toward a more stable arrangement. There was a widely misquoted statement long attributed to Jack Ward Thomas that went “ecosystems not only are more complex than we think, but more complex than we can think.” This fits very nicely with Gregory Bateson’s observation “The major problems in the world are the result of the difference between how nature works and the way people think.”

ESTABLISHED VERSUS NON-NATIVE VERSUS INVASIVE
It can be argued that unlike the invasive clams and oysters, the *Japonica* is sufficiently distributed in west coast waters from California to Alaska that it can be described as an established species. In fact, the invasive clams and oysters are sufficiently well established to

hold their own here, just not everywhere, and not necessarily in commercial quantities.

Japonica cannot compete with *Zostera Marina* in areas where they coexist but provides many of the same ecosystem functions, and at this point, because it's means of spreading - dispersing flowers as a result of wave action - is so effective, it has become so widely distributed that it is likely to be part of the Northwest's environment for the next few millennia, regardless of local efforts to control it. There is quite simply no known process whereby you can kill the *Japonica* without killing the *Marina* as well. And there is too much of it to kill. See distribution map below.

Figure 7. Geographic distribution of *Z. japonica* within the Pacific Northwest and Northern California

For this reason and others to be discussed below, the premise that once Eelgrass has been removed from a site under this permit, when and if it returns to the site it is no longer protected under other “no net loss” regulations, is unacceptable. From the standpoint of an agency charged with protecting species of concern it should be recognized as preposterous and offensive.

A note on non-native/invasive terminology

Inconsistent and imprecise use of terminology regarding species introductions has lead to divergent interpretations of published literature and to confusion on invasion theory. There have been some recent attempts to standardize terminology in invasion ecology (e.g., Colautti and MacIsaac 2004, Occhipinti-Ambrogi and Galil 2004, Carlton 2009).

Non–indigenous Species: Any species that is intentionally or unintentionally moved by human activities beyond its natural range or natural zone of potential dispersal.
Synonyms: alien, immigrant, introduced, non-native, exotic

Established Species: A species with one or more successfully reproducing (i.e., permanent) populations in an open ecosystem, which are unlikely to be eliminated by man or natural causes.
Synonym: naturalized

Invasive Species:
1) A species that threatens the diversity or abundance of native species, the ecological stability of infested ecosystems, economic activities dependent on these ecosystems, and/or human health.
Synonyms: harmful, injurious, invader, noxious, nuisance, pest

2) Non-indigenous species whose introduction does or is likely to cause economic or environmental harm to human health (Executive Order 13112, Clinton 1999).

And as explained in considerable detail below, and in nearly all current scientific literature, many species that utilize *Marina* will also utilize *Japonica*. Both are essential as they both provide critical habitat for protected species and species of concern.

Herring roe on eelgrass

THE FUNDAMENTAL PROBLEM IS SIMPLE, PARADOXICAL AND INESCAPABLE

Zostera Marina and *Japonica* root mats are problematic for the shrimp and effectively control their range. Thus, removing the Eelgrass rhizome mats “released” the third ecosystem engineer, the burrowing shrimp, to increase turbidity levels in the bay, rendering some areas of the nearshore problematic for both oysters and clams, using current methods. This is similar to the problems created by disturbing eelgrass by dredging and tilling. So, in order to keep using methods ill-suited to the waters, in a losing battle against the forces of nature (the 2 ecosystem engineers that had lived in balance for millennia before people started breaking things they did not understand) the “people” now demand that your agency, charged with environmental protection, provide permits to use MORE poisons to control BOTH the eelgrass and the burrowing shrimp. Have the poison people not earned their Darwin awards at this point?

IF GRANTED, THIS PERMIT WILL EVENTUALLY BE FOUND CONTRARY TO LAW
This commenter cannot comprehend how your agency can selectively focus on the opinions of a handful of compromised scientists working for industry, when their findings and conclusions contradict the broad body of literature and cannot be reconciled with historical photographs.

A Federal judge in review of USACE NWP 48 (the nationwide pollution permit relied upon for release of chemical poisons into waterways) came to a similar conclusion:
"*A reasonable mind reviewing the record as a whole would not accept Dumbauld and McCoy's limited findings regarding the landscape-level impact of oyster cultivation on a species of seagrass in the intertidal zone as support for the conclusion that entire ecosystems are resilient to the disturbances caused by shellfish aquaculture or that the impacts of those operations were either individually or cumulatively minimal.*"

The court further observes:

"*Under the APA, a reviewing court must set aside agency actions, findings, or conclusions that are "arbitrary, capricious, an abuse of discretion, [] otherwise not in accordance with law" or "without observance of procedure required by law." 5 U.S.C. § 706(2)(A) and (D). Agency action is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise."*

https://www.bdlaw.com/content/uploads/2019/10/Order-Holding-NWP-48-Unlawful-in-the-State-of-Washington-and-Requesting-Additional-Briefing.pdf

DNR ran a workshop a few years back that identified the overlapping regulatory framework in which Eelgrasses exit in Washington, from which the following list is excerpted.
"Listed below are details from some of the state and federal regulatory protections that include Zostera japonica, in addition, WACs govern eelgrass protection via state laws (RCWs) and concern the rights of aquaculturists to property development
(RCWs include 77.115.010, 77.12.047, 77.60.060, 77.60.080, 77.65.210, 77.115.030, & 77.115.040).
Hydraulic Code Rules WAC 220-110-250 Saltwater habitats of special concern
• Eelgrass (Zostera spp. [includes all species from the genus Zostera])
• Kelp (Order Laminariales)
• Intertidal wetland vascular plants (except noxious weeds)
• Eelgrass and vegetation that provides settlement and nursery areas for Pacific herring, rockfish, lingcod and juvenile salmonids

Shoreline Management Act Critical saltwater habitats include all kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sandlance; subsistence,

commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association. Critical saltwater habitats require a higher level of protection due to the important ecological functions they provide. Ecological functions of marine shorelands can affect the viability of critical saltwater habitats. Therefore, effective protection and restoration of critical saltwater habitats should integrate management of shorelands as well as submerged areas.

See: WAC 173- 26-221 (2.C iii and iv). WAC 173-26-221 Regulatory protections - General master program provisions "Critical saltwater habitats include all kelp beds, eelgrass beds… mudflats, intertidal habitats with vascular plants."

Growth Management Act and Fish and Wildlife Habitat Conservation Areas

The GMA requires cities and counties across the state to address land use issues that directly and indirectly impact fish and wildlife habitat. Fish and wildlife habitat conservation is the management of land for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created.

This does not mean that all individuals of all species must be maintained at all times, but it does mean cooperative and coordinated land use planning is critically important among counties and cities in a region. In some cases, intergovernmental cooperation and coordination may show that it is sufficient to ensure that a species will usually be found in counties and cities in a region. The designation of fish and wildlife habitat conservation areas should include: Areas with which endangered, threatened, and sensitive species have a primary association.

• Habitats and species of local importance.
• Commercial and recreational shellfish areas.
• Kelp and eelgrass beds.
• Mudflats and marshes.
• Herring, surf smelt and sand lance spawning areas.
• Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat.
• Waters of the state.
• Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity.
• State natural area preserves and natural resource conservation areas.
• Areas critical for habitat connectivity.
See http://www.commerce.wa.gov/site/747/default.aspx…

Additional regulatory measures that include Z. japonica protection:
• Army Corps of Engineers, Seattle, Washington – Regional General Permit 6
• Army Corps of Engineers, Seattle, Washington – Regional General Permit 48
• Army Corps of Engineers - Nationwide Permit 48
• Critical Area Ordinance – Fish and wildlife habitat conservation areas

• *Pacific Coast Groundfish Fishery Management Plan o Habitat Areas of Particular Concern (HAPC) 7.3*
• *WDFW Priority Habitats 'Puget Sound Nearshore' (WDFW 2010)"*
http://www.dnr.wa.gov/Publications/aqr_zostera_study.pdf

The full implications and impacts of the recent decision on the USACE 48 permits is as yet unknown, but it can probably be assumed that it will impact several business as usual assumptions in Willapa Bay, as these permits have historically been required for conversion of the bottom of the bay into clam and oyster beds.

A DECISION THAT RUNS COUNTER TO THE EVIDENCE BEFORE THE AGENCY

The Federal court's criticism of Dumbauld's work in the USACE NWP 48 decision clearly applies to Kim Patten, and the listing of *Zostera Japonica* as a Class C Noxious Weed by WA State Noxious Weed Control Board. Kim is the compromised WSU extension agent censured by the State Ethics Board in 2017 who stated to the WA State Noxious Weed Control Board: "*By restricting this listing to the 2012 wording, you are essentially preventing the management of this invasive weed for the purpose of maintaining or restoring critical habitat for an ESA (Endangered Species Act) - listed species. You will no doubt hear testimony that Z. japonica provides valuable forage habitat for waterfowl along the Pacific Flyway … "* a premise which on many occasions he has sought to dismiss as hearsay, essentially maintaining that ducks do not eat duckweed.

"… patten sampled duck fillets and many of them were empty. He counted them as ducks that did not ear eelgrass, when they were just ducks shot at high tide when food not in reach. Ducks not eating counted as ducks do not eat eelgrass. Another survey to justify dike busting and destruction of goose meadows showed 90% of the time geese were rafted out in the bay, so they can do fine without goose meadow. Again, geese not eating, so they do not need to eat. Pathetic."

and later

"… two of the phony goose survey days included a " goose day" when hunters were in meadows, and a day when meadows were being mowed, both chasing geese off. Ultimately Ecology had to stop using his duck gullet survey because of my and WA Waterfowl Association critique. They replaced it with a math study saying all waterfowl only needed 200 acres of eelgrass all fall. He fudged on math by slipping several orders of magnitude, converting joules to kilojoules, they needed over 200,000, acres. We testified to this and Ecology ignored it. Obviously we only have about 14,000 acres of z japonica, that is why ducks eat most of it and leave in a couple months. Now they just pass through in a few days."

and later

"I attended the Pacific County Commission closed hearing Tuesday where they accepted the new Shoreline Master Plan (SMP). A number of Bay Center folks were there, concerned they could no longer hard armor their property to protect it. I pointed out that not one public comment other than typos had

been accepted. Outside the Bay Center crew was talking afterward. They asked me what the name of "the fine little seagrass the ducks really like" was. I told them Zostera japonica, or duckgrass, aka Japanese eelgrass. They were shocked. I asked if the usual tens of thousands of ducks still parked in front of Bay Center any more? Not for four years, was the answer. This was fourth year of eelgrass spraying, I told them. Silence, sad silence. I had not seen ducks there for four years either, but am not there every day like they are. For thirty six years I have watched tens of thousands of ducks and Dusky Canada geese flood across Nemah Flats from Bay Center on incoming tide, and flood back out on the ebb to there, feeding on duckgrass all the way out. Last four years just a diminishing trickle. I am on the Nemah Flats every day. " - personal communications, Ross Barkhurst 2018

So Kim delivered data to the WA State Noxious Weed Control Board that was based on gullets of birds taken in freshwater areas of the refuge areas where no Eelgrass grows, and omitted the 10 widgeon gullets he was given that were full of grass. He counted Widgeon with empty gullets as Widgeon that don't eat Eelgrass. Widgeon are our most common duck and are grass eaters on land, and are Eelgrass eaters in estuaries. The deliberate misrepresentation of the facts (an explanation [] that runs counter to the evidence) would appear to a reasonable mind to constitute fraud and decisions based on this testimony should have been rescinded by the State Ethics Board when he was censured for conflict.

"As far as waterfowl are concerned, what the board needs to be aware of is that the amount of Z. japonica available for waterfowl forage is many orders of magnitude greater than what could ever be utilized. Therefore control of Z. japonica, even at an aggressive level, is highly unlikely to impact waterfowl population." - Kim Patten submittal to WA State Noxious Weed Control Board on Thursday, October 13, 2011.

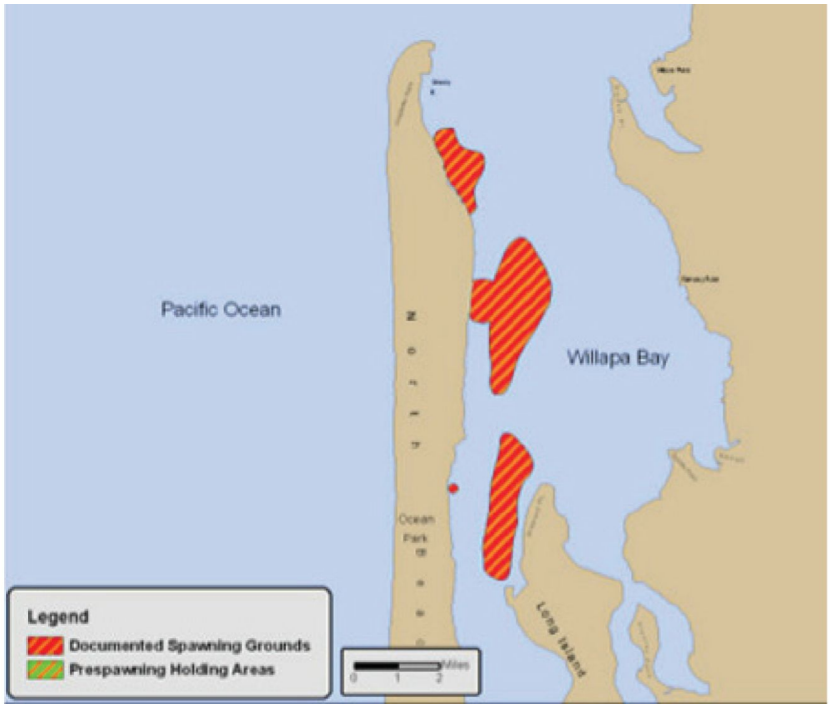
This statement would appear to be a perfect example of the Court's observation about agency reliance on information that "*is so implausible that it could not be ascribed to a difference in view or the product of agency expertise"* and more reason for agency decisions that have been based on such testimony to be rescinded in the wake of the ethics violation citation.

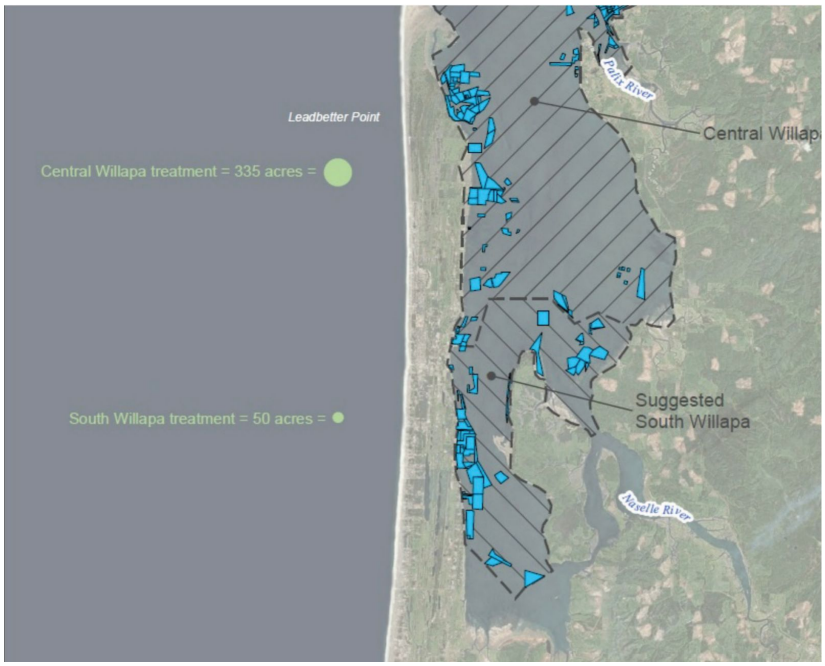
It was my intention to insert a detailed “bodycount” table even though I should not have to do this work for your agency. Population counts for Ducks, sturgeon, salmon, forage fish, shorebirds, etc. year by year following Spartina eradication and each year’s eelgrass removal. If these numbers are not ALL more or less stable or increasing annually then it is fair to assume that habitat has been lost, unless other reasons can explain the matter, no? But as far as I can tell, monitoring from which such a table can be produced has not been done. This is evidence of a very serious problem. Absent such data, it is impossible for your agency to state that there has been no net loss. Or that adverse impacts of permitting can be or have been mitigated.

Inventory year	2000	2002	2004	through	2018
Herring	*Herring spawning mass was not surveyed for years starting when Spartina was sprayed. WDFW data collection appears to end abruptly in 2007.*				
salmon	*Willapa Bay is now suffering a simultaneous failure of multiple species that we have not witnessed in over forty years. Chinook salmon, coho salmon,*				

	chum salmon are all failing to meet Salmon management requirements all at the same time.				
murreletts					
Shorebird species					
Duck species	*Waterfowl numbers have fallen during the November peak from 100,00 two years before eelgrass spraying to 70,000 one year before to 22,000 the first year of this permit. WDFW quit counting at that point.*				

The permitted defoliation plots clearly overlap well documented historical herring spawning grounds and pre-spawning holding areas:





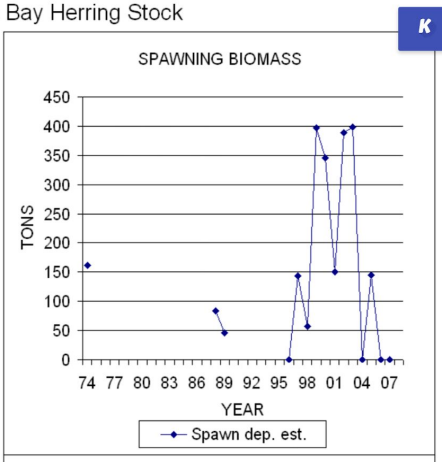
And herring production has plummeted since Spartina eradication began.
WDFW monitoring reports are not kept current

wdfw.wa.gov/sites/default/files/publications/00928/wdfw00928.pdf

STOCK STATUS PROFILE for Willapa Bay Herring Stock

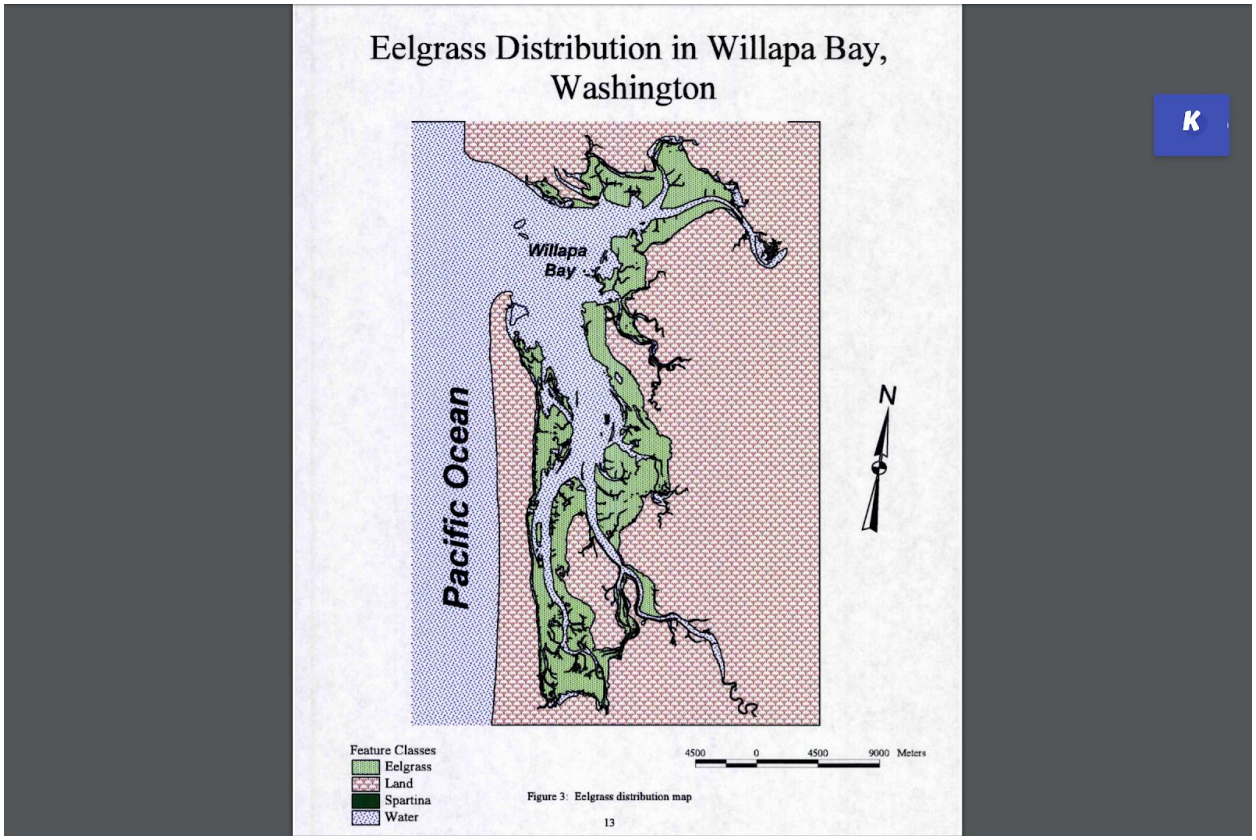
STOCK ASSESSMENT

YEAR	SPAWNING BIOMASS (tons): SPAWN DEPOSITION SURVEYS	ACOUSTIC/ TRAWL SURVEYS	FINAL BIOMASS ESTIMATE	RECRUITMENT (tons)
74	162		162	
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				



Look back at the historical distribution of eelgrasses in Willapa Bay.

(https://pdfs.semanticscholar.org/48ec/2aa3240e487af476bc3d2942623747229352.pdf)



… and now, please compare the 1996 mapping with current photography.

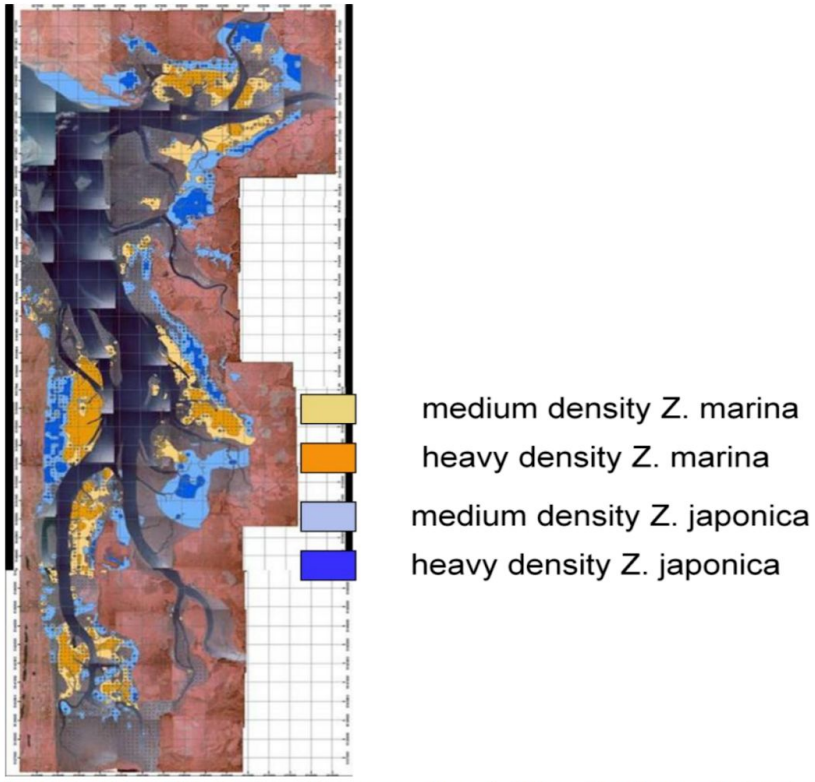


Figure 1. Current Distribution of Japanese eelgrass in Willapa Bay (Source: B. Dumbauld)

Why is this well-established invasive plant a problem? Well, it is not, for most native species.

"Competition with native eelgrass appears to retard the spread of Japanese eelgrass into deeper waters where the two species are collocated (Ruesink 2010). However, Japanese eelgrass can also assert competitive suppression of native eelgrass in some instances. Merrill (1995) reported that Z. japonica inhibited leaf growth and shoot recruitment of Z. marina in August within Padilla Bay. In a separate study, Hourdequin (1994, as cited in Riggs 2002) found that Z. marina grew significantly faster in areas isolated from Z. japonica. Harrison (1982b) reported that under simulated spring conditions (9ºC, 12 hr light: 12 hr dark, low irradiance), Z. japonica could compete successfully with Z. marina when both were submerged continuously. In contrast, under simulated summer conditions (18ºC, 14 hr light: 10 hr dark, higher irradiance), the vegetative growth of Z. marina was more than twice that of Z. japonica. "

And

"under simulated summer conditions (18ºC, 14 hr light: 10 hr dark, higher irradiance), the vegetative growth of Z. marina was more than twice that of Z. japonica. While Ruesink et al. (2010) reported that the two eelgrass species had similar patterns of productivity (growth) in Willapa Bay, Z. japonica significantly outperformed Z. marina in flowering and seed germination,

mechanisms that would likely favor its spread. Conversely, Z. marina was shown to negatively affect the distribution of Japanese eelgrass in the lower intertidal range where it is found. Increased desiccation and wave energy regimes typically retard native eelgrass establishment in tidal ranges above around +1 to +2 MLLW, however, below this zone, the native grass appears to be suppressing, at least to a limited degree, the density of japonica on those portions of the bed where the two species co-occur. "
https://www.nwcb.wa.gov/pdfs/Japonica_White_Paper.pdf

So, once again, why is this a problem?

"Z. japonica provides valuable habitat for other commercially and ecologically important vertebrates and macroinvertebrates at many different life stages (Dierssen and Zimmerman 2006; Mach et al. 2010; Simenstad et al. 1988; Thom 1987). The same community of epibenthic organisms that are found in Z. marina beds can also be found in Z. japonica (Thom et al. 1995); this additional habitat is inarguably beneficial for these epibenthic organisms."

And further:

"In most cases in the Pacific Northwest region, there is little opportunity for direct competition between the two Zostera species because they occupy different niches in the intertidal zone." – Excerpted from Shafer et al. 2007. Typically, Z. japonica and Z. marina have nonoverlapping distributions (70% of collocation occurrences; Mach et al. 2010) with respect to the vertical sea level; if the two species are located within the same intertidal system(30% of occurrences; Mach et al. 2010), Z. japonica and Z. marina exhibit competitive exclusion upon each other (Ruesink et al. 2010). "
https://depts.washington.edu/oldenlab/wordpress/wp-content/uploads/2013/03/Zostera-japonica_Hay.pdf

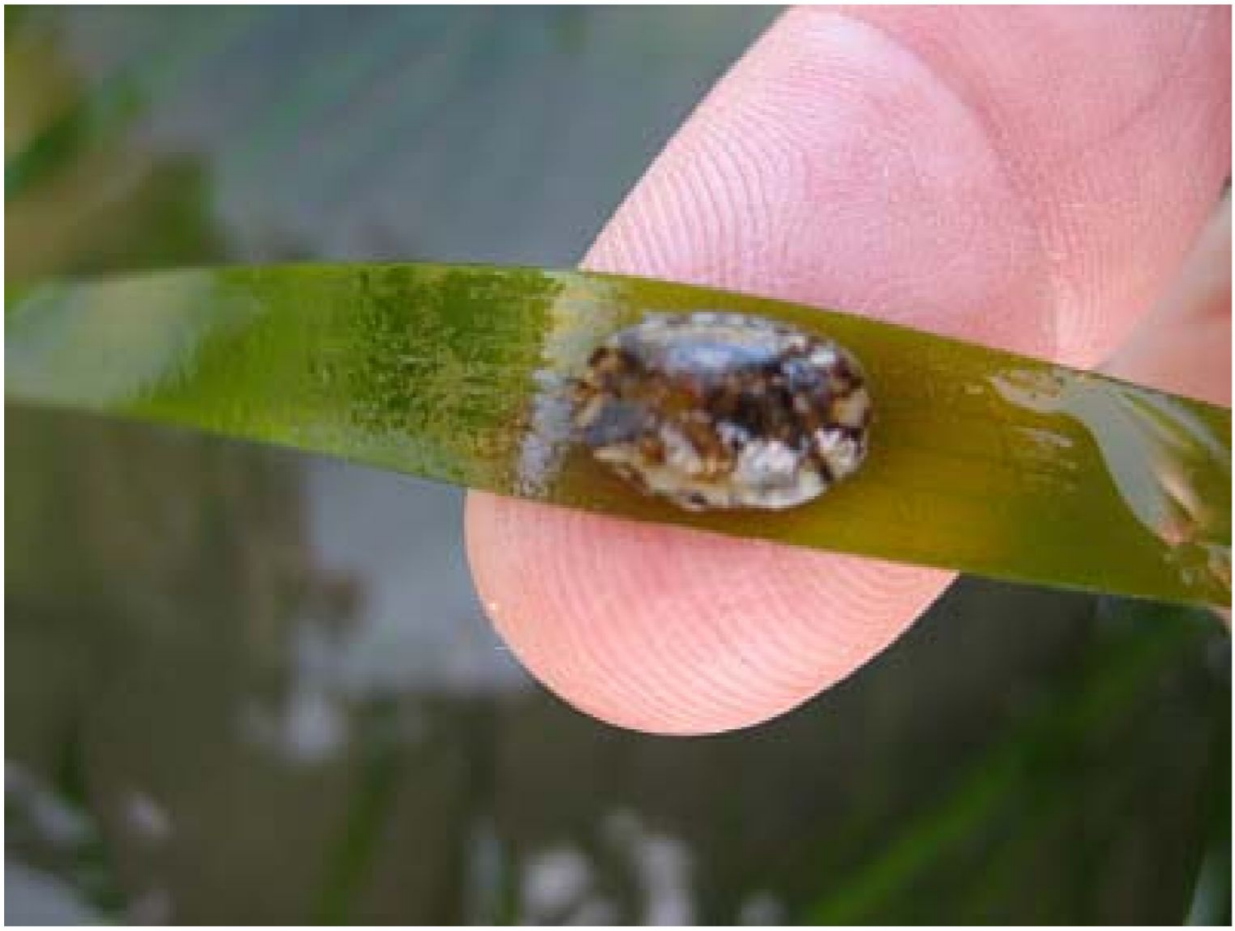


Figure 5. Limpet taking refuge on a *Z. japonica* blade. (Source: Friday Harbor Labs Marine Health Observatory)

This stands in marked contrast to Imazamox which destroys BOTH forms of Zostera via the same mechanism. The herbicide's mode of action is to inhibit acetohydroxyacid synthesis, an enzyme involved with the biosynthesis of the amino acids leucine, isoleucine, and valine.

NO NET LOSS (with the understanding that the most recent update of the Pacific County's SMP attempts to short-circuit the intent of the SMA *" No uses or activities, including preferred uses, are exempt from the requirement to protect shoreline ecological functions."*)

"*The SMP Guidelines establish the standard of “no net loss” of shoreline ecological functions as the means of implementing that framework through shoreline master programs. WAC 173- 26-186(8) directs that master programs “include policies and regulations designed to achieve no net loss of those ecological functions.”*

"Over time, the existing condition of shoreline ecological functions should remain the same as the SMP is implemented. Simply stated, the no net loss standard is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development. Both protection and restoration are needed to achieve no net loss. Restoration activities also may result in improvements to shoreline ecological functions over time.

*Local governments **must** achieve this standard through both the SMP planning process and by appropriately regulating individual developments as they are proposed in the future. "*

"There is no requirement to provide a place for all types of uses within shoreline jurisdiction. "

" No uses or activities, including preferred uses, are exempt from the requirement to protect shoreline ecological functions."
https://fortress.wa.gov/ecy/publications/parts/1106010part4.pdf

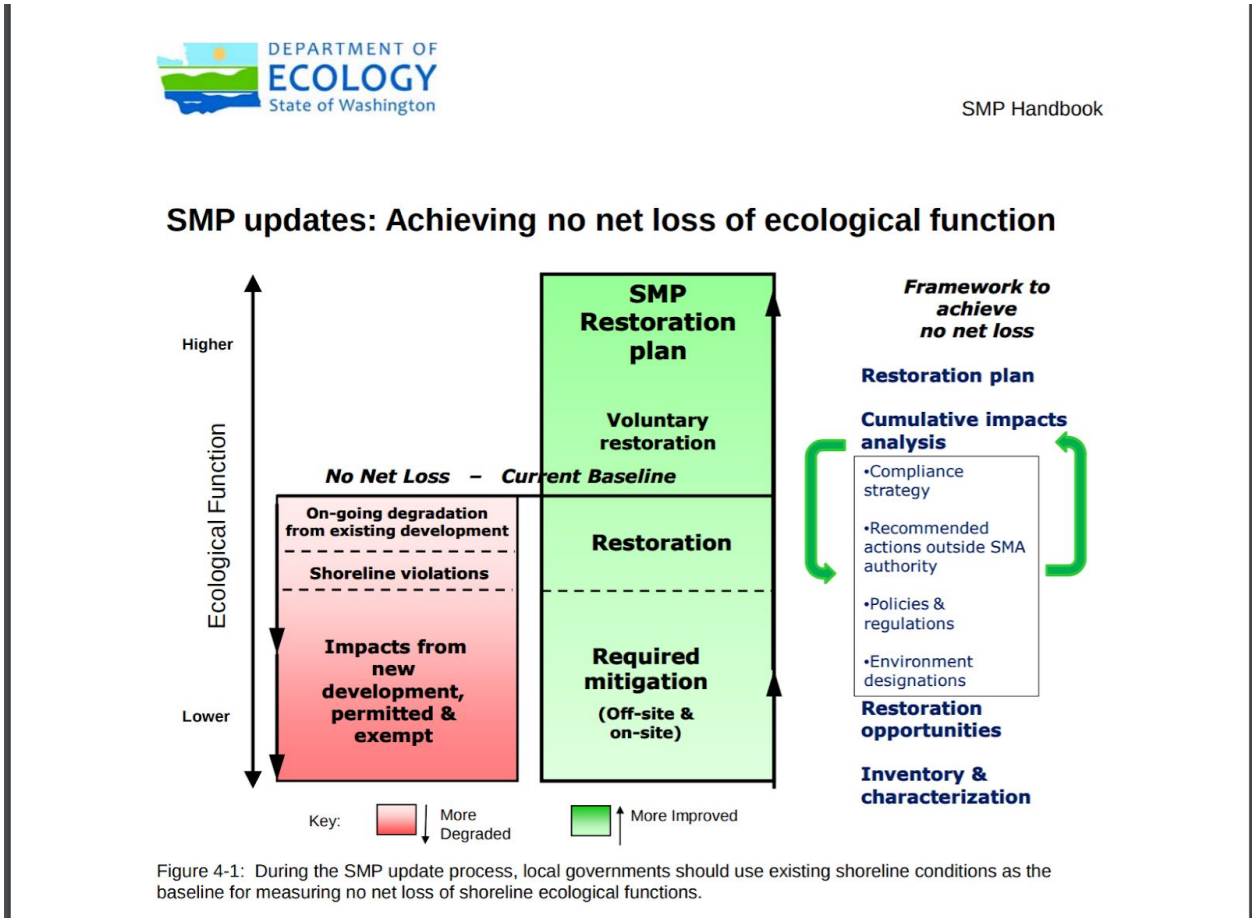


Figure 4-1: During the SMP update process, local governments should use existing shoreline conditions as the baseline for measuring no net loss of shoreline ecological functions.

2) CAUSAL RELATIONSHIPS AND UNINTENDED CONSEQUENCES

As noted above, the “explosion” of burrowing shrimp is directly and causally related to the defoliation of the eelgrass beds. The rhizome mats they developed excluded the shrimp and their destruction released the shrimp to enter eares they previously excluded. This has created the claimed “explosion” of shrimp populations that many of the same shellfish growers complain are destroying their industry and demanding to use other poisons to control.

The most recent published research demonstrates this relationship very clearly: https://castorani.evsc.virginia.edu/wp-content/uploads/2017/12/castorani_et_al_2014_ecology.pdf

“*To determine the relative competitive abilities of engineers, we conducted reciprocal transplantations of ghost shrimp and eelgrass. Local ghost shrimp densities declined rapidly following the addition of eelgrass, and transplanted eelgrass expanded laterally into the surrounding ghost shrimp-dominated areas. When transplanted into eelgrass patches, ghost shrimp failed to persist. Ghost shrimp were also displaced from plots with structural mimics of eelgrass rhizomes and roots, suggesting that autogenic habitat modification by eelgrass is an*

important mechanism determining ghost shrimp distributions. However, ghost shrimp were able to rapidly colonize experimental disturbances to eelgrass patch edges, which are common in shallow estuaries. We conclude that coexistence in this system is maintained by spatiotemporally asynchronous disturbances and a competition–colonization trade-off: eelgrass is a competitively superior ecosystem engineer, but benthic disturbances permit the coexistence of ghost shrimp at the landscape scale by modulating the availability of space."

But this has been known for decades.

"*These interspecific interactions are not simply one-sided but rather can be reciprocal in nature. Structurally complex root-rhizome mats associated with seagrass beds have been shown to reduce the mobility of several burrowing species (Brenchley 1982) and to limit the distribution of burrowers to areas outside these habitats (Ringold 1979; Harrison 1987; Swinbanks and Luternauer 1987). Similar findings of reduced mobility have been reported in dense beds of tube-building polychaetes (Brenchley 1982) and phoronids (Ronan 1975). In both habitat types, the extent to which roots and tubes are capable of excluding burrowing organisms is a function of root or tube density, size and body morphology of the burrower, and degree of mobility (Brenchley 1982). Brenchley (1982) found that mean burial time increased significantly for ghost shrimp in root-rhizome and animal tube mats compared to pre-burrowed bare sediments, and in the majority of laboratory trials shrimp were unable to establish a burrow at all. Field surveys have been consistent with Brenchley's (1982) findings, noting the abrupt decline and low densities of ghost shrimp burrows in Zostera marina beds compared to adjacent intertidal mudflats (Swinbanks and Murray 1981; Swinbanks and Luternauer 1987). Harrison (1987) reported that an expansion of Z. marina and Zostera japonica habitat was accompanied by a corresponding reduction in ghost shrimp density."*

"Harrison (1987) reported that an expansion of Z. marina and Zostera japonica habitat was accompanied by a corresponding reduction in ghost shrimp density. He suggested that in temperate geographic regions, cycles of eelgrass and shrimp activity are sufficiently out of phase to enable the rhizomes of eelgrass to expand in early spring before shrimp become too active. Other species of callianassids appear to be restricted by root mats as well: Coleman and Poore (1980) noted a reduction in population densities of Callianassa australiensis and Callianassa limosa in areas where Zostera was present."

Estuaries Vol. 23, No. 2, p. 141-176 April 2000 Oysters, Crabs, and Burrowing Shrimp: Review of an Environmental Conflict Over Aquatic Resources and Pesticide in Washington State's (USA) Coastal Estuaries https://sci-hub.se/10.2307/1352824 or http://mesh.biology.washington.edu/biol433-spr13/references/Feldman2000.pdf

HABITAT DESTRUCTION

https://www.ducks.org/washington/washington-conservation-projects/willapa-bay-national-wildlife-refuge-projects

Hundreds of thousands of waterfowl use Willapa Bay habitats including trumpeter swans, northern pintails, mallards, American wigeon, lesser scaup, scoters and canvasbacks.

From Ross Barkhurst's comments (some condensed into table above)
"*Willapa Bay is now suffering a simultaneous failure of multiple species that we have not witnessed in over forty years. Chinook salmon, coho salmon, chum salmon are all failing to meet Salmon management requirements all at the same time. Herring spawning mass has declined from four hundred tons to zero. Waterfowl numbers have fallen during the November peak from 100,00 two years before eelgrass spraying to 70,000 one year before to 22,000 the first year of this permit. WDFW quit counting at that point.*

We know what 22,000 looks like and have not seen that reached since. Herring spawning mass was not surveyed for years starting when Spartina was sprayed.

Spartina spraying was a one off, eelgrass spraying is proposed to go on indefinitely now by DOE. The permit would continue to allow spraying eelgrass in herring spawning beds. The structure for eggs there is eelgrass. This permit says it becomes unprotected as soon as it is removed. The permit as written would continue the unmeasured unmonitored removal of ecological function under the already mentioned unacceptable regime. "

For these reasons and many more, this permit should be denied and the entire matter rethought. Permission is not an entitlement and denial of a permit is neither an action requiring SEPA nor is it a taking. The agency is granted the power to issue pollution permits, but it is also responsible to insure that habitat is not destroyed.