# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
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In Reply Please Refer To:
**01EWFW00-2012-CPA-0080**

MAR - 7 2012

Kelly Susewind
Water Quality Program Manager
Washington State Department of Ecology
ATTN: Kathy Hamel
PO Box 47696
Olympia, Washington 98504-7696

Dear Mr. Susewind:

The Washington State Department of Ecology (Ecology) Aquatic Pesticide Permits program issues National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge permits that regulate the application of products used to control aquatic plants and algae, and control resulting direct and indirect discharges to the State of Washington's surface waters. Recently, Ecology provided notice that the program is considering the need for, and merits of, a NPDES and State Waste Discharge General Permit that would address application of the aquatic herbicide imazamox to control Japanese eelgrass (*Zostera japonica*) on commercial shellfish beds. Ecology requested comments no later than March 9, 2012, including "...comments about whether or not it is appropriate for Ecology to develop a [general] permit for this activity." (WDOE 2012a)

BACKGROUND

Japanese eelgrass, also known as "dwarf" or "narrow-bladed" eelgrass, is an herbaceous, aquatic monocotyledon (monocot), native to Asia but introduced to the waters of the Pacific Northwest and California during the 1930s, or earlier (NWCB 2011). Japanese eelgrass grows in intertidal marine waters, though generally "...higher in the intertidal [zone] ... than native *Z. marina*" (common eelgrass)(Fisher et al. 2011, p. 2). Nonnative Japanese eelgrass now inhabits the marine waters of the Pacific coast, from the vicinity of Humboldt Bay, California, north through

parts of the Strait of Georgia and British Columbia (NWCB 2011). The Washington State Noxious Weed Control Board (NWCB), citing the work of Mach et al. (2010), Britton-Simmons et al. (2010), and Shafer (2007), has summarized the patterns of distribution and co-occurrence of native and nonnative eelgrasses in the State of Washington's intertidal waters (NWCB 2011).

Fisher et al. (2011) and Ruesink et al. (2010) have reported information describing the complex relationship between native and nonnative eelgrasses, including apparent patterns of colonization, variable responses to abiotic factors, competition, and competitive suppression. These authors report some information to suggest that establishment of nonnative Japanese eelgrass has influenced abiotic factors at some sites, "... facilitating the spread of native eelgrass into shallower waters than it would normally be found." (Fisher et al. 2011, p. 6) Disturbance appears to enhance the productivity and fitness of Japanese eelgrass, which may partially explain its success as an invasive species (Bando 2006, pp. 755, 761).

At the request of commercial shellfish growers, the Washington State Department of Fish and Wildlife recently modified its Priority Habitat and Species designation to specifically exclude nonnative Japanese eelgrass from its definition of priority intertidal areas consisting of native substrate, vegetation, and habitat-forming species. Also at the request of commercial shellfish growers, during 2011 the NWCB published a finding and listed Japanese eelgrass as a Class C noxious weed where it occurs on commercially managed shellfish beds (NWCB 2011).

Imazamox, 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid with ammonium salt, is a "reduced risk" herbicide approved by the U.S. Environmental Protection Agency for terrestrial and aquatic uses, and is the first and only organic herbicide granted a food residue tolerance exemption (WDOE 2012b, p. 27). Imazamox is considered a selective herbicide, since dicots are generally less sensitive to the chemical treatment than monocots. Imazamox targets and inhibits the acetolactate synthase enzyme, and, because this biochemical pathway is absent in animals, the compound has an apparent low toxicity in animal taxa (WDOE 2012b, pp. 28, 35, 36). Imazamox is hydrophilic and fast-acting, readily absorbs into foliage, degrades rapidly in light by photolysis and aerobic microbial digestion, does not bind well to sediments, and is unlikely (under most conditions) to accumulate in sediments (WDOE 2012b, pp. 28-31).

Imazamox is one of only three herbicides with a marine/estuarine label under the Federal Insecticide, Fungicide, and Rodenticide Act (WDOE 2012b, p. 88). Glyphosate and imazapyr also have marine/estuarine labels. Ecology recently issued a NPDES and State Waste Discharge General Permit (Aquatic Noxious Weed Management General Permit, Permit No. WAG993000), regulating the application of these herbicides for management of Washington State noxious- and quarantine-listed weeds in freshwater and estuarine environments, where these herbicides or other products (i.e., associated adjuvants and/or marker dyes) may *indirectly* enter the surface waters of the State of Washington (WDOE 2012c). Imazapyr and glyphosate have been used extensively to successfully control and remove invasive cordgrass (*Spartina spp.*) from the State's estuarine environments (WSDA 2011).

COMMENTS

- While Ecology has issued a general permit regulating application of imazamox where the herbicide and associated adjuvants may *indirectly* enter estuarine surface waters, Ecology has made a determination that a separate permit would better address the issues specific to applications for the purpose of management and control of Japanese eelgrass on commercial shellfish beds (WDOE 2012b, p. 91). We support this decision. We agree that there are important, unresolved questions regarding whether and how imazamox can be safely applied to commercial shellfish beds without adversely affecting native eelgrass and other aquatic vegetation, or, more broadly, nearshore marine physical habitat and ecosystem functions important to native flora and fauna.

- Ecology has stated that application of imazamox to commercial shellfish beds "...*may* result in discharge of chemicals," and "...herbicides or other products *may* enter the surface waters." (WDOE 2012a). This language is less transparent than it should be and might mislead some interested stakeholders. In our view, the application of imazamox and associated adjuvants to commercial shellfish beds cannot feasibly avoid discharges to the State of Washington's surface waters, and very likely will require *direct* application to the State of Washington's waters. If Ecology chooses to develop a NPDES permit(s) addressing application of imazamox to commercial shellfish beds, please use permit language that communicates more clearly how the herbicide and associated adjuvants should be applied. Also, it is our understanding that there is currently no consensus definition regarding what constitutes a "commercial shellfish bed." If Ecology chooses to develop a NPDES permit(s), we assume there would be some effort to clearly identify what parties may seek coverage.

- Nonnative Japanese eelgrass appears to provide physical, intertidal structure and habitat functions similar to native eelgrass, and is utilized by fish, invertebrates, waterfowl, and other fauna, including as spawning substrate for native, marine forage fish (Fisher et al. 2011, p. 18; Mach et al. 2010; NWCB 2011). Because nonnative Japanese eelgrass appears to provide some of the same basic habitat functions as does native aquatic vegetation, we have concern that Japanese eelgrass control practiced on a large-scale could have measurable adverse effects to habitat functions important to native flora and fauna. Therefore, we urge a cautious approach to the control and management of Japanese eelgrass on commercial shellfish beds. We suggest that additional research is needed, examining the ecology of Japanese eelgrass, native and nonnative eelgrass interactions, and response of the biological community to limited, pilot-scale chemical treatments with imazamox and associated adjuvants.

- Overlapping distributions, complex patterns of co-occurrence, and the difficulty of detecting and discerning Japanese eelgrass from native eelgrass (NWCB 2011), all suggest that selective chemical treatment with imazamox will require careful planning and implementation at the scale of individual shellfish aquaculture farms and harvest plots. Careful planning and implementation at the scale of individual farms and harvest plots will be necessary to avoid dispersion into non-treatment areas, and unintended impacts to non-target, native eelgrass and other aquatic vegetation. Ecology's Environmental Impact Statement addressing freshwater uses of imazamox acknowledges

the complexity of this issue, citing factors such as wind, circulation patterns, currents, inflows and outflows, application equipment, compliance with label requirements, timing of application, and proximity to non-target aquatic vegetation (WDOE 2012b, pp. 31, 34, 37, 40). Any future NPDES permit addressing application of imazamox and associated adjuvants to commercial shellfish beds must outline 1) the conditions under which chemical treatments should, and should not, be employed, 2) how non-target, native eelgrass and other aquatic vegetation would be avoided, 3) how collateral damage to non-target vegetation should be mitigated, and 4) the monitoring and adaptive management protocols that would be implemented to achieve and demonstrate compliance with the permit requirements.

- Ecology's Environmental Impact Statement addressing freshwater uses of imazamox states that "Ecology mitigates indirect effects of food and habitat loss ... by requiring work windows." (WDOE 2012b, p. 37) Where persistent effects to, or loss of, habitat are concerned, timing of application is not an appropriate focus. Conservation measures that focus only on timing will not be sufficient to address potential effects to non-target aquatic vegetation, habitat, and long term marine forage fish productivity. If Ecology and the industry intend to pursue widespread and large-scale use of imazamox for the control and management of Japanese eelgrass on commercial shellfish beds, we expect that timing considerations will be necessary, but they will not be sufficient to fully offset or mitigate collateral damage to non-target, native vegetation and intertidal habitat functions.

- The commonly-available aquatic formulation, Clearcast, contains 12.1 percent imazamox ammonium salt, and 87.9 percent "other ingredients." We suggest that Ecology request and obtain additional information from the product's commercial manufacturer (BASF). It is unclear to us what the other chemical constituents may be. It is unclear to us how Ecology can fairly and objectively evaluate the range of potential effects to non-target species and habitat functions without more complete information regarding the product.

- While considered a selective herbicide, current information suggests that imazamox is not selective where many varieties of native aquatic vegetation are concerned (WDOE 2012b, p. 34). Available information would suggest that submerged, non-target varieties of native vegetation, including common eelgrass, are mostly unaffected (or minimally affected) by in-water or water column treatments with imazamox (WDOE 2012b, p. 34; Patten 2008), but "imazamox is not selective, if applied on exposed *Z. marina*" (i.e., the native, common eelgrass)(Patten 2008). Ecology has emphasized proper timing of application to coincide with rapid growth of the target species, and to maintain sufficient contact times and concentrations to be effective (WDOE 2012b, p. 32). Patten (2008) observed "no efficacy in standing or flowing water ... imazamox did not work at sites where tidal water did not drain off." Patten (2008) has demonstrated that careful application of imazamox to Japanese eelgrass monocultures exposed at low tide may be able to avoid significant collateral damage to non-target, native eelgrass. It is less clear how the use of imazamox and associated adjuvants by commercial shellfish operators can and should be reasonably constrained by permit conditions so as to avoid this collateral damage. At many sites, where Japanese eelgrass co-occurs with native aquatic

vegetation, imazamox application for the purposes of management and control of Japanese eelgrass will require very careful site-specific planning and implementation. We suggest that individual permits, rather than a programmatic or general permit, are the appropriate framework for ensuring safe application of imazamox in the commercial shellfish setting.

- Ecology has acknowledged that resistance to imazamox, and other acetolactate synthase inhibitor herbicides, can develop rapidly in surviving, exposed target populations (WDOE 2012b, p. 29). Ecology has suggested that chemical control should be part of a more comprehensive integrated pest management (IPM) program, including monitoring for loss of efficacy. We support these recommendations, and suggest that there is likely still a role for mechanical control of Japanese eelgrass on some commercial shellfish farms and harvest plots. We caution against widespread use and application of imazamox for the control and management of Japanese eelgrass on commercial shellfish beds, until substantially more has been done in Washington State to examine response of the biological community to limited, pilot-scale chemical treatments with the herbicide and associated adjuvants.

- Previous treatment studies completed by Patten (2008), and some of the other authors cited herein (unpublished works), provide useful information regarding target and non-target responses to limited chemical control with imazamox. However, we believe that important questions regarding native and nonnative eelgrass interactions, and community response to chemical treatments with imazamox, remain unresolved. Therefore we do not at this time support development of a NPDES and State Waste Discharge General Permit addressing the application of imazamox on commercial shellfish beds.

- In order to develop the science needed to assess the appropriate role for imazamox treatments, we recommend that Ecology and the industry identify candidate locations (farms and harvest plots) for additional, limited, pilot-scale studies. We recommend that these studies begin with locations where persistent Japanese eelgrass monocultures have taken-hold and are already measurably reducing commercial shellfish productivity. We do not support large-scale treatment of mixed native and nonnative eelgrass beds. We acknowledge, however, that some amount of collateral damage to non-target, native eelgrass and other aquatic vegetation will likely be unavoidable during pilot studies. However, if collateral damage, loss of efficacy, and general community response to imazamox treatments are carefully monitored and documented, we expect that this science and information will meaningfully inform future decisions regarding the role of imazamox treatments within IPM programs, how the use of imazamox can and should be reasonably constrained by permit conditions, and the appropriate permit framework for ensuring safe application of imazamox and associated adjuvants in the commercial shellfish setting. When pursuing additional studies, we recommend that Ecology and the industry investigate practical, real-world treatment scenarios, focus on application during drawdown conditions, document dispersion into non-treatment areas, and collect data to describe potentially important abiotic factors (such as low-light and/or low-dissolved oxygen conditions).

We appreciate the opportunity to comment, and express our concerns regarding the application of imazamox for control of Japanese eelgrass. We support Ecology's decision that a separate permit would better address the issues specific to applications on commercial shellfish beds. We caution against widespread use and application of imazamox for the control and management of Japanese eelgrass on commercial shellfish beds until substantially more has been done in Washington State to examine community response to limited, pilot-scale chemical treatments with the herbicide and associated adjuvants. In order to develop the science needed to assess the appropriate role for imazamox treatments, we recommend that Ecology and the industry pursue additional, limited, pilot-scale studies.

If you have any questions, if our comments require further explanation, or you would like to discuss the Aquatic Pesticide Permits program, please contact Ryan McReynolds at (360) 753-6047, or John Grettenberger at (360) 753-6044, of this office.

Sincerely,

John Grettenberger for

Ken S. Berg, Manager
Washington Fish and Wildlife Office

cc:
NMFS, Lacey, WA (S. Landino)
Corps, Seattle, WA (P. Sanguinetti)
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## LITERATURE CITED

Bando, K. Jun. 2006. The roles of competition and disturbance in a marine invasion. Biological Invasions 8:755-763.

Britton-Simmons, K.H., Wyllie-Echeverria, S., Day, E.K., Booth, K.P., Cartwright, K., Flores, S., Garcia, C.C., Higgins, T.L., Montanez, C., Rames, A., Welch, K.M., and V. Wyllie-Echeverria. 2010. Distribution and performance of the nonnative seagrass *Zostera japonica* across a tidal height gradient on Shaw Island, Washington. Pacific Science 64(2):187-198.

Fisher, J.P., Bradley, T., and K. Patten. 2011. Invasion of Japanese eelgrass, *Zostera japonica* in the Pacific Northwest: A preliminary analysis of recognized impacts, ecological functions, and risks. Prepared for Willapa-Grays Harbor Oyster Growers Association, Ocean Park, Washington. 28pp.

Mach, M.E., Wyllie-Echeverria, S., and J.R. Ward. 2010. Distribution and potential effects of a non-native seagrass in Washington State, *Zostera japonica* Workshop. Report for the Washington State Department of Natural Resources and Washington Sea Grant.

Patten, Kim. 2008. Japanese eelgrass – Is there an option for chemical control? Presentation to the Pacific Coast Shellfish Growers Association. Washington State University Extension, Long Beach, Washington. Available at < http://longbeach.wsu.edu/spartina/> Accessed 24 Feb. 2012.

Ruesink, J.L., Hong, J., Wisehart, L., Hacker, S.D., Dumbauld, B.R., Hessing-Lewis, M., and A.C. Trimble. 2010. Congener comparison of native (*Zostera marina*) and introduced (*Z. japonica*) eelgrass at multiple scales within a Pacific Northwest estuary. Biological Invasions 12:1773-1789.

Shafer, Deborah J. 2007. Physiological factors affecting the distribution of the non-indigenous seagrass *Zostera japonica* along the Pacific coast of North America. Dissertation, University of South Alabama, Mobile, Alabama. Publication No. 3255302, September 2007, DAI-B 68/03. 1388pp.

Washington State Department of Ecology. 2012a. Japanese eelgrass management on commercial shellfish beds general permit. Olympia, Washington. Available at <http://www.ecy.wa.gov/programs/wq/pesticides/eelgrass.html> Accessed 14 Feb. 2012.

Washington State Department of Ecology. 2012b. Environmental Impact Statement for penoxsulam, imazamox, bispyribac-sodium, flumioxazin, & carfentrazone-ethyl: Addendum to the Final Supplemental Environmental Impact Statement for Freshwater Aquatic Plant Management. Publication No. 00-10-040Addendum1, January 2012. Olympia, Washington. 110pp.

Washington State Department of Ecology. 2012c. Aquatic Noxious Weed Management General Permit. National Pollutant Discharge Elimination System and State Waste Discharge General Permit No. WAG993000, Issued 18 January 2012. Olympia, Washington.

Washington State Department of Agriculture. 2011. *Spartina* Eradication Program 2010 Progress Report. Publication No. 850-323 (N/1/11), January 2011. Olympia, Washington. 45pp.

Washington State Noxious Weed Control Board. 2011. Written findings of the Washington State Noxious Weed Control Board, Re: *Zostera japonica* Asch. & Graebn. Olympia, Washington. Available at <http://www.nwcb.wa.gov/siteFiles/Zostera_japonica.pdf> Accessed 14 Feb. 2012. 9pp.