FACT SHEET FOR THE AQUATIC AND INVASIVE SPECIES CONTROL GENERAL PERMIT

A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE WASTE DISCHARGE GENERAL PERMIT

ISSUANCE: JUNE 28, 2023

EFFECTIVE: JULY 28, 2023

DEPARTMENT OF ECOLOGY
State of Washington

SUMMARY OF PERMIT REVISIONS

Section	Modification Description
All	Updated format to current accessibility standards
S2.B, others	Updated language in several sections of the permit requiring electronic permit application and reporting
Table 1	Updated submittal summary table
S1.C.1	Revised exemption for “Federal lands” to operator
S1.D	Removed previous requirement for Zooplankton Study. Study completed in 2018. (WDFW request)
S2.B.7	Added note clarifying start of 30 public comment period
S2.B.2	Revised minimum number of days between permit application and first treatment event from 38 to 60 to provide adequate time for Ecology review
Several	Updated references to AFS Rotenone SOP Manual from 2010 to 2018 version
S4.D	Table 2 & 3: Added tracer and marker dyes Table 3: Removed and revised several limitations on Rotenone.
S5.B.3.g	Added requirement to get consent from public water providers before rotenone treatments on waterbodies with public drinking water intakes.
S5.B.4 and S10.D.2.e	Removed exception for biodegradable signage. Informational signs must be removed after treatment.
S6	Updated language for sampling, field measurements, and laboratory accreditation
S6.D	Revised due date for annual monitoring plans to February 1 of each year, to be consistent with the previous AISM and Moth control permits
S8.B	AIS Adaptive Management Plan due within 6 months instead of 18 months (WDFW request)
S7	Updated electronic reporting requirements
S8	Consolidated reporting requirements, referred to requirements in S7
S9.F.2	Removed trout bioassay testing for 24 hours after rotenone treatment. Historic data shows this is not necessary. Other testing requirements remain. (WDFW request)
Several	Updated IPM plan sections, and Appendix B
S9.B.1.c	Clarified that servicing or calibration of equipment requires trained personnel

S9.B.2.a	Clarified that products must be labelled as a fish toxicant at time of purchase or application. (WDFW request)
S10.A.5.c	Clarified that treatment should occur during appropriate insect life stage (WSDA Request)
S10.A.5.h	Updated language to clarify the scope of Invasive Insect Control activities.
S10.B.1	Removed Currant shoot borer pheromone (WSDA Request)
S10.B.3	Added reference to applicable RCW
S10.B.4	Added language allowing flexibility due to operational conditions
S10.E	Revised section related to monitoring of treatment for Invasive Insects
Appendix A	Revise definition of “control” to include introduced fish (WDFW request)
Appendix A	Revised definition of “deactivation zone” to be 30 min travel time, to be consistent with the 2018 AFS Rotenone SOP Manual, p. 94. (WDFW request)
Appendix A	At request of WSDA, revised use of “FIFRA product label” to “product label”, and added definition below. Verify how we should incorporate FIFRA and WSDA registration into permit language. What if label requirements vary between different labels? Which should permittees follow? Need to be clear on what permittees are required to follow. Most stringent?
Appendix B	Consolidated management plan requirements into one section
Appendix C	Removed previous requirements for a Zooplankton Study, which has been completed.

EXECUTIVE SUMMARY

This fact sheet is a companion document to the National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit[1] for Aquatic and Invasive Species Control. This new permit combines three previous permits issued to state agencies: Aquatic Invasive Species Control (WDFW), Fisheries Resource Management (WDFW), and Invasive Moth Control (WSDA). It also expands the scope of insect control activities beyond moths, to include all types of invasive insects.

The fact sheet explains the nature of the proposed discharge, the Washington State Department of Ecology's (Ecology) decisions on limiting pollutants in the receiving water, and the regulatory and technical basis for these decisions.

Ecology has tentatively determined to issue a permit to allow the use of algaecides, herbicides, insecticides, molluscicides, piscicides and any other chemical or appropriate product to surface waters of the state of Washington for the purposes of managing invasive insects, introduced and invasive fish and aquatic animals, and nonnative invasive marine algae. The permit allows short-term toxicity to aquatic organisms to perform essential activities that protect beneficial uses of the waters of the state from the impacts of these species.

Since the *Headwaters, Inc. v. Talent Irrigation District* Ninth Circuit Court decision, Ecology has maintained that to discharge chemicals to waters of the state, coverage under an NPDES permit is required. Ecology has issued general and individual NPDES permits for discharges of aquatic pesticides since 2002. The Sixth Circuit Court ruled in *National Cotton Council et al. v. EPA* that the discharge of pesticides and their residues to waters of the state requires NPDES coverage.

Ecology may change the proposed terms, limits, and conditions contained in the draft permit, based upon written public comments it receives, and testimony provided at public hearings. The draft permit does not authorize a violation of surface water quality standards, or any other applicable state or federal regulations. Ecology may require any person seeking coverage under this permit to obtain coverage under an individual permit instead.

Ecology will consider any person who applies control chemicals to surface water who is not covered under this general permit, another applicable general permit, an applicable individual permit, or a state experimental use permit to be operating without a discharge permit and subject to potential enforcement action. Exceptions include those discharges identified in Aquatic and Invasive Species Control Permit Condition S.1. B.

[1] The text of the fact sheet contains italicized and bolded words or phrases. These words or phrases are the first usage in this document and are defined in the Glossary, Appendix A.

Ecology proposes to issue this new general permit for aquatic and invasive organisms so that the applicators of chemicals and other control products to manage these species will comply with the Federal Clean Water Act and with RCW 90.48.080. The Permittee must monitor (depending on the type of chemical application), notify the public, post signs at treatment sites, and provide annual reports to Ecology.

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ADA ACCESSIBILITY

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[2] https://ecology.wa.gov/About-us/Accessibility-equity/Accessibility

INTRODUCTION

Since 2001, and based on the *Headwaters v. Talent Irrigation District* ruling from the federal Ninth Circuit Court, the Washington State Department of Ecology (Ecology) has maintained that discharges of pesticides to waters of the state require coverage under a National Pollutant Discharge Elimination System (NPDES) permit.

This fact sheet is a companion document to the draft Aquatic and Invasive Species Control General Permit and provides the legal and technical basis for permit issuance (WAC 173-226-110). Ecology proposes to issue a general permit to allow the use of chemicals (e.g., algaecides, herbicides, insecticides, molluscicides, piscicides and other chemicals or appropriate products) to manage nonnative insects, invasive or introduced aquatic animals, and nonnative invasive marine algae (herein after referred to as aquatic and invasive species).

Ecology determined it was appropriate to issue a general permit for these species because:

- Aquatic and invasive species control has a statewide scope.
- The activities for invasive species management are similar at different sites.
- It will facilitate early action and ***rapid response*** to new invaders and invasions.

Ecology may still require individual permits where a proposed activity requires additional guidance, or when an individual Permittee requests an individual permit and Ecology agrees to develop and issue one.

This Aquatic and Invasive Species Control permit (AISC) conditionally authorizes the discharge of pollutants to waters of the state and helps Ecology:

- Ensure that applicators use chemicals that have the lowest risk to human health and the environment but are still effective against the targeted species.
- Mitigate and condition the use of the chemicals.
- Track pesticide rates and use locations.
- Ensure that public notifications and postings occur when and where waters are treated.
- Monitor the effectiveness of the management activities.
- Allow a rapid response to early infestations and emergency situations.

This fact sheet explains the nature of the proposed discharges, Ecology's decisions on limiting the pollutants in the receiving water, and the regulatory and technical basis for these decisions. WAC 173-226-130 specifies public notice of the draft permit, public hearings, comment periods, and public notice of issuance before Ecology can issue the general permit. This fact sheet, application for coverage, and draft permit are available for review (see Appendix B - Public Involvement- for more detail on public notice procedures).

After the public comment period closes, Ecology will summarize and respond to substantive comments. These comments may cause Ecology to revise some of the permit language and requirements. The summary and response to comments will become part of the file for this permit and parties submitting comments will receive a copy of Ecology's response.

Ecology typically does not revise the original fact sheet for the draft permit after it publishes the public notice. Appendix C (Response to Comments) will summarize comments and the resultant changes to the permit.

AQUATIC PESTICIDE LEGAL HISTORY

Many events shaped how the application of aquatic pesticides are regulated in Washington State. Beginning with the Federal Clean Water Act of 1972 (CWA), a combination of laws, EPA rules, and legal decisions form the basis for water quality policy in Washington State. A summary of these formative events is included below.

1972+ ***Federal Clean Water Act (CWA), 33 U.S.C. §§1251 et seq. (1972, with major amendments enacted in 1977 and 1987)***; The CWA delegated authority to the EPA to administer a permit program. The EPA delegated authority to Washington State to issue federal permits in certain situations.

1979+ ***The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. §§136 et. seq. (1979)***, requires any person wishing to apply pesticides to Waters of the State to obtain an aquatic pesticide applicator license from the Washington State Department of Agriculture (WSDA) or operate under the supervision of an aquatic licensed pesticide applicator.

2001 ***Headwaters, Inc. v. Talent Irrigation District, 243 F.3d 526 (9th Cir. 2001)***; The Ninth Circuit Court determined that pesticide applications must be covered by a NPDES permit.

2002 ***League of Wilderness Defenders et al. v. Forsgren, 309 F.3d 1181 (9th Cir. 2002);*** The Ninth Circuit Court determined that aerial spraying directly to, and over, surface waters is a point source of pollution and must be covered by a NPDES permit.

2005 ***Fairhurst v. Hagener, 422 F.3d 1146 (9th Cir. 2005);*** The Ninth Circuit affirmed a district court's opinion that the pesticide applied was not a "pollutant" because it left no residue and did not cause an unintended effect. Therefore, a NPDES permit was not required.

2006 ***Northwest Aquatic Ecosystems v. Ecology, PCHB 05-101 (Feb. 15, 2006);*** The Washington State Pollution Control Hearings Board concluded that coverage under a NPDES permit is required for the application of pesticides, because they are considered a pollutant because they don't meet the criteria established by *Fairhurst v. Hagener* in 2005.

2006 ***EPA Final Rule;*** The EPA issued a federal rule addressing the application of pesticides. The rule stated that pesticides applied in accordance with the FIFRA label are not pollutants and, therefore, do not require coverage under a NPDES permit.

2009 ***National Cotton Council, et al. v. EPA, 553 F.3d 927 (6th Cir. 2009);*** The Sixth Circuit Court found that residues from applications of pesticides are considered "wastes" under the CWA and must be covered by a NPDES permit. The court also found the 2006

Federal Pesticide Rule to be invalid and gave the EPA twenty-four (24) months to develop a NPDES permit to address discharges from aquatic pesticide applications.

LEGAL BASIS FOR MANAGING INVASIVE SPECIES

Legal Basis for Managing Invasive Species in the United States

Agricultural protection from invasive weeds and animal pests has always been a national priority; only later did the federal government recognize invasive species also as threats to natural areas. In 1899, Congress passed the Rivers and Harbor Act authorizing the United States Army Corps of Engineers (USCOE) to crush, divert, or remove the nonnative invasive weed water hyacinth (*Eichhornia crassipes*) from access areas of the St. Johns River in Florida. In 1958, Congress amended Section 104 of the Rivers and Harbor Act to authorize the USCOE to manage a comprehensive program for control of invasive aquatic plants in United States waters. After zebra mussels invaded the Great Lakes, Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. One of its purposes was to "*prevent and control infestations of the coastal inland waters of the United States by the zebra mussel and other nonindigenous aquatic nuisance species*."

In 1999, President Clinton signed Executive Order 13112 that established a national Invasive Species Council and tasked them with developing a national invasive species plan (plan). The Invasive Species Council was asked to "*provide national leadership regarding invasive species, and… encourage planning and action at local, tribal, State, regional, and ecosystem-based levels… in cooperation with stakeholders and existing organizations addressing invasive species*." Council membership includes the Secretaries and Administrators of 13 federal departments and agencies. It is co-chaired by the Secretaries of Commerce, Agriculture, and the Interior.

Visit the National Invasive Species Council website[3] to learn more about the Council and its accomplishments.

Legal Basis for Managing Invasive Species in Washington State

Washington recognized the threat of nonnative invasive species when the legislature established laws in 1881 to protect crops from invasive weeds such as Canada thistle. Washington also established laws to protect agriculture from threats from invasive and native animal pests (pest districts authorized in 1919). The legislature has updated and refined these laws over the years to accommodate new information and changing needs. Although Washingtonians understood the impacts of invasive species on agriculture years ago, it took

[3] https://www.doi.gov/invasivespecies/

longer to recognize that invasive species also threaten natural areas. In 1987, the legislature revised chapter 17.10 RCW – the *Noxious Weed Law* - to incorporate noxious weed control in all natural areas including lakes, rivers, and streams. Laws to protect Washington from invasive aquatic animals are more recent and include chapter 77.12 RCW – *Prohibited Animal Species-Infested State Waters* and chapter 77.135 RCW – *INVASIVE SPECIES*.

In 2006, Washington's legislature took a further step in acknowledging the threat that invasive species pose to the state by creating the Invasive Species Council. By doing so, the legislature recognized: *"That the land, water, and other resources of Washington are being severely impacted by the invasion of an increasing number of harmful invasive plant and animal species and these impacts are resulting in damage to Washington's environment and causing economic hardships"* (RCW 79A.25.300).

Washington's legal system has also recognized that aquatic invasive animals are harmful and (in one case) the PCHB deemed that an "escaped" nonnative animal was a biological pollutant. In May 1997, the PCHB issued a First Order on Summary Judgment finding that escaped farmed Atlantic salmon (nonnative to the Pacific Ocean) are pollutants under the CWA (PCHB -96-257).

The proposed Aquatic and Invasive Species Control NPDES permit for Washington State will help Permittees limit the spread and reduce the impacts of aquatic and invasive species by allowing for their management with chemical control technologies. The permit also allows rapid response for early detections. Applicants may also obtain permit coverage for aquatic invasive plants and freshwater algae management projects under the Aquatic Noxious Weed Control permit or the Aquatic Plant and Algae Management permit whichever is appropriate for the project.

Regulations affecting management of aquatic and invasive species in Washington

The Washington State Legislature gave Ecology the authority to control and prevent the pollution of Waters of the State, as stated in the Washington State Water Pollution Control Act, Chapter 90.48 RCW. This statute requires that an industrial or commercial facility obtain a permit before discharging wastes to Waters of the State. The following summary is not intended to be exhaustive. It provides a broad overview of the laws and rules under which Ecology is given authority to regulate discharges to waters of the state.

- Water Quality Standards for Groundwaters of the State of Washington (Chapter 173-200 WAC)
- Water Quality Standards for Surface Water of the State of Washington (Chapter 173-201A WAC)
- Sediment Management Standards (Chapter 173-204 WAC)

- National Pollutant Discharge Elimination System Permit Program
  (Chapter 173-220 WAC)
- Determination and payment of permit fees
  (Chapter 173-224 WAC)
- Requirements for implementing and managing the State Waste Discharge Program
  (Chapter 173-226 WAC)
- Requirements for complying with the State Environmental Policy Act
  (Chapter 197-11 WAC)
- Requirements for complying with sections 120 and 130 of the State Fish and Wildlife Enforcement Code
  (Chapter 77-15 RCW, Sections 120 and 130)
- Noxious Weed Law (Chapter 17.10 RCW)
- Prohibited Animal Species-Infested State Waters (Chapter 77.12 RCW)
- Invasive Species (Chapter 77.135 RCW)
- Water Pollution Control Act (Chapter 90.48 RCW)
- Quarantine-Agricultural Pests (Chapter 16-470 WAC)
- Requirements for complying with the federal Endangered Species Act
  (16 USC 1531) (50 CFR 17.11(h)

AQUATIC AND INVASIVE SPECIES BIOLOGICAL BACKGROUND

The Aquatic and Invasive Species Control General Permit allows for management of nonnative invasive organisms (species not indigenous to Washington). Some species already present in Washington's marine and freshwaters include, but are not limited to, the European green crab, three species of invasive tunicates (sea squirts), several crayfish species, New Zealand mud snails, bullfrogs, and the amur goby. Between 1990 and 2014, at least 70 new insect species were found in Washington, according to a state study[4]. Invasive insects include the Spongy Moth, Spotted Lanternfly, and the Japanese Beetle. Other potential invaders include, but are not limited to, animals such as zebra and quagga mussels, Asian carp, the spiny water flea, and the marine alga *Caulerpa taxifolia*. This fact sheet provides specific species information in subsequent sections.

[4] https://academic.oup.com/ae/article/62/4/247/2712466

Regulators may also consider nonnative genotypes of a native species as not indigenous to an area, although there may be native genotypes of the same species present. *Phragmites australis* (common reed) is an example of a plant species that is indigenous to Washington, but non-indigenous genotypes of *Phragmites australis* are also present. These foreign genotypes may displace the native genotype and other native wetland species.

Ecology has developed the Aquatic and Invasive Species Control Permit, in part, to allow for rapid response when potentially devastating organisms such as quagga or zebra mussels are first detected in Washington waters. The permit will also allow treatment of species like invasive tunicates that are already present and where manual or mechanical methods are not the entire solution to managing the invasion.

Why Manage Aquatic Invasive Species?

The introduction of invasive species can cause economic damage and overwhelming impacts to ecosystems. While effects of individual organisms may vary by species, invasive species often have few predators, diseases, or competitors when introduced outside of their native range. This can allow their populations to explode at the expense of native organisms and existing ecosystems. These nonnative monoculture populations reduce species biodiversity and may lead to species extinction or wipe out a species in an ecosystem. Maintaining biodiversity is essential for the processes that support all life on Earth, including humans. Without a wide range of animals, plants and microorganisms, we cannot have the healthy ecosystems that we rely on.

The economic and environmental impacts of invasive species can be especially devastating. In a 2004 journal article, Cornell University scientists Pimentel et al. estimated that the costs associated with ecological damage and control of invasive species in the United States were $120 billion per year and increasing. Invasive species are one of the leading threats to the world's biodiversity. Pimentel et al. (2004) referencing Wilcove et al. 1998, also estimated that invasive species impact nearly half of the plants and animals currently listed as ***Threatened or Endangered*** under the United States Federal Endangered Species Act.

Molnar et al. (*Assessing the Global Threat of Invasive Species to Marine Biodiversity*) concluded that "marine invasive species are a major threat to biodiversity and have had profound ecological and economic impacts." They also found that marine invasive species had "high levels of invasion in the temperate regions of Europe, North America, and Australia."

Regionally, research by David Lodge (University of Notre Dame) and David Finnoff (University of Wyoming) on the impacts of invasive aquatic species on the Great Lakes regions through introduction by ocean going ships, estimated a median loss of $138 million per year in U.S. waters across multiple ecosystem services (Rothlisberger et. al. 2012). Damaged sectors of the economy include agriculture, sport fishing, wildlife viewing, raw water use by municipalities, power plants, industry, and commercial fishing and shellfishing.

Washington State depends on its abundant surface water resources for recreation, navigation, transportation, commercial and sport fishing and aquaculture, water supply (drinking water and agriculture), flood control, firefighting, power generation, fish and wildlife habitat, and aesthetics and has much to lose with the introduction of new aquatic invaders.

Specific Examples of Impacts from Aquatic and Invasive Organisms Covered under this NPDES Permit

Example 1. Freshwater Invaders - Zebra and Quagga Mussels

Zebra and quagga mussels in the Dreissena genus are small freshwater shellfish named for the striped light and dark areas of their shells. Both species entered the United States from Eurasia, perhaps initially through ballast water discharges into the Great Lakes. Zebra mussels, first observed in 1988 in the Great Lakes, rapidly spread throughout Midwestern and Eastern waters. In 2007, quagga mussels showed up in Lake Mead, Nevada and subsequently more were found in Lake Havasu and Lake Mohave, California and in seven California reservoirs. In January 2008, local authorities discovered zebra mussels in central California and in Pueblo, Colorado (USGS). In September 2008, Utah reported zebra mussel infestations in its waters. These western introductions were likely due to mussel hitchhikers on boats or trailers.

Under the Aquatic Invasive Species Enforcement Program, WDFW operates mandatory watercraft inspection stations to help prevent the introduction of invasive aquatic species into Washington State waters. During 2017-2021 the program inspected over 150,000 boats, and has intercepted and cleaned 96 boats/watercrafts with zebra or quagga mussels being transported through Washington. It is likely just a matter of time until these invasive mussels show up in Washington waters, particularly with established mussel infestations now on the West Coast.

Zebra and quagga mussels attach to hard substrates such as water intake pipes, boat hulls, and even native mussels. They clog pipes, foul boat hulls (and provide an opportunity for boaters to introduce them to new waters as hitchhikers) and kill native bivalves. Their sharp-edged shells litter beaches in the millions. Like tunicates, zebra and quagga mussels are filter feeders that primarily remove algae from the water. They grow in great densities; facilities in the Great Lakes report densities of up to 700,000 individuals per square meter. These quantities of filtering animals remove most of the algae, making the water very clear, but also remove the food for other organisms.

In the United States, congressional researchers estimated that during the 1993-1999 timeframe alone, these mussels cost the power industry $3.1 billion, with an impact on other industries, businesses, and communities of over $5 billion. In 2008, a coalition of water authority officials from Nevada, California, and Arizona asked Congress to direct more than $20 million into projects to research and kill quagga mussels that threaten

the region's waterways. In a 2008 letter, California Senator Dianne Feinstein (Feinstein 2008) urged the U.S. Department of the Interior to launch a robust federal response to address the growing problem of quagga mussel infestation in Western waterways.

Quagga and zebra mussel introductions on the West Coast are of great concern to the Pacific Northwest. With boat traffic between water bodies, it is inevitable that these mussels will make their way to Washington waters in spite of prevention efforts. At risk are dams on the Columbia and Snake Rivers, thousands of miles of irrigation canals, lakes, fish ladders, municipal water intakes, sewage outfalls, **threatened and endangered** salmon, native freshwater bivalves, and even human health. Studies report that invasive mussels encourage the growth of cyanobacteria, which can produce toxins that affect pets, humans, livestock, fish, and wildlife. Zebra mussels will selectively feed on phytoplankton by rejecting less palatable cyanobacterial species. The Columbia River Basin Interagency Invasive Species Response Plan[5] notes, *"The economic impact of the zebra and quagga mussels to the hydropower system on the Columbia and Snake Rivers is of particular concern. If introduced into the Columbia River Basin, the mussels could affect all submerged components and conduits of this system, including fish passage facilities, navigation locks, raw water distribution systems for turbine cooling, fire suppression and irrigation, trash racks, diffuser gratings and drains."*

The Washington State Aquatic Nuisance Species Committee Report to the 2008 Legislature states, *"The 2007 discovery of quagga mussels in Lake Mead and the rapid spread throughout the Colorado River Basin presents a serious threat to the ecology and economy of Washington State. Quagga mussels develop more rapidly in these warm water lakes than they do in the Great Lakes, and they are able to reproduce nearly year-round. These two species have cost the Great Lakes region billions of dollars in damage and control efforts. The ecological damage they have done by altering the ecosystem and crowding out native species cannot be quantified but is on a catastrophic scale."*

This NPDES permit for aquatic and invasive species management will help allow Washington to take immediate action against zebra or quagga mussels should authorities discover them in Washington waters.

[5] https://legislature.idaho.gov/wp-content/uploads/sessioninfo/2016/interim/161017_iswg_00a_CRB_Dreissenid_Rapid_Response_Plan.pdf

Example 2. Fisheries Management

Westslope Cutthroat Trout (WCT) Oncorhynchus clarki lewisi are native to the Pend Oreille River watershed in Washington but have declined in abundance and range. In March of 2013, the City of Seattle (hereafter Seattle City Light; SCL) was awarded a 42-year Federal Energy Regulatory Commission (FERC) license for operation of the Boundary Hydroelectric Project (FERC No. 2144), located on the Pend Oreille River in Pend Oreille County, Washington. The license stipulates that SCL shall implement measures under License Article 9 to protect and enhance fish and aquatic resources within the designated FERC boundary, especially in support of native salmonid recovery in tributaries (US-FERC 2013). In consultation with stakeholders that comprise the Fisheries and Aquatic Workgroup (FAWG), formed to oversee implementation of license requirements, SCL developed a Fish and Aquatics Management Plan to guide measures implemented under the current license. The presence of non-native fish species, particularly Brook Trout Salvelinus fontinalis, is a serious threat to persistence and/or recovery of native salmonids in the Pend Oreille Basin through interbreeding or competition for habitat and food resources. License Article 9(D) and FAMP section 5.4.2 describe measures for the suppression or eradication of non-native fish species, including eradication through piscicide. Cooperative efforts between Washington Department of Fish and Wildlife (WDFW), SCL, and the Kalispel Tribe of Indians Natural Resource Department (KNRD) are underway in Pend Oreille County to eradicate non-native fish from and restore native WCT to selected stream sections, which includes a small section of Flume Creek within the watershed.

Sampling in the Flume Creek by WDFW and KNRD revealed a simple fish community consisting of Brook Trout and WCT. The salmonid species occupying the drainage are geographically partitioned, with Brook Trout inhabiting most of the watershed and WCT limited to headwater areas above Brook Trout distribution. Flume Creek was stocked with Brook Trout by Pend Oreille County in 1916 and Washington Department of Game between 1933–1944 and in 1981 (WDFW unpublished data). No stocking records were found for WCT in the basin (WDFW unpublished data); however, genetic sampling of WCT in the Flume Creek watershed in 2012 revealed a high degree of relatedness between Flume Creek WCT and the WDFW Kings Lake WCT brood stock. Whether WCT are endemic to the Flume Creek drainage is unknown, but genetic data suggests that undocumented stockings of Kings Lake-origin WCT likely occurred in the Flume Creek watershed at some point in the past.

The Flume Creek watershed is well-suited to nonnative fish eradication via piscicide treatment due to the presence of a complete upstream fish passage barrier and geographic isolation of native species in the drainage above non-native fish distribution.

The NPDES Permit will allow WDFW to effectively treat stream reaches to extirpate non-native competitors for the purpose of reintroduction of native fish species and population restoration.

Example 3. Insect Invaders – Northern Giant Hornet

Northern giant hornet (*Vespa mandarinia*) is the world's largest species of hornet. In December 2019, WSDA received and verified two reports of the Northern giant hornet (NGH) near Blaine, WA. These are the first-ever sightings in the United States. Canada also discovered the hornets in two locations in British Columbia in the fall of 2019.

NGH is the largest hornet species in the world and is native to Asia. In its native range this species is a voracious predator of many insect species but is known as a particular pest of European honeybees (*Apis mellifera*), causing significant losses to beekeepers. It also poses a human health threat and is responsible for several deaths each year. Two recent studies conclude that without control, this species could establish populations across the Pacific Northwest and much of eastern North America (Zhu et al. doi.org/10.1101/2020.05.25.115311, Nuñez Penichet et al. doi.org/10.1101/2020.08.11.246991).

Washington State has robust fruit and berry industries including apples, pears, peaches, grapes, cherries, cane berries, blueberries, and many other agricultural commodities. These and many other crops in Washington depend on managed pollination for production. Even though evidence of only a few colonies of NGH has been found in Washington, three beekeepers have reported attacks on hives, with one reporting the loss of five hives directly attributed to NGH. Though the impact of NGH establishment is not yet known, these early reports of hive losses with only a few NGH colonies present is alarming. Permanent establishment of NGH would add another threat to an already challenged apiary industry, and lead to significant loss in fruit and berry production in Washington State.

Example 4. Marine Invaders - Tunicates

Tunicates, more commonly known as sea squirts, are small, sessile (when mature), marine filter-feeding animals. Some species form colonies that resemble sponges, while others are solitary animals (although capable of growing in large dense groups of individuals). Puget Sound has three species of invasive tunicates. Club tunicates (*Styela clava*) are solitary animals that can attach to artificial substrates such as boat hulls and docks. Club tunicates can grow in densities of up to 1,500 animals per square yard and crowd out beneficial marine species such as shellfish. Colonial tunicates (*Didemnum*

spp.) exhibit a wide variety of morphological variants that range from long, ropey or beard-like colonies that commonly hang from hard substrates such as docks, lines, and ship hulls; to low, undulating mats with short superficial appendages that encrust and drape rocky seabed's (pebbles, cobbles, boulders, and rock outcrops).

Ciona savignyi or transparent sea squirt is a solitary animal that prefers deep water. Scientists are less sure how invasive or problematic this species may be, although *Ciona savignyi* colonized large areas of the sea floor of Hood Canal at one time. Invasive tunicate species affect aquaculture by growing on mussel rafts and lines, overgrowing shellfish areas, and competing with native animals for food.

Aquaculture stands to lose when animals, such as invasive tunicates invade Washington's marine and estuarine waters. In a letter to the Washington Department of Health, the Pacific Coast Shellfish Growers Association stated, "*Washington State is the largest producer of farmed shellfish in the country. In 2002… there was approximately 86 million pounds of farmed oysters, Manila clams, geoducks and mussels worth $76 million dollars harvested in the state."*

The former Puget Sound Action Team reported, *"An invasive form of nonnative club tunicate poses a serious threat to marine habitat and the shellfish industry… In January, the Action Team coordinated an 11th-hour funding request that will enable the Washington Department of Fish and Wildlife to take immediate steps to eradicate known populations of tunicates. While Washington's shellfish industry does not view tunicates as having much impact to their operations now, that could change in the future if tunicates become more widespread."*

Examples of harm to the shellfish industry and the fishery from invasive tunicates exist on the east coast of North America. In 2003, scientists discovered that the colonial tunicate *Didemnum* (the same species found in Puget Sound) had colonized a 6.5-square-mile area of the Georges Bank. Georges Bank is historically New England's primary fishing ground and is highly productive for sea scallops. One year later, scientists estimated that tunicates had infested a 40-square mile area of the seabed of the Georges Bank. In large parts of the affected area, the sea squirts covered 50 percent or more of the seabed.

On Prince Edward Island in eastern Canada, clubbed tunicates have already caused substantial problems at commercial shellfish sites. First discovered on the island in 1998, the dense masses of tunicates have proliferated, growing on lines and other aquaculture gear, smothering and killing the mollusks. More than one million pounds of tunicates are removed from the island each year, yet they continue to come back.

In addition to causing problems with commercial fishing and aquaculture, tunicates can foul the hulls of recreational and commercial vessels, displace native marine species, and encrust marine sanctuaries. In Puget Sound, the Washington Department of Fish and Wildlife (WDFW) surveyed marinas and removed invasive tunicates from infested boats and docks in the summers of 2006 and 2007 using manual removal methods and often relying on volunteer divers.

Because of the extent of the tunicate infestation in Puget Sound, WDFW is considering using chemicals for these invasive organisms. In 2008, WDFW started trials under an experimental use permit from the Washington Department of Agriculture (WSDA) using acetic acid (vinegar) to kill tunicates hanging from floating docks at Maury Island's Dockton Park. In one trial, they directly sprayed the tunicates, in another; they wrapped the float with thick sheets of plastic and pumped in the weak acid. WDFW reported that chemical treatment was not 100 percent effective, but the results were still promising. However, under an experimental use permit, WDFW may only treat one-acre total per year. The Aquatic and Invasive Species Control NPDES permit will allow WDFW to expand its treatment acreage that may help facilitate effective treatment of these invasive organisms.

Example 5. Marine Invader – "Killer Algae" Caulerpa taxifolia

Caulerpa taxifolia, known as the alga that took over the Mediterranean, is a beautiful, bright green, popular salt-water aquarium specimen. Native to the Caribbean, aquarists developed this variety specifically for the aquarium trade. This alga apparently escaped from an aquarium, or somebody deliberately introduced it to the Mediterranean Sea off Monaco about 1984. By 1997, it had spread from an initial small patch to more than 11,000 acres of the northern Mediterranean coast. By 2001, scientists estimated that it had infested 30,000 acres of seafloor. It has caused ecological and economic devastation by overgrowing and eliminating native seaweeds, seagrasses, reefs, and other communities. The invasion of *Caulerpa taxifolia* has harmed tourism and pleasure boating, devastated recreational diving, and had a costly impact on commercial fishing, both by altering the distribution of fish as well as creating a considerable impediment to net fisheries. This same species (a clone genetically identical to the problem clone in the Mediterranean) has invaded the coasts of California and Australia.

California authorities discovered this "killer algae" in 2000 in a coastal lagoon off Carlsbad in San Diego County. They subsequently discovered a second infestation in Huntington Harbor (about 80 miles away). California took immediate steps to eradicate these infestations. They conducted extensive diver surveys, covered each algal patch with a tarp, and introduced a pesticide (chlorine) under the tarp. This management method proved very effective. After six years (mostly of follow-up surveillance to ensure

no new patches occurred) and more than seven million dollars, California declared *Caulerpa taxifolia* eradicated from both sites in July 2007.

To help prevent any new infestations, California passed a law prohibiting the sale, possession, or transport of *Caulerpa taxifolia* and eight other species in the genus *Caulerpa* that have the potential to become invasive. The federal government also listed the invasive Mediterranean strain of *Caulerpa taxifolia* on the federal noxious weed list.

Although scientists consider Caulerpa taxifolia to be a tropical species, the National Oceanic and Atmospheric Administration (NOAA) warned, this seaweed has been observed to survive many months in 50° F water. Given this tolerance to cold and the remarkable adaptability that this species has displayed, it would be wise for even more northern regions to be aware of the damage that introduction of this species could cause to their native ecosystems. It is because of the behavior of Caulerpa taxifolia and the potential of other known and unknown invasive algae species to invade Washington's marine and estuarine waters that Ecology and its advisory groups included nonnative marine algae in the Aquatic and Invasive Species Control permit.

FISHERIES RESOURCE MANAGEMENT

Piscicide Use in Fisheries Management

Over the years, fisheries biologists have used a number of techniques in efforts to eliminate nuisance fish from lakes (e.g., nets, traps, dynamite, electro-shocking, predator stocking, and even complete drainage). Fisheries biologists believe that the use of fish toxicants has been the most successful; and of these poisons, rotenone is the most commonly used today. In most cases, the technique is relatively simple; all fish in a waterbody are killed so that sport fish, usually trout, can then be stocked, free from predation or competition from other fish species (Bradbury 1986, cited in WDW 1992).

Rotenone is an alkaloid toxicant contained in the roots of certain South American and Asian plants. For centuries, people in those areas have obtained food fish by scattering rotenone in ponds and rivers (Bradbury 1986, cited in WDW 1992).

Michigan biologists in the 1930's were the first to make extensive use of rotenone for fisheries management, and it quickly became popular nationwide (Bradbury 1986, cited in WDW 1992). By 1949, 34 states and several Canadian provinces routinely used rotenone for the management of fish populations (Finlayson et al. 2000). A survey of rotenone use from 1988-2002 showed that rotenone was used by 38 states and 5 Canadian provinces (McClay 2005). Though an initial survey report (1988-1997) pointed to a decline in rotenone use, five additional years of survey data (1988-2003) makes it difficult to determine trends in rotenone usage (McClay 2005).

Agencies place the greatest emphasis on the use of powdered rotenone, especially for treating standing waters. This is probably due to the reduced cost of, and improved distribution techniques for, the powdered formulation, as well as increased environmental and public health concerns for the inert ingredients contained in liquid formulations. Some agencies have found it more difficult to plan and execute treatments using liquid formulations because of the demands for environmental monitoring studies not generally required for projects that utilize the powder formulation (McClay 2000). In 2004, a new liquid formulation of rotenone (CFT Legumine) was registered which contains significantly fewer volatile organic compounds (VOCs) than previous formulations (McClay 2005).

Current Piscicide Use by the Washington Department of Fish and Wildlife

This section provides information about WDFW's current fishery management program. It was adapted from the following documents:

1. Washington Department of Wildlife – Final Supplemental Environmental Impact Statement (FSEIS), Lake and Stream Rehabilitation, 1992-1993, Report #92-14.
2. Washington Department of Fish and Wildlife – Final Supplemental Environmental Impact Statement (FSEIS), Lake and Stream Rehabilitation: Rotenone Use and Health Risks, January 2002.
3. Washington Department of Fish and Wildlife – Final Programmatic Environmental Assessment For WDFW: Statewide Lake and Stream Rehabilitation Program. As funded by the USFWS Wildlife and Sportfish Restoration Program September 30, 2008.

To satisfy the annual demand for productive freshwater fishing, WDFW stocks selected waters with trout and select warmwater gamefish from hatcheries and/or fish from other waters. Many waters are managed for specific fisheries, such as trout-only or warmwater species. The management emphasis for state waters is determined according to habitat parameters, public desires, recreational demands, and previous management efforts. Occasionally, these waters become overpopulated with fish species which are incompatible with the fisheries emphasis. This leads to situation of increased predation and competition with desired gamefish, resulting in poor growth and survival. For example, if carp overpopulate, fish survival decreases, and nesting bird habitat is degraded due to siltation and uprooting of emergent vegetation. Infestations by undesirable fish species may occur through migration from other waters or through illegal transport and introductions. When undesirable fish species impact the desired gamefish population, three management options are available:

1. No action;
2. Establish new fisheries management objectives;
3. Eliminate competing species and stock with desired gamefish species.

Option 1 will lead to an increase in undesirable fish population(s), resulting in a waterbody that no longer supports a viable gamefish fishery.

Option 2 may allow for a viable fishery but can be relatively costly. For example, to establish a trout fishery, the cost of producing fingerling trout in a state hatchery is about 25% of the cost of producing a catchable-size trout (WDFW, 1983). In competition with warmwater fish, fingerling trout survival is lower when compared to catchable-size trout. However, catchable-size trout are generally considered to be of lower quality than fingerling trout.

Option 3 allows the lake to continue to provide a viable fishery for the managed fish species. Rotenone is the tool currently used by WDFW to eliminate fish in lakes and is far more economical than options l or 2.

Washington Department of Game (1983) compared the costs of three different management strategies for a typical lowland trout lake in western Washington (Lake Erie, Skagit County).

These options were:

1. Trout-only Lake maintained by fry stocking and periodic rotenone treatment;
2. Mixed-species Lake maintained by trout fry stocking (no rotenone); and
3. Mixed species lake maintained by catchable-size trout stocking (no rotenone).

The cost of a piscicide treatment was about 25% of the cost of either option 2 or 3. Also, note that option 2 is unlikely to be a viable alternative in many lakes for the reasons already discussed.

An analysis of the costs of rotenone treatment, combined with trout stocking in six eastern Washington lakes, estimated that for each dollar spent on rotenone and stocked trout, anglers spent between $32 and $105. On non-treated trout lakes, the estimated economic gain per dollar spent on trout stocking was between $10 and $15 (Breithaupt, as referenced in Bradbury 1986).

Similar results have been documented in other northwestern states. In 2006, the Oregon Department of Fish and Wildlife used rotenone to remove tui chub from Diamond Lake in order to improve the recreational rainbow trout fishery. Based on 2009 data, an estimation of return on investment for various use-scenarios was conducted and ranged from 309% to 2,454% (Andrew Loftus Consulting 2011). The same study used an estimate of $91.75 spent per angler trip. If the number of angler trips per year decreases due to a decline in the quality of a fishery, then sales and labor income are negatively affected.

Restoration of Native Fish and Habitat

Not all rotenone treatments conducted by WDFW have been conducted to support gamefish management objectives. WDFW has conducted rotenone treatments to support native fish and habitat restoration. Examples of native fish and habitat restoration include:

1. WDFW has successfully used rotenone to eliminate illegally planted, non-native fish (i.e., northern pike) from lakes where they are likely to negatively impact native fish populations (i.e., Coho salmon) through predation and downstream migration to other waters. Illegally planted fish populations can also serve as a source for additional illegally planted fish into other lakes.

2. Non-native fish species may also out-compete native fish populations, reducing their population levels or causing them to disappear from a waterbody. WDFW used rotenone to remove brook trout from 5.5 miles of Cee Cee Ah Creek (2008-2010), allowing for restoration of native cutthroat trout in this stream reach.
3. Some fish, such as carp, can reduce the quality of waterfowl habitat by destroying aquatic plants and causing turbidity (Ivey et al. 1998). WDFW used rotenone to remove fish populations in Byron Ponds (2008) to improve waterfowl nesting and rearing.
4. The Northern Leopard Frog is listed as endangered species by Washington State and is listed as a species of concern at the federal level. In 2008, WDFW used a rotenone treatment to remove fish from a portion of the Northern Leopard Frog Management Area in the Potholes Wildlife Area.

Evaluation of Available Fish Control Options

The WDFW Final Supplemental Environmental Impact Statement (FSEIS) – Lake and Stream Rehabilitations (1992) and Appendix II of the FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (EA) for WDFW Statewide Lake and Stream Rehabilitation Program As funded by the USFWS Wildlife and Sportfish Restoration Program (2008) identifies and evaluates all available control methods for targeted pest (fish) species. These options include the use of fish toxicants (piscicides); predator/competitor stocking; and mechanical means, such as water level drawdown, netting and trapping, dams and barriers, electrofishing, and removing congregations of spawning fish. These options, which are evaluated in the FSEIS and EA, are summarized in the following sections.

Predator Stocking

The use of apex predators (i.e., Tiger Muskie) for pest control has been used on an experimental basis in some systems with mixed species management goals with varying degrees of success. Large apex predators also eat trout and are not the most desirable option in “trout only” managed waters.

Modification of Regulations

Angling regulations may be modified to address low fish survival and growth in the presence of competing or predatory species. Advantages of this method are that it is low in cost, acceptable to the public, and the fish can be used as food. Limitations are that even successful regulation changes take years to achieve favorable results. Often, because fishing success is poor in compromised waters, the angler effort in a compromised lake is insufficient to effect population changes. Furthermore, many species of fish targeted for control cannot readily be caught by angling or are not considered desirable by anglers.

Mechanical Means
Water level drawdown: Very few lakes have water level control facilities. Accordingly, this is not regarded as an effective option in most situations.

Lake-wide Netting and Trapping
Some accounts show this method to be effective. Most attempts using commercial fishing gear have failed because they are extremely labor intensive and therefore not cost effective. Any benefits are of short duration, as escapement of target fish results in juveniles and other fish filling the niches of the fish that were removed. Removal of all targeted fish is highly unlikely using these methods.

Dams and Barriers
This method prohibits the migration of undesirable spawning fish to their spawning grounds; has little practical value since many undesirable fish species are lake-spawners; and is less effective under flood conditions, ineffective against downstream migrations of fish and illegal plantings, and is costly to maintain.

Electrofishing
This method has not been practical as a long-term control measure for the same reasons that netting and trapping typically fail.

Removing Congregations of Spawning Fish
Adult fish congregate in spawning areas which are subsequently blocked off. The fish are then poisoned, electroshocked, or netted. This method is rarely appropriate, since most of the species targeted by WDFW spawn lake-wide or over broad areas of the lake rather than congregating in any one section of the water. Similar to the above mentioned physical-removal techniques, this is labor-intensive and would have to be repeated yearly, creating a long-term time and labor investment.

In an email to Ecology, dated August 20, 2014, the WDFW provided a comparison of available fish control methods (Table 1).

Table 1: Comparison of Fish Control Methods

Criteria	Rotenone	Predator / Competitor Introduction (Biological Control)	Mechanical Fish Removal (nets, electrofishing, etc.)
Impact on aquatic environment (water quality and chemically)	Moderate and short term. Total detoxification through natural breakdown takes place normally within 5 weeks (Finlayson et al. 2000), Detoxification time can be reduced with the use of an oxidizer e.g., potassium permanganate.	Minimal and long term.	Minimal and long term.
Ability to meet water quality standards	Excellent – Concentrations of rotenone for proposed work is not toxic to humans (Finlayson et al. 2000) and is difficult to detect after approximately five weeks.	Excellent, since there are no introductions of chemicals.	Excellent, since there are no introductions of chemicals.
Effectiveness for goal	Good to excellent, depending on the target species, the concentration of the rotenone during application and the thoroughness of the application.	Low to significant, depending on the introductions (species and numbers). Results generally are not seen in the short term and can be unpredictable, depending on the target and introduced species.	Low to significant. It can be most effective in smaller waters but is labor intensive and requires a long-term commitment. It is usually only a short-term solution. Success can depend on target species and

			the target number to remove.
Cost effectiveness	WDFW estimated that for every dollar spent on rotenone and trout stocking, anglers gain between $32 - $105 worth of fishing.	Moderate to good, depending on the numbers of fish introduced.	High cost, labor intensive – low return in most cases.
Suitability for treatment sites	Suitable for most sites.	Suitability is dependent upon the target species and the species introduced and the size of the water. Proper planning is key.	Suitable for very few sites because of drawbacks mentioned.
Protection for human health concerns	Human health concerns can be adequately addressed by following label restrictions, SOP manual and safety procedures, which are part of permit requirements.	No human health concerns.	No human health concerns.
Response to emergency	Can be adequately addressed. Contingency plans are part of permit requirements.	No emergency response necessary.	No emergency response necessary.

Wastewater Characterization

The proposed wastewater discharge is characterized for the following parameters:

Table 2: Pollutant Characterization - Powdered Rotenone Formulations

Product Name	Application Rate	Active Ingredient Concentration in Treated Waters
Prentox ® Prenfish™ Fish Toxicant Powder or Peru Cube Powder®	Application rates on label range from 0.10 - 5 ***ppm*** (based upon 5% active rotenone).	0.005 - 0.20 ppm.
Potassium Permanganate (if deactivation is required)	Variable application rate depending on concentration of rotenone, total alkalinity, and organic demand. Application rates will be calculated and applied in accordance with "Rotenone SOP Manual" by Finlayson et al. (2018).	Variable concentration in the rotenone ***deactivation zone***, based upon formulas in Finlayson et al. (2010a). Outside of the deactivation zone the concentration shall not exceed 1 ppm.

Table 3: Pollutant Characterization - Liquid Rotenone Formulation

Product Name	Application Rate	Active Ingredient Concentration in Treated Waters
Prentox ® Prenfish™ Toxicant1	Application rates on label range from 0.10 - 5 ppm (based upon 5% active rotenone).	0.005 - 0.20 ppm active rotenone.
CFT Legumine™ Fish Toxicant2	Application rates on label range from 0.10 - 5 ppm (based upon 5% active rotenone).	0.005 - 0.20 ppm active rotenone.
Potassium Permanganate (if deactivation is required)	Variable application rate depending on concentration of rotenone, total alkalinity, and organic demand. Application rates will be calculated and applied in accordance with "Rotenone SOP Manual" by Finlayson et al. (2018).	Variable concentration in the rotenone deactivation zone, based upon formulas in Finlayson et al. (2010a). Below, the deactivation zone, the concentration will not exceed 1 ppm.

[1]Inert ingredients include aromatic petroleum solvent, not to exceed 80% (9.9% naphthalene, 1.7% 1,2,4-trimethylbenzene, and 7.5% acetone (Material Safety Data Sheet, U.S. Dept. of Labor)

[2]Inert ingredients include petroleum distillates, specifically N-Methylpyrrolidone (Material Safety Data Sheet, CWE Properties Ltd.)

The permit does not shield inerts or adjuvants for which the chemical composition has not been disclosed to Ecology.

WDFW Lake and Stream Rehabilitation Policy and Procedures

WDFW Policy POL-C3010 Lake and Stream Rehabilitation authorizes the use of rotenone to conduct lake and stream rehabilitation activities. This policy identifies the various roles and actions of WDFW staff involved in the rehabilitation program including relevant deadlines.

WDFW's document entitled "Schedule of Activities" is an internal WDFW document that summarizes the general timeline involved in the lake rehabilitation program including the schedule of planning, public notification, approval, treatment and post-rehabilitation reporting.

Pre-Treatment Procedures

WDFW selects lakes or streams for piscicide treatment when a viable fishery can only be maintained with introductions of catchable-size fish, or when removal of non-native fish is necessary to restore native fish or wildlife habitat. The WDFW District Fish Biologist, directly charged with managing recreational fisheries within a geographic area of responsibility, determines which lakes are proposed for treatment. To make this determination, standard indicators of fishery performance are evaluated: average angler catch rate on Opening Day, fish size, and fish population relative abundance. When fishery performance declines and fish sampling data indicate that undesirable fish species are the cause, the District Fish Biologist recommends treatment of the water(s) to his or her supervisor, the Regional Fish Program Manager.

The District Fish Biologist must then complete a pre-rehabilitation plan(s) containing vital information on the proposed treatment(s). In calculating the required concentration for a rotenone treatment, the biologist considers a variety of factors (e.g., target species, water chemistry, past successes or failures, presence of weedy shorelines). Planned rotenone concentrations for a treatment do not exceed that allowed by the FIFRA label and NPDES permit.

The Regional Fish Program Manager presents a list of proposed treatments along with justifications for each waterbody to the Fish Management Division of WDFW. Approval at this stage may depend not only on biological justification, but on other considerations such as the waterbody's public use, its importance as a recreational fishery, and availability of piscicide. WDFW establishes statewide priorities and creates a list of candidate lakes on an annual basis

After developing a list of candidate lakes, WDFW notifies the public of proposed treatments as well as an opportunity to comment through the State Environmental Policy Act (SEPA) process through a general news release, usually in early summer. District Fish Biologists also solicit public opinion from lakeshore residents and other interested parties. Public meetings are conducted in the vicinity of the waters proposed for treatment as well as the headquarters office in Olympia. After opportunities for public comment are completed, WDFW issues a final list of candidate waters as an addendum to the 2002 FSEIS to meet State Environmental Policy Act requirements.

The WDFW Director grants final agency approval of the list of candidate lakes. Even with the Director's approval, WDFW may elect not to treat a lake if all the pre-treatment steps, such as outlet deactivation and/or water control (e.g., diking or damming) have not been completed or other conditions have changed at the intended time of treatment.

Fishing regulations are liberalized through emergency regulation, when possible, to allow harvest opportunity in waters scheduled for rehabilitation. In some instances, warmwater gamefish, such as bass or panfish, may be collected and transported prior to treatment, to other waters to help enhance their warm-water fishing opportunities.

Treatment Procedures

The powdered rotenone application method, pioneered by the Utah State Department of Natural Resources – Division of Wildlife Resources, involves mixing powdered rotenone with lake water, using a pump and aspirator, to create a slurry. Standard packaging for powdered rotenone is a sealed, heavy gauge, removable plastic liner inside sealed, pressed fiber 25 or 50 kilogram container. The slurry is discharged directly in to the lake or water body surface (Thompson et al, 2001). For a detailed description of the application procedure, refer to Finlayson et al. 2018. "Operation of Semi-Closed Aspirator Systems for Application of Powdered Rotenone SOP: 9.1," in Planning and Standard Operating Procedures for Use of Rotenone in Fish Management.

In 2007, the EPA issued a Re-registration Eligibility Decision (RED) for Rotenone (EPA 2007). As a result of the RED for rotenone, the "Operation of Semi-Closed Aspirator Systems for Application of Powdered Rotenone SOP: 9.1" was adopted as a component of the FIFRA label for rotenone.

Liquid rotenone formulations are mixed with water, according to the FIFRA label, prior to discharge. WDFW treatments with rotenone formulations may be applied by pumper boat, airboat, helicopter, canoe, truck, ATV, backpack sprayer, drip can, gelatin/sand mixture, or other methods consistent with the 2018 AFS Rotenone SOP Manual.

Treatments conducted under this permit must follow all requirements in the product label for the product being used.

Post-Treatment Procedures

In lakes with a stream outlet, WDFW must control or detoxify runoff from the lake. In some cases, the runoff is minimal and can be dammed off (using sandbags, for example) until the rotenone naturally degrades. When runoff cannot be contained, WDFW applies potassium permanganate into the outlet stream to neutralize the rotenone before it can harm fish and invertebrates downstream. Between 1977 and 1984, WDFW required deactivation by potassium permanganate in only 16% of the lakes treated. Pfeifer (1985) provides a detailed account of outlet deactivation procedures, including dosage/deactivation curves and case histories in Martha and Silver Lakes, Snohomish County (WDW 1992).

Rotenone typically degrades within a few days to eight weeks in lowland lakes, and may persist somewhat longer in sub-alpine or alpine lakes (WDFW 2002). WDFW District Biologists perform live-fish bioassays to determine toxicity levels in recently treated lakes. Hatchery trout (5-10 fish) held in live boxes are placed into previously treated waters. Live boxes are checked 48 hours later to determine survival.

The District Fish Biologist submits a post-rehabilitation report to Ecology for each treated water. It describes the efficacy of the treatment, water conditions at the time of treatment, target and non-target species observed post-treatment, amount of rotenone (liquid and powder) used, and any deactivation measures taken (WDW 1992).

WDFW typically restocks fish following piscicide treatment when it fits the management plan for the waterbody. During the post-treatment years, the District Fish Biologist continues to monitor fish survival and growth, as well as catch rates for the water (WDW 1992).

Rotenone and Human Health

A WDFW internal memo summarizes WDFW's human health and safety procedures (February 3, 2001). This memo is included in WDFW's 2002 FSEIS as Appendix C.

Additionally, WDFW follows the American Fisheries Society rotenone standard operating procedures (SOP) manual which provides direction to applicators regarding project planning and safety (Finlayson et al. 2018). The SOP manual is considered to be part of the FIFRA label for rotenone.

Potential of rotenone to cause Parkinson's disease

The EPA review of rotenone for assessing its eligibility for re-registration (EPA, 2006a) has raised a concern because the extensive research on Parkinson's disease includes a paper that shows a Parkinson's disease-like effect resulting from rotenone exposure (Betarbet et al., 2000). Turner, L., et al. 2007 at 76.

Although rotenone-induced Parkinsonism is a useful research tool, Betarbet et al. (2000) cautioned that Rotenone had little toxicity when administered orally. A continuous, intravenous administration of rotenone for 1-5 weeks is not representative of any likely exposure to rotenone. However, EPA (2006a) stated that intravenous injection may mimic the inhalation route of exposure because it is a fairly direct route of exposure that avoids any metabolic breakdown that occurs from gut uptake. A subchronic neurotoxicity study via inhalation was recommended for rotenone because inhalation is a potential route of exposure to rotenone. However, with only piscicidal uses of rotenone remaining, the requirement has been placed "in reserve" since chronic exposure to rotenone is most likely from garden, agricultural, and animal uses. For piscicidal uses, chronic inhalation is likely only for handlers and applicators of rotenone who do not wear the required Protective Personal Equipment. It is also possible that inadvertent overspray could result in inhalation exposure of rotenone, but such an event would be a one-time, acute event because treatment of an individual lake would only re-occur after at least a year, and likely several years. For applicators and other regular handlers of rotenone, the required PPE would preclude any consequential exposure to rotenone, thus removing any possibility of a Parkinson like effect. Turner, L., et al. 2007 at 77.

Finlayson et al. 2012 at 473 concluded that: Collectively, the toxicology and epidemiological studies present no clear evidence that rotenone is causally linked to PD (Parkinson's Disease). Even if there were clear evidence, it would have little impact on the current and proposed use of rotenone in fish management. This is because the toxicology studies demonstrating PD-like effects were conducted using routes of exposure (e.g., intraperitoneal or intravenous injection or oral dosing with solvents) and exposure regimes (e.g., weeks to months) not germane to potential human exposure associated with fishery uses. The epidemiological studies on pesticide use by farmers assessed historical application scenarios that paid little or no attention to personal hygiene, safety, and safety equipment. For the applicator, the use of required PPE will significantly reduce, if not eliminate, exposure. For the general public, restricted access to the treatment area until rotenone subsides to safe levels and the use of potassium permanganate to detoxify water leaving the treatment area will greatly minimize exposure. Although everyone is at some risk of developing PD, the risk of developing PD-like symptoms as a result of rotenone exposure from use in fisheries management is negligible because with recommended care, rotenone exposure has been effectively eliminated.

Mobility of rotenone and considerations for use in fractured basaltic areas

Rotenone does not create a ground water concern. The strong tendency of rotenone to adsorb to soils, sediments, and other particulate matter precludes leaching almost entirely. The soil-water partition coefficients, Kd, range from 4.2 to 122 Kg/L for a variety of soil types. There is some potential for leaching only when rotenone reaches the most vulnerable soils, i.e., "very sandy soils with low organic content" (USEPA, 2006c); even then, mobility should be limited, and hydrolysis should degrade any rotenone that does reach water. Turner, L., et al. 2007 at 54. In a recent (2006) treatment of Diamond Lake, Oregon, groundwater samples have been taken in three wells, and no rotenone has been found at the detection limit of 2 ppb. (David Loomis, Project Manager, Oregon Department of Fish and Wildlife, telephone communication, May 14, 2007). Turner, L., et al. 2007 at 55.

No information on groundwater sampling for rotenone was located for Washington State.

Despite the lack of detection anywhere that sampling has been done, the geology of eastern Washington has large expanses of fractured basalt substrate similar to volcanic areas of the Pacific Northwest, California and the Great Basin. Specifically, concerns have been raised about the potential migration of rotenone through the fractured basalts of the Columbia plateau. Turner, L., et al. 2007 at 55.

To enter the fractured basaltic geologic system, rotenone would have to move through the lakebed into the fractured basalt area. Once it entered the fractured basalt area, it could move either laterally or vertically through openings, fissures and cracks in the rocks. However, the potential for that movement is expected to be zero because of adsorption to sediments in the lake bottom, and the immobility of rotenone. Turner, L., et al. 2007 at 56.

Lake bottoms are not simply underwater soils. Lakes have some level of algae and aquatic macrophytes. Decaying plant material and waste materials from aquatic animals, accumulate over time and most go to the bottom of the lake creating a lake sediment that is typically rich in organic material. Even a thin sediment layer would create a barrier for rotenone movement since it binds to particulate matter and does not leach. Turner, L., et al. 2007 at 57.

Frequency of Piscicide Treatments

Lakes or ponds treated with rotenone rarely remain free from undesirable fish species. Some undesirable species repopulate the lake from connected surface waters naturally over the course of time. Occasionally, some fish may avoid lethal concentrations of rotenone by taking refuge near underwater springs or freshwater inlets. In addition, intentional illegal introductions of undesirable fish species sometimes occur. Regardless of origin, the effect of undesirable fish species is fairly consistent in trout-managed waters. Trout production tends to decline, and the waterbody may need rehabilitation again. From 1940 to 1984 the average length of time between rotenone treatments, on lakes treated more than once, was 7.74 years (Bradbury 1986).

Target Species

In the eastern half of the state, WDFW has targeted pumpkinseed sunfish for elimination most frequently. In the western half of the state, WDFW has targeted yellow perch most frequently. No piscicide treatments have occurred in Western Washington since Crocker Lake in Jefferson County was treated in 1998 for removal of Northern Pike. Other important target species include Common Carp, Tench, Brown and Yellow Bullhead catfish, Largemouth Bass and Smallmouth Bass. All are non-native species. Native fish and wildlife restoration treatments are anticipated and may include removal of Common Carp to enhance waterfowl habitat or removal of non-native trout to restore native trout populations, and removal of fish to restore amphibian habitat.

A particular lake may experience recurring problems with the same target species over the course of many years. Often, however, the target species on frequently treated lakes changes over the years. This is often the case in "urban" lakes which frequently receive illegal fish introductions.

Timing of Piscicide Treatments

The majority of rotenone treatments occur in the fall months with only a small percentage of treatments occurring in spring. All spring treatments conducted by WDFW have occurred on eastern Washington lakes. From 2002 to 2012, only three treatments were performed in the spring; all others took place in the fall.

WDFW applies rotenone in the fall because water levels are low, aquatic vegetation is sparse, recreational use of the lake is reduced, and thermal stratification has ended in most lakes (allowing rotenone to circulate throughout the water column). WDFW also prefers fall treatments when they are targeting early spring spawners (e.g., perch). WDFW performs occasional spring rotenone treatments on certain lakes with extensive shallow or weedy areas. Higher water levels in the spring make these areas more accessible by boat. Where irrigation

water storage affects water level, WDFW treats in early spring when water levels and flows are lowest.

Integrated Pest Management (IPM)

All NPDES permits issued by Ecology must incorporate requirements to implement reasonable prevention, treatment and control of pollutants.

The legislature established in the Washington Pesticide Control Act (chapter 17.15 RCW) that prevention of pollution in this case is reasonable only in the context of an Integrated Pest Management (IPM) plan. IPM plans require the investigation of all control options, but do not require non-chemical pest controls as the preferred option. The goal of IPM is to establish the most effective means of control whether chemical, non-chemical, or a combination.

WDFW's fisheries resource management program currently utilizes integrated pest management (IPM) strategies. IPM programs include preventing pest problems, monitoring for the presence of pests, setting a population density at which treatment occurs, and evaluating efficacy of treatments. WDFW has worked to prevent illegal introductions through the creation of education materials and conducts annual monitoring of fish populations and fish size. WDFW selects lakes or streams for piscicide treatment when a viable fishery can only be maintained with introductions of catchable size fish, or when removal of non-native fish is necessary to restore native fish populations. The DMP, that will be required as a condition of the permit, requires WDFW to develop an action threshold that sets the parameters for when WDFW may use piscicides to control fish populations.

The treatment strategy of an IPM program is chosen after giving equal weight to all control strategies. The chosen control option will best fit the parameters of an individual situation after the ecologic and economic consequence of each option is considered. The treatment alternatives considered for fisheries resource management are fish toxicants, predator stocking, and mechanical removal (Table 1).

The treatment that has been preferred for most situations in the past is application of piscicide. This strategy is thought to give the best chance of eradicating infestations of non-native fish while minimizing risks to human health and to the environment. The success of the treatments is confirmed by fish population sampling and creel surveys.

WDFW will be required to submit a DMP prior to conducting treatments under coverage of this permit. The DMP will serve as the IPM plan for this general permit.

INVASIVE INSECT CONTROL

An invasive species is an organism that is introduced outside its native range, and which thrives and spreads without natural controls that would be present in its native range. Such a species had no natural predators or cycles to keep it in check, can spread quickly and displace native species, habitats and ecological functions. Invasive species can also cause, sometimes widespread, economic damage.

The Pest Program at WSDA is charged with monitoring for known and potential invasive species and eradicating populations of invasive species that are discovered. Some invasives, such as Spongy Moth, have been introduced and eradicated on numerous occasions. Other species, such as Light Brown Apple Moth (LBAM), European Grapevine Moth and Japanese beetle are species of intense interest should they be introduced into the state. Some of these invasives have known populations in Oregon (Japanese beetle), and Alameda County, California (LBAM), increasing the possibility that they could be introduced into Washington.

Two examples of invasive insects are provided here to illustrate the potential impacts that are possible.

Spongy Moth

Figure 1: Image of Male Spongy Moth

Figure 2: Image of Female Spongy Moth

Spongy Moth is a non-native, defoliating, invasive moth pest. The European Spongy Moth (Lymantria dispar dispar) was introduced originally to the Eastern United States. Females of this variety do not fly. Asian Spongy Moth (Lymantria dispar asiatica) has been introduced to Washington on numerous occasions. Females of this variety do fly, up to 25 miles, which greatly increases the likelihood of fast population spread in Washington should a population become established.

Larval Spongy Moth (caterpillars) is the destructive life stage. A One caterpillar can consume up to 11 square feet of leaf vegetation during this life stage. A few caterpillars may not do much damage, however during outbreaks (massive yearly increase of the population) millions of caterpillars can completely defoliate host plants weakening or killing the host.

Spongy Moth larvae feed on more than 250 host species. There are preferred, acceptable, and least desired hosts (preferred species listed below). However, under conditions where an outbreak is occurring and many host plants are already heavily infested, caterpillars will feed on any plant. Heavy feeding on plants will weaken the host and make it more susceptible to disease. A few years of heavy feeding by Spongy Moth caterpillars will likely kill many hosts, less in the case of evergreens.

Spongy Moth outbreaks usually last from 1-5 years followed by a 4–12-year period where the populations are much lower. During an outbreak, the population increases significantly over non-outbreak population densities.

Caterpillars are also covered by long hairs that can irritate people's skin or cause allergic reactions.

Preferred Larva Hosts

Alder (Alnus spp.)
Apple (Malus spp.)
Aspen (P. grandidenta, tremuloides)
Basswood
Beech, (Fagus americana)
Birch (B. populifera, nigra)
Boxelder (Acer negundo)
Cedar - Older Caterpillars
Fir - Older Caterpillars
Hawthorne (Crategus Sp.)
Hazelnut (Corylus spp.)
Oak
Hemlocks - Older Caterpillars
Larch (Larix spp.) – Older Caterpillars
Linden (Telia spp.)
Mountain Ash (Sorbus spp.)
Pines - Older Caterpillars
Poplar (P. nigra var. italica)
Serviceberry (Amelanchier canadensis)
Spruce- Older Caterpillars
Sweetgum (Liquidambar styraciflua)
Willow (Salix spp.)
Witch Hazel (Hamamelis spp.)

History of Control

Spongy Moths were accidentally introduced to the United States in 1869. Spongy Moths have since spread to 19 states, the District of Columbia, and parts of Canada.

The first Spongy Moth control program was initiated in 1889 in Massachusetts, twenty years after the first introduction, when populations finally reached epidemic levels. Eradication was not realized, as the pesticide and application equipment used were not designed for a forested environment. The control program was expanded to include the use of sprays, egg mass removal, trapping and sticky bands. The population was reduced to minor threat levels before funding was cut in the mid 1890's.

The federal government became involved in 1905 when a second outbreak spread across several states. A biological control program was introduced without much success. By 1908, the main treatment method was again a chemical approach. During the 1920's, a silvicultural approach was recommended that would replace preferred hosts, such as oak species, with less desirable food plants, such as maple. This method was rejected because of high costs.

In the 1940's, scientists discovered that DDT was very effective against Spongy Moths. Despite concern about the pesticide's effects on the environment, the government proceeded with its plan to eradicate Spongy Moths with DDT and treated 3 million acres in 1957. The federal government was forced to abandon its plan for Spongy Moth eradication when the environmental effects of DDT were discovered.

The use of biological controls has increased since the 1960's. A biological control is usually a host specific predator (so that only the pest is targeted) and will not eradicate the invasive species. The biological control will enter a cyclic predator/prey relationship with the invader. As the invasive enters the "boom (large increase in population)" part of a cycle the predator population also rises, though at a slower rate. Then when the invasive species population falls so does the biological control population. The population of the predator always lags behind the population of the invasive. Such a strategy makes sense from an IPM perspective when treating an area with established invasive moth populations.

The history of Spongy Moth control programs demonstrates the importance of excluding invasive species from Washington State.

Current Control Program

Washington has never had a permanent population of Spongy Moth. However new populations are introduced through people moving or goods being relocated from other areas of the country, or world, where Spongy Moth are present. Washington State Department of Agriculture (WSDA) has successfully detected and eradicated new introductions of Spongy Moths for more than 25 years. The current WSDA Spongy Moth control program is typical of an integrated pest management (IPM) program, where the pest is managed on an "as needed" basis. However, the goal of the WSDA program is not control, but eradication. The basis of IPM is pest detection and surveillance, setting thresholds above which action will be taken to control/eradicate the pest, and using multiple pest control strategies. A major factor in choosing an IPM prescription is its ability to be successful while not disrupting natural controls such as parasites.

The goal of the WSDA program is to eradicate Spongy Moth when discovered in Washington. In areas without established populations eradication is an attainable goal, one that WSDA has been successfully meeting for many years. The need for management is based on the detection of Spongy Moth presence through the use of pheromone traps. The WSDA Spongy Moth Eradication program annually employs a seasonal crew to place and check traps throughout the state. Areas with positive identifications may be slated for treatment the following season.

Spongy Moth control methods have evolved over time. The pesticides currently used in treating infested areas are biological in origin, highly specific to Lepidoptera species, and have little or no effect on other organisms. Currently, WSDA uses a relatively host specific insecticide, Bacillus thuringiensis var. kurstaki (Btk). Btk is similar to other Bacillus species, such as those used extensively in mosquito control (Bacillus sphaericus and Bti) in Washington. Btk is a relatively host-specific insecticide, which allows WSDA to carry out its Spongy Moth eradication program with minimal damage to non-target species.

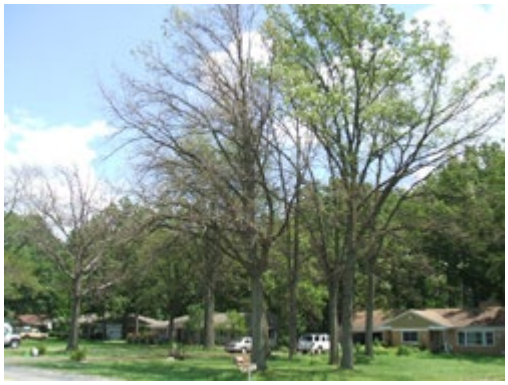
WSDA now intends to include mating disruption in its Spongy Moth program. Mating disruption uses a species-specific pheromone to confuse the male Spongy Moth. The males cannot locate a female to reproduce with, so a new brood is not produced that year. The pheromones are the same ones as used in the traps WSDA uses to detect Spongy Moth populations. Mating disruption provides another tool for use in Spongy Moth control that has even less non-target impact than the use of Btk.

Environmental Impact

During Spongy Moth outbreaks, environmental impacts may be more obvious. Impacts include:

- Stripping trees bare of leaves leading to less shade on streams
- Dead/dying trees leading to more erosion
- Higher loads of fecal matter from infested trees along water bodies, adding to the biological load on the waterbody, increase nutrients causing algae blooms.
- Displacing natural communities (e.g. willow) along a shoreline leaves the area open to invasion from undesirable species (e.g. reed canary grass)

Figure 3: Example Images of Defoliation Caused by Spongy Moth



Economic Impact

The presence of Spongy Moth can have a significant economic impact on the areas where it is present. Impacts include:

- Limiting the movement of saleable goods.
- Limiting the movement of cars for vacationers.
- Limiting the movement of RVs, boats, trailers and other outdoor recreational gear.
- Imposition of quarantines on the infested area (e.g. state or county).
- During outbreaks, reducing the number of tourists.
- Damage to the timber industry.
- Decrease in property values.
- Destruction of saleable goods (e.g. nursery stock).

The USDA (and now the Department of Homeland Security) has the authority to impose quarantines on the movement of goods if the area is known to be infested with a dangerous pest. Quarantines are established to prevent, or slow, the continued spread of the pest. County or state quarantines will:

- Limit exportation of plants or plant based products until inspected and certified (permits needed).
- Limit free movement of items stored out-of-doors until inspected and certified as Spongy Moth free. This limits free movement of things like RVs, ATVs, boats, and even cars from areas under quarantine.

Light Brown Apple Moth

Figure 4: Image of Light Brown Apple Moth

Light Brown Apple Moth (LBAM) (Epiphyas postvittana) another non-native invasive insect pest. It is originally from Australia, though established populations are now present in New Zealand, New Caldonia, Hawaii, the British Isle and as of 2007, Alameda County, California. Alameda County is under federal quarantine to prevent the spread of LBAM.

This species requires a cooler moderate climate. Populations do not respond will to temperatures over 90F, or below freezing for more than 24-48 hours. This is likely to limit LBAM spread in the mountainous and Eastern regions of Washington where the climate is more extreme. However, it may pose a problem in Western Washington where temperatures are usually more moderate.

As with the Spongy Moth, it is the larval stage that causes damage. LBAM hosts on over 2000 different plants and many types of fruits and vegetables, making it a possible economic pest should it be introduced to Washington. It is polyphagus, feeding on a wide range of host plants, though it prefers fruiting plants. Larva feed on leaves and buds which will deform plant growth patterns and reduce photosynthesis. Feeding on fruits deforms the surface or creates tunneling. Damaged fruit is considered unsalable. Susceptible fruits include grapes, pomes (e.g. apples), stone fruits (e.g. cherries, peaches, plums), kiwifruit, avocadoes, and citrus.

Economic Impact

Actual economic impact to Washington is hard to predict. However, if a population were to become established in Washington (Western is more likely that Eastern), economic damages resulting from ornamental plant damage, crop (commercial and non-commercial) damage, and restrictions on nursery trade are possible. Other countries, such as Canada, Chile and Mexico implement import restrictions from areas that are known to be infested with LBAM leading to wide economic difficulties selling products from areas with LBAM.

Analysis by USDA of the economic impact of LBAM on apple, grape, orange and pear crops in the US estimated damages up to $118 million per year. This analysis does not include other crops that may be impacted. This report concluded that: "The combined results of our geospatial and quantitative analyses indicate that LBAM could cause substantial economic losses to U.S. apple, grape, orange and pear crops if introduced throughout the conterminous United States. We note LBAM is highly polyphagous and would probably cause additional economic damage to other crops and sectors of the U.S. economy, e.g. domestic and international trade. Also, because LBAM can occur in nursery stock, this industry could provide another pathway for its introduction outside of the quarantined area in addition to movement on agricultural commodities."

Effluent Characterization

A. Disparlure

Disparlure is a species-specific (Spongy Moth and nun moth, another invasive tree pest) form of chemical control that is widely used in the U.S. It does not attract other species of lepidoptera, and is not known to work as an insecticide through toxic activity. It is classified as practically non-toxic by EPA. The most probable exposure route for people is dermal exposure.

The (+) Disparlure enantiomer is a naturally occurring chemical produced by the female Spongy Moth. It is used to attract males for mating. Commercial production of (+/-) Disparlure is used for Spongy Moth control. (+) Disparlure is used as an attractant in delta traps for population surveys and surveillance, and is also used in milk carton traps. Milk carton traps also contain the insecticide DDVP, however this permit does not address their use, only uses that may cause a discharge. A racemic (50:50 blend) of (+/-) Disparlure is used in several formulations of mating disruptor. Usually formulated as a PVC flake, bead, or microtube (hollow fiber) carrier with Disparlure inside, mating disruptors are used to confuse male Spongy Moth and reduce mating success. By broadcasting Disparlure over a wide area where Spongy Moth occurs, it fills the air, masking pheromone trails produced by the females. This prevents the males from finding the females over distances, though it does not work for individuals located near

each other on the same host. By preventing mating, the next year's population of Spongy Moth is reduced.

Insect pheromones are generally considered non-toxic to mammals. Studies with rats showed no effects when rats were given gavage doses of up to 34,600mg/kg/bw. Bobwhite quail given gavage doses of up to 2510mg/kg/bw showed no effects. (gavage does are typically administered through a feeding tube leading down the throat to the stomach) Mallard and bobwhite quail chicks exposed to doses of up to 5000 ppm in their diet for 5 days also showed no effects. Inhalation studies showed no effects when rats were exposed to 5.0mg/L Disparlure in air for 1 hour. A study of rabbits showed no toxicity from dermal contact of up to 5,000mg/kg/bw. A single dose directly in the eye of 0.1g/eye showed no eye irritation. However, a single dose of 0.5g on the bare skin or rabbits showed very mild irritation, but not enough to qualify Disparlure as a skin irritant based on EPA's requirements.

The doses presented in these studies are many times higher than a person could reasonably be expected to be exposed to in the environment, even directly after application.

Limited data is available for aquatic toxicity. Suggested solubility of Disparlure in water is within the range of 0.0019 and 0.0028 mg/L. The USFS estimates that when applied at label rates, concentrations of Disparlure in water would be within the range of 0.0015mg/L and 0.0037mg/L (based on a 1 meter deep body of water).Those aquatic toxicity studies performed on Bluegill sunfish, Rainbow trout, Daphnia and Eastern Oysters reported nominal concentrations (calculated based on how much Disparlure was added) of Disparlure, not measured concentrations (actual concentration in water, based on solubility). The nominal concentrations are higher than the solubility of Disparlure in water would allow to occur.

96-hour acute toxicity studies on Bluegill sunfish and Rainbow trout reported no effects at nominal concentrations of up to 100mg/L. Eastern oysters were also tested for 96 hours at nominal concentrations of up to 20mg/L. No effects related to toxicity were noted.

96-hour daphnia acute toxicity studies of Disparlure nominal concentrations of up to 0.22mg/L did show mortality. At the low end of the range 0.028 mg/L, 7% mortality was seen, while at the upper end of 0.22mg/L, 100% mortality was seen.

A further discussion of the daphnid test is necessary because the mortality was not related to toxicity. Mortality resulted from daphnia getting physically trapped in a surface layer of un-dissolved Disparlure (at the air/water interface). Being trapped like this creates intense respiratory distress, leading to its death much like the use of oil to kill mosquito larvae. Disparlure is an oily substance that has a very low solubility in water, so it can form a separate layer at the water's surface like cooking oil. In water bodies with natural surface movement due to current, wind, or wave action, and low application rates, the effects seen in a still laboratory setting are unlikely to occur.

B. Bacillus Thuringiensis var. kurstaki (Btk)

Bacillus thuringiensis var. kurstaki (Btk) is a naturally occurring bacterium that is available as an insecticide. It is used for invasive moth control because of its low toxicity to non-target species. Btk is an endospore-forming bacterium that is ingested by the actively feeding caterpillars. Once ingested, the bacteria produce a toxin specific to Order Lepidoptera (butterflies and moths) species that disrupts the lining of the caterpillar's intestine, killing the caterpillar. Timing is important and Btk is usually applied from one to four times per treatment season.

The bacteria are in the resting-spore phase of their life cycle when ingested. The spores do not germinate until they enter the insect's gut. Alkaline conditions (opposite of acidic conditions in mammals) in the insect gut are required as a signal for the spore to begin reproducing. Btk has no effect on the vast array of aquatic organisms.

Commercial strains of Btk are naturally occurring Btk that have been isolated from the environment and fermented in much the same way as baking or brewing yeast is selected from nature. Commercial Btk strains are maintained by industry laboratories in a pure, uncontaminated form that are used to inoculate large quantities of growth media for production.

Btk has been extensively studied for effects on non-target organisms and environmental consequences of use with few reported adverse effects. It is not toxic to bees, warm-blooded mammals, and it shows no reported effect on fish and amphibians when applied at field rates. Product labels indicate that direct contact with the product may cause mild to moderate eye or skin irritation.

No complaints were made after humans ate one gram of commercial Btk preparation daily for five days, on alternate days. Some inhaled 100 milligrams of powder daily, in addition to the dietary dosage. Humans who ate one gram per day for three consecutive days were not poisoned or infected. No complaints were made by eight men after they were exposed to fermentation broth, moist bacterial cakes, waste materials, and final powder created during the commercial production of Btk.

On plant surfaces, Btk products degrade rapidly. While Btk is moderately persistent in soil, its toxins degrade rapidly. Because of its host specificity, Btk lacks the ability to recycle readily in insect populations. Factors that influence its persistence in soil and water include UV exposure, agitation, sedimentation, water quality, pH, and temperature.

CHEMICALS FOR AQUATIC AND INVASIVE SPECIES MANAGEMENT

Under the Aquatic and Invasive Species Control permit, Ecology will allow the use of chemicals or control products in or near Washington's surface waters for the purpose of eradicating or controlling aquatic and invasive species. Except for fish, mosquitoes, and ballast water treatments, EPA labels few products specifically for the management of invasive aquatic animals, particularly chemicals that treat surface water rather than infrastructure. Because of this, ***in addition to permit coverage***, Permittees may also need to pursue an experimental use permit; a special local needs label; or an emergency exemption label for some of the products listed in the permit. Permittees will need to coordinate any additional labeling requirements with WSDA and EPA.

Ecology allows the use of many of the chemicals and products listed in this permit in other aquatic NPDES permits. Other chemicals and products are new to Washington State NPDES permitting and may not have aquatic labels. For example, EPA does not label chlorine for use in the marine environment, but California obtained a modified label to use chlorine for *Caulerpa taxifolia* eradication. California initially used a five percent chlorine solution under tarps to treat the alga, but later modified the procedure to use a solid form of chlorine.

WDFW used a similar technique to treat the marine tunicate *Didemnum* in the Edmonds marine sanctuary using acetic acid instead of chlorine. Because of the shortage of labeled products, invasive species managers have become creative in their use of chemicals and other products in their effort to thwart the spread of and to manage established population of these species.

Ecology proposes to include the chemicals or products listed below in the draft Aquatic and Invasive Species Control Permit. Ecology provides an overview, mitigations, and references for each chemical or product in a non-project Aquatic Invasive Species Environmental Impact Statement (EIS), the State Environmental Policy Act (SEPA) document for this permit. The chemicals include:

- Sodium chloride for marine and freshwater application
- Potassium chloride for marine and freshwater application
- Chlorine compounds including chlorine dioxide, sodium chlorite, sodium hypochlorite, and calcium hypochlorite for marine and freshwater application
- Acetic acid for marine and freshwater application
- Calcium hydroxide/oxide (lime) and carbon dioxide for marine and freshwater application
- Rotenone for freshwater application
- Potassium permanganate ($KMnO_4$) for marine and freshwater application

- Endothall (e.g., Hydrothol 191™): mono(N,N-dimethylalkyalmine) salt of 7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid for freshwater application
- Sodium carbonate peroxyhydrate for freshwater application
- Methoprene for marine and freshwater application
- Chelated copper compounds for freshwater application
- Pseudomonas fluorescens strain CL 145A
- Tracer and Marker dyes
- Heating/cooling (temperature alteration) for marine and freshwater application

In addition, this permit allows the indirect application of the following products for control of invasive insects. They could enter surface water through overspray, drift, or dripping off overhanging vegetation. These include chemicals, pheromones, bacteria, viruses, biological controls, and adjuvants.

Active Ingredients:

- Spongy Moth pheromone: (+) and (-) Disparlure enantiomers (cis-7,8-epoxy-2-methyloctadecane)
- *Bacillus thuringiensis* var. *kurstaki* (Btk)
- Chlorantraniliprole: 3-Bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide
- Cyfluthrin: cyano(4-fluoro-3-phenoxphenyl)methyl 3(2,2dichloroethenyl)-2, 2-dimethylcyclopropane-carboxylate
- Leafroller/fruitworm pheromone: E-11-Tetradecen-1-yl Acetate
- European grape vine moth pheromone: (E,Z)-7,9-Dodecadien-1-yl acetate
- Gypcheck Spongy Moth virus
- Imidacloprid: 1-[(6-Chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine
- Japanese beetle nematode

Adjuvants/Stickers:

Contact WSDA Registration Services to ensure any adjuvants intended for use are registered in Washington and approved for aquatic sites.

REGULATORY INFORMATION

Regulatory Pollution Reduction Requirements

Federal and state regulations require that effluent limits in an NPDES permit must be either technology-or-water-quality-based.

- Technology-based limitations are based upon the methods available to treat specific pollutants. Technology-based limits are either set by EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36).
- Ecology must apply the more stringent of these limits to each parameter of concern. These limits are described below.

This permit uses technology based and narrative effluent limitations. Setting a numeric effluent limitation is not feasible for incidental discharges from pesticide applications. Discharges of chemicals allowed under this permit are typically intermittent into surface waters, ditches, swales and other conduits to surface or ground waters. Application activities are spread across the state and discharges occur into many different water bodies that can all have different numeric limits. Water Quality Standards for Surface Water, Ground Water, and Drinking Water serve as limits. Discharges may not cause or contribute to an excursion above the limit.

Technology-Based Water Quality Protection Requirements

Sections 301, 302, 306, and 307 of the CWA establish discharge standards, prohibitions, and limits based on pollution control technologies. These technology-based limits are "best practical control technology" (BPT), “best available technology economically achievable" (BAT), and "best conventional pollutant control technology economically achievable" (BCT). Permit writers may also determine compliance with BPT/BAT/BCT using their "best professional judgment" (BPJ).

Washington has similar technology-based limits that are described as "all known, available, and reasonable methods of control, prevention, and treatment" (AKART) methods. State law refers to AKART under RCW 90.48.010, RCW 90.48.520, 90.52.040, and RCW 90.54.020. The federal technology-based limits and AKART are similar but not equivalent. Ecology may establish AKART:

- For an industrial category or for an individual permit on a case-by-case basis.
- That is more stringent than federal regulations.
- That includes Best Management Practices (BMP's) such as prevention and control methods (i.e. waste minimization, waste/source reduction, or reduction in total contaminant releases to the environment).

Ecology and EPA concur that, historically, most discharge permits have determined AKART as equivalent to BPJ determinations.

Historically, EPA has regulated the pesticide application industry under FIFRA. EPA developed label use requirements to regulate the use of pesticides. EPA also requires the pesticide manufacturer to register each pesticide, provide evidence that the pesticide will work as promised, and minimize unacceptable environmental harm.

The Pesticide Management Division of WSDA ensures that applicators use pesticides legally and safely in Washington. WSDA registers pesticides (in addition to EPA registration); licenses pesticide applicators, dealers and consultants; investigates complaints; maintains a registry of pesticide sensitive individuals; and administers a waste pesticide collection program. These duties are performed under the authority of the Washington Pesticide Control Act (15.58 RCW), the Washington Pesticide Application Act (17.21 RCW), the General Pesticide Rules (WAC 16-228), the Worker Protection Standard (WAC 16-233) and a number of pesticide and/or county specific regulations[6].

The standards for environmental protection are different between the CWA and FIFRA. Because of the *National Cotton Council, et al. v. EPA* court decision, in 2011, EPA regulates the application of aquatic pesticides under a general NPDES permit. EPA has developed a permit for non-delegated states (four states), federal lands, and Indian lands. EPA expects all delegated states to develop their own NPDES permits for aquatic pesticide application to comply with the federal court decision. The US Supreme Court turned down an appeal request to this decision, so in 2011 all aquatic pesticide applications must occur under NPDES permits.

[6] https://agr.wa.gov/washington-agriculture/laws-and-rules/pesticides

It is Ecology's intent that this general permit will authorize aquatic and invasive species management in a manner that complies with all federal and state requirements. Since 2002, Ecology has regulated aquatic pesticide application under general and individual NPDES permits. The Aquatic Invasive Species general permit is a general aquatic pesticide permit and authorizes aquatic invasive species control activities in a manner that complies with federal and state requirements.

All wastewater discharge permits issued by Ecology must incorporate requirements to implement reasonable prevention, treatment, and control of pollutants. This permit proposes treatment limitations that limit **treatment areas** within a given water body. Permittees may only use some chemicals in a contained situation such as under a tarpaulin or behind a barrier. Compliance with the PRODUCT label further limits the overuse of products and helps protect non-targeted organisms.

Ecology acknowledges that applicators could treat the pollutants addressed in this permit only with great difficulty due to the diffuse nature and low concentrations that exist after the pesticides have become waste. *The Headwaters, Inc, v. Talent* ruling established that aquatic pesticides become waste in the water after the pesticide has performed its intended action and the target organisms are controlled or if excess pesticide is present during treatment. Applicators may need to treat waters where chemical residues threaten to cause unacceptable environmental harm in some situations, but not routinely. The permit requires applicators to neutralize some of the chemicals after they have performed their intended action.

Water Quality-Based Requirements

Surface Water Quality-Based Effluent Limits

The Washington State Surface Water Quality Standards (chapter 173-201A WAC) were designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet established surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily loading study (TMDL).

Ecology conditions NPDES and waste discharge permits in such a manner that authorized discharges meet water quality standards. The characteristic beneficial uses of surface waters include, but are not limited to, the following: domestic, industrial and agricultural water supply; stock watering; the spawning, rearing, migration and harvesting of fish; the spawning, rearing and harvesting of shellfish; wildlife habitat; recreation (primary contact, sport fishing, boating, and aesthetic enjoyment of nature); commerce; aesthetics and navigation.

Numeric Criteria for the Protection of Aquatic Life and Recreation

Numeric water quality criteria are published in the Water Quality Standards for Surface Waters (chapter 173-201A WAC). They specify the levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numeric criteria along with chemical and physical data for the wastewater and receiving water to derive effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numeric Criteria for the Protection of Aquatic Life and Recreation

The EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (40 CFR 131.36). EPA designed these criteria to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The Water Quality Standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative Criteria

Narrative water quality criteria (e.g. WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that may be discharged to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria are statements that describe the desired water quality goal, such as waters being “free from” pollutants such as oil and scum, color and odor, and other substances that can harm people and fish. These criteria are used for pollutants for which numeric criteria are difficult to specify, such as those that offend the senses (e.g., color and odor). Narrative criteria protect the specific designated uses of all freshwaters (WAC 173-201-A-200, 2006) and of all marine waters (WAC 173-201A-210; 2006) in the State of Washington.

Antidegradation

The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three Tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollution. Tier II ensures that dischargers do not degrade waters of a higher quality than the criteria assigned unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters" and applies to all sources of pollution.

WAC 173-201A-320(6) describes how Ecology implements Tier I and II antidegradation in general permits. All Permittees covered under the general permit must comply with the provisions of Tier 1. Ecology determined that the permit does not cover discharges to Tier III waters.

The water quality standards at WAC 173-201A-320(6) describe how Ecology should conduct an antidegradation Tier II analysis when it issues NPDES general permits. This section of the rule requires Ecology to:

- Use the information collected, for implementation of the permit, to revise the permit or program requirements.
- Review and refine management and control programs in cycles not to exceed five years or the period of permit reissuance.
- Include a plan that describes how Ecology will obtain and use information to ensure full compliance with water quality standards. Ecology must develop and document the plan in advance of permit or program approval.

Although the antidegradation requirements for general permits state the individual actions covered under a general permit do not need to go through independent Tier II reviews, Ecology considers it important that the public have the opportunity to weigh in

on whether individual actions are in the overriding public interest. The antidegradation rule establishes a refutable presumption that they do, but only through a public notice of intent to provide coverage and expected compliance with antidegradation does the general public have an opportunity to question individual actions. Thus, facilities must publish requests for coverage in a local paper. Currently public notices must include:

- A statement that the applicant is seeking coverage under the Aquatic and Invasive Species Control General Permit.
- The name, address, and phone number of the applicant.
- The identity of the water body proposed for treatment.
- A list of products planned for use.
- The statement: "Any person desiring to present their views to the Department of Ecology regarding this application shall do so in writing within 30 days of the last date of publication of this notice. Comments must be submitted to the Department of Ecology. Any person interested in the Department's action on the application may notify the Department of interest within 30 days of the last date of publication of this notice."

This fact sheet describes how the permit and control program meets the antidegradation requirement.

Evaluation of Surface Water Quality-Based Effluent Limits for Numerical Criteria

Ecology made a reasonable potential determination on the application of chemicals approved for use in the draft permit based upon its knowledge of invasive species control methods, available EPA and Ecology risk assessment documents, published research, and information in non-peer reviewed publications about chemical properties. It based this decision using available information and prepared an Environmental Impact Statement as a companion document to the Aquatic and Invasive Species Control Permit. Ecology has determined that if dischargers properly apply and handle control chemicals in accordance with the terms and conditions of the general permit, the aquatic invasive species control activities will:

- Comply with state water quality standards.
- Maintain and protect the existing and designated used of the surface waters of the State.
- Protect human health.

New information regarding previously unknown environmental and human health risks may cause Ecology to reopen the general permit.

Short-Term Water Quality Modification Provisions

The short-term water quality modification provisions of the draft permit allow the discharges authorized by the general permit to cause a temporary diminishment of some designated beneficial uses while it alters the water body to remove aquatic invasive species.

The activities authorized by this general permit do not have a reasonable potential to cause a violation of state Water Quality Standards (chapter 173-201A WAC) so long as Ecology allows the activities under the short-term water quality modification provision. The water quality modification provides for an exception to meeting certain provisions of the state water quality standards, such as meeting all beneficial uses all the time. Activities covered under this permit are allocated a temporary zone of impact on beneficial uses, but the impact must be transient (hours or days) and must allow for full restoration of water quality and protection of beneficial uses upon project completion. The conditions of this permit constitute the requirements of a short-term water quality modification.

A short-term exceedance only applies to short lived (hours or days) impairments, but short-term exceedances may occur periodically throughout the five-year permit term. Short-term exceedances may also extend over the five-year life span of the permit (long-term exceedance) provided the Permittee satisfies the requirements of WAC 173-201A-410. The permit, fact sheet, SEPA documents, NOI and state agency aquatic invasive species response documents represent fulfillment of the plan requirement and development through a public process as required by WAC 173-201A-410 for long term exceedances.

Washington's Water Quality Standards now include 91 numeric health-based criteria that Ecology must consider when writing NPDES permits. The EPA established these criteria in 1992 in its National Toxics Rule (40 CFR 131.36). Ecology has determined that the Permittee's discharge does not contain chemicals of concern based on existing data or knowledge.

Ground Water Quality Standards

The Ground Water Quality Standards, (chapter 173-200 WAC), protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards. This permit does not allow the use of any pesticides expected to contaminate groundwater. In the event there is a concern, Ecology can issue orders requiring groundwater and well monitoring for different pesticides under this permit.

Drinking Water Standards

Federal and State drinking water regulations and standards (WAC 246-290-310 and 40 CFR Chapter 1, Part 141) are legally enforceable and apply to public drinking water supplies. They protect public health by limiting the levels of certain contaminants in drinking water. Potential drinking water contaminants include microorganisms (such as cryptosporidium, Giardia, and E. coli), disinfectants, disinfection by-products, inorganic chemicals (such as nitrates, lead and copper), organic chemicals (such as pesticides), and radionuclides. Federal and State drinking water regulations establish Maximum Contaminant Levels (MCL's), which are numeric limits that cannot be exceeded in the public drinking water supply. EPA's current list of drinking water standards[7] is available online.

Many contaminants are not regulated by drinking water standards, but EPA is considering some as candidates for regulation[8].

State Regulations also require source water protection around public drinking water supplies (WAC 246-290-135). Source water protection includes maintaining a protective Sanitary Control Area around ground water wells (100 feet for wells and 200 feet for springs) and a wellhead protection area around wells. Land uses or practices that could potentially contaminate a well are not allowed within the Sanitary Control Area and are strongly recommended against within the six-month time of travel zone of the wellhead protection area.

Sediment Quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards, Ecology may require a Permittee to evaluate the potential for the discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website[9].

Ecology has determined through a review of the discharger characteristics and effluent characteristics that this discharge has no reasonable potential to violate the Sediment Management Standards.

[7] https://www.epa.gov/sdwa/drinking-water-regulations-and-contaminants
[8] https://www.epa.gov/ccl
[9] https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups

SEPA Compliance

Ecology has developed a non-project EIS to fulfill the SEPA requirements for this permit. Based on this EIS and associated chemical risk assessments, the conditions of this draft permit should satisfy water quality-related SEPA concerns. The draft permit limits and conditions the use of chemicals to mitigate environmental impacts of concern noted in the EIS.

Ecology is proposing a procedural change in how it handles the project level SEPA determination for each permit coverage. A non-project SEPA review of the proposed action has been conducted for activities covered by this draft permit. The non-project SEPA review assesses all of the pesticides allowed for use under the permit and applies to all fresh waters of the state. Ecology will rely upon the non-project SEPA determination to issue permit coverage rather than issuing a SEPA determination for each separate coverage. In a change from the 2011 Permit, applicants no longer fill out a separate SEPA checklist. Instead, the Management Plans required for each type of permit activity provide site-specific project information to supplement Ecology's programmatic SEIS. Requirements for these management plans are described in Appendix B of the permit.

Endangered and Sensitive Species

EPA has implemented the Endangered Species Protection Program to identify all pesticides that may cause adverse impacts on threatened/endangered species and to implement measures that will mitigate identified adverse impacts. When an adverse impact is identified, the Endangered Species Protection Program requires use restrictions to protect these species at the county level. EPA will specify these use restrictions on the product label or by distributing a county specific Endangered Species Protection Bulletin. However, EPA has not labeled many of the chemicals allowed for use in the Permit for aquatic sites. Therefore, the draft permit requires the Permittee to check with WDFW biologists to determine critical habitat areas before using many of chemicals listed in the permit to manage invasive species. General Condition G5 of the permit requires the Permittee to comply with all applicable federal regulations.

At Ecology's request, WDFW biologists have developed work windows for aquatic pesticide permits to include all salmon species, bull trout, and any other sensitive species associated with aquatic habitats (e.g. waterfowl, amphibians, etc.). Ecology has imposed timing restrictions on chemicals expected to have lethal, sub-lethal, or habitat alteration impacts to these species. Ecology further limits the use of some chemicals such as copper until the state and federal fish agencies approve of the treatment. Ecology is trying to balance the impacts of the invasive organisms on the environment with the impacts of the chemical treatment.

Based upon annual reporting of pesticide use and other available information, Ecology may further restrict pesticide use to protect endangered, threatened, candidate and sensitive species such as pacific salmonids.

SPECIAL CONDITIONS

S1. PERMIT COVERAGE

Activities Covered under This Permit

Washington's Water Quality statutes and regulations do not allow the discharge of pollutants to waters of the state without permit coverage (RCW 90.48.080, 90.48.160, 90.48.260, 173-226, 173-201A WAC). Algaecides, herbicides, insecticides, molluscicides, piscicides and any other chemical or product appropriate for aquatic and invasive species management, and the residues of these, are pollutants and therefore require a discharge permit before application to Washington State surface waters.

This permit regulates the use of chemicals or control products for the management of invasive insects, invasive and introduced species of aquatic animals and nonnative invasive marine algae in surface waters in Washington State. Ecology limits chemical application to marine and freshwater animals or marine algae:

- Identified in WAC 220-12-090.
- Insects identified in Chapter 16-470 WAC: Quarantine-Agricultural Pests.
- Listed on Washington's Aquatic Nuisance Species Committee (ANS) watch list.
- Listed on the Washington Invasive Species Council's (WISC) management priority list.
- Listed by the United State Fish and Wildlife Service as Injurious Wildlife under the Lacey Act (18 U.S.C. 42; 50 CFR 16).

The permit also regulates the use of chemicals for ***potentially invasive*** aquatic species not listed on the above lists as determined by Ecology in consultation with WDFW, or WDNR, or WSDA, or WISC, or the ANS Committee, or applicable federal agencies.

Federal and tribal partners were added to the list of entities that the permittee may cooperate with.

Activities That May Not Need Coverage Under This Permit

Ecology has determined not to issue coverage for ***retention and detention ponds*** if:

- Ecology regulates its discharge under another permit (such as industrial or municipal stormwater permits) and the permit allows chemical treatment for aquatic pests, or
- There is no discharge to surface waters during and within two weeks of treatment.

Ecology has determined not to issue coverage for ***constructed water bodies*** or ***upland farm ponds*** if:

- The water bodies are five acres or less in surface area, and
- There is no discharge to surface waters during and within two weeks of treatment.

Ecology has determined not to issue coverage for seasonally dry ***wetlands*** if:

- The wetland is dry at the time of treatment and for two weeks following treatment, and
- The chemical will not be biologically available when the area is inundated with water.

Ecology believes that the two-week holding time sufficiently allows the dissipation of the product prior to possible discharge to surface waters and that if these conditions are met, the treatment poses no potential to violate the Water Quality Standards for Surface Waters of the State of Washington (chapter 173-201A WAC).

Geographic Area Covered

The draft permit applies to the application of chemicals/products for aquatic invasive species control to surface waters anywhere in the state of Washington where Ecology has authority. Surface waters include lakes, rivers, ponds, streams, inland waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the state of Washington (RCW 90.48.020, WAC 173-201A-020 and WAC 173-226-030). Aquatic invasive species have the potential to occur in or near virtually any freshwater, marine, estuarine, wetland, or semi-aquatic site in Washington State. These sites include but are not limited to riparian areas, wetlands, marshes, rivers, year-round and seasonal streams, lakes, ponds, wet pastures, brackish areas, estuaries, and marine waters up to 12 miles offshore.

In section S1.C.1, previous versions of the permit included language describing an exclusion for "Federal lands where a federal agency provided funding, made the decision to apply chemicals, or is the entity applying chemicals". This has been updated to language describing federal activities, to make it consistent with other NPDES permits.

Section S1.D has been revised, the previously required zooplankton study was completed in 2018 and that requirement has removed from the current permit. A copy of the study report is available upon request from Ecology and on the Aquatic and Invasive Species Control permit webpage[10].

S2. PERMIT ADMINISTRATION

Who May Apply for Coverage

A definition of "Permittee" is not provided in chapter 90.48 RCW, chapters 173-216, 173-220, or 173-226 WAC, nor is one provided in 40 CFR 122 (EPA NPDES Permit Program) or (State NPDES Permit Programs). Based upon the usage of Permittee in federal and Washington State law, Ecology takes the term "Permittee" to mean "the person or entity that discharges or controls the discharge of pollutants to waters of the state (surface or ground) and holds permit coverage allowing that specific discharge." For the Aquatic and Invasive Species Control Permit, Ecology has established that the Permittee is any state government agency conducting invasive species management in surface waters of the state. Examples of state government agencies that may become Permittees under this permit include, but are not limited to WDFW, DNR, and WSDA. Ecology does not issue NPDES coverage to federal agencies.

Ecology developed this permit so that other government entities, non-government entities, or private individuals may cooperate in aquatic invasive species control under the coverage issued to a Washington state agency. The Permittee, if they choose to do so, has the option to contract with other entities or private individuals for management activities. In this respect, this permit will operate similarly to the Aquatic Noxious Weed permit (the Permittee is WSDA). Under the Aquatic Noxious Weed permit, WSDA contracts with individuals and other entities for on-the-ground management of the targeted organism(s). The contracted entities, per individual agreements, can carry out notification, monitoring, reporting, documentation, planning, and other administrative tasks, but it is the responsibility of the Permittee to prepare and submit reports to Ecology. Because it holds permit coverage, the Permittee is liable for any violations of permit conditions and responsibility for permit fees (90.48.465 RCW, chapter 173.224 WAC) associated with coverage under the permit.

[10] https://ecology.wa.gov/AISC-general-permit

How to Obtain Coverage

Applicants must submit a complete application for permit coverage a minimum of 38 days before applying pesticides that result in discharge to waters of the state. The applicant must submit a complete application including a Notice of Intent (NOI). An official who has signature authority (173-226-200 WAC) for the entity applying for permit coverage must sign the NOI. Ecology must receive the complete application for permit coverage on or before the publication date of the first public notice the permit applicant posted in a newspaper of general circulation (173-226-130 WAC). Ecology considers a newspaper of general circulation as the major newspaper publication for a region.

The public has the opportunity to comment on the permit application and the proposed coverage during the 30 days after publication of the second public notice (public comment period). Ecology will consider comments about the applicability of the Permit to the proposed activity received during this period. If Ecology receives no substantive comments, it may issue permit coverage on or after the 38th day following the first publication of the public notice.

Length of Coverage

Ecology plans to issue the AISC permit for a period of five years, starting on the effective date of the permit (WAC 173-226-330). Coverage will last from the date of coverage to the date of permit expiration, which will be up to 5 years, unless the Permittee terminates coverage by submitting a notice of termination.

S3. DISCHARGE LIMITS

Short-Term Water Quality Modification of Water Quality Standards

In 2006, Ecology updated the Water Quality Standards for Surface Waters of the State of Washington (chapter 173-201A WAC). The standards allow a temporary exceedance of water quality criteria for up to five years (the term of a general permit) provided the Permittee has followed certain guidelines. A short-term exceedance only applies to short lived (hours or days) impairments, but short-term exceedances may occur periodically throughout the five-year permit term. Short-term exceedances may also extend over the five-year life span of the permit (long-term exceedance) provided the Permittee satisfies the requirements of WAC 173-201A-410. The permit, fact sheet, SEPA documents, NOI and state agency aquatic invasive species response documents represent fulfillment of the plan requirement and development through a public process as required by WAC 173-201A-410 for long term exceedances. Permittees who do not meet these requirements must ensure the short-term exceedance of water quality criteria is limited to only hours or days.

Impaired Water Bodies

Ecology periodically reviews water quality data to determine if water bodies meet criteria. Section ***303(d)*** of the CWA requires that waters not meeting criteria undergo an evaluation of the cause and amount of the contaminant. Ecology publishes Total Maximum Daily Load (TMDL) reports which may establish limits on the amounts of pollutants contributors may discharge.

Applications to water bodies listed on the 303(d) list have additional limits and conditions imposed upon them. Parameters of concern identified in the permit include phosphorus, dissolved oxygen, copper, temperature, and pH.

Ecology has removed the condition allowing discharge of copper to a waterbody listed as impaired for copper on the 303(d) list of impaired waters as long as the sediment copper concentration is below 110 mg/L. A discharge of copper to a water body listed as impaired for copper cannot be allowed (issuance of permit is prohibited) if the discharge will cause or contribute to a violation of water quality standards (Clean Water Act 122.4(i)).

Chemicals that cause a rapid die-off of animals may trigger release of phosphorus and other nutrients that in turn may trigger cyanobacteria blooms. This may lead to low oxygen conditions developing in the water body. Other chemicals may alter the pH and that may adversely affect aquatic life. The permit identifies and requires mitigation measures that can help prevent further impairment of 303(d)-listed waters.

S4. RESTRICTIONS ON THE APPLICATION OF PRODUCTS

Authorized Discharges

This permit allows the use of chemicals or products identified in the permit; most are regulated under FIFRA, but others are not. Ecology authorizes these discharges in accordance with WAC 173-201A-410 and chapter 90.48 RCW. The Aquatic and Invasive Species Control Permit does not cover activities that Ecology regulates under other NPDES permits.

The Permittee must comply with both the pesticide label requirements and the general permit conditions. **Coverage under this general permit does not supersede or preempt federal or state label requirements or any other applicable laws and regulations**. General permit Condition G5 informs the Permittee of this fact.

Chemicals and Products Allowed for Use under this Permit

This permit authorizes and conditions the use of pesticides, chemicals, and products that may be suitable for the management of invasive insects, aquatic invasive animals and marine algae. There are few aquatic pesticides specifically registered for management of these species in surface waters. When EPA has not labeled a chemical

for the use and a Permittee plans to use it as a pesticide, it must seek a special local need or emergency exemption label through WSDA and EPA prior to applying the pesticide to surface waters.

Ecology initially developed a list of chemicals with potential to manage aquatic invasive organisms by conducting its own research and by asking members of its advisory committees, members of the Washington Aquatic Nuisance Species Committee, and people working in the field of invasive species management to suggest potential pesticides, chemicals, or other suitable products. WDFW assigned an employee to research appropriate chemicals and provided this information to Ecology. Ecology also considered any chemicals and products used elsewhere in the world to manage aquatic invasive species.

Once Ecology compiled this list, it eliminated chemicals/products considered too toxic or not likely to be of use by consulting with toxicologists and advisory committee members. While chemicals to manage animals tend to be more toxic than herbicides, Ecology weighed temporary toxicity with long-term effects of the invasive species on the environment. In many cases, short-term environmental impacts from chemical use are less damaging than the long-term ongoing impacts of invasive species. Ecology also requires specific restrictions for the use of chemicals (see Tables 2 and 3, and section S10.B in the draft permit) to limit and mitigate chemical treatment effects.

Ecology has undertaken an independent state risk assessments for most, but not all, of the chemicals used in the Aquatic Plant and Algae Management Permit and the Noxious Weed Control Permit. Chapter 90.48.447 RCW requires Ecology to maintain the currency of the information on herbicides and evaluate new herbicides as they become commercially available for the Aquatic Plant Management Program. “The purpose of this act is to allow the use of commercially available herbicides that have been approved by the environmental protection agency and the department of agriculture and subject to rigorous evaluation by the department of ecology through an environmental impact statement for the aquatic plant management program.” However, this law is silent on requiring rigorous evaluation by Ecology for other chemical applications (e.g., mosquito management, aquatic and invasive species management, etc.).

Ecology does not have independent risk assessments on all of the chemicals used in other aquatic NPDES permits (e.g., products used for mosquito control, invasive moth control, and for management of aquatic plants in irrigation ditches). Some of the products used in these permits are more toxic than the active ingredients allowed for use under the Aquatic Plant and Algae Management permit or the Noxious Weed Control permit.

Due to the urgent need for a permit for aquatic and invasive species control, particularly if zebra or quagga mussels enter state waters, and a lack of state resources available to develop state risk assessments, Ecology decided to issue this permit without having independent state risk assessments for **every** chemical in the permit. However, many of the chemicals included in the Aquatic and Invasive Species Control Permit have already been independently evaluated through state risk assessments. For more information, see the AISC webpage[11]. EPA registers others as pesticides for non-aquatic uses. All EPA-registered pesticides have undergone some level of toxicity testing and a federal risk assessment process.

Federal law requires that before selling or distributing a pesticide in the United States, a person or company must obtain registration, or license, from EPA. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests from applicants. Where pesticides may be used on food or feed crops, EPA also sets tolerances (maximum pesticide residue levels) for the amount of the pesticide that can legally remain in or on foods.

EPA ensures that each registered pesticide continues to meet the highest standards of safety to protect human health and the environment. The Agency has several programs to ensure the review of registered pesticides[12], including re-registration, tolerance reassessment, registration review, and special review.

In this permit, Ecology approves active ingredients rather than brand name products; this does not limit Permittees to brand-name products.

Integrated Pest Management (IPM)

State agencies in Washington with pest control responsibilities must implement the principles of IPM. In the Washington Pesticide Control Act, RCW 17.15, the legislature established that prevention of pollution is reasonable only in the context of an IPM plan. IPM plans require the investigation of all control options, but do not require non-chemical pest controls as the preferred option. Most invasive species control strategies include a combination of control methods.

[11] https://ecology.wa.gov/AISC-general-permit
[12] https://www.epa.gov/pesticide-registration

The Aquatic and Invasive Species Control Permit requires that the Permittee develop or ***adopt*** an Ecology-approved adaptive management plan that incorporates IPM principles for any aquatic invasive organism treated under the permit. Permittees must submit a copy of their plan to Ecology no later than 6 months after starting initial treatment of that organism or category of organisms. The preferred alternative in the draft Environmental Impact Statement (EIS) is an integrated pest management approach that incorporates principles of adaptive management. The EIS provides guidance on developing such plans.

Experimental Use Permits

EPA regulates federal EUP's under section 5(f) of FIFRA and WSDA regulates both state and federal EUP's under RCW 15.58.405(3). Entities operating under a state EUP do not need coverage under the Aquatic and Invasive Species Control Permit because state EUP's are limited in acreage. However, entities operating under a federal EUP must obtain permit coverage. Federal EUP's typically allow treatment of up to several hundred acres.

WSDA requires a state EUP for all research experiments involving pesticides that are not federally registered or for uses not allowed on the federally registered pesticide label. WSDA experimental use permits limit the amount of an experimental use pesticide that a Permittee can distribute or use for testing purposes. WSDA grants experimental use permits for gathering data in support of registration under FIFRA Section (3) or Section 24(c). In most situations, only a state WSEUP is required for the use of an experimental pesticide.

When a proponent conducts a small-scale test on more than one surface acre of water per pest, it must obtain a federal experimental use permit in addition to a state permit. Any person may apply to the EPA for a federal experimental use permit for pesticides. Federal EUPs are usually valid for only one year. Applicants holding a federal experimental use permit must also apply for and obtain a state experimental use permit before initiating any shipment or use of the pesticide in Washington. Ecology requires coverage under the Aquatic and Invasive Species Control Permit for applicants operating under a federal experimental use permit.

Specific Restrictions on the Application of Pesticides

Unless it is an ***emergency*** or ***rapid response action***, Ecology requires the Permittee to minimize treatments that restrict public water use during high use holidays (e.g. Memorial Day, July 4, and Labor Day) and on weekends (173-201A-410 WAC). Water use restrictions occurring during those times will disproportionately impact public use of the waters. While situations may occur when this is the only appropriate time to treat, Ecology strongly encourages the Permittee not to treat during these high use times when chemical application may have greater effect on recreational water use.

Tables 2 and 3, and section S10 identify restrictions on chemicals/products that Ecology imposes (over and above any federal labeling restrictions). Ecology developed these restrictions in consultation with internal and external advisory committees that included toxicology and fish and wildlife experts and from information acquired during the EIS development process.

In the 2023 version of the permit, Ecology has removed the previous limitation for using liquid rotenone only for spot treatment in areas not practicably accessible by boat. This requirement is not consistent with the current product labels, or the 2018 AFS SOP. The requirements for testing concentrations of rotenone and Volatile Organic Compounds when using liquid rotenone around drinking water intakes help ensure the protection of public health. (Special Condition S9.F.4) In addition, WDFW is working with the Manchester Environmental Laboratory to develop analytical methods for specific VOC present in some liquid formulations of rotenone.

Tracer and Maker dyes have been added to the list of chemicals authorized for use under this permit. Tracer and marker dyes are generally considered nontoxic, and make no pesticidal or pest control claims, therefore such dyes are not registered as pesticides by EPA. Marker dyes allow better targeting of pesticide sprays since treated and untreated areas are more clearly seen by the applicator. Tracer Dyes can be either liquid or powdered dyes, are usually fluorescent, and are added to another liquid or water to analyze flow.

At Ecology's request, WDFW developed timing windows to protect salmon, steelhead, bull trout, and other sensitive species and habitats (including amphibians and nesting waterfowl) from the effects of aquatic pesticide application. (These timing windows also apply to aquatic pesticide treatments covered under the Aquatic Plant and Algae Management Permit). There are times when chemical applications have little to no impact on sensitive species and WDFW work windows identify these periods for specific water bodies. Not all chemicals are subject to work windows if Ecology does not identify an impact. However, some chemicals are lethal (rotenone) or may cause sub-lethal impacts (copper). In these cases, Tables 2 and 3 clearly identify the chemicals and the applicable timing windows. Even when the chemical is not subject to timing windows, Ecology requires that the Permittee check with WDFW biologists to determine critical habitat areas before treatment.

Ecology imposed recreational and/or swimming restrictions/advisories on some chemicals to protect human health. Any restrictions imposed by Ecology are in addition to any PRODUCT label requirements. A restriction is more stringent than an advisory. An advisory recommends that people not recreate in the treated area, but they may choose whether to comply. A restriction means no swimming for a set time after chemical application. A restriction or advisory requires public notification via sign posting (see S.5. Posting and Notification Requirements).

Treatment limitations help mitigate adverse impacts from chemical treatments and Ecology based these limits on the best scientific information available and its best professional judgment.

S5. NOTIFICATION AND POSTING REQUIREMENTS

Ecology based the posting and notification requirements in the Aquatic and Invasive Species Control Permit on similar requirements for posting and notification in the Aquatic Plant and Algae Management NPDES permit and the Noxious Weed Control NPDES permit. Other aquatic pesticide permits issued by Ecology require various levels of public notification. Ecology also considered input from advisory committees, end users, and the public's right to know. Ecology added additional notification over and above notification requirements in other pesticide permits by requiring the Permittee(s) to post treatment information on its website. The 2023 version of the permit also incorporates changes to be consistent with the 2018 American Fisheries Society Rotenone Standard Operating Procedures[13].

If the product used for treatment has potable water use restrictions, the current version of the permit also includes requirements to notify and get consent from public water providers before treatments on waterbodies with public drinking water intakes. This is consistent with requirements in other aquatic pesticide permits.

S6. MONITORING REQUIREMENTS

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

[13] https://units.fisheries.org/rotenone-stewardship/sop-manual/rotenone-sop-manual-2nd-edition/

All samples must be analyzed by a laboratory registered or accredited under the provisions of Accreditation of Environmental Laboratories, Chapter 173-50 WAC. RCW 90.48.260 gives Ecology the authority to establish inspection, monitoring, entry, and reporting requirements. WAC 173-220-210 gives Ecology the authority to require monitoring of the treated waters to determine the effects of discharges on surface waters of the state. Permittees with coverage under the Permit must monitor the amount of pesticides they use and report this information to Ecology in an annual report (S7.A).

Monitoring Plans

The Aquatic and Invasive Species Control Permit requires the Permittee to submit the results of the previous year's monitoring to Ecology by February 1 of each year. The Permittee's annual monitoring plan must propose specific monitoring locations and parameters to Ecology. In consultation with the Permittee, Ecology reviews and approves the annual monitoring plan.

Monitoring for Specific Chemicals

Ecology requires monitoring for specific parameters when using sodium chloride, potassium chloride, chlorine, acetic acid, calcium hydroxide/oxide, rotenone, copper, or heat/freezing (Tables 3-8). Ecology based these monitoring requirements on similar monitoring requirements in other NPDES pesticide permits or required monitoring for parameters that may be altered by the treatment (e.g., pH).

S7. REPORTING AND RECORDKEEPING REQUIREMENTS

Section S9 of the permit contains specific conditions based on Ecology's authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-226-090).

Annual Treatment Reports

Permittees meet part of their reporting requirements through annual treatment reporting. The annual report summarizes the amount of each chemical used during the course of each treatment season. It allows Ecology to track how much pesticide is used in Washington for a specific use. Permittees must submit their annual treatment report by February 1 of each year.

Electronic Reporting Requirements

Ecology has added electronic reporting requirements to this permit, consistent with the requirements in other recent NPDES permits.

Annual Monitoring Reports

The annual monitoring report summarizes the results of any monitoring identified in the annual monitoring plan (submitted to Ecology on February 1 of each year). Requiring an annual monitoring plan allows the Permittee and Ecology to discuss previous year's results and tailor monitoring to specific monitoring needs.

Ecology requires reporting in pounds of active ingredients or product applied at each location. The option for reporting in gallons has been removed to establish consistency with other aquatic pesticide permits.

Records Retention

Permittees must keep all records and documents required by this permit for at least 5 years. Ecology based this permit condition on its authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-226-090). If there is any unresolved litigation regarding the discharge of pollutants by the Permittee, they must extend the period of record retention through the course of the litigation (WAC 173-226-190) State Agencies may have their own records retention schedules that go beyond 5 years. The permitted agency is responsible for reviewing their own records retention requirements.

Reporting Permit Violations

WAC 173-226-080 (1)(d) states that a discharge of any pollutant more frequently or at a level in excess of that authorized is a permit violation. Ecology requires that if a Permittee violated the permit conditions, it must take steps to stop and minimize any violations and report those violations to Ecology. For pesticide applications authorized in the Permit, applicators must report violations to the Aquatic Pesticide Permit Manager and the Regional Spills (ERTS Hotline) within 24 hours. This allows Ecology to determine if more action is necessary to mitigate the permit violation.

WAC 173-226-070 allows Ecology to place permit conditions to prevent or control pollutant discharges from plant site run off, spillage or leaks, sludge or waste disposal, or materials handling or storage and allows Ecology to require the use of Best Management Practices (BMPs). BMPs means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of the waters of the state. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. 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 (see RCW 90.48.080, and WAC 173-226-070).

S8. AQUATIC INVASIVE SPECIES CONTROL

This section was revised in two ways. The AIS Adaptive Management Plan is due to Ecology within 6 months instead of the previous 18 months, and reporting requirements were consolidated into Condition S7.

S9. FISHERIES RESOURCE MANAGEMENT

Ecology clarified that piscicide products must be labeled for use as a fish toxicant in the State of Washington at the time of purchase and/or treatment, since product names can change over time. This also allows the use of older products purchased for treatment.

Ecology based these monitoring requirements on similar monitoring requirements in the NPDES Fisheries Resource Management General Permit.

For a discussion of rotenone monitoring requirements please see the Fisheries Resource Management NPDES and State Waste Discharge General Permit Fact Sheet. Both documents can be found in the Historic Permit Documents section of Ecology's AISC webpage[14].

> **Rotenone Standard Operating Procedures Manual, 2nd Edition**
> Several sections of the AISC permit refer to this document, which provides guidance on the safe and effective application of rotenone and is intended for use by fish biologists and fishery managers in the United States and Canada. This SOP manual is also referred to on the product labels for rotenone. The American Fisheries Society's Rotenone Stewardship program offers the SOP at no cost and the 2018 edition is available here[15], or on the AISC permit webpage[16].
>
> For reference, the Library of Congress Control Number for this document is: 2018940510ISBN 978-1-934874-49-3.

The use of 60% trout survival in the trout live-box assay and the analytical method allowance for a rotenone limit of 3.75 µg/L or less reflect the LC50 (lethal concentration where 50% of the organisms exposed suffer mortality) for rainbow trout (Bills & Marking 1986).

[14] https://ecology.wa.gov/AISC-general-permit
[15] https://units.fisheries.org/rotenone-stewardship/sop-manual/rotenone-sop-manual-2nd-edition/
[16] https://ecology.wa.gov/AISC-general-permit

Rotenone Monitoring Requirements

Revisions to Table 6: Post-Treatment Monitoring. Ecology revised the trout toxicity bioassay requirement in this section, removing the initial sampling at 24 hours after treatment. This change is based on the following information from WDFW demonstrating that conducting a trout toxicity bioassay 24 hours after treatment is not necessary to effectively evaluate sentinel fish survival.

An assessment of 36 lake treatments that occurred from 2012 to 2021 found that the average rotenone detoxification duration was 37 days where ice-over did not limit the ability to run contiguous bioassays of sentinel fish survival. There was no relationship observed between treatment rate (ppm) and duration of toxicity ($p = 0.57$). The minimum and maximum observed detoxification periods in the absence of ice-over were 22 days and 64 days respectively. Lake treatment monitoring requirements from 2015 stipulated that bioassays must begin 24 hours after treatment, repeated 7 days later and then conducted weekly until detoxification was observed. No instances of detoxification were observed at 24 hours after treatment, as shown in the following table.

Table 4: Trout Toxicity Bioassay Results – Sentinel Fish Survival Timeline, 2015-2021

Year	Lake	Rotenone Concentration (ppm)	24 hours	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	3/18/2016			
2015	Lower Lead King	4	0/5	0/5	0/5	0/5	0/8	1/6	1/5	5/5			
2015	Upper Lead King	4	0/5	0/5	0/5	0/5	0/8	0/6	5/5				
2015	No Name Lake	4	0/5	0/5	0/5	0/5	5/5						
2016	Blue Lake	4	0/5	0/5	0/5	0/5							
2016	Park Lake	4	0/5	0/5	0/5	0/5							
2016	Mirror	4	0/5	0/5	0/5	0/5							
			24 hours	**1 week**	**2 weeks**	**3 weeks**	**4 weeks**	**5 weeks**	**6 weeks**	**7 weeks**	**3/29/2018**	**3/31/2018**	**4/4/2018**
2017	Rocky	4	0/5	0/5	0/5	0/5	0/5	0/5	1/5	1/5	5/5		
2017	Rigley	4	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	Stolen	4/5	5/5
2017	Williams	4	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	5/5		
2018	West Medical Lake		0/5	0/5	0/5	4/5	5/5						
			24 hours	**1 week**	**2 weeks**	**3 weeks**	**4 weeks**	**5 weeks**	**6 weeks**	**7 weeks**	**8 weeks**	**9 weeks**	**3/26/2021**
2020	Hatch	2	0/5	0/5	0/5	0/5	0/5	4/5	5/5				
2020	Little Hatch	2	0/5	0/5	0/5	0/5	5/5						
2020	Keogh	2	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	1/5	5/5
2020	McDowell	4	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5	5/5
2021	Fish Lake	4	0/5	0/5	0/5	0/5	0/5	5/5					

S10. INVASIVE INSECT CONTROL

Ecology believes that IPM plans meet AKART. Ecology based the requirement for adaptive management plans that incorporate integrated pest management principles on:

- Integrated Pest Management Law (chapter 17.15 RCW)
- Water Quality Standards (173-201A-110 WAC)
- The Environmental Impact Statement for Aquatic Invasive Species[17]
- Similar planning requirements in the Noxious Weed NPDES permit
- Proposed federal IPM requirements in aquatic pesticide NPDES permits. In the federal NPDES permit for aquatic pesticide application, EPA considers IPM to meet technology-based standards.

General Application Restrictions

This section was revised to allow flexibility due to operational conditions such as adverse weather, staff availability, supply shortages, or equipment problems.

S11. SPILL PREVENTION AND CONTROL

This section was revised so that the Spill Prevention and Response plan must be submitted to Ecology electronically.

[17]https://apps.ecology.wa.gov/publications/documents/1010010.pdf

GENERAL CONDITIONS

Ecology bases the General Conditions on state and federal law and regulations.

PERMIT ISSUANCE PROCEDURES

Permit Modifications

Ecology may modify this permit to impose new or modified numerical limitations, if necessary to meet Water Quality Standards for Surface Waters, Sediment Quality Standards, or Water Quality Standards for Ground Waters. Ecology would base any modifications on new information obtained from sources such as inspections, effluent monitoring, or Ecology-approved engineering reports. Ecology may also modify this permit because of new or amended state or federal regulations.

Recommendation for Permit Issuance

The general permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. Ecology proposes to issue this general permit for five (5) years.

Bibliography

Documents prepared after June 12, 2014 also identify information sources by the following 11 categories:

1. Peer review is overseen by an independent third party.
2. Review is by staff internal to Department of Ecology.
3. Review is by persons that are external to and selected by the Department of Ecology.
4. Documented open public review process that is not limited to invited organizations or individuals.
5. Federal and state statutes.
6. Court and hearings board decisions.
7. Federal and state administrative rules and regulations.
8. Policy and regulatory documents adopted by local governments.
9. Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.
10. Records of best professional judgment of Department of Ecology employees or other individuals.
11. Sources of information that do not fit into one of the other categories listed.

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The Final Working Draft of the Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other *Dreissenid* Species. Columbia River Basin Team, 100th Meridian Initiative, February 6, 2008. 11]

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Headwaters et al., v. Talent Irrigation District. U.S. Ct. of Appeals for the Ninth Cir. Ct. Case No. 99-35373, D.C. No.CV-98-06004-ALA. March 12, 2001.

Cases not available online at www.ca9.uscourts.gov before 2005. [6]

Fairhurst v. Hagener, Director, Montana Department of Fish, Wildlife & Parks. U.S. Ct. of Appeals for the Ninth Cir. Ct. Case No. 04-35366, D.C. No.CV-03-00067-SEH OPINION. September 8, 2005. http://www.ca9.uscourts.gov/datastore/opinions/2005/09/07/0435366.pdf. [6]

League of Wilderness Defenders et al., v. Harv Forsgren, Regional Forester, Pacific Northwest Region United States Forest Service. U.S. Ct. of Appeals for the Ninth Cir. Ct. Case No. 01-35729, D.C No.CV-00-01383-RE OPINION. November 4, 2002.
Cases not available online at www.ca9.uscourts.gov before 2005. [6]

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Federal Publications

40 CFR 122: EPA Administered Permit Programs: the National Pollutant Discharge Elimination System. [7]

40 CFR 122.3: Exclusions. [7]

40 CFR 122.41: Conditions applicable to all permits. [7]

40 CFR 125.3: Technology-based treatment requirements in permits. [7]

40 CFR 131.36: Toxics criteria for those states not complying with Clean Water Act section 303(c)(2)(B). [7]

40 CFR 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants. [7]

40 CFR 171.4: Standards for certification of commercial applicators. [7]

40 CFR 172: Experimental Use Permits. [7]

40 CFR 403.3: Definitions. [7]

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Federal Insecticide, Fungicide and Rodenticide Act (FIFRA): https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act [7]

Federal Water Pollution Control Act. 33 USC 1251 et seq.: https://www.epa.gov/laws-regulations/summary-clean-water-act. [7]

Food Quality Protection Act: http://www.epa.gov/laws-regulations/summary-food-quality-protection-act . [7]

Toxic and Priority Pollutants: https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act [7]

Revised Code Washington (RCW)

Chapter 15.58 RCW: Washington Pesticide Control Act [7]

Chapter 17.10 RCW: Noxious Weeds — Control Boards [7]

Chapter 17.15 RCW: Integrated Pest Management [7]

Chapter 17.21 RCW: Washington Pesticide Application Act [7]

Chapter 34.05 RCW: Administrative Procedure Act [7]

Chapter 43.21C RCW: State Environmental Policy [7]

Chapter 77.12 RCW: Powers and Duties [7]

Chapter 77.135 RCW: Invasive Species [7]

Chapter 79A.25 RCW: Recreation and Conservation Funding Board [7]

Chapter 90.48 RCW: Water Pollution Control [7]

Chapter 90.52 RCW: Pollution Disclosure Act of 1971 [7]

Chapter 90.54 RCW: Water Resources Act of 1971 [7]

Chapter 90.58 RCW: Shoreline Management Act of 1971 [7]

Washington Administrative Code (WAC)

Chapter16-228 WAC: General Pesticide Rules [5]

Chapter 16-233 WAC: Worker Protection Standards [5]

Chapter 173-50 WAC: Accreditation of Environmental Laboratories [5]

Chapter 173-200 WAC: Water Quality Standards for Groundwaters of the State of Washington [5]

Chapter 173-201A WAC: Water Quality Standards for Surface Waters of the State of Washington [5]

Chapter 173-204 WAC: Sediment Management Standards [5]

Chapter 173-216 WAC: State Waste Discharge Program [5]

Chapter 173-220 WAC: National Pollutant Discharge Elimination System Permit Program [5]

Chapter 173-224 WAC: Permit Fee Schedule [5]

Chapter 173-226 WAC: Waste Discharge General Permit Program [5]

Chapter 197-11 WAC: SEPA Rules [5]

Chapter 220-12 WAC: Food Fish and Shellfish [5]

Additional Information Sources about Aquatic Invasive Species

- Washington Invasive Species Council: http://www.invasivespecies.wa.gov/.
- Washington Department of Fish and Wildlife: http://wdfw.wa.gov/fish/ans/index.htm.
- United States Department of Agriculture's National Invasive Species Information Center: http://www.invasivespeciesinfo.gov/index.html.
- USGS – NAS – Nonindigenous Aquatic Species Information Resource: https://nas.er.usgs.gov/.
- Aquatic Nuisance Species Task Force: https://www.fws.gov/program/aquatic-nuisance-species-task-force.
- Tunicate information: http://wdfw.wa.gov/fish/ans/identify/html/index.php?species=didemnum_lahilleiLink .
- *Caulerpa* information: https://www.fisheries.noaa.gov/west-coast/habitat-conservation/caulerpa-species-west-coast
- Zebra and Quagga Mussel Information Resource Page: https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=5

APPENDIX A: GLOSSARY

All definitions listed below are for use in the context of this permit only.

303(d)*:* Section 303(d) of the federal CWA requires states to develop a list of polluted water bodies every two years. For each of those water bodies, the law requires states to develop Total Maximum Daily Loads (TMDLs). A TMDL is the amount of pollutant loading that can occur in a given water body (river, marine water, wetland, stream, or lake) and still meet water quality standards.

***Adopt*:** Permittees may choose to use an existing adaptive management plan for organisms treated under this permit as long as Ecology has approved and accepted the plan. For example, if WDFW has an Ecology-approved adaptive management plan for tunicate treatment, WDNR may decide to follow this plan rather than developing a new plan. The adopted plan must include the treatment proposed by WDNR.

***Algae*:** Primitive, chiefly aquatic, one-celled or multi-cellular plant-like organisms that lack true stems, roots, and leaves but usually contain chlorophyll.

Algaecide: A chemical compound that kills or reduces the growth of algae.

***Allows*:** Permitted in compliance with the terms and conditions of this permit.
***All Known and Reasonable Technologies (AKART)*:** All known, available, and reasonable methods of pollution control and prevention as described in 90.48.010, 90.48.520, 90.52.040, and 90.54.020 RCW and 173-201A-020, 173-204-120, 173-204-400, 173-216-020, 173-216-050, 173-216-110, 173-220-130 WAC.

***Constructed Water Bodies*:** A human-made water body in an area that is not part of a previously existing watercourse, such as ponds, streams, wetlands, etc.

***Discharge*:** The addition of any pollutant to a water of the state.

***Emergency*:** A situation where an immediate response (i.e. same day response) is needed to prevent reproduction or the rapid spread of an invasive species (e.g. zebra or quagga mussels). Incidents where rapid and early intervention is crucial to a successful management effort constitute an emergency. Examples include, but are not limited to, needing to treat species immediately to preclude or limit spawning or reproduction (e.g. tunicates). Timing is critical in these situations. These actions are authorized for WDFW by Chapter 77.135.090 RCW, and for WSDA by Chapter 17.24.171 RCW.

***Experimental Use Permit*:** Federal and state permits that allow the use of unregistered pesticides in the context of research and development for registration of the pesticide under FIFRA Section 3, or in the context of research and development for registration of a new use of a currently registered pesticide under FIFRA Section 3 (see 40 CFR 172, 15.58.405 RCW, and WAC 16-228-1460).

***Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)*:** Federal Insecticide, Fungicide, and Rodenticide Act. This federal law provides the basis for regulation, sale, distribution, and use of pesticides in the United States. FIFRA authorizes EPA to review and register pesticides for specified used. EPA has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks.

***General Permit*:** A permit which covers multiple discharges of a point source category within a designated geographical rate, in lieu of individual permits being issue to each discharger.

***Herbicide*:** A chemical designed to control or kill plants.

***Individual Permit*:** A discharge permit specific to a single point source or facility.

***Insecticide*:** A chemical used to prevent, repel, control, or kill insects.

***Integrated Pest Management*:** An ecologically based strategy for pest control that incorporates monitoring, biological, physical, and chemical controls in order to manage pests with the least possible hazard to humans, environment, and property. IPM considers all available control actions, including no action. Pesticide use is only one control action.

***Molluscicides*:** Chemicals used to kill mollusks (such as snails).

***NOI*:** Notice of Intent. This is a term used to describe the completed permit application form.

***Nonnative Invasive*:** An organism outside of its natural or historical range of distribution that tends to spread and dominate new areas. Organisms considered to be nonnative were not present in Washington prior to European settlement. Many nonnative organisms are not invasive or problematic.

***Organisms*:** Any life form considered as an entity; an animal, plant, fungus, protistan, or moneran.

***Permittee*:** Any state government entity that applies for and gains coverage under this permit and has control of, or causes a discharge under coverage of this permit.

***Pesticide*:** Any substance or mixture of substances intended to prevent, destroy, control, repel, or mitigate any insect, rodent, snail, slug, fungus, weed, and any other form of plant or animal life or virus, except virus on or in a living person or other animal which is normally considered to be a pest or which the director (of Agriculture) may declare to be a pest (RCW 17.21.020).

***Piscicides*:** Chemicals used to kill fish.

***Pollutant*:** Means any substance discharged that would alter the chemical, physical, thermal, biological, or radiological integrity of the waters of the state or would be likely to create and nuisance or renders such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to any legitimate beneficial use, or to any animal life, either terrestrial or aquatic. Pollutants include, but are not limited to the following: dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, pH, temperature, total suspended solids, turbidity, color, biological oxygen demand, total dissolved solids, toxicity, odor, and industrial, municipal, and agricultural waste.

***Potentially Invasive*:** A nonnative organism that has a possibility of spreading and dominating new areas, displacing native species.

Product label: Pesticide and adjuvant labels currently registered and approved for use in Washington state. This definition was added to the 2023 version of the AISC permit at the suggestion of WSDA, since the EPA FIFRA label may not be identical to the version registered in Washington state. A product could have a federal FIFRA label and not even be registered for use in WA. Also, adjuvant labels are not registered by EPA so there is no FIFRA label for them.

***Rapid Response*:** Incidents where rapid and early intervention is crucial to a successful management effort. Examples include, but are not limited to, needing to treat species immediately to preclude or limit spawning or

reproduction (tunicates). Timing is critical in these situations.

Retention and detention ponds: A retention pond is designed to hold a specific amount of water indefinitely. A detention pond holds a set amount of water that slowly drains to another location. Detention ponds are often only full of water after rain whereas a retention pond should always have water in it.

Surface waters of the state of Washington: Freshwaters (lakes, rivers, ponds, streams, inland waters), brackish waters, marine waters, estuarine waters, and all other above ground waters and watercourses within the jurisdiction of the state of Washington.

***Threatened and Endangered Aquatic Species*:**

> ***Threatened*:** An animal species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. http://www.fws.gov/endangered/, http://www.noaa.gov/fisheries.html
>
> ***Endangered*:** An animal species in danger of extinction throughout all or a significant portion of its range. http://www.fws.gov/endangered/, http://www.noaa.gov/fisheries.html

Treatment Area: The area where the chemical is applied and the concentration of the chemical is adequate to cause the intended effect on targeted organisms.

***Upland Farm Pond*:** Private farm ponds created from upland sites that did not incorporate natural water bodies (WAC 173-201A-260(3)(f)).

***Waters of the State*:** All surface and ground waters in Washington State as defined by chapter 90.48.020 RCW, 173-201A-020 WAC, and 173-226-030 WAC including any future amendments of state law. Also includes drainages to waters of the state.

***Wetland*:** Any area inundated with water sometime during the growing season and identified as a wetland by a local, state, or federal agency.

In the absence of other definitions set forth herein, the definition as set forth in 40 CFR Part 403.3 or in chapter 90.48 RCW shall be used for circumstances concerning discharges.

APPENDIX B: PUBLIC INVOLVEMENT INFORMATION

The Washington State Department of Ecology (Ecology) has issued the Aquatic and Invasive Species Control General Permit. The draft permit and accompanying fact sheet, which explains the technical basis for the permit, were available for review and public comment from ***Wednesday, December 21, 2022, through Tuesday, February 21, 2023, at 11:59 pm.*** Ecology also hosted two public workshops and public hearings on the draft permit.

Purpose of the Permit

The permit provides statewide NPDES coverage for the use of specific chemicals to control invasive and introduced species of fish, animals and insects. The proposed Aquatic & Invasive Species Control General Permit limits the discharge of pollutants to surface waters under the authority of the Federal Water Pollution Control Act (33 U.S.C. 1251) and limits the discharge of pollutants to surface and groundwater under the authority of the State Water Pollution Control Act (Chapter 90.48 RCW).

Copies of the Permit and Fact Sheet

The permit and fact sheet are available online at Ecology's Aquatic and Invasive Species Control General Permit webpage[18]. You may also request physical copies from Water Quality reception at (360) 407-6600.

Ecology Contact

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Public Comments

Ecology received public comments from WDFW and WSDA. The full comments are available here: https://wq.ecology.commentinput.com/comment/extra?id=E3uSi

Ecology's response to these comments is posted on the Aquatic and Invasive Species Control General Permit webpage[19]. If you have questions, please contact Shawn Ultican, Aquatic Pesticide Permit Specialist , at shawn.ultican@ecy.wa.gov or (360) 407-6283.

[18] http://www.ecy.wa.gov/programs/wq/pesticides/invasive.html
[19] http://www.ecy.wa.gov/programs/wq/pesticides/invasive.html

Right to Appeal

Permittees and the public have a right to appeal this permit to the Pollution Control Hearings Board (PCHB) within 30 days of the date of issuance of the final permit. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC.

To appeal you must do the following within 30 days of the date of issuance of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form by mail or in person (see addresses below). Email is not accepted.

Appealing parties must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

Street Addresses

Department of Ecology
Attn: Appeals Processing Desk
300 Desmond Drive SE
Lacey, WA 98503

Pollution Control Hearings Board
1111 Israel Road SW
Suite 301
Tumwater, WA 98501

Mailing Addresses

Department of Ecology
Attn: Appeals Processing Desk
P.O. Box 47608
Olympia, WA 98504-7608

Pollution Control Hearings Board
P.O. Box 40903
Olympia, WA 98504-0903

APPENDIX C: RESPONSE TO COMMENTS

Look for the Response to Comments document on the Aquatic and Invasive Species Control Permit webpage[20].

[20] https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Aquatic-pesticide-permits/aquatic-invasive-species-control-general-permit