Redline Comparison between 2015 Draft Fisheries Resource Management General Permit and the 2002 Fisheries Resource Management Individual Permit

This document provides a comparison between the draft permit out for public review (June 3, 2015 through July 17, 2015) and the current permit (2002). Redlines and red text indicate where the current (2002) permit language has been removed. Blue text indicates where draft (2015) permit language has been added. Black text indicates that the language is the same in both the current and draft permits.

June 3, 2015

Issuance Date:
Effective Date:
Expiration Date: ~~July 5, 2007~~

~~FISHERY~~*Draft*

FISHERIES RESOURCE MANAGEMENT
~~**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE INDIVIDUAL**~~ **GENERAL PERMIT** ~~**No. WA0041009**~~
~~**WASHINGTON DEPARTMENT OF FISH AND WILDLIFE**~~
National Pollutant Discharge Elimination System and
State Waste Discharge General Permit

State of Washington
Department of Ecology
Olympia, Washington 98504~~-7600~~

In compliance with the provisions of
~~The~~ Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control ~~Law Chapter 90.48 Revised Code of Washington~~Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)
~~Title 33 United States Code, Section 1251 et seq.~~

~~**Washington Department of Fish and Wildlife 600 Capitol Way N. Olympia, WA 98501-1091**~~

~~is~~

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions ~~which~~that follow.

~~Megan White, P.E., Manager~~ The Permittee must reapply for permit coverage on or before DATE, 180 days before the expiration of this permit if the Permittee intends to continue operations and discharges beyond the term of this permit.

Scan with QR reader to go to permit webpage

Heather R. Bartlett
Water Quality Program Manager
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Post-Treatment Report / Discharge Monitoring Report	Annually	June 1, 2003
S3.E	Noncompliance Notification	As necessary	
S5.	Antimycin SEPA Review	One time	June 1, 2005
S7.	Spill Prevention and Response Plan	One time	Prior to first treatment
G1.	Notice of Change in Authorization	As necessary	
G4.	Permit Application for Substantive Changes to the Discharge	As necessary	
G7.	Application for Permit Renewal	1/permit cycle	January 5, 2007
G8	Notice of Permit Transfer	As necessary	
G21	Notice of Planned Changes	As necessary	
G22.	Reporting Anticipated Non-compliance	As necessary	

SPECIAL CONDITIONS

S1. DISCHARGE LIMITATIONS

A. Water Quality Standards

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit.

Use of any liquid or powder rotenone formulation shall not result in an exceedance of water quality standards as specified in WAC 173-201A.

B. Temporary Water Quality Modification

The application of chemicals listed in this permit to perform fish pest control activities is allowed so long as the conditions of this permit are satisfied and the transitory water quality impact is limited to the minimum time necessary to accomplish the desired pest control objectives.

This temporary water quality modification is allowed throughout the permit term, but its effect shall be temporary in a specific location, though locations where it is in effect may be widespread throughout the state, anywhere lakes or streams are subject to fish control activities by WDFW.

C. Permitted Chemicals

Rotenone is the only chemical permitted for use as a fish toxicant under this individual permit. The rotenone product used must be licensed for use as a fish toxicant in the State of Washington at the time of treatment.

The use of liquid rotenone is only authorized for spot applications in areas that are not practicably accessible by boat. Open water areas that are accessible by boat will be treated with powdered rotenone that is mixed with water and applied as a slurry, as described in S.6. Best Management Practices.

Potassium permanganate is the only chemical permitted to neutralize rotenone treated waters when necessary to prevent damage to non-targeted organisms and maintain water quality outside of the area intended for rotenone treatment.

Other pesticides may be applied on a limited basis in the context of a research and development effort under the jurisdiction of the Washington State Department of Agriculture (WSDA) through the issuance of a Washington State Experimental Use Permit. Limited amounts of an experimental use pesticide may only be distributed or used for testing purposes after a written permit has been obtained from WSDA for purposes which include gathering data in support of registration under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) Section (3) or Section 24(c).

~~All other conditions of this permit apply as to appropriate monitoring and public notification procedures.~~

S2. MONITORING REQUIREMENTS

A. Monitoring

The WDFW shall conduct monitoring on each water body treated with aquatic pesticides to determine the extent and duration of the short-term water quality reduction resulting from rotenone applications.

B. Monitoring Schedule

TABLE 1. MONITORING – ROTENONE TREATED WATERS

Parameters Permit Section	Units Submittal	Minimum Sampling Frequency	Sample Type Due Date(s)
Rotenone Toxicity – Trout Bioassay: 48-hr live box test (5 trout); 100% survival of rainbow trout S1.D.	Number of days until 100% survival Zooplankton study	Once post-treatment, approximately 3-8 weeks after treatment Once per permit cycle	Observation (no lab accreditation required) within 3 years of permit issuance
G21.	Re-Application for permit coverage	Once per permit cycle	At least 180 days prior to the permit expiration date
S3.C.	Discharge Management Plan (DMP)	Once per permit cycle, or when DMP is updated	30days prior to first discharge conducted under this permit.
S5.A.	Notification of adverse incidents	As necessary	As necessary

~~Parameters~~Permit Section	~~Units~~Submittal	~~Minimum Sampling~~ Frequency	~~Sample Type~~Due Date(s)
~~*If liquid rotenone is used: VOC, semi-VOC, plus any other inert ingredients listed on MSDS~~ [1]S7.A.	~~µg/L~~Post-treatment report	~~1. 24 hours after treatment, and 2. four weeks after treatment~~Annually	~~Grab~~December 31
~~pH~~	~~Standard~~	~~Once pretreatment~~	~~Grab~~
~~temperature~~	~~°F~~	~~Once pretreatment~~	~~Grab~~
~~Alkalinity~~ [2]	~~mg/L CaCO3~~	~~Once pretreatment~~ [2]	~~Grab~~
~~Organic demand~~ [2, 3]	~~Standard~~ [3]	~~Once pretreatment~~ [2]	~~Grab~~
~~Zooplankton sampling~~S7.A.	~~See below~~ [4]Pre-treatment report	~~1. Pre-treatment, 2. Six months after treatment, and 3. One year after treatment~~Annually	~~Composite~~ [4]April 1
S7.E.	Noncompliance notification	As necessary	As necessary
S8.	Annual SEPA Process	Annually	Prior to Treatment
S.9.C.	Spill notification	As necessary	As necessary

~~Parameters~~Permit Section	~~Units~~Submittal	~~Minimum Sampling~~ Frequency	~~Sample Type~~Due Date(s)
G3.	[1] ~~If liquid rotenone formulation is utilized, test for the following parameters: VOC (EPA method 8310) and semi-VOC (EPA method 502.2). Also test for any other inert ingredients listed on MSDS (i.e. the MSDS for Prentox®~~ ~~Prenfish™ Toxicant lists naphthalene; 1,2,4-trimethylbenzene; and acetone).~~ Permit modification and revocation	As necessary	Within 14 days of request
[2] ~~Only if neutralization of rotenone with potassium permanganate is required.~~			
G3.B.5.	[3] ~~Use the guidelines provided in Engstrom-Heg (1971) to determine organic demand for $KMnO_4$.~~ Request for modification	As necessary	As necessary
G7.	[4] ~~Lakes only. Zooplankton sampling protocols set forth on Page 4-5 of "Water Quality Assessments of Selected Lakes within Washington State – 1998" Department of Ecology, December 2000, Publication No. 00-03-039 (Appendix B).~~ Request for transfer of coverage	As necessary	As necessary

TABLE 2. MONITORING – RECEIVING WATERS DOWNSTREAM OF TREATED WATERS AND NEUTRALIZATION ZONE

Parameters	Units	Minimum Sampling Frequency	Sample Type
Rotenone Toxicity - Trout Bioassay: 48-hour live box test (5 trout)	% survival	1. Begin test at time of treatment and 2. Repeat at one week intervals until upstream treated water is detoxified per upstream bioassay.	Observation (no lab accreditation required)
Rotenone [1]	mg/L	Once 24 hours following treatment	Grab
*If liquid rotenone is used: VOC, semi-VOC, plus any other inerts [2]	µg/L	1. 24 hours after treatment, and 2. four weeks after treatment	Grab
pH	Standard	Once pretreatment	Grab
temperature	°F	Once pretreatment	Grab
Alkalinity [3]	mg/L CaCO3	Once pretreatment [3]	Grab
Organic demand [3, 4]	Standard [4]	Once pretreatment [3, 4]	Grab
Zooplankton sampling **TABLE 1**	See below [5]	1. **Pre-Treatment**, 2. Six months after treatment, and 3. One year after treatment **Monitoring –- Still Waters**	Composite [5] **11**
Macroinvertebrate monitoring (Only required for wadeable streams) **TABLE 2**	See below [6]	1. Pre-treatment, between August and September and 2. Post-treatment, approximately 1 year after treatment **Post-Treatment Monitoring - Still Waters**	See below [6] **11**
TABLE 3	[5] Lakes only. Zooplankton sampling protocols set forth on Page 4-5 of "Water Quality Assessments of Selected Lakes within Washington State - 1998" Department of Ecology, December 2000, Publication No. 00-		**12**

[1] Analyze using methods set forth in Dawson et al. (1983); Appendix A

[2] If liquid rotenone formulation is utilized, test for the following parameters: VOC (EPA method 8310) and semi-VOC (EPA method 502.2). Also test for any other inert ingredients listed on MSDS (i.e. the MSDS for Prentox® Prenfish™ Toxicant lists naphthalene; 1,2,4-trimethylbenzene; and acetone).

[3] Only if neutralization of rotenone with potassium permanganate is required.

[4] Use the guidelines in Engstrom-Heg (1971) for measuring organic demand for $KMnO_4$.

	03-039; Appendix B**Monitoring of Downstream and Deactivated Waters - Still Waters**	
TABLE 4	**Pre-Treatment Monitoring – Flowing Waters**	**12**
TABLE 5	[6] "Macroinvertebrate monitoring" includes gathering benthic invertebrate samples and summarizing the data using the benthic index of biotic integrity (B-IBI) and a ratio measure of the number of observed taxa divided by the number of expected taxa, the River Invertebrate Prediction and Classification System (RIVPACS). All bioassessment sampling and related habitat survey data, laboratory analysis, quality assurance, and data analysis shall follow the protocols in *Benthic Macroinvertebrate Biological Monitoring Protocols for Rivers and Streams: 2001 Revision*, Plotnikoff and Wiseman, August 2001 (http://www.ecy.wa.gov/biblio/0103028.html).**Monitoring of Downstream and Deactivated Waters - Flowing Waters**	**13**

SPECIAL CONDITIONS

The text of this permit contains words or phrases in ***bold and italics***. These words or phrases are the first usage in the permit and are defined in Appendix A.

S1. PERMIT COVERAGE

This permit covers activities of the Washington Department of Fish and Wildlife (WDFW) used to manage fish populations in surface waters of the state. This general permit covers discharge wastes from aquatic ***piscicide*** (***rotenone***) applications and the discharge of potassium permanganate for the deactivation of rotenone.

WDFW may cooperate with state, county and municipal governments, and with private citizens to conduct fisheries management projects under coverage of this permit.

A. Activities Covered under this Permit

This permit allows the use of rotenone and potassium permanganate in ***surface waters of the state of Washington*** for fish management activities.

B. Geographic Area Covered

This general permit applies to the application of piscicide to waters of the state throughout the state of Washington. Permittees operating on federal lands may be covered under this permit provided that the Permittee follows any land management agreements and complies with the conditions below.

This permit does not apply to:

1. Federal lands where a federal agency provided funding, made the decision to apply piscicides, or is the entity applying piscicides.

2. ***Indian Country*** and ***trust or restricted lands*** except portions of the Puyallup Reservation as noted below.

3. Puyallup Exception: Following the Puyallup Tribe of Indians Land Claims Settlement Act of 1989, 25 U.S.C. §1773; this permit does apply to land within the Puyallup Reservation except for discharges to surface water on land held in trust by the federal government.

C. Zooplankton Study

The Permittee must complete the zooplankton study as outlined in Appendix C and submit a final report to Ecology by Insert Date, within three (3) years of the permit issuance date.

S2. PERMIT ADMINISTRATION

Coverage under this general permit is available to the Washington State Department of Fish and Wildlife (WDFW) only.

A. How to Terminate Permit Coverage

A Permittee may request termination of permit coverage by submitting a written request for permit coverage termination. The request for permit coverage termination must include the date that permit coverage termination becomes effective and must be signed by a WDFW representative according to General Condition G1.D.

The Permittee will continue to incur an annual permit fee unless it submits a written request for permit coverage termination. Once permit coverage is cancelled, the Permittee may no longer discharge rotenone or potassium permanganate to waters of the state unless it applies for, and gains coverage under this permit again.

S3. DISCHARGE LIMITS

A. Compliance With Standards

Other than through the temporary exceedance of water quality criteria allowed under Special Condition S3.B, application of liquid or powdered rotenone formulations, and potassium permanganate must not cause or contribute to a violation of the Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A), Ground Water Quality Standards (WAC 173-200), Sediment Management Standards (WAC 173-204) and human health-based criteria in the National Toxics Rule (40 CFR 131.36). Ecology prohibits discharges that do not comply with these standards.

B. Temporary Exceedance of Water Quality Criteria

Temporary exceedance of water quality criteria are allowed under this permit provided the Permittee complies with the provisions of WAC 173-201A-410.

C. Discharge Management Plan (DMP)

The Permittee must develop a DMP that addresses water bodies managed for sport fisheries and water bodies managed for native fish and habitat restoration. Required elements of the DMP are given in Appendix B.

The Permittee must submit the DMP to Ecology 30 days prior to the first discharge conducted under this permit. Mail the complete DMP to:

Department of Ecology
Water Quality Program
Attn: Pesticide Permit Manager
PO Box 47696
Olympia, WA 98504-7696

The Permittee must follow its DMP. Significant deviation from the DMP during ***treatment*** projects must be documented and submitted to Ecology along with the Permittee's annual report, with a statement that the DMP has been updated to account for the deviation in the future.

After the effective date of this permit, the Permittee must keep the DMP updated. The Permittee should update the DMP when significant project changes occur. The Permittee

must keep an updated copy of the DMP at its business office and make it available upon request by Ecology or the public.

D. Impaired Water Bodies

The Permittee must not cause further impairment of any ***303(d)-listed water body*** as a result of the application of any piscicide. Permittees must get Ecology approval for treatments to water bodies on the 303(d) list for dissolved oxygen, phosphorous and nitrogen.

S4. The Application of Products

The Permittee must comply with all the requirements on the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) product label. Permit requirements do not reduce the requirements on the FIFRA label.

A. Pesticide Application Requirements

The Permittee must ensure that:

1. The application or direct supervision of the application of piscicide and potassium permanganate is performed by an ***aquatic licensed pesticide applicator***.

2. All pesticide applicators must have current training in the use of equipment necessary to apply piscicides correctly.

3. Appropriately trained personnel calibrate the application equipment prior to each application.

B. Authorized Discharges

1. Piscicide products must be labeled for use as a fish toxicant in the State of Washington at the time of treatment.

2. This permit allows the use of the active ingredient rotenone as a piscicide.

3. The use of liquid rotenone is only authorized for treatments in areas where the application of powdered rotenone in slurry form is not practical by pumper boat equipped with outboard motor. Waters typically treated with liquid formulations of rotenone include ***flowing water*** (e.g., rivers, streams, creeks), areas inundated with ***emergent vegetation***, thick ***submerged vegetation***, shallow areas, and areas where boats cannot be transported or launched. WDFW must treat open water areas that are accessible by boat with powdered rotenone that is mixed with water and applied as slurry, as described in Special Condition S.10.B.

4. This permit authorizes the use of potassium permanganate to deactivate piscicide-treated waters when necessary to prevent damage to ***non-targeted organisms*** and to maintain water quality outside of the treatment area and ***deactivation zone***. Other uses of potassium permanganate are not authorized.

Use of potassium permanganate to deactivate piscicide treated waters is required for the following situations.

a. When a treated lake has an outlet, the outflow water must be deactivated.

b. When treating rivers and streams the water downstream of the intended treatment area must be deactivated.

5. Piscicides treatments may be applied by pumper boat, airboats, canoe, trucks, ATV's, backpack sprayer, ***drip cans***, ***gelatin/sand mixtures***, and under certain conditions by helicopter. Helicopters may be used for liquid rotenone application on water bodies where use of boats and backpack sprayers are not practical, such as remote lakes and streams.

C. General Application Restrictions

The Permittee must avoid treatments that restrict public water use during the opening week of fishing season or during tribal fisheries, Memorial Day weekend, Independence Day weekend, and Labor Day weekend and must minimize treatments that restrict public water use during weekends.

S5. NOTIFICATION AND POSTING REQUIREMENTS

A. Ecology Notification Requirements for *Adverse Incidents* or Chemical Spills

The Permittee must immediately call Ecology headquarters or 1-800-645-7911 when they are aware of any of the following conditions occurring during or after treatment:

1. Any person(s) exhibiting or indicating any toxic and/or allergic response due to treatment.

2. Any non-targeted organisms exhibiting stress or dying outside of a treatment or neutralization area.

3. Any spill of chemicals covered under the permit that occurs into the water or onto land with a potential for entry into waters of the state.

B. Notification and Posting Requirements

1. Residential and Business Notice Procedures

a. WDFW must notify residents and businesses, within the area defined in S5.B.1.b, 14 to 45 days prior to treatment.

b. Prior to the start of any treatment, the Permittee must notify all property owners, other than the Permittee, within one-quarter (¼) mile in each direction along the shoreline or bank of the water bodies affected by the piscicide treatment, including downstream waters treated with potassium permanganate to deactivate piscicide treated waters.

c. The Permittee must provide notice to residences or businesses by mail, newsletter, or handbills delivered directly to the residences or businesses. If the Permittee uses handbills, it must secure the notices to the residences' or businesses' doorknob in a fashion that will hold them in place but will not damage property. If the residence or business is gated or guarded by watchdogs, the Permittee may secure the notice in clear view on the outside of the gateway or may attach the notice to the outside of the residence in a fashion that will hold it in place but will not damage property.

d. Notification information must include:

i. The name and location of the lake or stream to be treated;

ii. The name of the piscicide (and potassium permanganate, when applicable);

iii. The purpose of the treatment;

iv. Any public use or water use restrictions;

v. The date(s) of treatment/restricted use;

vi. The names and phone numbers of designated contact people for the Permittee and Ecology so that interested parties can obtain additional information.

vii. When the chemical or product's label has restrictions and/or precautions for potable or domestic water use, irrigation use, or livestock watering, the Permittee must not treat an area until the Permittee has notified people who legally withdraw surface water and:

For potable water rights:

Provide an alternative potable water supply for human consumption from the time of rotenone application until the treated water body is shown to be below 40 ppb rotenone (Special Condition S6.E).

For treatments using liquid rotenone formulations that contain volatile organic compounds (VOC's), as identified by the product Material Safety Data Sheet (MSDS); provide an alternative potable water supply for human consumption from the time of piscicide application until the treated water body is shown to have returned to pre-treatment levels for VOC's or VOC levels are below 0.5 ppb (Special Condition S6.E).

For irrigation and livestock watering rights:

Provide an alternative water supply for irrigation and livestock use from the time of piscicide application until the treated water body is shown to meet the standards applicable to crop irrigation and livestock watering required by the FIFRA label (Special Condition S6.E).

e. The Permittee must maintain a copy of the notice and a list of locations or addresses to which the notice was sent or delivered for five years. The Permittee must hand deliver or mail a copy of the notice and list of recipients to Ecology within five business days upon request.

2. Newspaper Notification

a. The Permittee must publish announcements in a newspaper of general circulation within the county where treatment will occur 14-45 days prior to the initial treatment.

b. The notice must include:

i. The name and location of the water body to be treated.

~~i.~~ii. The name of the piscicide (and oxidizer, when applicable) to be used.

~~ii.~~iii. The purpose of the treatment.

~~iii.~~iv. Any public use or water use restrictions.

~~iv.~~v. The posting procedures.

~~C. Sampling and Analytical Procedures~~

vi. The date(s) of treatment and use restrictions.

vii. The names and phone numbers of designated contacts at WDFW and Ecology from whom additional information can be obtained.

c. The Permittee must keep documentation of the newspaper announcement for five years.

3. Shoreline Posting Procedures

a. The Permittee must use the shoreline posting templates provided on the Fisheries Resource Management General Permit website. The Permittee must post signs, as specified below, no more than 72 hours prior to the application of products covered under this permit.

b. The Permittee must use good faith and reasonable effort to ensure that posted signs remain in place until the end of the period of water use restrictions, or until the chemical applied and its breakdown product(s) are no longer detectable by bioassay (Special Condition S6.C and S6.D), whichever occurs first.

c. The Permittee must remove all old signs after bioassays and/or toxicity testing has determined that the chemical applied and its breakdown products are no longer present at toxic levels (Special Condition S5.B.1.d.vii and S6).

d. All posted signs must explicitly state restriction(s) or precaution(s) when the EPA label restricts human consumption of fish, swimming, irrigation, livestock watering, or any other precaution(s) relevant to public or private water use.

e. Posting Publicly-Owned Property

i. The Permittee must post ***publicly accessible*** shorelines at all reasonable ***public access*** points.

ii. The Permittee must use the templates provided on the Fisheries Resource Management General Permit website and post signs that are a minimum of eight and one-half (8 ½) by eleven (11) inches in size.

iii. The Permittee must post signs to face all points of normal public access to the shoreline or stream bank; or WDFW must post one sign for every one-hundred (100) feet of shoreline and within 25 feet of the ***ordinary high water mark***.

iv. The Permittee must post signs that are secure from the normal effects of weather and water currents, but cause no damage to private or publicly owned shoreline.

f. Posting Public and Private Boat Access Areas:

i. The Permittee must post signs at all open ***boat launches*** on the water body to be treated.

ii. The Permittee must use the templates provided on the Fisheries Resource Management General Permit website and post signs that are a minimum of two (2) feet by three (3) feet in size and constructed of a durable weather-resistant material.

iii. WDFW must post signs within twenty-five (25) feet of the ordinary high water mark, facing the entrance to the boat launch.

iv. Where the public access has a shoreline length greater than one hundred fifty (150) feet, the Permittee must place signs so that they are clearly readable by all people using the access areas.

v. Signs must be posted so they are secure from the normal effects of weather and water currents but cause no damage to private or public property.

g. Posting Private Residences and Businesses:

i. For each residence or business located on the affected water body the Permittee must post signs or deliver handbills directly to the residences or businesses. If the Permittee uses handbills, it must secure the signs to the residences or businesses doorknob in a fashion that will hold them in place but will not damage property. If the residence or business is gated or guarded by watchdogs, the Permittee may secure the sign in clear view on the outside of the gateway or may attach the sign to the outside of the residence in a fashion that will hold it in place but will not damage property.

ii. The Permittee must use the templates provided on the Fisheries Resource Management General Permit website and post signs that are a minimum of eight and one-half (8 ½) by eleven (11) inches in size.

S6. MONITORING

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.

All samples must be analyzed by a laboratory registered or accredited under the provisions of *Accreditation of Environmental Laboratories*, WAC 173-50. The following parameters need not be accredited or registered:

a. Flow;
b. Temperature;
c. Settleable solids;
d. Conductivity, except that conductivity must be accredited if the laboratory must otherwise be registered or accredited;
e. pH, except that pH must be accredited if the laboratory must otherwise be registered or accredited;
f. Turbidity, except that turbidity must be accredited if the laboratory must otherwise be registered or accredited; and
g. Parameters which are used solely for internal process control.

Documentation of monitoring activities and results must include (if applicable):

a. The date, exact place, and time of sampling.
b. The date analyses were performed.
c. Who performed the analysis.
d. The analytical techniques/methods used (if any).
e. The results of such analyses.

The Permittee must take ***representative*** samples and measurements ~~taken~~ to meet the requirements of this permit ~~shall be~~(i.e., representative of the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including spills, ***upsets***, and maintenance-related conditions affecting ~~effluent~~water quality~~.~~).

~~Sampling and analytical methods used to meet the monitoring requirements specified in this permit shall conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 or to the latest revision of *Standard Methods for the Examination of Water and Wastewater* (APHA), unless otherwise specified in this permit or approved in writing by the Department of Ecology (Department).~~

~~D. Laboratory Accreditation~~

~~All monitoring data required by the Department shall be prepared by a laboratory registered or accredited under the provisions of, *Accreditation of Environmental Laboratories*, Chapter 173-50 WAC. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. Conductivity and pH shall be accredited if the laboratory must otherwise be registered or accredited. The Department exempts crops, soils, and hazardous waste data from this requirement pending accreditation of laboratories for analysis of these media.~~

~~S3. REPORTING AND RECORDKEEPING REQUIREMENTS~~

~~The Permittee shall monitor and report in accordance with the following conditions. The falsification of information submitted to the Department shall constitute a violation of the terms and conditions of this permit.~~

~~A. Reporting~~

~~The first monitoring period begins on the effective date of the permit. Monitoring results shall be submitted annually. Monitoring data obtained during each monitoring period shall be summarized, reported, and submitted in an annual report form approved by the Department.~~

~~Post Treatment Discharge Monitoring Report forms shall be received no later than June 1, the year following each treatment. The report(s) shall be~~

~~sent to Nancy C. Weller, Department of Ecology, Eastern Regional Office, N. 4601 Monroe, Spokane, WA 99205-1295.~~

A. ~~Post~~ **Monitoring**

The Permittee must conduct monitoring on each contiguous site (this includes but is not limited to lakes, chains of lakes, reservoirs, rivers, streams or ponds) treated with piscicides to determine the extent and duration of the treatment. The Permittee must:

1. Use the actual piscicide concentration, as provided by the vendor for each batch, to ensure accuracy in application rates.

2. Conduct monitoring as specified in Tables 1-5 in Special Conditions S6.C and S6.D.

B. **Monitoring a Chain of Lakes**

When monitoring a ***chain of lakes***, each individual water body need not be monitored. The Permittee must submit a sampling plan, for monitoring lake chains, for Ecology approval at least one month prior to treatment. The Permittee must monitor treatments on a chain of lakes according to the Ecology approved sampling plan.

C. **Monitoring Schedule *Still Water***

TABLE 1. PRE-TREATMENT MONITORING

Monitoring to occur within 48hours prior to treatment

Parameters	**Units**	**Minimum Sampling Frequency**	**Type**	**Sampling Point**
pH	Standard	Once pre-treatment	Grab	Representative
Temperature	°F	Once pre-treatment	Grab	Representative
Organic demand[1,2]	Standard[2]	Once pre-treatment[1]	Grab	Representative
Dissolved Oxygen	mg/L	Once pre-treatment	Grab	Representative
[1]WDFW need monitor only when potassium permanganate is used to deactivate the treatment.				
[2]WDFW must use the guidelines provided in Engstrom-Heg (1971) to determine organic demand for $KMnO_4$.				

TABLE 2. POST-TREATMENT MONITORING

Monitoring to occur immediately after treatment event but must not exceed 24 hours post-treatment event unless specified otherwise in the table.

Parameters	**Units**	**Minimum Sampling Frequency**	**Type**	**Sampling Point**
pH	Standard	Once post-treatment	Grab	Representative
Temperature	°F	Once post-treatment	Grab	Representative
Dissolved Oxygen	mg/L	Once post-treatment	Grab	Representative
Trout Toxicity Bioassay: 48-hr live box test (5 trout); 100% trout	trout survival	24 hr, 7 days and weekly until 100% trout survival	Observation (No lab accreditation required)	***Worst-case scenario***

survival				

TABLE 3. MONITORING OF DOWNSTREAM AND DEACTIVATED WATERS

Pre-treatment sampling to occur within 48 hours prior to treatment event unless specifically stated. Post-treatment monitoring to occur immediately after treatment but not to exceed 24 hours after the treatment event unless specified otherwise in the table.

Parameters	**Units**	**Minimum Sampling Frequency**	**Type**	**Sampling Point**
pH	Standard	Twice: once pre-treatment and once post-treatment	Grab	Representative
Temperature	°F	Twice: once pre-treatment and once post-treatment	Grab	Representative
Dissolved Oxygen	mg/L	Twice: once pre-treatment and once post-treatment	Grab	Representative
Organic demand[1,2]	Standard[2]	Once pre-treatment[1]	Grab	Worst-case scenario
Potassium Permanganate[3]	mg/L	Hourly during the period of deactivation	Grab	Downstream of Deactivation Zone
Trout Toxicity Bioassay: 24-hr live box test (5 trout) 60% trout survival	60% trout survival	Every 2-4 hours until 60% of trout survive	Observation (No lab accreditation required)	Upstream and Downstream of Deactivation Zone
[1] Only required when potassium permanganate is used to deactivate the treatment.				
[2] Must use the guidelines provided in Engstrom-Heg (1971) to determine organic demand for $KMnO_4$.				
[3] Must measure $KMnO_4$ in waters downstream of the deactivation zone using one of the two techniques given in Finlayson (2010). *				

[*] Finlayson, B., R. Schnick, D. Skaar, J. Anderson, L. Demong, D. Duffield, W. Horton, and J. Steinkjer. 2010. Planning and Standard Operating Procedures for Use of Rotenone in Fish Management. American Fisheries Society, Bethesda, MD.

D. **Monitoring Schedule for Treated Flowing Water**

TABLE 4. PRE-TREATMENT MONITORING OF TREATED WATER

Pre-treatment sampling to occur within 24 hours prior to treatment event unless specified otherwise in the table.

Parameters	**Units**	**Minimum Sampling Frequency**	**Type**	**Sampling Point**
pH	Standard	Once pre-treatment	Grab	Representative
Temperature	°F	Once pre-treatment	Grab	Representative
Dissolved Oxygen	mg/L	Once pre-treatment	Grab	Representative
Organic demand[1,2]	Standard[2]	Once pre-treatment[1]	Grab	Representative

[1]Monitor only when potassium permanganate is used to deactivate the treatment.

[2]Must use the guidelines provided in Engstrom-Heg (1971) to determine organic demand for $KMnO_4$.

TABLE 5. POST TREATMENT MONITORING OF TREATED AND DEACTIVATED WATERS

Post-treatment monitoring to occur immediately after treatment but not to exceed 24 hours post- treatment event unless specified otherwise in the table.

Parameters	**Units**	**Minimum Sampling Frequency**	**Type**	**Sampling Point**
pH	Standard	Once post-treatment	Grab	Representative
Temperature	°F	Once post-treatment	Grab	Representative
Dissolved Oxygen	mg/L	Once post-treatment	Grab	Representative
Potassium Permanganate[1]	mg/L	Hourly during the period of deactivation	Grab	Downstream of Deactivation Zone
Trout Toxicity Bioassay: 24-hr live box test (5 trout) 60% trout survival	60% trout survival	Every 2-4 hours until 60% of trout survive	Observation (No lab accreditation required)	Upstream and Downstream of Deactivation Zone

[1] Must measure $KMnO_4$ in waters downstream of the deactivation zone using one of the two techniques given in Finlayson (2010).*

*Finlayson,, B., R. Schnick, D. Skaar, J. Anderson, L. Demong, D. Duffield, W. Horton, and J. Steinkjer. 2010. Planning and Standard Operating Procedures for Use of Rotenone in Fish Management. American Fisheries Society, Bethesda, MD.

E. **Monitoring For Water Bodies with Potable Water Users or With Surface Water Rights**

When the chemical or product's label has a restriction and/or precautions for potable or domestic water use, irrigation use, or livestock watering the following monitoring must be completed prior to the Permittee notifying people who withdraw surface water that they may resume withdrawal (See Special Condition S5.B.1.d.vii).

1. For potable water rights:

   a. Permittees must test the treated water body until it is shown to be below the EPA estimated drinking water level of concern of 40 ppb for rotenone. Permittees must use one of the methods given in SOP: 16 in the Rotenone SOP Manual*. The Permittee must test either three locations or test a number of locations equivalent to 20% of the potable water intakes on the water body, whichever is greater. Testing must occur in locations that are representative of the potable water intakes located on the water body.

   b. For treatments using liquid rotenone formulations that contain VOC's: Permittees must demonstrate that the treated water body has returned to pre-treatment levels or is below 0.5 ppb for any VOC identified by the Material Safety Data Sheet (MSDS) for the product used. Permittees must conduct pre-treatment VOC testing to determine if VOC's are present in the water body prior to treatment (background levels of VOCs). Permittees are responsible for

ensuring VOC's discharged to the water body from treatments have dissipated to background levels or dropped below 0.5 ppb before surface water withdrawal can resume. Analytical methods used for VOC monitoring must have a 0.5 ppb lower detection limit.

2. For irrigation and livestock watering rights: Permittees must demonstrate that the treated water body meets the standards applicable to crop irrigation and livestock watering required by the FIFRA label for the rotenone product used.

*Finlayson, B., R. Schnick, D. Skaar, J. Anderson, L. Demong, D. Duffield, W. Horton, and J. Steinkjer. 2010. Planning and Standard Operating Procedures for Use of Rotenone in Fish Management. American Fisheries Society, Bethesda, MD.

S7. REPORTING AND RECORDKEEPING REQUIREMENTS

A. **Report Submittal**

1. The Permittee must submit the Pre-treatment Plan to Ecology no later than April 1 of each year prior to treatment. The Permittee must submit the Post-Treatment Discharge Monitoring Report to Ecology no later than December 31 of each year following treatment. Send the reports to:

   Department of Ecology
   Water Quality Program
   Attn: Aquatic Pesticide Permit Manager
   PO Box 47696
   Olympia, WA 98504-7696

2. The Pre-treatment Plan must contain the following information for each surface water proposed for treatment:

   a. Name of surface water;

   b. County;

   c. Section, township, range and the decimal latitude and longitude of the approximate center of the lake;

   d. If the water body to be treated is a still water, a surface water description: Surface acreage, number of acre-feet, maximum depth and estimated average depth;

   e. If the water body to be treated is flowing water, a stream description: Width, length, flow rate of stream/outlet (cu. ft. per sec.) and volume;

   f. Description of any surface water withdrawal for potable, irrigation or livestock watering uses;

   g. Identify any analytical methods to be used in the monitoring for the proposed treatments.

   h. If not included in the amendment to the Final Supplemental Environmental Impact Statement for the lakes/streams treated during the reporting period, the following information must be provided in the Pre-treatment Plan:

      i. Purpose of treatment;

      ii. Description of fish species to be eradicated and how the action threshold defined in the DMP was met;

      iii. Description of the intended outcome and measures of success;

      iv. Description of resource impacts;

v. Mitigation for adverse impacts;

vi. Description of recreational impacts;

vii. Description of economic impacts;

viii. Related management actions; such as fish stocking and methods to control re-introduction of undesirable fish species.

~~1.~~3. Post-Treatment Discharge Monitoring Reports ~~shall~~must contain the following information:

a. Name of ~~lake or stream~~surface water;

b. County;

c. Section, Township and Range and the decimal latitude and longitude of the approximate center of the lake;

d. Date(s) ~~of~~ treatment occurred;

e. Purpose of treatment;

f. Name of licensed applicator(s);

g. ~~Lake~~Surface water description: Surface acreage, number of acre-feet, maximum depth and estimated average depth;

h. Stream description: Width, length, flow rate of stream/outlet (cu. ft. per sec~~.); Volume~~.) and ~~weight of water treated (gallons, pounds)~~volume;

i. Name of fish toxicant product used;

j. Quantity of fish toxicant active ingredient applied (pounds);

k. Concentration of active ingredient in formulated product (percentage (%));

l. Maximum concentration of the active ingredient in the water (ppb);

~~j.~~m. Description of treatment method(s~~)~~);

~~1. Quantity of fish toxicant used (pounds and/or gallons)~~

~~2. Concentration of active rotenone in formulated rotenone product (%)~~

~~3. Concentration of active rotenone in water (ppm)~~

~~k.~~n. Water conditions/quality (temperature, pH, ~~hardness,~~ alkalinity – and any other additional data collected~~)~~);

~~l.~~o. ~~Detoxification~~Deactivation of ~~rotenone~~piscicide treated water (if required): Description of ~~detoxification~~deactivation methods/equipment; potassium permanganate application rate (pounds per hour); flow rate of stream/outlet (cu. ft. per sec.); ~~estimate~~measurement of average concentration ~~(ppm)~~downstream of the deactivation zone;

~~m.~~p. Description of lake inlet(s)/outlet(s) and any temporary water control measures (if required~~)~~);

~~n.~~q. Period of toxicity (duration of water quality reduction~~)~~);

~~o.~~r. Eradicated fish species;

~~p.~~s. Results of pre- and post-treatment monitoring;

~~q.~~t. Summary of impact on non-targeted organisms;

~~4. Brief description of treatment/detoxification and other comments~~

~~r.~~u. A copy of the ~~amended FSEIS~~ amendment to the Final Supplemental Environmental Impact Statement for the lakes/streams treated during the reporting period including all ~~SEPA~~State Environmental Policy Act comments, results and decisions.

~~5. A list of the lakes/streams proposed for treatment during the upcoming year~~

B. **Additional Monitoring by the Permittee**

If the Permittee monitors any parameter not specified by this permit or monitors a parameter more frequently than required by this permit using test procedures specified by Special Condition S6, it must include the results of this monitoring in the calculation and reporting of the data submitted in its Post Treatment Discharge Monitoring Report.

~~A.~~C. **Records Retention**

The Permittee ~~shall~~must retain records of all monitoring information for a minimum ~~of three~~

1. ~~(~~3five (5) years. Such information ~~shall~~must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit.

2. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by ~~the Director~~Ecology.

~~B. Recording of Results~~

~~For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place, method, and time of sampling or measurement; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) the individual who performed the analyses; (5) the analytical techniques or methods used; and (6) the results of all analyses.~~

~~C. Additional Monitoring by the Permittee~~

~~If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Condition S2. of this permit, then the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Permittee's Post Treatment Discharge Monitoring Report.~~

3. The Permittee must make records, reports, surveys, plans, public notices, and other information required by this permit available to Ecology on request.

~~B.~~D. **Noncompliance Notification**

~~In the event the Permittee is unable to comply with any of the terms and conditions of this permit due to any cause, the Permittee shall:~~

~~1. Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the noncompliance, correct the problem and, if applicable, repeat sampling and analysis of any noncompliance~~

~~immediately and submit the results to the Department within thirty (30) days after becoming aware of the violation.~~

~~2. Immediately notify the Department of the failure to comply.~~

~~3. Submit a detailed written report to the Department within thirty (30) days, unless requested earlier by the Department. The report shall contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.~~

Compliance with ~~these~~the requirements of this special condition does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for ~~failure~~failing to comply.

~~S4.~~

In the event the Permittee is unable to comply with any part of this permit, which may threaten human health or the environment, the Permittee must:

1. Immediately take action to minimize potential pollution or otherwise stop the noncompliance and correct the problem.

2. Immediately notify the appropriate Ecology regional office and the aquatic pesticides permit manager of the failure to comply via the regional spills telephone hotline and the aquatic pesticides permit manager's phone number below.

Central (CRO) ----------	**509-575-2490**
Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, and Yakima counties	
Eastern (ERO) ----------	**509-329-3400**
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, and Whitman counties	
Northwest (NWRO) ----------	**425-649-7000**
Island, King, Kitsap, San Juan, Skagit, Snohomish, and Whatcom counties	
Southwest (SWRO) ----------	**360-407-6300**
Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, and Wahkiakum counties	
Aquatic Pesticide Permit Manager ----------	**360-407-6283**

3. The Permittee must provide a written report to Ecology within five (5) days of the time that the Permittee becomes aware of any permit non-compliance unless Ecology requests and earlier submission. The report must contain a description of the noncompliance and its cause, the exact date(s), time(s), place(s), and duration(s) of the noncompliance, whether the noncompliance has been corrected and, if not, when the noncompliance will be corrected, and the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

4. The Permittee must submit noncompliance notifications to:

Washington State Department of Ecology
Water Quality Program
Attn: Aquatic Pesticide Permit Manager
PO Box 47696
Olympia, WA 98504-7696

S8. ANNUAL SEPA PROCESS

All ~~lakes~~waters proposed for treatment ~~are~~must be included in an ***addendum*** to the Final Supplemental Environmental Impact Statement (FSEIS). The FSEIS is subject to a ~~30 day~~ public

comment period. ~~The~~WDFW must complete an annual ***State Environmental Policy Act (SEPA)*** process ~~must be completed~~ prior to conducting ~~lake or stream rehabilitation~~surface water treatment activities.

~~**S5. ANTIMYCIN SEPA REVIEW**~~

~~On or before June 1, 2005, WDFW shall the complete the SEPA review process regarding the use of Antimycin as a fish toxicant for certain fish management projects. Based upon the outcome of the SEPA process, Ecology may modify the permit to include the use of Antimycin.~~

~~**S6. BEST MANAGEMENT PRACTICES**~~

~~A. In order to prevent unnecessary damage to the environment, the permittee shall follow the best management practices defined below on the day of application.~~

~~B. The permittee shall comply with all product label instructions. When application requirements specified in this permit differ from those on the label, the more stringent of the two requirements must be complied with. However, no condition in this permit or any amended Order shall reduce or modify the label instruction. All applicable federal, state and local laws and ordinances shall be followed.~~

~~C. Powdered rotenone formulations shall be applied in such a way that minimizes airborne dust, using the best available technology such as the method outlined in "Utah's Procedure for Mixing Powdered Rotenone into a Slurry" (Thompson et al. 2001).~~

~~**In order to prevent an exceedance of water quality standards outside the area intended for rehabilitation, rotenone**~~ **S9. SPILL PREVENTION AND CONTROL**

A. **Spill Prevention**

The Permittee must:

1. Handle, store, and use all oil, fuel, chemicals, and products authorized under this permit in a manner that prevents spills.

2. Ensure that they maintain all mobile equipment to prevent leaks or spills of petroleum products.

3. Report significant spills into waters of the state, spills on land with a potential to enter into waters of the state, and other significant water quality impacts to the appropriate Ecology regional office as soon as possible after the spill takes place.

4. Implement the Spill Plan developed under Special Condition S9.B.

B. **Spill Plan**

~~D.~~ At least 30 days prior to the first treatment ~~should only take place in lakes that are not discharging to downstream waters. This is accomplished by limiting treatments to lakes with closed basins or conducting treatments only during periods of low water, usually September or October.~~

~~In instances where treated waters may potentially discharge to downstream waters resulting in an exceedance of water quality standards outside the treatment area, such discharge shall be prevented by installing adequate temporary water control measures.~~

~~When it is necessary and unavoidable to discharge rotenone treated waters to downstream waters, the permittee shall conduct pretreatment water quality and biological monitoring, as specified in the monitoring plan.~~

~~Treated waters shall be effectively neutralized and detoxified using potassium permanganate so that water quality standards are not exceeded below the neutralization zone. For purposes of this section, neutralization zone is defined as the downstream waters where potassium permanganate has been applied but has not yet fully neutralized the rotenone, due to the lag time normally associated with detoxification.~~conducted under this permit, The ~~neutralization zone is typically considered the distance that water can be expected to travel in 20 minutes. Since the neutralization zone may contain toxic levels of rotenone and potassium permanganate, some fish mortalities may occur in this zone.~~

~~Below the neutralization zone, rotenone~~Permittee must ~~be totally neutralized and residual potassium permanganate levels maintained at a non-toxic level of 1 mg/L, not to exceed 2 mg/L. Live trout cars will be set up below the neutralization zone to monitor the effectiveness of detoxification measures.~~

~~Detoxification procedures must utilize calibrated equipment to achieve the minimum effective concentration of potassium permanganate to oxidize the rotenone within the neutralization zone. Potassium permanganate concentrations must be closely monitored using a field calibrated spectrophotometer to keep residual permanganate levels at a level that effectively neutralizes rotenone while preventing damage to aquatic life downstream of the treatment area and neutralization zone.~~

~~F. In order to minimize the discharge of inert ingredients contained in liquid rotenone formulations, only powdered rotenone formulations shall be utilized, except in very limited cases when the WDFW finds it necessary to treat waters that are inaccessible by boat, such as weedy shorelines or marshy areas.~~

~~S7. SPILL PREVENTION AND RESPONSE~~

1. ~~Prior to the first rotenone treatment, WDFW shall~~ submit a Spill Prevention and Response Plan to Ecology that addresses all piscicide treatments. Submit the plan to:

   Department of Ecology~~, Eastern Regional Office, N. 4601 Monroe, Spokane~~
   Water Quality Program
   Attn: Aquatic Pesticide Permit Manager
   PO Box 47696
   Olympia, WA ~~99205-1295.~~ 98504-7696

2. The ~~spill plan should cover a~~ plan ~~for~~must address the following:

   a. Prevention, containment, and control of spills or unplanned discharges from the application, storage and transportation of the ~~pesticides. It should also include spills of oil~~piscicide and potassium permanganate.

   ~~a.~~b. Spills and drips of oils, gasoline and other petroleum products from application equipment including boats. ~~According to~~ Based on the severity of the spill, ~~it should tell~~the plan must describe when to report certain magnitudes of spills along with a list of names and telephone numbers of spill respondent teams ~~at~~for both ~~WDFW~~the Permittee and Ecology.

~~Spills into state waters, spills onto land with a potential for entry into state waters, or other significant spills that may effect health, the environment, or property must immediately be reported~~

C. Spill Notification Requirements

Report spills immediately to the following appropriate state and federal contacts:

National Response Center (Federal): ~~1-~~800-424-8802, and
Emergency Management Division (State): ~~1-~~800-258-5990, and
the appropriate ~~Dept. of~~ Ecology regional office:

- Northwest Office, Bellevue: ~~1-~~425-649-7000
- Southwest Office, Olympia: ~~1-~~360-407-6300
- Central Office, Yakima: ~~1-~~509-575-2490
- Eastern Office, Spokane: ~~1-~~509-~~456-2926~~329-3400

~~Within 5 days the event must be also be reported to Nancy C. Weller, Permit Manager, Department of Ecology, Eastern Regional Office, N. 4601 Monroe, Spokane, WA 99205- 1295. It should be a written report that includes a description of the event, including exact date and time, and the actions taken to correct the problem~~

See http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm for environmental reporting requirements.

D. Spill Cleanup Requirements

1. In the event of a spill, Permittees must begin immediate containment and ~~clean-up efforts shall begin immediately and be completed as soon as possible, taking precedence~~cleanup using appropriate materials. Cleanup takes precedent over normal work. ~~Clean-up shall include~~

~~1.~~2. Cleanup includes proper disposal of any spilled ~~material~~materials and used ~~clean-up material~~cleanup materials.

~~**PUBLIC NOTICE PROCEDURES**~~

~~**P1. RESIDENTIAL AND BUSINESS NOTICE PROCEDURES**~~

~~**Prior to**~~ S10. BEST MANAGEMENT PRACTICES

The Permittee must follow the ~~initiation~~best management practices defined below for piscicide application.

A. **The Permittee must comply with the product label.**

1. When application requirements specified in this permit differ from those on the label, the Permittee must comply with the more restrictive of the two requirements.

2. The Permittee is responsible for ensuring that it follows applicable federal, state and local laws and ordinances.

B. **The Permittee must apply powdered rotenone** ~~treatment, the WDFW shall notify all property owners located within one-quarter (1/4) mile~~**formulations using the best available and practical technology.**

The Permittee must use the best available and practical rotenone application technology that minimizes airborne dust, such as the method outlined in Finlayson et al. 2010. "Operation of ~~the shoreline or stream bank radius and five- hundred (500) feet upland~~Semi-Closed Aspirator Systems for Application of ~~the~~ Powdered Rotenone SOP: 9.0," in *Planning and Standard Operating Procedures for Use of Rotenone in Fish Management*, (American Fisheries Society, 2010), pp 81-85.

C. **The Permittee must prevent a discharge to downstream waters** ~~affected~~**that results in an exceedance of water quality criteria by** ~~rotenone treatment, including waters~~ **:**

1. Installing adequate temporary water control measures.

2. Conducting pretreatment water quality and biological monitoring, as specified in the permit monitoring section (Special Condition S.6).

3. Effectively deactivate treated ~~with~~waters using potassium permanganate ~~to detoxify or neutralize~~ so that water quality criteria are not exceeded outside of the deactivation zone.

~~1.~~4. Ensuring that rotenone ~~treated waters.~~is totally deactivated and residual potassium permanganate levels are maintained at a level of 1 mg/L outside or downstream of the deactivation zone.

A. This notification may be done by mail, e-mail, or by handbills given directly to the residences or businesses. If hand bills are used, the applicator shall secure the notices to the residences or businesses doorknob in a fashion that will hold them in place but will not damage property. If the residence or business is gated or guarded by watch dogs, the applicator may secure the notice in clear view on the outside of the gateway or may attach the notice to the outside of the residence in a fashion that will hold it in place but will not damage property.

B. A copy of the notice and a list of names and addresses where they were sent shall be kept by the applicator for seven (7) years and be hand delivered or mailed to Ecology immediately upon request. Where notices were delivered by hand (hand bills), names are not required to be recorded; only the address where notification was made.

C. Notification must take place at least 10 days, but not more than 21 days prior to initial treatment.

D. Notification information must include:

1. The lake or stream to be treated.
2. The name of the pesticide (and oxidizer, when applicable) to be used.
3. The internet address (URL) of the Material Safety Data Sheet (MSDS) for the chemical products used. For example, the URL for the MSDS for Prenfish™ Fish Toxicant Powder is http://www.prentiss.com/msds/pdf/655_691.pdf .
4. The purpose of the treatment.
5. Any public use or water use restrictions.
6. The date(s) of treatment / restricted use.
7. The names and phone numbers of designated contact people at WDFW and Department of Ecology so people can obtain additional information.

P2. LEGAL NOTIFICATION PROCEDURES

A. The Department of Fish and Wildlife shall publish announcements in the legal section of the local newspaper of general circulation (or nearest regional paper if local paper does not exist) 10 to 21 days prior to initial treatment. The legal notice shall include:

1. The lake or stream to be treated.

v.viii. The name of the pesticide (and oxidizer, when applicable) to be used.

vi.ix. The purpose of the treatment.

vii.x. Any public use or water use restrictions.

viii.xi. The posting procedures.

2. The date(s) of treatment / restricted use.
3. The names and phone numbers of designated contact people at WDFW and Department of Ecology so people can obtain additional information.

B. An original affidavit from the legal department of the newspaper shall be kept by the Department of Fish and Wildlife for seven years and be mailed to the Department of Ecology upon request.

P3. POSTING PROCEDURES

A. The WDFW shall post signs prior to the application of any pesticide(s) no more than forty-eight (48) hours prior to application. The Department of Fish and Wildlife shall use good faith and reasonable effort to ensure that posted signs remain in place until the end of the period of water use restrictions, or 30 days, whichever is longer. The Department of Fish and Wildlife shall be responsible for removal of all signs before the following treatment of the waterbody.

B. When the EPA label restricts human consumption of fish, swimming, irrigation, livestock watering, or any other precaution(s) relevant to public or private water use, all posted signs shall explicitly state the restriction(s) or precaution(s).

C. The WDFW shall construct and post signs as follows:

1. Public Property

Signs shall be a minimum of eight and one-half (8 ½) by eleven (11) inches in size and be made of durable weather-resistant material. Lettering shall be bold black type with the word "CAUTION" at least one (1) inch high and all other words at least one-quarter (1/4) inch high. The sign board shall be white, yellow, or orange. Signs shall be placed facing all points of normal public access to the shoreline or stream bank; or one every one- hundred (100) feet of public shoreline within ten (10) feet of the mean high water mark. Signs shall be posted so that they are secure from the normal effects of weather and water currents but cause no damage to private or public property. The applicator shall post all signs within 24 hours of initial treatment.

2. Boat Access Areas

Boat launches are defined as publicly designated and privately owned community access boat launches. Signs shall be posted at all boat launches on the waterbody to be treated. Signs shall be a minimum of two (2) feet by three (3) feet in size and be made of durable weather-resistant material. Lettering shall be bold black type with the word "CAUTION" at least two (2) inches high and all other words at least one-half (1/2) inch high. The colors used for the sign board shall be white, yellow, or orange.

~~Signs must be placed within twenty-five (25) feet of the shoreline, facing the entrance to the boat launch. Where the public access has a shoreline length greater than one hundred- fifty (150) feet, the applicator shall place signs so that they are clearly readable by all people using the access areas. Signs shall be posted so that they are secure from the normal effects of weather and water currents but cause no damage to private or public property.~~

5. Using calibrated equipment during deactivation procedures to achieve the minimum effective concentration of potassium permanganate to oxidize the piscicide within the deactivation zone. The Permittee must closely monitor potassium permanganate concentrations using methods provided in the Rotenone SOP Manual (Finlayson 2010) to keep residual permanganate levels at a concentration that effectively deactivates rotenone while preventing damage to aquatic life downstream of the treatment area and deactivation zone.

S11. APPENDICES

The attached appendices are incorporated by reference into this permit.

APPENDIX A - DEFINITIONS

APPENDIX B - DISCHARGE MANAGEMENT PLAN

APPENDIX C – ZOOPLANKTON STUDY DESIGN

General Conditions

G1. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to ~~the Department shall~~Ecology must be signed and certified.

A. ~~All permit applications shall be signed by either a~~ In the case of corporations, by a responsible corporate officer ~~of at least the level of vice~~. For the purpose of this section, a responsible corporate officer means:

1. A president ~~of a~~, secretary, treasurer, or vice-president of the corporation~~, a general partner~~ in charge of a principal business function, or any other person who performs similar policy- or decision making functions for the corporation, or

2. The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

B. In the case of a partnership, ~~or~~by a general partner.

~~A.~~C. In the ~~proprietor~~case of ~~a~~ sole proprietorship~~.~~, by the proprietor.

D. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

~~B.~~E. All reports required by this permit and other information requested by ~~the Department shall~~Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by ~~a~~the person described above and is submitted to ~~the Department.~~Ecology at the time of authorization, and

2. The authorization specifies either ~~an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either~~ a named individual or any individual occupying a named position~~.)~~.

~~A.~~ **Changes to authorization. If an authorization under paragraph ~~B.2~~E above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization ~~satisfying the requirements of paragraph~~**

~~C.~~F. ~~B.2 above~~ must be submitted to ~~the Department~~Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

~~D.~~G. ~~C. Certification.~~ Any person signing a document under this section ~~shall~~must make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant

penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations~~.~~."

G2. RIGHT OF ENTRY AND INSPECTION ~~AND ENTRY~~

~~**The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials and such other documents as may be required by law:**~~

~~To enter upon the premises where a~~ Representatives of Ecology must have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state.

Reasonable times include normal business hours; hours during which production, treatment, or discharge ~~is located or where~~occurs; or times when Ecology suspects a violation requiring immediate inspection.

Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records ~~must~~required to be kept under ~~the~~ terms and conditions of ~~this~~the permit~~.~~; to inspect any monitoring equipment or method required in the permit; and to sample any discharge, waste treatment processes, or internal waste streams.

~~**A. To have access to and copy - at reasonable times and at reasonable cost - any records required to be kept under the terms and conditions of this permit.**~~

~~**B. To inspect - at reasonable times - any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.**~~

~~**C. To sample or monitor - at reasonable times - any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.**~~

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon ~~the Department's~~Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

~~**procedures of 40 CFR 124.5.**~~

A. The following are causes for terminating ~~this~~ permit coverage during its term, or for denying a permit renewal application:

1. Violation of any permit term or condition.

2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.

3. A material change in quantity or type of waste disposal.

4. A determination that the permitted activity endangers human health or the environment or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination [40 CFR part 122.64(3)].

5. A change in any condition that requires either a temporary or permanent reduction or elimination of any discharge or sludge use or disposal practice controlled by the permit [40 CFR part 122.64(4)].

6. Nonpayment of fees assessed pursuant to RCW 90.48.465.

7. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

B. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

1. A material change in the condition of the waters of the state.

2. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

3. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

4. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

5. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

6. ~~The Department~~Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

7. Incorporation of an approved local pretreatment program into a municipality's permit.

C. The following are causes for modification or alternatively revocation and reissuance:

1. Cause exists for termination for reasons listed in A1 through A7, of this section, and ~~the Department~~Ecology determines that modification or revocation and reissuance is appropriate.

2. ~~The Department~~Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer ~~(General Condition G8)~~ but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING ~~A~~PLANNED CHANGES, CAUSE FOR MODIFICATION

The Permittee ~~shall submit~~ must, as soon as possible, but no later than sixty (60) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).

B. A significant change in the nature or an increase in quantity of pollutants discharged.

C. A significant change in the Permittee's sludge use or disposal practices.

Following such notice, and the submittal of a new application~~,~~ or ~~a~~ supplement to the ~~previous~~existing application, along with required engineering plans and reports ~~whenever a material change to the facility or in the quantity or type of discharge is anticipated which is not specifically authorized by~~, this permit~~. This application shall be submitted at least sixty (60) days prior to any proposed changes. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not relieve the Permittee of the duty to comply with the existing permit until it is~~ may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

~~.~~

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications ~~shall~~must be submitted to ~~the Department~~Ecology for approval in accordance with ~~Chapter~~WAC 173-240~~ WAC~~. Engineering reports, plans, and specifications ~~shall~~must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities ~~shall~~must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit ~~shall~~must be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

~~G7. DUTY TO REAPPLY~~

~~**The Permittee shall apply for permit renewal at least 180 days prior to the specified expiration date of this permit.**~~

~~G8.~~ TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee ~~shall~~must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which ~~shall~~must be forwarded to ~~the Department.~~Ecology. This permit is automatically transferred to a new owner or operator if:

~~**A. Transfers by Modification**~~

~~**Except as provided in paragraph B below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.**~~

~~**B. Automatic Transfers**~~

~~**This permit may be automatically transferred to a new Permittee if:**~~

~~**1. The Permittee notifies the Department at least 30 days in advance of the proposed transfer date.**~~

A. ~~The notice includes~~ A written agreement between the ~~existing~~old and new ~~Permittee's~~owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability ~~between them.~~is submitted to Ecology; ~~The Department~~

B. A copy of the permit is provided to the new owner and;

C. Ecology does not notify the ~~existing~~ Permittee ~~and the proposed new Permittee of its intent~~of the need to modify ~~or revoke and reissue~~the permit.

Unless this permit~~. A modification under the subparagraph may also be minor modification under 40 CFR 122.63. If~~ is automatically transferred according to section A. above, this ~~notice is not received, the transfer is effective on the date specified in~~permit may be transferred only if it is modified to identify the ~~written agreement.~~new Permittee and to incorporate such other requirements as determined necessary by Ecology.

~~G9.~~

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, ~~shall~~must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

~~G10.~~ G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, ~~sludges~~sludge, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters ~~shall~~must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

~~G11.~~ G10. DUTY TO PROVIDE INFORMATION

The Permittee ~~shall~~must submit to ~~the Department~~Ecology, within a reasonable time, all information which ~~the Department~~Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee ~~shall~~must also submit to ~~the Department~~Ecology upon request, copies of records required to be kept by this permit ~~[40 CFR 122.41(h)].~~.

~~G12.~~ G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

~~G13.~~ G12. ADDITIONAL MONITORING

~~The Department~~Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

~~G14.~~ G13. PAYMENT OF FEES

The Permittee ~~shall~~must submit payment of fees associated with this permit as assessed by ~~the Department.~~Ecology. Ecology may revoke this permit if the permit fees established under WAC 173-224 are not paid.

~~G15.~~ G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit ~~shall be~~is deemed guilty of a crime, and upon conviction thereof ~~shall~~will be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs ~~may be deemed a separate and additional~~is a

separate and additional violation. Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

~~**Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten**~~

~~thousand dollars ($10,000) for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be deemed to be a separate and distinct violation.~~

~~G16.~~ G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent ~~limitations~~limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent ~~limitations~~limits if the requirements of the following paragraph are met. A Permittee who wishes to establish the affirmative defense of upset ~~shall~~must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in condition ~~S3.E~~S5.A; and 4) the Permittee complied with any remedial measures required under ~~S5~~S9.D of this permit. In any enforcement proceedings the Permittee seeking to establish the occurrence of an upset has the burden of proof.

~~In any enforcement proceeding the Permittee seeking to establish the occurrence of an upset has the burden of proof.~~

~~G17.~~ G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

~~G18.~~ G17. DUTY TO COMPLY

The Permittee ~~shall~~must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

~~G19.~~ G18. TOXIC POLLUTANTS

The Permittee ~~shall~~must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

~~G20.~~ G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit ~~shall~~will, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this Condition, punishment ~~shall~~will be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

~~G21. REPORTING PLANNED CHANGES~~

~~The Permittee shall, as soon as possible, give notice to the Department of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in: 1) the permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b); 2) a significant change in the nature or an increase in quantity of pollutants discharged; or 3) a significant change in the Permittee's sludge use or disposal practices. Following such notice, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.~~

~~G22.~~ G20. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. REPORTING ANTICIPATED NON-COMPLIANCE

The Permittee shall give advance notice to ~~the Department~~Ecology by submission of a new application, or supplement ~~thereto~~to the existing application, at least ~~one hundred and eighty (180)~~45 days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during non-critical water quality periods and carried out in a manner approved by ~~the Department~~Ecology.

~~G23. REPORTING OTHER INFORMATION~~

~~Where~~ G22. Duty to Reapply

The Permittee ~~becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.~~

~~G24. REPORTING REQUIREMENTS APPLICABLE TO EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL DISCHARGERS~~

~~The Permittee belonging to the categories of existing manufacturing, commercial, mining, or silviculture~~ **must** ~~notify the Department as soon as they know or have reason to believe:~~

~~A. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in~~reapply for coverage under this ~~permit, if that discharge will exceed the highest of the following "notification levels:"~~

~~1. One~~ general permit at least one hundred ~~micrograms per liter (100 µg/l).~~

~~2. Two hundred micrograms per liter (200 µg/l) for acrolein~~ and ~~acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4,6- dinitrophenol; and one milligram per liter (1 mg/l) for antimony.~~

~~3. Five (5) times the maximum concentration value reported for that pollutant in~~eighty (180) days prior to the specified expiration date of this general permit. An expired general permit and coverage under the permit ~~application in accordance with 40 CFR 122.21(g)(7).~~

~~4. The level established by the Director in accordance with 40 CFR 122.44(f).~~

~~B. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in this~~ continues in force and effect until Ecology issues a new general permit~~, if that discharge will exceed the highest of the following "notification levels:"~~

~~1. Five hundred micrograms per liter (500µg/L).~~

~~2. One milligram per liter (1 mg/L) for antimony.~~

~~Ten (10) times the maximum concentration value reported for that pollutant in the~~ or until Ecology cancels it. Only those Permittees that reapply for coverage are covered under the continued permit ~~application in accordance with 40 CFR 122.21(g)(7).~~.

~~3. The level established by the Director in accordance with 40 CFR 122.44(f).~~

~~G25. COMPLIANCE SCHEDULES~~

~~Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than fourteen (14) days following each schedule date.~~

APPENDIX A – DEFINITIONS

~~Rapid Method~~ All definitions listed below are for ~~Measuring~~ use in the context of this permit only.

303(d)-listed water body:
Section 303(d) of the federal Clean Water Act 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.

Addendum:
See also the definition for the State Environmental Policy Act (SEPA).
"Addendum" means an environmental document used to provide additional information or analysis that does not substantially change the analysis of significant impacts and alternatives in the existing environmental document. The term does not include supplemental EISs. An addendum may be used at any time during the SEPA process (WAC 197-11-706)." A SEPA addendum provides additional site-specific information about a project.

Adverse incident:
An unusual or unexpected incident in which:

1. There is evidence that a person or non-target organism has likely been exposed to a pesticide residue, and
2. The person or non-target organism suffered a toxic or adverse effect. Toxic or adverse effects include effects that occur within waters of the State on non-target plants, fish, or wildlife that are unusual or unexpected (e.g., effects are to organisms not otherwise described on the product label or otherwise expected to be present) because of exposure to a pesticide residue, and may include:
   - Distressed or dead fish.
   - Unexpected stunting, wilting, or desiccation of non-target submersed or emergent aquatic plants.
   - Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.).

The phrase, "toxic or adverse effects", also includes any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either from direct contact with, or as a secondary effect from a discharge (e.g., sickness from consumption of plants or animals containing pesticides) to waters of the State that are temporally and spatially related to exposure to a pesticide residue (e.g., vomiting, lethargy).

Aquatic licensed pesticide applicator:
Any individual with an aquatic pesticide endorsement who is licensed as a commercial pesticide operator, public operator, private-commercial applicator, demonstration and research applicator, or certified private applicator, or any other individual who is certified by the director of WSDA to use or supervise the use of any pesticide which is classified by the EPA as a restricted use pesticide or by the state as restricted to use by certified applicators only.

Boat launches:
Publicly designated and/or privately owned community access launches for boats.

Chain of lakes:
Lakes that are physically connected by a channel of surface water but have different names or are un-named.

Deactivation zone:
The downstream waters where potassium permanganate has been applied but has not yet fully deactivated the rotenone, due to the lag time normally associated with deactivation. The distance that water can be expected to travel in 20 minutes. Since the deactivation zone may contain toxic levels of rotenone and potassium permanganate, some fish mortalities may occur in this zone.

Drip Cans:
A container filled with diluted piscicide solution, equipped with a nozzle that meters out the solution to deliver a known amount of piscicide over a given time period.

Emergent vegetation:
Plants that are rooted within sediment covered or saturated by water but whose upper parts (e.g., leaves) are above the surface of the water (e.g., sedges, rushes, and grasses). Emergent vegetation does not include submersed aquatic plants that have only flowering or reproductive structures above the water surface.

Flowing Water:
Rivers, streams, creeks and other water bodies where water is moving down an elevation gradient.

Gelatin/sand mixtures:
Rotenone ~~**in Water at Piscicidal Concentrations**~~powder/gelatin/ sand mixture for treating sources of upwelling groundwater in springs, streams and lakes and other areas with limited water circulation (e.g., dense weed beds). See SOP 13.0 in the Rotenone SOP Manual, Finlayson et. al. 2010.

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~~*United States Fish and Wildlife Service National Fishery Research Laboratory*~~
~~*Post Office Box 818, La Crosse, Wisconsin 54601*~~

~~**Abstract**~~

~~A high-performance liquid chromatography (HPLC) procedure that is rapid, specific, and sensitive (limit of detection <0.005 mg/liter) was developed for monitoring application and degradation rates of rotenone. For analysis, a water sample is buffered to pH 5 and injected through a Sep Pak ® C_{18} disposable cartridge. The cartridge adsorbs and retains the rotenone which then can be eluted quantitatively from the cartridge with a small volume of methanol. This step effectively concentrates the sample and provides sample cleanup. The~~

methanol extract is analyzed directly by HPLC on an MCH 10 reverse-phase column; methanol: water (75:25, volume: volume) is the mobile phase and flow rate is 1.5 ml/minute. The rotenone is detected by ultraviolet spectrophotometry at a wavelength of 295 nm.

Received November 29, 1982 Accepted May 24, 1983

Rotenone, the active constituent of derris root, has been used widely as an insecticide and piscicide. Its use for removing undesired fish populations in the United States began in the 1930s (Schnick 1974). Several analytical procedures have been reported for the analysis of rotenone, including colorimetry (Gross and Smith 1934; Goodhue 1936), infrared spectrometry (Delfel 1976), thin-layer chromatography (Delfel and Tallent 1969), gas chroma- tography (Delfel 1973), and high-performance liquid chromatography (HPLC) (Bushway et al. 1975; Freudenthal and Emmerling 1977; Bowman et al. 1978; Kobayashi et al. 1980). These procedures are either costly, time-consuming, insensitive, or lack specificity for monitoring concentrations of rotenone in water during fish- eradication projects.

We describe a simple, rapid HPLC procedure with a sample-concentrating step that can be used to determine residues of rotenone in water at piscicidal concentrations.

Methods

Apparatus

1. HPLC—Varian 5000 equipped with varichrom ultraviolet light detector and optional Model CDS- 111L data system.[1] Operating conditions:

   stationary phase—30 cm X 4 mm Varian micropak MCH- 10 reverse phase; mobile phase—methanol: water (75:25, volume: volume);

   flow rate—1.5 ml/minute; chart speed—1 cm/minute; wavelength—295 nm;

   attenuation—0.04 absorbance full scale.

[1] Mention of commercial products does not imply endorsement by the United States Government.

2. Sep Pak® C_{18} disposable cartridges from Waters Associates, Incorporated.

3. Vortex stirrer.

4. Disposable syringes (50 ml).

5. Test tubes (15 ml) with Teflon-lined screw caps.

Reagents

1. Methanol—HPLC grade.

2. Water—HPLC grade.

3. Rotenone—purified grade from Aldrich Chemical Company; 0.0 1 g/ 100 ml methanol (made fresh daily).

4. Acetic acid (glacial)—American Chemical Society (ACS) reagent grade, 0.2 M; 11.6 ml diluted to 1 liter with water.

5. Sodium acetate—ACS reagent grade, 0.2 M; 2.72 g of $C_2H_3O_2Na \cdot 3H_2O$ diluted to 100 ml with water.

6. Buffer reagent—0.1 M; 14.8 ml of 0.2 M acetic acid + 35.2 ml of 0.2 M sodium acetate diluted to 100 ml with water.

Procedure

1. Precondition Sep Paks with 2 ml methanol and 5 ml water according to instruction sheet supplied by manufacturer.

2. Add 1 ml buffer reagent for each 50 ml of water sample (if expected concentration is less than 0.02 mg/liter, more than 50 ml of sample may have to be extracted).

3. Attach preconditioned Sep Pak to 50 ml syringe with plunger removed.

4. Transfer sample to syringe, insert plunger, and force sample through Sep Pak at a rate of not more than 40 ml/minute. Discard water.

5. Remove Sep Pak, remove plunger, and replace Sep Pak on syringe.

6. Add 2 ml methanol, insert plunger, and slowly force methanol through Sep Pak into test tube.

7. Cap tube and mix on vortex stirrer.

8. Analyze by HPLC against 50 ml of a standard containing a known concentration of rotenone in water solution processed as above.

Results and Discussion

The ultraviolet spectrum of rotenone has an absorption maximum at 295 nm (Fig. 1). A monochromatic detector (254 nm) can be used, but a considerable loss of sensitivity and potential loss of specificity will occur. Performance of monochromatic detectors can be enhanced by the use of 313-nm filters, but a grating monochrometer set at 295 nm provides optimal results.

~~As indicated in step 1 of the procedure, the Sep Paks must be prerinsed with methanol followed by water before they are used in the analyses. Previous tests (Dawson 1982) indicated that, for best results, this step should not be completed more than 2 hours before an analysis.~~

~~Rotenone recovery is influenced by the rate water samples flow through the Sep Paks during extraction and by the elution rate of methanol. The recovery was less than 70% at a flow of 100 ml/minute but exceeded 90% at flows of 40 ml/minute or less. Several volumes of methanol were evaluated for most efficient elution of adsorbed rotenone from Sep Paks. Small volumes of methanol provided more~~

concentrated samples, but recoveries were consistently better when 2 ml or more of methanol were used for elution.

Recoveries of rotenone were evaluated at various pH values to determine whether or not acidity of water samples affected the utility of the method. Water samples were fortified with 0.08 mg/liter of rotenone and buffered to pH 5, 7, and 9 before the Sep Pak extraction. Recoveries of rotenone from the buffered samples were 98, 94, and 73%, respectively, indicating that acidification is essential for optimal performance of the Sep Paks.

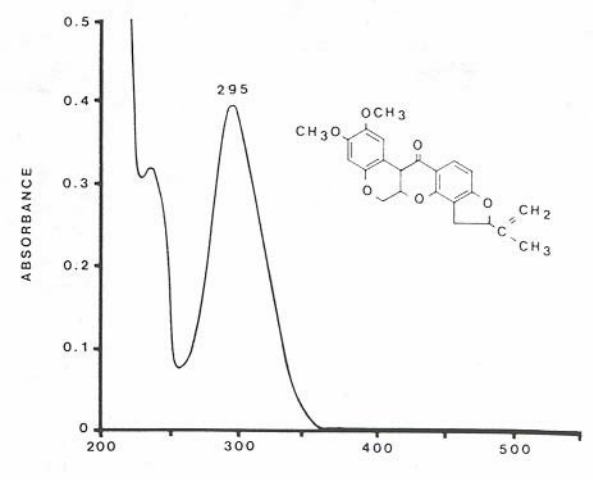


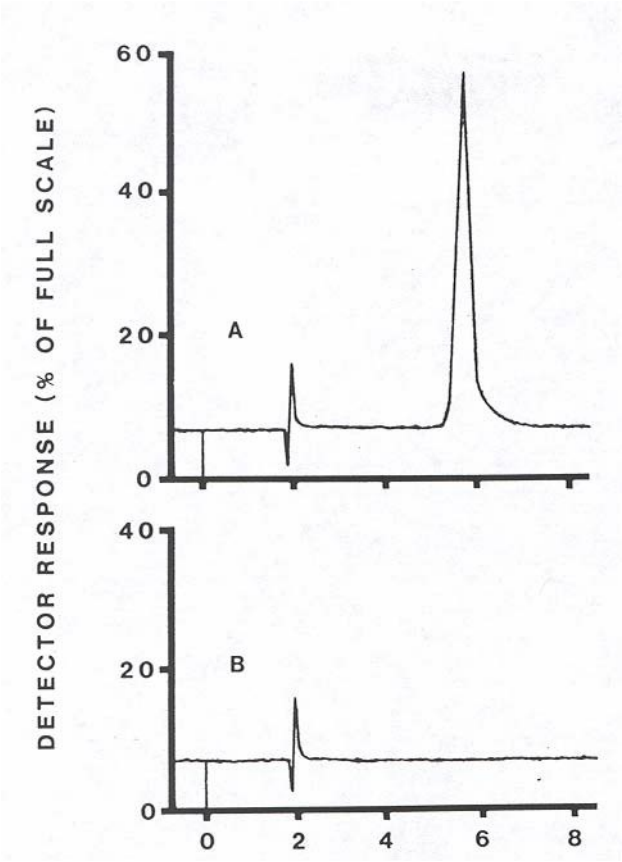
FIGURE 1. *Chemical structure and ultraviolet spectrum of rotenone (10 mg/liter) in methanol : water (75:25, volume : volume).*

A water sample volume of 50 ml is sufficient for the analysis of rotenone concentrations of 0.02 mg/liter or greater. However, as much as 200 ml of sample may have to be extracted to achieve a sensitivity of 0.005 mg/liter. The limiting factors for greater sample concentration are the tedium of extracting large volumes of sample and possible interferences that may develop in samples as a result of the extraction and concentration of contaminants. Recently, J. T. Baker Chemical Company developed the Baker-10® extraction system, in which similar adsorption chromatography is used and the tedium of analysis is reduced by a vacuum manifold that extracts up to 10 samples simultaneous.

Samples extracted on Sep Paks are stable for only a few hours. However, if the sample is eluted from the Sep Pak and stored in the methanol eluate, the samples are stable for up to 2 days. For best results, samples should be kept cool and in the dark.

Retention time for rotenone from a sample of spiked pond water injected on the reverse-phase column was 5.7 minutes (Fig. 2). Unfortified pond water had no interfering peaks. The pen deflection at 2 minutes in Fig. 2 is the solvent injection peak.

Water samples from ponds treated with rotenone in summer and late fall were analyzed for residues of rotenone by this HPLC method (unpublished data). No interference problems were encountered and the measured concentration agreed closely with that calculated on the basis of the application rate.



~~FIGURE 2. *Liquid chromatograms of (A) pond water sample fortified with rotenone (0.1 mg/liter) and*~~

~~*(B) unfortified pond water; mobile phase—methanol:water (75:25, volume:volume); flow rate—1.5 ml/minute; wavelength—295 nm; attenuation—0.04 absorbance full scale. The water sample (50 ml) was concentrated 25 times on Sep Pak by elution with 2 ml methanol*~~

~~Five replicate sample of pond water fortified with rotenone (0.1 mg/liter) were analyzed to evaluate the consistence of the method. The mean percentage of recovery and standard error were 97.6 ± 1.6.~~

~~The use of a micro-processor data system, such as a Varian CDS-111L, greatly facilitates the analysis by integrating peak areas and converting values directly into concentration units.~~

Indian Country:
Indian Country includes: All land within any Indian reservation notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation. This includes all federal, tribal, and Indian and non-Indian privately owned land within the reservation. All off-reservation Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same. All off-reservation federal trust lands held for Native American tribes.

Non-targeted organism:
Organisms other than that which the pesticide is intended to kill.

Ordinary high water mark:
The point that represents the maximum rise of a body of water over land.
http://www.ecy.wa.gov/programs/sea/sma/st_guide/jurisdiction/ohwm.html

Permittee:
WDFW, who may apply for and gain coverage under this permit and has control of, or causes a discharge under coverage of this permit.

Piscicide:
A chemical applied to fresh water to kill undesirable fish species.

Public access:
The point of entry to a location that all members of the community may use.

Publicly accessible:
A location that all members of the community may use. There may be limited restrictions such as required passes or fees, or use may be limited to certain hours (e.g. daylight hours).

Representative:
Representative of the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including spills, upsets, and maintenance-related conditions affecting water quality.

Rotenone:
2R,6aS,12aS)-1,2,6,6a,12,12a-hexahydro-2-isopropenyl-8,9-dimethoxychromeno[3,4-b]furo[2,3-h]chromen-6-one.

State Environmental Policy Act (SEPA):
A state policy that requires state and local agencies to
consider the likely environmental consequences of a proposal before approving or denying the proposal (See RCW 43.21C and WAC 197 -11).

Still water:
A water body where the water is not moving down an elevation gradient.

Submerged vegetation:

Submerged plants generally always remain under water, although many submersed species produce above-water flowers (e.g., pondweed, milfoil).

Surface waters of the state of Washington:
All waters defined as "waters of the United States" in 40 CRF 122.2 within the geographic boundaries of the state of Washington. All waters defined in RCW 90.48.020. This includes lakes, rivers, ponds, streams, inland waters, and all other fresh or brackish surface waters and water courses within the jurisdiction of the state of Washington, plus drainages to those surface waters.

Treatment:
The application of a piscicide product to waters of the state for the purpose of removing non-desirable fish species.

Trust or Restricted Lands:
Means as defined in 25 USC 2201(4): *"(i) ''trust or restricted lands'' means lands, title to which is held by the United States in trust for an Indian tribe or individual, or which is held by an Indian tribe or individual subject to a restriction by the United States against alienation; and (ii) ''trust or restricted interest in land'' or ''trust or restricted interest in a parcel of land'' means an interest in land, the title to which interest is held in trust by the United States for an Indian tribe or individual, or which is held by an Indian tribe or individual subject to a restriction by the United States against alienation."*

Upset:
An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

Wadeable streams:
Those streams that are at a depth that permits a person to "walk" them.

Worst-case scenario:
This refers to sampling points. WDFW must monitor at the point where, based on wind and application, the rotenone concentration should be the highest. This location is based upon the best professional judgment of WDFW.

In the absence of other definitions set forth herein, the definitions set forth in 40 CFR Part 403.3 or in RCW 90.48 apply.

APPENDIX B – DISCHARGE MANAGEMENT PLAN

The following elements are minimum requirements for a Discharge Management Plan (DMP). The applicant must prepare a DMP and submit it to Ecology 30 days prior to the first treatment conducted under this permit. The Permittee must revise the DMP whenever there is a significant change in the quantity or type of chemicals discharged or if it adds additional management activities. Changes to the DMP must be made prior to the discharge or as soon as possible thereafter. The Permittee must follow its DMP.

For sections B., C., and D. the Permittee must provide information that addresses projects managed as recreational fisheries as well as projects managed for habitat and native fish restoration.

A. Discharge Management Plan Team

The DMP must identify the people (by name and contact information) that compose the team as well as each person's individual responsibilities, including the person(s) responsible for:

1. Managing the fishery rehabilitation project.

2. Developing and revising the DMP.

3. Developing, revising, and implementing corrective actions and other permit requirements.

4. Applying the piscicide (licensed applicators with license numbers and license expiration dates).

When changes to the DMP team occur, the Permittee must provide updated contact information to Ecology.

B. Fisheries Resource Management

The DMP must:

1. Include a general location map or maps that identify the geographic boundaries of the area to which the plan applies. For example: If management goals or options change by eco-region.

2. Establish action thresholds that trigger the need to remove introduced fish. Include the data used in developing the action thresholds and the methods to determine when the action threshold has been met.

3. Consider the timing of piscicide treatments to avoid treatments of lakes that will freeze-over prior to the monitoring requirements being completed.

C. Piscicide Use

Identify standard operating procedures to be followed before, during and after piscicide application.

The DMP must detail the surveillance procedures that the Permittee will use to determine:

1. When the action threshold is met.

2. Treatment efficacy.

3. Non-target impacts.

D. Response Procedures

The DMP must detail procedures that the Permittee will use to determine:

1. Compliance with labeled rates (equipment calibration and maintenance).

2. The procedures for preventing spills and leaks of chemicals or petroleum products (oil, gasoline, and hydraulic fluid) associated with the chemical application.

E. Signature Requirements

The DMP must include a signature statement and the signature of Permittee. The signature statement shall read:

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of those persons directly responsible for gathering information, the information in the DMP is, to the best of my knowledge and belief, true, accurate, and complete and will be updated as necessary. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment of knowing violations.

_____ _____

Signature *Date*

APPENDIX C – ZOOPLANKTON STUDY DESIGN

Washington Lakes Recovery Study

The proposed study that the Washington Department of Fish and Wildlife and Portland State University are undertaking will assess recovery of zooplankton communities in lakes following rotenone treatments to remove unwanted fish populations as a management action. Recovery is notoriously difficult to define; here we will define recovery as no significant difference between impact and control lakes following treatment for four key metrics of zooplankton communities (abundance, composition, species richness, and species diversity). We will not assume that zooplankton will recover to a pre-treatment state; rather that zooplankton in treatment lakes will be no different than zooplankton in control lakes following rotenone treatment (Figure 1). For this reason, we have chosen lakes that contain stocked trout species as our controls; treatment lakes will be re-stocked with trout in the spring, making this the most direct comparison (control trout-stocked lakes vs. treatment trout-stocked lakes).

In order to understand the effect of rotenone treatments on zooplankton communities, we will employ a BACI design. BACI stands for Before-After-Control-Impact, and is a commonly used study design to test the effects of environmental impacts (Underwood 1991, 1993; McDonald et al. 2000). In its simplest form, a single site is monitored both before and after an environmental event for changes in a response variable (e.g., nutrients, temperature, and biomass). However, this design suffers from lack of understanding of other concurrent factors that could be driving these changes. The addition of a control site helps to rectify this problem by studying a reference site to detect any baseline changes over the study time frame. An additional issue is that single sites or single sampling periods may not be representative of reference conditions. This is particularly true for biotic responses, which may be quite variable. Therefore, the best design for a BACI study is to have multiple control and impact sites that are monitored several times before and after the impact to examine changes in the response variable (Underwood 1994). This design is illustrated in Figure 1.

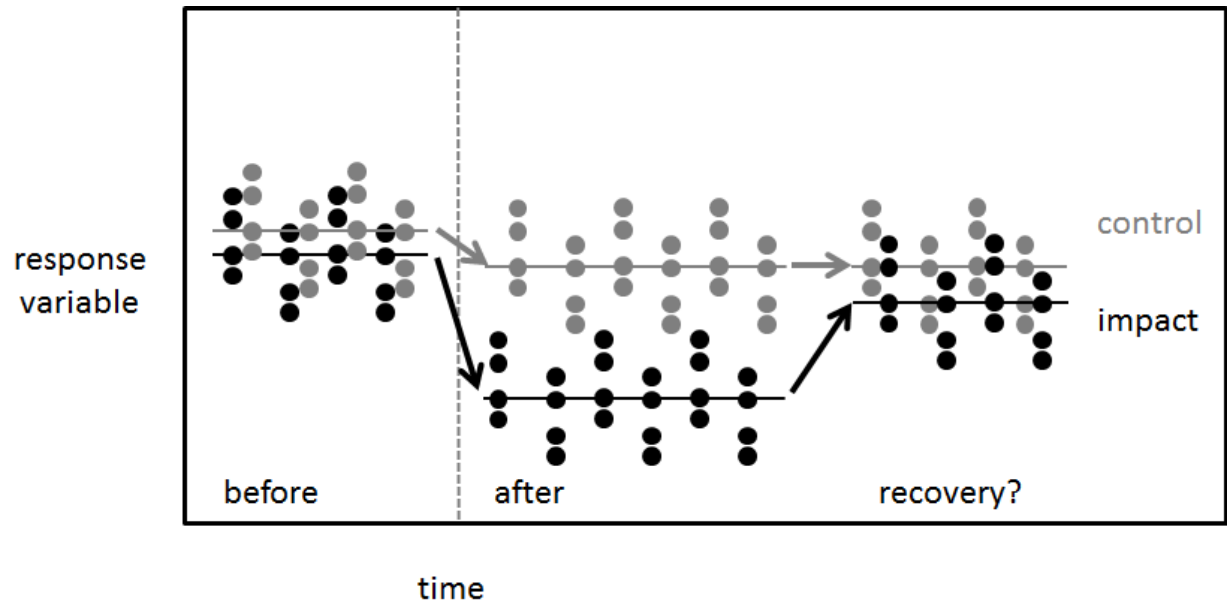


Figure 1. A response variable is measured in four impact (black) sites and four control (grey) sites both before (n=4 dates) and after (n=10 dates). In this conceptual diagram, both the control sites and impact sites decrease after the environmental impact, perhaps because of some other confounding factor; however, the change in the impact sites is much more substantial. This highlights the need for having multiple control sites and sampling prior to the impact in both the control and impact to understand the baseline variability. Recovery will be determined when the control and impact sites are no longer significantly different.

This study will employ seven (7) control lakes and seven (7) impact lakes, which will be monitored for 6 months prior to the rotenone treatment, which is scheduled to be applied in October 2015 (described in Study-Table 1). Control lakes that are currently stocked with trout were chosen for the study. Control lakes will not be altered in any other significant way during the course of the study. Although ideally control and treatment lakes would be as similar as possible in regards to basic physical and chemical characteristics, very little baseline data exists for these lakes. The data that does exist suggests that for the most part these lakes are generally small (<100 acres), shallow (<25m max depth), and moderately productive (Secchi disc depths of 2-8m). Control lakes are slightly larger and at higher elevations compared to treatment lakes. Both sets of lakes encompass similar areas, with the maximum distance between treatment lakes at 218 km and the maximum distance between control lakes at 222 km. The study was started in April 2014, shortly after ice-off in order to capture the period of hatching and growth of zooplankton communities. Samples are taken from impact and control lakes once per month, except immediately following the treatment, at which time impact lakes will be monitored every two weeks. The study will conclude in May 2016.

Study-Table 1. Study lakes, treatments, districts, and timeframe of study.

			Sampling events per month																									
			2014									2015												2016				
Lake	Treatment	District	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
Browns	control	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bayley	control	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cedar	control	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Amber	control	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dry Falls	control	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Big Twin	control	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lost	control	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
McDowell	treatment	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
No Name	treatment	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Upper Hampton	treatment	5	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lower Hampton	treatment	5	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Widgeon	treatment	5	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Katy	treatment	5	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Susan	treatment	5	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Zooplankton samples and environmental data will be collected as described below (*Sampling Plan Summary*). At the conclusion of the study, community-level attributes, such as abundance, biomass, richness, and diversity, and species-level attributes, such as abundance and biomass, will be summarized in spreadsheets. These data will be analyzed for differences using a mixed-effects ANOVA model, with time period, treatment, and site as variables. Community composition will be evaluated visually with a redundancy analysis and statistically with a permutational MANOVA.

Sampling Plan Summary

Field Sampling

On first visit, three sampling sites should be chosen and marked with a GPS unit. The three sites (deep, intermediate, relatively shallow), will each be sampled for zooplankton, while only the deep site will be sampled for other physical and chemical parameters. Sampling at multiple sites within a lake, especially at shallower sites, maximizes the ability to detect rare species, particularly of littoral taxa (Arnott et al. 1998). The deep site should be selected using a bathymetric map and known value of maximum depth. At the deep site, record the lake name, sampling crew, time, date, weather conditions, and maximum depth on waterproof paper (Rite in the Rain). Take a Secchi disc reading from the shaded side of the boat, as recommended by Wetzel and Likens (2000) (no sunglasses) and record. Using a HydroLab or YSI meter, record temperature, dissolved oxygen, pH, and conductivity at 1m intervals, starting at the surface. In July, water samples will be taken from the epilimnion for nutrient analysis. Samples will be integrated across depths using a tube sampler, which will be lowered to the bottom of the epilimnion, corked, and pulled up by a line attached to the bottom of the tube, which will be weighted to ensure it descends vertically. This integrated sample will be consolidated in a bucket and subsampled. The epilimnion is defined by temperature changes of <1°C per meter. For example, in this table of data, the epilimnion would be defined as the upper 4m, as the temperature drops by >1°C between 4 and 5 meters.

Depth (m)	Temperature (°C)
0	20.0
1	19.7
2	19.1
3	18.5
4	18.0
5	16.0

At each of the three sites, zooplankton will be sampled with an 80 µm-mesh net. The length of the net will determine how many meters deep the sample can be. The net should be lowered to the predetermined depth, and after waiting ~30-60 seconds for turbulence to subside, net should be pulled up at a steady rate (~0.5m/s). If the net is pulled up too fast, filtration efficiency is low as the hydraulic head displaces plankton. Depth should be recorded to calculate the volume of water sampled. Zooplankton density can then be computed from the known volume in the sample and expanded to number/liter. To reduce the error of overestimating zooplankton abundance, each sample should be taken from an anchored site, from the bottom of the lake straight up to the lake surface, rather than at an angle. If a sample contains benthic debris, the sample should be emptied and taken again, adjusting the depth of the tow as necessary. In addition, each sample should contain a label tag written in pencil on waterproof paper (e.g., “Rite in the Rain”®) for site identification. Some of the sample bottles were labeled in permanent ink, which dissolves in ethanol. Consequently, some of the sample bottles lacked pertinent information regarding area of collection and depth. The following information should be recorded on a label tag:

- Lake Name
- Location of Sample (description or coordinates)
- Date
- Time
- Depth

Preservation

Immediately following a tow, each sample should be flushed into an open-ended nitex mesh cup designed to capture all zooplankton within the sample while allowing the water to pass through. Once the majority of water has drained from the sample, the sample contents should be transferred

to a 125 or 250 mL plastic bottle. Samples should be topped up to a final concentration of 70% ethanol. To prevent samples from drying, an adequate volume of ethanol should be used to fill the storage vessel.

Laboratory Analysis

Preserved samples from each of the sites within each lake will be kept separate, but a volume-weighted composite sample will likely be taken to reduce the overall total number of samples. The volume-weighted composite sample will account for the different volumes of water that were sampled in the different lake zones (deep, intermediate, shallow). Sample enumeration will follow Strecker and Arnott (2005). Samples will be homogenized using a plankton splitter and subdivided until a reasonable subsample can be enumerated. A total of 250 individuals will be counted, with no more than 50 individuals per taxa, and no more than 50 individuals of juvenile life stages. This sampling protocol is designed to detect rare species, thus, if the sample is dominated by a few taxa, more fractions of the entire sample will be scanned for increasingly rare species (see Study-Table 2 for example). Based on the fraction of the sample counted, counts will be extrapolated to the entire sample and densities calculated on a per liter basis. Samples will also be scanned for rare species that may be present in low densities.

Study-Table 2. Counting protocol in which subsamples (e.g., a quarter of the sample volume) are counted sequentially. After counting half of the sample, spp A is no longer counted. This allows more of the sample to be analyzed for rare species (e.g., spp D). In this example, the entire sample is counted, as the threshold of 250 individuals was not met.

Taxa	Sample fraction				species total #	species fraction analyzed
	1/4	1/4	1/4	1/4		
1) spp A	12	40	stop	stop	52	1/2
2) spp B	15	20	18	stop	53	3/4
3) spp C	1	5	7	4	17	1
4) spp D	0	0	0	4	4	1
Total # in fraction (running total)	28 (28)	65 (93)	25 (118)	8 (126)		
Total fractions analyzed	1/4	2/4	3/4	4/4		

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~~APPENDIX B~~

~~Sampling Protocols for Zooplankton~~

~~The new approach to measure uses on a given lake includes a need to evaluate the health of a fishery. A widely utilized tool on the east coast of the United States is the measuring of zooplankton as a cost effective surrogate to collecting and measuring fish. An index has been developed in order to determine the predator/prey balance in the fish communities within a given lake (Mills and Schavone, 1982). In a study of 18 natural lakes in upstate New York, Mills and Schavone (1982) demonstrated a strong correlation between mean length of cladocerans and planktivore weight ($r^2 = .70$; $P<0.05$). In other words, the presence of large zooplankton indicate predator fish are keeping prey species in balance.~~

~~Dominance of smaller zooplankton suggests an ineffective amount of predators to suppress planktivore density.~~

~~A standard approach to sampling zooplankton was followed in the field. Methods for collecting, storage, and enumeration are patterned after the "Zooplankton Workshop Reference Guide" prepared by BSA Environmental Services, Inc. (Beaver, 1997).~~

~~Sampling Period~~

~~Five vertical tows were pulled in June and five were pulled in August from the deep site of each selected lake. Tows were composited into one 125ml sample bottle. Five tows were not necessary if there were an abundance of zooplankton in the first few tows. Duplicate samples (again, five tows if necessary) were taken at duplicate TP sample sites.~~

~~Field Procedure~~

~~The Wisconsin net was pulled from a depth of one meter off the bottom or 20 meters, whichever was less. The depth was rounded to the most conservative meter to ensure bottom sediments weren't disturbed.~~

~~Nets were retrieved at a rate of one meter per three seconds.~~

~~Upon retrieval of the sample, a squirt bottle filled with tap or distilled water was used to dislodge any zooplankton that may have been clinging to the mesh. Samples were discharged into a 125 mL amber, Lugol-treated sample container and preserved with approximately 15 mls of Lugol's solution.~~

~~Sample Analysis~~

~~Samples were analyzed for relative abundance of cladocerans and copepods and their mean length. Relative abundance was determined using a Sedgewick-Rafter counting chamber and a compound microscope. Subsamples were analyzed to estimate mean length of the zooplankton using a compound microscope and an ocular equipped with a reticle. Measurements were~~

~~recorded to the nearest 0.2mm. Results were tabulated as the ratio of total cladocerans:total copepeods.~~

Data Interpretation

Due to time constraints in 1998, it was not possible to fully analyze the collected samples of zooplankton but the following provides possibilities for future data interpretation. A subset of lakes sampled by Ecology in 1998 were also surveyed by the Washington State Department of Fish and Wildlife.

Zooplankton mean length data should be compared to fish length-frequency distributions to evaluate whether there is a particular mean zooplankton length that could be used as a pivot indicator of a balanced predator/prey fish population in a given lake (e.g. 1.0 mm is used in some states). An index with a range of mean lengths within given categories may be the most effective use of the zooplankton data. For example, mean zooplankton lengths between 0.9 mm and 1.0 mm may be rated as "fair" for predator/prey populations and mean lengths between 1.0 mm and 1.1 mm may rate "good" and above 1.1 mm rated as "fair," etc. A fair rating or worse could then be used to demonstrate impairment of a beneficial use.

Relative zooplankton abundance data may be correlated with nutrient and Secchi data. It is uncertain at this time whether or not zooplankton abundance is a good indicator of predator/prey balance. However, correlations with traditional water chemistry data and additional fish population data may demonstrate whether or not trophic cascade effects are present in Washington lakes (Brett and Goldman, 1996).

Zooplankton data may also explain differences between total phosphorus concentrations and expected correlated values for chlorophyll *a*/Secchi measurements.

*Appendix B Sampling Protocols for Zooplankton was taken from pages 4-5 of *Water Quality Assessments of Selected Lakes Within Washington State 1998*, Washington State Department of Ecology. December 2000. Publication No. 00-03-039.