STATE OF MAINE

DEPARTMENT OF ENVIRONMENTAL PROTECTION

General Permit
Application of Piscicides for the Control of Invasive Fishes

Maine Pollutant Discharge Elimination System
Maine Waste Discharge License Program

Bureau of Land and Water Quality — September 1 2009
Maine Pollutant Discharge Elimination System (MEPDES) Permit — #MEG180000
Maine Waste Discharge License (WDL) — #W-009045-5Y-A-N

Note: Blue, underlined text within this document signifies hyperlinks to additional informational sources relative to the indicated text. Printed copies of these materials will be maintained by MDIFW.

TABLE OF CONTENTS

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION
AUGUSTA, ME 04333

DEPARTMENT ORDER

IN THE MATTER OF

GENERAL PERMIT		) MAINE POLLUTANT DISCHARGE
PISCICIDES FOR THE CONTROL		) ELIMINATION SYSTEM PERMIT
OF INVASIVE FISHES		)
STATE OF MAINE		) AND
#W-009045-5Y-A-N		) WASTE DISCHARGE LICENSE
#MEG180000	**NEW**	) **APPROVAL**

Pursuant to the provisions of the Federal Water Pollution Control Act, Title 33 USC, Section 1251, et. seq. and Maine law, 38 M.R.S.A. §414-A et seq., and applicable regulations, the Department of Environmental Protection (Department, MEDEP) has considered the issuance of a Maine Pollutant Discharge Elimination System (MEPDES) Permit / Maine Waste Discharge License (WDL) for the **APPLICATION OF PISCICIDES FOR THE CONTROL OF INVASIVE FISHES** (GENERAL PERMIT), with its supportive data, agency review comments, and other related materials on file, and FINDS THE FOLLOWING FACTS:

PERMIT SUMMARY

Pursuant to applicable laws and rules of the State's Maine Pollutant Discharge Elimination System (MEPDES) / Maine Waste Discharge License (WDL) Program, the Department's Bureau of Land and Water Quality, Division of Water Quality Management has developed a general permit for the application (discharge) of piscicides for the control of invasive fishes. This general permit authorizes the Maine Department of Inland Fisheries & Wildlife (MDIFW) and its qualifying agents to directly discharge authorized aquatic piscicides to Class GPA, AA, A, B and C waters of the State, tributaries to Class GPA waters, and those waters having drainage areas of less than ten square miles, that contain populations of invasive fishes.

CONCLUSIONS

Based on the findings in the attached Fact Sheet dated July 21, 2009 and revised September 1, 2009, and subject to the conditions listed in Part I and Part II of this general permit, the Department makes the following conclusions:

1. The discharge, either by itself or in combination with other discharges, will not lower the quality of any classified body of water below such classification.

2. The discharge, either by itself or in combination with other discharges, will not lower the quality of any unclassified body of water below the classification which the Department expects to adopt in accordance with state law.

3. The provisions of the State's antidegradation policy, 38 M.R.S.A. §464(4)(F), will be met, in that:

   (a) Existing in-stream water uses and the level of water quality necessary to protect and maintain those existing uses will be maintained and protected;

   (b) Where high quality waters of the State constitute an outstanding national resource, that water quality will be maintained and protected;

   (c) The standards of classification of the receiving water body are met or, where the standards of classification of the receiving water body are not met, the discharge will not cause or contribute to the failure of the water body to meet the standards of classification;

   (d) Where the actual quality of any classified receiving water body exceeds the minimum standards of the next highest classification that higher water quality will be maintained and protected; and

   (e) Where a discharge will result in lowering the existing water quality of any water body, the Department has made the finding, following opportunity for public participation, that this action is necessary to achieve important economic or social benefits to the State.

4. The discharge will be subject to effluent limitations that require application of best practicable treatment as defined in Maine law, 38 M.R.S.A. §414-A(1)(D).

5. The discharge of authorized aquatic piscicides in accordance with the terms and conditions of this general permit will provide adequate protection of non-target species.

6. The discharge of authorized aquatic piscicides in accordance with the terms and conditions of this general permit will not have a significant adverse effect on receiving water quality or violate the standards of the receiving water's classification.

ACTION

Based on the findings and conclusions as stated above, the Department APPROVES this Maine Pollutant Discharge Elimination System Permit / Maine Waste Discharge License General Permit for the APPLICATION OF PISCICIDES FOR THE CONTROL INVASIVE FISHES to Class GPA, Class AA, A, B, and C waters, tributaries to Class GPA waters, and those waters having drainage areas of less than ten square miles, that contain populations of invasive fishes, SUBJECT TO THE ATTACHED CONDITIONS, including:

1. *"Maine Pollutant Discharge Elimination System Permit Standard Conditions Applicable To All Permits"*, revised July 1, 2002, copy attached.

2. The attached Special Conditions included as Part I of this general permit.

3. The attached Standard Conditions included as Part II of this general permit.

The expiration date of this general permit is five (5) years from the date of signature below.

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

This Order prepared by Robert D. Stratton, BUREAU OF LAND & WATER QUALITY

PART I – SPECIAL CONDITIONS

A. AUTHORITY

A permit is required for the direct or indirect discharge of pollutants to waters of the State pursuant to Maine law, 38 M.R.S.A. §413. The Maine Department of Environmental Protection (Department, MEDEP) may issue a general permit authorizing the discharge of certain pollutants pursuant to Chapter 529 of Department rules. The similarity of discharges for the application of authorized aquatic piscicides for the control of invasive fishes has prompted the Department to issue this general permit for those receiving waters not otherwise prohibited by Maine law and which contain populations of invasive fishes as determined by MDIFW pursuant to 38 MRSA §466, sub-§8-A. A violation of a condition or requirement of a general permit constitutes a violation of the State's water quality laws, and subjects the discharger to penalties under Maine law, 38 M.R.S.A. §349. Nothing in this general permit is intended to limit the Department's authority under the waste discharge and water classification statutes or rules. This general permit does not affect requirements under other applicable Maine statutes and Department rules.

B. SPECIALIZED DEFINITIONS

In addition to the definitions found in Department rule Chapter 520 and in the waste discharge and water classification laws, the following terms have the following meanings when used in this general permit.

1. Authorized Aquatic Piscicide. "Authorized aquatic piscicide" means granular, solid, powder, liquid, or other formulations of piscicides whose sole active ingredients are registered with both the United States Environmental Protection Agency (USEPA) and Maine Board of Pesticides Control (BPC) and are applied in accordance with USEPA approved label use by a licensed applicator to control invasive fishes. Specifically, the formulations that may be used under this permit are those below, or successor formulations with substantially the same constituents. From time to time, formulations may be re-registered or minor modifications, including product names, may be made subject to EPA and Maine BPC registration. If new formulations replace these listed below, the Notice of Intent (NOI) will include those formulations proposed for use, their specifications, and information sufficient to allow the Department to conclude that conditions and safeguards in this permit will be met.
    a. PRENTOX Prenfish Toxicant Liquid E.C. (EPA Reg No. 655-422) (5% rotenone).
    b. PRENTOX Rotenone Fish Toxicant Powder (EPA Reg No. 655-691) (7.4% rotenone).
    c. PRENTOX CFT Legumine™ Fish Toxicant (EPA Reg No. 75338-2). (5% rotenone) (upon registration with Maine BPC)
2. Booster Treatment. "Booster treatment" means one or more piscicide applications which are planned and executed as part of a comprehensive treatment program following an initial application within the same season.
3. Department. "Department" and 'MEDEP" mean the Maine Department of Environmental Protection.

B. SPECIALIZED DEFINITIONS (cont'd)

4. Invasive Fishes. "Invasive fishes" means a fish species considered invasive as determined by MDIFW pursuant to 38 MRSA §466, sub-§8-A. A species may be determined to be invasive for all waters or for specific waters.
5. Licensed Applicator. "Licensed applicator" means a person licensed by the State of Maine Department of Agriculture Board of Pesticides Control to apply aquatic piscicides.
6. MDIFW. "MDIFW" means the Maine Department of Inland Fisheries and Wildlife.
7. Notice of Intent ("NOI"). "Notice of Intent" or "NOI" means a notification of intent to seek coverage under this general permit, submitted by MDIFW to the Department on a form provided by the Department.
8. Notice of Termination ("NOT"). "Notice of Termination" or "NOT" means a notification of intent to end coverage of a piscicide treatment program for a waterbody licensed under this general permit, submitted by MDIFW on a form provided by the Department.
9. Public Water Supplier. "Public water supplier" means water systems which regularly serve 25 or more people per day or which have at least 15 service connections as defined in Chapter 22 M.R.S.A.§ 2601 and 10-144 CMR 231 Section 2 in the State of Maine Rules Relating to Drinking Water.
10. Treatment Area. "Treatment Area" means a defined waterbody containing identified invasive fishes with boundaries extending to identifiable physical obstructions beyond which unaided reestablishment of the invasive fishes is not anticipated by MDIFW. A treatment area typically includes an additional defined secondary effects zone downstream determined through modeling, in which decreasing concentrations of rotenone may be detected but which also provides opportunities for escape, refuge, and/or other means of non-target species protection.
11. Treatment Program. "Treatment Program" means an initial piscicide application and any booster applications within the same season and/or follow-up applications which are planned for subsequent years at rates and intervals specified in an NOI. It may also include the use of other non-chemical methods which will be used in combination with piscicide applications to enhance its efficacy.
12. Waters of the State. "Waters of the State" means any and all surface and subsurface waters that are contained within, flow through, or under or border upon this state or any portion of the state except such waters as are confined and retained completely upon the property of one person and do not drain into or connect with any other waters of the state, as defined at 38 M.R.S.A., §361-A.7.

C. APPLICABILITY AND COVERAGE

Coverage under this general permit is limited to those receiving waters that conform to the Area of Coverage described below and that have had a completed NOI accepted by the Department. Applicability of this general permit is limited to activities described in the NOI that are in conformance with the terms and conditions of this general permit.

C. APPLICABILITY AND COVERAGE (cont'd)

1. **Area of Coverage.** The geographic area covered by this general permit is the entire State of Maine. This general permit covers application of authorized aquatic piscicides by a licensed applicator to fresh waters of the State classified by Maine's water classification laws as Class GPA, Class AA, Class A, Class B, Class C, tributaries to Class GPA waters, and those waters having drainage areas of less than ten square miles, that contain populations of invasive fishes. No waterbody that serves as a Public Water Supply is eligible for coverage under this General Permit.

2 **General Restrictions.** Authorized piscicides may only be used where the hydrology of the receiving waterbody proposed for treatment allows for sufficient contact to prove effective against the target species. Aerial spraying of aquatic piscicides from fixed wing or rotary wing aircraft is not authorized under this general permit. **The Department may deny applications when the Department determines that proposed aquatic piscicide treatments are duplicative or ineffective in controlling the target species or that the methods and materials proposed do not adequately ensure protection of non-target resources or organisms.**

3. **Applicant.** MDIFW shall be the only approved general permit licensee. However, MDIFW may use qualified agents under its direct supervision and control in conducting activities approved by this general permit.

4. **Concentrations and Application Rates.** Maximum application rates and water concentrations shall comply with amounts specified on USEPA registered product labels and as specified in this permit. MDIFW will calculate actual dosages based upon the particular species pursuant to the tables of target concentrations in the Environmental Assessment, target species, site conditions, and other appropriate factors, and shall supply this information with the NOI. MDIFW shall comply with all applicable state laws.

5. **Treatment Plan.** Prior to piscicide application, MDIFW shall develop a treatment plan specifying the treatment program for the infested water body as directed in MDIFW's Rapid Response Plan for Invasive Aquatic Plants, Fish, and Other Fauna, Part 2: Fish and other Fauna Protocol and will retain the treatment plan at the MDIFW office in Augusta, available for inspection.

6. **Application Methods.** MDIFW shall use methods and rates optimal for successful treatment while limiting impacts to non-target resources and organisms. Specific application methods are described in the Fact Sheet. An application will consist of either a whole lake treatment, where the objective is to remove all fish species throughout a defined treatment area, or a spot or area treatment, where the objective is to remove specific populations of fish when concentrated in a limited area of the treatment area.

   MDIFW shall provide details of the proposed treatment program demonstrating accommodations incorporated to ensure protection of non-target resources and organisms such as indicated below. If aquatic piscicide toxicity is anticipated to extend beyond the defined treatment area based on modeling or other predictive tools, MDIFW shall provide a clear demonstration of the significant need to conduct the program as designed as well as measures taken to ensure protection of non-target resources and organisms.

C. APPLICABILITY AND COVERAGE (cont'd)

Table 1. Application Methods for Protecting Non-target Resources and Organisms

Description (provide details for each with NOI)	Indicate
Well defined treatment area with no toxic discharge beyond physical obstructions.	
Well defined treatment area & minimized secondary effects zone with provisions for non-target protection.	
Summer treatment program with provisions for non-target protection..	
Fall/winter treatment program with provisions for non-target protection..	
Physical drawdown of treatment area planned.	
Provisions to treat/recycle/retain treated discharges until nontoxic.	
Limited spot/area treatments based on life histories of target species.	
Protection ensured for non-target resources and organisms by other means.	

D. DISCHARGE CONCENTRATION LIMITS

In conducting an approved invasive fish treatment program, average piscicide concentrations within the treatment area and secondary effects zone shall at no time exceed USEPA approved label rates. Further, to achieve greater protection of non-target resources and organisms while still achieving treatment efficacy, the treatment program shall be designed so that average concentrations of piscicides after dilution and dispersion shall not exceed the following concentrations which are all at or below label rates, as described in the Fact Sheet.

Fish designated by the MDIFW as invasives pursuant to 38 MRSA §466, sub-§8-A may be treated with an authorized piscicide provided that all conditions of this General Permit are met including that at no time shall the average concentration within the treatment area and secondary effects zone exceed the highest specified for the applicable piscicides in Table 2.

Table 2. Maximum permitted piscicide application rates authorized in this general permit.

	PRENTOX Prenfish Toxicant Liquid E.C.	PRENTOX CFT Legumine Fish Toxicant	PRENTOX Rotenone Fish Toxicant Powder
Maximum Permitted Concentration	2.0 mg/L	2.0 mg/L	2.0 mg/L

E. MONITORING

All sampling and analysis must be conducted in accordance with: (a) methods approved by 40 Code of Federal Regulations (CFR) Part 136, (b) alternative methods approved by the Department in accordance with the procedures in 40 CFR Part 136, or (c) as otherwise specified by the Department. Routine water quality samples that are sent out for analysis shall be analyzed by a laboratory certified by the State of Maine's Department of Health and Human Services (DHHS). Monitoring requirements are described in summary below and in further detail in the Fact Sheet and constitute minimum monitoring requirements. **Additional monitoring will be based on waterbody specific and treatment specific conditions and properties and will be**

E. MONITORING (cont'd)

specified in the NOI as needed. MDIFW's monitoring plans shall also consider information received from consultation with the MDIFW Non-game Program, MDIFW Regional Wildlife Biologist, MDOC Natural Areas Program, MDMR Bureau of Sea-Run Fisheries and Habitats, US Fish and Wildlife Service, and US NOAA Fisheries.

To determine the effectiveness of the piscicide treatment program, the need for booster piscicide treatments, and effects on non-target resources and organisms, monitoring efforts shall consist of biological, piscicide, chemical, and physical monitoring and computer modeling for the treatment area and downstream. The following tables provide the types of monitoring in each of these categories, to be indicated by the permittee in the NOI and reviewed and approved by the Department.

Table 3. Proposed monitoring activities within treatment area associated with rotenone treatment of freshwater lake. The permittee shall provide justification for proposed monitoring choices with the NOI.

Monitoring Within the Treatment Area			
Description	Before Treatment	During Treatment	After Treatment
Biological Monitoring -Conduct all surveys indicated unless extenuating circumstances and justification provided			
Treatment area fish survey	X	---	X
Treatment area visual invertebrate survey	X	---	X
Area non-game, threatened or endangered species survey.	X	---	---
PEARL species research	X	---	---
Piscicide Monitoring			
Sentinel fish cages in treatment area (standard, other options must be justified)	---	---	X
Sentinel fish tested offsite with water samples from treatment area using *S. fontinalis* or other MEDEP approved species.	---	---	
Indirect rotenone levels using *C. dubia* or other MEDEP approved species.	---	---	
Direct rotenone levels (not currently available in Maine)	---	---	
Water Quality Monitoring - Conduct all monitoring indicated unless extenuating circumstances and justification provided			
Dissolved oxygen profiles	X	---	X
Water temperature profiles (degrees C)	X	---	X
Secchi Disk transparency	X	---	X
pH	X	---	X
Alkalinity	X	---	X
Phosphorus	X	---	X
Conductivity	X	---	X
Physical Monitoring -drawdown and intermittent outlet conditions only			
Water level	X	X	X
Outlet flow	X	X	X
Computer Modeling of Rotenone Degradation and Dispersal -conduct and provide both models unless extenuating circumstances and justification provided.			
Computer modeling of treatment area	X	---	---
Computer modeling of outlet	X	---	---

E. MONITORING (cont'd)

Table 4. Proposed monitoring activities downstream of treatment area associated with rotenone treatment of freshwater lake. The permittee shall provide justification for proposed monitoring choices with the NOI.

Monitoring Within the Secondary Effects Zone and Downstream of Treatment Area			
Description	Before Treatment	During Treatment	After Treatment
Biological Monitoring -Conduct all surveys indicated unless extenuating circumstances and justification provided			
Secondary effects zone and downstream fish composition using IFW Stream Survey Protocol Level 1, Level 2 or Level 3	X	---	X
Secondary effects zone and downstream habitat composition		---	
Secondary effects zone and downstream visual invertebrate survey	X	---	X
Area non-game, threatened or endangered species survey.	X	---	---
PEARL species research	X	---	---
Piscicide Monitoring			
Sentinel fish cages in secondary effects zone and downstream area(s) (standard, other options must be justified)	---	---	X
Sentinel fish tested offsite with water samples from downstream area using *S. fontinalis* or other MEDEP approved species.	---	---	
Indirect rotenone levels using *C. dubia* or other MEDEP approved species.	---	---	
Direct rotenone levels (not currently available in Maine)	---	---	
Water Quality Monitoring -Conduct all monitoring indicated unless extenuating circumstances and justification provided			
Dissolved oxygen profiles	X	---	X
Water temperature profiles (degrees C)	X	---	X
Secchi Disk transparency	X	---	X
pH	X	---	X
Alkalinity	X	---	X
Phosphorus	X	---	X
Conductivity	X	---	X
Physical Monitoring -drawdown and intermittent outlet conditions only			
Water level	X	X	X
Outlet flow	X	X	X
Computer Modeling for Rotenone Degradation and Dispersal -conduct and provide both models unless extenuating circumstances and justification provided.			
Computer modeling of treatment area	X	---	---
Computer modeling of secondary effects zone and downstream areas.	X	---	---

E. MONITORING (cont'd)

1. **Biological Monitoring.** Aquatic community monitoring shall be conducted as follows:

   a. **Treatment Area**. MDIFW will monitor the fish populations within the treatment area at least once before each initial annual treatment and within one year after the treatment program ends to evaluate treatment efficacy and effects on non-target fish species.

   b. **Downstream Areas**. For treatment with outflow during the period when the piscicide is active within the treatment area, MDIFW shall monitor fish populations in one representative area within the secondary effects zone and one representative area further downstream below the outlet once before treatment and within one year after the treatment program ends.

      Treatment area and downstream fish monitoring shall be conducted during the field season and at a time chosen to be representative of normal conditions. Monitoring methods shall consist of visual shoreline surveys followed by one or more of the following: angler surveys, seine, gillnet, minnow trap, electrofishing, or other appropriate methods. MDIFW shall record fishes found by scientific name and report any evidence of negative effects of the treatment program on those fishes to the Department.

   c. **Non-Target Fauna.** MDIFW will consult with HMAP and the MDIFW Reptile, Amphibian, and Invertebrate Group Leader before filing a general permit NOI to determine the presence, composition, and relative abundance of any known non-target fauna in the treatment area and outlet areas. MDIFW will also conduct visual observations in the treatment area, secondary effects zone, and further downstream throughout the treatment program for treatment-related effects on macroinvertebrates, fish, and other aquatic organisms. MDIFW shall report the occurrence and significance of any adverse findings within 24-hours. MDIFW and the Department shall evaluate the occurrence and determine an appropriate course of action. MDIFW shall also report observations on recovery of non-target faunal communities after treatment.

2. **Piscicide Concentration Monitoring.** Unless otherwise designated and adequately justified in the NOI, piscicide sampling will be conducted through sentinel fish testing. The permittee shall conduct monitoring within the treatment area once within 30-hours of each initial annual treatment to determine the concentration (mg/L) of rotenone at the time of treatment, at the time of testing, and the necessity of additional (booster) treatments. A minimum of three grab samples shall be collected for water column profile analysis from the surface to the bottom. Analyses shall be conducted using bioassay methods described in Demong (1992) using a minimum of three 3-6-inch long live brook trout per profile depth, with trout responses used to calculate rotenone concentrations. Results shall be reported to the Department in writing pursuant to Permit Special Condition F. Under unusual conditions and Department approval, sentinel cages may be proposed to be replaced with collection of treated water and laboratory sentinel fish (*Salvelinus fontinalis*) testing or testing on

E. MONITORING (cont'd)

Ceriodaphnia dubia according to standard toxicity testing methods, proper sample handling requirements, etc. The monitoring location shall be specified on a map submitted with the NOI. When ambient conditions do not favor brook trout health and survival, MDIFW may propose indigenous sentinel species instead. MDIFW computer models of rotenone dilution and decomposition can be used to predict treatment times and detoxification rates, subject to Department approval. Sentinel cage testing must be used to determine the toxicity of discharge water and effects on non-target resources and organisms.

a. Summer treatments: During summer treatments, rotenone degradation in surface waters occurs more rapidly, typically less than seven days at 70 degrees F. MDIFW will monitor rotenone levels in a treatment area with sentinel cages. **Summer treatments are preferred by the Department when feasible based on the developmental stage of target species, because of more rapid rotenone decomposition and a greater ability to protect non-target resources and organisms**.

b. Fall/winter treatments: During fall and winter treatments, rotenone degradation occurs more slowly, typically between three and twelve weeks depending on water conditions such as temperature, depth, organic matter and light intensity. MDIFW anticipates detoxification during the spring snow melt and turnover at the latest. Sentinel cages will be used to determine when the lake is safe to restock. **Fall and winter treatments will only be considered when there are no other practical alternatives and when it can be clearly demonstrated and verified by sentinel cage testing and other available methods that non-target resources and organisms will be protected to the extend possible and not unreasonably adversely impacted.**

c. Downstream Monitoring. Secondary effects zone and downstream monitoring is required when a whole lake treatment is performed and there is anticipated to be outflow during the time of effective piscicide concentrations within the treatment area. The permittee shall conduct residual rotenone toxicity testing within the secondary effects zone and in proximity to the downstream boundary of the secondary effects zone immediately upon occurrence of post-treatment outlet flow. This analysis shall utilize 48-hour toxicity tests on five live brook trout placed in sentinel cages and timed so that completion of the test shall occur no less than 48-hours before outlet flow. When ambient conditions do not favor brook trout health and survival, MDIFW may propose indigenous sentinel species instead. Analyses shall be repeated at one-week intervals until tests indicate 100% survival of the sentinel fish, regardless of the status of outlet flow. Results shall be reported to the Department in writing pursuant to Permit Special Condition F. The sampling location will be designated on a map submitted with the NOI and will be representative of downstream conditions. Additional downstream sentinel locations may be required to demonstrate protection of sensitive non-target resources and organisms.

E. MONITORING (cont'd)

Requirements for secondary effects zone and downstream monitoring for spot or area treatment shall be based on the dilution within the receiving water and whether the discharge is anticipated to result in the release of detectable piscicide concentrations downstream. This determination shall be made by the Department based on the extent of spot or area treatments proposed.

d. Duration of Piscicide Monitoring. MDIFW will monitor piscicide levels in the treatment area to determine when the water is sufficiently nontoxic to restock with fishes and will monitor piscicide levels within the secondary effects zone and further downstream to demonstrate that non-target resources and organisms within are protected. Monitoring will be conducted until it is clearly demonstrated that the discharge is non-toxic to non-target resources and organisms.

3. Water Quality Monitoring. MDIFW will sample lake water quality at least twice per field season, separated by approximately 60-days (i.e. spring/summer and fall) timed to entail pre and post-treatment during years in which treatment occurs, for the following parameters: dissolved oxygen profiles (mg/L), temperature profiles (degrees C), Secchi disk transparency (m/ft), pH (s.u., at surface and within 1-meter of bottom), alkalinity (mg/L $CaCO_3$, at surface and within 1-meter of bottom), total phosphorous (mg/L), and conductivity (umhos/cm). Monitoring shall conform to the Department's Standard Field Methods for Lake Water Quality Monitoring and shall be reported to the Department in writing pursuant to Permit Special Condition F.

4. Physical Monitoring. For treatment programs involving a drawdown and for those with intermittent outlet conditions, MDIFW will propose a frequency for, and conduct, physical monitoring based on site specific hydrologic factors, with a minimum frequency consisting of once per month during the active period for the piscicide.

5. Computer Modeling. MDIFW will conduct and provide results of computer modeling predictions of rotenone degradation and dispersal in treatment areas and downstream areas.

F. REPORTING

MDIFW shall conduct monitoring programs as described in Part I- Special Conditions. MDIFW shall report monitoring results to the Department as follows:

Piscicide concentration monitoring results shall be reported on a quarterly basis, with the results of monitoring conducted from January through June each year (2 quarters) reported to the Department on or before July 15; the results of monitoring conducted from July through September each year reported on or before October 15; and the results of monitoring conducted from October through December reported on or before January 15.

Biological, water quality, and physical monitoring results for each calendar year in which treatments occur shall be reported on an annual basis in a report to the Department submitted on or before January 15 of the following year.

F. REPORTING (cont'd)

Computer modeling results shall be provided with the NOI and immediately upon discovery that modeling predictions have changed from previously submitted model results.

A signed copy of all reports required herein shall be submitted to the Department's assigned compliance inspector (unless otherwise specified) at the appropriate DEP regional office (Portland, Augusta, Bangor, Presque Isle), to be assigned upon approval of the NOI, based on the location of the treatment program.

G. NOTIFICATION AND ACCEPTANCE

1. **NOI Required.** MDIFW shall submit a completed **Notice of Intent (NOI)** with the appropriate initial permit fee to the Department for review and approval. NOI forms may be obtained from, and completed forms must be sent or hand delivered to:

   Department of Environmental Protection
   Bureau of Land and Water Quality
   Division of Water Quality Management, Permitting Section
   17 State House Station, Augusta, ME 04333-0017

   The Department reserves the right to request additional information from MDIFW as necessary to determine if the application of authorized aquatic piscicides is warranted and justified.

2. **Required NOI Information.** A complete NOI must contain the following information for each individual piscicide treatment program the applicant proposes to conduct.

   a. The legal name, mailing address and telephone number (e-mail address optional) and signature of MDIFW staff member responsible for the invasive fishes control project.

   b. The legal name, mailing address, telephone number (e-mail address optional) and affiliation of any agents assisting, in full or in part, with the application of piscicides acting as agents of the MDIFW.

   c. The legal name, mailing address, telephone number and Maine Board of Pesticides Control license number (e-mail address optional) of the licensed applicator to perform the aquatic piscicide treatment.

   d. A statement demonstrating a significant need to control the invasive species and why application of the authorized aquatic piscicides is the most effective means of fish control. The statement must provide reasonable justification for the proposed treatment. Significant need to control the target species includes, but is not limited to:

      1. demonstration that a target population of aquatic fishes cannot be controlled by non-chemical means;

      2. the potential for the invasive fish populations to spread rapidly;

      3. any significant disruption of aquatic habitat caused by the invasive species;

G. NOTIFICATION AND ACCEPTANCE (cont'd)

4. if treatment is required to enable a broader scale fish control project under an aquatic fish management plan;
5. if treatment is needed to restore habitat and/or that failure to rapidly control the invasive species threatens to result in significant environmental harm to this or other natural resources.

e. Justification for the project discussing why piscicide use is proposed over other treatment options which were considered, attempted, or are being used secondarily. Include a statement as to whether the proposed waterbody has been treated with aquatic piscicides in the past, and if so, dates, amounts, and identification of the aquatic piscicide(s) applied.

f. A statement whether the proposed aquatic piscicide application(s) will be performed:
   1. as a rapid response project requiring immediate action to contain a newly identified invasive fish population, and why the response is necessary;
   2. in conjunction with a specific written management plan for the receiving water and including a reference to that plan; or
   3. pursuant to other resource management tools or objectives, details provided.

g. A detailed project timeline describing proposed before, during, and after treatment data collection and monitoring.

h. A topographic or similar type map, or copy thereof, extending approximately one mile beyond the proposed treatment site and specific detailed written directions to the proposed treatment site. The extent of the defined treatment area and secondary effects zone shall be indicated.

i. A map of the waterbody to be treated showing monitoring location(s) and the area(s) to be treated if spot treatments are proposed. The extent of the defined treatment area and secondary effects zone shall be indicated.

j. A description of each area to be treated, including, but not limited to, range of depths, average depth, substrate character (sand, gravel, mud/organic, etc), identification of any intermittent or permanent inlets to or outlets from the waterbody, presence or absence and characterization of non-target fish species within the waterbody, and any physical aspects of the site(s) to be treated that affect operations. The estimated size of the area(s) to be treated reported in square meters or acres. The estimated volume(s) to be treated reported in cubic meters or acre-feet.

k. The USEPA registration number, formulation, concentration, maximum application rate, and frequency of application for all authorized aquatic piscicides proposed for use.

l. Project modifications for protection of non-target resources and organisms. The treatment area must be defined in terms of the presence of identified invasive fishes, with the boundaries extending to identifiable physical obstructions beyond which unaided reestablishment of the invasive fishes is not anticipated. The piscicide treatment program shall be designed to limit toxic piscicide discharges

G. NOTIFICATION AND ACCEPTANCE (cont'd)

to within the defined treatment area or shall adequately demonstrate to the Department's satisfaction, project modifications that otherwise ensure protection of non-target resources and organisms. MDIFW shall provide information on the extent of any secondary effects zone and opportunities for escape, refuge, etc.

m. Selection of the appropriate biological monitoring regime for the effects of the piscicide(s) on aquatic communities, including non-target species, pursuant to Part I – Special Conditions of this general permit. Monitoring shall be sufficient to evaluate the community of fishes as to species present and relative abundances before and after the treatment program. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

n. Selection of the appropriate piscicide monitoring regime for the piscicide used and type of treatment pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

o. Selection of the appropriate water quality monitoring regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

p. Selection of the appropriate physical monitoring regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

q. Selection of the appropriate computer modeling regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

r. Submit a statement that the MDIFW Non-Game Program, MDIFW Regional Wildlife Biologist, Maine Department of Conservation-Natural Areas Program, Maine Department of Marine Resource-Bureau of Sea-Run Fisheries and Habitats, USFWS, and US NOAA Fisheries (for projects affecting estuarine or marine habitats) have received notice of the proposed treatment and have responded that no elements of special concern for rare, threatened, or endangered species or natural communities are known in the affected area or that the treatment as proposed is considered to not significantly threaten the species or natural communities in question.

s. A statement demonstrating notification of abutting landowners to all affected resources (efforts to notify when unsuccessful), lake associations / watershed associations, and the municipality, counties and/ or LURC Regional Offices.

t. A copy of the press release or advertisement publication, date, and name of newspaper with general circulation in the area of the proposed treatment program.

u. Signatures of the MDIFW Division Contact and Managing Agent certifying that the NOI were prepared with direct supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Failure to submit all required NOI information may result in finding the NOI incomplete for processing and may delay processing or result in denial of the NOI.

G. NOTIFICATION AND ACCEPTANCE (cont'd)

3. Public Informational Meeting, Filing of a NOI, Public Notice Required. Prior to submitting a NOI for an invasive fish control project under this General Permit, MDIFW must hold a public informational meeting in the vicinity of the treatment area or, if the treatment area is extremely remote, in a location convenient to most abutting landowners to all affected resources. The purpose of the meeting is for MDIFW to inform the public of the project and its anticipated environmental impacts, and to educate the public about the opportunities for public comment to the Department during the application process. At least 10 days prior to the public informational meeting, notice of the meeting must be mailed to abutting landowners to all affected resources, the civil jurisdiction (for example, municipal office or in LURC jurisdiction, the LURC regional office and County Commissioners' office) in which the treatment will be located, and any affected lake associations / watershed associations. Notice of the meeting must also be published once in a newspaper of general circulation in the project area. MDIFW shall compile a record of all attendees, comments received, and resulting actions.

A copy of the NOI must be filed with each civil jurisdiction in which the treatment will be located, and with the MDIFW Non-Game Program, MDIFW Regional Wildlife Biologist, MDOC Natural Areas Program, MDMR Bureau of Sea-Run Fisheries and Habitats, USFWS, US NOAA Fisheries (for projects affecting estuarine or marine habitats), and lake associations / watershed associations in proximity to the treatment area, at the time it is submitted to the Department. Further, notice that MDIFW is applying to conduct the proposed project must be provided to abutting landowners to all affected resources. A press release must be issued or an advertisement must be published in a newspaper having general circulation in the area of the treatment program within the 30-day period prior to submittal of the NOI to the Department. Information to be provided in the press release or advertisement will include treatment purpose, treatment methods and materials, treatment location, date, and duration, how to get more information, and any applicable cautionary notes regarding human water consumption, water contact, livestock use, and irrigation. Note, **no waterbody that serves as a public water supply is eligible for coverage under this general permit**.

In addition, the treatment area(s) will be posted at likely access points with information about the treatment including advisories against swimming, drinking, and eating dead fish. **All known public access points to areas affected by the treatment must be closed during the period in which the authorized piscicide is active**.

4. Review of NOI and Other Information. Upon review of a NOI for determination of coverage under this general permit, the Department may, at its discretion, require an applicant to apply for an individual permit for any proposed treatment. In making such a determination, the Department may consider factors including, but not limited to, the location of the waterbody and water quality issues particular to that area, expressed comments from state or federal agencies or the general public, consideration of invasive fish control strategies in or surrounding the proposed treatment sites, and potential effects on non-target resources and organisms.

G. NOTIFICATION AND ACCEPTANCE (cont'd)

5. **Effective Date of Coverage.** The Department shall notify an applicant of coverage under this general permit within 30 days of receipt of each complete NOI as to whether or not coverage for the specific discharge is permitted. If the Department does not notify the applicant within 30 days, the NOI is accepted and coverage is granted. In the event coverage is not granted, the Department shall notify the applicant of the reason(s) for not granting coverage. MDIFW may apply for issuance of an individual waste discharge license if the proposed discharge(s) is not acceptable for coverage under this general permit.

   Pursuant to the Department's administrative Rule Concerning the Processing of Applications and other Administrative Matters (06-096, Chapter 2, section 24.B.1), "(w)*ithin 30 days of the filing of a license decision by the Commissioner with the Board* (of Environmental Protection), *an aggrieved person may appeal to the Board for review of the Commissioner's decision*." The Department notes that a permittee has the legal authority to proceed with an approved project upon approval by the Commissioner and subject to any conditions established. However, the Department advises that **if MDIFW proceeds with an approved project prior to the end of the 30-day appeal period, it assumes all risks and responsibilities in the event that the Commissioner's decision is overturned or modified on appeal.**

6. **Changed Conditions.** In the event that MDIFW proposes to make significant changes in the nature or scope of the aquatic piscicide treatment(s) described in a NOI previously submitted and approved, MDIFW shall notify the Department as soon as becoming aware of and before implementing such changes. Based on its evaluation of proposed changes, the Department may require the submission of a new NOI or application for an individual waste discharge license. Significant changes include, but are not limited to, changes in the extent of the waterbody or areas to be treated, changes in the hydrology in and surrounding the treatment area, changes in methods or materials used, changes in facts or information described in the NOI previously submitted and approved, or changes in anticipated impacts to non-target resources or organisms.

7. **Notice of Termination (NOT)**. The permittee holding approval to discharge pursuant to this general permit may submit a Notice of Termination (NOT) on a form provided by the Department at any time to voluntarily terminate coverage. Authorization to discharge under this general permit terminates on the day the signed NOT is received by the Department.

H. CONTINUING COVERAGE AND TERMINATION

1. **Notices By Applicant and Payment of Annual Fees.** The term of this general permit is five years, and coverage for an individual project under this general permit lasts for a period of 12 months from the date the NOI is approved by the Department or though the expiration date of this general permit, which ever period is shorter. MDIFW may continue project coverage under this general permit from one year to the next, contingent upon compliance with the terms and conditions of the general permit, payment of an annual fee pursuant to 38 M.R.S.A. §353-B, demonstration of

H. CONTINUING COVERAGE AND TERMINATION (cont'd)

a continuing significant need to control the target species and provided there are no significant changes in the discharge as described in the NOI. **A statement demonstrating a significant need to control the target species and coordination with a management strategy must accompany MDIFW's annual fee for continuing coverage.** The demonstration of significant need shall also be sent to the MDIFW Non-Game Program, MDIFW Regional Wildlife Biologist, MDOC Natural Areas Program, MDMR Bureau of Sea-Run Fisheries and Habitats, USFWS, US NOAA Fisheries (for projects affecting estuarine or marine habitats), abutting landowners to all affected resources (describe efforts to notify when unsuccessful), and affected lake associations / watershed associations. Failure to pay the annual fee within 30 days of the anniversary date of previous NOI coverage is sufficient grounds for revocation or suspension of coverage. If changes occur or are proposed, MDIFW shall notify the Department as specified in Part I.G.6 of this general permit.

2. Individual Permit Coverage. The Department may require that MDIFW apply for an individual permit to apply aquatic piscicides for the following reasons:

a. The aquatic piscicide application project is not in compliance with the conditions of this general permit.

b. The aquatic piscicide application project is a significant contributor of pollutants. In making this determination, the Department may consider the following factors:

1. the location of the project with respect to waters of the State;

2. the size of the discharge;

3. the quantity and nature of the pollutants discharged to waters of the State; or

c. The project as proposed is determined to present significant adverse impacts on non-target resources and/or organisms.

d. Any other factors the Department determines are relevant, including information pursuant to Part I, §3 and §5, and pursuant to Department Rules, Chapter 529.

3. Exclusion from Coverage. When an individual MEPDES Permit / Maine WDL is issued to MDIFW, the applicability of this general permit to MDIFW for that project is automatically terminated on the effective date of the individual Permit/WDL.

PART II – STANDARD CONDITIONS

The application of authorized aquatic piscicides for invasive fish control under this general permit must, at all times, comply with the State's water quality laws, including, the following restrictions, limitations and conditions.

A. NARRATIVE EFFLUENT LIMITATIONS.

This permit is subject to the following conditions outside of the defined treatment area and a minimized secondary effects zone:

1 The discharge shall not contain a visible oil sheen, foam or floating solids at any time which would impair the usages designated by the classification of the receiving waters.
2. The discharge shall not contain materials in concentrations or combinations which pose unacceptable risks to non-target species or resources or which would impair the usages designated by the classification of the receiving waters.
3. The discharge may not impart color, taste, turbidity, radioactivity, settleable materials, floating substances or other properties that cause the receiving water to be unsuitable for the designated uses ascribed to its classification.
4. Notwithstanding specific conditions of this general permit, the discharge must not lower the quality of any classified body of water below such classification, or lower the existing quality of any body of water if the existing quality is higher than the classification.

B. MONITORING REQUIREMENT

The Department may require, following approval of a NOI, any monitoring of an individual discharge in addition to the standard protocols contained in this permit as may be reasonably necessary in order to characterize the nature, volume or other attributes of that discharge or its sources.

C. OTHER INFORMATION

When MDIFW becomes aware that it has failed to submit any relevant facts or submitted incorrect information in the NOI or in any other report to the Department, MDIFW shall promptly submit such facts or information.

D. OTHER APPLICABLE CONDITIONS

The conditions applicable to all permits in Department rule Chapter 523 sections 2 and 3 also apply to discharges pursuant to this general permit and are incorporated herein as if fully set forth.

E. ACCESSIBILITY

Employees and agents of the Department may enter any property at reasonable hours in order to determine compliance with water quality laws or this general permit.

F. SEVERABILITY

In the event that any provision or part thereof, of this general permit is declared to be unlawful by a reviewing court, the remainder of the permit shall remain in full force and effect, and shall be construed and enforced in all respects as if such unlawful provision, or part thereof, had been omitted, unless otherwise ordered by the court.

PART III – FACT SHEET

Application of Piscicides for the Control of Invasive Fishes

Maine Pollutant Discharge Elimination System
Maine Waste Discharge License Program

DATE: July 21, 2009
REVISED: September 1, 2009

MEPDES Permit: **#MEG180000**
Maine WDL: **#W-009045-5Y-A-N**

Note: Blue, underlined text within this document signifies hyperlinks to additional informational sources relative to the indicated text. Printed copies of these materials will be maintained by MDIFW.

A. AREA OF COVERAGE AND RECEIVING WATER CLASSIFICATION

The area of coverage under this general permit is the entire state of Maine. This general permit covers the direct discharge of authorized aquatic piscicides, as defined in Part I.B.1. of the general permit, to fresh waters classified by Maine law as Class GPA, AA, A, B, C, tributaries to Class GPA waters, and those waters having drainage areas of less than ten square miles, that contain populations of invasive fishes. No waterbody that serves as a public water supply is eligible for coverage under this general permit.

B. APPLICATION SUMMARY

The Maine Department of Environmental Protection (Department, MEDEP) has issued this general permit authorizing direct discharges of aquatic piscicides by the Maine Department of Inland Fisheries and Wildlife (MDIFW) and its qualifying agents to certain waters of the State. MDIFW shall file a separate Notice of Intent (NOI) for each individual piscicide treatment program. A copy of the NOI must also be sent to the civil jurisdiction in which the treatment program will be located; to the MDIFW Non-Game Program, MDIFW Regional Wildlife Biologist, MDOC Natural Areas Program, MDMR Bureau of Sea-Run Fisheries and Habitats, US Fish and Wildlife Service, US NOAA Fisheries (for projects affecting estuarine or marine habitats), and lake associations /watershed associations in proximity to the treatment area. Further, notice of the proposed project must be provided to abutting landowners to all affected resources. Coverage under this general permit is dependent upon the ability to meet the eligibility, and the special, standard, and general conditions of the general permit. Continuing coverage is contingent upon compliance with the terms and conditions of the general permit, payment of an annual fee, demonstration of a continuing significant need to control the target species, and provided there are no significant changes in the discharge as described in the NOI. Coverage for MDIFW or the waterbody may be terminated in the event of non-compliance with the terms and conditions of the general permit or based on a Department determination that the discharge is having an unreasonable adverse impact on receiving water quality, non-target resources or organisms. MDIFW may apply for an individual Maine Pollutant Discharge Elimination System (MEPDES) Permit / Maine Waste Discharge License (WDL) for waterbodies or activities that are not covered by this general permit.

C. REGULATORY SUMMARY

A permit is required for the discharge of aquatic piscicides pursuant to Maine law,

38 M.R.S.A. §413(1) and Department rule, Chapter 514. A general permit authorizing the discharge of certain pollutants may be issued pursuant to Department rule Chapter 529. The similarity of discharges resulting from the application of authorized aquatic piscicides for the control of invasive fishes prompted the Department to issue this general permit for those receiving waters not otherwise prohibited by Maine law and that contain population(s) of invasive fishes.

A violation of a condition or requirement of a general permit constitutes a violation of the State's water quality laws, and subjects the discharger to penalties under Maine law, 38 M.R.S.A. §349.

C. REGULATORY SUMMARY (cont'd)

Pursuant to Maine law, 22 M.R.S.A. §1471-A, the Maine Board of Pesticides Control within the Maine Department of Agriculture, Food and Rural Resources regulates the sale and application of chemical insecticides, fungicides, piscicides and other chemical pesticides. Maine law, 22 M.R.S.A. §1471-D requires certification of commercial and private applicators for the use of any piscicide within the State.

On January 12, 2001, the MEDEP received authorization from the U.S. Environmental Protection Agency (USEPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program in Maine, excluding areas of special interest to Maine Indian Tribes. On October 30, 2003, after consultation with the U.S. Department of Justice, USEPA extended Maine's NPDES program delegation to all but tribally owned discharges. That decision was subsequently appealed. On August 8, 2007, a panel of the U.S. 1st Circuit Court of Appeals ruled that Maine's environmental regulatory jurisdiction applies uniformly throughout the State.

On November 27, 2007, the USEPA issued a final rule stating that pesticides applied in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) were exempt from the federal Clean Water Act's NPDES permitting requirements. The USEPA's determination specifically referenced the application of pesticides directly to waters of the United States in order to control pests that are present in those waters. On January 7, 2009, the US 6th Circuit Court of Appeals (*National Cotton Council, et al. v. EPA*) vacated USEPA's 2007 rule. On June 8, 2009, the 6th Circuit granted a two year stay of its mandate that USEPA issue NPDES permits for the pesticide discharges described. USEPA sought the stay to provide time to develop a suitable permit program for state and tribal areas that do not have delegated permit authority.

It is noted that Maine law, 38 MRSA, Section 413, *Waste discharge licenses*, and MEDEP rule 06-096 CMR Chapter 514, Regulations Concerning the Use of Aquatic Pesticides, already provide MEDEP with the authority to regulate such discharges. Therefore, this General Permit is being issued pursuant to the Maine Pollutant Discharge Elimination System (MEPDES) permit and Maine Waste Discharge License (WDL) program and Maine's delegated permit authority.

Nothing in this general permit is intended to limit the Department's authority under the waste discharge and water classification statutes or rules. This general permit does not affect requirements under other applicable Maine statutes and Department rules.

D. PROJECT AUTHORITY AND NEED

MDIFW was established by the Maine Legislature "*to preserve, protect and enhance the inland fisheries and wildlife resources of the State*" and as such to develop policies and programs for the management of Maine's inland fisheries. The State of Maine Action Plan for Managing Invasive Species charges MDIFW as being responsible for coordinating the State's efforts to prevent, limit the spread, and reduce the harmful effects of invasive fish species; and for preventing, controlling, and managing invasive aquatic fish populations. Invasive fishes are determined by

D PROJECT AUTHORITY AND NEED (cont'd)

MDIFW pursuant to 38 MRSA §466, sub-§8-A. A species may be determined to be invasive for all waters or for specific waters. Invasive fish species includes, but is not limited to:

common carp *Cyprinus carpio* Linnaeus, 1758

goldfish *Carassius auratus* Linnaeus, 1758

northern pike *Esox lucius* Linnaeus, 1758

rainbow smelt *Osmerus mordax* Mitchill, 1814

smallmouth bass *Micropterus dolomieu* Lacepède, 1802

white sucker *Catostomus commersonii* Lacepède, 1802

Maine law includes narrative water quality criteria for each of the water classes covered by this general permit. The criteria describe the water quality values, habitat values, and designated uses that must be maintained for each of these water classes. Invasive aquatic species are fishes that threaten the animal or vegetational composition and diversity, habitat structure and suitability, values and uses of Maine waters. This general permit is intended as a tool to facilitate the MDIFW's mandates on invasive species and protection of Maine waters.

The aggressive tendencies and significant adverse effects of certain fishes on Maine's environment have caused those fishes to be classified as invasive fish species. This general permit may be used to control an established population of invasive fish species so that other non-chemical techniques can be used, or used to depopulate a waterbody so that native fish assemblages can be re-established. In 2006 Commissioners of the MEDEP and MDIFW approved a statewide Rapid Response Plan for responding to new infestations of invasive fish species and for dealing with invasive faunal introductions. This general permit addresses only invasive fish species but it is a critical part of the both MDIFW's abilities to carry out their legislative charge and the directives in the Rapid Response Plan.

In recent years the Department has issued two individual Maine Waste Discharge Licenses to MDIFW for invasive fish control projects. In 2006, Maine WDLs were issued for Big Speck Pond in Norway (#W-008231-5U-A-N/#MEU508231) for eradication of introduced chain pickerel and golden shiners and restocking with brook trout and for Nadeau Lake in Fort Fairfield (#W-008235-5U-A-N/#MEU508235) for eradication of introduced smallmouth bass, fathead minnow, and brown bullhead and restocking with brook trout. In both of these waters, the programs involved eradication of introduced fish species, restocking with native brook trout, and in the case of Nadeau Lake it also involved extensive restoration of a resource damaged by years of human alterations. These projects were successful, but required a significantly longer time to license than is desirable under a Rapid Response action. This General Permit will provide for the same level of environmental protection under a more expedited review period.

E. ADMINISTRATIVE REQUIREMENTS

The administrative procedures and requirements associated with this general permit are based on the following Department rules (CMR 06-096): Chapter 2, *Rules Concerning the Processing of Applications and Other Administrative Matters*; Chapter 514, *Regulations Concerning the Use of Aquatic Piscicides*; Chapter 529, *General Permits for Certain Wastewater Discharges*, and applicable Maine laws. In seeking coverage under this general permit, MDIFW must file a Notice of Intent (NOI) containing sufficient information and facts to describe all proposed aquatic piscicide treatments and waterbodies, so as to allow the Department to determine if the proposed activities are anticipated to comply with the general permit terms and conditions. Prior to submittal of a NOI, MDIFW must hold a public informational meeting to inform the public of the project and its anticipated environmental impacts, and to educate the public about the opportunities for public comment to the Department during the application process. Once a completed NOI is received, the Department has a maximum of 30 calendar days in which to act on it. If no other action is taken within that 30-day period, the NOI is considered approved at the close of business (5:00 p.m. Eastern Time Zone) on the thirtieth day following the Department's receipt of the NOI. A copy of the NOI must be also filed with other agencies and public notice provided as detailed in general permit Part 1.G.3.

Pursuant to Chapter 2, section 24.B.1, "(w)*ithin 30 days of the filing of a license decision by the Commissioner with the Board* (of Environmental Protection)*, an aggrieved person may appeal to the Board for review of the Commissioner's decision.*" The Department notes that a permittee has the legal authority to proceed with an approved project upon approval by the Commissioner and subject to any conditions established. However, the Department advises that if MDIFW proceeds with an approved project prior to the end of the 30-day appeal period, it assumes all risks and responsibilities in the event that the Commissioner's decision is overturned or modified on appeal

This general permit is valid for a five-year term, and coverage under an approved NOI lasts for a period of 12 months from the date the NOI is approved by the Department, or through the expiration date of this permit, whichever period is shorter. MDIFW may continue coverage under this general permit from one year to the next, contingent upon compliance with the terms and conditions of the general permit, payment of an annual fee pursuant to 38 M.R.S.A. §353-B, demonstration of a continuing significant need to control the target species, and provided there are no significant changes in the discharge as described in the NOI. In the event that any individual aquatic piscicide application project is not in compliance with this general permit or upon determination by the Department that the discharge is having an unreasonable adverse impact on receiving water quality, non-target resources or organisms, the Department may require that MDIFW apply for an individual MEPDES Permit / Maine WDL or cease discharge. Examples of significant changes in activities include, but are not limited to, changes in the extent of the waterbody or areas to be treated, the hydrology in and surrounding the treatment area, methods or materials used, facts or information previously submitted and approved, or changes in anticipated impacts to non-target resources or organisms.

F. DESCRIPTION OF AUTHORIZED ACTIVITIES

This general permit authorizes the discharge (application) of authorized aquatic piscicides as defined in general permit Part I.B.1 that are registered with both the USEPA and the Maine Board of Pesticides Control and are applied in accordance with USEPA approved label use to control the existence of invasive fishes. This general permit requires the use of an appropriately certified applicator that has been licensed by the Maine Board of Pesticides Control for applications of the authorized aquatic piscicides to waters of the State. Authorized aquatic piscicides should be applied at the lowest appropriate labeled rates whenever possible (for example, when they can be applied during the most sensitive life stages of the target species or in specific areas so as to minimize non-target damage).

This general permit authorizes applications of certain piscicides to those waterbodies specified in Section A of this Fact Sheet to control invasive fishes. This general permit is not intended to control or eradicate any aquatic fish species other than those specifically listed in this permit as invasive fishes or as determined pursuant to 38 MRSA §466, sub-§8-A. It is noted, however, that certain waterbodies may contain several species of non-target fishes susceptible to the effects of the authorized aquatic piscicides. To the greatest extent possible, applications of piscicides under this general permit will be conducted to minimize impacts to non-target species, especially outside of the defined treatment area. This may be done by a number of means, including the use of the most selective formulation allowed by this permit, using the lowest effective dose or duration of exposure of piscicides to achieve efficacy, differentially dosing areas of waterbodies to areally target species of concern, lowering the water level in the treatment area to provide for additional time for piscicide degradation, altering the timing of piscicide use, and other methods including, but not limited to, those described in Permit Special Condition C, Table 1.

G. CONCENTRATIONS OF AUTHORIZED AQUATIC PISCICIDES

Typical rates of use along with highest rates allowed in this permit are specified below. Typical concentrations were derived from literature on field studies and interviews with fish control experts. Some of this is summarized by species in the Rapid Response Plan (DEP 2006), which was developed after significant review of available information by DEP staff and contractors. In all cases, the permitted rate is at or below the maximum USEPA approved label rate, and in most cases, the treatment concentration will be chosen in consultation with treatment professionals.

Since field conditions, the species involved, time of year, and hydrology, among other factors, will vary between treatments, the maximum permitted rate was chosen to allow some flexibility in specifying individual treatments. In all cases, the minimum effective concentrations and times will be used to minimize damage to non-target populations. However, the actual concentrations chosen need to be adequate to achieve significant control of the target species. Failure to do this may defeat the purpose of the applications and possibly invite environmental damage from more aggressive management that may be needed if the initial infestation is not reduced in a timely manner.

For those species where available information does not allow more defined specification of dosing, the specified maximum permitted rate is used as a default. If new information becomes available from field or lab experience elsewhere, MDIFW will incorporate that information into decisions on reducing rates applied to target species. For those species which are designated in

G. CONCENTRATIONS OF AUTHORIZED AQUATIC PISCICIDES (cont'd)

the future as invasive by the MDIFW, use of the piscicide as permitted herein may be specified, with consideration of the life history, morphology, and similarities to other invasive fishes for which more is known concerning their susceptibility to piscicides.

The following table from the Prenfish product label provides information on the amount of toxicant recommended and active rotenone included for specified types of treatments. Note that the maximum concentration of toxicant approved in this General Permit is 2.0 mg/L.

Table 1 Table 1. Prenfish Label Use Table adapted from Kinney, Edward 1965 Rotenone in Fish Pond Management. USDI Washington, D.C. Leaflet FL-576.

Types of Use	Parts per Million		Number of Acre-Feet/Gallon
	Concentration of Prenfish Toxicant	Concentration of Active Rotenone	
Selective Treatment	0.1 to 0.13	0.005 to 0.007	30 to 24
Normal Pond Use	0.5 to 1.0	0.025 to 0.050	6.0 to 3.0
Remove bullheads or carp	1.0 to 2.0	0.50 to 0.100	3.0 to 1.5
Remove bullheads or carp in rich organic ponds	2.0 to 4.0	0.100 to 0.200	1.5 to 0.75
Preimpoundment treatment above a dam.	3.0 to 5.0	0.200 to 0.250	1.0 to 0.60

Please note that a 2007 USEPA Re-registration Eligibility Decision (RED) recommends revision of the above cited label based on the maximum solubility of rotenone. This general permit limits the use of rotenone to a maximum of 2.0 mg/L (General Permit Part I, Section D) and further requires that it be applied in accordance with the USEPA approved label (General Permit Part I, Section B.1, etc.) In the event that the approved label is changed during the term of this General Permit, the more restrictive of 2.0 mg/L or the newly approved label rate shall apply until this General Permit is revised by the Department.

H. DESCRIPTION OF AUTHORIZED AQUATIC PISCICIDES

This general permit authorizes the application (discharge) of granular, solid, powder, liquid, or other formulations of piscicides as described in the following sections. Specifically, the formulations that may be used under this permit are those below, or successor formulations with substantially the same constituents. From time to time, formulations may be re-registered or minor modifications, including product names, may be made subject to EPA and Maine BPC registration. If new registered formulations replace these listed below, the NOI will include those formulations proposed for use, their specifications, and information sufficient allow the Department to conclude that conditions and safeguards in this permit will be met.

H. DESCRIPTION OF AUTHORIZED AQUATIC PISCICIDES (cont'd)

PRENTOX Prenfish Toxicant Liquid E.C. (EPA Reg No. 655-422) (5% rotenone).

PRENTOX Rotenone Fish Toxicant Powder (EPA Reg No. 655-691) (7.4% rotenone).

PRENTOX CFT Legumine™ Fish Toxicant (EPA Reg No. 75338-2) (5% rotenone) (upon registration with Maine BPC)

Descriptions of the properties and potential effects of each of these approved aquatic piscicides are included as Attachment A

I. MONITORING AND REPORTING REQUIREMENTS

This general permit requires monitoring of biological conditions, piscicide concentrations, water quality, physical conditions, and computer modeling, as described below. The monitoring requirements included herein constitute minimum monitoring requirements. Additional monitoring will be based on waterbody specific and treatment specific conditions and properties and will be specified in the NOI as needed. MDIFW's monitoring plans shall also consider information received from consultation with the MDIFW Non-Game Program, MDIFW Regional Wildlife Biologist, MDOC Natural Areas Program, MDMR Bureau of Sea-Run Fisheries and Habitats, US Fish and Wildlife Service, and US NOAA Fisheries.

1. Biological Monitoring (see General Permit Cond. E.1, Biological Monitoring): Biological monitoring is conducted to establish the extent and variety of the aquatic communities within the defined treatment area, secondary effects zone, and in downstream areas prior to and following piscicide treatment.

Aquatic community monitoring is conducted for two basic reasons: to assess the success of control on the target population(s) and to assess effects of treatment of the fish community as a whole within and beyond the defined treatment area. There are many ways to monitor fish populations, ranging from simple physical examination and field identification of fishes to very labor-intensive quantitative sampling. MDIFW will conduct before and after fish community monitoring according to MDIFW protocols.

As described in the General Permit, downstream biological monitoring must be conducted for treatment programs in which outflow occurs during the period when the piscicide is active within the treatment area. For projects consisting only of spot treatments in a waterbody, the need to conduct biological monitoring in the outlet stream will be based on determinations of the dilution and potential effects. At a minimum, MDIFW will conduct visual observations within the secondary effects zone and further downstream in the outlet stream for dead fishes to ensure that there is no evidence of effect on downstream fishes.

Non-target Fauna Observations: MDIFW will consult with HMAP and the MDIFW Reptile, Amphibian, and Invertebrate Group Leader before filing a rotenone NOI to determine the presence, composition, and relative abundance of any known non-target fauna in the treatment area and outlet areas. MDIFW will also conduct visual observations in the treatment area, secondary effects zone, and further downstream throughout the treatment program for treatment-related effects on macroinvertebrates, fish, and other aquatic organisms. MDIFW shall report the occurrence and significance of any adverse findings within 24-hours. Effects on non-target

I. MONITORING AND REPORTING REQUIREMENTS (cont'd)

fauna will be reported on Maine Amphibian and Reptile Atlasing Project Site Cards (MARAP). MDIFW and the Department shall evaluate the occurrence and determine an appropriate course of action. MARAP cards will be forwarded to the MDIFW Reptile, Amphibian and Invertebrate Group Leader. MDIFW shall also report observations on recovery of non-target faunal communities after treatment.

2. Piscicide Monitoring (see General Permit Cond. E.2, Piscicide Monitoring): Piscicide monitoring is typically done to ensure that permit limits are not exceeded, to assure that target concentrations are met (or maintained in the event that booster treatments are required to maintain residuals over time), to determine when to re-apply (booster treatments), or to assess when concentrations drop below levels that will have an effect on invasive fish populations. Bioassay is the only allowed and currently available method of determining rotenone concentration.

Secondary effects zone and downstream monitoring is required when a whole lake treatment is performed and there is anticipated to be outflow during the time of effective piscicide concentrations within the treatment area. Secondary effects zone and downstream monitoring is conducted to determine and prevent adverse impacts on non-target resources and organisms. Sampling locations will be designated on a map submitted with the NOI based on downstream conditions and pursuant to guidance discussed in General Permit Cond. E.2, Downstream Monitoring.

3. Water Quality Monitoring (see General Permit Cond. E.3, Water Quality Monitoring): Water quality monitoring is conducted in order to evaluate treatment related effects on water quality in the treatment area and downstream resources, including to detect whether there are increases in total phosphorus associated with releases from dying fishes. Also, abnormally low Secchi disk transparencies (algae response to increased nutrients) or low dissolved oxygen beyond conditions typically expected in the waterbody, which may be due to fish decay, may be detected. Data taken as part of the treatment project will be compared to pre-treatment data, if available, to determine evidence for water quality impacts due to the treatment.

Water quality monitoring will be conducted at least twice per field season, separated by approximately 60-days (i.e. spring/summer and fall) timed to entail pre and post-treatment, during years when a lake is treated. Monitoring will include dissolved oxygen profiles, water temperature profiles, Secchi disk transparency, pH, alkalinity, total phosphorous, and conductivity conducted in conformance with the Department's Standard Field Methods for Lake Water Quality Monitoring.

4. Physical Monitoring (see General Permit Cond. E.4, Physical Monitoring): Physical monitoring is conducted in order to provide information necessary in managing the treatment program and minimizing adverse effects on non-target resources and organisms for treatment programs involving a drawdown and for those with intermittent outlet conditions. Monitoring will include the water level in the treatment area, the outlet flow status, and other parameters as necessary. MDIFW will propose a frequency for, and conduct, physical monitoring based on site specific hydrologic factors, with a minimum frequency consisting of once per month during the active period for the piscicide.

I. MONITORING AND REPORTING REQUIREMENTS (cont'd)

5. Computer Modeling (see General Permit Cond. E.5, Computer Modeling): Computer modeling will be conducted to predict rotenone degradation and dispersal in treatment areas, secondary effects zones, and downstream areas. MDIFW's computer models for the treatment program shall be provided with the NOI.

6. Reporting: Results of all monitoring and modeling shall be reported to the Department as described in general permit Part I.F.

J. PUBLIC HEALTH CONCERNS AND RISK REDUCTION

Aquatic piscicides covered under this permit have been reviewed by the USEPA during the registration process. USEPA considered studies on human exposure as well as laboratory and field studies of both acute and chronic effects on animals. The labels set limits that are unlikely to pose risk to humans given normal behavior and using very conservative assumptions as to exposure and duration of piscicides in the environment. Aquatic pesticides covered under this permit have been reviewed by other private and public organizations including:

Maine Department of Inland Fisheries and Wildlife, Programmatic Environmental Assessment: for reclamation of various lakes and ponds in the State of Maine under the Brook Trout and Native Fish Restoration and Enhancement Program. Appendix A (below)

Washington Department of Fish and Wildlife, Lake and Stream Rehabilitation: Rotenone Use and Health Risks, Final Supplemental Environmental Impact Statement.

American Fisheries Society, Rotenone Stewardship Program, Rotenone Use in Fisheries Management Manual.

New Zealand, Department of Conservation, Rotenone-a review of its toxicity and use for fisheries management.

The actual limits set in this permit are at or below the maximum allowable under USEPA approved label rates. This is done both to limit human contact and to reduce non-target effects to the maximum extent practicable.

As noted above, a public informational meeting will be held prior to submittal of a NOI to inform the public of the project and its anticipated environmental impacts, and to educate the public about the opportunities for public comment to the Department during the application process. Abutting landowners to all affected resources will then be notified when MDIFW submits a NOI for General Permit coverage. In addition, the treatment area(s) will be posted at likely access points with information about the treatment including advisories against swimming, drinking, and eating dead fish. And, all known public access points to areas affected by the treatment will be closed during the period in which the authorized piscicide is active.

K. CONDITIONS OF LICENSES / PERMITS

Discharges of authorized aquatic piscicides under this general permit are subject to 38 M.R.S.A. §414-A. 1(E), provisions and conditions of Maine's Water Classification Program at 38 M.R.S.A. §§ 464(4), 465, and 465-A and Department rules Chapters 514 (Regulations Concerning the Use of Aquatic Pesticides), 523(2) (Waste Discharge License Conditions Applicable to All Permits), and 529 (General Permits for Certain Wastewater Discharges).

L. REGULATIONS CONCERNING THE USE OF AQUATIC PESTICIDES

Department Rules, Chapter 514, REGULATIONS CONCERNING THE USE OF AQUATIC PESTICIDES. Section 1, Definition. states, "an aquatic pesticide is any substance applied in, on or over the waters of the State or in such a way as to enter those waters for the purpose of inhibiting the growth or controlling the existence of any fish or animal in those waters". In accordance with Chapter 514, Section 2, Criteria for Approving a License to Use Aquatic Pesticides,

Subsection A, "Except as provided in 38 M.R.S.A. Section 362-A, no permit for aquatic pesticide use will be issued for a pesticide which is not registered for the intended use by the United States Environmental Protection Agency and the Maine Department of Agriculture".

Subsection B, "No permit for aquatic pesticide use will be issued unless the applicant or agent for the applicant is certified and licensed in aquatic pest control by the Maine Board of Pesticides Control".

Subsection C, "A permit for aquatic pesticide use will be issued only if the applicant provides adequate protection for non-target species".

Subsection D, "A permit for aquatic pesticide use will be issued only if the applicant can demonstrate a significant need to control the target species and that pesticide control offers the only reasonable and effective means to achieve control of the target species. Demonstration of significant need may include, but not be limited to, health risk, economic hardship, or loss of use."

Subsection E, "In addition to paragraphs (A) through (D), any discharge of aquatic pesticides, alone or in combination with all other discharges, shall meet all other applicable requirements of Maine's waste discharge laws including, but not limited to, the provisions of 38 M.R.S.A. Sections 464 and 465".

In response to the citations above: PRENTOX Prenfish Toxicant Liquid E.C. (EPA Reg No. 655-422), and PRENTOX Rotenone Fish Toxicant Powder (EPA Reg No. 655-691), are registered for the use proposed in this licensing action by the USEPA and the Maine Department of Agriculture. PRENTOX CFT Legumine™ Fish Toxicant (EPA Reg No. 75338-2) is authorized for use pursuant to this General Permit only upon its registration with Maine BPC. The permittee shall utilize a pesticide applicator who is certified and licensed in aquatic pesticide control by the Maine Bureau of Pesticide Control and shall provide proof of certification / licensing to the Department with the NOI. The permittee has disclosed that effects on non-target species are anticipated due to the scope of treatment projects, but that such effects shall be minimized to the extent possible. In submitting a NOI for coverage under this General Permit, the permittee has demonstrated a significant need to control the target species, has explored potential treatment methods, and has designed an effective treatment program that incorporates appropriate methods. The Department anticipates that proposed treatment programs will result in short-term adverse impacts to non-target organisms especially within the defined treatment area, but that such impacts are necessary in order to eliminate invasive fishes, prevent long-term adverse impacts to non-target organisms and resources, and ensure long-term maintenance of receiving water quality and uses in both treated and connected waters. The Department finds that the aquatic piscicide treatment program described herein complies with Chapter 514. Additional details on the aquatic piscicide treatment program water quality and fish community monitoring program and reporting requirements are detailed in this Fact Sheet.

M. RECEIVING WATER QUALITY STANDARDS

This general permit authorizes discharges to Class GPA, AA, A, B and C waters of the State, tributaries to Class GPA waters, and those waters having drainage areas of less than ten square miles. Maine law, 38 M.R.S.A. §465 describes the standards for Class AA, A, B, and C waters, 38 M.R.S.A. §465-A describes the standards for Class GPA waters, and 38 M.R.S.A. §464(4) describes the standards for tributaries to Class GPA waters and those waters having drainage areas of less than ten square miles. This General Permit does not authorize the discharge of piscicides to any Public Water Supply.

N. RECEIVING WATER QUALITY AND HABITAT CONDITIONS

The active ingredients in the aquatic piscicides authorized for use under this general permit are EPA registered and formulated for aquatic use. Further discussion on the basic identification and information about formulations covered under this permit are included in Fact Sheet Attachment A. This general permit does not authorize the use of other compounds; thus concerns with chemical toxicity are limited to the specific authorized aquatic piscicides, for which such information is provided herein.

Lakes and ponds and streams dominated by invasive fishes do not exhibit natural habitat characteristics, suffering reduced habitat suitability for fish and other aquatic life and those species managed for by MDIFW. Invasive fish species disrupt natural systems by crowding out native and managed fishes and altering the physical and biological structure of the aquatic habitat. Eradication of invasive fishes is often feasible, and significant protection for native and managed fish communities can be achieved even by reducing densities of aggressive invasive fishes. This reduces their ability to spread to new habitat within the infested water or to other waterbodies.

Piscicide applications under this permit are designed to eradicate invasive species in an attempt to restore and preserve the natural habitat characteristics of the specific water of the State. As stated in Fact Sheet Section L, the Department anticipates some short-term adverse impacts, but considers such impacts as necessary in order to control invasive species, prevent long-term adverse impacts to non-target organisms and resources, and ensure long-term maintenance of receiving water quality and uses in subject waterbodies and connected waters.

No waterbody that serves as a public water supply is eligible for coverage under this general permit. The Department has not identified other significant geographical areas of concern that should be excluded from coverage under this general permit. Additional diligence is required in applications in any waters known to contain rare, endangered, or threatened aquatic species. The Department anticipates that treatment programs approved under this general permit will result in long-term improvement in receiving water quality, habitat, and designated uses.

O. ANTI-DEGRADATION

The State's antidegradation policy is set forth in Maine law at 38 M.R.S.A. §464(4)(F). The Department has determined that the discharge of the authorized aquatic piscicides in accordance with the terms and conditions of this general permit will not violate the provisions of the anti-degradation policy.

P. PUBLIC COMMENTS

Public notice of this general permit was made in the Bangor Daily, Morning Sentinel, Kennebec Journal, Sun-Journal, Portland Press Herald and The Times Record newspapers on or about June 29, 2009. The Department receives public comments on an application until the date a final agency action is taken on the application. Those persons receiving copies of draft permits shall have at least 30 days in which to submit comments on the draft or to request a public hearing, pursuant to Chapter 522 of the Department's rules.

Q. DEPARTMENT CONTACTS

Additional information concerning this licensing action may be obtained from and written comments should be sent to:

Robert D. Stratton, Division of Water Quality Management

Bureau of Land and Water Quality

Department of Environmental Protection

17 State House Station, Augusta, Maine 04333-0017

Telephone: (207) 287-6114; Fax: (207) 287-3435; email: Robert.D.Stratton@maine.gov

R. RESPONSE TO COMMENTS

During the period of July 21, 2009 through August 20, 2009, the Department solicited comments on the proposed draft General Permit for the use of Piscicides for the Control of Invasive Fishes. The Department communicated with the Maine Department of Inland Fisheries and Wildlife, the potential General Permit permittee, on several issues and modified the draft General Permit as appropriate. The Department did not receive any other comments that resulted in significant revisions to the permit, but made some minor internal revisions. Therefore, no response to comments has been prepared.

ATTACHMENT A

Maine Department of Inland Fisheries and Wildlife

Programmatic Environmental Assessment: for reclamation of various lakes and ponds in the State of Maine under the Brook Trout and Native Fish Restoration and Enhancement Program

Prepared by:

James Pellerin
Asst. Regional Fisheries Biologist, MDIFW
March 2008

Table of Contents

Introduction

Use of the aquatic piscicide rotenone to eliminate or reduce "invasive" and/or undesirable fish species is a widely accepted practice by Federal and State fish and wildlife agencies throughout the United States. Historically, the Maine Department of Inland Fisheries and Wildlife (MDIFW) was quite active in performing reclamation projects to restore and/or improve angling opportunities for salmonids, particularly brook trout. However, by the late 1980's the program was essentially discontinued due to a lack and/or change in the federal funding requirements for these types of projects. Illegal introductions of native and nonnative fish species have become increasingly more rampant and are even beginning to threaten native fish populations in more remote regions of the State. These activities have forced the MDIFW and other States to reconsider more active reclamation programs. While MDIFW has recently applied for several Maine Pollutant Discharge Elimination Permits (MEPDES Permit) to eradicate "invasive" fish species from State waters, funding is a significant limitation. Matching federal funds are severely needed to make this a viable program, which will be used to combat the loss of quality fish habitat and native fish populations to invasive fish species in Maine. This program will largely target brook trout restoration; however, other native fish species and habitats may be considered. The following document is a programmatic environmental assessment required by the United States Department of the Interior, Fish and Wildlife Service to determine whether reclamation of lakes and ponds in the State of Maine constitutes a major federal action, which significantly affects the quality of the human environment within the meaning of Section 102(2)(c) of the National Policy Act of 1969. An evaluation of other management alternatives is also provided in this assessment report.

I. Background

A. Pesticide Description

Common Name: Rotenone
Empirical Formula: $C_{23}H_{22}O_6$
Chemical Name: (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
Trade Name: Prentox Rotenone Fish Toxicant Powder & Prenfish Toxicant
EPA Registration Numbers: 655-422; 655-691
CAS Number: 83-79-4

Rotenone is a natural substance produced in the stems and roots of certain tropical plants in the bean family (*Leguminosea*). Rotenone has been used for centuries to capture food-fish in areas where these plants occur naturally. Until recently, rotenone was routinely used as an agricultural insecticide to treat both crops and livestock, and was commonly applied to household gardens. Its widespread use was largely due to several factors including its organic origin; its non-persistence in the environment; and its limited and/or short-term impacts to nontarget organisms and applicators. Rotenone works by inhibiting the biochemical process that allows the use of oxygen in the release of energy required for bodily processes (Sousa et al. 1991). In 2007, product manufacturer's decided not to re-register rotenone with the EPA for uses other than as a piscicide due to the high costs associated with re-registration, lack of interest/funding from users to obtain re-registration, and the availability of lower cost alternatives (Ruth Fisher 2007).

Rotenone formulations for fisheries management work come in three general formulations: (1) a dry powder, (2) a liquid, and (3) a liquid with a synergist. The dry powder is the least expensive form and lacks the petroleum-based products present in the liquid formulations. The liquid formulation has several petroleum-based emulsifiers to assist with the horizontal and vertical dispersal of rotenone (5%) throughout the water column. The third is similar to the straight liquid formulation, except it contains a synergist with approximately half the amount of rotenone (2.5%). The synergist is added to increase the effectiveness of rotenone, which reduces the amount and costs associated with rotenone treatments. Historically, MDIFW has not used the synergist formulation for several reasons including: a report of variable results from other agencies, environmental persistence of synergist compounds, and public concerns regarding the synergist compounds. A "new" liquid rotenone formulation, CFT Legumine, has recently become available and registered for use in the United States. This product reduces or eliminates the hydrocarbon solvents, making it more environmentally acceptable (Fisher 2007).

B. History of Use for Fisheries Management

Rotenone is a relatively selective piscicide. Although rotenone has some toxicity to all oxygen breathing organisms,

fish are highly susceptible for 2 reasons: (1) rotenone is readily absorbed through the gill epithelium, which gives it direct access to the circulatory system, and (2) when applied to an aquatic environment fish cannot escape from it (Sousa et al. 1991). Initial effects on fish are often seen within an hour of treatment for more sensitive fish species, whereas more resistant species typically die within 24 hours. Rotenone has very low toxicity to terrestrial wildlife and humans for several reasons including: the low amount of active ingredient used in commercial rotenone products; its low solubility in water; its rapid degradation in the environment by light and heat; its vomit inducing properties; and inefficient absorption in the gastrointestinal tract, as well as, the presence of digestive enzymes that oxidize rotenone (Bradbury 1986).

Rotenone's ability to completely eradicate undesirable fish species, its limited persistence in the environment, and minimal/short-term impacts to nontarget wildlife has made it a very important fishery management tool. Its first recorded use in North America for fisheries management occurred in 1934, and its use spread rapidly throughout the United States and Canada. By 1970, 39 states and 2 provinces had reportedly used rotenone to reclaim waters (Lennon 1971). Today it is the most commonly used and preferred aquatic piscicide for fishery management projects, and only one of four (2 of which are lampricides) currently approved by the USEPA. McClay (2000) reported 37 states and 5 provinces/territories used rotenone between 1988-1997. Maine's first reported use of rotenone occurred in 1939 when the Maine Department of Inland Fisheries and Wildlife reclaimed two waters, Sabbathday Lake in New Gloucester and Lone Pond in Waterboro. To date, Maine biologists have conducted over 198 reclamations statewide on public waters and numerous private ponds with no known significant, long-term impacts.

Rotenone has been used for a wide variety of fishery management applications including:

- eradication of exotic fish to restore native fisheries and aquatic communities;
- control and/or eradication of undesirable fish to improve sport fishing opportunities;
- elimination of fish to control disease(s);
- eradication of fish in rearing facilities to eliminate competing species;
- fish sampling and quantification of populations;
- treatment of drainages prior to impounding;
- and restoration of threatened and endangered species (McClay 2000).

Rotenone has also been used for wildlife habitat restoration, particularly the improvement of wetlands for waterfowl by controlling or eradicating carp populations that destroy aquatic macrophyte communities. Chemical reclamations are also being used successfully for biomanipulation projects to improve water quality. In Maine, reclamations with rotenone have primarily been used to control or eradicate undesirable fish species to improve sport-fishing opportunities and to eradicate nonnative exotics to restore native fisheries.

Aquatic habitats are being threatened worldwide by the introduction of invasive aquatic organisms including plants, invertebrates, and fish. Illegal fish introductions are occurring at an alarming rate in Maine and elsewhere in the United States, and they pose one of the most significant threats to native fish and their habitats. The use of rotenone has been recognized as a viable and relatively innocuous method for restoring native fish communities. Harig and Bain (1995) have demonstrated chemical reclamations not only restore native fish communities, but top-down cascading trophic effects also re-establish phytoplankton and zooplankton communities that are more representative of "natural" lake ecosystems. In essence, rotenone is one of the few tools resource managers have to successfully "turn back the clock" and restore aquatic communities.

II. Program Authority and Need

A. Program Authority

The proposed program is consistent with and supported by the Department's legislative mandate Title 12 MRSA Ch. 702 §7011, Administrative Policy Regarding Fisheries Management, State of Maine Action Plan for Managing Invasive Species, and the Revised Strategic Management Plan for Fisheries, 2001-2016 as follows:

(1) The Maine Legislature established the Department "to preserve, protect and enhance the inland fisheries and wildlife resources of the State." This legislation empowers the Department to develop policies and

programs for the management of Maine's inland fisheries. Reclamation projects under this program are consistent with the Department's legislative mandate as an effort to restore and/or enhance native fisheries and fishery opportunities in the State;

(2) Administrative Policy Regarding Fisheries Management states "Management programs will focus on…protection and restoration of habitat…" and Habitat Section-3 reads, "Projects intended to enhance habitat, although very similar to restoration projects, are intended to improve the habitat value for certain fish species, but are not being done to restore a pre-existing, or historical condition." The proposed reclamation program certainly falls under the umbrella of habitat restoration and/or enhancement as defined in our management policy.

(3) State of Maine Action Plan for Managing Invasive Species states that MDIFW will remove illegally introduced fish when feasible, and chemical reclamation is the most common and effective means of accomplishing this goal. The proposed program helps the Department achieve the objectives outlined in this federally approved plan.

(4) The Revised Strategic Management Plan for Fisheries, 2001-2016 - under the Brook Trout Species Plan states,

"Objective 4: Improve fishing quality in lakes and ponds.

A. General Management Waters: meet angler expectation of a catch rate of 5-6 brook trout/angler-day ranging from 10 to 15 inches long

B. Size Quality Waters: meet angler expectation of the presence of brook trout with a minimum size of 12 to 16 inches long.

C. Trophy Management Waters: meet angler expectation of the presence of brook trout with a minimum size of 18 inches and/or 3 pounds in 1 new water."

Reclaimed trout ponds provide a mechanism for meeting Objective 4, particularly in southern and central regions of the State where unauthorized introductions have severely compromised native fisheries and fishing opportunities for native species like brook trout.

B. Program Need

1. The Invasive Species Threat

The Eastern Brook Trout Joint Venture was formed in 2004 to address the region-wide decline in brook trout populations and habitats in the eastern United States. As part of that effort, Hudy et al. (2006) conducted a study on the distribution, status, and threats to the eastern brook trout across 17 eastern states, and Maine was reportedly "the last stronghold" for stream and lake populations. According to their research, Maine still retained 185 subwatersheds with intact lake and pond brook trout populations, versus only six subwatersheds among all 16 of the other states reviewed. The deliberate introduction and spread of nonnative fish have been identified as one of the most serious threats to Maine's brook trout populations and their habitat (Bonney 2003; Hudy et al. 2006). Consequently, brook trout have been identified in Maine's Wildlife Action Plan as a Species of Greatest Conservation Need to further highlight its status in Maine. The Maine Legislature also recently recognized brook trout as a heritage fish species, which affords specific populations additional protections.

Brook trout populations evolved in relatively simple aquatic communities, and they are very sensitive to introductions of other fish species. In addition, brook trout waters in Maine are typically small, infertile lakes, which tend to be more sensitive to new species introductions (Magnuson 1976, Li and Moyle 1981). Magnan (1988) studied 26 small, oligotrophic lakes in Quebec where he demonstrated the presence of other fish species, even one, can effectively alter zooplankton and benthic invertebrate communities, resulting in declines of native brook trout populations. Brook trout simply do not tolerate competition and predation by other fish species.

Illegal introductions of fish has and continues to occur at an almost maniacal pace in southern and central Maine, and the dilemma is also becoming more prevalent in the northern regions of the state. Bass species are a good example of this south to northward progression; they have already been widely introduced into southern, coastal, and central Maine lakes and ponds, but more remote regions of the state are documenting more and more new bass introductions. On the other hand, southern and central Maine are now being plagued with introductions of several "new" non-native species including northern pike, black crappie, bluegills, green sunfish, and rock bass. For example, since 1980 MDIFW has documented the introduction of northern pike and black crappie into 42 and 77

new waters, respectively! Of these 119 unauthorized introductions, only seven were located in regions other than southern and central Maine. Chemical reclamations are the only practical and effective way for MDIFW to restore lost brook trout/native fish habitats and populations, and potentially reduce the extent of damage when these introductions occur in new watersheds. Even under a well-funded reclamation program, MDIFW will never fully regain the significant losses of habitat to both native and nonnative invasives. None-the-less, the battle to protect, enhance, and restore native trout habitat is a worthwhile and necessary one.

It is well known within the fisheries community that chemical reclamation with rotenone significantly improves coldwater fisheries by removal of invasive or undesirable fish species. Flick and Webster (1982) studied seven ponds in the Adirondacks, and found that the standing crops of brook trout increased from 0.1-3.9 pounds/acre to 5-16 pounds/acre following reclamation with rotenone. Similarly, a relatively recent reclamation project conducted in Maine during the 1990's on Overset Pond in Greenwood showed a significant improvement in the brook trout fishery following reclamation (Table 1). More recently, researchers have demonstrated that reclamation projects cannot only restore fish communities, but also the entire aquatic community to a more "natural" state (Harig and Bain 1995).

Table 1. Pre/Post Reclamation Data on Brook Trout for Overset Pond in Greenwood.

Data Collection	Mean Length	Mean Weight	Mean K-factor	Holdover beyond Age I+
Pre-reclamation (1-2dys)	10.3 inches	0.4 pounds	0.78	none
Post-reclamation (1 yr)	13.0 inches	1.0 pounds	1.17	Substantial (up to Age IV+)

2. Habitat Suitability and Fisheries Availability

Most lakes and ponds are capable of supporting warmwater fish populations; however, suitable coldwater brook trout habitat is more limited, particularly in southern, central, and coastal Maine. Even where summer lake water quality is suitable; brook trout habitat statewide has been severely reduced by introductions of other native and nonnative fish species. In addition, Maine already has an abundance of quality warmwater fisheries, whereas quality trout fisheries are becoming more and more scarce each year. Trout waters are continually being lost to invasives at an alarming rate.

3. Public Demand and Preferences

It is quite clear that Maine anglers strongly prefer brook trout to all other fish species. The 1999 Maine Open Water Fishing Survey asked anglers how important the opportunity was to catch various inland fish species, brook trout ranked first Statewide for important/very important responses. Many of the other invasive species commonly encountered in historical brook trout ponds (i.e. chain pickerel, perch, bullhead, etc.) targeted for reclamation ranked very low or were not even listed, because they are rarely targeted by anglers or nongame species.

As described elsewhere, lakes and ponds targeted for reclamation are typically relatively remote in nature, and these types of fishing experiences are highly valued by Maine anglers. The 1999 Maine Open Water Fishing Survey asked anglers how important the opportunity was to fish remote waters, 63% of the respondents rated this type of experience as important/very important (Patterson et al. 2001). Although remote trout fishing experiences are fairly common in northern and western portions of Maine, these opportunities are limited in southern and central areas due to high population densities and heavy development. A few "remote" ponds still exist in southern and central Maine, but most of these historical trout fisheries have succumbed to put-and-take and/or poor trout fisheries due to introductions of invasives. Appropriate f~~o~~unding for a reclamation program would allow fishery mangers to restore a handful of these truly unique gems.

4. Economics

Maine's economy is largely driven by its natural resources, and the recreational opportunities they provide. Freshwater fishing is a significant contributor to Maine's economy, a recent survey (American Sportfishing Association 2002) reported:

- 376,372 anglers live in Maine, and more than 44 million Americans fish.
- $322,122,047 in retail sales was generated by Maine's anglers, which rippled through the economy to generate $541 million in economic output for the state.

- The Maine fishing industry supports over 6,000 jobs and those workers earned $129 million in salaries and wages.
- Fishing-related purchases in Maine generated $7 million in state tax revenues and $13 million in federal income tax.

Although no economic data is available specifically for brook trout in Maine, New York indicates a value of $18,000,000 per year for Adirondack lakes and ponds with a cost benefit ratio of 39:1 for managing those brook trout resources (Demong 2001). As reported earlier, chemical reclamations typically improve angling opportunities and generate higher use. A review of 6 waters in eastern Washington revealed a net economic gain: every dollar spent on rotenone and trout stocking yielded $32-$105 spent by anglers versus $10-$15 for non-treated lakes (Breithapt 1985 as cited by Bradbury 1986). In order to continue to provide this type of economic input for Maine, fishery managers need to provide the types of fishing opportunities desired by our anglers. Based on experience, there is certainly more demand for quality trout fisheries, and this program has the potential to restore trout habitat and create these types of quality fisheries.

III. Area Description

Due to the widespread and indiscriminate nature of historical and future unauthorized introductions, candidate waters for the program may be located anywhere in the state. Southern and central portions of Maine are expected to perform more reclamation projects under the program for several reasons including: a longer history of illegal introductions; higher human population densities and better water accessibility increase the odds for future introductions; and fewer opportunities for quality brook trout fishing creates a greater demand or need for restoration projects of this nature.

MDIFW staffing and funding would likely limit the number of individual waters reclaimed in any given year. In general, we would not expect to reclaim more than 4-6 waters per year.

IV. Reclamation Candidate Selection Criteria

Reclamation candidate selection will target waters that (1) currently or historically supported brook trout fisheries (stocked/wild) and are now infested with competing “invasive” fish species; (2) waters with “invasives” that are located in a watershed containing wild brook trout populations; or (3) waters/drainages with “invasives” that threaten othe significant native fish species. Historical information on the presence/absence of native “invasive” fish species is typically lacking and will often be based on MDIFW’s best judgment from related circumstantial evidence (i.e. absence of species in the watershed, presence of natural barriers, etc.). Regional Fishery Biologists submit potential candidate waters annually, and waters selected for treatment by the administration are prioritized based on the biological threat/need, as well as, available funding and staff time.

Typical candidate waters under the program usually include the following characteristics: most ponds will be relatively small (< 100 acres); are remote in description; have few if any residences or camps; and they are rarely used for “irrigation” or “public” water supplies. Waters with these types of attributes are generally preferred due to higher success rates, lower incidences of reintroductions, lower cost, fewer landowners, and a more receptive public. On the other hand, some high priority projects may occasionally deviate from the “typical” project waters.

Re-introduction stockings of native species will typically be required after reclamation. Maintenance stocking of brook trout may be necessary on reclaimed waters that lack suitable and/or sufficient habitat for natural reproduction.

V. Alternatives

A. Rotenone Treatment - Preferred Alternative

Reclamation projects performed under this program will generally be one-time treatment events intended to eliminate the existing invasive/undesirable species. Partial reclamations are routinely used in other states and provide short-term improvements (3-8 years) to trout fisheries (Bradbury 1986, CDFG 1994). Although not always successful, Maine fishery biologists typically strive for complete kills to provide the best long-term results and benefits. After reclamation, the pond would be restocked with brook trout or other target native fish species, which

is a native species of the water and/or drainage. These projects are intended to restore the pond's biological communities to a more "natural" state, and to secondarily create or enhance the trout fishery. If warranted, special regulations may also be adopted to support these initiatives.

1) Treatment

Rotenone (Rotenone Fish Toxicant Powder & Prenfish Toxicant, product of Prentiss Inc.)

2) Concentrations

Concentrations of 0.2-8.0 ppm are allowed on the labels of formulated rotenone products (Appendices A and B). Currently, the USEPA is undergoing a re-registration process for rotenone and changes to the product labels are proposed. Rotenone treatment recommendations vary depending on target fish species and organics in the system. Target treatments are typically an initial whole-lake treatment at 0.10 ppm active rotenone, which equates to 2.0 ppm rotenone formulation. This treatment level effectively targets more resistant fish species (i.e. golden shiners and bullheads), compensates for chemical potency losses associated with the heavy organic loads commonly present in Maine waters, and addresses our goal of complete eradication. This treatment is a one-day, single treatment with concentration levels diminishing over time via natural degradation processes. See section on persistence in the environment. The actual amount of rotenone applied depends on the formulation used, and is based on the estimated water volume of the pond.

3) Timing

Rotenone treatments for fishery management projects are typically performed from late summer to late fall. Historically, rotenone treatments in Maine have primarily been conducted in the fall for a variety of reasons including: low water levels, low flow/discharge, reduced aquatic vegetation, reduced recreational use, reduced costs, applicator comfort, fewer impacts to nontarget species, and to allow treatment after destratification. Uniform water temperatures promote complete dispersal of the chemical throughout the water column. Poor dispersal of rotenone through the thermocline has been known to cause treatment failures. Fall treatments take place when the surface temperature approaches 50^{o}F, which would usually occur from September to mid-November depending on latitude and elevation. Fall treatment also has some disadvantages, primarily related to toxicity time. In some cases, temperate climate ponds treated in late fall have remained toxic to fish into the following April (Woodward 2005, Demong 2005). These extended toxicity times may slow recovery of nontargets, delay restocking efforts, and create monitoring and downstream detoxification issues that are difficult to overcome.

Although much more difficult to perform, late summer treatment allows more flexibility in terms of monitoring requirements and would likely insure detoxification prior to ice-up. The big disadvantages with late summer treatments would be the use of liquid rotenone formulations, which are more expensive and have petroleum based emulsifiers for improved dispersal/mixing. WDFW (1988) predominantly uses powdered formulations to avoid the inert ingredient issue, but other states routinely use liquid formulations and claim no additional adverse environmental impacts beyond those caused by rotenone (CDFG 1994, Demong 2005). See section on liquid rotenone formulations. CFT Legumine may be considered as an alternative liquid formulation for future projects. Either late summer or fall treatments may be used for projects under this program, and the preferred treatment option would be decided on a case-by-case basis.

4) Methods

For fall treatments the bulk of the chemical is applied to the lake surface as a soluble powder containing approximately 5% rotenone via a specially equipped boat. Rotenone shipments are chemically assayed by the supplier to determine active rotenone content, and biologists/applicators adjust the amount of powder used as needed to meet target treatment levels. A gas-powered pump located in a small, motorboat draws in pond water and mixes it with the powdered rotenone via a venturi system. The rotenone/pond water mixture is then piped overboard and dispersed over the entire surface area by motoring the boat around the pond. Liquid rotenone is commonly applied to small backwater areas, inlets, other shallow areas unreachable by motorized boat, and the outlet area downstream to the first impassable barrier via backpack tanks with manually operated hand pumps. This incidental use of liquid formulation involves very small quantities.

On the other hand, late summer treatments typically involve the use of entirely liquid rotenone to aid with dispersal through and within stratified thermal layers. Although liquid based rotenone formulations contain petroleum-based emulsifiers, which may generate some environmental concerns, Finlayson et al. (2000) and CDFG (1994) provide evidence that these products do not present environmental or human health risks when used for prescribed fisheries management projects.

MDIFW may use a modified late summer treatment plan to minimize the amount of liquid rotenone used for the treatment. Liquid rotenone is applied in deeper stratified waters by means of a weighted distribution hose and manifold. Deeper waters are treated in various strata starting from the bottom and working up towards the surface. The top 10-ft stratum is treated with powdered rotenone as described above for fall treatments. Backwater areas, inlets, other shallow areas unreachable by motorized boat, and the outlet area downstream to the first impassable barrier are treated with liquid rotenone dispensed via backpack tanks with manually operated hand pumps.

5) Staff

Currently, MDIFW regional fisheries staff apply rotenone under the direct supervision of William Woodward, Assistant Regional Fisheries Biologist out of the Sidney Office. Bill has decades of experience with rotenone applications, holds a Maine Master Pesticide Applicators License, and recently completed (2004) a rotenone course at the USFWS National Conservation Training Center. MDIFW will maintain a licensed Maine Master Pesticide Applicator to supervise all reclamation projects conducted under this program.

6) Monitoring

The Maine Department of Inland Fisheries and Wildlife typically assesses pre/post rotenone treatments to evaluate the project's success (or failure) as it relates to fisheries objectives. After treatment, live cages with sentinel fish are used prior to re-stocking to insure rotenone levels have dissipated. Pre-post treatment work often involves several years of follow-up sampling of fish populations with nets (i.e. trapnets, gillnets) to determine if nuisance species have been successfully eliminated, and to evaluate how trout populations have responded to the reduction in competition and predation. Pre/post fisheries work also includes some basic water quality work (i.e. temperature-dissolved oxygen profiles, pH, alkalinity).

Field testing of rotenone in water via colorimetric methods are described by Post (1955); however, based on detection limits (down to 0.2 ppm) the usefulness of the test methods for anything other than qualitative (presence/absence) data is limited (Ling 2003). Sentinel fish would likely provide a better level of detection and are commonly used during fishery reclamation projects. New York has successfully developed a field bioassay method, which is used to monitor rotenone levels between 0.05 and 3.0 ppm. New York biologists commonly use this method to insure they have reached their target treatment level and to re-boost rotenone concentrations as needed (Demong 1992). This method has some promise for monitoring rotenone in Maine, particularly when treating remote waters. Dawson et al. (1983) describes a much more sensitive method of determining rotenone levels using high performance liquid chromatography; however, this type of equipment is limited in Maine. Costs, manpower, and feasibility of monitoring rotenone from remote waters with this method are issues that are difficult to overcome. Monitoring plans are developed on a case-by-case basis, and are considered during the state's environmental review and permitting process.

7) Fish Removal

Late summer and fall reclamations are timed such that dead fish do not pose a health hazard or environmental risk (Finlayson et al. 2000). Although a few researchers have implicated decaying fish as a source of short-term odor and water quality changes, these are not expected to be significant issues (see sections on air and water quality). Consequently, many states including Maine rarely recommend removal of dead or decaying fish. Furthermore, most Maine lakes are relatively sterile, and significant removal of biomass would reduce the productivity of the system.

MDIFW does not propose removal of dead fish for these projects. However, dead fish will be removed and disposed of properly if they become a public nuisance and we are requested to do so by the MDEP.

8) Barrier Dams

The construction of small barrier dams on lake and pond outlets may also be required as part of these projects. Barrier dams are an important component to any reclamation project, because they insure that invasive species cannot re-enter the lake or pond system from downstream sources. Many outlets have natural barriers to fish, which can often be utilized as the actual fish barrier by identifying a short stream segment as part of the treatment area. The need for a barrier dam is considered on a case-by-case basis, and will be included in all appropriate MDEP review and U.S. Fish and Wildlife Service permitting processes.

The following list of criteria identifies threshold levels that are not to be exceeded, or defines parameters that must be met for this programmatic Environmental Assessment:

- The number of rotenone treated waterbodies will not exceed ten public waters per year. Additionally, a limited number of private waters (<10 acres) may be treated to remove invasive species that potentially threaten native fish habitat or populations.
- Rotenone treatments are directed at removing invasive and undesireable fish species (Title MRSA Ch.183 §7).
- Only ponded waters are to be treated including any pond inlets and outlets down to a specified fish barrier and/or neutralization zone; streams and rivers are not subject to federal funding under this programmatic permit.
- A low human residence on the waterbody.
- The waterbody is not actively used by humans for consumption or irrigation during the treatment and detoxification period; alternatively active detoxification methods may be used according to label instructions.
- U.S. Fish and Wildlife Service Section 7 compliance must be met.
- All necessary Federal, State, and local permits will be obtained prior to treatment.
- Treatments will meet MDEP's permitting conditions/requirements.
- Treatments will meet MDEP's public noticing requirements.
- A licensed Maine master pesticide applicator will supervise all aspects of the treatment procedure.

In the case where a proposed waterbody exceeds any threshold level or does not meet any defined parameter, a complete NEPA review will be required to receive federal funds under this programmatic permit.

B. Other Means to Control Undesirable Fish.

Finlayson et al. (2000) provides a comprehensive review of alternative methods for reducing or controlling fish communities including:

- use of a piscicide other than rotenone (antimycin);
- angling regulations (i.e., modifications to promote or favor over harvest);
- physical removal techniques (e.g., nets, traps, or electrofishing);
- biological control (i.e., predators, intraspecific manipulation, pathological reactions);
- dewatering or water fluctuation techniques;
- stream flow augmentation (e.g., create water temperatures or current conditions that negatively impact the species to be reduced);
- fish barriers (i.e., protect against entry by undesirable fish);
- and explosives for flowing waters and impoundments.

The advantages and limitations of each technique are also thoroughly discussed; however, the bottom line is that chemical reclamation or complete dewatering are the only two viable methods for completely eradicating invasive/undesirable fish populations (Schnick 1974 as cited by Finlayson et al. 2000), which is the typical objective of Maine reclamation projects. Complete dewatering on natural waters is generally not feasible due to the lack of outlet control structures or the lack of structures designed to allow complete dewatering. In addition, full dewatering may have more serious environmental consequences than rotenone treatments (Demong 2005). Other than temporary loss of use no human impacts would be anticipated.

Antimycin is an alternative chemical treatment, which is generally reserved for stream treatments. Antimycin is not currently registered for use in the State of Maine. Although registration for antimycin could be pursued, its

environmental impacts have not been as thoroughly researched and reviewed by the scientific community. In addition, the use of antimycin can be more expensive (WDFW 1988), and its potency can be quite variable depending on the batch (Leathe 2006). Human and environmental impacts would be similar to rotenone use.

C. Fingerling Brook Trout Stocking.

- This is the typical management strategy for smaller, sized trout ponds that lack sufficient spawning and nursery habitat. However, fingerling trout produce extremely poor survival in the presence of predatory and/or competing fish species.
- Poor survival reduces angling opportunities, and precludes establishing a quality trout fishery.
- Stocking fall fingerlings under heavy competition/predation does not typically produce a satisfactory fishery, and often results in a poor use of angler dollars.
- This alternative does not restore the aquatic habitat and community to a more natural condition.
- This alternative does not remove the invasives, which may threaten other waters in the same drainage, and/or act a source for additional illegal introductions.
- No human or long-term environmental impacts anticipated.

D. Put-and-Take Brook Trout Stocking (stock pond with large catchable trout, 10-12 inches).

- Catchable trout perform poorly under competition from other fish species, and demonstrate limited to no survival to older ages.
- Large invasive fish species (i.e. largemouth bass, northern pike) effectively predate on even catchable-sized trout, resulting in little to no survial.
- Poor survival reduces angling opportunities, and precludes establishing a quality trout fishery.
- Catchable fish for "put-and-take" programs are stocked in mid-late spring and provide shorter seasonal availability to the angler than fall stocked fish.
- Stocking catchables is costly, and under certain circumstances (i.e. heavy predation, low angler use) provides a poor use of angler dollars.
- This alternative does not restore the aquatic habitat and community to a more natural condition.
- This alternative does not remove the invasives, which may threaten other waters in the same drainage, and/or act a source for additional illegal introductions.
- No human impacts or long-term environmental impacts anticipated.

E. Stock Warmwater Species of Fish.

- Most angler-preferred warmwater species would be considered invasive or nonnative to the particular systems being considered under this program. It would be irresponsible of the Department to endorse and conduct this type of stocking program.
- Maine anglers (most) would not support replacing historical or potential brook trout/native fish habitat with warmwater fish associations.
- Warmwater fisheries are generally abundant nearby, and trout or native fish habitat is a more limited or threatened resource.
- Warmwater fisheries seldom establish quality fisheries in small, unproductive ponds that are generally targeted by this program.
- This alternative will likely impact establish non-native fish species, which impact certainly impact the ecology of the system, present a new source for illegal stocking, and the fish would likely spread throughout the drainage where they are undesired. No significant human impacts anticipated.

F. No Action (No management and no stocking)

- MDIFW would not be meeting its legislative mandate to protect and enhance fish, fish habitat, and fishing opportunities.
- Invasive species often provide limited or no fishing opportunity in the smaller-sized ponds, typically targeted for treatment.

- No action would substantially reduce or eliminate the viability of native fisheries, and invasive species would have more potential to become established in other lakes/ponds in the watershed.
- Poor fishing equates to disgruntled anglers, which potentially contributes to additional illegal introductions of invasive fish species.
- As a result of the no action alternative, Maine's native brook trout population's would be less secure and subject to the type of distribution contractions that have been documented by the EBTJV, leading to its status as a Species of Greatest Conservation Need.
- Other than the loss of habitat from invasives, we would not anticipate any new human or environmental impacts from this alternative.

VI. Environmental Impact Assessment and Mitigation Measures

The following section provides an in depth discussion and literature review of rotenone's environmental impacts, as well as, possible mitigation measures that will be used to minimize potential impacts and/or risks. In summary, rotenone is a naturally occurring compound that rapidly decomposes under typical environmental conditions, and has a long history of safe and effective use as a fishery management tool. Although rotenone can also be toxic to nontarget species, particularly other aquatic invertebrates and juvenile amphibians, the scientific literature clearly indicates that impacts are relatively short-term and natural communities typically recover to pre-treatment levels of abundance and diversity.

A. Rotenone Persistence in the Environment

Rotenone degrades very rapidly in water with exposure to light, heat, and oxygen. Other factors that contribute to the break down of rotenone include alkalinity and pH (CDFG 1994), the presence of organics, turbidity, lake morphology, and dilution rate from surface runoff and inlets. Detoxification can also be expedited by neutralizing with oxidizing chemicals like potassium permanganate or chlorine. Toxicity time is somewhat variable depending on the factors mentioned above, but most lakes naturally detoxify within 5 weeks of treatment (Schnick 1974 as cited by Bradbury 1986). A review of 103 lakes treated with rotenone in Washington showed that on average lakes remained toxic for 4-5 weeks. However, toxicity was highly variable from water to water with a range as short as 3 days to as long as 11 weeks (Bradbury 1986). The organic and rapid, natural degradation characteristics of rotenone are what make it such a useful and environmentally safe product for fisheries management.

Temperature and photolysis are two of the primary agents responsible for the detoxification of rotenone. Post (1958 as cited by Bradbury) examined the effect of water temperature, TDS, pH, alkalinity, dissolved oxygen, and various cations and anions on the decomposition rate of rotenone. He concluded temperature was the most significant factor, and developed two empirical equations to predict toxicity time (Table 2). Swingle (as cited by S.B. Penick and Company 1963) found exposure to sunlight for 3.5 hours reduced rotenone toxicity by 66%. Engstrom-Heg and Colesante (1979) proved the amount of sunlight reaching rotenone toxic water also plays a significant role in its degradation. They concluded Post's equations' work well for shallow, homothermous ponds due to photolysis and temperature, but temperature plays an even more significant role in the breakdown of rotenone with increasing water depth. They developed different equations to more accurately predict rotenone degradation in thermally stratified waters.

Table 2. Temperature and Rotenone Dissipation (Post 1958).

Temperature (^{o}F)	No. days for dissipation
50	26
60	14
70	7
80	4

Obviously, rotenone is an unstable, organic chemical with a very short half-life. Gilderhus et al. (1986) determined the half-life of rotenone to be 13.9 hours in warm water (75 ^{o}F) and 83.9 hours in coldwater (32 ^{o}F). Similarly, another study reported a half-life of 10.3 days and 0.94 days at water temperatures of 32-41^{o}F and 73-81^{o}F, respectively. Rotenone residues decreased to below detection limits after 64 days in cold water versus 24 hours in the warm water treatment. (Gilderhus et al. 1988). Dawson et al. (1991) reports water sample half-lives of 1.3, 3.7,

and 5.2 days for rotenone applications when water temperatures were 73°, 60 °, and 47°F, respectively. Four to five half-lives are typically required for a 2 ppm formulation to be reduced to undetectable limits of 2 *u*g/l (CDFG 1994). Rotenone degradation is even more rapid in river/stream environments. In flowing waters rotenone breaks down in less than 24 hours due to dilution, hydrolysis, and photolysis (CDFG 1994).

Rotenone has been detected in bottom sediments of treatment lakes, and although persistence is somewhat longer than in water its degradation in sediments is still fairly rapid. Dawson et al. (1991) reported sediment rotenone levels decreased below detection limits by day 14 at 47°F, and by day 3 at water temperatures of 73°F. CDFG (1994) observed sediment rotenone levels similar to those found in water and natural detoxification lagged 1-2 weeks behind water levels. CDFG also reports that rotenone is rarely found in stream sediments following treatments.

Rotenone decomposes into at least 20 different degradation products, mainly rotenoids. Only one of the degradation products, rotenolone, is toxic (Cheng et al. 1972 as cited by Bradbury 1986). However, studies indicate rotenolone is approximately one-tenth as lethal to salmonids as rotenone (CDFG 1991 as cited by CDFG 1994). Rotenolone generally parallels rotenone residues, and is rarely found in the absence of the parent compound. The exception, rotenolone has been found to persist as long as 6 weeks in cold (<50 °F), alpine lakes with low alkalinity (CDFG 1994).

B. Drift to Non-target Areas

1. Downstream

There is a potential for rotenone to be discharged downstream during the treatment period, which could impact nontarget species discussed in later sections. Ponds selected for treatment generally have small watersheds, limited outflow, and often intermittent outlet channels during dryer years.

Mitigation:

Late summer treatment plans are designed to reduce any potential downstream impacts. At this time, surface water levels are typically quite low, rainfall is limited, and outlet discharge is expected to be minimal or nonexistent. In addition, MDIFW will often consider drawing the pond level down approximately 3 feet with siphons to eliminate the initial potential for downstream migration of rotenone, and to provide time for the rotenone to degrade via natural processes before any discharge occurs. If a drawdown is used, basic watershed modeling is performed to predict the amount of time for the pond to refill and begin discharging on a case-by-case basis.

Lakes and ponds treated with rotenone are generally left to detoxify naturally, but discharges of rotenone can be neutralized with oxidizing chemicals such as potassium permanganate ($KMnO_4$) or chlorine, particularly when there are significant downstream resources (i.e. potable water supplies, important tail-water fisheries). Historically, MDIFW has not neutralized outlet flows with oxidizing chemicals, and Demong (2005) claims New York does not detoxify outlet flows on remote ponds.

Today, $KMnO_4$ is the preferred option when a neutralizing agent is required, but detoxifiers should only be used when necessary (Marking and Bills 1976). The use of $KMnO_4$ requires extra precautions to protect aquatic life, applicators, and to avoid spontaneous combustion (Finlayson et al 2000). Neutralization with $KMnO_4$ would typically require a treatment of 2-4 ppm to neutralize 2.0 ppm rotenone formulation; however, the 96-hr LC50 for fish ranges from 0.75 for channel catfish to 3.6 ppm for goldfish (CDFG 1994). Thus, there is only a small margin of error between detoxification and toxicity. The benefit of using a detoxifier is that the toxic plume will be reduced to a smaller size. $KMnO_4$ is caustic to mucous membranes, and extremely reactive with other oxidizing materials. The use of $KMnO_4$ also adds some logistical and expense issues that are difficult to overcome in remote pond situations.

Neutralization of rotenone by any method is not an immediate process, and there is a transition zone where potential fish or other organism mortalities are to be expected (Finlayson et al. 2000). MDIFW generally proposes a neutralization/impact zone without the use of a detoxifier; however, a detoxifier may be considered on a case-by-case basis. When a detoxifier is not used, the potential impact zone is determined by modeling the natural

degradation process of rotenone within and downstream of the pond using calculations derived by Engstrom-Heg and Colesante (1979).

2. Groundwater

Dawson et al. (1991) found rotenone sediment residues decreased below detection within 14 days at 47^{o}F and 3 days at 73^{o}F, which suggests limited opportunity for rotenone to occur in groundwater. In addition, he also discovered rotenone leached vertically less than 1 inch in most soils, but just over 3 inches in sandy soils; and readily bound to sediments. Based on the results, he concluded it was highly unlikely rotenone would enter groundwater (Dawson 1986 as cited by Finlayson et al 2001).

More recently, CDFG has conducted extensive testing on rotenone's potential impacts to groundwater. Siepmann and Finlayson (1999) reported rotenone and rotenolone in sediments fell below detectable limits at all sample sites within 55 days post-treatment. In addition, no VOCs from the petroleum-based compounds in the liquid formulation Nusyn-Noxfish® were detected in groundwater. Finlayson et al. (2001) monitored 26 wells adjacent to 9 treatments of rotenone in California since 1987 and no detectable formulation components have ever been found in well samples. The authors concluded ground waters were not contaminated by rotenone treatments.

A propensity for rapid detoxification under natural conditions, a strong affinity for organics, and low permeability in soils suggest a very low potential for impacts to either groundwater or surface water resources. Extensive testing in California confirms this to be the case.

Mitigation:

No mitigation is necessary. However, treatments scheduled from late summer to fall occur during periods when surface and groundwater levels are naturally low and the incidence of precipitation is limited. The accumulation of organic sediments in most Maine ponds provides an additional layer of protection, as rotenone has a high affinity for organics.

C. Air Quality

Air quality is not likely to be significantly impacted by fishery related rotenone treatments. Although, chemical like odors from liquid formulations and odors from decaying fish may persist in the air for short periods of time. Odor persistence depends on air and water temperatures, as well as, air movement caused by wind. Based on our experiences in Maine, odors rarely persist for more than 1 to 2 weeks.

In 1997, CDFG monitored the airborne drift of powder and liquid rotenone formulations into nearby areas. The airborne rotenone concentration immediately adjacent to the treatment site and just after treatment reached a high of 0.00053 mg/m^3 and fell to nondetectable levels within two weeks. The highest level recorded was 1,000-fold lower than the estimated NOEL of 0.43 mg/m^3/24-hours as estimated by the California Office of Environmental Health and Hazard Assessment and the California Department of Pesticide Regulation (CARB 1997 as cited by Finlayson et al. 2000).

Mitigation:

Odors and other air quality issues are not likely to be a problem for the typical remote pond with limited access, where few (if any) camps/homes exist and recreational use is light. Different situations will be handled on a case-by case basis. Use of all powdered rotenone during fall treatments and powdered rotenone for surface waters during summer treatments will reduce the short-lived (few days) chemical smell associated with the liquid formulation. A new formulation recently approved by the EPA (CFT Legumine) reduces or eliminates the use of the petroleum based emulsifiers by using a soap type compound to perform the same function. This new formula reportedly has little to no odor, and may be considered as an alternative to the older liquid formulations in future reclamations. Although fish odors may have a slightly longer persistence, they do not typically create a significant problem or issue. A discussion on dead fish removal is presented in the methodology section. In addition, the area will be posted at likely access points to inform the public about the treatment and to avoid water contact until rotenone levels have dissipated.

D. Water Quality

Several researchers have examined the impacts of rotenone on various water quality parameters. Bradbury (1986) conducted a comprehensive literature review and concluded water temperature, dissolved oxygen, pH, alkalinity, and carbon dioxide were likely not affected either directly or indirectly by rotenone treatments. Following are some of the specific studies Bradbury used to make his conclusion:

- Bonn and Holbert (1961) tested 18 water quality parameters on two Texas lakes following rotenone treatment and only four showed significant change: turbidity decreased, plankton increased, noncoliform bacteria increased, and taste/odor was affected.
- Brown and Ball (1943 as cited by Bradbury 1986) examined water temperature, dissolved oxygen, alkalinity, and pH on a Michigan lake and found no significant change within 4 days of rotenone treatment.
- Houf and Cambell (1977) conducted rotenone experiments on 3 small Missouri ponds and two control ponds. No significant changes in water temperature, pH, dissolved oxygen, hardness, and alkalinity were reported up to 1 year after treatment.
- Wollitz (1962 as cited by Bradbury 1986) determined no change in oxygen saturation, pH, nitrate, and inorganic phosphate after rotenone treatment. However, turbidity decreased and transparency increased after treatment.
- Bandow (1980) found no evidence of significant change in surface water temperature, dissolved oxygen, or nitrate nitrogen on a Michigan lake following treatment with rotenone. Yet, transparency increased substantially due to lower algae levels.

Contrary to Bradbury's review, more recent data suggests in some cases dissolved oxygen may be temporarily reduced due to chemical oxygen demand from rotenone degradation processes, as well as, the biological oxygen demand created by decaying fish (CDFG 1994). If it occurs, this is a short-term phenomenon and dissolved oxygen levels return to normal by the time the water body has detoxified (Harrington and Finlayson 1988 as cited by CDFG 1994).

On the other hand, Bradbury's review concluded four water quality parameters are likely to be affected including: phytoplankton, bacteria, water odor/taste, and turbidity/transparency. Phytoplankton is considered as a water quality parameter here only in that it impacts the aesthetic quality of a water body. Various researchers have shown both increases and decreases in phytoplankton levels following rotenone treatments, which will be discussed in further detail under the specific section on phytoplankton. The other three parameters are discussed in more detail below.

Bonn and Holbert (1961) noted an increase in noncoliform bacteria levels following rotenone treatment in two Texas lakes, which they attributed to decaying fish and/or agitation of the water and bottom sediments during treatment. The increase in bacteria was a temporary phenomenon.

Rotenone treated water may have a "kerosene" like odor/taste, which is attributed to the hyrocarbon solvents used in liquid rotenone formulations (Bonn and Holbert 1961, and Cohen et al. 1961 as cited by Bradbury 1986). In addition, Bonn and Holbert also reported a fishy odor 17 days after rotenone treatment, which was probably the result of decaying fish. Both researchers indicated odors were temporary and could be eliminated from drinking water supplies by treating with activated carbon.

Many researchers have reported a reduction in turbidity and/or increases in transparency following rotenone treatments, which is generally considered a beneficial side-effect of rotenone treatments. Consequently, rotenone has more recently been used in many biomanipulation projects to improve water quality. Bradbury (1986) and Ling (2003) conclude changes in turbidity/transparency are generally the result of elimination/reduction of bottom scavenging and/or planktivorous fish populations. Benthic fish species are believed to impact turbidity by resuspension of bottom sediments and nutrients. Planktivorous fish can reportedly create bottom-up cascading trophic effects, essentially they control or limit zooplankton populations that in-turn results in higher phytoplankton levels. Following are some studies reporting water clarity improvements irrespective of the two likely mechanisms, more discussion on potential causes of improved clarity are presented in the section on phytoplankton.

Bradbury (1986) has cited several instances were researchers have documented increased transparencies due to the removal of carp via rotenone including: Bennett (1943), Needham (1966), Tanner and Hayes (1955), Weier and

Starr (1950), Klingbiel (1975), and Eschmeyer (1953). However, none of these authors quantified the extent of the changes or indicated whether the changes were due to the result of suspended silt or reductions in algae. Bonn and Holbert (1961) reported an 85% decrease in turbidity 5 days after a rotenone treatment; and Wollitz (1962 as cited by Bradbury 1986) showed a 54% reduction in turbidity. Both authors attributed the improvements to the removal of bottom-feeding fish. MDIFW has observed similar increases in water clarity following rotenone treatments in Maine due largely to the removal of brown bullhead populations, which have been reported by others to cause turbidity (Bandow 1980, Smeltzer and Shapiro 1982 and Wollitz 1962 both as cited by Bradbury 1986).

The Minnesota Pollution Control Agency (1997) reported water quality, based on several trophic status indicators, improved dramatically on Lura Lake following a rotenone treatment in 1994. Transparency and algae levels remained relatively low up to 2 years after treatment. Dawson et al. (1991) observed significant improvements in several water quality parameters including turbidity, BOD, TSS, chlorophyll a, and pheophytin a. Interestingly, none of the rotenone treated ponds in Dawson's study contained fish suggesting improvements were likely related to shifts in algal and/or phytoplankton biomass. Prejs et al. (1997) conducted a 7-year biomanipulation project on a lake in Poland and reported a 40% increase in transparency, almost a 50% reduction in total phosphorus, and a 2.8 fold decline in algal biomass. The improvements were sustained for a period of at least 3-years, at which time the study was concluded.

Mitigation:

Odors, tastes, and bacteria level impacts are all unlikely to be an issue on Maine project waters for several reasons including: the remoteness of the pond limits recreational uses; few (if any) camps or homes in the vicinity of the pond; and we rarely treat drinking water supplies. Bacteria levels are also not expected to be as high as that reported in Texas due to lower productivity and lower fish biomass. Again, any potential affects are typically very short-term in nature. The full/partial use of powdered rotenone is another mitigation technique that would reduce odor and taste issues. Bonn and Holbert (1961) reported that powdered rotenone did not produce any kerosene type odors.

Water clarity may improve after treatment, particularly on waters where benthic feeding fish (i.e. bullhead) have been removed. Improvements in turbidity/transparency and possibly other trophic indicators are not expected to be a problem, and are often considered a potential side benefit related to rotenone treatments. Furthermore, some of the more dramatic changes observed elsewhere are not expected to occur on Maine waters due to the relatively low productivity of our systems, and more limited fish populations.

E. Non-target Animal Effects

1. Effects on Fish

Obviously, fish are extremely vulnerable to an aquatic piscicide like rotenone, but susceptibility varies among species. Rotenone toxicity tests conducted by Marking and Bills (1976) indicated goldfish (*Carassius auratus*) were the most resistant of the 21 species tested, whereas Atlantic salmon (*Salmo salar*) were the most sensitive. Table 3 provides rotenone toxicity information for selected fish species that are commonly encountered in Maine.

Table 3. Toxicity of Rotenone Formulation(s) to Selected Fish Species (Adapted from Marking and Bills 1976).

Species	**LC_{50} and 95% Confidence Intervals (ppm)**	
	24-H	**96-H**
Rainbow trout *Oncorhynchus mykiss*	0.0689 0.0562-0.0844	0.0460 0.0326-0.0649
Atlantic salmon Salmo salar	0.0350 0.0297-0.0412	0.0215 0.0155-0.0298
Brook trout Salvelinus fontinalis	0.0470 0.0422-0.0523	0.0443 0.0411-0.0477
Lake trout Salvelinus namaycush	0.0269 0.0198-0.0365	0.0269 0.0198-0.0365
White sucker Catostomus commersoni	0.0719 0.0640-0.0808	0.0680 0.0540-0.0856
Smallmouth bass	0.0932	0.0790

Micropterus dolomieui	0.0851-0.102	0.0707-0.0882
Largemouth bass Micropterus salmoides	0.200 0.131-0.305	0.142 0.115-0.176
Yellow perch Perca flavescans	0.092 0.080-0.106	NA
Northern Pike Esox lucius	0.045 0.031-0.064	0.033 0.027-0.041

Fishery managers typically recommend and use dosages of rotenone (i.e. 2.0 ppm for this project) that far exceed the LC_{50} levels reported in the literature. According to Marking and Bills (1976) actual field dosages for rotenone treatments are higher for a variety of reasons including: (1) LC_{50s} produce 50% mortality, whereas biologists are striving for 100% mortality; (2) environmental factors like sunlight, temperature, and organic matter quickly detoxify rotenone in the field, whereas these factors are controlled in laboratory type settings; (3) it is difficult to obtain uniform concentrations in a natural water, so larger doses are needed to insure target organisms are eliminated; and (4) some individuals in a population are more resistant.

Fish eggs are more resistant to rotenone than older life stages such as fry or fingerlings (Marking and Bills 1976, Bills et al. 1988). Marking and Bills (1976) reported rainbow trout eggs were 47 to 106 times more resistant than fingerling trout depending on alkalinity. Bradbury (1986) reported several other researchers have demonstrated similar results. Egg resistance is an additional reason for biologists to postpone rotenone treatments until late summer through fall, since most target species spawn from spring to early summer. If fish eggs are likely to be present then a second follow-up treatment is often recommended or required to insure success of the project.

Mitigation: Late summer/fall treatments potentially eliminates the need for a 2nd follow-up treatment, which minimizes the use of rotenone required for the project. Obviously, target and nontarget species of fish will be eliminated in project waters and possibly other areas within the neutralization zone. Although not anticipated, drawdowns are often utilized to extend the time period available for natural detoxification, which minimizes or eliminates potential downstream impacts to nontarget fishes in the outlet stream system beyond the designated neutralization area. If an impact did occur it would likely be limited to a very short stream segment, and fish and invertebrate species located upstream and downstream would quickly repopulate the affected area.

2. Effects on Benthos

Sensitivity to rotenone is highly variable among the benthic invertebrates, although most species studied are more tolerant than fish (Table 4). Bradbury (1986) conducted a comprehensive review of LC_{50}'s for many aquatic benthos subjected to rotenone, and found a range of as low as 0.1 ppm to as high as 47.2 ppm depending on the species tested. He also suggests LC_{50}'s are of limited value in examining impacts in natural systems, since most studies were conducted in bare aquarium systems. Lindgren (1960 as cited by Bradbury 1986) found rotenone levels of 0.3 ppm killed all midges in a bare aquarium compared with 50% mortality at ten times the dosage (3.0 ppm) in aquaria where midge larvae had access to sediments. Nonetheless, LC_{50} studies are still valuable in that they provide some context as to the relative susceptibilities of the various aquatic organisms. Decapod crustaceans are the most tolerant, followed by caddis fly larvae, aquatic snails and clams, larval dragonflies/damselflies, phantom midges, true midges, and lastly mayflies. Actual field data reflects similar susceptibilities (Bradbury 1986).

Table 4. Toxicity of Rotenone Formulation(s) to Selected Benthic Invertebrates (Adapted from Ling 2003 and Bradbury 1986).

Group	Species	Test Endpoint	Lethal Concentration	Reference
Flatworm	Catenula sp.	LC_{50} 24H	5.10 mg/l	1
Ostracod	Cypridopsis sp.	LC_{50} 24H	0.49 mg/l	1
Freshwater Prawn	Palaemonetes kadiakenis	LC_{50} 24H	5.15 mg/l	1
Dragon Fly Larvae	Macromia sp.	LC_{50} 24H	4.70 mg/l	1
Crayfish	Orconectes immunis	LC_{50} 24H	9.6-47.2	2
Backswimmer	Notonecta sp.	LC_{50} 24H	3.42 mg/l	1

Mayfly Larvae	Siphlonurus sp.	50% mort @ 48H	1.25 mg/l	4
	Caenis sp.	50% mort @ 30H	0.1 mg/l	5
Caddis Fly Larvae	Hydropsyche sp.	LC_{50} 96H	0.61 mg/l	1
	Hesperophylax sp.	LC_{50} 24H	5.1-15.0 mg/l	2
Whirligig Beetle	Gyrinus sp.	LC_{50} 24H	3.55 mg/l	1
Midges	Unid. midges	LC_{50} 48H	0.31 mg/l	3
	Unid. Phantom midges	LC_{50} 48H	1.13 mg/l	3
Snails	Physa pomilia	LC_{50} 24H	6.35 mg/l	1
	Oxytrema catenaria	LC_{50} 96H	1.75 mg/l	1
	Heliosoma sp.	LC_{50} 96H	7.95 mg/l	1
Clams	Elliptio buckleyi	LC_{50} 96H	2.95 mg/l	1
	Elliptio complanata	LC_{50} 96H	2.95 mg/l	1
	Corbicula manilensis	LC_{50} 96H	7.50 mg/l	1
1. Chandler and Marking 1982, 2. Farringer 1972, 3. Brooks 1961, 4. Claffey and Ruck 1967, 5. Lindgren 1960				

Bradbury (1986) conducted a thorough review of field experiments regarding the impacts of rotenone on aquatic benthos, which included 13 experiments on 23 different lakes and ponds with treatment levels ranging from 0.25-5.0 ppm. Based on his review, the immediate reduction of aquatic benthos ranged from 0-71%, and averaged 25%. Results were highly variable, presumably due to environmental differences, and there was no clear correlation between rotenone levels and benthic mortality. Eleven of the 13 studies indicated benthos had fully recovered some point after treatment, with several studies reporting almost immediate recovery. Meelas et al. (2001) reported no significant short-term effect on benthic taxa in prairie wetlands treated with rotenone, which also suggests almost immediate recovery. Miller et al. (1992) indicates mollusks, annelids, leeches, crayfish, and various aquatic insects all recovered from rotenone treatments in New York waters treated at 1 ppm. Other studies reviewed by Bradbury reported recovery times up to 2 months, and Schnick (1974 as cited by Bradbury 1986) suggests benthic recoveries may take up to 3 months.

Almost half of the studies reviewed by Bradbury (1986) indicate benthic abundance increased significantly above pre-rotenone treatments. Ball and Hayne (1952) reported the number of benthic organisms doubled, and Walters and Vincent (1973) found a 3.5 fold increase in the benthic population following rotenone treatments. More recently, Schrage and Downing (2002) observed a 5-fold increase in benthic biomass following rotenone treatment. Demong (2005) claims that he generally finds several additional benthic taxa present after rotenone treatments in New York, which is likely due to higher abundance levels of rare taxa after rotenone treatments. Most researchers have attributed these increases to a reduction in fish predation; however, rotenone treatments on fishless ponds have shown similar results. Lellak (1965 as cited by Bradbury 1986) suggested benthic population increases might also occur due to an increase in the food supply resulting from the deposition of dead plankton. In any case, these increases are typically reported to be temporary responses to the initial rotenone treatment.

Of the studies reviewed by Bradbury (1986), Smith (1941) was the only one to report a disappearance of a species (snail) following rotenone treatment, whereas 5 studies with adequate analysis reported all taxa had reappeared. Harig and Bain (1995) reported the loss of Chaoborus in New York lakes treated with rotenone and predicted recovery would likely take more than 2 years, because the species would have to recolonize from nearby lakes. However, Demong (2005) reports he observed Chaoborus in trout stomachs sooner than predicted by Harig and Bain. Others have reported chaoborid larvae surviving rotenone treatments in large numbers (Hongve 1977 and Wright 1957 as cited by Bradbury 1986), and MDIFW biologists have noted Chaoborus species in trout stomachs a year or two after rotenone treatments.

Of the study's reviewed by Bradbury (1986), three studies examined species diversity following rotenone treatments and reported either no change, diversity was reduced but appeared to be recovering, and an increase in species diversity. In addition, several researchers noted changes in community structure following rotenone treatments, but changes were again reported to be temporary responses. Not all, but many of the reviewed studies indicated rotenone tolerant species initially dominated the habitat following the reduction of other benthic organisms.

Based on the information presented, it is clear that rotenone levels used for this project will impact more sensitive benthos, particularly mayflies and midges, and have little to no impact on some of the more tolerant species. Initial

reductions in benthic communities are common, and are an unavoidable environmental impact. On the other hand, reported impacts are typically minor and relatively short in duration.

Mitigation:

Methods (i.e. drawdowns, neutralization) are often employed to reduce or eliminate the downstream drift of rotenone (see section on drift to nontarget areas) to minimize the extent of impacts on local benthic communities. In addition, late summer and fall treatments are expected to reduce the effect on invertebrate communities as reported by Meelas (2001). Based on the literature and past experiences, benthic organisms are expected to naturally recolonize the available habitat in short order.

3. Effects on Zooplankton

Bradbury (1986) conducted a comprehensive review of LC_{50}'s for zooplankton subjected to rotenone, and found a range of 0.028 to 0.55 ppm depending on the species tested (Table 5). The data below suggests microscopic crustaceans would likely be quite vulnerable to rotenone at the levels used in typical fish control projects. In field studies, cladocerans and copepods are clearly the most susceptible group of zooplankters, followed by protozoans and then rotifers (Bradbury 1986).

Table 5. Toxicity of Rotenone Formulation(s) to Selected Zooplankton (Adapted from Ling 2003 and Bradbury 1986).

Group	Species	Test Endpoint	Lethal Concentration	Reference
Cladocera	Daphnia pulex	LC_{50} 24H	0.028 mg/l	1
	Daphnia sp.	LC_{50} 48H	0.24-0.57 mg/l	2
	Dapnia sp.	LC_{50} 48H	0.31-0.55 mg/l	3
	Dapnia sp.	LC_{50} 48H	0.10 mg/l	4
	Simocephalus serrulatus	LC_{50} 48H	0.19 mg/l	4
Copepoda	Cyclops sp.	LC_{50} 48H	0.12-0.24 mg/l	2
	Cyclops sp..	LC_{50} 48H	0.14-0.18 mg/l	3
1. Chandler and Marking 1982, 2. Wright 1957, 3. Brooks 1961, Sanders and Cope 1966				

Several studies have reported rotenone has an almost immediate, catastrophic impact on zooplankton populations, particularly microscopic crustaceans (Anderson 1970, Bandow 1980, Beal and Anderson 1993, Brown and Ball 1943 as cited by Bradbury 1986, Harig and Bain 1995, Hoffman and Olive 1961 as cited by Bradbury 1986), Kiser et al 1963, Melaas et al. 2001, Neves 1975, Smith 1940, and Smith 1941). Bradbury (1986) summarized 19 separate field studies where zooplankton abundance was recorded pre and post rotenone treatment including some of those referenced above. Sixteen of the nineteen studies reported a 95-100% reduction in zooplankton abundance within a few days of rotenone treatment.

On the other hand, many of the same studies referenced above suggest the impacts on zooplankton communities are a relatively short-term phenomenon with little to no long-term, significant impacts. Bradbury (1986) concluded that zooplankton, particularly Cladocera and Copepoda, populations quickly repopulate a rotenone treated lake following a brief period of absence (2-12 weeks) from the pelagic zone. Although the literature is variable, he suggests zooplankton communities completely recover to pre-rotenone levels of abundance and diversity within 2-12 months, although alpine lakes have reportedly taken up to 3 years to recover. Despite heavy mortality, it appears zooplankton are able to survive rotenone treatments in several ways including: species specific tolerance to rotenone (Bradbury 1986); parthenogenic summer eggs and tough ephippial eggs that lie dormant in the sediments over the winter are unaffected by rotenone (Kiser et al. 1963, Anderson 1970); and adult zooplankton survive in shallow, littoral areas that quickly detoxify rotenone. Several studies indicate zooplankton associated with the pelagic zone are much more susceptible to rotenone than species or individuals associated with benthic and littoral areas (Kiser et al. 1963, Melaas et al. 2001, Harig and Bain 1995). Zooplankton in these habitats exhibit 30% survival and can quickly repopulate the treated water (Miller et al. 1995). Kiser et al. (1963) also suggest some species may recolonize from other nearby waters; however, this has never been documented (Bradbury 1986).

A variety of changes in the zooplankton community structure have been observed following rotenone treatments; however, most are relatively minor and temporary changes that appear to be associated with a temporary dominance of species less affected by the rotenone treatment (Bradbury 1986). Two of the more commonly reported changes in community structure after rotenone treatment are the dominance of larger-sized cladocerans, and an increase in zooplankton body size (Anderson 1970, Bandow 1980, Walters and Vincent 1973, Harig and Bain 1995, Carpenter et al. 2001, Prejs 1997, Schrage and Downing 2002). These reported changes in community structure are typically associated with the absence and/or reduction of predatory fish. Nearly all fish species eat zooplankton to some degree and several authors have noted that fish populations can exert dramatic influences on zooplankton communities (Brooks and Dodson 1965, Galbraith 1967). Galbraith (1967) also reported yellow perch and rainbow trout do not simply feed indiscriminately on zooplankton, instead they specifically target larger individuals. Such changes in community structure may be temporary or permanent depending on whether or not fish are reintroduced to the system. If fish are reintroduced, zooplankton structure and abundance typically return to pre-rotenone levels (Bradbury 1986).

According to Bradbury (1986), four out of ten studies he reviewed reported that a zooplankton species failed to reappear after rotenone treatment. However, three out of the four reported inadequate sampling or the occurrence of a rare specimen prior to rotenone treatment was likely responsible for the "disappearance." The fourth study proclaimed the "disappearance" was the result of exclusion by a large Daphnia species in the absence of fish. Kiser et al. (1963) reported that none of the 42 species of zooplankton failed to reappear in Fern Lake, Washington after rotenone treatment, and concluded that complete elimination of a species was unlikely. Several studies have reported the appearance of new zooplankton species following rotenone treatments; however, Bradbury (1986) suspects many new species were simply the result of species that went undetected during pre-rotenone sampling due to rarity, lack of littoral habitat sampling, and/or low seasonal abundance at the time of sampling. He further reports that in cases were "new" species occurred, they never became dominant.

The reported results clearly indicate microscopic crustaceans are very sensitive to rotenone and would be heavily impacted during any proposed treatment, and short-term impacts on the zooplankton communities are an unavoidable environmental impact. On the other hand, zooplankton communities are expected to fully recover within a relatively short period of time.

Mitigation:

Methods (i.e. drawdowns, neutralization) are often employed to reduce or eliminate the downstream drift of rotenone (see section on drift to nontarget areas) to minimize the extent of impacts on local zooplankton communities. In addition, late summer and fall treatments are expected to reduce the affects on zooplankton communities as suggested by Meelas (2001) and Kiser et al. (1963). Based on the literature and past experiences, pre-existing zooplankton are expected to naturally recolonize the available habitat within a relatively short time frame.

4. Effects on Birds/Mammals

Wild birds and mammals, as well as, domestic animals are not affected by drinking water treated with rotenone or by eating fish killed from rotenone treatments related to fisheries management projects. However, birds and mammals that rely on fish or aquatic organisms as food may be indirectly affected by forcing these animals to temporarily search elsewhere for food resources.

A review of avian oral toxicity (LD50) values for rotenone ranges from 113 mg/kg for nestling chipping sparrows to greater than 2000 mg/kg for mallard ducks. Young birds are apparently more sensitive than adults (Table 6).

Table 6. Toxicity of Rotenone to Selected Birds and Mammals (Adapted from Bradbury 1986, CDFG 1994, and Ling 2003).

Group	Species	Test Endpoint	Lethal Concentration	Reference
Birds	Eastern chipping sparrow (nestling)	acute LD50 oral	113 mg/kg	1a
	Eastern robin (nestling)	acute LD50 oral	195 mg/kg	1a

	English sparrows (nestling)	acute LD50 oral	199 mg/kg	1a
	English sparrows (nestling)	acute LD50 oral	199 mg/kg	1a
	English sparrows (adults)	acute LD50 oral	853 mg/kg	1a
	Pheasant (5-day)	acute LD50 oral	850 mg/kg	1a
	Pheasant (4-week)	acute LD50 oral	1190 mg/kg	1a
	Japanese Quail	acute LD50 oral	1882 mg/kg	2
	Mallard duck	acute LD50 oral	2600-3568 mg/kg	2
Mammals	Rat (female)	acute LD50 oral	39.5 mg/kg	3
	Rat (male)	acute LD50 oral	102 mg/kg	3
	Rat	acute LD50 oral	132-1500 mg/kg	4
	Rat	chronic LD50 oral	~10 mg/kg	5
	Guinea pig	acute LD50 oral	55-60 mg/kg	1b
	Rabbit	acute LD50 oral	~1500 mg/kg	1
	Dog (30d)	chronic LD50 oral	~10 mg/kg	1
	Dog (180d)	chronic LD50 oral	>10 mg/kg	5
1. Cutkomp 1943ab 2. Hill et al. 1975, 3. USEPA 1988, 4. Kidd and James 1991, 5. NRC 1983				

Oral ingestion of rotenone is the only likely mechanism of uptake by wildlife during fishery management projects, but the potential for acute or chronic toxicity is highly unlikely. Rotenone residues in dead fish are typically low (<0.1 ug/g), unstable, and not readily absorbed through the gastrointestinal tract (Finlayson et al. 2000, CDFG 1994). To put this into perspective, at the most sensitive level a 4-ounce bird would need to consume 26.4 gallons of rotenone treated water (2.0 ppm) or over 220 pounds of dead fish within a 24-hour period to receive a lethal dose. Yet, this size bird would typically consume no more than 0.2 ounces of water and 0.35 ounces of food on a daily basis. Consequently, environmental levels of rotenone related to fishery management projects have at least a 1,000-10,000-fold safety margin against a lethal dose (CDFG 1994).

It appears that few long-term chronic toxicity studies have been performed on birds. However, Brooks and Price (1961 as cited by CDFG 1994 – incorrect citation) orally administered rotenone (25-50ppm) to ducks and chickens for more than 30 days with no toxic effects. Based on this study, no latent or continuing toxicity to birds would be expected. Rotenone levels for fishery related projects are substantially lower than those tested and environmental persistence of the chemical is relatively short.

A review of mammalian oral toxicity (LD50) values for rotenone ranges from 39.5 mg/kg for female rats to 1,500 mg/kg for rabbit (Table 6). Although the lowest reported toxicity is almost 3 times lower than that reported for birds, it is still highly unlikely that a mammal would suffer a lethal dose from either ingestion of water or consumption of fish that have died by rotenone. LD50 values for subcutaneous or intravenous injections in mammals are substantially lower than oral toxicities (CDFG 1994, Ling 2003); however, these routes of rotenone entry are unrealistic in fishery management applications.

Several chronic oral toxicity studies for rotenone have been conducted on dogs and rats (6). Bradbury (1986) and CDFG (1994) provide reviews on several studies and indicate rotenone has produced some sub-acute effects, particularly in regards to weight loss. Marking (1988) demonstrated weight loss in both rats and dogs. Rats demonstrated weight loss at 37.5 and 75.0 mg/kg in the diet. Several studies have attributed some of the weight loss to reduced food consumption due to taste avoidance and palatability or rotenone treated feed (Marking 1988, Brooks and Price 1961). Dogs fed rotenone via gelatin capsules have also demonstrated weight loss at 10mg/kg in the diet (Marking 1988) and 10 mg/d (Haag 1931 as cited by Bradbury 1986). In either case, these studies involved high doses of rotenone over extended periods that are unrealistic in relation to typical fishery management projects.

Mitigation:

Not necessary, treatments associated with this program are not expected to produce any significant impacts on birds or mammals. Indirect impacts from the loss of food resources are temporary and not likely a problem for adult birds and mammals, which are highly mobile and typically feed over extensive areas. MDIFW will mitigate the impacts on juvenile birds, waterfowl, and mammals by conducting a late summer to fall treatment. Project timing occurs after young, less mobile birds have fledged and mammals will have matured enough to have feeding patterns similar to adults.

5. Effects on Amphibians and Reptiles

Adult amphibians are less sensitive to rotenone than fish, and should not be significantly affected at typical piscicidal concentrations (CDFG 1994, Farrington 1972 as cited by Ling 2003). Farrington reported that toxicity values for adult frogs, Rana pipiens, ranged from 5.8 ppm (LD50 96H) to 24.0 ppm (LC_{50} 24H). On the other hand, rotenone is readily absorbed through gill epithelium, which makes larval amphibians and gill-breathing amphibian adults more susceptible to rotenone. Chandler and Marking (1982) reported toxicity as low as 0.5 ppm (LC_{50} 96 H) for frog tadpoles, *Rana sphenocephaly*. Similarly, Hamilton (1941 as cited by Ling 2003) conducted toxicity studies on larval frogs and salamanders and reported relatively low toxicity values. He concluded toxicity of rotenone to larval stages is largely dependent on their stage of metamorphosis and how dependent they are on gill respiration.

Observations of dead amphibians including frog larvae, as well as, adult and larval salamanders have been reported following rotenone treatments to eradicate fish (Brown and Ball 1943 as cited by Bradbury 1986, Demong 1997, Knowlton 1955, Meehean 1942, Miller et al. 1992). Although amphibian deaths have been documented following rotenone applications, there is strong evidence that rotenone likely has little long-term impact on amphibian populations. Brown and Ball (1943 as cited by Bradbury 1986) observed dead tadpoles following rotenone treatment on a Michigan Lake; however, three months later tadpoles were reported as numerous. Knowlton (1955) reported dead salamanders following a New Hampshire rotenone treatment conducted in August, but noted live and dead salamanders before and after a second treatment done in September of the same year. Lastly, Miller et al. (1992) and Demong (1997) provide numerous examples of post reclamation amphibian surveys conducted in Adirondack waters of New York. According to these studies, amphibians that had experienced mortality during the reclamation projects were consistently documented in post treatment surveys. In addition, post reclamation amphibian populations maintained their species diversity.

Bradbury (1986) stated he was unable to find any lab testing on rotenone and reptiles, and found little field data. He found only a single reference reporting deaths of soft-shelled turtles, which are not present in Maine. Soft-shelled turtles may exhibit a higher uptake of rotenone due to an ability to respire anally (Miller et al. 1992). Farrington (1972 as cited by Ling 2003) states rotenone treatments intended for fish reclamations would not significantly affect reptiles. NY DEC staff and staff reports, which includes observations from hundreds of reclamations, suggests turtles are unaffected by rotenone treatments (Miller et al. 1992).

Mitigation:

Based on the scientific literature, projects conducted under this progam would likely have no impact on reptiles; however, there may be some short-term impacts on amphibians, particularly juveniles. Overall, amphibian populations are expected to fully recover within a relatively short period of time. Late summer and fall treatments are expected to minimize impacts on juvenile amphibians as reported by Bradbury (1986).

F. Non-target Plant Effects

1. Effects on Phytoplankton

Rotenone treatments for fishery management projects are not known to create any direct toxic impacts on phytoplankton. However, some indirect effects on the phytoplankton community may occur due to changes in phosphorus levels and zooplankton grazing (Bradbury 1986). Short-term increases in algal production are not uncommon, and are often followed by a longer-term reduction. Changes in phytoplankton communities are often restored shortly after fish are re-introduced into the system. Details of the potential changes and impacts are discussed in more detail below.

Several researchers have reported phytoplankton blooms shortly after rotenone treatments (Kiser et al 1963, Anderson 1970, Bonn and Holbert 1961), although blooms do not always occur. The two most likely causes of such blooms are the release of phosphorus from decaying fish and/or reduced grazing pressures from zooplankton (Bradbury 1986, Bonn and Holbert 1961). Rotenone treatments may temporarily increase phosphorus availability due to dead and decaying fish, which can be expected to contribute 0.4% phosphorus by wet weight (Bull and Mackay 1976). Fish decay is fairly rapid and phosphorus would likely become available to plankton and other plants fairly quickly. In addition, fish decay may contribute to anoxic conditions, which could release additional

phosphorus from the sediments. The resultant nutrient pulse may contribute to a post-rotenone algal bloom, which have reportedly involved a 4 to 6- fold increase in algae levels. Post-rotenone nutrient pulses appear to be a relatively short-term phase with little potential for recurrence in subsequent years. It should also be noted, these nutrient inputs are not additional loads, but simply a temporary, sudden availability of nutrients already present in the existing system (Bradbury 1986).

Rotenone's initial reduction of zooplankton populations, the primary grazers in a freshwater eco-system, coupled with phytoplankton's resistance to the chemical is also a logical explanation for post-rotenone algal blooms. Several researchers have implicated reduced grazing by zooplankton as the likely cause and/or contributor to short-term post-rotenone algal blooms (Bandow 1980, Bonn and Holbert 1961, Kiser et al. 1963). Although no definitive study was found, Burress' (1982 as cited by Bradbury 1986) work on a fishless pond in Georgia certainly suggests this explanation was the likely cause of a post-rotenone algal bloom. As reported earlier, zooplankton populations generally recover in 2-12 months and similar blooms are unlikely to occur in subsequent years (Bradbury 1986).

On the other hand, rotenone treatments have reportedly resulted in longer-term improvements in water clarity and lower phytoplankton levels, which have been attributed to the removal of benthivorous fish and/or increases in zooplankton grazing levels due to reduced fish predation. Many researchers have associated bottom-feeding fish such as carp or bullheads with cloudy water, and removal of these species by rotenone treatments has successfully improved water clarity. Bottom feeding fish are believed to impact water quality by continually stirring up bottom sediments and/or by increasing algal populations by enhancing nutrient availability. Unfortunately, many studies do not characterize or quantify the mechanism responsible for the turbid conditions (see water quality section). Smeltzer and Shapiro (1982 as cited by Bradbury 1986) studied a Minnesota Lake infested with carp and bullhead, and determined that 71% of the light attenuation was caused by algae and suspended silt was only a minor contributor. On the other hand, Breukelaar et al. (1994) and Meijer et al (1990) suggests suspended sediments from benthivorous fish can be significant, particularly in shallow water bodies.

Many researchers have reported notable decreases in algal counts following the removal of benthivorous fish, and it seems likely that bottom-feeding fish likely play a role in higher phytoplankton production. At one time, many believed bottom-dwelling fish contributed to algal production by simply stirring the sediments, which enhanced nutrient availability (Bradbury 1986, Bandow 1980). Yet, Lamarra (1975 as cited by Bradbury) indicates simple mechanical stirring did not release appreciable amounts of phosphorus nor did it increase algae levels, although the digestive activity of carp did release phosphorus from the sediments and raised chlorophyll levels. In fact, 50% of the total phosphorus excreted by carp was orthophosphate, which is an immediately available form for phytoplankton use. Smeltzer and Shapiro (1982 as cited by Bradbury) determined carp and bullhead populations were contributing as much phosphorus in a eutrophic Minnesota Lake as all external sources combined, and implicated them as a major contributor to algal blooms. Vanni and Finlay (1990) also suggest excretion and egestion of phosphorus from both fish and smaller forms of zooplankton can be significant. In conclusion, lakes with heavy benthic fish populations may experience a decline in phytoplankton/algal biomass following treatment, and complete eradications would likely produce long-term improvements.

As discussed earlier (section on zooplankton), post-rotenone zooplankton communities may exhibit temporary or longer-term changes including: increases in abundance, dominance of larger sized cladocerans, and individuals obtain larger sizes. These changes have been attributed to the absence and/or reduction of fish predation, and would likely lead to reductions in phytoplankton. Larger sized zooplankton are reportedly more efficient grazers on phytoplankton than smaller-bodied species or individuals (Brooks and Dodson 1965, Carpenter et al. 1985, and Shapiro and Wright 1984). Prejs et al. (1997) conducted a 7-year biomanipulation project on a lake in Poland and reported a 40% increase in transparency and a 2.8 fold decline in algal biomass, which was attributed to a significant increase in a large cladoceran. Other researchers have shown similar results (Schrage and Downing 2002, Carpenter et al. 2001). According to Bradbury (1986), long-term effects on phytoplankton communities from excessive grazing are unlikely in fishery management projects, because zooplankton populations typically return to pre-rotenone levels when the desired fish species are re-introduced.

In conclusion, rotenone projects proposed under this program will not likely have any long-term, adverse impacts on the phytoplankton community. Short-term increases in phytoplankton production may result subsequent to a treatment event.

Mitigation:

Fall rotenone treatments are expected to be the best option for minimizing the potential of temporary algal blooms, because they occur near or after fall turnover when dissolved oxygen levels adjacent to bottom sediments would not likely become anoxic. In addition, decreasing temperatures and day-length would likely reduce algal production at the time of any nutrient pulse. Although late summer treatments may be employed to address other environmental issues, algal blooms on Maine waters following summer treatment are not anticipated due to the relatively low abundance of benthivorous fish species and relatively small fish populations. Indirect effects on the phytoplankton community from the treatment are likely to be short-term impacts related to temporary changes in grazing levels. However, recent research from the Adirondacks indicates that restoration of native brook trout waters has resulted in mild top-down cascading facts that also creates a more historical or natural community of zooplankton and phytoplankton (Harig and Bain 1995).

2. Effects on Terrestrial Plants/Aquatic Macrophytes

According to the USEPA (1989 as cited by CDFG 1994) rotenone formulations are not toxic to plants. In addition, nitrogen fixation in soil, sediment, and water is neither greatly reduced or enhanced by rotenone; however, relatively long-term impacts on microbial activity was observed in sediments with rotenone levels between 5 and 25 ppm (Hazelton Raltech 1982b as cited by CDFG 1994). In reality this is not likely a problem with fish management projects. Extensive monitoring by CDFG indicates that rotenone is rarely detected in sediments (0.05 ppm detection level), and when detected rotenone levels have never exceeded the 0.50 ppm threshold reported by Hazelton Raltech (CDFG 1994). Lastly, Finlayson and Harrington (1991 as cited by CDFG 1994) indicate that rotenone residues did not persist in sediments for more than ten days.

Smith (1940) reported there was no evidence that rotenone effected the rooted aquatic vegetation in a New Brunswick lake following treatment. On the other hand, WDFW (1988) suggests populations of aquatic plants may increase or decrease depending on the fish species present before and after reclamation. The Minnesota Pollution Control Agency (1997) reported an increase in abundance of two species of pondweeds, along with decreases of other submergents and emergents including coontail, cattail, and rushes. Several studies report that removal of benthivorous fish via rotenone treatments has successfully restored aquatic macrophyte communities including increases in diversity and abundance (Brasstrup 2001, Schrage and Downing 2002, Hansen and Butler 1993, Anderson 1950). Bandow (1980) noted significant increases in Elodea after bullhead removal in a shallow Minnesota lake, which he attributed to increased light penetration. On the other hand, MDIFW has anecdotally observed a slight decrease in aquatic macrophyte growth on at least one pond 1-year post rotenone treatment. We suspect this was the result of a decrease in nutrient availability caused by bottom-feeding fish as discussed earlier.

Mitigation:

None proposed. Given the characteristics of Maine waters and the cited literature, we do not anticipate any significant long-term changes to terrestrial or aquatic plants in and around treatment ponds from rotenone. The only short-term impact on plants would be direct, physical damage related to the treatment process (i.e. trampling by staff/equipment, propeller damage). These impacts are not likely to be significant due to the small crew size (3-4 people), and limited amount of equipment needed to conduct this treatment.

G. Threatened and Endangered Species

MDIFW fisheries staff consults the Wildlife Division and requests a map of critical habitats and known occurrences of threatened or endangered species. This same map also depicts if any rare plants or rare/exemplary natural communities as identified through the Maine Natural Areas Program occur in the vicinity of the project site.

Mitigation:

If applicable, mitigation for Federally or State listed rare, threatened, or endangered species will be addressed on a case-by-case basis during the MDEP permitting process.

H. Environmental Impacts from Inert Ingredients in Liquid Formulations

Liquid based rotenone formulations contain petroleum-based products to aid with vertical and horizontal dispersion

of rotenone throughout the water column. Several of these products (trichloroethylene TCE, naphthalene, and xylene) are also found in fuel oil and are typically present in surface waters due to the use of outboard motors (Finlayson et al. 2000).

California researchers have documented the presence of several volatile and semi-volatile organic compounds (VOC/semi-VOC) in waters treated with the liquid formulation Nusyn-Noxfish® (CDFG 1994; Siepmann and Finlayson 1999; Finlayson et al. 2001). A summary of the California research is provided below in Table 8. Dibble Lake in Washington was treated with 3.0 ppm liquid rotenone and tested for VOCS and semi-VOCs 24 hours and four weeks after treatment. VOCs were not detected in either sample; however, low levels (<70 ug/l) of semi-VOCs were detected (WDFG 2002).

The persistence of the VOCs and semi-VOCs is relatively short in both water and sediments, and these compounds have not been detected in wells used to monitor groundwater (Finlayson et al. 2001). Initial concentration levels of xylenes, naphthalene, and methylnaphthalenes did not exceed water quality criteria or guidelines (based on lifetime exposure) set by the USEPA. Although TCE is a carcinogen, its initial concentration was also well below USEPA levels (5 ppb) allowed for drinking water (Finlayson et al. 2000).

Table 8. Initial water/sediment concentration and persistence of VOCs and semi-VOCS in waters treated with 2.0 ppm liquid rotenone formulations (Adapted from Finlayson et al. 2000).

Chemical Compound	Initial Water Concentration	Water Persistence	Initial Sediment Concentration	Sediment Persistence
Trichloroethylene	1.4 ppb	<2 weeks	ND	
Xylene	3.4 ppb	<2 weeks	ND	
Trimethylbenzene	0.68 ppb	<2 weeks	ND	
Naphthalene	140 ppb	<3 weeks	146 ppb	<8 weeks
1-m-naphthalene	150 ppb	<3 weeks	150 ppb	<4 weeks
2-m-naphthalene	340 ppb	<3 weeks	310 ppb	<4 weeks
ND = below detection limit				

California has detected two of the heavier hydrocarbons, naphthalene and methylnaphthalene, in air samples, but levels diminished within 2 weeks (CARB 1997 as cited by Finlayson et al. 2000). On the other hand, a treatment in Washington conducted periodic air sampling for organic vapors, and no unsafe levels were recorded even when samples were taken within inches of the open barrel of liquid rotenone (WDFG 2002).

Mitigation:

Fall treatments typically minimize the use of liquid formulations to small treatment areas (i.e. shallow water, backwaters, inlets) and mitigate the issues associated with VOCs and semi-VOCs by utilizing mostly powdered formulations. However, MDIFW will often choose a late summer treatment to address more significant environmental issues including downstream migration, longer toxicity times, and monitoring problems. Although not commonly done by other agencies, MDIFW's method of a combination powdered and liquid formulations to treat above and below the thermocline minimizes the use of liquid formulations while maintaining a reasonable possibility of a successful treatment. In addition, MDIFW will consider the use of CFT Legumine for future projects, which has reduced or eliminated the hydrocarbon emulsifiers.

VII. Human Heath

A. General

The safety of rotenone has been extensively studied as part of the US Environmental Protection Agency's (USEPA) approval process, and much of this research has been geared towards human health issues. As discussed earlier, rotenone has very low toxicity to humans for several reasons including: the low amount of active ingredient used in commercial rotenone products; its low solubility in water; its rapid degradation in the environment by light and heat; its vomit inducing properties; and inefficient absorption in the gastrointestinal tract, as well as, the presence of digestive enzymes that oxidize rotenone. The USEPA has determined rotenone use for fishery management projects

does not present a risk of unreasonable adverse effects to humans and the environment (USEPA 1981, 1989 as cited by Finlayson et al. 2000).

B. Teratogenicity, Mutagenicity, and Carcinogenicity

The prevailing scientific opinion is that rotenone is not known to be teratogenic, fetotoxic, mutagenetic, or carcinogenic.

Hazleton Raltech Laboratories (1982 as cited by CDFG 1994) determined that rotenone did not appear to cause fetal abnormalities or toxicity when orally administered to rats at doses of 0, 0.75, 1.5, 3.0, and 6.0 mg/kg/d on day 6 through 19 of gestation. The 6.0 mg/kg/d treatment produced a few maternal and fetal changes (i.e. body weight) that established a No Effect Level (NOEL) of 3.0 mg/kg/d.

Goethem et al. (1981 as cited by CDFG 1994) demonstrated that rotenone caused no DNA modifying activity up to 10 ppm in liquid suspension tests performed on E. coli; higher doses could not be tested due to precipitation of rotenone. Biotech Research (1981 as cited by CDFG 1994) conducted cytogenetic analysis of bone marrow cells from rats and concluded rotenone was not clastogenic and did not cause chromosomal breaks. The National Academy of Science (NAS) reported no scheduled DNA synthesis was observed in human fibroblast cultures when rotenone was tested at concentrations as high as 1,000 Nm; and negative results were obtained in a rat UDS hepatocyte assay (NAS 1983 as cited by CDFG 1994).

Bradbury (1986) and CDFG (1994) both cite numerous studies where rotenone testing on rats, mice, and dogs has not resulted in any significant increases in the incidence of tumors. Tisdel (1985 as cited by CDGF 1994) is one of the most comprehensive carcinogenic studies available for rotenone. This 2-year study subjected rats to dietary concentrations of 0, 7.5, 37.5, and 75 ppm rotenone, no parathyroid tumors were observed at any level and incidences of pituitary tumors were significantly reduced in mononuclear cell leukemias. Similarly, Haley (1978 as cited by CDFG 1994) reported rotenone to be a powerful inhibitor of cancer in cell cultures.

C. Parkinson's Disease

There has been significant discussion in recent years regarding a possible link between rotenone and Parkinson's disease, which was the result of an Emerson University study (Betarbet et al. 2000). The study dissolved rotenone in DMSO (a very potent solvent) and administered it directly into the jugular vein of the study animals, where researchers then observed physical and structural changes in the brain that resembled changes observed in humans with Parkinson's. Dr. Borzellaca (2001) has reviewed the findings and concluded that they have little relevance for humans and realistic exposures to rotenone. The American Fisheries Society Fish Management Chemicals Subcommittee (2001) has also reviewed the study and concluded that the method of exposure was highly unnatural and has little resemblance to exposures and levels pertinent to fisheries management projects.

D. Human Fatalities

Ling (2003) reported no human deaths have ever been reported by normal rotenone use; however, a child was killed when he directly consumed a rotenone-based product called Gallicide. Gallicide contains 6% rotenone and several other natural oils. The lethal dose was estimated to be 40 mg/kg, which is significantly less than estimated lethal dose levels. It was alleged that the oils in Gallicide promoted abnormal rotenone absorption from the gastrointestinal tract, and caused kidney failure that reduced the bodies ability to clear the toxicant (DeWilde et al. 1986). No human fatalities have ever been associated with rotenone used for fishery management projects (Ling 2003, Gleason et al. 1969, and Lehman 1948 as cited by CDFG 1994).

E. Potential Exposure and Risk to Non-applicators

In regards to fishery management projects, there are several pathways that non-applicators might possibly come into contact with rotenone including: consumption of fish or water treated with rotenone; physical contact with rotenone treated water; and direct contact with rotenone dust or liquid formulations during its application.

F. Acute and Chronic Oral Toxicity

No direct tests for rotenone toxicity have been conducted on humans; thus, oral toxicity must be inferred from other

mammalian-based studies. Several researchers have estimated human oral toxicities, and the reported range is quite broad with a low of 100 mg/kg to a high of 2,850 mg/kg (Table 7).

Table 7. Estimated Acute Oral Toxicity for Humans (Adapted from Bradbury 1986, CDFG 1994, Ling 2003).

Oral Lethal Dose of Pure Rotenone	Reference(s)
2,850 mg/kg	Tilemans and Dormal (1952)
300-500 mg/kg	Gleason et al. (1969), Gosselin (1991), Ray (1991)
300-400 mg/kg	Arena (1979)
200 mg/kg	Sax (1984)
132 mg/kg	Dreisbach (1983), Lehman (1951)
100-199 mg/kg	USEPA (1970)

Using the 300 mg/kg estimate and the highest rotenone residue levels found in dead fish (< 0.10 *u*g/g @ a typical 2.0 ppm treatment level), a 132-pound person would need to consume about 396 pounds of fish at one-time to receive a lethal dose (CDFG 1994). Although risks associated with eating dead fish from rotenone treated waters are extremely low, MDIFW does not support and/or recommend the practice. The USEPA has not established any consumption guidelines, and there are risks of bacterial contamination from eating fish that have been dead for some period of time. In addition, there is no risk from eating fish that have been stocked after the reclamation procedures, because fish are not stocked until rotenone drops below detectable levels.

Similarly, any risks associated with drinking rotenone treated water are very unlikely due to the low concentration levels (0.025-0.25 mg/l) allowed for fishery management applications, as well as, the rapid degradation of rotenone. At the highest allowable treatment level (0.25 mg/l) and the 300 mg/kg oral LD estimate a 132-pound person would have to drink 19,022 gallons of rotenone treated water at a single sitting to receive a lethal dose (CDFG 1994). Keep in mind the proposed treatment dose is 4 times lower than used in the example above. In addition, rotenone has been used extensively on drinking water supplies without any known impacts (Bradbury 1986). The USEPA has established a drinking water level of concern (DWLOC) of 40 ppb for the most sensitive population subgroups (infants and children) (USEPA 2007). The Maine Center for Disease Control has established a Maximum Exposure Guideline (MEG) for rotenone in drinking water at 28 ppb (MCDC 2006). Most established "safe" levels of rotenone (i.e. Maine's MEG, California's AL, and the National Academy of Science's SNARL) are **lifetime** exposure levels, typically based on applying a 1,000-fold-safety factor to the chronic feeding study conducted by Ellis et al. in 1980 (Finlayson et al. 2000). Lifetime exposures are not all that relevant to piscicidal applications, because rotenone breaks down rapidly in the environment and treatments are typically a one-time event or certainly infrequently applied. In addition, drinking water supplies would rarely be targeted under this program. If one was targeted MDIFW would follow all label pre-cautions including: notifying the public water utility, notifying the public users of the water supply, provide alternate water source until toxicity falls below Federal and Maine guidelines, and/or treat the water to neutralize the rotenone below the established guidelines prior to public distribution.

Haley (1978 as cited by CDFG 1994) reported an intake of 0.7 mg/kg/d is considered safe, which is far greater than any possible exposure from a fish management project with a maximum treatment level of 0.25 mg of rotenone per liter of water. On the other hand, Berteau (1984 as cited by CDFG 1994) has suggested 0.004 mg/kg/d as an "Acceptable Daily Intake" over a lifetime, which includes a 1,000-fold safety factor over the no effect level of 0.4 mg/kg/d established from Ellis et al. (1980 as cited by CDFG 1994). This is far lower than that reported by Haley; however, a 132-pound person would still need to consume over half a pound of fish/day over an entire lifetime (CDFG 1994). None of these scenarios are even remotely likely to occur for the following reasons: it is a single treatment event, rotenone breaks down rapidly in the environment, people would not likely consume dead or dying fish, and new fish would not be restocked until rotenone levels have dissipated.

G. Direct Public Contact with Treated Water

Bodily contact with rotenone treated water may potentially occur via recreational activities such as boating, fishing, and swimming. Product labels for rotenone generally state people should not be allowed to swim in rotenone treated waters until the application is complete and all of the rotenone has been thoroughly mixed into the water (Appendices A & B). According to the USEPA, there is no reason to restrict the use of rotenone in waters intended

for swimming use, and based on toxicology data and exposure levels a waiting interval was not necessary for swimming in waters treated with rotenone (USEPA 1981 and USEPA 1990 as cited by Finlayson et al. 2000). Although bodily contact with rotenone treated waters is not considered harmful, some states prohibit swimming until rotenone has detoxified as a precautionary measure (CDFG 1994). The water will be posted according to label instructions, which are currently be revised to prohibit swimming for a specified period of time.

H. Direct Public Contact with Chemical

Direct contact with dust and/or liquid formulations is not a significant issue with the general public. The general public is prohibited from handling any of the chemicals involved, and/or from being in the local vicinity of the chemical (i.e. loading and dispensing areas). In addition, application methods significantly reduce dust and liquid exposure potential to very localized areas directly around the applicators.

I. Applicator Exposure and Risk

Applicators have a much greater risk exposure to rotenone due the direct handling and application of the products. Rotenone formulations used in fisheries management are classified as Category 1 materials by the USEPA, which means they are in the "extremely toxic" range for acute toxicity (Finlayson et al. 2000). Inhalation, skin, and eye contact are the most common routes of applicator exposure to rotenone formulations. Fishery biologists have reported skin, eye, and mucus membrane irritations, as well as, other related symptoms following rotenone treatments (Bradbury 1986).

Mitigation:

The public will not be allowed in the vicinity of the treatment areas while the chemical is being applied. In addition, project sites will be posted at likely access points with information about the treatment including advisories against swimming, drinking, and eating dead fish. Rotenone exposure to applicators can be significantly reduced by the use of proper handling procedures and protective equipment. Staff members involved in application will be required to wear full rain gear, rubber gloves, and air-purifying respirators with full-face shields.

VIII. Permitting and Licensing

While the Department has been given the charge of managing the state's fish and wildlife resources, MDIFW no longer has the sole authority and discretion of performing reclamation projects. Until recently, there was an exemption under the Maine water/waste discharge law (38 MRSA, Section 413.2-E (A)) for "the application of aquatic pesticides by the Department of Inland Fisheries and Wildlife to waters of the State for the purpose of restocking, including the elimination of undesirable species." However, this exemption was eliminated when the law was revised in 1997 to meet USEPA standards. Currently, the MDIFW needs to file a full MEPDES Permit with the Maine Department of Environmental Protection (MDEP) for reclamation projects conducted on or potentially impacting water resources of the State. Section 1. Title 38 MRSA §464, sub-§4 grants MDEP the authority to issue wastewater discharge permits for aquatic pesticides to MDIFW for the purpose of restoring biological communities affected by invasive species. Title 38 MRSA Ch. 183 §7 defines an "invasive species" as, "…an invasive animal as determined by the Department of Inland Fisheries and Wildlife…A species may be determined to be invasive for all waters or for specific waters." Consequently, all individual projects being conducted under this program will also be subject to the MDEP's review and permitting process.

IX. Public Noticing and Involvement

During the planning stages, MDIFW (1) contacts and informs all riparian landowners of a proposed project; and (2) holds a locally advertised public informational meeting to inform and solicit public comments. The Department also typically discusses our intentions to pursue a reclamation project at various local speaking engagements, in regional newsletters, weekly newspaper reports, and/or on our website. The Department then moves on to the permitting stage, where we then attempt to address and incorporate public comments or concerns to the best of our ability. The Department continues to provide public notifications/updates as this project moves forward through regional newsletters, weekly fishing reports, public speaking engagements, and other means of communication.

MDIFW must also meet the noticing requirements of the MDEP permitting process. Following is a list of their noticing requirements, some of which are satisfied by own public outreach:

1. *Publication of Public Notice.* Applicants for waste discharge permits are required to publish a public notice that the application is being file with the Department of Environmental Protection. The notice must be published within 30 day prior to the application being sent to the Department. The notice should be published in the legal advertisement section of a daily or weekly newspaper having general circulation in the area where the discharge will occur. If the public notice is not published at the proper time or if the application is returned because it is incomplete, you may be asked to have the notice published as second time.

Using the form on the next page, fill in the blanks with the appropriate information. Strike out all of the items (CSO, multiple discharge sources, etc.) in the second paragraph that do not apply to your discharge. The form may then be sent to the newspaper that is to publish the notice. Additionally, include a copy of the form with the application filed with the Department.

2. *Notice to Abutters.* Applicants are also required to send a copy of the public notice by certified mail to all abutting property owners within 30 days prior to the application being filed with the Department.

3. *Notice to Municipal Office.* Applicants are required to send a copy of the public notice by certified mail to the town or city clerk of each municipality where the discharge is located within 30 days prior to the application being filed with the Department. Applicant must also file a duplicate copy of the application with each municipality.

4. *Public Meeting.* Where the application is for a new discharge of greater than 25,000 gallons per day, you must hold a public meeting in accordance with Chapter 2, Section 8, of the Department's rules. Notice of the meeting must be sent to abutters and the clerk of the municipality(ies) where the discharge is located at least 10 days prior to the meeting. Notice of the meeting must be published in the same newspaper used to publish the notice of filing.

Each stage of the MDEP permitting process (application review, issuance of draft license, and final license) also has a formal public comment period. After approval, MDIFW staff insures public notice of the projected event by:

(1) Mailing, by registered mail to all riparian landowner, not more than 21 days prior to treatment, of a notice regarding the specifics of the treatment and a copy of the American Fisheries Society Brochure on Rotenone use.
(2) Informational Posters about the treatment at likely access points to the pond and other places in Town likely to receive attention. Information will include: treatment purpose, treatment materials, treatment date and duration, who to contact for more information, and any cautionary notes (i.e. drinking/swimming).
(3) Complete all other notifications as required through MDEP's Wastewater Discharge Permitting Process.

This process adequately allows public input into the reclamation process, and gives MDIFW an opportunity to address any public concerns associated with the specifics of each individual project conducted under this program.

References Cited

American Fisheries Society Fish Management Chemicals Subcommittee. 2001. Relationship between rotenone use in fisheries management and Parkinson's disease. AFS Website. Rotenone Stewardship Program. www.fisheries.org/html/rotenone/parkinsonstudy.shtml. 4 pp.

American Sportfishing Association. 2002. Sportfishing in America: values of our traditional pastime. Alexandria, Virginia. 12 pp.

Anderson, J. M. 1950. Some aquatic vegetation changes following fish removal. J. Wildl. Manage. 14(2):206-210.

Anderson, Jon. 2005. Personal communication. Washington Department of Fish and Wildlife Olympia, Washington.

Anderson, R.S. 1970. Effects of rotenone on zooplankton communities and a study of their recovery patterns in two mountain lakes in Alberta. J. Fish. Res. Board. Can. 27:1335-1356.

Arena, J. M. Poisoning: toxicology, symptoms, and treatments. 4th ed. Charles C. Thomas. Springfield, Illinois. 827 pp.

Ball, R.C., and D.W. Hayne. 1952. Effects of the removal of fish population on the fish-food organisms of a lake. Ecology 33(1):41-48.

Bandow, F. 1980. Effects of winterkill and chemical eradication of fish on a lake ecosystem. Investigative Report No. 369. Minnesota Department of Natural Resources. Division of Fish and Wildlife.

Beal D. L., and R.V. Anderson. 1993. Response of zooplankton to rotenone in a small pond. Bulletin of Environmental Contamination and Toxicology 51:551-556.

Bennett, G.W. 1943. Management of small artificial lakes. Ill. Nat. Hist. Surv. Bull. 22:357-376.

Betarbet, R., T. Sherer, G. MacKenzie, M. Garcia-Osuna, A. Panov, and J. Greenamyre. 2000. Chronic systemic pesticide exposure reproduces features of Parkinson's disease. Nature Neuroscience 3:12 1301-1306.

Bills, T.D., J.J. Rach, and L.L. Marking. 1988. Toxicity of rotenone to developing trout. U.S. Fish Wildl. Serv. Invest. Fish Control 93. 3 pp.

Bonn, E. W., and L. R. Holbert. 1961. Some effects of rotenone products on municipal water supplies. Trans. Am. Fish. Soc. 90(3):287-297.

Bonney, Forrest. 2001. Brook trout assessment: 2001-2016 Species Plan. Maine Department of Inland Fisheries and Wildlife. Fisheries and Hatcheries Division. Augusta, Maine.

Bonney, Forrest. 2003. Maine brook trout: biology, conservation, and management. Maine Department of Inland Fisheries and Wildlife. Augusta, Maine. 153 pp.

Borzelleca, J.F. 2001. Rotenone and Parkinson's disease. Memorandum. Virginia Commonwealth University. Pharmacology and Toxicology. Richmond, Virginia. 2 pp.

Bradbury, A. 1986. Rotenone and trout stocking: a literature review with special reference to Washington department of game's lake rehabilitation program. Washington Department of Game. Fisheries Management Report 86-2. 181 pp.

Breukelaar, A.W., E.H.R.R. Lammens, J.G.P. Klein-Breteler, and I. Tatrai. 1994. Effects of benthivorous bream (*Abramis brama*) and carp (*Cyprinus carpio*) on sediment resuspension and concentrations of nutrients and chlorophyll *a*. Freshwater Biology 32:113-121.

Brooks and Dodson. 1965. Predation, body size, and composition of plankton. Science 150: 28-35.

Brooks , I., and R. Price. 1961. Studies on the chronic toxicity of Pro-Noxfish, a proprietary synergized rotenone fish toxicant. Toxicology and Applied Pharmacology 3:49-56.

Bull, C.J., and W.C. Mackay. 1976. Nitrogen and phosphorus removal from lakes by fish harvest. J. Fish. Res. Board. Can. 33:1374-1376.

CDFG (California Department of Fish and Game). 1994. Rotenone use for fisheries management
- final programmatic environmental impact report (SCH 92073015). CDFG, Environmental Services Division,

Sacramento.

Carpenter, R.C., J.C. Cole, J. R. Hodgson, J. F. Kitchell, M. L. Pace, D. Bade, K. L. Cottingham, T. E. Essington, J,. N. Houser, and D. E. Schindler. 2001. Trophic cascades, nutrients, and lake productivity: whole-lake experiments. Ecological Monographs, 71(2):163-186.

Carpenter, R.C., J. F. Kitchell, and J. R. Hodgson. 1985. Cascading trophic interactions and lake productivity. BioScience 35:634-639.

Clemens, H.P., et al. 1952. Transactions of American Fisheries. 82, 166-177.

Chandler, J.H., Jr. and L.L. Marking 1982. Toxicity of rotenone to selected aquatic invertebrates and frog larvae. The Progressive Fish Culturist 44: 78-80.

Dawson, V.K.; Harman, P.D.; Schultz, D.P.; Allen, J.L. 1983. Rapid method for measuring rotenone in water at piscicidal concentrations. Transactions of the American Fisheries Society 112:725-727.

Dawson, V.K., Gingerich, W.H., Davis, R.A., and Gilderhus, P.A. 1991. Rotenone persistence in freshwater ponds: effects of temperature and sediment adsorption. North American Journal of Fisheries Management 11:226-231.

Demong, Leo, 1992. Rotenone bioassay in region 5. New York Department of Environmental Conservation. Ray Brook, New York. 16 pp.

Demong, Leo. 1997. Impacts of rotenone on amphibian diversity. Region 5 Bureau of Fisheries Report. New York Department of Environmental Conservation. Ray Brook, New York. 6 pp.

Demong, Leo. 2001. The use of rotenone to restore native brook trout in the Adirondack Mountains of New York – an overview. Pages 29-35 in R.L. Cailteau. et al. Rotenone in fisheries science: are the rewards worth the risk? American Fisheries Society, Trends in Fisheries Science and Management 1, Bethesda, Maryland.

Demong, Leo. 2005. Personal communication. New York Department of Environmental Conservation. Ray Brook, New York.

DeWilde A.R.; A. Heyndrickx, and D. Carton. 1986. A case of fatal rotenone poisoning in a child. Journal of Forensic Sciences 31:1492-1498.

Dreisbach, R.H. 1983. Handbook of poisoning: prevention, diagnosis, and treatment, 11th ed. Lange Medical Publications, Los Altos, California. 632 pp.

Engstrom-Heg, R. and R.T. Colesante. 1979. Predicting rotenone degradation in lakes and ponds. New York Fish and Game J. 25(1):31-41.

Finlayson, B., R. Schnick, R. Cailteux, L. Demong, ; W. Horton, W. McClay, C. Thompson, and G. Tichacek. 2000. Rotenone Use in Fisheries Management: Administrative and Technical Guidelines. American Fisheries Society, Bethesda, Maryland.

Finlayson, B. J., S. Siepmann, and J. Trumbo. 2001. Chemical residues in surface and ground waters following rotenone applications in California lakes and streams. Pages 37-54 in R.L.

Fisher, Ruth. 2007. Personal communications. Prentiss Incorporated. Floral Park, NY.

Flick, W. A. and D.A. Webster.1982. Standing crops of brook trout in Adirondack waters before and after removal of non-trout species. North Am. J. of Fish. Mgmt. 12:783-796.

Cailteau. et al. Rotenone in fisheries science: are the rewards worth the risk? American Fisheries Society, Trends in Fisheries Science and Management 1, Bethesda, Maryland.

Galbraith, M. G. 1967. Size-selective predation on Daphnia by rainbow trout and yellow perch. Trans. Am. Fish Soc. 96:1-10.

Gilderhus, P.A., Allen, J.L, and Dawson, V.K. 1986. Persistence of rotenone in ponds at different temperatures. North American Journal of Fisheries Management 6:129-130.

Gilderhus, P.A., Dawson, V.K., and Allen, J.L. 1988. Deposition and persistence of rotenone in shallow ponds during cold and warm seasons. USFWS Investigations in Fish Control 95.

Gleason, M., R. Gosselin, H. Hodge, and P. Smith. 1969. Clinical toxicology of commercial products. The William and Wilkins Company, Baltimore, Maryland.

Hanson, M.A. and M.G. Butler. 1993. Responses of plankton, turbidity, and macrophytes to biomanipulation in a shallow prairie lake. Can. J. Fish. Aquat. Sci. 512:1180-1188.

Harig, A.L. and Bain, M.B. 1995. Restoring the Indigenous Fishes and Biological Integrity of Adirondack Mountain Lakes: A Research and Demonstration Project in Restoration Ecology. Final Report to NYDEC. 63 pp.

Houf, L.J., and R.S. Campbell. 1977. Effects of antimycin A and rotenone on macrobenthos in ponds. U.S. Fish and Wildl. Serv. Invest. Fish Control 80. 29 pp.

Hudy, M., T.M. Thieling, N. Gillespie and E.P. Smith. 2005. Distribution, Status and Perturbations to Brook Trout within the eastern United States. Final report to the steering committee of Eastern Brook Trout Joint Venture. 77 pp.

Kidd, H. and D.R. James, Eds. 1991. The agrochemicals handbook, 3rd edition. Royal Society of Chemistry Information Services. Cambridge, UK.

Kiser, R. W., J. R. Donaldson, and P. R. Olson. 1963. The effect of rotenone on zooplankton populations in freshwater lakes. Trans. Am. Fish. Soc. 92:17-24.

Knowlton, Robert. 1955. Report on the use of Pro-Noxfish at Chapin Pond, Newport, New Hampshire. New Hampshire Fish and Game Department. Concord, NH. Pages 9-11 in S. B. Pennick Company Publication on Pro-Noxfish. 24 pp.

Leathe, Steve. 2006. Personal communications. Montana Fish, Wildlife & Parks. Great Falls, Montana.

Lenon, R.E., J.B. Hunn, R.A. Schnick, and R.M. Burress. 1971. Reclamation of ponds, lakes, and streams with fish toxicants: a review. FAO Fisheries Technical Paper 100.

Li, H.W., and P.E. Moyle. 1981. Ecological analysis of species introductions into aquatic systems. Trans. Am. Fish. Soc. 110:772-782.

Ling, Nicholas. 2003. Rotenone – a review of its toxicity and use for fisheries management. Department of Conservation. Wellington, New Zealand. 40 pp.

Maine Interagency Task Force on Invasive Aquatic Plants and Nuisance Species. 2002. Action plan for managing invasive aquatic species. State of Maine. Augusta, Maine. 37 pp.

Magnan, P. 1988. Interactions between brook charr, Salvelinus fontinalis and nonsalmonid species: ecological shift, morphological shift, and their impact on zooplankton communities. Canadian Journal of Fisheries and Aquatic Sciences. 45:999-1009.

Magnuson, J.J. 1976. Managing with exotics – a game of chance. Trans. Am. Fish. Soc. 105:1-9.

MCDC. 2006. Maine CDC maximum exposure guidelines (MEGs) for drinking water. Maine Department of Human Resources. Environmental and Occupational Health Program. Center for Disease Control and Prevention. Augusta, Maine. 6 pp.

MDIFW (Maine Department of Inland Fisheries and Wildlife). 2001. State of Maine Inland Fisheries and Wildlife Laws: 12 MRSA Part 10 Chapters 701-721 and 811 as enacted by Public Law, Chapter 420, Section 1 and as Amended. Augusta, Maine. 486 pp.

MDIFW (Maine Department of Inland Fisheries and Wildlife). 2002. Administrative policy regarding fisheries management in Maine Department of Inland Fisheries and Wildlife Administrative Policy Manual. Augusta, Maine.

Marking, L.L. 1988. Oral toxicity of rotenone to mammals. U.S. Fish Wildl. Serv. Invest. Fish Control 94. 5 pp.

Marking, L.L. and T.D. Bills. 1976. Toxicity of rotenone to fish in standardized laboratory tests. U.S. Fish Wildl. Serv. Invest. Fish Control 72. 11 pp.

McClay, W. 2000. Rotenone use in North America (1988.1997). Fisheries Management 25: 15-21.

Meelas, C., K. Zimmer, M. Butler, and M. Hanson. 2001. Effects of rotenone on aquatic invertebrate communities in prairie wetlands. Hydrobiologia 459 (1-3): 177-186.

Meehean, O.L. 1942. Fish populations of five Florida lakes. Trans. Am. Fish. Soc. 71:184-194.

Meiger, M.L., M.W. de Hann, A.W. Breukelaar, and H. Buiteveld. 1990. Is reduction of the benthivorous fish an important cause of high transparency following biomanipulation in shallow lakes? Hydrobiologia 200/201:303-315.

Miller, Jr.,W.W., W.F. Schoch, and L.E. Strait. 1992. Restoration of aquatic Adirondack ecosystems and the recovery of nontarget species from rotenone. New York State Department of Environmental Conservation, Bureau of Fisheries. Ray Brook, New York. 31 pp.

Minnesota Pollution Control Agency. 1997. Lake assessment program: 1995 Lura Lake. Minnesota Pollution Control Agency. Southeast Regional Office. St. Paul. Minnesota. 32 pp.

Neeves, R.J. 1975. Zooplankton recolonization of a lake cove treated with rotenone. Trans. Am. Fish. Soc. 104:390-393.

Patterson, R.W., D.O. Scrogin, K.J. Boyle, and D. McNeish. 2001(revised). Maine open water fishing survey, summer 1999. Staff Paper REP 493. Department of Resource Economics and Policy. University of Maine at Orono. Orono, Maine. 62 pp.

Post, G. 1955. A simple chemical test for rotenone in water. The Progressive Fish Culturist 17: 190-191.

Prejs, A., J. Pijanwska, P. Koperski, A. Martyniak, S. Boron, and P. Hliwa. 1997. Food-web manipulation in a small, eutrophic Lake Wirbel, Poland: long-term changes in fish biomass and basic measures of water quality. A case study. Hydrobiologia 342/343:383-386.
Ray, D.E. 1991. Pesticides derived from plants and other organisms. In Hayes, W.J. Jnr. and E.R. Laws Jnr. (Eds). Handbook of Pesticide Toxicology. Academic Press, New York.

Sanders, H.O. and O.B. Cope. 1966. Toxicities of several pesticides to two species of cladocerans. Trans. Am. Fish. Soc. 95:165-169.

Sax, N.I. 1984. Dangerous properties of industrial materials, 6th ed. Van Nostrad Reinhold Co., New York. 3124 pp.

Schrage, L., and J. Downing. 2000. Pathways leading to water clarity in Ventura Marsh following benthivorous fish removal. Clear Lake Report. Iowa State University.

Shapiro, J. and D.I. Wright. 1984. Lake restoration by biomanipulation: Round Lake, Minnesota, the first two years. Freshwater Biology 14:371-383.

Siepmann, S., and B. Finlayson. 1999. Chemical residues in water and sediment following

rotenone application to Lake Davis, California. California Department of Fish and Game, Office of Spill Prevention and Response Administrative Report 99-2, Sacramento.

Smith M.W. 1940. Copper sulfate and rotenone as fish poisons. Trans. Am. Fish. Soc. 69:141-157.

Smith M.W. 1941. Treatment of Potter's Lake, New Brunswick, with rotenone. Trans. Am. Fish. Soc. 70:347-355.

Sousa, R.J., F.P. Meyer, R.A. Schnick. 1985. Better fishing through management. California Department of Fish and Game, Environmental Services Branch, Pesticides Investigation Unit. 23 pp.

USEPA (Unite States Environmental Protection Agency). 2007. Reregistration Eligibility Decision for Rotenone. Prevention, Pesticieds and Toxic Substances. EPA 738-R-07-005. Washington, D.C.

Vanni, M.J. and D.L. Findlay. 1990. Trophic cascades and phytoplankton community structure. Ecology 71(3):921-937.

Walters, C.J. and R.E. Vincent1973. Potential productivity of an alpine lake as indicated by removal and reintroduction of fish. Trans. Am. Fish. Soc. 102(4):675-697.

WDFW (Washington Department of Fish and Wildlife). 1988. Lake and stream rehabilitation program: 1988-1989. Final Environmental Impact Statement. Olympia. Washington.

WDFW (Washington Department of Fish and Wildlife). 2001. Lake and stream rehabilitation: rotenone use and health risks. Draft Supplemental Environmental Impact Statement. Olympia. Washington.

WDFW (Washington Department of Fish and Wildlife). 2002. Dibble Lake post treatment discharge monitoring report. Washington. 2 pp.

Weier, J. L. and D.F. Starr. 1950. The use of rotenone to remove rough fish for the purpose of improving migratory waterfowl refuge areas. J. Wildl. Manage. 14(2):203-205.

Woodward, William. 2005. Personal communication. Maine Department of Inland Fisheries and Wildlife. Sidney Regional Office. Sidney, Maine.

References Cited by Other Authors

Berteau, P. 1984. Memorandum to B. Finlayson, California Department of Fish and Game, Pesticide Investigations Unit, June 26, 1984, from California Department of Health Services, Epidemiological Studies Section.

Biotech Research. 1981. Analytical studies for detection of chromosomal aberrations in fruit flies, rats, mice and horse bean. Report to U.S. Geological Service, Upper Midwest Environmental Sciences Center (U.S. Fish and Wildlife Service Study 14-16-990-80-54), La Crosse, Wisconsin.

Brastrup, T.J. 2001. Abstract: Knife Lake and Knife River rehabilitation project. Pages 9-28 in R.L. Cailteau et al. Rotenone in fisheries science: are the rewards worth the risk? American Fisheries Society, Trends in Fisheries Science and Management 1, Bethesda, Maryland.

Brooks, I.C. 1961. Research methods and findings on fish toxicants and their application. S.B. Penick and Co. Research Dep., New York, New York. 10 pp.

Brown, C.J., and R.C. Ball. 1943a. An experiment in the use of derris root (rotenone) on the fish and fish-food organisms of Third Sister Lake. Trans. Am. Fish. Soc. 72:267-284.

Burress, R.M. 1982. Effects of synergized rotenone on nontarget organisms in ponds. U.S. Fish Wild. Serv. Invest. Fish Control 91. 7pp.

CDFG (California Department of Fish and Game). 1991. Pesticides investigation unit, aquatic toxicology laboratory annual (1990) progress report. Elk Grove, California.

CARB (California Air Resources Board). 1997. Lake Davis fish kill emergency response—final report. CARB, Sacramento.

Cheng, H., I. Yamamoto, and J. Casida. 1972. Rotenone photodecomposition. Journal of Agricultural Food Chemistry 20:850-856.

Claffey, F.J., and J.E. Ruck. 1967. The effects of rotenone on certain fish food organisms.Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 20:278-283.

Cohen, J.M., G.A. Rourke and R.L. Woodward. 1961. Effects of fish poisons on water supplies. Part 2. Odor problems. J. Am. Water Works Assoc. 53(1):49-62.

Cutkomp,.L.K. 1943a. Toxicity of rotenone and derris extract administered orally to birds. J. Pharmacol. Exp. Ther. 77:238-246.

Cutkomp,.L.K. 1943b. Toxicity of rotenone to animals. Soap Sanitary Chem. 19(10):107-123.

Dawson, V. 1986. Adsorption/desorption of rotenone by bottom sediments. U.S. Fish and Wildlife Service, National Fisheries Research Laboratory, La Crosse, WI. (unpublished)

Ellis, H., A. Sillnwin, J. Cox, I. Elwood, E. Castillo, E. Ellis, and J. Carter. 1980. Subchronic oral dosing study for safety evaluation of rotenone using dogs. (U.S. Fish and Wildlife Service Study 14-16-009-79-115).

Eschmeyer, P.H. ed. 1975. Rehabilitation of fish populations with toxicants: a symposium. Am. Fish. Soc., North Central Div., Spec. Publ. 4. 74pp.

Eschmeyer, R.W. 1953. Oklahoma program. Bull. Sport Fish. Inst. 24:2.

Farringer, J.E. 1972. The determination of the aquatic toxicity of rotenone and Bayer 73 to selected aquatic organisms. Unpubl. MSc thesis, University of Wisconsin. Lacrosse, WI.

Finlayson, B.J. and J.M. Harrington. 1991. Chemical residues in surface and ground waters following rotenone application to California lakes and streams. Presented at Chemical Rehabilitation Projects Symposium: Procedures and Issues; Western Division, American Fisheries Society, Bozeman, Montana (July 15 to 19, 1991).

Goethem, D., B. Barnhart, and S. Fotopoulos. 1981. Mutagenicity studies on rotenone. Report to U.S. Geological Service, Upper Midwest Environmental Sciences Center (U.S. Fish and Wildlife Service Study 14-16-009-80-076), LaCrosse, Wisconsin.

Haag, H. B. 1931. Toxicological studies of Derris elliptica and its constituents. I. Rotenone. J. Pharmacol. Exp. Ther. 43:193-208.

Haley, T. 1978. A review of the literature of rotenone. Journal of Environmental Pathology and Toxicology 1:315-337.

Hamilton, H.L. 1941. The biological action on freshwater animals. Proceedings of the Iowa Academy of Science 48: 467-479.

Harrington, J.M., and B.J. Finlayson. 1988. Rotenone residues in water following application to Kaweah River and Tulare Lake Basin, California. California Department of Fish and Game, Environmental Services Division Administrative Report 88-1. Sacramento, California. 62pp.

Hazleton Raltech. 1982. Teratology study with rotenone in rats. Hazelton Laboratories, Madison, Wisconsin (U.S. Fish and Wildlife Service Study 81178).

Hazleton Raltech. 1982b. Effects of rotenone on microflora of soil, sediment, and water. Hazelton Laboratories, Madison, Wisconsin (U.S. Fish and Wildlife Service Study 81178).

Hester, F.E. 1959. The tolerance of eight species of warmwater fishes to certain rotenone formulations. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 13:325-331.

Hill, E.F., R.G. Heath, J.W. Spann, and J.D. Williams. 1975. Lethal dietary toxicities of environmental pollutants to birds. U.S. Fish and Wildlife Service Special Scientific Report. Wildlife 191.

Hoffman, D.A., and J.R. Olive. 1961. The effects of rotenone and toxaphene upon plankton of two Colorado reservoirs. Limnol. Oceanogr. 6(2):219-222.

Hongve, D. 1977. Virkniger av rotenonbehandling pa zooplanktonfaunaen I et lite vann. (in Norwegian). Vatten 33(1):39-42.

Klingbiel, J.H. 1975. Use of fish toxicants in Wisconsin, 1941-1973. Pages 54-59 in P.H. Eschmeyer, ed. 1975.

Lamarra, V.A. 1975. Digestive activities of carp as a major contributor to the nutrient loading of lakes. Verh. Internat. Verein. Limnol. 19:2461-2468.

Lehman, A.J. 1948. The toxicology of the newer agricultural chemical. Association of Food and Drug Officials 12:82-89.

Lehman, A.J. 1951. Chemicals in foods: a report to the Association of Food and Drug Officials on current developments. Part II. Pesticides. Section V. Pathology. Quart. Bull. Assoc. Food Drug Officials U.S. 16:126-132.

Lellak, J. 1965. The food supply as a factor regulating population dynamics of bottom animals. Mitt. Internat. Verein. Limnol. 13:128-138.

Lindgren, P.E. 1960. About the effect of rotenone on benthic animals in lakes. Inst. Freshwater Res. Drottnigholm Rep. 41:172-184.

NAS (National Academy of Science). 1983. Drinking water and health, volume 5. Safe Drinking Water Committee Board of Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, National Academy Press, Washington, D.C.

NRC (National Research Council). 1983. Drinking water and health, vol. 5. National Academy Press, Washington.

Needham, R.G. 1966. Effects of toxaphene on plankton and aquatic invertebrates in North Dakota Lakes. U.S. Fish Wildl. Serv. Invest. Fish Control 4. 16pp.

Post, G. 1958. Time versus water temperature in rotenone dissipation. Proc. Western Assoc. Game Fish Comm. 38:279-284.

Schnick, R. A. 1974. A review of the literature on the use of rotenone in fisheries. U.S. Fish and Wild. Serv. Rep. LR-74 15. 130 pp.

Shapiro, J., B. Fosberg, V. Lamarra, G. Lindmark, M. Lynch, E. Smeltzer, and G. Zoto. 1982. Experiments and experiences in biomanipulation: studies of biological ways to reduce algal abundance and eliminate blue-greens. U.S. Environmental Protection Agency, Corvallis Environmental Research Laboratory, Rep. 600/3-82-096. 250 pp.

Smeltzer, E. and J. Shapiro. 1982. Biological effects on the size of the nutrient pool. The role of benthivores in Lake Marion, Minnesota. Pages 12-29 in Shapiro et al. 1982.

Swigle, H.S., Private communication, S.B. Penick Project.

Tanner, H.A., and M.L. Hayes. 1955. Evaluation of toxaphene as a fish poison. Colo. Coop. Fish. Res. Unit Quart. Rep. 1:31-39.

Tilemans, E., and S. Dormal. 1952. Toxcite des produits phytopharmaceutiques eheurs l-home et les unimaux a sang chaud. Pavasitica 8:64-91.

Tisdel, M. 1985. Chronic toxicity study of rotenone in rats. Final report: Study No. 6115-100. Unpublished study prepared by Hazelton Laboratories America Inc.

USEPA (Unite States Environmental Protection Agency). 1970. Water quality criteria databook, vol.1: organic chemical pollutants of freshwater. Washington, D.C.

USEPA (Unite States Environmental Protection Agency). 1981. Completion of pre-RPAR review of rotenone. Office of Toxic Substances. (June 22, 1981). Washington, D.C.

USEPA (Unite States Environmental Protection Agency). 1989. Guidance for the reregistration of pesticide products containing rotenone and associated resins as the active ingredient. EPA document 540/RS-89-039. Washington, D.C.

USEPA (Unite States Environmental Protection Agency). 1990. Rotenone re-entry statement for swimmers. USEPA Administrative 6704-Q, (JANUARY 17, 1990). Washington, D.C.

Wollitz, R.E. 1962. Effects of certain commercial fish toxicants on the limnology of three cold-water ponds, Montana. Proc. Mont. Acad. Sci. 22:54-81.

Wright, T.W. 1957. The rates of dissipation of certain rotenone preparations, their residual effects on bluegill production, and their effects on populations of fish-food organisms. M.S. Thesis. Alabama Polytechnic Institute, Auburn, Alabama. 47 pp.

Appendix A. Product Label for Liquid Rotenone Generally Used by MDIFW.

RESTRICTED USE PESTICIDE

DUE TO AQUATIC AND ACUTE INHALATION TOXICITY

For retail sale to, and use only by, Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

PRENFISH TOXICANT

Liquid Emulsifiable

*For Control of Fish in Lakes, Ponds, Reservoirs and Streams

ACTIVE INGREDIENTS:	
Rotenone	5.0%
Other Associated Resins	10.0%
INERT INGREDIENTS*:	85.0%
TOTAL	100.0%

*This product contains aromatic hydrocarbons.
PRENTOX® - Registered Trademark of Prentiss Incorporated

KEEP OUT OF REACH OF CHILDREN

DANGER - POISONOUS

See Left Panel for additional precautionary statements.

EPA Reg. No. 655-422

EPA Est. No. 655-GA-1

Manufactured by:

PRENTISS INCORPORATED

Plant: Kaolin Road, Sandersville, GA 31082
Office: C.B. 2000, Floral Park, NY 11002-2000

Appendix A (con.). Product Label for Liquid Rotenone Generally Used by MDIFW.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER

Fatal if inhaled. May be fatal if swallowed. Harmful if absorbed through skin. Causes substantial but temporary eye injury. Causes skin irritation. Do not breath spray mist. Do not get in eyes, on skin or on clothing. Wear goggles or safety glasses.

Wear either a respirator with an organic-vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G), or a NIOSH approved respirator with an organic vapor (OV) cartridge or canister with any R, P or HE prefilter.

Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse.

STATEMENT OF PRACTICAL TREATMENT

If inhaled: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
If in eyes: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.
If swallowed: Promptly drink a large quantity of milk, egg white, gelatin solution, or if these are not available, large quantities of water. Avoid alcohol. Do not induce vomiting. Call a physician or Poison Control Center.
If on skin: Wash with plenty of soap and water. Get medical attention.

ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate untreated water when disposing of equipment washwaters.

CHEMICAL AND PHYSICAL HAZARDS

FLAMMABLE: KEEP AWAY FROM HEAT AND OPEN FLAME. FLASH POINT MINIMUM 45° F (7° C).

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
Storage: Store only in original containers, in a dry place inaccessible to children and pets. Prentox Prenfish Toxicant will not solidify nor show any separation at temperatures down to 40°F and is stable for a minimum of one year when stored in sealed drums at 70°F.
Pesticide Disposal: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions contact your state pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.
Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

General Information

Prentox Prenfish Toxicant is a specially formulated product containing rotenone, to be used in fisheries management for the eradication of fish from lakes, ponds, reservoirs and streams.

Since such factors as pH, temperature, depth and turbidity will change effectiveness, use this product only at locations, rates, and times authorized and approved by appropriate state and federal fish and wildlife agencies. Rates must be within the range specified on the label.

Properly dispose of unused product. Do not use dead fish for food or feed.

Do not use water treated with rotenone to irrigate crops or release within 1/2 mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond or reservoir.

Re-entry Statement: Do not allow swimming in rotenone-treated water until the application has been completed and all pesticide has been thoroughly mixed into the water according to labeling instructions.

Appendix A (con.). Product Label for Liquid Rotenone Generally Used by MDIFW.

For Use in Ponds, Lakes and Reservoirs

The actual application rates and concentrations of rotenone needed to control fish will vary widely, depending on the type of use (e.g., selective treatment, normal pond use, etc.) and the factors listed above. The table below is a general guide for the proper rates and concentrations.

Prentox Prenfish Toxicant disperses readily in water both laterally and vertically, and will penetrate below the thermocline in thermally stratified bodies of water.

Computation of Acre-Feet: An acre-foot is a unit of volume of a body of water having the area of one acre and the depth of one foot. To determine acre feet in a given body of water, make a series of transects across the body of water taking depths with a measured pole or weighted line. Add the soundings and divide by the number made to determine the average depth. Multiply this average depth by the total surface area in order to determine the acre feet to be treated. If number of surface acres is unknown, contact your local Soil Conservation Service, which can determine this from aerial photographs.

Amount of Prentox Prenfish Toxicant Needed for Specific Uses: To determine the approximate number of gallons of Prentox Prenfish Toxicant (5.0% Rotenone) needed, find your "Type of Use" in the first column of the table below and then divide the corresponding numbers in the forth column, "Number of Acre-Feet Covered by One Gallon" into the number of acre-feet in your body of water.

General Guide to the Application Rates and Concentrations of Rotenone Needed to Control Fish in Lakes, Ponds and Reservoirs[1]

Type of Use	Parts Per Million Prenfish Toxicant	Active Rotenone	Number of Acre-Feet Covered by One Gallon
Selective Treatment	0.10 to 0.13	0.005 to 0.007	30 to 24
Normal Pond Use	0.5 to 1.0	0.025 to 0.050	6.0 to 3.0
Remove bullheads or carp	1.0 to 2.0	0.050 to 0.100	3.0 to 1.5
Remove bullheads or carp in rich organic ponds	2.0 to 4.0	0.100 to 0.200	1.5 to 0.75
Preimpoundment treatment above dam	3.0 to 5.0	0.150 to 0.250	1.0 to 0.60

[1] Adapted from Kinney, Edward. 1965. Rotenone in Fish Pond Management. USDI Washington, D.C. Leaflet FL-576.

Pre-Mixing and Method of Application: Pre-mix with water at a rate of one gallon Prentox Prenfish Toxicant to 10 gallons of water. Uniformly apply over water surface or bubble through underwater lines.

Detoxification: Prentox Prenfish Toxicant treated waters detoxify under natural conditions within one week to one month depending upon temperatures, alkalinity, etc. Rapid detoxification can be accomplished by adding chlorine or potassium permanganate to the water at the same rate as Prentox Prenfish Toxicant in parts per million, plus enough additional to meet the chlorine demand of the untreated water.

Removal of Taste and Odor: Prentox Prenfish Toxicant treated waters do not retain a detectable taste or odor for more than a few days to a maximum of one month. Taste and odor can be removed immediately by treatment with activated charcoal at a rate of 30 ppm for each 1 ppm Prentox Prenfish Toxicant remaining. (Note: As Prentox Prenfish Toxicant detoxifies, less charcoal is required.)

Restocking After Treatment: Wait 2 to 4 weeks after treatment. Place a sample of fish to be stocked in wire cages in the coolest part of the treated waters. If the fish are not killed within 24 hours, the water may be restocked.

Use in Streams Immediately Above Lakes, Ponds and Reservoirs

The purpose of treating streams immediately above lakes, ponds and reservoirs is to improve the effectiveness of lake, pond and reservoir treatments by preventing target fish from moving into the stream corridors, and not to control fish in streams per se. The term "immediately" means the first available site above the lake, pond or reservoir where treatment is practical, while still creating a sufficient barrier to prevent migration of target fish into the stream corridor.

In order to completely clear a fresh water aquatic habitat of target fish, the entire system above or between fish barriers must be treated. See the use directions for streams and rivers on this label for proper application instructions.

In order to treat a stream immediately above a lake, pond or reservoir you must: (a) select the concentration of active rotenone, (b) compute the flow rate of the stream, (c) calculate the application rate, (d) select an exposure time, (e) estimate the amount of product needed, (f) follow the method of application. To prevent movement of fish from the pond, lake or reservoir, stream treatment should begin before and continue throughout treatment of the pond, lake or reservoir until mixing has occurred.

Appendix A (con.). Product Label for Liquid Rotenone Generally Used by MDIFW.

1. Concentration of Active Rotenone
Select the concentration of active rotenone based on the type of use from those listed on the table. Example: If you select "normal pond use" you could select a concentration of 0.025 part per million.

2. Computation of Flow Rate for Stream
Select a cross section of the stream where the banks and bottom are relatively smooth and free of obstacles. Divide the surface width into 3 equal sections and determine the water depth and surface velocity at the center of each section. In slowly moving streams, determine the velocity by dropping a float attached to 5 feet of loose monofilament fishing line. Measure the time required for the float to move 5 feet. For fast-moving streams, use a longer distance. Take at least three readings at each point. To calculate the flow rate from the information obtained above, use the following formula:

$$F = \frac{Ws \times D \times L \times C}{T}$$

Where F = flow rate (cubic feet/second), Ws = surface width (feet), D = mean depth (feet), L = mean distance traveled by float (feet), C = constant (0.8 for rough bottoms and 0.9 for smooth bottoms), and T = mean time for float (sec.).

3. Calculation of Application Rate
In order to calculate the application rate (expressed as gallons/second), you convert the rate in the table (expressed as gallons/acre-feet), to gallons per cubic feet and multiply by the flow rate (expressed as cubic feet/second). Depending on the size of the stream and the type of equipment, the rate could be expressed in other units, such as ounces/hour, or cc/minute.

The application rate for the stream is calculated as follows:

$$R_s = R_p * C * F$$

where R_s = application rate for stream (gallons/second), R_p = application rate for pond (gallons/acre-feet), C = 1 acre foot/43560 cubic feet, and F = flow rate of the stream (cubic feet/second).

4. Exposure Time
The exposure time would be the period of time (expressed in hours or minutes) during which Prentox Prenfish Toxicant is applied to the stream in order to prevent target fish from escaping from the pond into the stream corridor.

5. Amount of Product
Calculate the amount of product for a stream by multiplying the application rate for streams by the exposure time.

$$A = R_s * H$$

where A = the amount of product for the stream application, R_s = application rate for stream (gallons/second), and H = the exposure time expressed in seconds.

For use in Streams and Rivers

Only state or federal Fish and Wildlife personnel or professional fisheries biologists under the authorization of state or federal Fish and Wildlife Agencies are permitted to make applications of Prentox Prenfish Toxicant for control of fish in streams and rivers. Informal consultation with Fish and Wildlife personnel regarding the potential occurrence of endangered species in areas to be treated should take place. Applicators must reference Prentiss Incorporated's Prentox Prenfish Toxicant Stream and River Use Monograph before making any application to streams or rivers.

Warranty Statement: Our recommendations for the use of this product are based upon tests believed to be reliable. The use of this product being beyond the control of the manufacturer, no guarantee, expressed or implied, is made as to the effects of such or the results to be obtained if not used in accordance with directions or established safe practice. The buyer must assume all responsibility, including injury or damage, resulting from its misuse as such, or in combination with other materials.

Appendix B. Product Label for Powdered Rotenone Generally Used by MDIFW.

RESTRICTED USE PESTICIDE
DUE TO AQUATIC, ACUTE ORAL AND INHALATION TOXICITY
For retail sale to, and use by, Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

ROTENONE FISH TOXICANT POWDER

ACTIVE INGREDIENTS:	
Rotenone- Minimum Guaranteed	7.4% w/w
Other Associated Resins	11.1%
INERT INGREDIENTS:	81.5%
TOTAL:	100.0% w/w

ROTENONE ASSAY _____% ROTENONE

PRENTOX® - Registered Trademark of Prentiss Incorporated

KEEP OUT OF REACH OF CHILDREN

DANGER
POISON

SEE INSIDE LEAFLET FOR ADDITIONAL PRECAUTIONARY STATEMENTS

Manufactured by:

PRENTISS INCORPORATED

E.P.A. REG. NO. 655-691
E.P.A. EST. NO. 655-GA-1

Plant: Kaolin Road, Sandersville, GA 31082
Office: C.B. 2000, Floral Park, NY 11002-2000

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER

Fatal if inhaled or swallowed. Harmful if absorbed through the skin. Causes moderate eye irritation. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Do not breathe dust. Use a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C), or a NIOSH approved respirator with any N, R, P or HE filter. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash clothing before reuse.

FIRST AID

If inhaled — Remove victim to fresh air. If not breathing, give artificial respiration preferably mouth-to-mouth. Get medical attention. **If swallowed** — Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person. **If in eyes** — Flush with plenty of water. Call a physician if irritation persists. **If on skin** — Wash with plenty of soap and water. Get medical attention

ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate untreated water when disposing of equipment washwaters.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
STORAGE: Store only in original container, in a dry place inaccessible to children and pets. If spilled, sweep up and dispose of as below.
PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.
CONTAINER DISPOSAL: Completely empty bag into application equipment. Then dispose of bag in a sanitary landfill or by incineration, or if allowed by State and local authorities by burning. If burned, stay out of smoke.

Appendix B (con). Product Label for Powdered Rotenone Generally Used by MDIFW.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

USE RESTRICTIONS:

Use against fish in lakes, ponds, and streams (immediately above lakes and ponds).

Since such factors as pH, temperature, depth, and turbidity will change effectiveness, use this product only at locations, rates, and times authorized and approved by appropriate state and Federal fish and wildlife agencies. Rates must be within the range specified in the labeling.

Properly dispose of dead fish and unused product. Do not use dead fish as food or feed.

Do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond or reservoir.

Note to User: Adjust pounds of Rotenone according to the actual Rotenone Assay as noted under the Ingredient Statement on this label. For example, if the required amount of 5% rotenone is 21 pounds, and the Rotenone Assay is 7%, use $^{5}/_{7}$ of 21 pounds or 15 pounds of this product to yield the proper amount of active rotenone.

APPLICATION DIRECTIONS:

Treatment of Lakes and Ponds

1. **Application Rates and Concentrations of Rotenone**

The actual application rates and concentrations of rotenone needed to control fish will vary widely, depending on the type of use (e.g. selective treatment, normal pond treatment, etc.) and the factors listed above. The table below is a general guide for the proper rates and concentrations.

2. **Total Amount of Product Needed for Treatment**

To determine the total number of pounds needed for treatment, divide the number of acre-feet covered by one pound for a specific type of use (e.g., selective treatment, etc.), as indicated in the table below, into the number of acre-feet in the body of water.

General Guide to the Application Rates and Concentrations of Rotenone Needed to Control Fish in Lakes and Ponds[1]

Type of Use	No. of Acre-Feet Covered by One Pound	Parts Per Million	
		Active Rotenone	5% Product
Selective Treatment	3.7 to 2.8	0.005 - 0.007	0.10 - 1.3
Normal Pond Use	0.74 to 0.37	0.025 - 0.050	0.5 - 1.0
Remove Bullheads or Carp	0.37 to 0.185	0.050 - 0.100	1.02 - 2.0
Remove Bullheads or Carp in Rich Organic Ponds	0.185 to 0.093	0.100 - 0.200	2.0 - 4.0
Pre-impoundment Treatment above Dam	0.123 to 0.074	0.150 - 0.250	3.0 - 5.0

[1]Adapted from Kinney, Edward, 1965 Rotenone in Fish Pond Management. USDI Washington, D.C. Leaflet FL-576.

Computation of acre-feet for lake or pond: An acre-foot is a unit of water volume having a surface area of one acre and a depth of one foot. Make a series of transects across the surface, taking depths with a measured pole or weighted line. Add the measurements and divide by the number made to determine the average depth. To compute total acre-feet, multiply this average depth by the number of surface acres, which can be determined from an aerial photograph or plat drawn to scale.

3. **Pre-Mixing Method of Application**

Pre-mix one pound of Rotenone with 3 to 10 gallons of water. Uniformly apply over water surface or bubble through underwater lines.

Alternately place undiluted powder in burlap sack and trail behind boat. When treating deep water (20 to 25 feet) weight bag and tow at desired depth.

4. **Removal of Taste and Odor**

Rotenone treated waters do not retain a detectable taste or odor for more than a few days to a maximum of one month. Taste and odor can be removed immediately by treatment with activated charcoal at a rate of 30 ppm. for each 1 ppm. Rotenone remaining (Note: As Rotenone detoxifies, less charcoal is required).

5. **Restocking**

Waters treated with this product detoxify within 2 to 4 weeks after treatment, depending on pH, temperature, water hardness, and depth. To determine if detoxification has occurred, place live boxes containing samples of fish to be stocked in treated waters. More rapid detoxification can be accomplished by adding Potassium Permanganate or chlorine at a 1:1 ratio with the concentration of rotenone applied, plus sufficient additional compound to satisfy the chemical oxidation demand caused by organic matter that may be present in the treated water.

Treatment of Streams Immediately Above Lakes and Ponds

The purpose of treating streams immediately above lakes and ponds is to improve the effectiveness of lake and pond treatments and not to control fish in streams per se. The term "immediately" means the first available site above the lake or pond where treatment is practical.

In order to treat a stream immediately above a lake or pond, you must select a concentration of active rotenone, compute the flow rate of a stream, calculate the application rate, select an exposure time, estimate the amount of product needed, and follow the method of application.

Appendix B (con). Product Label for Powdered Rotenone Generally Used by MDIFW.

1. **Concentration of Active Rotenone**

Select the "Concentration of Active Rotenone" based on the type of use from those on the table. For example, if you select "Normal Pond Use" you could select a concentration of "0.025 Parts per Million".

2. **Computation of Flow Rate for Stream**

Select a cross section of the stream where the banks and bottom are relatively smooth and free of obstacles. Divide the surface width into 3 equal sections and determine the water depth and surface velocity at the center of each section. In slowly moving streams, determine the velocity by dropping a float attached to 5 feet of loose, monofilament fishing line. Measure the time required for the float to move 5 feet. For fast-moving streams, use a longer distance. Take at least three readings at each point. To calculate the flow rate from the information obtained above, use the following formula:

$$F = \frac{Ws \times D \times L \times C}{T}$$

where F = flow rate (cu. ft./sec.), Ws = surface width (ft.), D = mean depth (ft.), L = mean distance traveled by float (ft.), C = constant (0.8 for rough bottoms and 0.9 for smooth bottoms), and T = mean time for float (sec.).

For example, after using the above formula, you might have computed the stream's flow rate to be "10 cu. ft. per sec.".

3. **Calculation of Application Rate**

In order to calculate the application rate (expressed as "pound per sec"), you convert the rate in the table (expressed as "pound per acre-feet"), to "pound per cu. feet" and multiply by the flow rate (expressed as "cu. ft. per sec."). Depending on the size of the stream and the type of equipment, the rate could be expressed in other units, such as "ounces per hr."

The application rate for the stream above is calculated as follows:

$R_s = R_p \times C \times F$

where R_s = Application Rate for Stream (lb/sec), R_p = Application Rate for Pond (lb/acre feet), C = 1 acre foot/43560 cu. ft., and F = Flow Rate (cu. ft/sec).

In the example, the Application Rate for Stream would be:

R_s = 1 lb/0.74 acre-foot x 1 acre-foot/43560 cu. ft. x 10 cu. ft./sec.

R_s = .00031 lb/sec or 17.9 oz./hr.

4. **Exposure Time**

The "Exposure Time" would be the period of time (expressed in hours or seconds) during which target fish should not enter the lake or pond under treatment. In the example, this period of time could be 4 hours.

5. **Amount of Product**

Calculate the "Amount of Product" for a stream by multiplying the "Application Rate for Stream" by the "Exposure Time". In the example, the "Amount of Product" would be 71.6 oz. (17.9 oz./hr. x 4 hr.) or 4.5 lb.

RE-ENTRY STATEMENT

Do not allow swimming in rotenone-treated water until the application has been completed and all pesticide has been thoroughly mixed into the water according to labeling instructions.

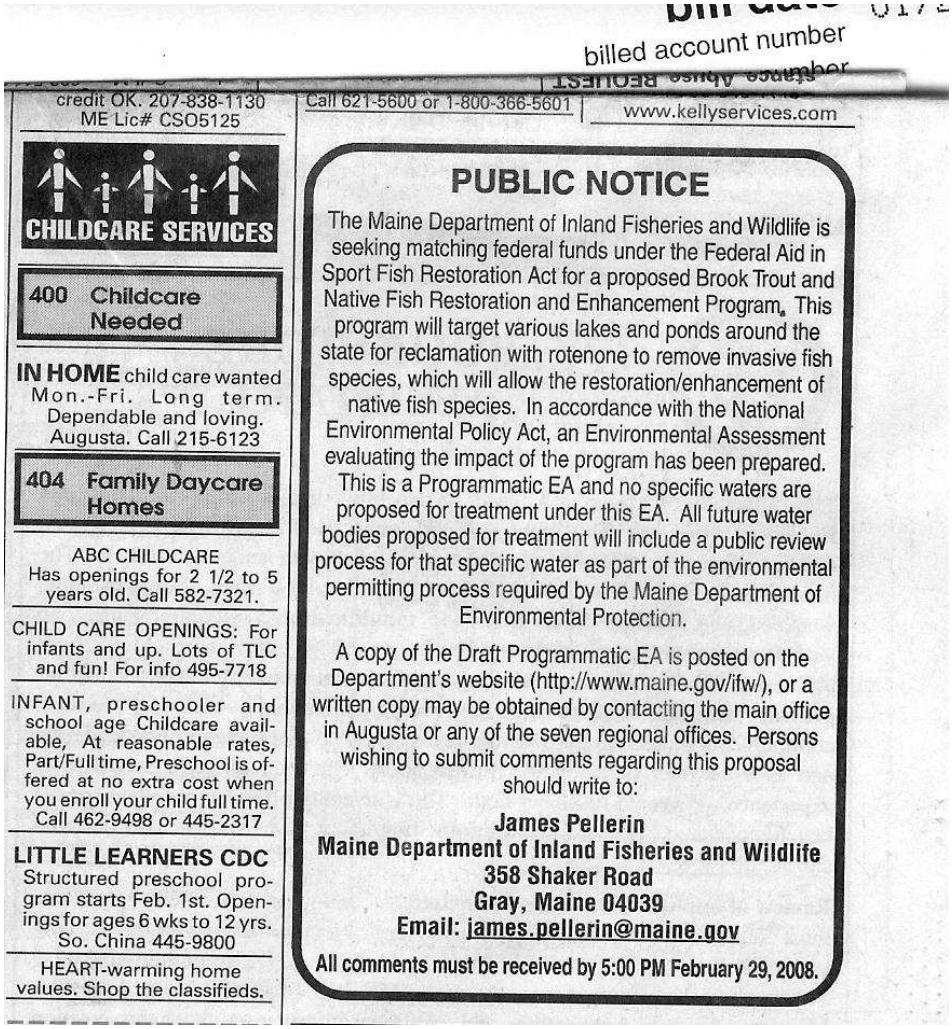
Appendix C. Public Noticing and Copies of Newspaper Ads.

The Programmatic Environmental Assessment was noticed in three major Maine newspapers on January 26 or 27, 2008 (see list below and Appendix C of PEA).

Kennebec Journal (1/27/2008)
Bangor Daily News (1/26/2008)
Portland Press Herald (1/26/2008)

The public comment period was from January 26, 2008 through February 29, 2008. Additionally, the public notice and a copy of the Programmatic Environmental Assessment were published on the Maine Department of Inland Fisheries and Wildlife web site during the month of February. Notice of the Programmatic Environmental Assessment was also sent to several potentially interested parties including: members of the Fish and Wildlife Advisory Council, Sportsman's Alliance of Maine, and Trout Unlimited. Maine's four Federally Recognized Tribes (Aroostook Band of Micmacs, Houlton Band of Maliseet, Passamaquoddy Tribe (Pleasant Point and Indian Township), and Penobscot Indian Nation) were also noticed.

Add #1. Kennebec Journal



billed account number

credit OK. 207-838-1130
ME Lic# CSO5125

Call 621-5600 or 1-800-366-5601 | www.kellyservices.com

CHILDCARE SERVICES

400 Childcare Needed

IN HOME child care wanted Mon.-Fri. Long term. Dependable and loving. Augusta. Call 215-6123

404 Family Daycare Homes

ABC CHILDCARE
Has openings for 2 1/2 to 5 years old. Call 582-7321.

CHILD CARE OPENINGS: For infants and up. Lots of TLC and fun! For info 495-7718

INFANT, preschooler and school age Childcare available, At reasonable rates, Part/Full time, Preschool is offered at no extra cost when you enroll your child full time. Call 462-9498 or 445-2317

LITTLE LEARNERS CDC
Structured preschool program starts Feb. 1st. Openings for ages 6 wks to 12 yrs. So. China 445-9800

HEART-warming home values. Shop the classifieds.

PUBLIC NOTICE

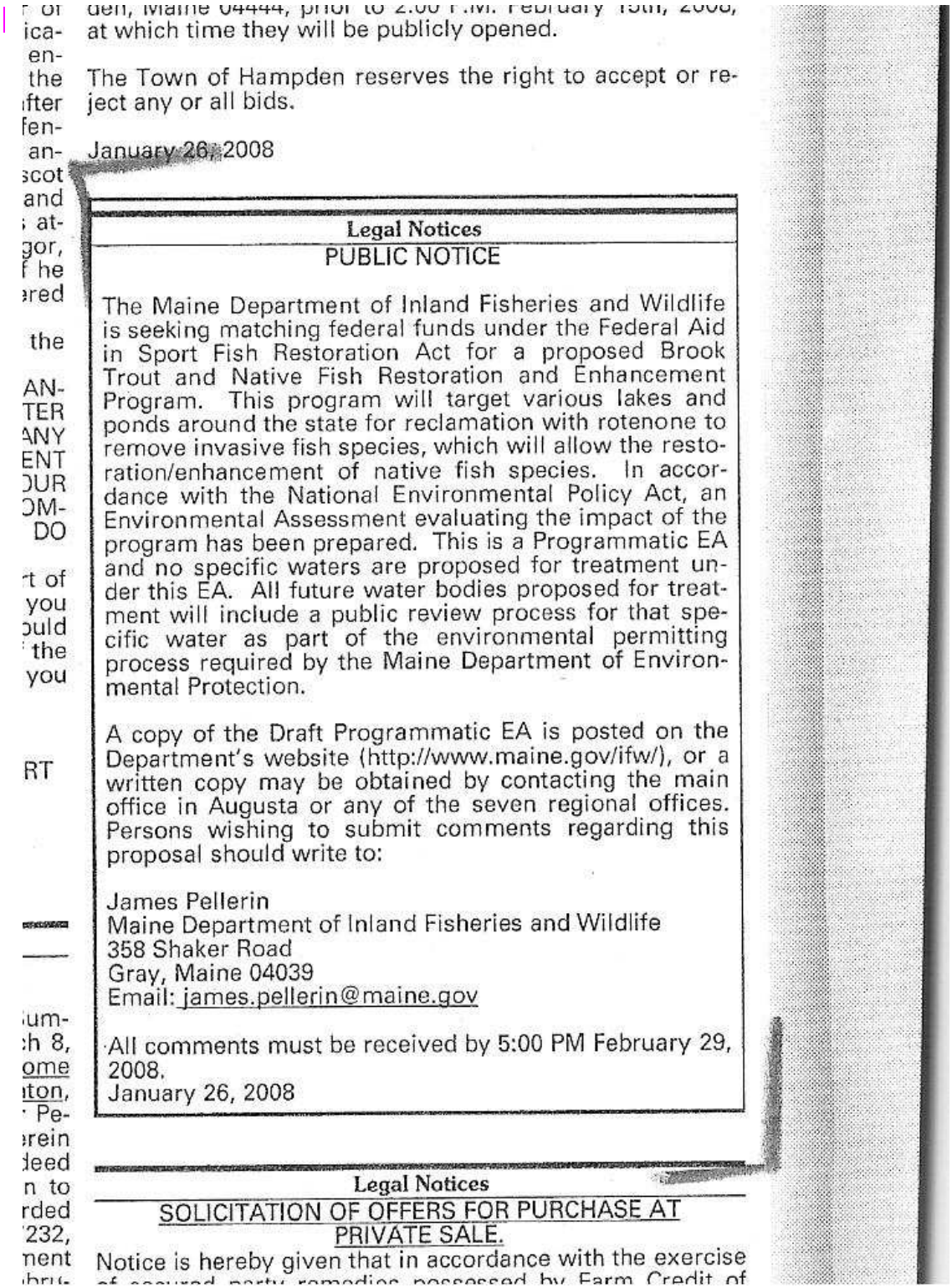
The Maine Department of Inland Fisheries and Wildlife is seeking matching federal funds under the Federal Aid in Sport Fish Restoration Act for a proposed Brook Trout and Native Fish Restoration and Enhancement Program. This program will target various lakes and ponds around the state for reclamation with rotenone to remove invasive fish species, which will allow the restoration/enhancement of native fish species. In accordance with the National Environmental Policy Act, an Environmental Assessment evaluating the impact of the program has been prepared. This is a Programmatic EA and no specific waters are proposed for treatment under this EA. All future water bodies proposed for treatment will include a public review process for that specific water as part of the environmental permitting process required by the Maine Department of Environmental Protection.

A copy of the Draft Programmatic EA is posted on the Department's website (http://www.maine.gov/ifw/), or a written copy may be obtained by contacting the main office in Augusta or any of the seven regional offices. Persons wishing to submit comments regarding this proposal should write to:

James Pellerin
Maine Department of Inland Fisheries and Wildlife
358 Shaker Road
Gray, Maine 04039
Email: james.pellerin@maine.gov

All comments must be received by 5:00 PM February 29, 2008.

Add #2. Bangor Daily News.



den, Maine 04444, prior to 2:00 P.M. February 15th, 2008, at which time they will be publicly opened.

The Town of Hampden reserves the right to accept or reject any or all bids.

January 26, 2008

Legal Notices

PUBLIC NOTICE

The Maine Department of Inland Fisheries and Wildlife is seeking matching federal funds under the Federal Aid in Sport Fish Restoration Act for a proposed Brook Trout and Native Fish Restoration and Enhancement Program. This program will target various lakes and ponds around the state for reclamation with rotenone to remove invasive fish species, which will allow the restoration/enhancement of native fish species. In accordance with the National Environmental Policy Act, an Environmental Assessment evaluating the impact of the program has been prepared. This is a Programmatic EA and no specific waters are proposed for treatment under this EA. All future water bodies proposed for treatment will include a public review process for that specific water as part of the environmental permitting process required by the Maine Department of Environmental Protection.

A copy of the Draft Programmatic EA is posted on the Department's website (http://www.maine.gov/ifw/), or a written copy may be obtained by contacting the main office in Augusta or any of the seven regional offices. Persons wishing to submit comments regarding this proposal should write to:

James Pellerin
Maine Department of Inland Fisheries and Wildlife
358 Shaker Road
Gray, Maine 04039
Email: james.pellerin@maine.gov

All comments must be received by 5:00 PM February 29, 2008.
January 26, 2008

Legal Notices

SOLICITATION OF OFFERS FOR PURCHASE AT PRIVATE SALE.

Notice is hereby given that in accordance with the exercise of secured party remedies possessed by Farm Credit of

Add #3. Portland Press Herald.

'e a minimum
'ears experi-
mputer liter-
d excellent
skills. Back-
in multiple
aw preferred.
o work from
ossibility.

resume to

ing Partner
. Box 568
ME 04112-0568

UBLIC NOTICES

LIC NOTICE

OF GORHAM
otice of
ic Hearing
nam Planning
vill hold two
Hearings on
, February 4,
7:00 PM in the
Chamber, 75
reet, Gorham,
ear comment
proposed
nents to the
Land Use and
oment Code,
II, Section V.
Standards for
lgn and Con-
of Streets and
elating to the
requirements
ng as well as
iscellaneous
es to the
nents for the
nd construc-
reets and ways
) proposed
ients to Chap-
tion II, Parking,
and Traffic,
gravel parking
ertain limited
ances. Copies
roposed ordi-
nendments are
e in the Plan-
ept., at the
Municipal Cen-
South St.,
, ME during
usiness hours.
ional informa-
222-1620.
3187899

LIC NOTICE

ls give that
ion has been
the Office of
ptroller of the
y, Northeast-

PUBLIC NOTICE

The Maine Department of Inland Fisheries and Wildlife is seeking matching federal funds under the Federal Aid in Sport Fish Restoration Act for a proposed Brook Trout and Native Fish Restoration and Enhancement Program.

This program will target various lakes and ponds around the state for reclamation with rotenone to remove invasive fish species, which will allow the restoration/enhancement of native fish species. In accordance with the National Environmental Policy Act, an Environmental Assessment evaluating the impact of the program has been prepared. This is a Programmatic EA and no specific waters are proposed for treatment under this EA. All future water bodies proposed for treatment will include a public review process for that specific water as part of the environmental permitting process required by the Maine Department of Environmental Protection.

A copy of the Draft Programmatic EA is posted on the Department's website (http://www.maine.gov/ifw/), or a written copy may be obtained by contacting the main office in Augusta or any of the seven regional offices. Persons wishing to submit comments regarding this proposal should write to:

James Pellerin
Maine Department of
Inland Fisheries and Wildlife
358 Shaker Road, Gray, Maine 04039
Email: james.pellerin@maine.gov
All comments must be received by
5:00 PM February 29, 2008

3195501

Law, PLLC, 95 Middle Street, Portsmouth, New Hampshire, 03801, telephone (603) 766-6300.

TERMS OF SALE: Any and all persons wishing to bid for the real estate must, prior to the time of the auction, make a deposit. The amount of the deposit required in order to make any bid shall be $5,000.00. All deposits shall be made in cash or certified or bank cashier's check in U.S. Funds, made payable to SunTrust Mortgage, Inc. (deposited with Attorney Flagg as a qualification to bid), with the balance due and payable within thirty (30) days upon presentation of a conveyance deed.

Bidders shall, prior to the start of the auction, register and sign a bidding contract available at the auction. Absentee bids will not be accepted. Bidding and acknowledgment of bids will be by number only. Mortgage Electronic Registration Systems, Inc. c/o SunTrust Mortgage, Inc. reserves the right to bid without making the required deposit and may pay for the real estate in the event that it is the successful bidder with a credit against indebtedness owed by the borrowers. Unsuccessful bidders shall receive a refund of their deposit. As to a successful bidder, the deposit shall be non-refundable and it will be credited to the purchase price. The successful bidder for the real estate will be required to sign a Purchase and Sale Agreement at the conclusion of the auction. The balance of the purchase price shall be due and payable thirty (30) days after the date of the auction, upon presentation of the Deed. Real estate shall be conveyed by Quitclaim Deed Without Covenant.

The property shall be sold on an AS IS and WHERE IS basis without

Appendix D. Public Comments and Responses.

Comment 1 (E-mail):

Dear James,

I received the Notice regarding the programmatic EA for the fish enhancement program. I understand that this does not list the specific water bodies proposed to be reclaimed since it's a programmatic EA, but, if you do have a list of the waters that the MeDIFW is proposing to reclaim, I would like a copy.

Thank you very much !

Sincerely,

John S. Banks
Director of Natural Resources
Penobscot Nation
12 Wabanaki Way
Indian Island, ME 04468
(207) 817-7330
(207) 356-5022 (cell)
(207) 817-7466 (fax)

Response to Comment #1 (E-mail):

John -

As stated this is simply a programmatic EA to receive matching federal dollars for future projects. Although a few waters are currently in the works for reclamation, there is no specific list of future waters to be reclaimed. The program will be somewhat dynamic in that we may have to respond to recent illegal introductions as they occur, as well as restoration of historical brook trout waters.

If an individual water is considered for reclamation the Department is still required to notify all land owners surrounding the water body and the local municipality, hold a public informational meeting, and file a permit through the Maine Department of Environmental Protection with mandated public comment periods. Regional fisheries staff would certainly notify the Penobscot Nation if a reclamation was planned in your area, and there would be ample opportunity to provide input. The EA provides more details on the process, and may provide further clarification. Hope this helps, and feel free to contact me if you have any additional questions.

Comment #2 (E-mail attachment):

James Pellerin
Fisheries Biologist
Maine Department of Inland Fisheries and Wildlife
RR1, 358 Shaker Road
Gray, Maine 04039

RE: Programmatic Environmental Assessment: for reclamation of various lakes and ponds in the State of Maine under the Brook Trout and Native Fish Restoration and Enhancement Program

Mr. Pellerin,

The Dud Dean Angling Society supports the efforts of the Maine Department of Inland Fisheries and Wildlife in securing federal funding to acquire Rotenone as a tool to reclaim bodies of water as a tool in their Brook Trout and Native Fish Restoration and Enhancement Programs.

It is a sad fact that many Maine Brook Trout and Native Fish populations are threatened or lost every year through the illegal or unintentional introduction of exotic and/or invasive species. In the last few years, the number of these introductions has increased drastically and the Maine Department of Inland Fisheries and Wildlife has very few resources to restore these fisheries. As a result Maine's Native Fish resources are declining every year, especially its Brook Trout resources which represent over 97% of the nation's Brook Trout populations. (Eastern Brook Trout Joint Venture, 2006)

From an ecological perspective, many of these Brook Trout and other Native Fish resources are some of the last in the nation and are deserving of restoration efforts. Unfortunately, funding on a local level for Rotenone as a reclamation tool is not available and thus federal funding is required to protect and restore these resources.

The Dud Dean Angling Society supports this assessment and request for funding with the understanding that post-reclamation management of the reclaimed waters supports maintaining self-sustaining populations wherever habitat conditions allow.

Sincerely,

Jeffery Levesque
Conservation Coordinator
Dud Dean Angling Society

Response to Comment #2:

Letter of support, no response required required.

Comment #3 (E-mail):

Mr Pellerin,

As a Registered Maine Guide and a life-long fisherman, I am writing to tell you how excited I am to hear that the State is making plans to reclaim waters that have been degraded by invasive and exotic species. I fullysupport the use of Rotenone to
accomplsh this task, as it seems to be the most effective method not only in Maine, but in many other states as well. The only thing that I regret is

that the DIFW does not seem as enthusiastic about preventing the introduction of invasives, as
evidenced by the recent defeat of a bill that would have more strictly controlled the use of baitfish. Regardless, I strongly believe that this program is a step in the right direction. Thank you for your dedication to our fisheries and good luck
with your project.

Very Sincerely,

Brian Foley

Brian H. Foley
UMaine Facilities Management
5765 Service Building, Room 118
Orono, Maine 04469-5765
Phone: 207-581-2682, Cell: 207-949-3852
Email: brian.foley@umit.maine.edu

Response to Comment #3:

Letter of support, no response required.

Comment #4 (E-mail attachment):

James Pellerin
Fisheries Biologist
Maine Department of Inland Fisheries and Wildlife
RR1, 358 Shaker Road
Gray, Maine 04039

RE: Programmatic Environmental Assessment: for reclamation of various lakes and ponds in the State of Maine under the Brook Trout and Native Fish Restoration and Enhancement Program

Mr. Pellerin,

I strongly support the efforts of the Maine Department of Inland Fisheries and Wildlife in securing federal funding to acquire Rotenone as a tool to reclaim bodies of water as a tool in their Brook Trout and Native Fish Restoration and Enhancement Programs.

Maine serves as one of the last great strongholds for wild, native brook trout in the continental US, deriving much needed economic activity for chronically depressed rural local economies across the Maine landscape. Maine has also been the location of much illegal or unintended movement of invasive species which often out-compete native species. Angling and other methods of control or eradication often prove ineffective at removing undesirable non-native species from waters once they become established. Chemical reclamation is often the only alternative for sustaining wild ecological systems with native species once they've been contaminated with non-native species.

From an ecological perspective, many of these Brook Trout and other Native Fish resources are some of the last in the nation and are deserving of restoration efforts. Unfortunately, funding on a local level for Rotenone as a reclamation tool is not available and thus federal funding is required to protect and restore these resources.

Therefore, I support this assessment and request for funding with the understanding that post-reclamation management of the reclaimed waters supports maintaining self-sustaining populations wherever habitat conditions allow.

Sincerely,

Dave Huntress
Orono, Maine

Response to Comment #4:

Letter of support, no response required.

ATTACHMENT B

Maine Department of Environmental Protection
General Permit Notice of Intent (NOI)
Piscicide for the Control of Invasive Fishes

NOTE: A copy of this NOI Form must be filed with each civil jurisdiction in which the treatment will be located (municipal office, LURC Regional Office, County Commissioners office, as appropriate); with MDIFW, MDOC-NAP, MDMR-BSRFH, USFWS, NOAA Fisheries, and affected lake and watershed associations. Notification must also be provided to abutting landowners. Waters used as Public Water Supplies are not eligible for coverage.

This NOI is subject to General Permit #MEG180000 / WDL #W-009045-5Y-A-N, issued by the Maine Department of Environmental Protection (MEDEP) for the piscicide treatment of invasive fishes. Project specific information may be obtained from MDIFW staff listed in Section 1 below:

General Information

1. MDIFW Fisheries Division Contact

John Boland, Director of Fisheries
284 State Street, SHS 41
Augusta, ME 04330
(207) 287-5261
john.boland@maine.gov

2. Agent Managing the Project (if different from Division Contact)

3. Licensed Applicator Information

Maine Board of Pesticides Control License Number: ----------, expiration MM/DD/YYYY.

4. Statement of Significant Need to Control Invasive Species

The proposed treatment is consistent with and supported by MDIFW's legislative mandate Title 12 MRSA Ch. 702 §7011, Administrative Policy Regarding Fisheries Management, State of Maine Action Plan for Managing Invasive Species, and the Revised Strategic Management Plan for Fisheries, 2001-2016 as follows. MDIFW may submit additional justification.

- ☐ The Maine Legislature established the MDIFW "to preserve, protect and enhance the inland fisheries and wildlife resources of the State." This legislation empowers the MDIFW to develop policies and programs for the management of Maine's inland fisheries. Reclamation projects under this program are consistent with the MDIFW's legislative mandate as an effort to restore and/or enhance native fisheries and fishery opportunities in the State;
- ☐ MDIFW Administrative Policy Regarding Fisheries Management states "Management programs will focus on…protection and restoration of habitat…" and Habitat Section-3 reads, "Projects intended to enhance habitat, although very similar to restoration projects, are intended to improve the habitat value for certain fish species, but are not being done to restore a pre-existing, or historical condition." The proposed reclamation program falls under the umbrella of habitat restoration and/or enhancement as defined in MDIFW's management policy.
- ☐ State of Maine Action Plan for Managing Invasive Species states that MDIFW will remove illegally introduced fish when feasible, and chemical reclamation is the most common and effective means of accomplishing this goal. The proposed program helps MDIFW achieve the objectives outlined in this federally approved plan and MDIFW has identified invasive fish species in the treatment area, pursuant to 38 MRSA, §466.8-A.
- ☐ The Revised Strategic Management Plan for Fisheries, 2001-2016 - under the Brook Trout Species Plan states, "Objective 4: Improve fishing quality in lakes and ponds.

In the treatment area, MDIFW has determined that the following species is/are INVASIVE.

☐ Common sucker *Catostomus commersoni*	☐ Golden shiner *Notemigonus crysoleucas*	☐ Rudd *Scardinius erythrophthalmus*
☐ Creek chub sucker *Erimyzon oblongus*	☐ Common shiner *Luxilus cornutus*	☐ Goldfish *Carassius auratus*
☐ Creek chub *Semotilus atromaculatus*	☐ Rainbow smelt *Osmerus mordax*	☐ Carp *Cyprinus carpio*
☐ Lake chub *Couesius plumbeus*	☐ Emerald shiner *Notemigonus crysoleucas*	☐ Northern pike *Esox lucius*
☐ Muskellunge *Esox masquinongy*	☐ Largemouth bass *Micropterus salmoides*	☐ Smallmouth bass *Micropterus dolomieu*
☐Black crappie *Pomoxis nigromaculatus*	☐ Brown bullhead *Ameirus nebulosus*	☐ Other List: _____

In the treatment area, MDIFW has determined that the following native species are to be RESTORED or ENHANCED.

☐ Brook trout *Salvelinus fontinalis*	☐ Landlocked Atlantic salmon *Salmo salar sebago*	☐ Swamp darter *Etheostoma fusiforme*
☐ Landlocked Arctic charr *Salvelinus alpinus oquassa*	☐ Lake whitefish *Coregonum clupeaformis*	☐ Other List: _____

5. Reasons for this project:

Reclaimed trout ponds provide a mechanism for meeting MDIFW species management objectives, where unauthorized introductions have severely compromised native fisheries and fishing opportunities for native species like brook trout. Application of the authorized aquatic piscicides is the most effective means of fish control. The significant reasons to control the invasive species in this treatment area include, but are not limited to the following. MDIFW shall provide an accompanying project narrative.

☐ Invasive population of fish cannot be controlled by non-chemical means;

☐ Significant potential for the invasive fish populations to spread rapidly;

☐ Significant disruption of the aquatic habitat is being caused by the invasive species;

☐ Treatment is required to enable a broader scale fish control project under a fish management plan;

☐ Treatment is needed to restore habitat and/or that failure to rapidly control the invasive species threatens to result in significant environmental harm to this or other natural resources.

Describe past control efforts

☐ Rapid Response action is proposed as the first effort to control invasive species.

☐ Rotenone has been used to treat this area **with** success but invasive fish have been reintroduced.

☐ Rotenone has been used to treat this area **without** complete success and this treatment is necessary to control the invasive species..

☐ Management plan and/or the stocking program for the resource was revised in response to the invasive species introduction, however control is now necessary.

☐ Other, provide additional detail.

6. This treatment

The proposed aquatic piscicide application(s) will be performed:

☐ As a rapid response project requiring immediate action to contain a newly identified invasive fish population;

☐ In conjunction with a specific written management plan for the receiving water and including a reference to that plan; or

☐ Pursuant to other resource management tools or objectives (provide details).

7. Project timeline

8. Topographic or similar map extending one mile beyond treatment site(s), indicating extent of defined treatment area and secondary effects zone.

9. A map of the water body to be treated showing monitoring location(s) and the area(s) to be treated (spots or entire lake). Indicate the extent of the defined treatment area and secondary effects zone.

10. A description of each area to be treated, including, but not limited to, range of depths, average depth, substrate character (sand, gravel, mud/organic, etc), identification of any intermittent or permanent inlets to or outlets from the water body, presence or absence and characterization of non-target fish species within the water body, and any physical aspects of the site(s) to be treated that affect operations. The estimated size of the area(s) to be treated reported in square meters or acres. The estimated volume(s) to be treated reported in cubic meters or acre-feet. Ideally list PEARL DATABASE INFORMATION.

11. The USEPA registration number, formulation, application rate, and frequency of application for all authorized aquatic piscicides proposed for use.

☐ PRENTOX Prenfish Toxicant Liquid E.C. (EPA Reg No. 655-422)(5% rotenone).
Application rate: ☐ 0.5 mg/L ☐ 0.75 mg/L ☐ 1.0 mg/L ☐ 1.5 mg/L ☐ 2.0 mg/L
Frequency of Application: ☐ Single application with ability to reboost within 30-hours; ☐ Annual application.

☐ PRENTOX Rotenone Fish Toxicant Powder (EPA Reg No. 655-691)(7.4% rotenone).
Application rate: ☐ 0.5 mg/L ☐ 0.75 mg/L ☐ 1.0 mg/L ☐ 1.5 mg/L ☐ 2.0 mg/L
Frequency of Application: ☐ Single application with ability to reboost within 30-hours; ☐ Annual application.

☐ PRENTOX CFT Legumine™ Fish Toxicant (EPA Reg No. 75338-2)(5% rotenone).
Application rate: ☐ 0.5 mg/L ☐ 0.75 mg/L ☐ 1.0 mg/L ☐ 1.5 mg/L ☐ 2.0 mg/L
Frequency of Application: ☐ Single application with ability to reboost within 30-hours; ☐ Annual application.

12. Application Methods for Protection of Non-Target Resources and Organisms

Description (provide details for each in supplemental materials)	Indicate
Well defined treatment area with no toxic discharge beyond physical obstructions.	☐
Well defined treatment area & minimized secondary effects zone with provisions for non-target protection.	☐
Summer treatment program with provisions for non-target protection.	☐
Fall/winter treatment program with provisions for non-target protection.	☐
Physical drawdown of treatment area planned.	☐
Provisions to treat/recycle/retain treated discharges until nontoxic.	☐
Limited spot/area treatments based on life histories of target species.	☐
Protection ensured for non-target resources and organisms by other means.	☐

☐ Provide a narrative description of the defined treatment area noting locations of physical obstructions that will prevent unaided reestablishment of target invasive fishes.

☐ If aquatic piscicide toxicity is anticipated to extend beyond the defined treatment area based on modeling or other predictive tools, MDIFW shall provide a clear demonstration of the significant need to conduct the program as designed, details of the resulting secondary effects zone, and measures taken to ensure protection of non-target resources and organisms.

MONITORING PROGRAM (SECTIONS 13 – 17

13. BIOLOGICAL MONITORING: Select the appropriate monitoring regime for the effects of the piscicide(s) on fishes and other aquatic organisms, including non-target species, pursuant to Part I – Special Conditions of this general permit. Monitoring shall be sufficient to evaluate the community as to species present and relative abundances before and after the treatment program. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

14. PISCICIDE MONITORING: Select the appropriate piscicide monitoring regime for the piscicide used and type of treatment pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

15. WATER QUALITY MONITORING: Select the appropriate water quality monitoring regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

16. PHYSICAL MONITORING: Select the appropriate physical monitoring regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI.

17. COMPUTER MODELING: Select the appropriate computer modeling regime pursuant to Part I – Special Conditions of this general permit. Any deviations from these standard protocols will be detailed and a justification for deviation supplied with the NOI. The computer model(s) indicating projected rotenone degradation and dispersal shall be provided.

Monitoring Within the Treatment Area

Table 3 from Invasive Fishes General Permit			
Description	Before Treatment	During Treatment	After Treatment
Biological Monitoring - Conduct all surveys indicated unless extenuating circumstances and justification provided			
Treatment area fish survey	X	---	X
Treatment area visual invertebrate survey	X	---	X
Area non-game, threatened or endangered species survey.	X	---	---
PEARL species research	X	---	---
Piscicide Monitoring			
Sentinel fish cages in treatment area (standard, other options must be justified)	---	---	X
Sentinel fish tested offsite with water samples from treatment area using *S. fontinalis* or other MEDEP approved species.	---	---	
Indirect rotenone levels using *C. dubia* or other MEDEP approved species.	---	---	
Direct rotenone levels (not currently available in Maine)	---	---	
Water Quality Monitoring -Conduct all monitoring indicated unless extenuating circumstances and justification provided			
Dissolved oxygen profiles	X	---	X
Water temperature profiles	X	---	X
Secchi Disk transparency	X	---	X
pH	X	---	X
Alkalinity	X	---	X
Phosphorous	X	---	X
Conductivity	X	---	X
Physical Monitoring -for drawdown and intermittent outlet conditions only			
Water level	X	X	X
Outlet flow	X	X	X
Computer Modeling of Rotenone Degradation and Dispersal -conduct and provide both models unless extenuating circumstances and justification provided.			
Computer modeling of treatment area	X	---	---
Computer modeling of outlet	X	---	---

Monitoring Within the Secondary Effects Zone and Downstream of the Treatment Area

Table 4 from Invasive Fishes General Permit			
Description	Before Treatment	During Treatment	After Treatment
Biological Monitoring -Conduct all surveys indicated unless extenuating circumstances and justification provided			
Secondary effects zone and downstream fish composition using IFW Stream Survey Protocol Level 1, Level 2 or Level 3	X	---	X
Secondary effects zone and downstream habitat composition		---	
Secondary effects zone and downstream visual invertebrate survey	X	---	X
Area non-game, threatened or endangered species survey.	X	---	---
PEARL species research	X	---	---
Piscicide Monitoring			
Sentinel fish cages in secondary effects zone and downstream area(s). (standard, other options must be justified)	---	---	X
Sentinel fish tested offsite with water samples from downstream area using *S. fontinalis* or other MEDEP approved species.	---	---	
Indirect rotenone levels using *C. dubia* or other MEDEP approved species.	---	---	
Direct rotenone levels (not currently available in Maine)	---	---	
Water Quality Monitoring -Conduct all monitoring indicated unless extenuating circumstances and justification provided			
Dissolved oxygen profiles	X	---	X
Water temperature profiles	X	---	X
Secchi Disk transparency	X	---	X
pH	X	---	X
Alkalinity	X	---	X
Phosphorous	X	---	X
Conductivity	X	---	X
Physical Monitoring -for drawdown and intermittent outlet conditions only			
Water level	X	X	X
Outlet flow	X	X	X
Computer Modeling of Rotenone Degradation and Dispersal -conduct and provide both models unless extenuating circumstances and justification provided.			
Computer modeling of treatment area	X	---	---
Computer modeling of secondary effects zone and downstream areas.	X	---	---

18. Conservation Agency Notification List

The following organizations have received written notification of this project and have responded that no elements of special concern for rare, threatened, or endangered species or natural communities are known in the affected area or that the treatment as proposed is considered to not significantly threaten the species or natural communities in question.

☐ MDIFW Non-Game Program
☐ MDIFW Regional Wildlife Biologists
☐ Maine Department of Conservation-Natural Areas Program
☐ Bureau of Sea-Run Fisheries and Habitats, Maine Department of Marine Resources
☐ USFWS
☐ NOAA Fisheries (for projects affecting estuarine or marine habitats)

19. Public Notice

List municipalities, counties, and/or LURC Regional Offices to be notified by copy of NOI:

☐ Public Informational Meeting was held (provide date, attendees, comments received, actions taken.)

☐ Abutting landowners to all affected resources have been notified of proposed project (attach list and include any comments received. Note efforts undertaken to contact if unsuccessful.)

☐ Lake Association / Watershed Association has been notified of proposed project (list and include any comments received.)

☐ Provide information on measures to restrict access to, and public posting of, affected areas.

20. Copy of press release or advertisement publication date and name of newspaper with general circulation in the area of the treatment program

21. Signature of Division Contact and Managing Agent

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 gather and evaluate the information submitted. 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.

John Boland, (AGENT MANAGING PROJECT)
Director of Fisheries

Keep a copy as record of permit. Send the form with attachments via certified mail to the Maine Department of Environmental Protection, 17 SHS, Augusta, ME 04333-0017 or as described in the general permit. A copy of this NOI must be provided to the municipal office or County Commissioners' office and LURC Regional Office if any part of the water body is LURC jurisdiction. Authorization to discharge is valid for one year. Work carried out in violation of any applicable standard is subject to enforcement action.

This area for office use only.

NOI #	Date Received	Date Approved	Date Returned	Staff
#MEG180000				

A complete NOI must contain the following information for each individual piscicide treatment program the applicant proposes to conduct.

CONTENTS

A. GENERAL PROVISIONS

1. **General compliance**. All discharges shall be consistent with the terms and conditions of this permit; any changes in production capacity or process modifications which result in changes in the quantity or the characteristics of the discharge must be authorized by an additional license or by modifications of this permit; it shall be a violation of the terms and conditions of this permit to discharge any pollutant not identified and authorized herein or to discharge in excess of the rates or quantities authorized herein or to violate any other conditions of this permit.

2. Other materials. Other materials ordinarily produced or used in the operation of this facility, which have been specifically identified in the application, may be discharged at the maximum frequency and maximum level identified in the application, provided:

(a) They are not

(i) Designated as toxic or hazardous under the provisions of Sections 307 and 311, respectively, of the Federal Water Pollution Control Act; Title 38, Section 420, Maine Revised Statutes; or other applicable State Law; or
(ii) Known to be hazardous or toxic by the licensee.

(b) The discharge of such materials will not violate applicable water quality standards.

3. Duty to comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of State law and 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.

(a) The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act, and 38 MRSA, §420 or Chapter 530.5 for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.
(b) Any person who violates any provision of the laws administered by the Department, including without limitation, a violation of the terms of any order, rule license, permit, approval or decision of the Board or Commissioner is subject to the penalties set forth in 38 MRSA, §349.

4. Duty to provide information. The permittee shall furnish to the Department, within a reasonable time, any information which the Department 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 also furnish to the Department upon request, copies of records required to be kept by this permit.

5. Permit actions. This permit may be modified, revoked and reissued, or terminated for cause. 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 stay any permit condition.

6. Reopener clause. The Department reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedule of compliance or other provisions which may be authorized under 38 MRSA, §414-A(5).

7. Oil and hazardous substances. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under section 311 of the Federal Clean Water Act; section 106 of the Federal Comprehensive Environmental Response, Compensation and Liability Act of 1980; or 38 MRSA §§ 1301, et. seq.

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

9. Confidentiality of records. 38 MRSA §414(6) reads as follows. "Any records, reports or information obtained under this subchapter is available to the public, except that upon a showing satisfactory to the department by any person that any records, reports or information, or particular part or any record, report or information, other than the names and addresses of applicants, license applications, licenses, and effluent data, to which the department has access under this subchapter would, if made public, divulge methods or processes that are entitled to protection as trade secrets, these records, reports or information must be confidential and not available for public inspection or examination. Any records, reports or information may be disclosed to employees or authorized representatives of the State or the United States concerned with carrying out this subchapter or any applicable federal law, and to any party to a hearing held under this section on terms the commissioner may prescribe in order to protect these confidential records, reports and information, as long as this disclosure is material and relevant to any issue under consideration by the department."

10. Duty to reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

11. Other laws. The issuance of this permit does not authorize any injury to persons or property or invasion of other property rights, nor does it relieve the permittee if its obligation to comply with other applicable Federal, State or local laws and regulations.

12. Inspection and entry. The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the EPA Administrator), upon presentation of credentials and other documents as may be required by law, to:

(a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
(d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

B. OPERATION AND MAINTENACE OF FACILITIES

1. General facility requirements.

(a) The permittee shall collect all waste flows designated by the Department as requiring treatment and discharge them into an approved waste treatment facility in such a manner as to

maximize removal of pollutants unless authorization to the contrary is obtained from the Department.

(b) The permittee shall at all times maintain in good working order and operate at maximum efficiency all waste water collection, treatment and/or control facilities.

(c) All necessary waste treatment facilities will be installed and operational prior to the discharge of any wastewaters.

(d) Final plans and specifications must be submitted to the Department for review prior to the construction or modification of any treatment facilities.

(e) The permittee shall install flow measuring facilities of a design approved by the Department.

(f) The permittee must provide an outfall of a design approved by the Department which is placed in the receiving waters in such a manner that the maximum mixing and dispersion of the wastewaters will be achieved as rapidly as possible.

2. Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

3. Need to halt or reduce activity not a defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

5. Bypasses.

(a) Definitions.

(i) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

(ii) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

(b) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs (c) and (d) of this section.

(c) Notice.

(i) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(ii) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D(1)(f), below. (24-hour notice).

(d) Prohibition of bypass.

(i) Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:

(A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
(C) The permittee submitted notices as required under paragraph (c) of this section.

(ii) The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in paragraph (d)(i) of this section.

6. Upsets.

(a) Definition. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations 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.

(b) Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph (c) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(c) Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(i) An upset occurred and that the permittee can identify the cause(s) of the upset;
(ii) The permitted facility was at the time being properly operated; and
(iii) The permittee submitted notice of the upset as required in paragraph D(1)(f) , below. (24 hour notice).
(iv) The permittee complied with any remedial measures required under paragraph B(4).

(d) Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

C. MONITORING AND RECORDS

1. General Requirements. This permit shall be subject to such monitoring requirements as may be reasonably required by the Department including the installation, use and maintenance of monitoring equipment or methods (including, where appropriate, biological monitoring methods). The permittee shall provide the Department with periodic reports on the proper Department reporting form of monitoring results obtained pursuant to the monitoring requirements contained herein.

2. Representative sampling. Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. If effluent limitations are based wholly or partially on quantities of a product processed, the permittee shall ensure samples are representative of times when production is taking place. Where discharge monitoring is required when production is less than 50%, the resulting data shall be reported as a daily measurement but not included in computation of averages, unless specifically authorized by the Department.

3. Monitoring and records.

(a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(b) Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years, the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart 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, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

(c) Records of monitoring information shall include:

(i) The date, exact place, and time of sampling or measurements;
(ii) The individual(s) who performed the sampling or measurements;
(iii) The date(s) analyses were performed;
(iv) The individual(s) who performed the analyses;
(v) The analytical techniques or methods used; and
(vi) The results of such analyses.

(d) Monitoring results must be conducted according to test procedures approved under 40 CFR part 136, unless other test procedures have been specified in the permit.

(e) State law provides that any person who tampers with or renders inaccurate any monitoring devices or method required by any provision of law, or any order, rule license, permit approval or decision is subject to the penalties set forth in 38 MRSA, §349.

D. REPORTING REQUIREMENTS

1. Reporting requirements.

(a) Planned changes. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

(i) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

(ii) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Section D(4).

(iii) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan;

(b) Anticipated noncompliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(c) Transfers. This permit is not transferable to any person except upon application to and approval of the Department pursuant to 38 MRSA, § 344 and Chapters 2 and 522.

(d) Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(i) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Department for reporting results of monitoring of sludge use or disposal practices.

(ii) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR part 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Department.

(iii) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Department in the permit.

(e) 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 14 days following each schedule date.

(f) Twenty-four hour reporting.

(i) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance

has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(ii) The following shall be included as information which must be reported within 24 hours under this paragraph.

(A) Any unanticipated bypass which exceeds any effluent limitation in the permit.
(B) Any upset which exceeds any effluent limitation in the permit.
(C) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit to be reported within 24 hours.

(iii) The Department may waive the written report on a case-by-case basis for reports under paragraph (f)(ii) of this section if the oral report has been received within 24 hours.

(g) Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (d), (e), and (f) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (f) of this section.

(h) Other information. Where 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.

2. Signatory requirement. All applications, reports, or information submitted to the Department shall be signed and certified as required by Chapter 521, Section 5 of the Department's rules. State law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan or other document filed or required to be maintained by any order, rule, permit, approval or decision of the Board or Commissioner is subject to the penalties set forth in 38 MRSA, §349.

3. Availability of reports. Except for data determined to be confidential under A(9), above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by State law, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal sanctions as provided by law.

4. Existing manufacturing, commercial, mining, and silvicultural dischargers. In addition to the reporting requirements under this Section, all existing manufacturing, commercial, mining, and silvicultural dischargers 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 the permit, if that discharge will exceed the highest of the following "notification levels":

(i) One hundred micrograms per liter (100 ug/l);
(ii) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
(iii) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with Chapter 521 Section 4(g)(7); or
(iv) The level established by the Department in accordance with Chapter 523 Section 5(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 the permit, if that discharge will exceed the highest of the following ``notification levels'':

(i) Five hundred micrograms per liter (500 ug/l);
(ii) One milligram per liter (1 mg/l) for antimony;
(iii) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with Chapter 521 Section 4(g)(7); or
(iv) The level established by the Department in accordance with Chapter 523 Section 5(f).

5. Publicly owned treatment works.

(a) All POTWs must provide adequate notice to the Department of the following:

(i) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA or Chapter 528 if it were directly discharging those pollutants.
(ii) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
(iii) For purposes of this paragraph, adequate notice shall include information on (A) the quality and quantity of effluent introduced into the POTW, and (B) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

(b) When the effluent discharged by a POTW for a period of three consecutive months exceeds 80 percent of the permitted flow, the permittee shall submit to the Department a projection of loadings up to the time when the design capacity of the treatment facility will be reached, and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans.

E. OTHER REQUIREMENTS

1. Emergency action - power failure. Within thirty days after the effective date of this permit, the permittee shall notify the Department of facilities and plans to be used in the event the primary source of power to its wastewater pumping and treatment facilities fails as follows.

(a) For municipal sources. During power failure, all wastewaters which are normally treated shall receive a minimum of primary treatment and disinfection. Unless otherwise approved, alternate power supplies shall be provided for pumping stations and treatment facilities. Alternate power supplies shall be on-site generating units or an outside power source which is separate and independent from sources used for normal operation of the wastewater facilities.

(b) For industrial and commercial sources. The permittee shall either maintain an alternative power source sufficient to operate the wastewater pumping and treatment facilities or halt, reduce or otherwise control production and or all discharges upon reduction or loss of power to the wastewater pumping or treatment facilities.

2. Spill prevention. (applicable only to industrial sources) Within six months of the effective date of this permit, the permittee shall submit to the Department for review and approval, with or without conditions, a spill prevention plan. The plan shall delineate methods and measures to be taken to prevent and or contain any spills of pulp, chemicals, oils or other contaminates and shall specify means of disposal and or treatment to be used.

3. **Removed substances.** Solids, sludges trash rack cleanings, filter backwash, or other pollutants removed from or resulting from the treatment or control of waste waters shall be disposed of in a manner approved by the Department.

4. **Connection to municipal sewer.** (applicable only to industrial and commercial sources) All wastewaters designated by the Department as treatable in a municipal treatment system will be cosigned to that system when it is available. This permit will expire 90 days after the municipal treatment facility becomes available, unless this time is extended by the Department in writing.

F. DEFINITIONS. For the purposes of this permit, the following definitions shall apply. Other definitions applicable to this permit may be found in Chapters 520 through 529 of the Department's rules

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For bacteria, the average shall be the geometric mean.

Average monthly discharge limitation means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. Except, however, bacteriological tests may be calculated as a geometric mean.

Average weekly discharge limitation means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best management practices ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Composite sample means a sample consisting of a minimum of eight grab samples collected at equal intervals during a 24 hour period (or a lesser period as specified in the section on monitoring and reporting) and combined proportional to the flow over that same time period.

Continuous discharge means a discharge which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities.

Daily discharge means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.

Discharge Monitoring Report ("DMR") means the EPA uniform national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by approved States as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Flow weighted composite sample means a composite sample consisting of a mixture of aliquots collected at a constant time interval, where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab sample means an individual sample collected in a period of less than 15 minutes.

Interference means a Discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(1) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
(2) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Maximum daily discharge limitation means the highest allowable daily discharge.

New source means any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(a) After promulgation of standards of performance under section 306 of CWA which are applicable to such source, or
(b) After proposal of standards of performance in accordance with section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

Pass through means a discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an approved State to implement the requirements of 40 CFR parts 122, 123 and 124. Permit includes an NPDES general permit (Chapter 529). Permit does not include any permit which has not yet been the subject of final agency action, such as a draft permit or a proposed permit.

Person means an individual, firm, corporation, municipality, quasi-municipal corporation, state agency, federal agency or other legal entity.

Point source means any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant means dredged spoil, solid waste, junk, incinerator residue, sewage, refuse, effluent, garbage, sewage sludge, munitions, chemicals, biological or radiological materials, oil, petroleum products or byproducts, heat, wrecked or discarded equipment, rock, sand, dirt and industrial, municipal, domestic, commercial or agricultural wastes of any kind.

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly owned treatment works ("POTW") means any facility for the treatment of pollutants owned by the State or any political subdivision thereof, any municipality, district, quasi-municipal corporation or other public entity.

Septage means, for the purposes of this permit, any waste, refuse, effluent sludge or other material removed from a septic tank, cesspool, vault privy or similar source which concentrates wastes or to which chemicals have been added. Septage does not include wastes from a holding tank.

Time weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected over a constant time interval.

Toxic pollutant includes any pollutant listed as toxic under section 307(a)(1) or, in the case of sludge use or disposal practices, any pollutant identified in regulations implementing section 405(d) of the CWA. Toxic pollutant also includes those substances or combination of substances, including disease causing agents, which after discharge or upon exposure, ingestion, inhalation or assimilation into any organism, including humans either directly through the environment or indirectly through ingestion through food chains, will, on the basis of information available to the board either alone or in combination with other substances already in the receiving waters or the discharge, cause death, disease, abnormalities, cancer, genetic mutations, physiological malfunctions, including malfunctions in reproduction, or physical deformations in such organism or their offspring.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole effluent toxicity means the aggregate toxic effect of an effluent measured directly by a toxicity test.

DEP INFORMATION SHEET

Appealing a Commissioner's Licensing Decision

Dated: May 2004 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner: (1) in an administrative process before the Board of Environmental Protection (Board); or (2) in a judicial process before Maine's Superior Court. This INFORMATION SHEET, in conjunction with consulting statutory and regulatory provisions referred to herein, can help aggrieved persons with understanding their rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

DEP's *General Laws*, 38 M.R.S.A. § 341-D(4), and its *Rules Concerning the Processing of Applications and Other Administrative Matters* (Chapter 2), 06-096 CMR 2.24 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written notice of appeal within 30 calendar days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner and the applicant a copy of the documents. All the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

The materials constituting an appeal must contain the following information at the time submitted:

1. *Aggrieved Status*. Standing to maintain an appeal requires the appellant to show they are particularly injured by the Commissioner's decision.
2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.
3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.

5. *All the matters to be contested.* The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.

6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.

7. *New or additional evidence to be offered.* The Board may allow new or additional evidence as part of an appeal only when the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process or show that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2, Section 24(B)(5).

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license file is public information made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials. There is a charge for copies or copying services.

2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.

3. *The filing of an appeal does not operate as a stay to any decision.* An applicant proceeding with a project pending the outcome of an appeal runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge initiation of the appeals procedure, including the name of the DEP project manager assigned to the specific appeal, within 15 days of receiving a timely filing. The notice of appeal, all materials accepted by the Board Chair as additional evidence, and any materials submitted in response to the appeal will be sent to Board members along with a briefing and recommendation from DEP staff. Parties filing appeals and interested persons are notified in advance of the final date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision. The Board will notify parties to an appeal and interested persons of its decision.

II. APPEALS TO MAINE SUPERIOR COURT

Maine law allows aggrieved persons to appeal final Commissioner licensing decisions to Maine's Superior Court, see 38 M.R.S.A. § 346(1); 06-096 CMR 2.26; 5 M.R.S.A. § 11001; & MRCivP 80C. Parties to the licensing decision must file a petition for review within 30 days after receipt of notice of the Commissioner's written decision. A petition for review by any other person aggrieved must be filed within 40-days from the date the written decision is rendered. The laws cited in this paragraph and other legal procedures govern the contents and processing of a Superior Court appeal.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, contact the DEP's Director of Procedures and Enforcement at (207) 287-2811.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.