



THE STATE  
of **ALASKA**  
GOVERNOR BILL WALKER

Department of Fish and Game

DIVISION OF SPORT FISH  
Soldotna

43961 Kalifornsky Beach Rd, Suite B  
Soldotna, AK 99669-8276  
Main: 907.262.9368  
Fax: 907.262.4709

April 5, 2018

To: ADEC Pesticide Control Program

Enclosed is an ADEC P.U.P. application for a proposed ADFG pike removal project for a group of lakes and ponds located south of Soldotna referred to as the "Tote Road pike lakes". If you have any questions please contact me.

Sincerely, Rob Massengill  
Project Biologist  
Office# 262-9368: [robert.massengill@alaska.gov](mailto:robert.massengill@alaska.gov)

**State of Alaska DEC**

APR 9 2018

**Pesticide Control Program**



## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

### Part One: Contact Information

**APPLICANT** (Person, organization, or business applying for this permit)

Organization/business Alaska Department of Fish and Game Sport Fish Division

Contact person Robert Massengill

Mailing address 43961 Kalifornsky Beach Road, Suite B

City, State, Zip Soldotna, AK 99669

Telephone Number 907-262-9368

Email Address robert.massengill@alaska.gov

Is the applicant a government entity?

18 AAC 90.620

☒

Yes

☐

No

**APPLICATOR** (Person, organization, or business who will be applying the pesticides)

Organization/business Alaska Department of Fish and Game Sport Fish Division

Contact person Robert Massengill

Mailing address 43961 Kalifornsky Beach Road, Suite B

City/State/Zip Soldotna, AK 99669

Telephone Number 907-262-9368

Email Address robert.massengill@alaska.gov

Pesticide Applicator Certification Number 10177-2006-6

18 AAC 90.515(13)



## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

✓	#	Part Two: Treatment Location Information
	1	<p>Treatment site location: 18 AAC 90.515(B)(A)</p> <p>Street Address <u>See description below</u></p> <p>City _____</p> <p>OR</p> <p>For remote areas, fill in an informal location description such as mileposts, landmarks, distance and direction from nearest community, latitude and longitude, UTM coordinates, etc.</p> <div style="border: 1px solid black; padding: 5px;"><p>The treatment area is located about five miles south of Soldotna in the vicinity of Tote Road, Leisure Lake Road, Stubblefield Drive and Gruber Road. Most of the waterbodies have no official names. All treatment area waterbodies are within 1.25 miles of Hope Lake and includes Hope Lake (N60° 25' 17.41"; W151° 11' 16.36).</p></div>
	2	<p>Describe treatment site (lake, stream, river, wetland, etc.), including inflow and outflow characteristics, stream flow, etc.:</p> <div style="border: 1px solid black; padding: 5px;"><p>The treatment site includes eight lakes and ponds and linking tributary/outflow streams. Seven of the lakes and ponds are linked by small stream connections. Drainage from the group of seven linked lakes is westward via a small creek that eventually dissipates into a vast bog. One 20-acre lake referred to as "G Lake" is considered a closed lake. The approximate total surface area of all treatment area lakes and ponds is 92 acres which contains about 1,197 acre-feet of water. All streams in the treatment area typically discharge at &lt; 1cfs at times dry up.</p></div>
	3	<p>List each public or private drinking water system within 200 feet of the treatment area. 18 AAC 90.515(B)(D)</p> <div style="border: 1px solid black; padding: 5px;"><p>No public drinking water wells are known to exist within 200 feet of the waterbodies to be treated. Private subsurface wells are common throughout the area. Private drinking water wells potentially existing within 200 feet of the treatment area waters were identified by querying the Kenai Peninsula Borough GIS database for waterfront properties that had minimum land/structure improvements of at least \$10,000.</p></div>



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✓	#	Part Two: Treatment Location Information
	4	<p>Approximate size of the treatment area. Please specify units (acre feet, flow rate, etc. The units should match units on the pesticide label):</p> <p>18 AAC 90.515(8)(B)</p> <p>The combined total surface area of all lakes, ponds and wetlands in the treatment area is 102 acres containing a total of ~1,207 acre-feet of water. There are up to two miles of very small (sometimes ephemeral) streams, each &lt;1 cfs, that interconnects seven of the lakes and ponds including one which ultimately drains the entire lake complex towards the west.</p>
	5	<p>If the treatment location has been identified as habitat for an endangered or threatened species, list each species and category (threatened, endangered). 50 CFR 17.11-12</p> <div style="border: 1px solid black; padding: 5px; min-height: 100px;">None</div>

✓	#	Part Three: Treatment Information
	1	<p>List the dates &amp; times (or range of dates and times) that pesticide is proposed to be applied: 18 AAC 90.515(9)</p> <div style="border: 1px solid black; padding: 5px; min-height: 100px;"><p>The treatment is anticipated to take 4-5 days to complete. The application date range is anytime throughout the duration of the P.U.P. and during daylight hours. Ideally, the treatment would occur just before freeze-up in early to mid-October but unforeseen conditions may change the preferred treatment dates. The treatment application would occur on contiguous weekdays. Posttreatment gillnet surveys will determine whether pike are successfully removed from all waters in the treatment area. If live pike are detected posttreatment in any treated waters, those waters with pike present may be retreated with CFT Legumine again the following year (2019), and if necessary, a third application would occur in 2020 if live pike are detected again after the second treatment. Any retreatment application will be conducted per original treatment dosages and methods.</p></div>



## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

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	2	<p>Target pest of pesticide project: 18 AAC 90.515(2)</p> <table border="1"><thead><tr><th>✓</th><th>Category</th><th>List specific targets</th></tr></thead><tbody><tr><td></td><td>Fungus</td><td></td></tr><tr><td></td><td>Vegetation</td><td></td></tr><tr><td></td><td>Insects</td><td></td></tr><tr><td>X</td><td>Fish</td><td>Northern pike</td></tr><tr><td></td><td>Rodents</td><td></td></tr><tr><td></td><td>Other</td><td></td></tr></tbody></table>	✓	Category	List specific targets		Fungus			Vegetation			Insects		X	Fish	Northern pike		Rodents			Other	
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✓	#	Part Three: Treatment Information
	3	<p>Provide a description of the method of pesticide application, including details about any equipment that will be used. 18 AAC 90.515(10)</p> <div><p>Please see Appendix 1 (DRAFT Tote Road Pike Lakes (TRPL) Restoration Plan) for more in-depth pesticide application details. The TRPL Plan serves as an operational plan for ADFG and is a living document subject to changes, additions and deletions as project plans evolve and adapt to the input of new information. However, information regarding pesticide application methods, concentration, and other details of pesticide application will remain as described in this permit application</p><p>For all pesticide applications, the following ratio of pesticides will be applied: Prentox CFT Legumine Fish Toxicant will be applied to treat 100% of all the lake water volume and 100% of all wetlands and streams. This pesticide project will treat identified waterbodies within the TRPL area using a variety of methods and equipment. General methods for the treatment methods are provided below:</p><p>The primary method of pesticide application in the TRPL area will be two outboard powered boats equipped with gas-powered pump systems for applying the pesticide. The pumps will premix lake water with the pesticide and delivery the mixture below the waterline and into the propeller wash of the boat to aid in mixing. Boats will also be equipped with electronic charts/sounders that will allow the boat applicators to visually monitor their application paths and adjust boat speed to accommodate for varying water depths and subsequent pesticide application rates. A handheld spray nozzle will be equipped on one outboard boat to facilitate spraying the pesticide mixture up to 50 feet.</p><p>Backpack applicators on foot will also be used to spot treat along small streams and hard to access wetland areas adjacent to lakes and ponds. The type of backpack sprayer that will be used has a four gallon capacity and is pressurized up to 90psi with a hand lever pump. CFT Legumine would be diluted to 1-2% with water in the sprayer tank.</p><p>Up to six drip stations using battery powered peristaltic pumps may be used to apply pesticide directly to streams. The drip stations would be regularly monitored to ensure the pesticide dosage is appropriate for the stream discharge. Drips stations would operate between 4 and 8 hours in each stream.</p></div>



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✓	#	Part Four: Pesticide List
	1	<p>List the common or brand name of <b>EACH</b> proposed pesticide and adjuvant. <span style="float: right;">18 AAC 90.515(1)</span></p> <ul style="list-style-type: none"><li>• Pesticides <b>MUST</b> be registered in the State of Alaska.</li><li>• Adjuvants <b>MUST</b> be registered in the State of Washington to be considered for use in Alaska.</li></ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"><p>1) Prentox CFT Legumine™ Fish Toxicant</p></div>
	2	<p>Total number of pesticides and adjuvants listed: <u>1</u></p>

To find pesticide products registered in Alaska, search by EPA registration number here:

<http://www.kellysolutions.com/ak/pesticideindex.htm>

To find adjuvants registered in Washington, search here <http://cru66.cahe.wsu.edu/labels/Labels.php>. For "Item to search on", select "Crop". For "Common name", select "adjuvant".



## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

✓	#	<b>Part Five: Product Information</b> For EACH proposed pesticide and adjuvant, fill out the following information. Copy and attach additional sheets for each product. <small>18 AAC 90.515(1)(i)</small>												
	1	Common or brand name of proposed pesticide or adjuvant detailed on this sheet: <u>CFT Legumine Fish Toxicant (Lake and Pond Boat Application)</u>												
	2	EPA Registration Number (not applicable for adjuvants): <u>89459-48</u>												
	3	Specify the formulation of the pesticide or adjuvant (liquid, granular, aerosol, etc.): <u>Liquid</u>												
	4	Name of the seller or distributor from whom the pesticide will be obtained: <u>Envincio LLC represented by Central Life Sciences</u>  OR  Check here if pesticide is from a previous surplus <input checked="" type="checkbox"/> *Note Most of the pesticide will be ordered new but some surplus will be used. <small>18 AAC 90.515(1)</small>												
	5	List each active ingredient (or principal functioning agent) in this product AND it's percent composition: <table border="1"><thead><tr><th>Active Ingredient</th><th>% composition</th></tr></thead><tbody><tr><td>Rotenone</td><td>5%</td></tr><tr><td>Rotenoid cube resins other than rotenone</td><td>5%</td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></tbody></table>	Active Ingredient	% composition	Rotenone	5%	Rotenoid cube resins other than rotenone	5%						
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✓	#	<b>Part Five: Product Information</b> For EACH proposed pesticide and adjuvant, fill out the following information. Copy and attach additional sheets for each product. <small>18 AAC 90.515(6)</small>																				
	6	<p>If this product will be diluted prior to application to the water body, specify the rate of dilution as it will be applied for this project: <small>18 AAC 90.515(6)</small></p> <p>Not applicable – product won't be diluted <input type="checkbox"/></p> <p><b>UNITS MUST MATCH LABEL INSTRUCTIONS</b></p> <table border="1"><tr><td>Amount of product (list units)</td><td>1 gallon product</td></tr><tr><td>Amount of diluent (list units)</td><td>9 gallons of water</td></tr></table> <p>Example:</p> <table border="1"><tr><td>3 oz product</td></tr><tr><td>1 gallon water</td></tr></table>	Amount of product (list units)	1 gallon product	Amount of diluent (list units)	9 gallons of water	3 oz product	1 gallon water														
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	1	Common or brand name of proposed pesticide or adjuvant detailed on this sheet: <u>CFT Legumine Fish Toxicant (Stream Drip Station Application)</u>																						
	2	EPA Registration Number (not applicable for adjuvants): <u>89459-48</u>																						
	3	Specify the formulation of the pesticide or adjuvant (liquid, granular, aerosol, etc.): <u>Liquid</u>																						
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	6	<p>If this product will be diluted prior to application to the water body, specify the rate of dilution as it will be applied for this project: <small>18 AAC 90.515(6)</small></p> <p>Not applicable – product won't be diluted <input checked="" type="checkbox"/></p> <p><b>UNITS MUST MATCH LABEL INSTRUCTIONS</b></p> <table border="1"><tr><td>Amount of product (list units)</td><td></td></tr><tr><td>Amount of diluent (list units)</td><td></td></tr></table> <p>Example:</p> <table border="1"><tr><td>3 oz product</td></tr><tr><td>1 gallon water</td></tr></table>	Amount of product (list units)		Amount of diluent (list units)		3 oz product	1 gallon water				
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	1	Common or brand name of proposed pesticide or adjuvant detailed on this sheet: <u>CFT Legumine Fish Toxicant (wetland backpack application)</u>						
	2	EPA Registration Number (not applicable for adjuvants): <u>89459-48</u>						
	3	Specify the formulation of the pesticide or adjuvant (liquid, granular, aerosol, etc.): <u>Liquid</u>						
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✓	#	<b>Part Six: Storage and Disposal</b> <span style="float: right;">18 AAC 90.515</span>
	1	<p>List the location where pesticide will be stored prior to final disposal.</p> <p>Physical Address <u>ADFG 43961 Kalifornsky Beach Road, Suite B</u></p> <p>City, State, Zip <u>Soldotna, AK 99669</u></p>
	2	<p>Describe how and where excess <u>mixed</u> pesticides and adjuvants will be disposed:</p> <div style="border: 1px solid black; padding: 5px;"><p>Because all pesticide used will be mixed with lake or stream water onsite as it is applied, no excess mixed pesticides and/or adjuvants will result. Unmixed and unused pesticide will remain in the original container for storage.</p></div>
	3	<p>Describe how and where empty pesticide and adjuvant containers will be disposed:</p> <div style="border: 1px solid black; padding: 5px;"><p>Empty pesticide containers will be triple-rinsed by hand or with a power washer so that all rinse water returns to the treatment waterbody. Cleaned and empty pesticide containers will be punctured and transported to the Soldotna landfill for disposal.</p></div>
	4	<p>If excess material or empty containers will be disposed in a landfill, provide the following information:</p> <p>Facility Name <u>Kenai Peninsula Borough Soldotna Landfill</u></p> <p>City, State, Zip <u>Soldotna, AK 99669</u></p> <p>Date when disposal site was contacted to confirm acceptance of materials: <u>XXXXXXX</u></p>



## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

Please provide EACH required item in a separate, stand-alone document.

Check off each item that is attached. Some items may not be applicable; if so, check the N/A column.

### Part Seven: Supporting Documentation

✓	#	N/A	Item
✓	1.	Required	Justification for the pesticide application - why you need to apply a pesticide and the benefits you expect to achieve from the treatment.
✓	2.	Required	Map that shows the location of the treatment area within the state of Alaska. Map must be issued by the United States (e.g., USGS), the State, or the Municipality.
✓	3.	Required	Maps and/or aerial photos that show details within the treatment area, included areas where pesticides will be applied. Map/photo must include a scale to show distances.
✓	4.		Map and/or aerial photo that shows the treatment area and the location of all sources of drinking water within 200 feet of the treatment area. Map/photo must include a scale to show distances.
✓	5.	Required	EPA approved label for each proposed pesticide and adjuvant to be used.
✓	6.	Required	Material Safety Data Sheet for each proposed pesticide and adjuvant to be used.
✓	7.	Required	Description of potential impacts to the environment and non-target plants and animals including invertebrates. Should address any potential impacts to biodiversity and distribution of species, potential for anoxia due to plant decomposition, impact to the overall ecological health of the water body, and any other expected impacts.
✓	8.	Required	Description of precautions planned to protect human health, safety, welfare, animals, and the environment.
✓	9.		Proof of liability insurance (for non-government applicants)
✓	10.		Information about how the proposed pesticide application might affect any threatened or endangered species that may be found in or near treatment area, and any proposed measures to prevent or reduce impacts.
✓	11.	Required	Documentation of compliance with APDES permit requirements (see instructions on page 1).





## Pesticide-Use Permit Application Packet To Apply Pesticides to Water

### Part Eight: Signatures

All applications must be signed as follows, per 18 AAC 15.030:

- **Corporations:** A principal executive officer, an officer that is no lower than the level of vice president, or a duly authorized representative who is responsible for the overall management of the project or operation
- **Partnerships:** A general partner
- **Sole proprietorship:** The proprietor
- **Municipal, state, federal, or other public entity:** A principal executive officer, ranking elected official, or duly authorized employee

I, Robert Massengill certify under penalty of perjury, that all of the information  
And exhibits in this application and attached documentation are true, accurate, and complete.

Robert Massengill                      4      5      2018  
Applicant's Signature                      Month      Day      Year

Fishery Biologist II  
Applicant's Title

## **Supporting document #1. Justification for treating the Tote Road Pike Lakes (TRPL) area with a fish pesticide.**

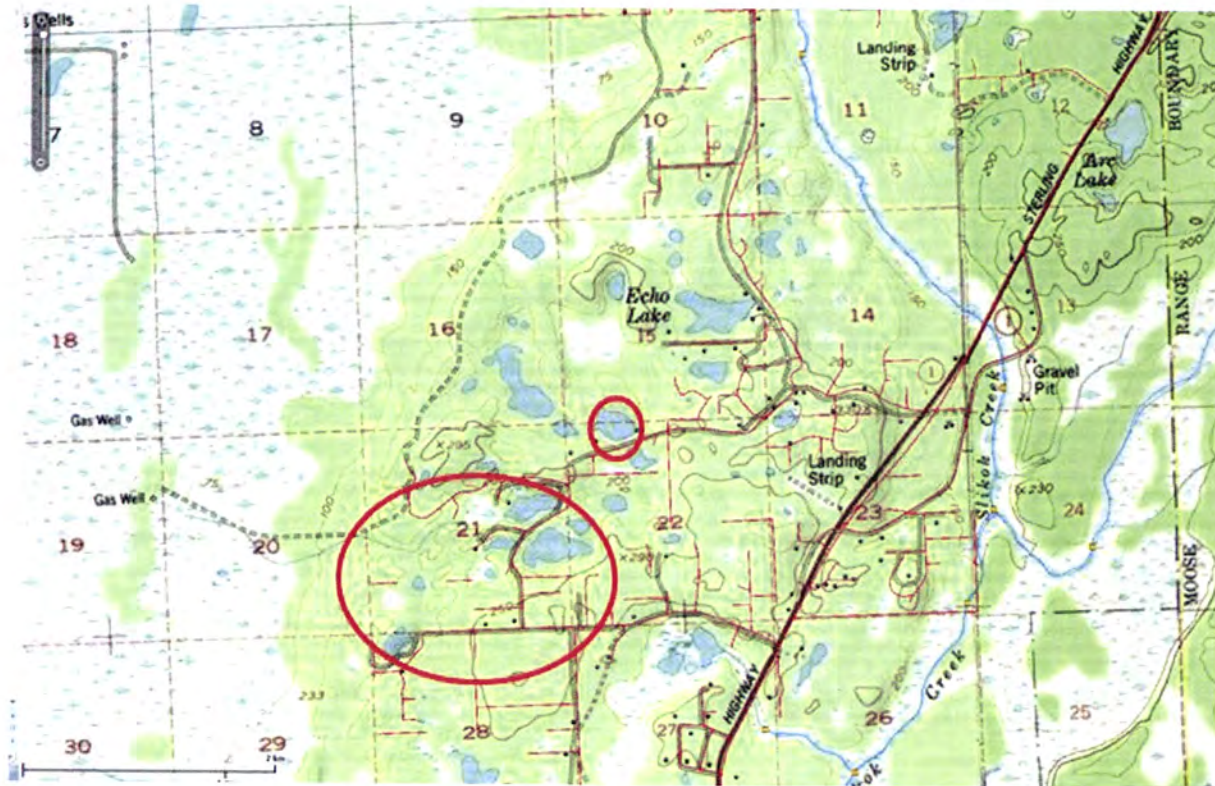
The illegally introduced population of northern pike in the Tote Road Pike Lakes (TRPL) area is located five miles south of Soldotna. This invasive pike population has caused the complete loss of wild native sticklebacks within most of the affected waterbodies. Perhaps more concerning is that the presence of this predatory fish indirectly threatens other valuable wild fish populations throughout the Kenai Peninsula such as salmon and trout. Currently, all known northern pike populations have been eradicated from the Kenai Peninsula except those in the TRPL. This northern pike population could be used as a source for illegal introductions. In fact, two new waterbodies in the TRPL were found to contain northern pike that did not have pike detected in them in earlier surveys. Northern pike in the TRPL are found within 0.6 miles of a Kenai River tributary (branch of Slikok Creek). If TRPL northern pike expand into an open system like Slikok Creek in the Kenai River drainage, that could have disastrous affects to juvenile salmon and resident fish species elsewhere in the drainage.

The objectives of this treatment are to completely remove the northern pike population from the TRPL using a fish pesticide (rotenone) while making efforts to reestablish native fish (stickleback, coho salmon, rainbow trout) to the area. This project would restore angling opportunities for the public and help protect critical wild fish habitat throughout the Kenai Peninsula. Other alternatives were considered to address the northern pike issue in the TRPL area and include:

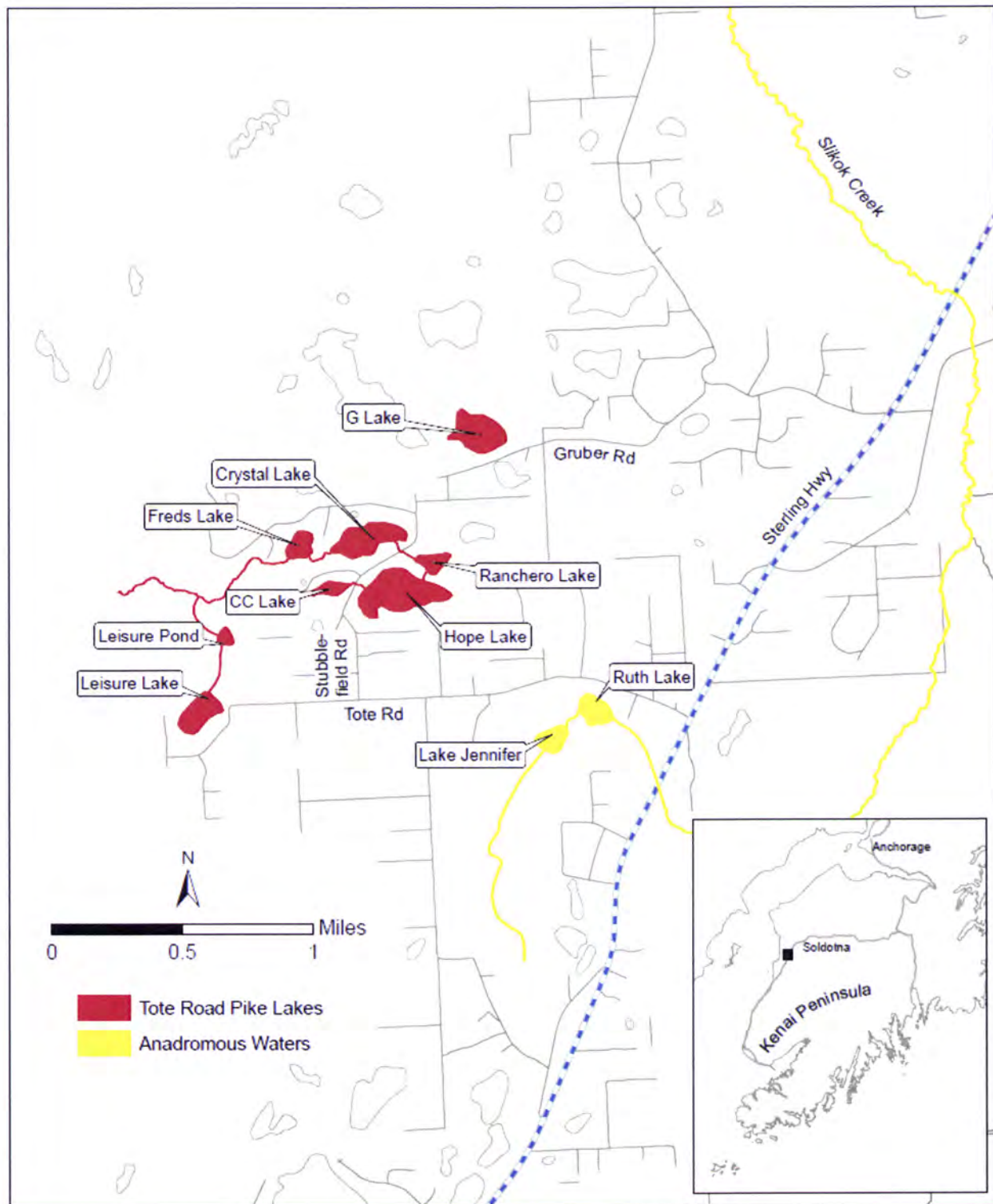
- A) Long-term control gillnetting or other mechanical removal methods
- B) No action

The mechanical removal option was rejected due to ongoing high manpower and funding costs and the low likelihood of success at completely removing the northern pike population. The no action option has an unacceptable risk that these northern pike could be used for illegal introduction elsewhere. See Appendix 1 (Tote Road Restoration Plan) for more details on alternatives considered.

**Supporting document #2: USGS topo map showing the general location of the treatment area.**

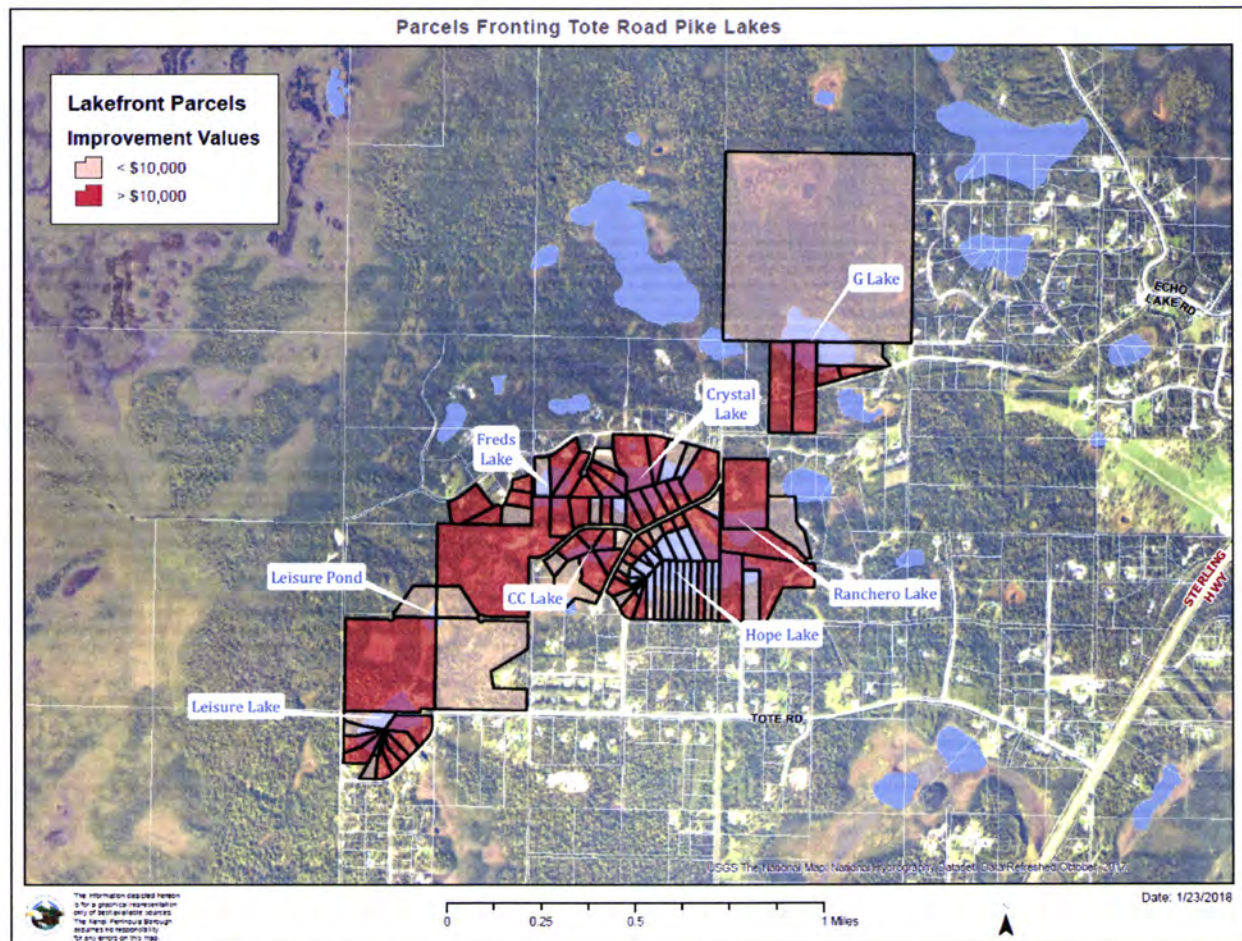


Supporting document #3. Map of the TRPL pesticide treatment area. The treatment area (red highlighting) consists of eight lakes and ponds, associated stream tributaries and wetland edges adjacent to these waterbodies.





**Supporting Document #4. Map of potential parcels with private drinking water wells within 200 feet of the treatment area. Red colored parcels indicate properties that have improvements of >\$10,000 value which may include a private drinking water well. Pink parcels have improvements <\$10,000 value and likely without a drinking water well.**



# CFT Legumine

## Fish Toxicant

SHAKE WELL  
BEFORE  
USING

### RESTRICTED USE PESTICIDE

Due to acute inhalation, acute oral and aquatic 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.

THE APPLICATOR IS RESPONSIBLE FOR CONFORMING TO THE LABEL. IMPORTANT GUIDANCE ON THE SAFE AND EFFECTIVE USE OF THIS PRODUCT IS PROVIDED IN THE *ROTENONE SOP MANUAL*, AVAILABLE FROM THE REGISTRANT OR THE AMERICAN FISHERIES SOCIETY AT [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone)

**FOR CONTROL OF:** Fish in Lakes, Ponds, Reservoirs and Streams

## SPECIMEN LABEL

### ACTIVE INGREDIENTS:

Rotenone ..... 5% w/w  
Cube Resins other than rotenone..... 5%  
OTHER INGREDIENTS\*..... 90%  
TOTAL: ..... 100%

\*Contains Petroleum Distillates

### KEEP OUT OF REACH OF CHILDREN WARNING

See Additional First Aid, Precautionary Statements and  
Directions for Use including Storage and Disposal Instructions

EPA Reg.No. 89459-48

EPA Est. No. (A) 44616-MO-1 (B) 44616-MO-2

### PRECAUTIONARY STATEMENTS – HAZARDS TO HUMANS AND DOMESTIC ANIMALS – WARNING

May be fatal if inhaled. Do not breathe the vapors or spray mists. May be fatal if swallowed. Causes moderate eye irritation. Harmful if absorbed through skin. Do not get in eyes or on skin or clothing.

### FIRST AID

Have product container or label with you when obtaining treatment advice.

<b>If inhaled</b>	<ul style="list-style-type: none"><li>• Move person to fresh air.</li><li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible.</li><li>• Call a poison control center or doctor for further treatment advice.</li></ul>
<b>If swallowed</b>	<ul style="list-style-type: none"><li>• Call a poison control center or doctor immediately for treatment advice.</li><li>• Do not give any liquid to the person.</li><li>• Do not induce vomiting unless told to do so by the poison control center or doctor.</li><li>• Do not give anything by mouth to an unconscious person.</li></ul>

<b>If in eyes</b>	<ul style="list-style-type: none"><li>• Hold eye open and rinse slowly and gently with water for 15-20 minutes.</li><li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li><li>• Call a poison control center or doctor for treatment advice.</li></ul>
<b>If on skin or clothing</b>	<ul style="list-style-type: none"><li>• Take off contaminated clothing.</li><li>• Rinse skin immediately with plenty of water for 15-20 minutes.</li><li>• Call a poison control center or doctor for treatment advice.</li></ul>
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may contact 1-800-248-7763 for emergency medical treatment information. You may also contact the National Pesticide Telecommunication Network at 1-800-858-7378 for information including health concerns, medical emergencies or pesticide incidents.	
<b>NOTE TO PHYSICIAN:</b> Contains petroleum distillate. Vomiting may cause aspiration pneumonia. Symptoms of exposure include numbness, lethargy and incoordination. Decontamination, symptomatic and supportive treatment is recommended.	

### Personal Protective Equipment (PPE)

Some materials that are chemical resistant to this product are Barrier Laminate, Nitrile Rubber, Neoprene Rubber or Viton. If you want more options, follow the instructions for Category E on EPA chemical-resistance category selection chart.

All mixers, loaders, applicators, and other handlers (except pilots) must wear at a minimum, the following PPE: (1) coveralls, over long-sleeved shirt and long pants; (2) chemical-resistant gloves; (3) chemical-resistant footwear plus socks; (4) protective eyewear; and (5) a dust/mist respirator.

In addition, mixers, loaders, and others exposed to the concentrate, through cleaning equipment or spills must wear a chemical-resistant apron.

Exception: waterproof waders may be worn in place of coveralls, chemical-resistant apron and chemical-resistant footwear.

See Engineering Controls for additional requirements and exceptions.

### User Safety Requirements

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate; do not reuse them. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

### Engineering Controls for Mixing/Loading/Applying Liquid Formulations Packaged in Containers > 5 Gallons

Mixers/loaders/applicators must either:

- (1) Use a closed system that meets the requirements listed in Worker Protection Standard (WPS) for dermal protection of agricultural pesticides [40 CFR 170.240(d)(4)], or
- (2) Use the Semi-Closed Probe Mixing/Loading/Applicator System described below.

Remove plug from bung of drum containing this product only when drum is sitting on the ground or on a secure level platform, with the drum pointed up. Do not pour this product from its drum.

Transfer product from the drum of the mixing tank by use of a suction hose connected to one end of the suction pump on the mixing tank and connected at the other end to a probe/dip tube. Remove the plug from the bung of the drum and insert the probe/dip tube into the bung of the drum until the foam ring/gasket fits snugly around the bung opening to minimize leakage of liquid rotenone. The probe/dip tube should be specifically sized to insure a snug fit into the bung which incorporates an anti-drip flange to remove excess liquid rotenone when the probe/dip tube is removed. In addition, the foam ring/gasket on the probe/dip tube insures a snug fit to minimize leakage of liquid rotenone. Do not handle the probe/dip tube in a manner that allows dripping or splattering of the product onto yourself or any other person. Do not touch the portion of the probe/dip tube that has been in contact with this product until the probe has been triple rinsed with water. See Rotenone SOP Manual (SOP 8) for further information on the operation of the Semi-Closed Probe system.

If the entire product is removed from the drum, then triple rinse the probe while it remains inside of the drum if possible. If not, remove the aspirator probe and triple rinse it and all parts of the aspirator in site water. If an unrinsed probe must be removed from the drum, triple rinse it and all parts of the aspirator in treated site water. The anti-drip flange must be designed to remove excess rotenone product from the probe as it is extracted from the drum. Take the following steps if the probe must

be disconnected from the suction hose before both the probe and the hose have been triple rinsed: (1) equip the probe end of the hose with a shutoff valve; (2) install a dry-brake coupling between the valve and the probe, and then close the shut off valve before disconnecting the probe. See Rotenone SOP Manual (SOP 8) for further information on unrinsed probes.

Mixers/loaders/applicators using all systems must wear PPE as required in the PPE section of this labeling for mixers/loaders. All systems must be capable of removing the pesticide from the shipping container and transferring it into mixing tanks and/or application equipment. At any disconnect point, the system must be equipped with a dry disconnect or dry-couple shutoff device to minimize drips.

### Transferring (Mixing/Loading) Liquid Formulations

Mixers and loaders must transfer product from original to mixing tank or secondary container using a measuring device, inside a plastic-lined bermed area or other secondary confinement area capable of recovering spilled product. Wash plastic liner or other secondary confinement area and dispose of into treated site water. Do not handle this product in a manner that drips or splatters the product onto yourself or any other person. See Rotenone SOP Manual (SOP 10) for further guidance.

**Product Containers ≤ 5 Gallons** – Transfer product from original container into measuring device, within secondary confinement area, by pouring or using pump or pipette-type device. See Rotenone SOP Manual (SOP 10) for further guidance.

**Product Containers > 5 Gallons** – Do not pour rotenone concentrate from containers > 5 gallons. Transfer product from original container into measuring device, within secondary confinement area, using hand or electric drum pump. See Rotenone SOP Manual (SOP 10) for further guidance.

### Engineering Controls for Applying Liquid Formulations

Applications using a boom or other mechanized equipment must release this product below the water surface. Applications made with aircraft, backpack sprayer, drip can, or handheld or hand-directed nozzle may release this product above the water surface.

### Engineering Controls for Aerial Applications

Open cockpits are prohibited. Pilots must use a cockpit that has a nonporous barrier that totally surrounds the cockpit occupants and prevents contact with pesticides outside the enclosed area. Pilots in enclosed cockpits may wear a long-sleeved shirt, long pants, shoes, and socks instead of the PPE required for applicators in the PPE section of this labeling.

### Engineering Controls for Boat Applications

When boat pilots or others on the application boat are located within an enclosed area that has a nonporous barrier that totally surrounds the occupants and prevents contact with pesticides outside the enclosed area; they: (1) may wear long-sleeved shirt, long pants, shoes, and socks, instead of the PPE required for applicators in the PPE section of this labeling; (2) must be provided and have immediately available in the use of an emergency when they must exit the enclosed area while the application is taking place, the PPE required for applicators of the PPE section of this labeling; (3) must take off any PPE that is worn while outside the enclosed area before reentering the enclosed area; and (4) store all used PPE in a chemical-resistant container, such as a plastic bag, to prevent contamination of the enclosed area.

#### **User Safety Recommendations**

Certified Applicators applying or supervising any aspect of the application of this product should attend a training program for the Rotenone SOP Manual. The American Fisheries Society offers this training: go to [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone) for current schedule of training.

Users should remove clothing/PPE if pesticide gets inside. Then wash thoroughly and put on clean clothing. Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

#### **ENVIRONMENTAL HAZARDS**

This product is extremely toxic to fish and other aquatic organisms. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency and other agencies before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate water outside of the treatment area by cleaning of equipment or disposal of equipment washwaters. Do not contaminate water outside of the treatment area, food or feed by storage or disposal. Do not discharge effluent containing this pesticide into sewage systems without notifying the sewage treatment plant authority (PTOW).

#### **PHYSICAL AND CHEMICAL HAZARDS**

**Flammable.** Keep away from heat and open flame.

#### **DIRECTIONS FOR USE**

##### **RESTRICTED USE PESTICIDE**

IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING, INCLUDING BOTH THE CONTAINER LABEL AND THE ROTENONE STANDARD OPERATION PROCEDURES MANUAL (SOP) available from the registrant or the American Fisheries Society at [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone). THIS PRODUCT MUST BE ACCOMPANIED BY AN EPA-APPROVED ROTENONE SOP MANUAL. READ THE CONTAINER LABEL AND ROTENONE SOP MANUAL PRIOR TO USE. THE APPLICATOR IS RESPONSIBLE FOR FOLLOWING THE DIRECTIONS FOR USE CONTAINED WITHIN BOTH THE CONTAINER LABEL AND THE SOP MANUAL.

This product is registered for use by or under permit from, and after consultation with State and Federal Fish and Wildlife and/or Natural Resource Agencies.

#### **GENERAL INFORMATION**

This product is a specially formulated product containing rotenone to be used in fisheries management for the eradication of fish from lakes, ponds, reservoirs, rivers and streams. 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 ½ mile upstream of an irrigation water intake in a standing body of water such as a lake, pond, or reservoir.

**General Application Precautions and Restrictions:** The Certified Applicator supervising the treatment must remain on site for the duration of the application. Do not allow recreational access (e.g., wading, swimming, boating, and fishing) within the treatment area while rotenone is being applied (see Placarding of Treatment Areas). In streams/rivers/lakes/reservoirs/ponds, do not apply this product in a way that will result in active rotenone concentrations > 200 parts per billion/0.2 ppm (> 4.0 ppm 5% rotenone formulation). Do not apply this product in a way that will contact workers or other persons, either

directly or through drift. Only protected handlers may be in the area during application (see Placarding Treatment Areas and Re-entering of Treatment Area). This product must not be applied to estuarine or marine environments. Where practical, users should collect and bury dead fish.

Applications using a boom or other mechanized equipment must release this product below the water surface. Applications made with aircraft, backpack sprayer, drip can, or hand-held or hand-directed nozzle may release this product above the water surface.

Mixers/loaders of liquid rotenone product containers of 5 gallons or less should not handle more than 25 gallons of undiluted product per day.

**Re-entering the Treatment Area:** For applications that result in concentrations greater than 0.09 ppm active rotenone (when applying at a rate of > 1.8 ppm of 5% rotenone formulation), handlers reentering treated water, must wear, at a minimum, the following PPE: (1) coveralls over long-sleeved shirt and long pants; (2) chemical-resistant gloves; (3) chemical-resistant footwear plus socks; and (4) Chemical-resistant apron. Duration of PPE requirements for handlers re-entering treated water exactly corresponds to duration of placarding requirements (e.g., PPE requirements end when placards are removed; see Placarding of Treatment Areas section of this labeling). Exception: waterproof waders may be worn in place of coveralls, chemical-resistant apron and chemical-resistant footwear.

**Placarding of Treatment Areas:** The Certified Applicator in charge of the application (or someone under his/her supervision) must placard all access areas to the treatment area. Detailed instructions for placarding are presented in the Rotenone SOP Manual. Placards must be placed every 250 feet along the shoreline of the treated area OR, at public access points (e.g., trailheads, roads and trails). Placards must contain the following information: (1) DANGER/PELIGRO; (2) DO NOT ENTER WATER/NO ENTRE AGUA; Pesticide Application; (3) CTF Legumine Fish Toxicant; (4) the purpose of the application; (5) the start date and time of application; (6) end date and time of application; (7) "Recreational access (e.g., wading, swimming, boating, fishing, etc.) within the treatment area is prohibited while rotenone is being applied"; (8) "Do not swim or wade in treated water while placard is displayed"; (9) "Do not consume dead fish from treated water"; and (10) the name, address, and telephone number of the responsible agency or entity performing the application.

Signs must remain legible during the entire posting period. For lotic (flowing water) and lentic (standing water) applications of ≤ 0.09 ppm active rotenone (≤ 1.8 ppm 5% formulation), signs can be removed once application is complete. For lotic applications > 0.09 ppm active rotenone (> 1.8 ppm 5% rotenone formulation), signs can be removed 72 hours after application is complete. For lentic applications > 0.09 ppm active rotenone (> 1.8 ppm 5% rotenone formulation), signs can be removed following 24-hour bioassay demonstrating survival of bioassay sentinel fish or 14 days, whichever is less.

**Monitoring and Notification Requirements for Water Aquaculture:** For treated water bodies used for aquaculture, the Certified Applicator or designee under his/her direct supervision must prohibit the restocking of fish unless monitoring samples confirm rotenone concentrations are below the level of detection for 3 consecutive samples taken no less than 4 hours apart. Detailed guidance for monitoring levels of rotenone in water is presented in the Rotenone SOP Manual (SOP 16).

**Drinking Water:** For applications > 40 ppb or 0.04 ppm active rotenone (> 0.8 ppm 5 % rotenone formulation) in waters with drinking water intakes or hydrologic connections to wells, 7 to 14 days prior to



application, the Certified Applicator or designee under his/her direct supervision must provide notification to the party responsible for the public water supply or individual private water users against the consumption of treated water until: (1) active rotenone < 0.04 ppm as determined by analytical chemistry, or (2) fish of the *Salmonidae* or *Centrichidae* families can survive for 24 hours, or (3) dilution with untreated water yields a calculation that active rotenone is < 0.04 ppm, or (4) distance or travel time from the application sites demonstrates that active rotenone is < 0.04 ppm. See Rotenone SOP Manual (SOP 16) for guidance on notification and bioassay and chemical analysis techniques and dilution, distance, and travel time criteria.

#### Specifications to Control Spray Drift

**RELEASE HEIGHT:** Spray must be released at the lowest height consistent with pest control and flight safety.

**BOOM LENGTH:** The boom length must not exceed 75% of the wing span or 90% of the rotor blade diameter. Orient nozzles backward with minimal downward angle into slip stream.

**SWATH ADJUSTMENT:** When applications are made with cross wind, the swath will be displaced downwind. The applicator must compensate for this displacement at the downwind edge of the application area by adjusting the path of the aircraft upwind. Leave at least one swath unsprayed at the downwind edge of the treated area.

**DROPLET SIZE:** Use low drift nozzles designed to produce larger spray droplets with fewer driftable fines. Apply as a medium or coarser spray (ASAE standard 572).

**WIND SPEED:** Do not apply when wind speeds are >12 miles per hour.

### DETERMINING TREATMENT RATE

Use this product only at locations, rates, and times authorized and approved by appropriate State and Federal Fish and Wildlife and/or Natural Resource Agencies. The actual treatment rate and rotenone concentration needed to control fish varies widely, depending on the type of water environmental factors including pH, temperature, depth, turbidity, and the target species. The tables below are a general guide for the proper rates and concentrations for complete kills of target species. The Certified Applicator must conduct bioassays using site water (or water of similar quality) and target species (or surrogate species of similar sensitivity) to refine the treatment rate with the maximum limit allowed. Detailed guidance bioassays and designing treatment for complete kills of target species are presented in the Rotenone SOP Manual (SOP 5). Rates must be within the range specified on the label.

### FOR USE IN PONDS, LAKES, AND RESERVOIRS

The tables in this booklet are a general guide for the proper rates and concentrations. This product disperses readily, laterally and vertically. For complete coverage, it is best to apply this material to water bodies that are not thermally-stratified. However, this material will eventually penetrate below the thermocline in thermally-stratified bodies of water.

**Computation of Water Body Volume:** To determine volume of any given body of water, make a series of transects across the body of water taking depths at regular intervals. Add the depths and divide by the number of measurements made to determine the average depth. Multiply this average depth by total surface area in order to determine the volume to be treated. Volume is expressed as acre-feet (AF) or cubic meters (m<sup>3</sup>). Surface area can be determined by Global Positioning System (GPS) instrumentation and topographic maps. See Rotenone SOP Manual for further guidance.

**Amount of CFT Legumine Fish Toxicant Needed for Specific Uses:** To determine the approximate number of gallons (or liters) needed, find your "Type of Use" in the first column of the tables below and then divide the corresponding numbers in the fourth column, "AF (or m<sup>3</sup>)

per Gallon (or Liter) Liquid" into the number of AF or m<sup>3</sup> in your body of water. For example, a normal use of 0.05 ppm active rotenone will require 33 gallons of 5% active rotenone liquid for 100 AF.

**Table – Recommended rotenone treatment concentrations and number of acre-feet (AF) standing water covered by one gallon (5% A.I.) product.** Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		AF Per Gallon Liquid
	Product (5% A.I.)	Active Rotenone	
Normal	0.5 – 1.0	0.025 – 0.05	6.0 to 3.0
Tolerant Species	1.0 – 3.0	0.05 – 0.15	3.0 to 1.0
Tolerant Species in Organic Ponds	2.0 – 4.0	0.10 – 0.20	1.5 to 0.75

**Table – Recommended rotenone treatment concentrations and number of cubic meters (m<sup>3</sup>) standing water covered by one liter of (5% A.I.) product.** Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		m <sup>3</sup> per Liter Liquid
	Product (5% A.I.)	Active Rotenone	
Normal	0.5 – 1.0	0.025 – 0.05	2000 to 1000
Tolerant Species	1.0 – 3.0	0.05 – 0.15	1000 to 333
Tolerant Species in Organic Ponds	2.0 – 4.0	0.10 – 0.20	500 to 250

**Recommended Pre-Mixing and Method of Application:** Pre-mix with water at a rate of 10% of product to site water. Uniformly apply over water surface or through underwater lines. Divide water body into manageable sections, delineated by marker buoys or flags or GPS coordinates, and treat within 48 hours to avoid deactivation. See Rotenone SOP Manual (SOP 8) for additional guidance.

**Deactivation:** Water treated with this product will deactivate (neutralize) under natural conditions within one week to one month depending upon temperatures, alkalinity, etc. Rapid deactivation can be accomplished by adding potassium permanganate to the water at the same rate as CFT Legumine Fish Toxicant in parts per million, plus enough additional to meet the organic demand of the untreated water. See Rotenone SOP Manual (SOP 6 and 7) for guidance.

**Restocking after Treatment:** Typically, wait 2 to 4 weeks after treatment prior to restocking. 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 AND RIVERS

In order to treat a stream you must: (1) Select the concentration of active rotenone; (2) Compute the flow rate of the stream; (3) Select an exposure time; (4) Select dilution of product and calculation of application rate; (5) Estimate the amount of product needed; and (6) Follow the method of application. For practicality, flows > 25 ft<sup>3</sup>/s (> 0.708 m<sup>3</sup>/s) should have undiluted product applied, and flows < 25 ft<sup>3</sup>/s (< 0.708 m<sup>3</sup>/s) should have diluted product applied. For streams associated with a treatment of a standing body of water, to prevent movement of fish from the pond, lake, or reservoir, the stream treatment should begin before and continue throughout treatment of the pond, lake or reservoir until mixing has occurred.

#### Concentration of Active Rotenone

Select the concentration of active rotenone based on the type of use from those listed on the tables on the next page. Example: If you select "normal use", you could select a concentration of 0.025–0.05 parts per million.

**Table** – Recommended rotenone treatment concentrations and number of cubic feet per second (ft<sup>3</sup>/s) flowing water treated for 4- and 8-hour periods with one gallon of (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		ft <sup>3</sup> /s per Gallon (4-hr)	ft <sup>3</sup> /s per Gallon (8-hr)
	Product (5% A.I.)	Active Rotenone		
Normal	0.5 – 1.0	0.025 – 0.05	18.4 to 9.2	9.2 to 4.6
Tolerant Species	1.0 – 3.0	0.05 – 0.15	9.2 to 3.1	4.6 to 1.6
Tolerant Species in Organic Waters	2.0 – 4.0	0.10 – 0.20	4.6 to 2.3	2.3 to 1.2

**Table** – Recommended rotenone treatment concentrations and number of cubic meters per second (m<sup>3</sup>/s) flowing water treated for 4- and 8-hour periods with one liter of (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on Label.

Type of Use	Parts per Million (ppm)		m <sup>3</sup> /s per Liter (4-hr)	m <sup>3</sup> /s per Liter (8-hr)
	Product (5% A.I.)	Active Rotenone		
Normal	0.5 – 1.0	0.025 – 0.05	0.138 to 0.069	0.069 to 0.034
Tolerant Species	1.0 – 3.0	0.05 – 0.15	0.069 to 0.024	0.034 to 0.013
Tolerant Species in Organic Waters	2.0 – 4.0	0.10 – 0.20	0.034 to 0.018	0.018 to 0.008

#### Measurement of Flow Rate for Stream

Select a cross section of the stream where the banks and bottom are relatively smooth and free of obstacles and the flow appears laminar. Best discharge measurements are achieved with an electronic flow meter and use of the United States Geological Survey *Weighted Area Method*. Alternatively, divide the stream surface width into 3 equal sections and determine the water depth and surface velocity at the center of each section. Determine the velocity by dropping a float and measure the time required to move 10 feet or more. 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 (ft<sup>3</sup>/s or m<sup>3</sup>/s), Ws = surface width (ft or m), D = mean depth (ft or m), L = mean distance traveled by float (ft or m), C = Constant (0.8 for rough bottoms and 0.9 for smooth bottoms), T = mean time (s) for float to travel distance.

#### Exposure Time and Spacing

Apply rotenone as a drip for 4 to 8 hours to the flowing portion of the stream. Multiple application sites are used along the length of the treated stream, spaced approximately ½ to 2 miles apart depending on the water flow travel time between sites. Multiple sites are used because rotenone is diluted and detoxified with distance. Application sites are spaced at no more than 2 hours or at no less than 1-hour travel time intervals. This assures that the treated stream remains lethal to fish for a minimum of 2 hours. A non-toxic dye such as Rhodamine-WT or fluorescein can be used to determine travel times. Cages containing live fish placed immediately upstream of the downstream application sites can be used as sentinels to assure that lethal conditions exist between sites.

#### Amount of Product and Calculation of Application Rate of Undiluted Product:

$$X = F1 (1.699 B) \text{ or } X = F2 (59.99 B)$$

X = ml per minute of undiluted CFT Legumine Fish Toxicant applied to the stream, F1 = the flow rate (ft<sup>3</sup>/s) and F2 the flow rate (m<sup>3</sup>/s) (see Measurement of Flow Rate for Stream on this labeling), B = parts per million desired concentration of CFT Legumine Fish Toxicant. Total amount of product needed:

$$Y = X(60)H$$

Y = total ml of undiluted CFT Legumine Fish Toxicant required for treatment, X = ml per minute of undiluted product, and H = duration (hours) of treatment.

#### Amount of Product in Drip Can and Flow Rate of Diluted Product:

$$Y = B(102 F1)H \text{ or } Y = B(3, 602 F2)H$$

Y = ml of undiluted product in the reservoir, B = parts per million desired concentration of CFT Legumine Fish Toxicant, F1 = the flow rate (ft<sup>3</sup>/s) and F2= flow rate (m<sup>3</sup>/s) (see Measurement of Flow Rate for Stream in this labeling), and H = duration (hours) of treatment.

Discharge of the diluted product:

$$X = Z/60/H$$

X = ml per minute of diluted CFT Legumine Fish Toxicant applied to the stream from drip can, Z = volume (ml) of drip can, and H = duration (hours) of treatment.

#### Method of Application

The unique nature of every application site could require minor adjustments to the method and rate of application. Should these unique conditions require major deviation from the use directions, a Special Local Need 24(c) registration should be obtained from the state. Before application, authorization must be obtained from state or federal Fish and Wildlife and/or Natural Resource agencies. Since local environmental conditions will vary, consult with the state Fish and Wildlife and/or Natural Resource agency to ensure the method and rate of application are appropriate for that site.

Contact the local water department to determine if any water intakes are within one mile downstream of the section of stream, river, or canal to be treated. If so, coordinate the application with the water department to make sure the intakes are closed during treatment and detoxification.

CFT Legumine Fish Toxicant can drain directly into the center of the stream. Flow should be checked at least hourly. Backwater, stagnant, and spring areas of streams should be sprayed by hand with a 1 to 2 % v/v solution of 5% rotenone product to assure complete coverage. Streams should be treated for 4 to 8 hours in order to clear the treated section of stream of fish. See Rotenone SOP Manual for detailed guidance on application equipment, methods, and strategies.

#### DEACTIVATION

Flow in a stream and outflow from a treated lake beyond the treatment area must be deactivated with potassium permanganate to minimize exposure beyond the treatment area unless unnecessary. (See Rotenone SOP Manual [SOP 6] for the definition of treatment area, examples when deactivation with potassium permanganate is unnecessary and detailed guidance for deactivating with potassium permanganate [SOP 7].)

Within 1 to 2 hours travel time from the furthest downstream rotenone application site, the rotenone can be deactivated with a potassium permanganate solution or granules at a resultant stream concentration of 2 to 4 parts per million, depending on rotenone concentration and organic demand of the water. A 2.5% (10 pounds potassium

permanganate to 50 gallons of water) permanganate solution is dripped in at a continuous rate using the equation:

$$X = Y(70 F1) \text{ or } X = Y(2,472 F2)$$

X = ml of 2.5% permanganate solution per minute, Y = ppm of desired permanganate concentration, F1 = stream flow (ft<sup>3</sup>/s) or F2 = stream flow (m<sup>3</sup>/s) or, granular potassium permanganate is applied at a continuous rate using the equations:

$$Z = Y(1.7 F1) \text{ or } Z = Y(60.02 F2)$$

Z = grams of granular potassium permanganate per minute, Y = ppm of desired permanganate concentration, F1 = stream flow (ft<sup>3</sup>/s) or F2 = stream flow (m<sup>3</sup>/s).

Flow of permanganate should be checked at least hourly. Live fish in cages placed immediately above the permanganate application site will show signs of stress signaling the need for beginning deactivation. Deactivation can be terminated when replenished fish survive and show no signs of stress for at least four hours.

Deactivation of rotenone by permanganate requires between 15 to 30 minutes contact time (travel time). Cages containing live fish can be placed at these downstream intervals to judge the effectiveness of deactivation. At water temperatures less than 50°F, deactivation may be retarded, requiring a longer contact time.

### STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

**PESTICIDE STORAGE:** Store only in original containers, in a dry place inaccessible to children and pets. This product 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 HANDLING:** Nonrefillable container. Do not reuse or refill this container. Clean container promptly after emptying.

*(For Containers equal to or less than 5 Gallons:)* Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Offer for recycling, if available or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

*(For Containers greater than 5 Gallons:)* Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

### 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. To the extent consistent with applicable law, the buyer must assume all responsibility, including injury or damage, resulting from its misuse as such, or in combination with other materials.

Circled letter in front of the EPA Est No. corresponds to the first letter in lot number on bottom of container.

**Central Garden & Pet Company**, 1501 East Woodfield Road, 200W, Schaumburg, Illinois 60173

**NOTE:** This specimen label is for informational purposes only. All uses may not be approved in all states. See product labeling for use directions.

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VEC 15-036

December, 2015  
Schaumburg, IL

## Supporting document # 6. MSDS for CFT Legumine.

Prentox CFT Legumine Fish Toxicant

### Safety Data Sheet



#### Section 1: Identification

##### Product Identifier

- Product Name** • Prentox CFT Legumine Fish Toxicant  
**Synonyms** • 100209000; 100209001; EPA Reg. No.: 89459-48  
**Product Description** • Orange viscous liquid.

##### Relevant identified uses of the substance or mixture and uses advised against

- Recommended use** • Piscicide.  
**Restrictions on use** •

KEEP OUT OF THE REACH OF CHILDREN. Avoid contact with eyes, skin and clothing. Do not use or store near heat or open flame. Avoid release to the environment. Use in well ventilated area. Avoid inhalation of vapors or fumes. For use by certified applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

##### Details of the supplier of the safety data sheet

- Manufacturer** • Central Garden & Pet Company  
1501 E. Woodfield Road, Suite 200W  
Schaumburg, IL 60173  
United States  
[www.central.com](http://www.central.com)

##### Emergency telephone number

- Manufacturer (Transportation)** • 1-800-424-9300 - CHEMTREC  
**Manufacturer (Transportation)** • 1-703-527-3887 - Chemtrec - Outside US collect calls accepted  
**Manufacturer** • 1-800-248-7763

#### Section 2: Hazard Identification

##### United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

##### Classification of the substance or mixture

- OSHA HCS 2012** • Eye Irritation 2A  
Flammable Liquids 4  
Skin Irritation 2  
Acute Toxicity Oral 4  
Acute Toxicity Inhalation 2  
Reproductive Toxicity 1B  
Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects

##### Label elements

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OSHA HCS 2012

OSHA HCS 2012

**DANGER**



**Hazard statements** • Causes serious eye irritation  
Causes skin irritation  
Combustible liquid  
Fatal if inhaled  
Harmful if swallowed  
May damage fertility or the unborn child.  
May cause drowsiness or dizziness

**Precautionary statements**

- Prevention** • Wash thoroughly after handling.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.  
Do not eat, drink or smoke when using this product.  
Use only outdoors or in a well-ventilated area.  
Do not breathe dust, fume, gas, mist, vapours and/or spray.  
In case of inadequate ventilation wear respiratory protection.  
Keep away from flames and hot surfaces. - No smoking.  
Wear respiratory protection.
- Response** • IF ON SKIN: Wash with plenty of soap and water.  
Specific treatment, see supplemental first aid information.  
If skin irritation occurs: Get medical advice/attention.  
Take off contaminated clothing and wash before reuse.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.  
Do NOT induce vomiting.  
If eye irritation persists: Get medical advice/attention.  
In case of fire: Use appropriate media Water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>), for extinction.  
Immediately call a POISON CENTER or doctor/physician.  
If exposed or concerned: Get medical advice/attention.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison control center or doctor if you feel unwell.
- Storage/Disposal** • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.  
Store in a well-ventilated place. Keep cool.  
Store locked up.  
Keep container tightly closed.

**Other hazards**

OSHA HCS 2012

• This product is extremely toxic to fish. Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

**Section 3 - Composition/Information on Ingredients**

**Substances**

- Material does not meet the criteria of a substance.

## Mixtures

Composition		
Chemical Name	Identifiers	%
Rotenone	CAS:83-79-4	5%
Cubé Resins other than Rotenone	NDA	5%
2-Pyrrolidinone, 1-methyl-	CAS:872-50-4	10%
Diethylene glycol monoethyl ether	CAS:111-90-0	56.7%
Other ingredients	NDA	Balance

## Section 4: First-Aid Measures

### Description of first aid measures

#### Inhalation

- IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CONTROL center or doctor.

#### Skin

- IF ON SKIN: Wash with plenty of soap and water. If irritation or rash occurs, get medical advice/attention. Take off contaminated clothing and wash before reuse.

#### Eye

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

#### Ingestion

- IF SWALLOWED: Immediately call a poison control center or doctor. Aspiration hazard - if swallowed, do NOT induce vomiting.

### Most important symptoms and effects, both acute and delayed

- Harmful if swallowed, fatal if inhaled, causes dizziness or drowsiness if inhaled at non-lethal doses, causes serious eye irritation, causes skin irritation, may damage fertility or the unborn child. Refer to Section 11 - Toxicological Information.

### Indication of any immediate medical attention and special treatment needed

#### Notes to Physician

- Treat symptomatically and supportively.

## Section 5: Fire-Fighting Measures

### Extinguishing media

#### Suitable Extinguishing Media

- Use water spray, alcohol-resistant foam, carbon dioxide, or dry chemical.

#### Unsuitable Extinguishing Media

- Avoid heavy hose streams.

#### Firefighting Procedures

- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.  
Do not allow fire fighting water to escape into waterways or sewers.  
LARGE FIRES: Dike fire control water for later disposal; do not scatter the material.  
LARGE FIRES: Move containers from fire area if you can do it without risk.

Stay upwind.  
Ventilate closed spaces before entering.  
Do not breathe gas/fumes/vapor/spray.  
Keep unauthorized personnel away.

### Special hazards arising from the substance or mixture

- Unusual Fire and Explosion Hazards
  - Combustible liquid.
  - Containers may explode when heated.
- Hazardous Combustion Products
  - Carbon monoxide and carbon dioxide.

### Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA).

## Section 6 - Accidental Release Measures

### Personal precautions, protective equipment and emergency procedures

#### Personal Precautions

- Do not walk through spilled material. Ventilate enclosed areas. Wear appropriate personal protective equipment, avoid direct contact. Avoid breathing fumes. Keep all sources of ignition away.

#### Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Ventilate closed spaces before entering. Avoid release into the environment. Keep out of low areas. Keep unauthorized personnel away. Stay upwind. Take precautionary measures against static discharge. Turn off electric power to area.

### Environmental precautions

- LARGE SPILLS: Prevent entry into waterways, sewers, basements or confined areas.

### Methods and material for containment and cleaning up

#### Containment/Clean-up Measures

- Absorb spills with an inert material, clay granules or other inert absorbent material and put in container for disposal.
- LARGE SPILLS: Dike far ahead of spill for later disposal.
- Stop leak if you can do it without risk.
- SMALL SPILLS: Take up with sand or other non-combustible absorbent material and place into containers for later disposal.
- Wear appropriate personal protective equipment, avoid direct contact.

## Section 7 - Handling and Storage

### Precautions for safe handling

#### Handling

- Keep away from fire - No Smoking. Avoid breathing fumes. Use only in well ventilated areas. Wear appropriate personal protective equipment, avoid direct contact. Avoid contact with skin or eyes.

### Conditions for safe storage, including any incompatibilities

#### Storage

- Store locked up. Store in a cool/low-temperature, well-ventilated dry place away from heat and ignition sources. Keep from freezing. Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F. Do not store at temperatures below 4.4°C/40°F. Keep container tightly closed. Store only in original container.

#### Incompatible Materials or Ignition Sources

- Heat, sparks, open flame. Strong acids, oxidizing agents and toxic materials.

## Other Information

- See product label for additional information.

## Section 8 - Exposure Controls/Personal Protection

### Control parameters

Exposure Limits/Guidelines • No data available.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Rotenone (83-79-4)	TWAs	5 mg/m <sup>3</sup> TWA (commercial)	5 mg/m <sup>3</sup> TWA	5 mg/m <sup>3</sup> TWA

### Exposure Limits Supplemental

#### ACGIH

• Rotenone (83-79-4): TLV Basis - Critical Effects: (CNS impairment, eye and upper respiratory tract irritation)

### Exposure controls

#### Engineering

#### Measures/Controls

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values.

### Personal Protective Equipment

#### Pictograms



#### Respiratory

- Wear a dust/mist (or particulate) respirator.

#### Eye/Face

- Wear chemical splash safety goggles.

#### Hands

- Impervious gloves. Some materials that are chemical resistant to this product are Barrier Laminate, Nitrile Rubber, Neoprene Rubber or Viton.

#### Skin/Body

- Coveralls, over long-sleeved shirt and long pants will be needed. Mixers, loaders, and others exposed to the concentrate, through cleaning equipment or spills must wear a chemical-resistant apron.

### Environmental Exposure Controls

- Refer to Section 13 - Disposal Considerations.

## Other Information

- See product label for specific use PPE instructions.

## Section 9 - Physical and Chemical Properties

### Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Orange viscous liquid.
Color	Orange	Odor	Solvent
Odor Threshold	No data available		
General Properties			

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Boiling Point	No data available	Melting Point/Freezing Point	No data available
Decomposition Temperature	No data available	pH	4.5 (1% aqueous solution)
Specific Gravity/Relative Density	= 1.09 Water=1	Density	No data available
Water Solubility	No data available	Viscosity	No data available
Critical Temperature	No data available		
<b>Volatility</b>			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
<b>Flammability</b>			
Flash Point	192 °F(88.8889 °C)	UEL	No data available
LEL	No data available	Autoignition	No data available
Flammability (solid, gas)	No data available		
<b>Environmental</b>			
Octanol/Water Partition coefficient	No data available		

## Section 10: Stability and Reactivity

### Reactivity

- Non-reactive under normal handling and storage conditions.

### Chemical stability

- Stable under normal temperatures and pressures.

### Possibility of hazardous reactions

- Hazardous polymerization will not occur.

### Conditions to avoid

- Excessive heat >110°F. Heat, sparks, open flame, other ignition sources, and oxidizing conditions. Keep away from fire. Do not allow product to freeze.

### Incompatible materials

- Strong oxidizing agents and strong acids.

### Hazardous decomposition products

- Thermal decomposition may produce oxides of carbon.

## Section 11 - Toxicological Information

### Information on toxicological effects

Components		
Rotenone (5%)	83-79-4	Acute Toxicity: Ingestion/Oral-Rat, adult female LD50 • 39.5 mg/kg; Ingestion/Oral-Rat, adult male LD50 • 102 mg/kg; Inhalation-Rat LC50 • 0.0212 mg/L 4 Hour(s); Skin-Rabbit LD50 • >5000 mg/kg; Irritation: Eye-Rabbit • Essentially non-irritating; Skin-Rabbit • Essentially non-irritating

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation 2; Acute Toxicity - Oral 4
Skin corrosion/Irritation	OSHA HCS 2012 • Skin Irritation 2

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Serious eye damage/Irritation	OSHA HCS 2012 • Eye Irritation 2A
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met - Not classified - data lacking
Toxicity for Reproduction	OSHA HCS 2012 • Toxic to Reproduction 1B
STOT-SE	OSHA HCS 2012 • Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects
STOT-RE	OSHA HCS 2012 • Classification criteria not met

## Potential Health Effects

### Inhalation

#### Acute (Immediate)

- Fatal if inhaled. May affect the central nervous system. Symptoms may include dizziness or drowsiness. May cause respiratory irritation.

#### Chronic (Delayed)

- No data available

### Skin

#### Acute (Immediate)

- Causes skin irritation.

#### Chronic (Delayed)

- No data available

### Eye

#### Acute (Immediate)

- Causes serious eye irritation.

#### Chronic (Delayed)

- No data available

### Ingestion

#### Acute (Immediate)

- Harmful if swallowed.

#### Chronic (Delayed)

- No data available

### Mutagenic Effects

- Rotenone is not mutagenic.

### Carcinogenic Effects

- No component in this product present at 0.1% or greater is listed by IARC, OSHA or NTP.

### Reproductive Effects

- Rotenone has been tested and does not cause birth defects. Rotenone does not have adverse effects on reproduction. 2-Pyrrolidinone, 1-methyl- caused adverse effects on sexual function and fertility and/or development based on animal experiments.

## Section 12 - Ecological Information

### Toxicity

Components		
Rotenone (5%)	83-79-4	Aquatic Toxicity-Fish: 96 Hour(s) LC50 <i>Rainbow Trout</i> 0.00194 mg/L [Acute] NOEC <i>Rainbow Trout</i> 0.00101 mg/L [Chronic] Aquatic Toxicity-Crustacea: NOEC <i>Daphnia magna</i> 0.00125 mg/L [Chronic] 96 Hour(s) EC50 <i>Daphnia magna</i> 0.0037 mg/L [Acute]

### Persistence and degradability

- Rotenone is not persistent in the environment and its low vapor pressure ( $6.9 \times 10^{-10}$  torr) and Henry's Law constant ( $1.1 \times 10^{-13}$  atm-m<sup>3</sup> mol<sup>-1</sup>) limit its volatility. If released

to water, rotenone generally degrades quickly through abiotic (hydrolytic and photolytic) mechanisms.

### Bioaccumulative potential

- Rotenone has a relatively low potential for bioconcentrating in aquatic organisms.

### Mobility in Soil

- Rotenone is mobile to moderately mobile in soil and sediment with a half-life of a few days to several weeks or longer depending on water temperature.

### Other adverse effects

#### Potential Environmental Effects

- Extremely toxic to fish and aquatic invertebrates.

## Section 13 - Disposal Considerations

### Waste treatment methods

#### Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Never place unused product down any indoor or outdoor drain.

#### Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. See product label for disposal instructions. Nonrefillable container.

## Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class(es)	Packing group	Environmental hazards
DOT	NA1993	Bulk packaging only: Combustible liquid, n.o.s. (Diethylene glycol monoethyl ether)	Comb. Liq.	III	Marine Pollutant
IMO/IMDG	UN 3082	Environmentally hazardous substance, liquid, n.o.s. (Rotenone)	9	III	Marine Pollutant
IATA/ICAO	UN 3082	Environmentally hazardous substance, liquid, n.o.s. (Rotenone)	9	III	Acute Aquatic Toxicity

Special precautions for user • None specified.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code • No data available

#### Other information

IMO/IMDG • No data available

IATA/ICAO • No data available

## Section 15 - Regulatory Information

### Safety, health and environmental regulations/legislation specific for the substance or mixture

**SARA Hazard Classifications** • Acute, SARA Title III Section 313, Chronic

**FIFRA – Pesticide Labeling**

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

**WARNING**

**Precautionary Statements** • KEEP OUT OF THE REACH OF CHILDREN.

**Hazards to Humans and Domestic Animals**

May be fatal if inhaled. Do not breathe the vapors or spray mists. May be fatal if swallowed. Causes moderate eye irritation. Harmful if absorbed through skin. Do not get in eyes or on skin or clothing.

**First Aid**

Have product container or label with you when obtaining treatment advice. If inhaled • Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice. If swallowed • Call a poison control center or doctor immediately for treatment advice. • Do not give any liquid to the person. • Do not induce vomiting unless told to do so by the poison control center or doctor. • Do not give anything by mouth to an unconscious person. If in eyes • Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice. If on skin or clothing • Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor at for treatment advice.

**Environmental Hazards**

This product is extremely toxic to fish and other aquatic organisms. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency and other agencies before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate water outside of the treatment area by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water outside of the treatment area, food or feed by storage or disposal. Do not discharge effluent containing this pesticide into sewage systems without notifying the sewage treatment plant authority (PTOW).

**Physical or Chemical Hazards** • FLAMMABLE Keep away from heat and open flame.

Inventory		
Component	CAS	TSCA
Diethylene glycol monoethyl ether	111-90-0	Yes
2-Pyrrolidinone, 1-methyl-	872-50-4	Yes
Rotenone	83-79-4	No

**United States**

**Environment**

U.S. - CERCLA/SARA - Section 313 - Emission Reporting  
• Diethylene glycol monoethyl ether

111-90-0 Not Listed

• 2-Pyrrolidinone, 1-methyl-	872-50-4	1.0 % de minimis concentration
• Rotenone	83-79-4	Not Listed
<b>U.S. - EPA - Designated Generic Categories - Certain Glycol Ethers</b>		
• Diethylene glycol monoethyl ether	111-90-0	
• 2-Pyrrolidinone, 1-methyl-	872-50-4	Not Listed
• Rotenone	83-79-4	Not Listed

## Section 16 - Other Information

Revision Date	• 20/June/2016
Last Revision Date	• 20/June/2016
Preparation Date	• 20/June/2016
Disclaimer/Statement of Liability	• The information and statements herein are believed to be reliable but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE.

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**Supporting Document #7. Description of potential impacts to the environment and non-target plant and animals including invertebrates.**

This project will intentionally introduce rotenone, a natural botanical piscicide, to surface waters to kill invasive northern pike, but the anticipated impacts to other species will be short-term. CFT Legumine™ (5% rotenone) is registered by both the Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation and is deemed safe to use to eradicate invasive fish when applied according to label instructions. The proposed treatment using a combination of the two products will result in a peak rotenone concentration of <0.04 ppm active ingredient (rotenone). According to the EPA's re-registration of rotenone, there are no adverse environmental or human health effects from rotenone when used at this concentration (USEPA 2007) and is below the drinking water level of concern.

There are three ways in which rotenone can be detoxified once applied. The first detoxification method involves dilution by other water sources. This may be accomplished by groundwater or surface water mixing with treated water and diluting the rotenone below 2.0 parts per billion (ppb) which is considered non-detectable by product labeling thus requiring no active deactivation if the rotenone travels outside the treatment area.

Another common method of rotenone detoxification is to allow the rotenone to naturally breakdown. Rotenone is susceptible to natural detoxification through a variety of mechanisms, but warm water temperatures and exposure to sunlight are the two factors with the greatest influence on degradation rate (Ware 2002; ODFW 2008; Loeb and Engstrom-Heg 1970; Engstrom-Heg 1972; Gilderhus et al. 1986). Rotenone released into relatively warm water (~15°C) is expected to fully detoxify within two to four weeks (Dawson et al. 1991; Brian Finlayson retired California DFG pesticide specialist, personal communication). Colder water < 15°C is expected to delay rotenone degradation for months. For example, between 2000 and 2014, rotenone applied to other Kenai Peninsula lakes during September and October, when water temperatures ranged from 3.5°C to 12°C at the time of application persisted from five to nine months. Natural detoxification of rotenone will be the method of rotenone detoxification during the TRPL treatment.

The third method of detoxification involves the application of potassium permanganate, an oxidizing agent. This dry crystalline substance is mixed with water to detoxify the rotenone. Detoxification is typically accomplished after about 30 minutes of mixing between the two compounds at a (1.5-2.0):1 ratio of potassium permanganate and rotenone, respectively. Detoxification by this method is specific to stream treatments and will not be used on this project because the small streams that interconnect the TRPL waters and drain the lake complex terminates in a bog.

Private drinking water wells exist throughout much of the TRPL area and representative wells will be monitored for rotenone as part of this project. Similar well monitoring was done by ADF&G for a recent project (Soldotna Creek Drainage Restoration: pike eradication). Well water samples were collected periodically posttreatment until the rotenone fully degraded in the treated lakes based on analytic testing. No rotenone or rotenolone (degradation product) was detected in any well. Also, well monitoring efforts for other rotenone treatments in California, Oregon (Finlayson et al. 2001; Finlayson et al. 2014) or Montana (Don Skaar, MFWP, unpublished data) have never detected rotenone. Nonetheless, water samples from a private ground water well near each TRPL waterbody with lakes with lakeside residences (N=7) will be analyzed for rotenone content periodically to ensure that well water is not affected by the treatment. Rotenone penetrates approximately one inch in most soil types; the only exception is sandy soil where movement is about three inches (Hisata 2002). Additionally, national rotenone experts are unaware of any instance in which ground water has been affected by rotenone traveling through soils (Turner et al. 2007).). Also, the EPA stated in their 2007 decision to reregister rotenone that “Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater” (USEPA 2007).

There are no known public drinking water wells within 200 feet of the TRPL treatment area. Because the drainage’s surface waters must travel through sediments, soils, and gravels to reach ground aquifers, and rotenone is known to bind readily with these materials, contamination of ground water should not occur. If rotenone did somehow enter an underground aquifer, it would be further diluted and subject to natural degradation processes that would render it far below the EPA Drinking Water Level of Concern (DWLOC) of 40ppb. Available well logs for the TRPL area were evaluated by an Alaska Department of Natural Resources hydrologist for potential groundwater concerns related to treating the TRPL area with rotenone. In summary, the hydrologist stated the drinking water aquifer is below a confining layer that will largely preclude water or contaminants from reaching the lower drinking water aquifer (Appendix 1).

Following any rotenone treatment, there may be a substantial number of fish carcasses present. Bradbury (1986) reported that approximately 70% of rotenone-killed fish in Washington lakes immediately sink. Parker (1970) reported that at water temperatures of 5° C and cooler, dead fish required 20-41 days to surface. The most important factors inhibiting dead fish from surfacing are cooler water (<10° C) and deep water (> 15 feet). Most lakes in the TRPL are shallow with limited areas exceeding 25 feet in depth, the desired treatment period will be October, and water temperatures will likely be <10°C (Massengill 2011). Because of the relatively cold water temperatures expected during the TRPL treatment and the planned pre-treatment fish removal using gillnets, few dead fish are expected to be present following the treatment and odor from decaying fish should be lessened.

Bradbury (1986) reported that nine of eleven water bodies in Washington treated with rotenone experienced an algae bloom shortly after treatment. This occurred from the input of phosphorus to the water as fish decayed. Bradbury further noted that approximately 70% of the phosphorus content in the dead fish will be released into the lake through bacterial decay. This stimulates phytoplankton production which in turn increases zooplankton production, providing prey for macroinvertebrates and fish. This change in water chemistry is viewed as a benefit to stimulate plankton growth (UDWR 2007). Any changes or impacts to water quality resulting from decaying fish are expected to be short-term and minor.

Rotenone, at treatment concentrations, is not known to affect vegetation. Locations with inundated wetlands adjacent to northern pike infested waters will require rotenone treatment. This can be accomplished with a variety of equipment depending on water conditions, and could include the use of outboard boat(s), backpack applicators and drip stations. In most cases, the only practical way to apply rotenone to very small creeks having little discernible discharge is to apply rotenone using backpack sprayers. Lakeside-submerged wetlands and dense emergent lake weed beds will be treated using a surface drive outboard boat equipped with a pumping/application system. Inundated wetlands not accessible with watercraft will be best treated with backpack sprayers.

Large game such as grizzly bears, black bears, and wolves are found in the TRPL area but are not exclusively dependent on fish from these lakes. The removal of visible dead fish, where feasible, should reduce the potential for these species to consume rotenone-killed fish in great quantity. Even if rotenone-killed fish were consumed by mammals, there will be no adverse effects because rotenone at trace dosages is expected to be degraded by enzymes in the animals' digestive tracts (Finlayson et al. 2000; USEPA 2007). The LC50 to female rats from oral ingestion is 320 mg/Kg (Lowe 2006). No definitive evidence for carcinogenicity has been documented in mice/rat studies (National Toxicology Program 1986). Following rotenone treatment, frequent monitoring of the waterbodies, particularly those close to residences, to collect dead fish should limit fish carcasses from becoming an attractant to bears.

There is a year-round presence of moose in the TRPL area and a spring through fall presence of caribou. It is possible that either of these species may ingest treated water or that moose feed on aquatic vegetation exposed to rotenone. EPA-approved bioassays indicate that, at the proposed concentrations, rotenone will have no effect on mammals that drink the treated water (Schnick 1974a, 1974b; Herr et al. 1967). Ingestion of treated waters by any terrestrial wildlife will have no adverse effects because of the low rotenone concentration found in the lake water and the enzymatic action in the animals' digestive tracts. Particularly, the gastrointestinal absorption of rotenone is inefficient (Finlayson et al. 2000).

Finally, rotenone has a low acute toxicity via the dermal route of exposure and receives a toxicity category IV (safest) rating in rabbits, the LD50 is >5000 mg/kg (USEPA 2007). Risk of

inhalation exposure to rotenone from the liquid CFT Legumine™ to wildlife is nonexistent because the vapors rapidly dissipate, and the application method for powdered rotenone which involves using a semi-closed system pumping apparatus prevents exposure hazard to wildlife. In conclusion, this project will have no significant impact on game mammals.

Small game such as coyote, lynx, muskrat, beaver, mink, otter, weasel, snowshoe hare, red squirrel, porcupine, flying squirrel, shrew, vole and domesticated dogs and cats are present in the area. Some of these mammals could scavenge on rotenone killed fish or drink treated lake water. The effects of rotenone on non-target organisms have been studied extensively. Again mammals, in general, are not affected by rotenone in fisheries treatment concentrations because they neutralize rotenone by enzymatic action in their stomach and intestines (Finlayson 2000: AFS 2002; USEPA 2007). Laboratory tests have been conducted in which rats and dogs have been fed forms of rotenone as part of their diet for periods of six months to two years (Marking 1988). Observed effects included diarrhea, decreased food consumption, and weight loss. Researchers reported that despite the unusually high treatment concentrations of rotenone fed to rats and dogs, the chemical did not cause tumors or reproductive problems in these mammals.

CDFG (1994) studies of potential risks to terrestrial animals found that a 22-pound dog will have to drink thousands of gallons of lake water or eat thousands of pounds of rotenone killed fish in 24 hours to receive a lethal dose. The State of Washington reported that a half-pound mammal (red squirrel size) will need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). It is important to note that nearly all of the aforementioned examples were based upon subjecting laboratory specimens to unusually high concentrations of rotenone that are far above concentrations used in fisheries management uses. For this project, ADF&G will use a rotenone product containing 5% rotenone. Assuming the primary way an animal may consume the compound under field conditions is by drinking lake water, a half-pound animal will need to drink 66 gallons of TRPL water treated at 0.05 ppm rotenone to receive a lethal dose. Based on this information, we expect the impacts to non-target organisms to range from non-existent to short-term.

Birds common to the treatment area that could potentially consume dead fish following treatment include bald eagles, herring gull, Bonaparte's gull, parasitic jaeger, common loon, Pacific loon, horned grebe, red-necked grebe, crow, raven, magpie, stellar jay, gray jay and osprey. Additionally, non-piscivorous birds such as passerines, woodpeckers, geese, ducks, plovers, owls, etc. are present in the area. During the proposed TRPL treatment period (October), many piscivorous waterfowl will have migrated from the drainage. Following the treatment, it is likely that some birds will be present and forage on rotenone-killed fish, however research has indicated it is not physiologically possible for birds to consume sufficient quantities of rotenone-killed fish to result in a lethal dose (Finlayson 2000: USEPA 2007).

Rotenone residues in dead fish are generally very low (<0.1 ppm), unstable, and not readily absorbed through the gut of the animal eating the fish (Finlayson et al. 2000). A bird weighing ¼ pound will have to consume 100 quarts of treated water or more than 40 pounds of fish and invertebrates within 24 hours to receive a lethal dose. This same size bird will normally consume 0.2 ounces of water and 0.32 ounces of food daily, thus a safety factor of 1,000 to 10,000 fold exists under normal conditions for birds and mammals. The LD50 values for mallard ducks and ring-necked pheasants were 2200 mg/kg and 1680 mg/kg, respectively, as reported online at:

<http://pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/rotenone-ext.html>. Regardless, ADF&G efforts to remove rotenone-killed fish that surface following treatment will minimize risks to these birds; thus, impacts should be negligible.

This project is designed to eradicate invasive northern pike using rotenone. It is anticipated that all fish exposed to the rotenone will be killed. Three-spine stickleback were also present throughout the TRPL area prior to the introduction of northern pike but are no longer found in most of the TRPL waters. Anecdotal reports indicate that some TRPL waters supported rainbow trout and Chinook salmon that originated from illegal stocking.

The primary sport fishery in the TRPL is currently for northern pike. After native fish are reintroduced to Area One and have had time to rebuild, these native fish should provide an increase in sport fishing opportunities beyond what currently exists. Removing northern pike will result in a loss of fishing opportunity for this invasive species. Northern pike fishing has attracted some sport anglers who are enthusiastic about fishing for them.

Generally, zooplankton species are more vulnerable to rotenone than fish or macroinvertebrates (Bradbury 1986, Melaas et al. 2001, Vinson et al. 2010). However, many zooplankton species have life stages (eggs, resting stages) that are very rotenone-resistant so complete eradication is unlikely (Kiser et al. 1963, Melass et al. 2001). Zooplankton populations have been observed to fully recover to pre-treatment levels in Southcentral Alaska within one to three years after a rotenone treatment with no observed loss of species (Chlupach 1977). Recent rotenone treatments at Arc Lake and Scout Lake on the Kenai Peninsula indicate macroinvertebrate diversity remained comparable to pretreatment levels less than one year post treatment, but zooplankton abundance was temporarily reduced (Massengill In prep a,b). Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to rotenone. Because of their short life cycles (Anderson and Wallace 1984), good dispersal ability (Pennack 1989) and generally high reproductive potential (Anderson and Wallace 1984), aquatic invertebrates are capable of rapid recovery from disturbance (Jacobi and Deegan 1977; Boulton et al. 1992; Matthaei et al. 1996). Recolonization will include aerial dispersal of adult invertebrates from adjacent areas to the project area (e.g., mayflies and caddis flies).

Wood frogs are the only amphibians on the Kenai Peninsula and are presumed to be common to the TRPL area. Wood frogs mate in the spring, and their offspring quickly develop from egg to tadpole to frog. This northern adaptation helps ensure complete metamorphosis before fall freeze-up (ADF&G Wildlife Notebook Series: Frogs and Toads [http://www.adfg.alaska.gov/static/education/wns/frogs and toads.pdf](http://www.adfg.alaska.gov/static/education/wns/frogs_and_toads.pdf)). Adult frogs are generally more resistant to the effects of rotenone than fish. Grisak et al. (2007) conducted laboratory studies on long-toed salamanders, Rocky Mountain tailed frogs, and Columbia spotted frogs and concluded that the adult life stages of these species will not suffer an acute response to rotenone, but larval and tadpole stages could be affected by rotenone at fish killing concentrations. It is anticipated that surrounding ponds and wetlands that are not treated will help restore any potential depletion of wood frog populations at the TRPL area. It is noteworthy that wood frog tadpoles were observed in Scout Lake (Sterling, Alaska) the spring following a fall rotenone treatment (Massengill 2014b)

**Supporting Document #8. Description of precautions to protect human health, safety, welfare, animals and the environment.**

Plans to protect human health, safety, welfare, animals, and the environment during this project are summarized below but can also be found in the TRPL Restoration Plan (Appendix 1).

The greatest health threat posed to humans by this project is to the applicators who will be working with a concentrated rotenone product. Safety training will be provided to all personnel associated with this project to include how to safely apply and handle pesticide and emergency incidents protocols. All pesticide will be stored in a spill containment system.

During the treatment, signage will be posted at access locations within the treatment area warning the public to not contact treated waters until ADFG announces that all the rotenone has deactivated. Neighboring landowners will also be directly notified about the treatment. These precautions are beyond EPA and label guidelines that indicate contact and/or drinking of treated waters with <40ppb rotenone content is allowable. The concentration of the rotenone in the treatment area will be periodically monitored through analysis of water samples sent to an approved laboratory. The target rotenone concentration for all treatments is <40ppb which will degrade over time through natural mechanisms. The treatment will have at least one DEC certified applicator directly supervising the application.

Treatment timing will play a large role in minimizing impacts to humans and the environment. For instance, the desired fall application timing produces the benefit of prolonging the persistence of the rotenone via colder temperatures (and prolonging rotenone exposure to the target species) while reducing the impact to the public that might otherwise be recreating in lakes when temperatures are warmer. The desired October treatment timing will also occur when many local migratory birds have left the area. During late fall and winter ice cover will serve to limit terrestrial animal exposure to the treated waters.

Post-treatment, ADFG will closely monitor the rotenone concentrations in all treated waterbodies including the monitoring of representative drinking water wells adjacent to the treatment area to document that well water is not impacted and safe.

At the very low rotenone concentration needed for this treatment (<04ppm rotenone) no impacts to birds or mammals are expected, however, we expect a temporary reduction of some invertebrate populations, particularly zooplankton. Rotenone is not known to affect plants.

Studies conducted in Alaska indicate that within 1-3 years, all zooplankton species fully recover after rotenone exposure in lakes. Other invertebrate species are either more resistant to rotenone or have life stages (eggs/cysts or dormant phases) that allow representatives to survive the treatment. More information on effects to the environment and wildlife can be found in Appendix 1..

The native fish assemblage of the TRPL area (stickleback) will be reintroduced and wild fish (i.e. rainbow trout, juvenile salmon) will also be released into the TRPL area to provide for an alternate fishery.



**Supporting Document #9. Proof of liability insurance**

Not Applicable to State agencies.

**Supporting Document #10. Information about how the proposed pesticide application might affect threatened or endangered species.**

The Cook Inlet beluga whale is the only endangered species found in the area of Cook Inlet. No direct impacts to beluga whales are expected because the TRPL area is not utilized by beluga whales. Rotenone, at fish management concentrations, poses no known threat to wild mammals or birds.

Supporting Document #11. Documentation of APDES compliance.



THE STATE  
of **ALASKA**  
GOVERNOR BILL WALKER

Department of Environmental  
Conservation

DIVISION OF WATER  
Wastewater Discharge Authorization Program

555 Cordova Street  
Anchorage, Alaska 99501-2617  
Main: 907.269.6285  
Fax: 907.334.2415  
[www.dec.alaska.gov/water/wwdp](http://www.dec.alaska.gov/water/wwdp)

January 17, 2018

Alaska Department of Fish and Game  
Attn: Tammy Davis, Statewide Invasive Species Coordinator  
PO Box 115526  
Juneau, AK 99811

Re: AKG870004 ADF&G

Dear Ms. Davis:

The Alaska Department of Environmental Conservation (DEC) has completed its review of your AKG870000 Pesticide General Permit (PGP) Notice of Intent (NOI) for modification (Jan. 2018) and is issuing the following authorization number: AKG87004. The wastewater discharge is authorized in accordance with the terms of the general permit and any site specific requirements in this authorization for the following pest management areas identified in the NOI:

**Pest Management Area: Soldoma Creek Drainage Treatment Area**

**Pesticide Use Patterns:**

- ☐ Mosquito and Other Flying Insect Pest Control ☒ Animal Pest Control  
☐ Weed and Algae Pest Control ☐ Forest Canopy Pest Control

Pest(s) to be controlled:	Pesticide Products	
	Product Name	EPA Registration Number
Northern Pike	CFT Legumine	75338-2
	Rotenone Fish Toxicant Powder	655-691

**Pest Management Area: Tote Road Treatment Area**

**Pesticide Use Patterns:**

- ☐ Mosquito and Other Flying Insect Pest Control ☒ Animal Pest Control  
☐ Weed and Algae Pest Control ☐ Forest Canopy Pest Control

Pest(s) to be controlled:	Pesticide Products	
	Product Name	EPA Registration Number
Northern Pike	CFT Legumine	75338-2
	Rotenone Fish Toxicant Powder	655-691

An electronic copy of the PGP is available at [http://dec.alaska.gov/water/wnpssc/stormwater/docs/AKG870000\\_2017\\_PGP.pdf](http://dec.alaska.gov/water/wnpssc/stormwater/docs/AKG870000_2017_PGP.pdf) and a copy of this authorization letter is posted to the DEC water permit search website <http://dec.alaska.gov/Applications/Water/WaterPermitSearch/Search.aspx>.

The authorization effective date is 4/13/2017

The authorization to discharge expires upon submittal of a Notice of Termination, see Permit Part 1.2.6.

The permittee is reminded of the following permit requirements:

- Technology-Based Effluent Limitations, Part 2.2. Decision-makers' Responsibilities for All Decision-makers
- Technology-Based Effluent Limitations, Part 2.2. Decision-makers' Responsibilities for Decision-makers Required to Submit NOIs

AKG870004 - MxdAUCH.docx

January 17, 2018

- Water Quality, Part 3
- Monitoring, Part 4
- Pesticide Discharge Management Plan, Part 5
- Corrective Action, Part 6
- Recordkeeping, Parts 7.1, 7.4, and 7.5
- Annual Report, Part 7.6
- Standard Permit Conditions, Permit Appendix A

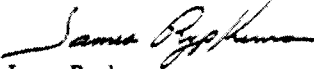
If you are self-applying a pesticide, your requirements also include:

- Technology-Based Effluent Limitations, Part 2.1 Applicators' Responsibilities

A copy of the PGP AKG870000 and this authorization must be kept at the address provided in the NOI. This authorization does not relieve the permittee from other local, state, or federal government permitting requirements.

If you have any questions regarding the above, please contact me at 907-334-2288 or via email at [James.Rypkema@alaska.gov](mailto:James.Rypkema@alaska.gov).

Sincerely,



James Rypkema  
Section Manager, Storm Water and Wetlands

Enclosure: Pesticide Discharge map(s)

cc: w/enclosure (email)  
Robert Massengill, ADF&G (Soldotna)

Appendix 1. Tote Road Restoration Project referenced in ADEC P.U.P. permit

## **Northern Kenai Peninsula Area Treatment Plan**

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# **Treatment Plan: Tote Road Pike Lakes Restoration: Northern Pike Eradication**

by

**Rob Massengill and Kristine Dunker**

March 2017

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



## Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative		<i>all standard mathematical</i>	
deciliter	dL	Code	AAC	<i>signs, symbols and</i>	
gram	g	all commonly accepted		<i>abbreviations</i>	
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H <sub>A</sub>
kilogram	kg			base of natural logarithm	<i>e</i>
kilometer	km	all commonly accepted		catch per unit effort	CPUE
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
meter	m			common test statistics	(F, t, $\chi^2$ , etc.)
milliliter	mL	at	@	confidence interval	CI
millimeter	mm	compass directions:		correlation coefficient (multiple)	R
		east	E		
<b>Weights and measures (English)</b>		north	N	correlation coefficient (simple)	r
cubic feet per second	ft <sup>3</sup> /s	south	S		
foot	ft	west	W	covariance	cov
gallon	gal	copyright	©	degree (angular )	°
inch	in	corporate suffixes:		degrees of freedom	df
mile	mi	Company	Co.	expected value	<i>E</i>
nautical mile	nmi	Corporation	Corp.	greater than	>
ounce	oz	Incorporated	Inc.	greater than or equal to	≥
pound	lb	Limited	Ltd.	harvest per unit effort	HPUE
quart	qt	District of Columbia	D.C.	less than	<
yard	yd	et alii (and others)	et al.	less than or equal to	≤
		et cetera (and so forth)	etc.	logarithm (natural)	ln
<b>Time and temperature</b>		exempli gratia		logarithm (base 10)	log
day	d	(for example)	e.g.	logarithm (specify base)	log <sub>2</sub> , etc.
degrees Celsius	°C	Federal Information		minute (angular)	'
degrees Fahrenheit	°F	Code	FIC	not significant	NS
degrees kelvin	K	id est (that is)	i.e.	null hypothesis	H <sub>0</sub>
hour	h	latitude or longitude	lat or long	percent	%
minute	min	monetary symbols		probability	P
second	s	(U.S.)	\$, ¢	probability of a type I error (rejection of the null hypothesis when true)	α
<b>Physics and chemistry</b>		months (tables and figures): first three letters	Jan,...,Dec	probability of a type II error (acceptance of the null hypothesis when false)	β
all atomic symbols		registered trademark	®		
alternating current	AC	trademark	™	second (angular)	"
ampere	A	United States		standard deviation	SD
calorie	cal	(adjective)	U.S.	standard error	SE
direct current	DC	United States of		variance	
hertz	Hz	America (noun)	USA	population	Var
horsepower	hp	U.S.C.	United States Code	sample	var
hydrogen ion activity (negative log of)	pH	U.S. state	use two-letter abbreviations (e.g., AK, WA)		
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

***REGIONAL TREATMENT PLAN SF.2A.2017.XX***

**TREATMENT PLAN: TOTE ROAD PIKE LAKES RESTORATION:  
NORTHERN PIKE ERADICATION**

by

Robert Massengill

Alaska Department of Fish and Game, Division of Sport Fish, Anchorage

Alaska Department of Fish and Game  
Division of Sport Fish  
March 2017

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: <http://www.adfg.alaska.gov/sf/publications/>

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## SIGNATURE PAGE

Project Title: Tote Road Pike Lakes Restoration: Northern Pike Eradication

Project leader(s): Robert Massengill, Kristine Dunker

Division, Region, and Area Division of Sport Fish, Region II, Soldotna Office

Project Nomenclature: Northern pike, Invasive species, Tote Road Pike Lakes, Gillnets, eDNA, Eradication, Rotenone

Period Covered March 1 2017 – October 2019

Field Dates: July 2017 – October 2019

Plan Type: Treatment Plan

### Approval

Title	Name	Signature	Date
Project co- leader	Rob Massengill		
Project co-leader	Kristine Dunker		
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# INTRODUCTION

## BACKGROUND

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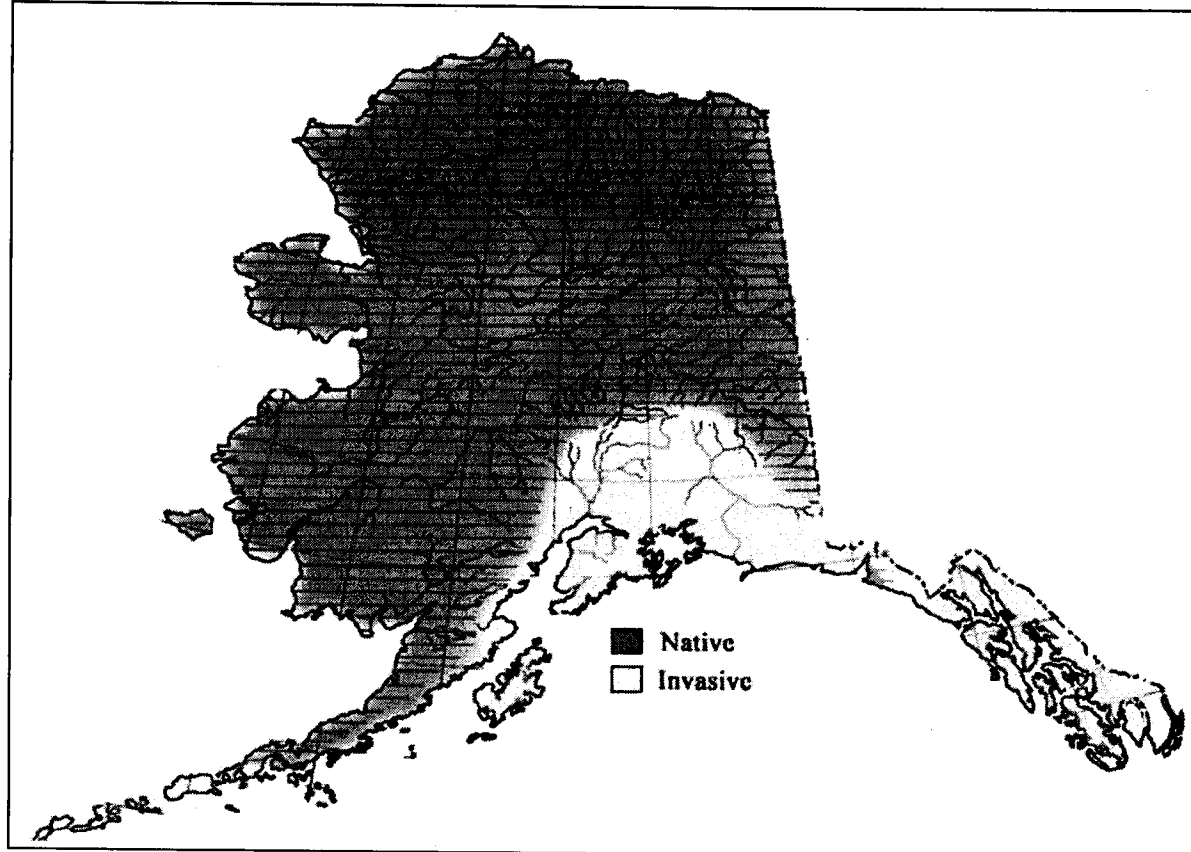
In Alaska northern pike *Esox lucius* are an invasive species south and east of the Alaska Range (Figure 1) and are implicated in the decline of native fisheries throughout the region (Rutz 1999; Sepulveda et. al. 2013; Sepulveda et. al. 2015; Glick and Willette 2016; Patankar and Von Hippel 2006). There is evidence that northern pike prefer soft-finned juvenile salmonids over other available prey species in southcentral Alaska (Rutz, 1996 and 1999). Consumption of native juvenile salmonids by introduced northern pike has also been observed elsewhere in the northwestern United States (Rich 1992, McMahon and Bennett 1996, Schmetterling 2001, Muhlfeld et al. 2008). In Southcentral Alaska, northern pike prey may be particularly vulnerable to predation because they evolved in the absence of these predators whereas in interior Alaska, native northern pike share an evolutionary history with their prey which evolved adaptations for predator-avoidance (Oswood et al. 2000). Also, prevalent shallow lake morphology throughout much of southcentral Alaska offers limited deep water refugia for northern pike prey as northern pike prefer shallow vegetated waters (Cook and Bergersen. 1988, Inskip 1986).

Introduced northern pike were first documented on the Kenai Peninsula in the Soldotna Creek drainage in the 1970's (ADFG unpublished). Subsequent dispersal and illegal introductions resulted in northern pike occurring in at least twenty Kenai Peninsula waterbodies (Figure 2). Of these, seven such waterbodies were identified since 2000, however, the date of these introductions are unknown. Kenai Peninsula northern pike have reduced or eliminated wild and stocked fish populations from some lakes (McKinley 2013; Massengill 2014 a,b). Beginning in 2008, the Alaska Department of Fish and Game (ADFG) initiated a program to eradicate northern pike from the Kenai Peninsula. Initial efforts focused on eradicating northern pike from landlocked lakes (Massengill 2014a; 2014b) followed by eradication efforts in progressively more complex open waterbodies within the Swanson River and Soldotna Creek drainages. Currently, the Tote Road Pike Lakes (TRPL) harbors the last known northern pike population on the Kenai Peninsula.

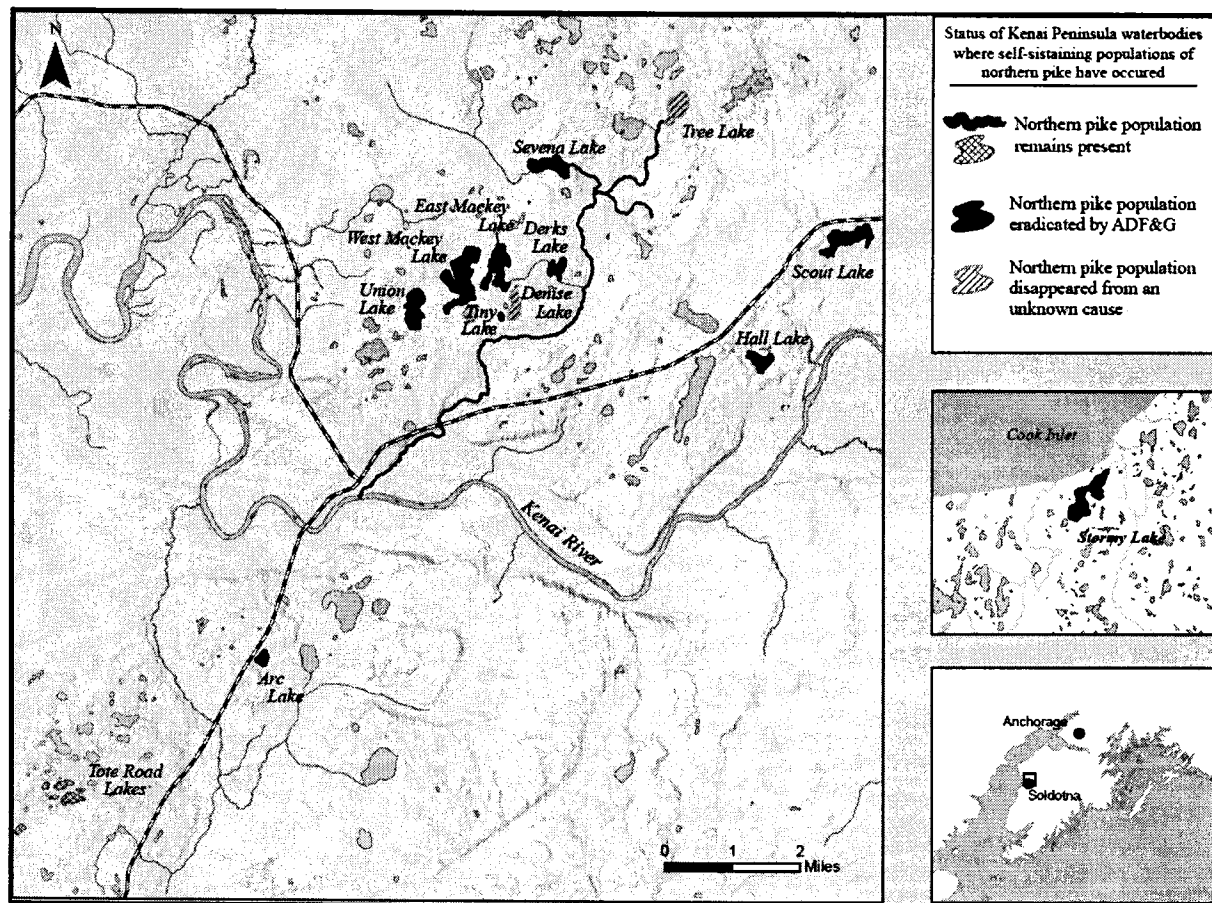
Located about five miles south of Soldotna, the TRPL is currently comprised of six small lakes of which five are linked by intermittent stream flow. The linked lakes have an outlet creek (< 1cfs) that flows westward for about one mile then diffuses to a vast bog and eventually goes subterranean. In total, the waters of the TRPL cover about 63 surface acres and contain 892 of acre-feet of water. Five of the six lakes are found near Stubblefield Drive and one near Tote Road (Figure 3). Threespine stickleback *Gasterosteus aculeatus* are believed to be the only fish species native to the TRPL although in some lakes they may be extirpated by northern pike predation. Rainbow trout *Oncorhynchus mykiss* were reported to occur in some lakes within the TRPL area decades ago but they likely resulted from undocumented introductions and did not represent a natural self-perpetuating population. Rainbow trout are no longer present in the TRPL area.

With the exception of threespine stickleback, the TRPL northern pike population does not pose a direct threat to local fisheries as the TRPL have no surface connections to waterbodies inhabited by fish other than threespine stickleback. However, northern pike in the TRPL do pose a very

serious indirect threat to local fisheries in that this population is a convenient source for intentional introductions elsewhere.



**Figure 1. Map of Alaska's northern pike native and invasive ranges.**



**Figure 2. Kenai Peninsula invasive northern pike waters status map.**

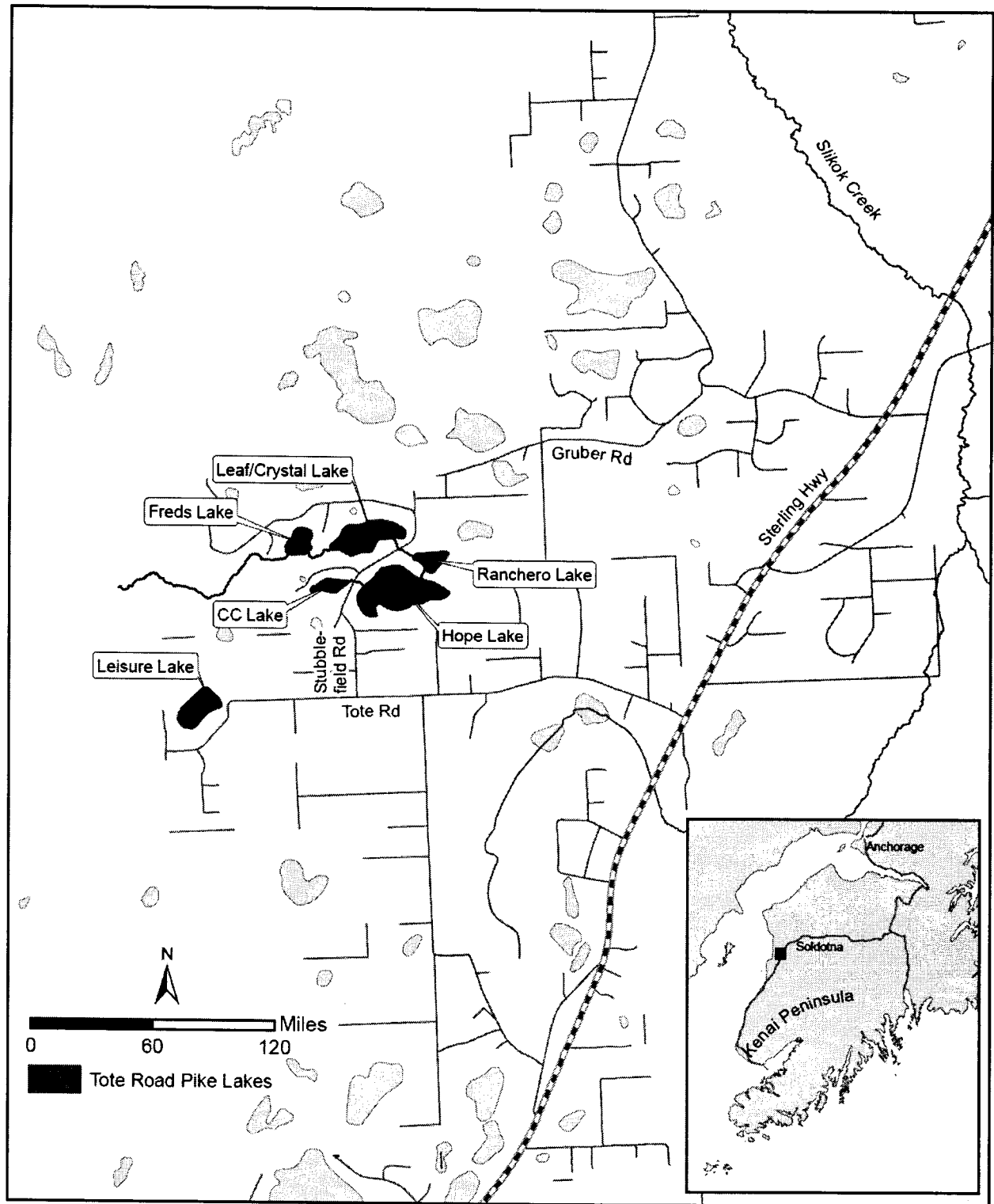


Figure 3. Map of the Tote Road Pike Lakes and surrounding area.

**PROJECT GOAL:**

- 1) To restore the aquatic habitat of the TRPL

**PROJECT OBJECTIVE:**

- 1) To eradicate the invasive northern pike population in the TRPL in 2018

**PROJECT TASKS:**

- 1) Conduct public scoping for eradicating northern pike from the TRPL
- 2) Fulfill all permitting obligations required to eradicate northern pike from the TRPL
- 3) Treat the TRPL with rotenone in the fall of 2018
- 4) Monitor the TRPL pre and posttreatment to include biological and water quality monitoring
- 5) Restock all the waters of the TRPL posttreatment with threespine stickleback beginning in 2019. Restock wild salmonids (rainbow trout and/or coho salmon) to those lakes with public access beginning in 2019.

## **PROJECT PLANNING/AUTHORIZATIONS**

**Guiding Management Plans**

The Department of Fish and Game Sport Fish Division has documents to guide the Department's response to the threat of invasive northern pike. These documents include the Management Plan for Invasive Northern Pike available online at:

[http://www.adfg.alaska.gov/static/species/nonnative/invasive/pike/pdfs/invasive\\_pike\\_management\\_plan.pdf](http://www.adfg.alaska.gov/static/species/nonnative/invasive/pike/pdfs/invasive_pike_management_plan.pdf), and the Alaska Aquatic Nuisance Species Management Plan available online at: <http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2002.10.pdf>. These plans aid in identifying specific threats from invasive northern pike, statutes and regulations pertinent to invasive species, and actions to evaluate, prevent, control, contain and eradicate invasive northern pike.

To prioritize northern pike control projects within the Region, a Department planning subcommittee developed a model that prioritized the numerous potential northern pike projects and defined program goals. Eradicating northern pike from the TRPL drainage is the highest ranking northern pike project priority remaining for the Northern Kenai Peninsula Management Area.

**Clearances for Treatment**

The TRPL restoration project will require approvals by multiple government entities. The following is a list of the known permits and authorizations required for this project:

- 1) National Environmental Policy Act (NEPA) compliance: A federal nexus exists for the TRPL restoration project because the primary funding source for this project is the Alaska Sustainable Salmon Fund (AKSSF) which manages the State of Alaska allocation of the federal Pacific Coastal Salmon Recovery Fund (PCSRF) administered by National



Oceanic and Atmospheric Administration Fisheries (NOAA). Having a federal nexus with a pesticide project mandates NEPA compliance, and in most cases, means that an environmental assessment (EA) be submitted to a reviewing federal agency. An EA for the TRPL drainage restoration proposal will be submitted to the USFWS Fishery Resource Office in Soldotna, Alaska. A public release of the TRPL restoration EA will be made available online by ADFG for public review. The USFWS will determine whether or not a "Finding of No Significant Impact" (FONSI) is applicable for the TRPL drainage restoration EA. If a FONSI is issued, that will conclude the Federal approval process for the EA. If a FONSI is not issued due to concerns that cannot be addressed by an EA revision, an environmental impact statement (EIS) may be required. To identify the existence of potential EPA pesticide use limitations for protection of endangered species within treatment area, and to help address those concerns in the EA if any exist, an EPA resource called the "Endangered Species Protection Bulletin" can be accessed online at: <http://www.epa.gov/oppead1/endanger/bulletins.htm>. A USFWS listing of endangered species found in Alaska can be viewed online at: <http://ecos.fws.gov/ecp0/reports/species-listed-by-state-report?state=AK>.

- 2) Environmental Protection Agency (EPA) compliance: The National Pollutant Discharge Elimination System (NPDES) is an EPA program set out under section 402 of the Clean Water Act that requires pollutant discharges to surface waters be authorized by permit. EPA has transferred the permitting authority for Alaska discharges to the State of Alaska Department of Environmental Conservation (ADEC). The associated ADEC permit is called the Alaska Pollutant Discharge Elimination System (APDES). Details for this permit are available at: <http://dec.alaska.gov/water/wwdp/index.htm>
- 3) Alaska Department of Environmental Conservation (ADEC) Pesticide Use Permit (PUP): This permit is required for all Alaskan pesticide applications involving aircraft, applications to waters or executed by government agencies. The PUP requires the name(s) of the certified pesticide applicator(s) supervising the pesticide treatment in addition to extensive treatment plan details. ADEC also requires that the intended pesticide is registered for use in Alaska. Pesticide registration can be verified online at: <http://www.kellysolutions.com/ak/pesticideindex.htm>. To satisfy the ADEC Pesticide Use Permit Application requirements, two public notices must be placed in a local newspaper on two consecutive days per ADEC approval that describe the project and dates of the public commenting period for the permit. Often, the PUP notice is run concurrently with the EA notice in a local paper.
- 4) Kenai River Center Multi-Agency permit application. This permit is required for installing any structures (i.e., barriers, deactivation station) or for adding and removing fill in waterbodies. The multi-agency permit is reviewed by several agencies that include the Alaska Department of Natural Resources (Alaska State Parks), Alaska Department of Fish and Game (Habitat Division) and the Kenai Peninsula Borough.
- 5) Army Corps of Engineer permit: may be required for some fish barriers.

- 6) ADFG Board of Fisheries and ADFG Commissioner and Sport Fish Division Director consent.
- 7) Alaska Department of Fish and Game Fish Transport Permit (FTP) and Fish Resource Permit (FRP). An FTP is required to collect and transport wild juvenile salmonids for use as sentinel and bioassay specimens. An FRP is needed to capture and relocate fish for reintroduction following the pesticide treatment.
- 8) Alaska Department of Natural Resources (ADNR) Land Use Permit. This permit is required for activities on state lands, including submerged lands under navigable waterbodies, that are not considered a "generally allowed use" as defined in 11 AAC 96.020.

## **METHODS**

### **Waterbody Physical/Chemical Characterization**

#### **Bathymetric mapping**

Bathymetric maps and volume estimates are needed for all the northern pike lakes within the TRPL area. Volume estimates and bathymetric maps allow estimation of the amount of pesticide (rotenone) needed for the project and for determining the rotenone application rate based on water depth. Current TRPL bathymetric maps are found in (Appendix 1-6) and volume estimates are found in Appendix 7. These maps and estimates will be updated in the summer of 2017, prior to rotenone treatment. Bathymetric mapping for this project is conducted using technology that incorporates GPS instrumentation and GIS software.

Depth and location data (sonar logs) are gathered electronically and forwarded to a vendor for data processing. The data is collected using a boat mounted Lowrance™ HDS 7 Touch depth finder/chart plotter. The Lowrance™ HDS 7 Touch unit simultaneously records data at a user-selected "ping rate" (5 to 20 signals per second). Mapping coverage guidelines suggest that boat operators not exceed thirty feet between boat mapping swaths which can be visually monitored on the Lowrance™ HDS 7 Touch screen while mapping. Typically an entire lake is mapped by first mapping the lake perimeter then by mapping line transects across the lake. The Lowrance™ HDS 7 Touch mapping data can be stored on an SD card but no more than one hour of mapping data should be collected per SD card due to memory limits.

Once mapping is completed, all data records are uploaded to ciBioBase. ciBioBase is a subscription-based software service provided by Contour Innovations LLC and serves as a cloud-based GIS software platform that automates data processing of the Lowrance™ HDS sonar logs. At ciBioBase the data undergoes editing for erroneous data and interpolation using algorithms. Optional products include bathymetry maps, processed depth data records, volume estimates and vegetation reports.

#### **Water quality**

Water quality data will be collected from all TRPL waters on a monthly basis for one year before and one year following the rotenone treatment. This data will allow water quality comparisons and will be useful for assessing the appropriate target concentration of rotenone required and its potential persistence. Water quality can affect the effectiveness of rotenone which degrades

faster in areas with higher light, heat, organics, shallows and turbidity, (Bradbury 1986; Dawson et al. 1991; and Schnick 1974). Rotenone is more effective when the water has low oxygen, pH, alkalinity and organic load (Wayne et. al. 2010). Low pH, alkalinity and temperature can increase rotenone persistence (Brian Finlayson, retired California Department of Fish and Game, personnel communication).

As suggested by Finlayson et al. (2000), water quality data useful for planning a rotenone treatment includes water temperature, pH, dissolved oxygen, specific conductivity, and turbidity. All those parameters except turbidity will be collected using a Quanta Hydrolab™. Turbidity will be measured with a Secchi disc to the nearest 0.1 meter. All water quality data will be collected from each lake in 1-meter increments beginning from just above the lake bottom at a location near the deepest part of each lake. Turbidity will be measured with a Secchi disc or similar device. Alkalinity will be measured at each lake just once before the rotenone treatment initiates using a Hach™ Model AL-TA test kit. All water quality sampling locations will be recorded with a hand held GPS to facilitate sample site repeatability.

### **Stream Discharge/Travel Time**

Five of the lakes in the TRPL area are connected by intermittent streams. Fred's Lake is the furthest downstream of the five linked lakes and its outlet stream flows westward about one mile where it diffuses into a vast fishless bog. Discharge in the streams connecting the TRPL waters are typically <.05 cfs based on sporadic historical discharge observations (ADF&G unpublished data). The stream connecting Rancho Lake to Crystal/Leaf Lake travels under Stubblefield Drive through a semi-perched culvert and it is immediately downstream of this culvert where stream discharge can be measured by collecting the culvert's discharge in a bucket to estimate gallons/second which is easily converted to cubic feet/second (cfs) (1 cfs = 7.48 gallons).

Typically, the stream discharge is too shallow for measurement with standard discharge measuring tools (i.e. wading rod and pygmy meter). Beginning in November, 2016 stream discharge will be measured monthly by bucket collection, as practical. If stream discharge appears sufficient for standard measuring methods, discharge will instead be measured with a Pygmy™ current meter attached to a wading rod and read with a battery powered AquaCount™ digital meter reader. Measuring techniques will comply with United States Geological Survey (USGS) specifications as described in Nolan and Shields (2000). The stream discharge measurement taken at the culvert under Stubblefield Drive will serve as a surrogate discharge measurement for all the streams linking the lakes within the TRPL. Stream discharge data will be recorded manually in the field in a Rite –in-the-Rain™ notebook and later transcribed to a Microsoft Excel database.

### **Biological Inventory**

#### *Invertebrates*

Rotenone is toxic to many aquatic invertebrates and some species are more tolerant than others. Whelan (2002) noted that the effects of rotenone on macroinvertebrates are most severe when treatments cover an entire watershed, the rotenone is at a high concentration, treatments are conducted multiple times in succession and are of long duration. Chulpach (1977) studied rotenone effects on zooplankton in southcentral Alaska lakes and noted that zooplankton populations crashed following the treatments but fully recovered in 1-3 years with no loss of

species. Rotenone treatments conducted at Arc Lake (2008) and Scout Lake (2009) on the Kenai Peninsula indicate the diversity of posttreatment invertebrate taxa was similar to that pretreatment in less than one year, however, zooplankton abundance was temporarily but drastically reduced (Massengill 2014 a,b).

To document any large changes in aquatic invertebrate diversity in the TRPL area following the rotenone treatment, invertebrate sampling will be done at least twice during the summer of 2018 (pretreatment) and twice posttreatment in 2019. Invertebrate sampling will occur at one representative lake (Hope Lake). This sampling will provide a minimum list of taxa present in the TRPL area before and after the rotenone treatment. All sampling surveys will be conducted mid-summer when most aquatic invertebrates are in active life stages.

Zooplankton collections will be made at 2 sites by replicate vertical tows (from the bottom of the lake to the surface) in two mid-lake locations using a 0.5-meter diameter Wisconsin net with 153  $\mu\text{m}$  mesh. The Wisconsin net will be lowered to near the lake bottom (~30 feet) with a hand line and then retrieved at a rate of 1 meter every 2 seconds. Captured zooplankton will concentrate in the net bottom inside a screened PVC collection bucket that is detachable from the net so captured zooplankton can easily be transferred to a collection jar. Zooplankton samples will be analyzed to a reasonable degree of taxonomic resolution using illustrations found in Bachmann (1973) and taxonomic keys found in Pennak (1989).

Multiple gear types will be used to sample macroinvertebrates. To collect benthic macroinvertebrates, a 9-inch Ekman Bottom Grab Sampler will be used to collect bottom sediment from four offshore sites. The Ekman dredge will be deployed from an anchored outboard boat at each of the four sites in 1 to 10m of water. Collected sediment will be screened through screening pans of varied mesh size to filter out invertebrates. Handheld D-nets will be used to sample invertebrates along five vegetated near-shore areas (<1.0m in depth). The D-net will be swept the back and forth through submerged and emergent vegetation beds for 30 seconds. A visual wading/boating survey will be conducted opportunistically to locate and collect freshwater mussels and/or snails. All macroinvertebrates collected will be identified to the taxonomic level of order or higher using keys provided by Pennack (1989) and Voshell (2002).

All sample site locations will be recorded with a GPS to ensure repeatability. A map showing approximate locations of all the lake invertebrate sampling sites is found in Appendix 8. All invertebrate specimens will be preserved in denatured ETOH, labeled with the date, gear method, collector initials and site location and archived at the Soldotna ADF&G Office.

#### *Fish*

Pretreatment minnow trapping surveys will be conducted in all lakes within the TRPL to confirm species presence. In each lake at least five minnow traps baited with salmon eggs will be fished for a minimum of one hour each. All catches will be speciated, enumerated and measured for fork length (FL) to the nearest mm. Fish sampling data including net/trap howill be recorded manually in the field in a Rite -in-the-Rain™ notebook and later transcribed to a Microsoft Excel database.

All lakes and ponds within a two mile radius of Hope Lake (approximately two dozen waterbodies) will be surveyed pretreatment for northern pike presence using both eDNA

sampling methods and experimental gillnet surveys. The purpose of these surveys is to confirm the northern pike are still present in the six lakes comprising the TRPL area and that no previously undocumented northern pike populations are overlooked. The eDNA surveys will occur prior to the gillnet surveys to reduce the likelihood northern pike eDNA is accidentally introduced to waters by the gillnetting gear which could potentially cause false positive eDNA test results.

At each lake a minimum one sample for each 4.8 surface acres of lake or five samples, whichever is greater, will be collected during the mid-summer of 2017 and/or 2018. The seasonal timing of the collections is intentional in an effort to reduce the likelihood northern pike eDNA preserved in sediment from non-living sources (i.e. animal feces, failed introductions, etc.) becomes suspended in the water column from fall and spring turnover events. Previous northern pike eDNA sampling on the Kenai Peninsula during the springtime coincided with false positive eDNA detections which were hypothesized to have resulted from eDNA preserved in sediment getting resuspended in the water column (Dunker 2016). Also, eDNA sampling will not be conducted for one week following high wind events (> 20 mph) that could result in significant lake sediment disturbance.

eDNA sample sites will be subjectively chosen in each lake by the collectors who will target weedy littoral areas that appear to provide optimal pike habitat as described by Inskip (1984). This strategy of targeting optimal habitat with a sampling rate of one sample/4.8 surface acres produced an average positive northern pike eDNA detection rate of 82.4% during a recent Kenai Peninsula northern pike eDNA study (Dunker 2016).

Each eDNA sample will consist of a subsurface water grab collected in a sterilized one-liter Nalgene™ bottle. To minimize eDNA contamination risk, we will utilize DNA contamination prevention protocols similar to those described by Laramie et al. (2015) and Carime et al. (2015). Precautions will include sterilization of all sampling equipment using a 50% bleach solution rinse (50% deionized water: 50% household bleach product containing 8.25% sodium hypochlorite), followed by deionized water rinses between all sampling sites. New latex gloves will be donned for each sample collected. When possible, samples will be collected via foot travel along the lake bank. Chest waders will be worn that are sterilized with a bleach solution rinse prior to sampling each lake. If a boat is needed for sampling, we will avoid driving the boat atop or beyond a sample site until the sample is collected. A bleach rinse solution will be used to sterilize the boat hull and it will air dried before launching at each lake. Immediately after collection, eDNA samples will be stored in Whirl-Pak® bags then placed in a cooler with ice for transport.

To test for contamination during the sample collection and filtering, each day eDNA sampling occurs we will collect a travel, field, and lab blank. All blanks will consist of collecting a deionized water sample in a sterile 1-L bottle during specific phases of sample handling. First, a travel blank will be prepared prior to departing for the field and placed in the same container used to transport all samples throughout the day. Second, a deionized water sample will be collected in the field at each lake where sampling occurs using the same equipment used to collect the eDNA samples. Third, a lab blank will be prepared in the same room where the eDNA samples are temporarily stored then filtered.

An effort will be made to filter all eDNA samples within 24 hours of collection at the ADFG limnology lab in Soldotna. We will use a 120V Geotech™ peristaltic pump (Geotech Environmental Equipment, Inc.; Denver, CO) to draw water from the sample bottle through a silicon tube filter assembly that incorporates an inline round PVC filter holder. Filters will be round, 47-mm nitrocellulose mixed ester membrane (Sterlitech Corporation; Kent, WA). Filter pore size will be 1.0 µm. The number of filters required to filter each sample will vary depending on how much organic material is in the sample. All filters will be handled with sterilized metal tweezers. All filters from each unique water sample will be stored into a single sterile 50-ml centrifuge tube then sealed in a Whirl Pak® bag and placed into -20° C storage until processed.

Prior to filtering each eDNA sample, all tweezers and filter pump assemblies will be sterilized in a 50% bleach solution bath for 10-15 minutes followed by two deionized water baths. Before filtering a new sample, the pump and associated work area will be sprayed with a 10% bleach solution and wiped dry. The filter assembly will be reassembled and 0.5 - 1.0 L of deionized water pumped through the assembly as a final rinse. New latex gloves will be worn whenever a new sample is handled.

All eDNA samples will be processed by the U.S. Fish & Wildlife's Conservation Genetics Laboratory (Anchorage, AK) using qPCR assay methods described in Olsen et.al. (2015) and Olsen et. al. (2016). A standard curve will be run for the qPCR assay to help estimate absolute quantity of DNA found in each sample.

Gillnetting surveys will be conducted to aid in assessing northern pike distribution. At each waterbody surveyed at least two gillnets will be fished simultaneously for up to 24 hrs. The gillnets will be made of single-strand monofilament mesh with floating polypropylene hanging line and half-inch lead line and manufactured by Christiansen Net Company. Each net will be 120 ft. long, 6 ft. deep, with six -20 ft. wide panels of variable mesh net (1 each of sequentially attached half-inch, five-eighths-inch, three-quarter-inch, 1-inch, 1½-inch, and 2-inch stretched mesh). The nets will be fished in weedy littoral areas and generally parallel to the shoreline in waters 0.5 to 4.0 meters deep. Nets will be tethered to the shore at one end and a buoy placed on the untethered flagging end of the net to aid in retrieving the net. Owl decoys will be staked near any unattended net to discourage waterfowl from the area. Fish catches will be speciated, enumerated and measured for FL to the nearest mm. Fish of practical size for human consumption will be donated for food or utilized for educational uses. To reduce the potential for gillnets to transport invasive species, all gillnets upon removal will be visually inspected and cleaned of aquatic plant fragments then air dried and/or disinfected with a bleach solution soak and water rinse prior to redeployment in a new water body.

The probability of failing to detect a small population (20 individuals) of northern pike is provided in Appendix 9 (Table 2) under various levels of sampling effort. It is important to note that a positive eDNA detection does not necessarily mean live northern pike are present because non-living DNA sources or false-positives from DNA contamination could account for the detection. Therefore, any lake with a positive eDNA detection will be gillnetted with enough effort that the probability of failing to detect a population of 20 individuals is < 0.10 Only if a

northern pike is physically captured will that waterbody will be included in the TRPL rotenone treatment area.

### **Groundwater Hydrology/Risk Assessment**

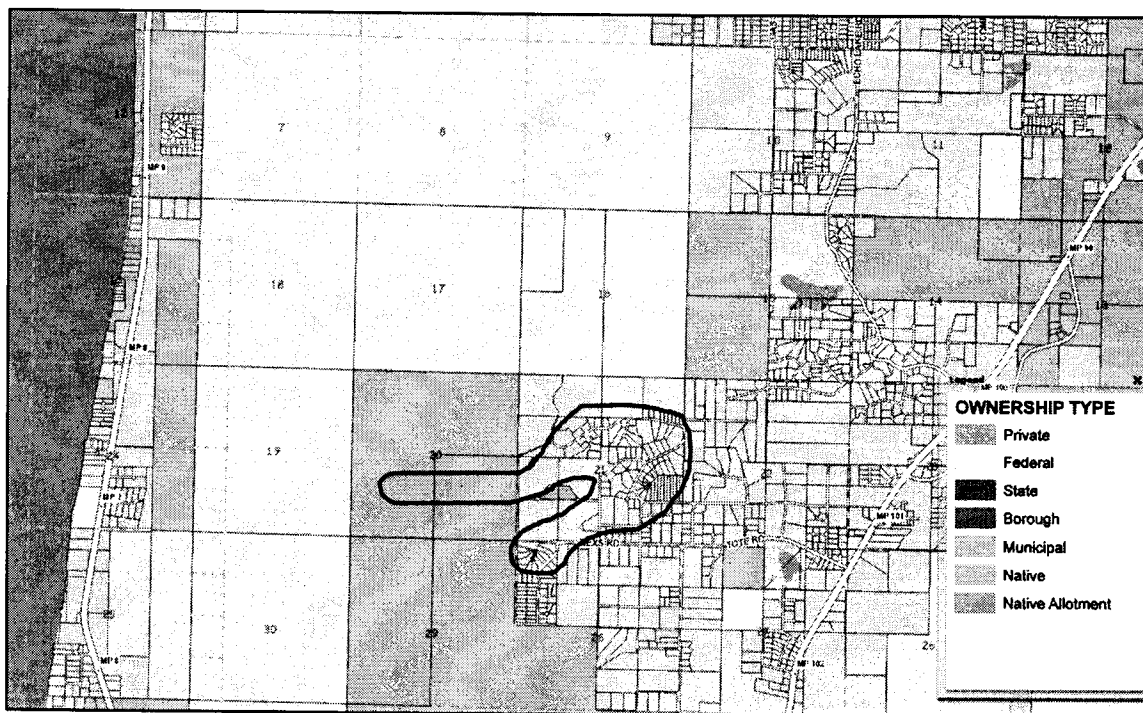
A review of available well log data for the TRPL area was provided by the Alaska Department of Natural Resources (Appendix 10). This review summarizes surface and subsurface hydrology within the TRPL and assesses the risk of rotenone applied to surface waters to drinking water aquifers. Based on available well log data in the TRPL area, well depths are below a clay layer separating a lower aquifer utilized for well water from an uncontained upper aquifer that includes surface waters. The confining clay layer between the two aquifers will largely preclude uncontained surface waters and contaminants from reaching the lower aquifer.

ADF&G collected representative well water samples from six residences in the Soldotna Creek Drainage following rotenone treatments to the Mackey Lake system (2012) and Soldotna Creek (2016). Samples were collected periodically until rotenone fully degraded in the treated waterbodies based on analytic testing. No rotenone or rotenolone (degradation product) was detected in any tested well. In addition, monitoring efforts of wells in conjunction with rotenone treatments in California, Oregon (Finlayson et al. 2001; Finlayson et al. 2014) or Montana (Don Skaar, MFWP, unpublished data) have detected rotenone. Nonetheless, water samples from a private ground water well near each TRPL waterbody will be analyzed for rotenone periodically to verify well water is not affected by the treatment.

### **Public Scoping**

The Department will hold at least one public scoping meeting during 2017 or 2018 to provide stakeholders an opportunity to exchange information with the Department and comment about any issues or concerns they may have with this project. The meeting agenda will discuss the following: 1) background on invasive northern pike in Alaska, 2) why ADFG is concerned about the pike population in the TRPL area and 3) provide information on several Department action alternatives being considered (i.e. no action, long term gillnetting, rotenone treatment (preferred alternative)). The public scoping meeting will be advertised in an ADF&G news release and landowner notices delivered by hand or mail. All land within the TRPL treatment area is under private ownership (Figure 4). In addition to a formal public scoping meeting, the project biologist will conduct door-to-door interviews with all available lakeside residents to provide landowners with project information and to solicit access for treatment related activities.

Periodic courtesy notices will be provided to TRPL landowners and other interested stakeholders to update them on project milestones. An environmental assessment (EA) and ADEC Pesticide Use Permit (PUP) is required for this project and both require public notices and 30-day commenting periods. Comments for the PUP will be directed to an ADEC representative and comments for the EA will be directed to the ADF&G project biologist. Comments directed to the EA will be summarized and addressed in a revision to the EA before submitting the EA to the USFWS for review and consideration of a Finding of No Significant Impact (FONSI).



**Figure 4. Kenai Peninsula Borough map of general land ownership surrounding the TRPL area. The area encircled in red encompasses the general TRPL treatment area.**

### **Pretreatment Northern Pike Removal**

In addition to pretreatment gillnetting surveys during open water to determine northern pike distribution, under-ice gillnetting will occur in all TRPL waters from ice-up to ice-out beginning in the fall of 2017 and ending in the spring of 2018. All under-ice netting will utilize using the same experimental gillnets used for the pike distribution surveys.

The purpose of under-ice gillnetting is to reduce the number of sexually mature northern pike capable of spawning during the spring of 2018 while mitigating netting impacts to non-target wildlife like waterfowl and raptors. Reducing or preventing northern pike spawning success should correspond to a decrease in the abundance of juvenile pike present in the TRPL during the 2018 rotenone treatment. Juvenile northern pike rear in dense aquatic vegetation beds (Inskip 1982) and these habitats are difficult to treat with rotenone due to difficulties with penetrating the pesticide thoroughly in these habitats. A substantial reduction in juvenile northern pike abundance should increase the likelihood of project success.

Under-ice netting was employed for this purpose twice before by ADF&G on the Kenai Peninsula; first in the fall-spring of 2013/2014 at Union Lake, West Mackey Lake, East Mackey Lake and Derks Lake and again during the fall-spring of 2015/2016 at Sevena Lake. Post-netting, no juvenile northern pike were observed or collected following the rotenone treatments at Sevena Lake and Derks Lake suggesting that northern pike reproduction may have been curtailed in these two lakes where netting effort was greatest. The density of gillnets used at Derks Lake and Sevena Lake was 1.4 and 3.5 surface acres/net, respectively (ADFG unpublished data, Soldotna Office). Therefore, our target netting effort for the TRPL will be in that range.



All northern pike of practical size and condition for eating will be either donated for food or used for education purposes.

### **Fish Relocation/Restocking**

If northern pike are not detected in the TRPL treatment area during posttreatment eDNA and gillnetting surveys, all TRPL waters will be restocked with wild threespine sticklebacks collected from a wild southcentral Alaska population. This will restore the only known species of fish native to the TRPL. ADFG has received interest from Stony Brook University (New York) to utilize the stickleback restocking effort as a research opportunity to study adaptive changes that anadromous stickleback populations undergo after establishment in freshwater. ADF&G has agreed to cooperate with Stony Brook to restock the TRPL with an anadromous form of wild threespine stickleback pending approval of the required ADF&G permits. Anadromous threespine sticklebacks are capable of adapting their life history to only freshwater. Similar stocking of anadromous threespine stickleback to establish new freshwater resident populations occurred at Scout Lake (Sterling, Alaska 2010) and Cheney Lake (Anchorage, Alaska 2009). The target number of threespine stickleback to be stocked into the TRPL has yet to be determined and ADF&G will coordinate with Stony Brook University to develop a stocking number goal.

To provide a replacement sport fishery to the TRPL northern pike sport fishery, ADF&G is planning to stock all TRPL waterbodies having some form of public access (i.e. right-of-way, section line easements, etc.) with wild juvenile coho salmon and rainbow trout collected from the Kenai River drainage starting in 2019. Annual target stocking densities will be 50-100 salmonids/surface acre (combination of rainbow trout and coho salmon). The wild fish used for restocking will be collected with minnow traps baited with salmon roe. Fish will be transported from the Kenai River drainage to the TRPL by highway vehicle equipped with an aerated live well.

Stocking of wild salmonids will occur annually for up to five years. After 2023, wild fish stocking may be discontinued and replaced using fish provided by the ADFG Salmon in the Classroom program. It is unlikely wild rainbow trout stocked into the TRPL will result in a self-sustaining population. Stocked wild coho salmon are also not expected to self-sustain in the TRPL. It is assumed the historical rainbow trout population reportedly found in the TRPL, and now extirpated, was maintained by undocumented illegal introductions. It is questionable if suitable rainbow trout spawning habitat exists in the TRPL for self-propagation. Rainbow trout generally require streams with gravel substrate in riffle areas for spawning (Raleigh et. al. 1984) and this habitat is very limited and perhaps nonexistent in the TRPL.

### **Rotenone Treatment Overview**

Eradicating invasive northern pike from the TRPL will be achieved by applying rotenone to the waterbodies with northern pike. Currently, the known northern pike waters in the TRPL consist of six lakes and their tributaries but upcoming fish distribution survey work within a two mile radius of Hope Lake may result in new northern pike populations being identified which will be would expand the TRPL rotenone treatment area.

Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean and pea family including jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America (Ling 2003). People have utilized rotenone for centuries to capture fish for food in areas where these plants are naturally found (Quigley 1956, Bearez 1998, Robertson and Smith-Vaniz 2008). It has been used in fisheries management in North America since the 1930s (Finlayson et al. 2000).

There are several commercial formulations of rotenone available as a piscicide including liquid and powdered formulations. CFT Legumine™ is a liquid product of 5% rotenone with additives that facilitate the emulsification and dispersion of rotenone in water. CFT Legumine™ was selected as the product for this project because of its relative safety to applicators, high dispersal properties, and lower content of petroleum hydrocarbon solvents. CFT Legumine™ was analyzed for ingredients by an independent contractor for the California Fish and Game Department in 2007 (Fisher 2007).

This analysis showed that the primary inert ingredients of CFT Legumine™ is diethylene glycol ethyl ether (a solvent known as DGEE) (61.1%), Fennedefo 99™ - a fatty acid ester mixture (17.1%), N-methyl pyrrolidone - a solvent (9.8%), in addition to some trace volatile organic compounds (VOCs). None of the compounds identified are considered persistent in the environment nor will they bioaccumulate. They are rapidly biodegraded, hydrolyzed and/or degraded by sunlight.

Rotenone acts by inhibiting oxygen transfer needed for cellular respiration. The biochemical process affected by rotenone takes place within the cell mitochondria and involves blocking electron transport by inhibiting NADH-ubiquinone reductase, resulting in the uncoupling of the metabolic pathway oxidative phosphorylation (Singer and Ramsay 1994, USEPA 2007). Fish die from tissue anoxia due to cardiac and neurological failure (Ling 2003). It is effective at low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Typically, non-target organisms that do not have this rapid absorption route are not negatively affected at the concentrations necessary to kill fish (Finlayson 2000, Ling 2003, NPS 2006, USEPA 2007, MFW&P 2008).

The timing of the TRPL treatment is planned to start just prior to ice up during October 2018. Doing so will greatly slow the natural degradation of rotenone caused by sunlight and warm temperatures so there will be little chance northern pike will avoid exposure to the pesticide. Previous cold weather rotenone treatments in southcentral Alaska lakes resulted in the rotenone persisting for 3-8 months. This contrasts with a 2016 warm water rotenone treatment (late June) at Sevena Lake (Soldotna Creek drainage) wherein the rotenone degraded fully within 10 days or less of application. The TRL treatment timing is subject to change if conditions of extreme high water, unfavorable weather conditions, or other factors are present that could compromise the project's success, cause a large increase in project costs, or compromise safety.

Specific treatment components are divided into steps and described in this section. Some of these steps listed will likely evolve and undergo revisions as this project moves through the public scoping and permitting processes or if new information is garnered from upcoming field work. These steps are as follows:

- 1) Bioassays
- 2) Product calculations
- 3) Rotenone treatment application details
- 4) Posttreatment monitoring

Appendix 11 provides a detailed list of the expected staff and equipment required to complete a single treatment of the TRPL.

### Bioassays

Bioassays are an important tool for evaluating acute toxicity (Saila 1954). Bioassays using live fish are needed to determine the minimum effective dose (MED) of rotenone to use in the TRPL. The bioassays will occur just prior to the rotenone treatment. The rotenone product (CFT Legumine™) will be tested using similar environmental conditions (sunlight, temperature and water chemistry) expected during the actual treatment

Because it is very difficult to collect northern pike small enough to be suitable bioassays utilizing aquaria, juvenile coho salmon collected from the Kenai River drainage will be used as a surrogate species to test for the MED. Coho salmon rotenone tolerance (24-h  $LC_{50}$  = 3.6 ppb rotenone) is similar to northern pike tolerance (24-h  $LC_{50}$  = 2.2 ppb rotenone) (Markings and Bills 1976). Bioassays will evaluate the fate of fish at predetermined concentrations of rotenone. For each target concentration, at least four coho salmon will be placed in a white plastic five gallon bucket filled with 20 liters of TRPL site water then dosed with enough rotenone to attain the target rotenone concentration. A control bioassay will not be dosed with any rotenone. All fish weights will be recorded prior to placement in the buckets. Each bioassay will avoid loading the buckets at a rate greater than 1 gram of fish per liter (Brian Finlayson of California Department of Fish and Game, personal communication).

The bioassays will be conducted for up to eight hours, if necessary, and a MED determined. The criterion for selection of an MED for the TRPL treatments is the rotenone concentration that kills all the fish within eight hours (Finlayson et al. 2010). Depending on the pH, turbidity, temperature, sunlight intensity, water depth, organic loads and other variables, a minimum rotenone concentration should be at least twice the observed MED determined by the bioassays (Finlayson et al. 2014). Eight hour bioassays will be conducted with the following rotenone concentrations: 6.25 ppb, 12.5ppb, 25.0ppb, 50.0 ppb, 100.0ppb and 200.0 ppb.

Table 1 provides a reference for how much CFT Legumine™ stock solution is needed to attain various bioassay rotenone concentrations (Finlayson et al. 2010).

**Table 1. Amount (in ml) of 50ppm rotenone stock solution (1 ml of CFT Legumine™ mixed in 1 liter of water) needed to achieve various concentrations of active rotenone in 20 liters of bioassay water.**

Rotenone concentration in ppb	0	12.5	25	50	100	200
ml of stock solution required	0	5	10	20	40	80

## Calculating Amount of Product Needed for Lake Treatments

The actual volume (gallons) of liquid CFT Legumine required to treat the TRPL will be determined by:

- 1) volume estimates for individual lakes,
- 2) consideration of treatment site/environmental conditions that could reduce the potency and mixing ability of the rotenone (i.e. organic load, weed beds, substrate type, etc.)
- 3) bioassay results to determine the MED

An example calculation is provided below that calculates the amount of liquid CFT Legumine™ required to treat a given volume of water at a specified rotenone concentration.

### CFT Legumine™ Example

The CFT Legumine™ specimen label (Appendix 12) indicates adding 1 gallon of CFT Legumine™ to 1 acre-foot of water will create a rotenone concentration of 0.15 ppm (or 150 ppb). Therefore, adding 0.00667 gallons of CFT Legumine™ (1/150) to one acre-foot of water produces a rotenone concentration of 1.0 ppb.

Therefore,

$$G_p = R_c \times A_e \times 0.006667 \frac{(\text{gallons of CFT Legumine})}{\text{acrefeet of water}}$$

where,

$G_p$  = CFT legumine required to achieve  $R_c$  (in gallons)

$R_c$  = Rotenone concentration target or the waterbody (in ppb)

$A_e$  = Volume estimate for the waterbody (in acrefeet)

So a waterbody estimated to contain 100 acre-feet and having a target rotenone concentration of 40 ppb would require 26.7 gallons of CFT Legumine™

$$G_p = 40\text{ppb} \times 100\text{ acrefeet} \times 0.006667 \frac{\text{gallons}}{\text{acrefeet}} = 26.7 \text{ gallons of CFT Legumine™}$$

## Treatment Details

Boat application

TRPL waters will be treated with CFT Legumine™ in the fall of 2018 just prior to freeze up. The treatment will consist of applicators using outboard boats and backpack sprayers. Lakes will be divided into two or more treatment sections of similar size, with the water volume of each section estimated using GIS software and bathymetric (x,y and z) data (Appendix 1-7). The lake sections will be identified using tethered buoys placed along adjacent lake section boundaries. Treating the lakes in sections helps ensure the rotenone is dispersed more evenly. Because all the lakes are relatively shallow (<32 feet), the CFT Legumine™ will only be applied to the lake

surface. The specific gravity of CFT Legumine™ is 9% higher than water so the product will sink and help promote dispersion into deeper areas (Finlayson 2000).

In each lake section the application boat(s) will first apply the product along the perimeter then continue to make application swaths in increasingly smaller concentric circles towards the center of the section. Once a section is treated the boat applicators will continue on to an adjacent lake section and repeat the process until all sections are completed. Application swath width should not exceed 30 feet as suggested by Randall (2006). Boat speed will be manipulated during the application in an attempt to apply the CFT Legumine™ as evenly as possible with respect to the water depth being traversed. For instance, the application boat will slow over deeper water and speed up over shallower waters to help control the rate of application.

A GPS/chart plotter mounted on the boat console will allow boat applicators to visually track their application swaths, water depth, and boat speed to ensure no large gaps in coverage occur and boat speed is appropriately adjusted. A spreadsheet developed for calculating the preferred boat speed for a given water depth and pesticide pumping rate will be used to print boat speed reference charts that boat applicators can use for quick reference in the field. One chart will be for a slow pesticide pump rate (0.25 gallons of CFT Legumine™/minute) for waters < five feet in depth and the other for 1.0 gallons of CFT Legumine™/minute for water depths ≥ five feet. The total amount of rotenone applied to each section will be recorded by the project leader who will coordinate the entire rotenone application. Once an entire lake is treated, the application boat(s) will be driven randomly across the lake in a manner that creates large boat wakes to help mix the rotenone.

A practical method to calibrate or test the discharge rate of the CFT Legumine™ in the field is to record the time it takes to pump a known volume of CFT Legumine™. By adjusting the variable speed controller of the 12-volt pesticide pump, an applicator can attain a desired discharge rate through trial and error. Conducting such testing prior to treatment using a safe surrogate liquid with similar viscosity as CFT Legumine (e.g. cooking oil) is useful. Adding marks on the 12-volt pesticide pump variable speed controller knob to identify settings for attaining target pesticide discharge rates (i.e. 0.25 gallons/minute or 1.0 gallons/minute) will help boat applicators quickly make gross adjustments to the pesticide discharge rate for water depths < five feet or ≥ five feet.

The boat application pump apparatus will consist of a portable gas operated trash pump mounted on the floor of a boat that draws lake water from a transom mounted 2-inch diameter intake line and discharges the water back into the lake through a 1.5-inch diameter discharge line mounted near the bow of the boat. A 12-volt powered pesticide pump with a variable speed controller draws CFT Legumine™ directly from the product container through a 3/8-inch diameter intake hose and injects it into the intake line of the trash pump. This premixes the CFT Legumine™ with lake water before it is discharged back into the lake as required by the product label.

#### Backpack application

Backpack spray applicators will apply CFT Legumine™ to areas difficult to treat by the boat applicators such as shallow weedy shorelines or in the small streams linking the lakes. Backpack sprayers have a four gallon tank capacity which requires adding 1.3 cups of CFT Legumine™ to four gallons of water (Finlayson et. al. 2010). Dye may be added to the mixture (about one



tablespoon/tank), if desired, to aid in visually identifying areas that have been sprayed to prevent under or over treatment.

### **Rotenone Deactivation**

The rotenone applied to the TRPL will be allowed to naturally degrade and no deactivation using potassium permanganate is planned. Based on recent ADF&G projects where rotenone was applied during freeze-up, complete deactivation may require 3-8 months.

## **POST TREATMENT**

### **Fish Disposal**

Dead fish could begin to surface within hours of starting a rotenone treatment (Bradbury 1986). ADFG will retrieve dead fish in the TRPL as practical to reduce potential odor and nuisance issues. Carcass collections will continue regularly in the TRPL until ice-up or until carcasses become too scarce to justify the effort. Unrecoverable dead fish should help stimulate plankton growth and aid in the recovery of zooplankton and aquatic insect populations (WDFW 2002).

### **Treatment Success Evaluation**

The success of the treatment will be evaluated by multiple methods. The first method will be observing the responses of caged sentinel fish during and immediately following the treatment. Caged fish will be placed at various locations and depths within TRPL waterbodies, including areas likely to have poor water mixing. If all sentinel fish die within one day of the treatment, likely the treatment was sufficient to kill the northern pike population. If sentinel fish survive in some area of a lake, re-treating that area immediately with enough rotenone to kill the sentinel fish is warranted.

Additional treatment success evaluation will be conducted using posttreatment gillnet surveys and eDNA sampling. Gillnet effort (total days of gillnet effort) will be determined by each lake's surface acreage and the desired probability of not detecting a small northern pike population of just four individuals. Details on calculating the probability of not detecting a small surviving northern pike population using gillnets is found in Appendix 9. Because of the relatively small size of waterbodies found in the TRPL area, it is reasonable to strive for a < 1% probability of not detecting a small surviving pike population based upon on assumptions and calculations described in Appendix 9.

Gillnet surveys will be conducted under the ice to reduce incidental take of non-target animals and conflicts with water recreationists. Nets will be set shortly after the rotenone treatment and just as the lakes begin to freeze over. One caveat of long-term under ice netting is the nets will freeze into the ice and cannot be removed or thoroughly inspected until ice-out. A northern pike caught long before removal at ice-out may decompose and be lost and not detected. Dunker (2016) conducted a northern pike carcass retention trial and reported that it took 49 days before the first of twelve gillnet-entangled northern pike carcasses to decompose enough to drop out of a gillnet that was suspended under the ice at Derks Lake (Kenai Peninsula). The TRPL waters are expected to have similar under-ice environmental conditions as Derks Lakes which is located about ten miles away. Therefore when nets used for the TRPL treatment success evaluation and fished under the ice for approximately 6-7 months are pulled in the spring observed catches will represent just fish captured in the last 49 days.. Under such a scenario, the post treatment netting

evaluation could be considered an extension of the rotenone treatment in that any surviving individuals will be captured and killed with high probability at some point prior to ice-out. The gillnets and placement strategies used for the TRPL treatment evaluation will be identical to that describe for the pretreatment northern pike distribution surveys.

In addition to gillnetting, a minimum of five minnow traps baited with salmon eggs will be fished continuously for 24 hours in each treated lake to assess if small/juvenile fish survived the treatment. The minnow trapping survey will occur shortly after the rotenone in the TRPL waterbodies naturally detoxifies which will likely occur no later than June, 2019.

Northern pike eDNA sampling will be conducted posttreatment at each TRPL waterbody during mid-summer of 2019 using the same collection and processing methods described earlier for the pretreatment northern pike distribution surveys. The minimum number of eDNA samples to collect from each lake will be ten. For the largest TRPL waterbody (Hope Lake = 27 acres) this sampling effort equates to one sample for every 2.7 surface acres (27 acres/10 samples = 2.7). For comparison, a recent study using eDNA methodology to detect northern pike in the Soldotna Creek drainage which sampled four lakes at an average rate of one sample for every 11.4 surface acres which yielded an 82% positive detection rate (N=79) despite the pike population being reduced significantly reduced by mechanical removal prior to sampling (Dunker et.al. 2016).

It is important to note that a positive eDNA detection does not necessarily mean live northern pike are present because historical and/or non-living DNA sources could account for the DNA presence. Therefore, any TRPL lake with a positive eDNA detection will be resampled again at least 70 days later. This delay in resampling is supported by northern pike DNA persistence time being < 70 days in Alaska lakes during the summer (Dunker et al. 2016). An increasing eDNA detection rate over time would also suggest the potential for survivors. If that occurs, additional gillnet surveys will be conducted in an attempt to corroborate the positive eDNA detection(s). If live northern pike are detected, a second rotenone treatment or intensive gillnetting effort will be conducted on that waterbody as soon as practical.

## **Water Monitoring**

### *Rotenone Sampling*

Water and sediment samples will be collected periodically from TRPL waters. Samples will be analyzed for rotenone and rotenolone content and used to assess rotenone persistence, mixing and degradation rate.

Rotenolone is the lone toxic degradation product of rotenone and is about  $1/10^{\text{th}}$  as toxic. At each lake, pretreatment control samples will be collected from the following locations: 1) 0.5 meter below the lake surface, 2) a ground water well source and 3) nearshore lake sediment sample. The pretreatment samples will be collected about one week prior to the start of the rotenone treatment. Posttreatment, water samples will be collected periodically from each lake at the following locations: 1) 0.5 below the lake's surface near the center of the lake, 2) (within 2 meters of the lake's greatest depth), 3) a ground water well source and 4) nearshore lake sediment sample. All sample sites will be recorded with a handheld GPS to facilitate site repeatability for subsequent sampling events.

The frequency of posttreatment water sampling will be determined by the observed degradation rate of rotenone but will likely approximate a monthly or bimonthly sampling schedule. The first



post-treatment water and sediment samples will be collected about 24 hours after the rotenone is applied to capture near peak concentrations. Sampling will continue until rotenone is no longer present (defined as  $< 2.0\text{ppb}$ ), at each waterbody. Posttreatment sediment samples will be collected less frequently than the water samples, this is a financial consideration as sediment bound rotenone can persist longer in the environment so sampling less frequently will extend sampling funds longer. The sediment sampling schedule will be at the discretion of the project leader.

Deep lake water samples will be collected using a Kemmerer sampler and shallow lake water samples will be collected either by submerging a collection bottle by hand or with a Kemmerer sampler. Well water will be collected by hand by holding a collection bottle below a spigot after it has discharged cold water for at least one minute. Sediment samples will be collected using a clean metal trowel to extract sediment from nearshore areas in  $< .5$  meters of water. The size of each water and sediment sample is unknown at this time and will be determined by the recommendation of the yet-to-be contracted lab that will analyze them. All samples will be collected in sterilized amber glass bottles, immediately chilled on ice and expressed shipped to a contracted laboratory within 24 hours of collection accompanied by chain-of-custody documentation.

#### *Water Quality Sampling*

Posttreatment water quality data will be collected from all TRPL waters on a monthly basis for a full year post treatment as described earlier.

## **DATA COLLECTION**

### **Biological Data**

All fish captured in gillnets and minnow traps will be counted and identified to species. The fork lengths (FL; tip of nose of fork of tail) of all captured fish will be measured and recorded to the nearest millimeter. For each sampling event we will also record the date, collector initials, waterbody name, waypoint (location) and set/pull times of the gear. All data will be recorded in the field in a Rite-in-the Rain™ notebook.

### **Water Quality and Stream Discharge Data**

All water quality (depth, pH, Specific conductivity, DO, turbidity and temperature), waypoint (location), waterbody name, date/time, general weather conditions and collectors initials will be recorded in a Rite-in-the Rain™ notebook. Stream discharge data will be recorded in the field on Rite-in-the-Rain paper forms.

### **eDNA Sampling and Rotenone Monitoring Data**

Sampling data collected during eDNA surveys and rotenone monitoring will be recorded on each sample bottle's label and will include: date/time, waterbody name, waypoint (location), water temperature, collector initials, and unique sample identification (date -waterbody name -sample number)



## DATA REDUCTION

Data recorded in the field in Rite-in-the-Rain notebooks/paper forms and labels of sample bottles will be entered into Microsoft<sup>TM</sup> Excel data files at the Soldotna ADF&G office. All Excel files will be converted to .csv format and electronically stored in a manner that allows public access to the electronic data per NOAA funding requirements (i.e. Alaska Sustainable Salmon Fund).

## SAFETY

There are safety plans for multiple aspects of this project which are located in Appendix 13. Alaska Department of Environmental Conservation pesticide signage and storage requirements are found in Appendix 14 and 15 respectively. The Safety Data Sheet for CFT Legumine is found in Appendix 16.

## PERSONNEL DUTIES

**Project leader:** Rob Massengill (FBII) and Kristine Dunker (FBIII) will be co-project leaders and will oversee all aspects of the treatment to include: fulfilling permitting requirements, facilitating public scoping, developing the treatment plan, reporting, coordinating treatment logistics, project budgeting and staffing, providing staff training, ensuring all safety requirements are met and overseeing all treatment and monitoring related tasks. This position will work with the Area Sport Fish Manager to address any media requests. This position will also be the primary contact for reporting any incidents and will adhere to the incident chain-of-command found in Appendix 13. Project leaders must be currently certified as an aquatic pesticide applicator for the State of Alaska and have successfully completed a four and a half day training course on rotenone and antimycin use in fish management.

**Outboard boat applicators:** A minimum of four people will be divided into two boat crews to apply CFT Legumine<sup>TM</sup> from outboard boats. Each boat will include a boat driver and at least one person to operate the pumping system that mixes and applies the rotenone mixture. One person will be assigned as team leader for all the boat applicators. This person will be most familiar with the application equipment and procedures and can serve to train others in proper boat application operation, oversee boat crew safety, ensure quality control of the boat application treatments and be responsible for the setup of boat application equipment including calibration of the pesticide pumping apparatuses.

**Backpack applicators:** at least two backpack applicators will be needed for the TRPL rotenone treatment. One person will be assigned as team leader for the backpack applicators. This person will be familiar with the equipment and application procedures and can serve to train others in the backpack application details such as proper application techniques, backpack sprayer maintenance and cleaning.

**Sentinel fish monitoring and dead fish removal:** at least two people will collect dead and dying fish in the TRPL area. This team will also place and monitor caged sentinel fish during the treatment.

**Loading, equipment maintenance, cleanup:** one or two people will be onsite to help troubleshoot equipment issues, load rotenone on boats by hand or with a bobcat and may also assist with cleaning of empty rotenone containers.

**Communication/media contact:** at least sport fish manager will be assigned as a contact for media or public interaction during the treatment

## REPORTING

This project will be reported in an ADF&G Special Publication following the completion of one year of post-treatment monitoring. A first draft of the report will be available in the winter of 2020.

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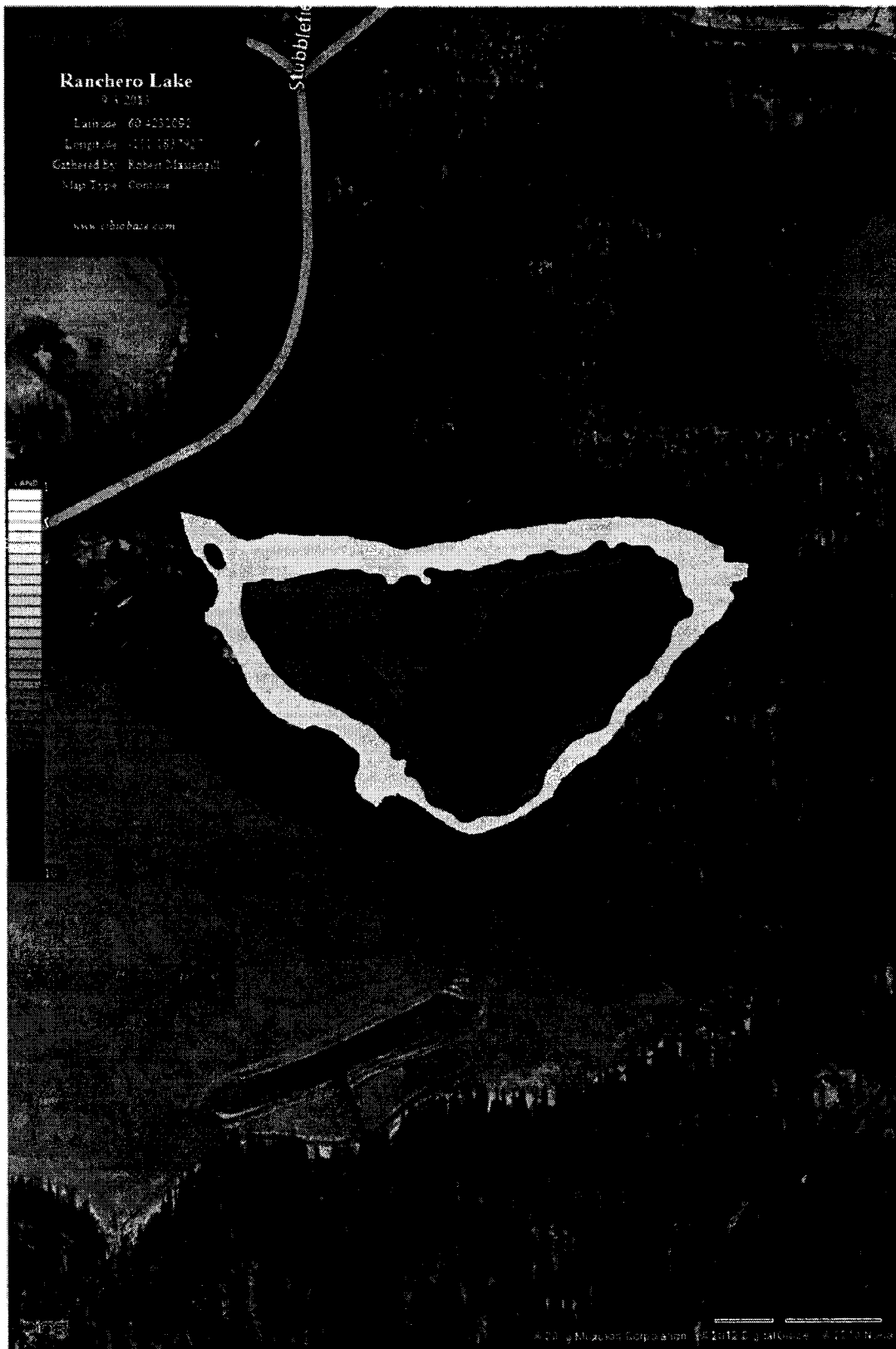
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Appendix 1. Hope Lake bathymetric map

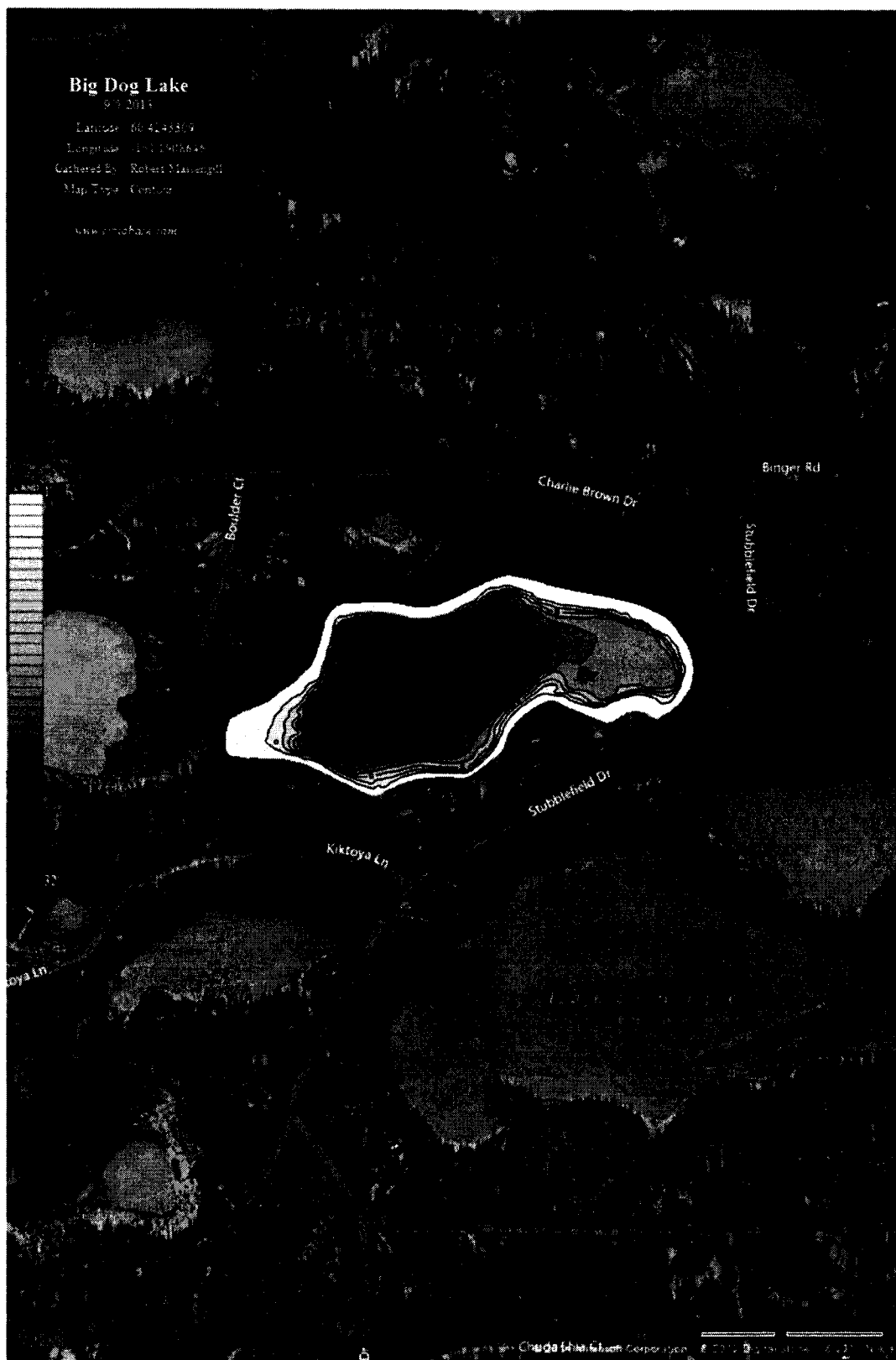




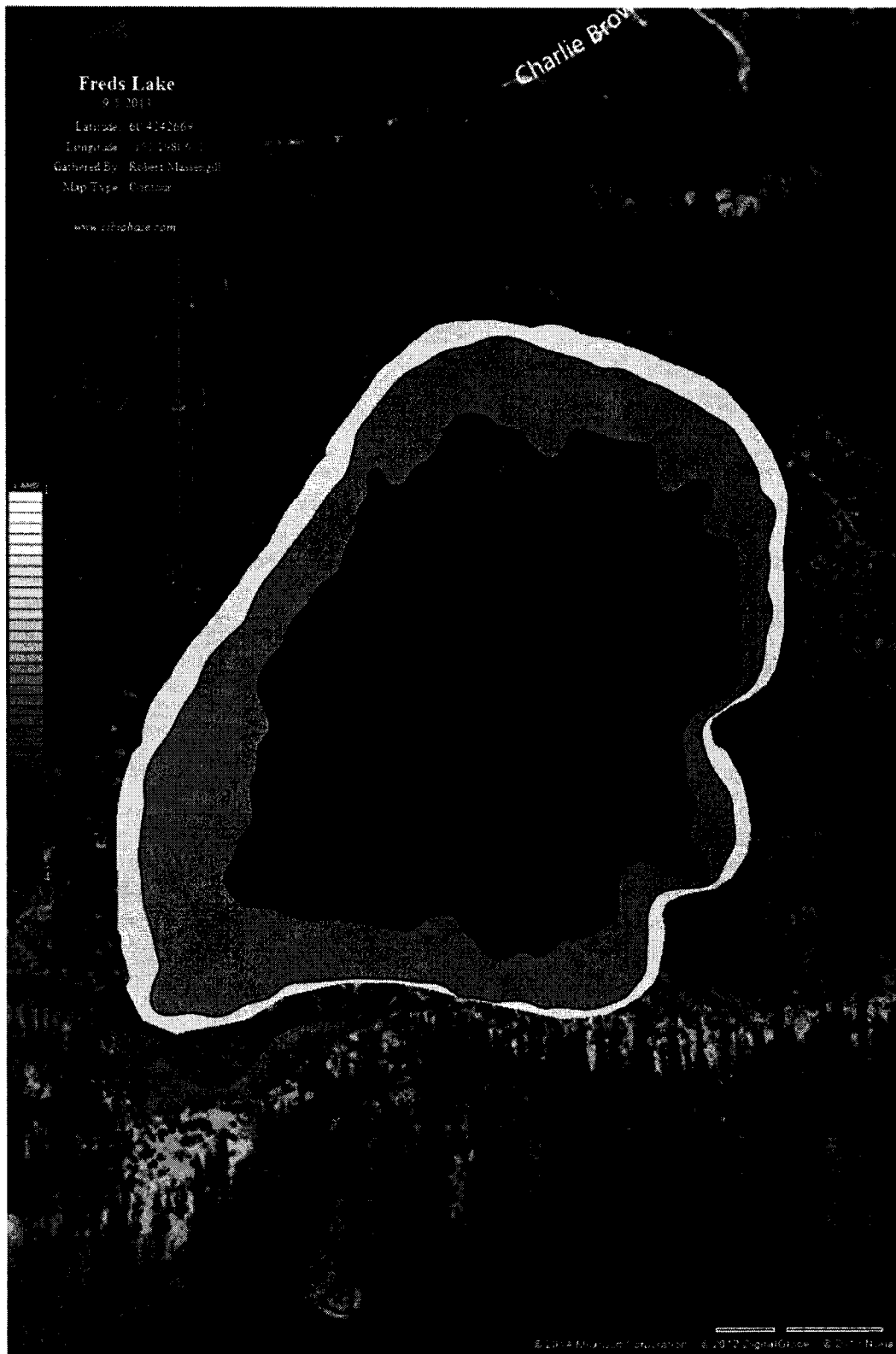
## Appendix 2. Ranchero Lake bathymetric map



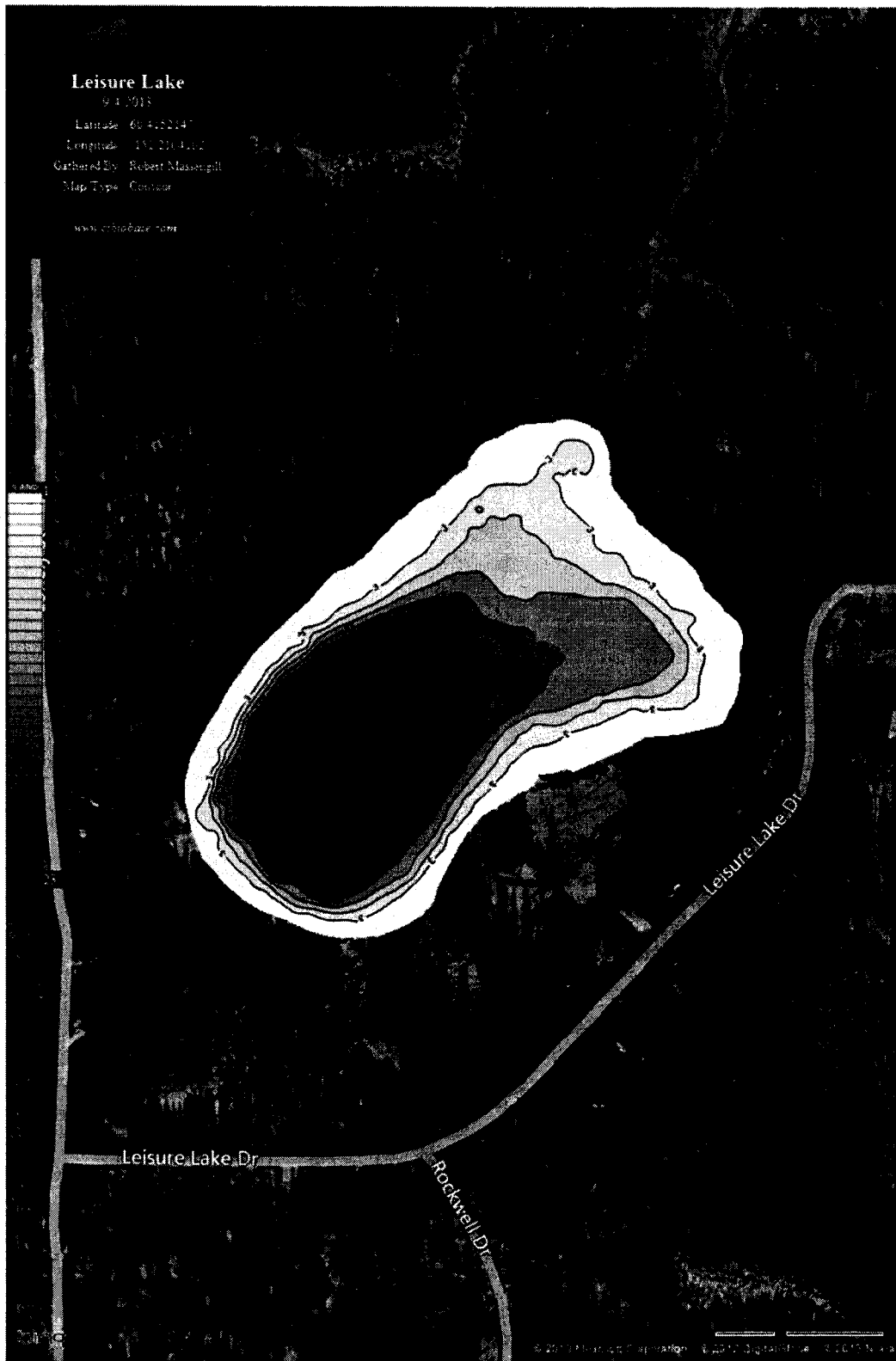
**Appendix 3. Crystal Lake bathymetric map (also known as Leaf Lake or Big Dog Lake)**



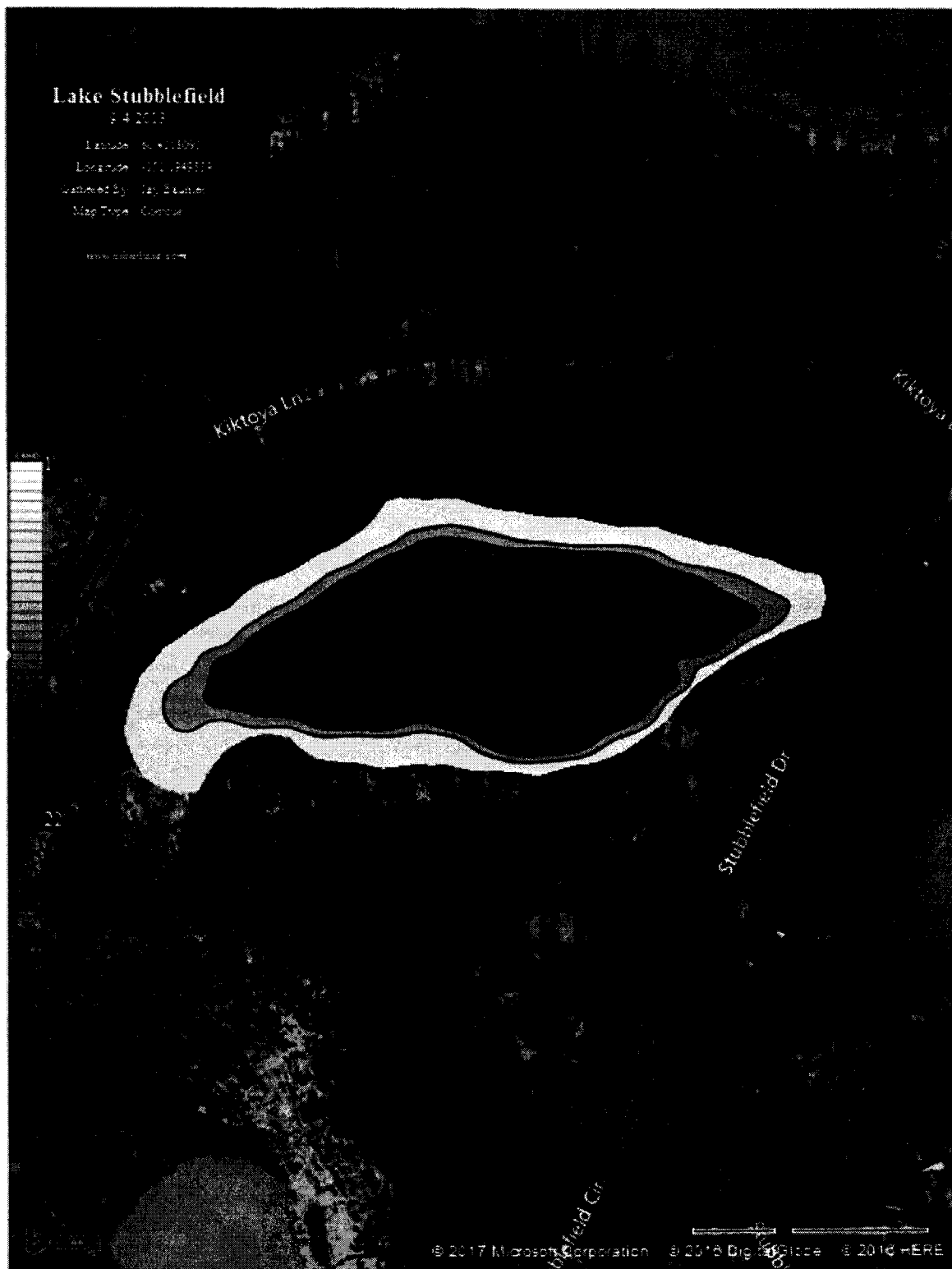
#### Appendix 4. Fred's Lake bathymetric map



## Appendix 5. Leisure Lake bathymetric map



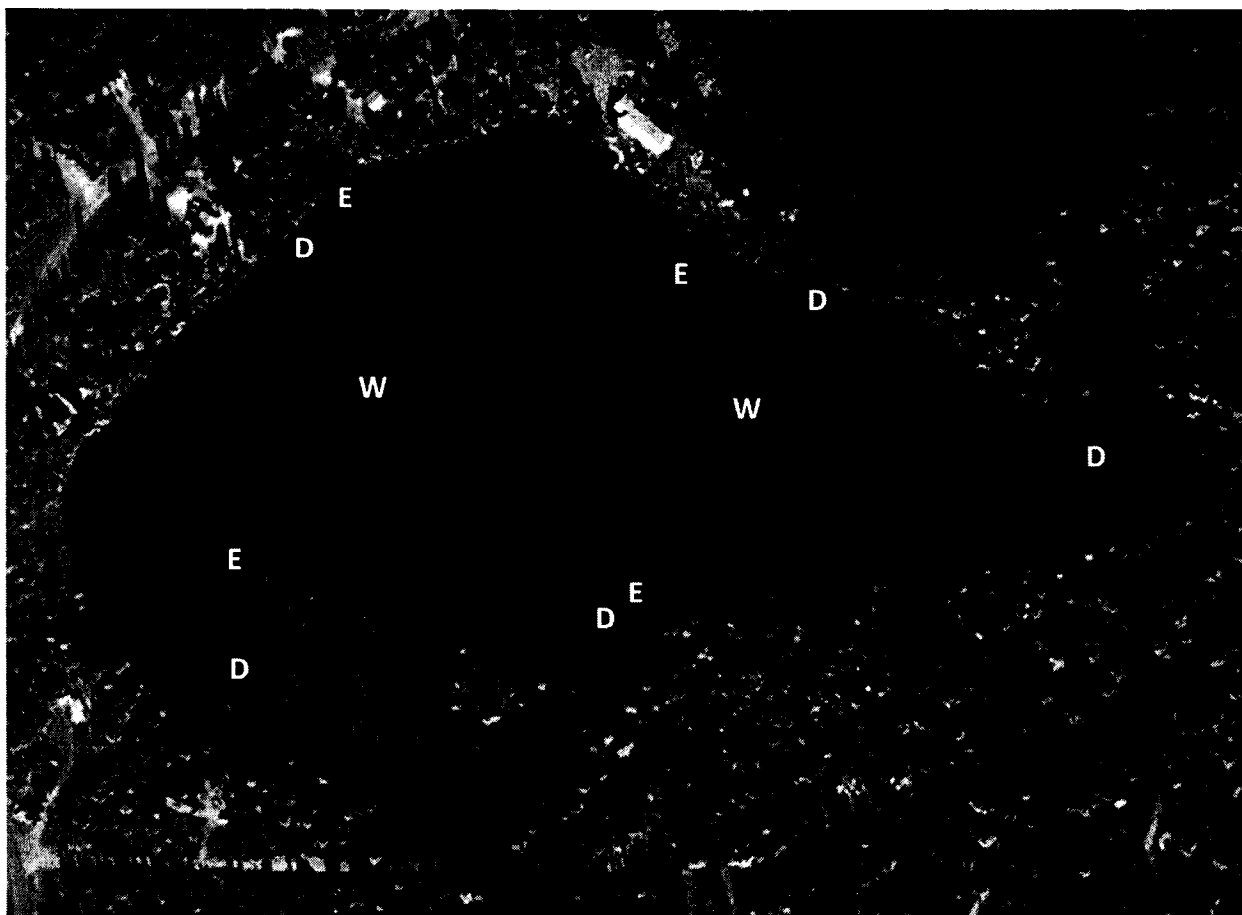
**Appendix 6. CC Lake bathymetric map (this map will be revised in 2017)**



**Appendix 7. Surface acres, maximum depth (m) and volume of lakes in the TRPL area.**

<b>Waterbody</b>	<b>Surface Acres</b>	<b>Max Depth in Meters</b>	<b>Volume (Acre feet)</b>
Hope Lake	26.9	3.81	411.7
Ranchero Lake	7.7	3.00	41.6
Leaf/Crystal L./Big Dog Lake	16.7	9.80	276.4
Fred's Lake	6.1	1.20	6.1
CC Lake	4.4	5.80	33.5
Leisure Lake	11.1	2.87	123.2
<b>Total</b>	<b>72.9</b>		<b>892.4</b>

**Appendix 8. Hope Lake aquatic invertebrate sampling sites (W = Wisconsin net, D = D-Net and E = Ekman Dredge).**



## Appendix 9. Calculating the probability of detecting northern pike with gillnetting efforts.

Between 2005 and 2010, ADF&G conducted 12 removal experiments with northern pike populations on the Kenai Peninsula using similar sampling methods. Data collected from these experiments included catch  $C_{ij}$  and effort  $E_{ij}$  (in units of net-hours per surface acre) for sample  $i$  ( $i = 1, \dots, s$ ) and experiment  $j$  ( $j = 1, \dots, 12$ ). Populations are assumed to be closed except for fish caught and the fishing is assumed to represent a Poisson process with a constant probability of capture for all individuals. Data was analyzed using a hierarchical version of Leslie's regression method (Seber 1982):

$$CPUE_{ij} = K_j N_j - K_j C_{ij}^*$$

where:

$$CPUE_{ij} = C_{ij} / E_{ij}$$

$$C_{ij}^* = \sum_{k=1}^{i-1} C_{kj} \text{ for } (i \text{ in } 2, \dots, s+1) \text{ with } C_{1j}^* = 0$$

$N_j$  = the initial population size in experiment  $j$

$K_j$  = average probability that a fish is captured with one unit of effort during experiment  $j$ ,

The probabilities of capture for each experiment are assumed to come from a common distribution:

$$K_j \sim \text{beta}(a, b)$$

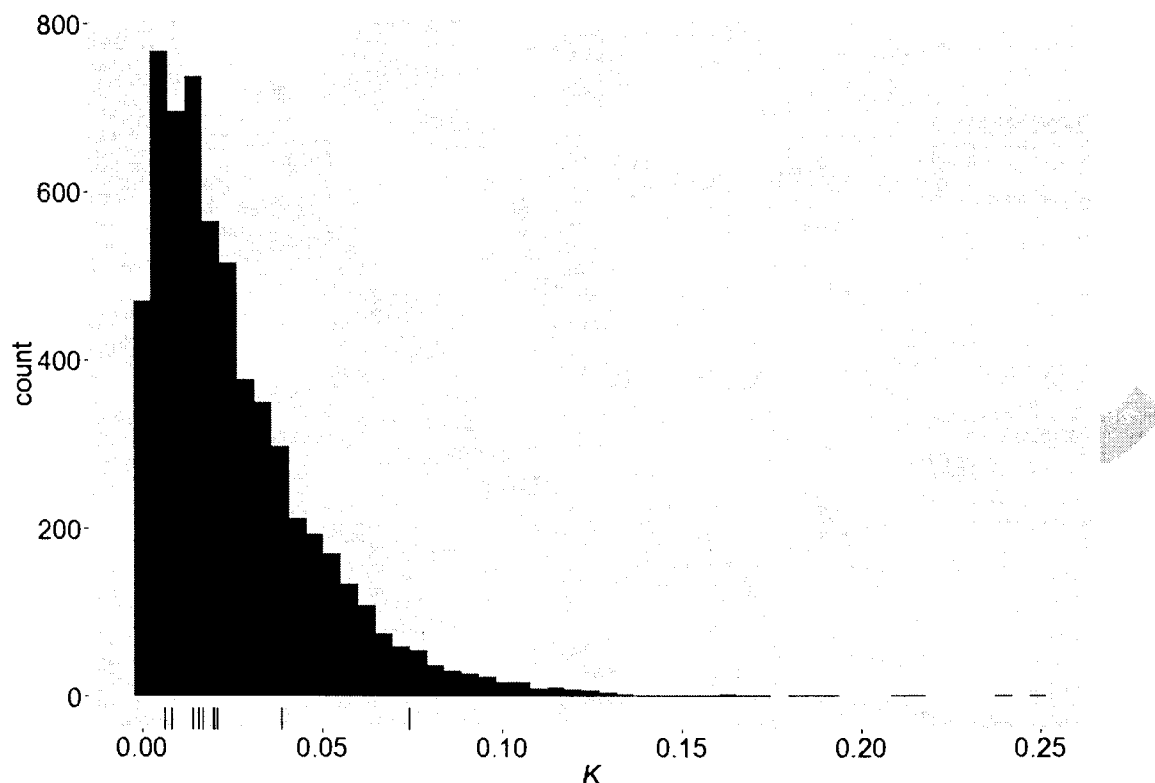
The analysis was conducted using the RJAGS package (Plummer 2013) within R (R Core Team 2016). Non-informative priors were used for all parameters. Although Leslie's method is typically used to estimate the initial population size our interest was in the posterior and predictive distributions of  $K$  for the purpose of estimating the probability of detecting small pike populations in future removal experiments.

Percentiles from the predictive distribution for the value of  $K$  in a new removal experiment are shown in Table 1 and the predictive distribution is shown in Figure 1.

**Table 1: Percentiles from the predictive distribution of  $K$ .**

Percentile	predicted $K$
5%	0.001
10%	0.003
median	0.019
90%	0.055
95%	0.073





**Figure 1:** Prediction distribution for  $K$ , the average probability a fish is captured in a new removal experiment with one unit of effort. Tick marks along the  $x$ -axis show the median values for  $K_p$ , the average probability a fish is captured with one unit of effort in each of the previous removal experiments.

The probability of failing to detect a population of pike of size  $N$  using gillnetting is given by:

$$D_p = \exp(-KE)^N$$

Likely values of  $K$  can be chosen from the percentiles in Table 1, values of effort ( $E$ ) are based on logistical considerations and values of  $N$  are based on the population size we are attempting to detect.

Detection probability is of interest in two situations. Pretreatment, lakes in close proximity to known pike lakes will be netted and sampled for eDNA to determine if additional lakes require rotenone treatment. In this situation we assume the median value of the prediction for  $K$  as netting will be conducted in open waters using similar methods as used during previous removal experiments. Our interest is in detecting a pike population of 20 individuals as populations as small as 25 individuals have been previously located in other Kenai Peninsula lakes (R. Massengill, personal communication). The probability of failing to detect a pike population of 20 individuals using various levels of netting effort is given in Table 2. In practice, each lake will also be sampled for pike eDNA. When at least one eDNA sample is collected for every 4.8 surface acres, the estimated probability of detecting pike eDNA in each sample was

## Appendix 9. page 3 of 3

**Table 2: Probability of failing to detect a population of 20 pike with various levels of netting effort.**

Hours fished	Net Density (nets per surface acre)				
	0.1	0.25	0.5	1	2
6	0.793	0.629	0.313	0.098	0.010
24	0.395	0.156	0.010	0.000	0.000

demonstrated to be 0.824 (Dunker et. al. 2016). The probability of both methods failing to detect a pike population, assuming one eDNA sample<sup>1</sup> and independence of the two techniques is shown in Table 3.

**Table 3: Probability of failing to detect a population of 20 pike with various levels of netting effort and eDNA sampling (minimum of one sample/4.8 surface acres).**

Hours fished	Net Density (nets per surface acre)				
	0.1	0.25	0.5	1	2
6	0.140	0.111	0.055	0.017	0.002
24	0.070	0.027	0.002	0.000	0.000

Post-treatment, rotenone treated lakes will monitored with gillnets placed under the ice to validate treatment success. In this situation, the 10<sup>th</sup> percentile of the predictive distribution for *K* is used because netting will occur under the ice and capture probabilities may be reduced from those experience during open water. Our interest is in detecting a population of only 4 pike. The probability of failing to detect a pike population of 4 individuals with various levels of netting effort is given in Table 4. Post-treatment sampling for eDNA will also occur although detection probabilities for eDNA are unknown with extremely small populations.

**Table 4: Probability of failing to detect a population of 4 pike with various levels of netting effort.**

Months fished	Net Density (nets per surface acre)	
	0.2	0.5
1	0.159	0.010
2	0.025	0.000
3	0.004	0.000
4	0.001	0.000
5	0.000	0.000
6	0.000	0.000

<sup>1</sup> Probabilities will be lower than shown in table 3 in lakes where multiple samples are collected.

## Appendix 10. Summary of the hydrology in the TPRL.

Page 1 of 2.



# MEMORANDUM

Department of Natural Resources

STATE OF ALASKA  
Office of the Commissioner

TO: Robert Massengill  
Fishery Biologist II

DATE: 4/6/17

TELEPHONE: 465-5341

FROM: Terry Schwarz  
Hydrologist II

SUBJECT: Hydrologic condition in the  
Tote Lakes area, Kenai AK

The Alaska Department of Fish and Game (ADFG) is planning on applying rotenone in late 2018 to Leisure, CC, Hope, Ranchero, Leaf/Crystal, and Fred's Lakes (see figure 1) collectively known as the Tote Road Lakes, on the Kenai Peninsula in an effort to eradicate invasive Pike. To ensure that this application will not harm adjacent surface and ground water resources, ADFG Fishery Biologist, Robert Massengill, requested a review of the surface and groundwater condition near the Tote Road Lakes. Included in this review are a summary of local water rights, regional geologic structure, local ground wells stratigraphy and surficial topography.

As search of the Alaska Department of Natural Resources (ADNR) Water Right and Temporary Water Use Authorizations database <sup>1</sup> by Meridian, Township, Range (Seward Meridian, Township 4 North, Range 11 West) yielded only three water rights and no temporary water use authorizations. Of the three, two are certificated (LAS 22274 and 4492) and one is permit issued (LAS 30090) and all of them are subsurface wells. Only the two certificated wells have permitted amounts, LAS 4492 is certified for 500 gallons a day year round and the other is certified for 500 gallons per day year round and another 500 gallons May to October. Again, only the certified water rights reported well depth, LAS 4492 at 120 feet and LAS 22274 at 112 feet.

The surficial geologic setting of Lower Kenai River region can be characterized as series of glacial outwash plain of mostly unconsolidated sediments interspersed with fluvial clay layers. Several pro-glacial lobes overrode the area providing multiple-layers of coarse to fine sediment separated by semi-impermeable clay lenses. These clay lenses act as an aquitard greatly restricting water flow between the upper confined aquifer and the lower confined aquifers. A review of local groundwater wells reinforces the regional geologic maps. 40 well logs were found in the vicinity of the Tote Lakes<sup>2</sup>. A majority of the wells are located in the Stubblefield and Leisure Lake subdivisions. Reporting for well logs is can be variable by driller but a summary of the pertinent statics is available in Table 1. All 22 of the well logs that reported have both hole depth and clay layer stratigraphy, show that hole depth is greater than the bottom of the clay layer. This indicates that water for theses well is being drawn from the lower confined aquifer below the aquitard clay layer. The clay aquitard will largely preclude water or contaminates from the upper unconfined aquifer from reaching lower confined aquifer.

**Figure 1- Map of the Tote Road pike lakes**

<sup>1</sup> Water Right and Temporary Water Use Authorizations database.

[http://dnr.alaska.gov/mlw/mapguide/water/wr\\_start\\_tok.cfm](http://dnr.alaska.gov/mlw/mapguide/water/wr_start_tok.cfm), retrieved 4/3/17

<sup>2</sup> Well Log Tracking System, <https://dnr.alaska.gov/wellogs>, retrieved 3/27/17

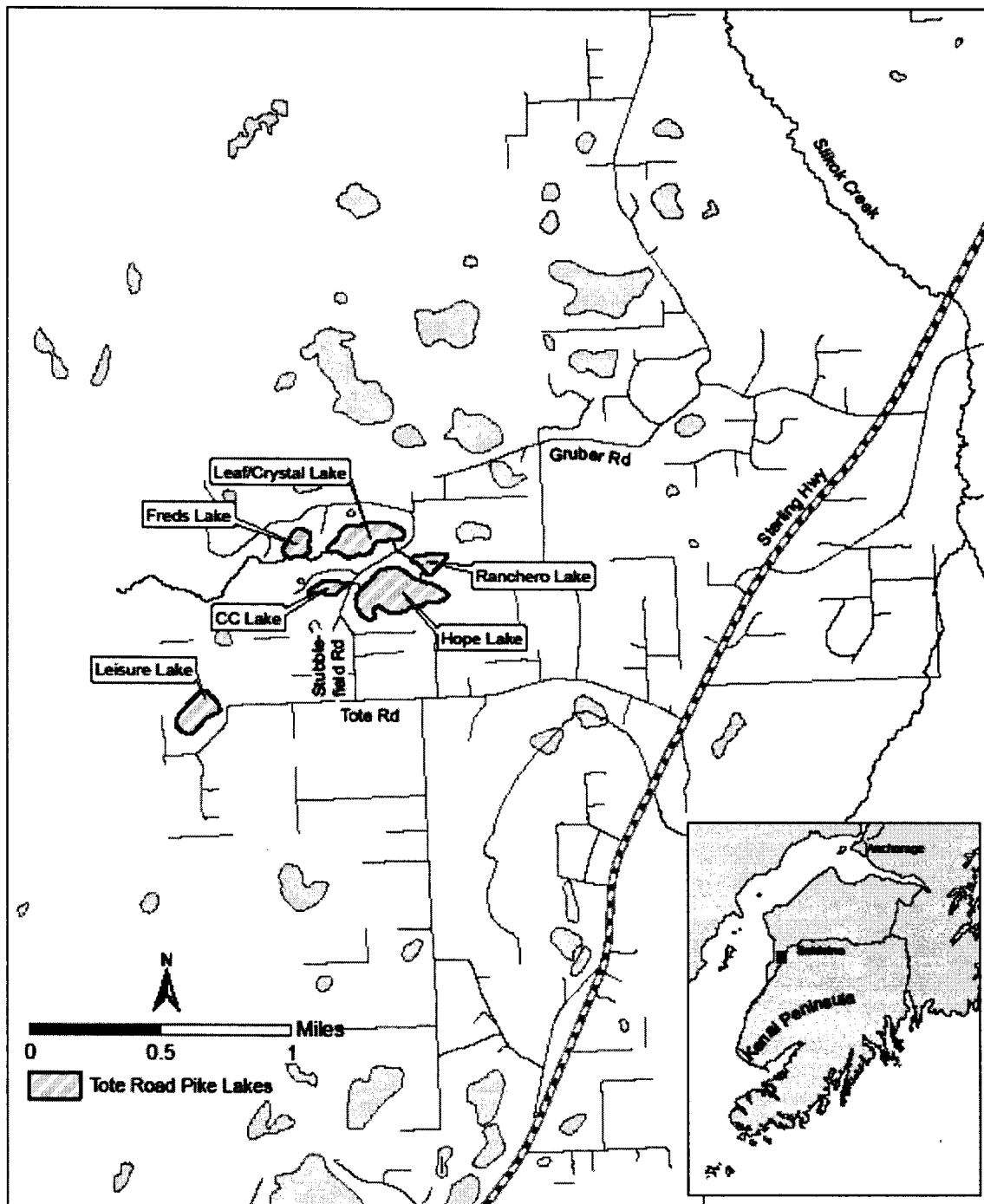


Table 1-Summary of well log statistics in the Tote Road Lakes area

**Appendix 10. Page 3 of 3.**

	HOLE DEPTH	CASING DEPTH	STATIC WATER LEVEL	CLAY start	CLAY stop
Mean	108	110	61	32	61
Maximum	208	119	86	70	97
Minimum	58	94	31	3	11
Count	36	4	10	22	22

I have not personally been to the Tote Road Lakes area, so an examination of USGS topographic maps at 1:250000, 1:63360 and 1:25000 scales (Kenai, Kenai B-4 and Kenai, B-4 NE respectively) and Google Earth was done instead. In both cases, no discernible creek or stream channel could be seen connecting the lakes to each other, or to inlet or outlets channels. However, the local ADFG office indicated the CC, Hope, Ranchero Crystal and Fred's Lake are interconnected by a small surface channel.<sup>3</sup> They have taken some incidental discharge measurements in this set of channels and all measurements have been below  $\frac{1}{2}$  CFS. The majority of the lakes interconnectivity and drainage seems to mainly occur via upper unconfined aquifer and wetland flow. According to local topography drainage is westerly. The area looks to be on a plateau with an average elevation of 200 feet. A bluff exists to the west of lake complex that drops off to approximately 100 feet to the broad coastal wetlands of the western Kenai Peninsula that borders Cook Inlet. The rate of water movement between lakes and to lower to wetlands complex is hard to determine but it will be slower than overland channel flow.

DRAFT

## Appendix 11. Project tasks, timelines and staffing requirements.

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Appendix XX. Treatment related tasks, timeline and staffing

	Staff	Timeline
<b>Pre Treatment Tasks</b>	Task	
Public Scoping	~1-2 public meetings	Winter 2017-2018
Permitting	NEPA compliance (EA), ADEC PUP, APDES, ADF&G Fish Transport/Resource permits, EPA compliance, ADNR Land Use, KRC multi-agency permit	Winter 2016 through spring 2018
Fish surveys	Summer/fall 2017 and 2018 eDNA and gillnet surveys	Summer/fall 2017 and 2018
Pretreatment biological monitoring	Aquatic invert surveys during summer	Mid-summer 2017
Removal Netting	Pretreatment gillnet removal	Oct 2017-late April/early May 2018
Pretreatment environmental monitoring	Collect monthly lake water quality and stream discharge	Dec 2016-Dec 2017
Well water sampling	Collect pretreatment water samples from representative lakeside water wells	September 2018-June 2019
Pretreatment Bioassays	Juvenile coho salmon bioassays onsite	Mid October 2018
Signage	Post pesticide public signage 1Week prior to TX during October 2018	Early October 2018
Posttreatment water quality monitoring	Collect water quality monthly for one year post-treatment	October 2018-October 2019
Site set-up/signage	Post pesticide public signage 1Week prior to TX during October 2018	Early October 2018
Wild fish stocking	Collect and relocate wild fish to TRPL, ~6,000 salmonids per year	Mid-summer 2019-late summer 2024
Posttreatment biological monitoring	Aquatic invert surveys during summer	Mid-summer 2019
Salmon in the Classroom stocking	By 2024, start stocking TRPL with coho reared I classrooms	Summer 2024 until indefinitely

## Appendix 11 continued

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Staffing		
<b>Positions</b>	<b>Tasks</b>	<b>Minimum number of people</b>
Project Leader	Oversee all aspects of project - must be certified pesticide applicator	1
Outboard Applicators	Apply pesticide from boats	4
Backpack Applicators	Apply pesticide to shorelines/creeks via backpack sprayers	2
Sentinel fish monitoring and dead fish cleanup	place and monitor sentinel fish and clean up fish carcasses	2
Loading and cleanup	Load barrels/buckets of rotenone with equipment, troubleshoot equipment problems, clean up empty rotenone containers	2
Communication and Media Contact	Onsite person to talk with media/public about project and assist as needed	1
<b>Total</b>		<b>12</b>

## Appendix 12. CFT Legumine Fish Toxicant Specimen Label

Page 1 of 6

# CFT Legumine

## Fish Toxicant

SHAKE WELL  
BEFORE  
USING

### RESTRICTED USE PESTICIDE

Due to acute inhalation, acute oral and aquatic 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.

THE APPLICATOR IS RESPONSIBLE FOR CONFORMING TO THE LABEL. IMPORTANT GUIDANCE ON THE SAFE AND EFFECTIVE USE OF THIS PRODUCT IS PROVIDED IN THE *ROTENONE SOP MANUAL*, AVAILABLE FROM THE REGISTRANT OR THE AMERICAN FISHERIES SOCIETY AT [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone)

**FOR CONTROL OF:** Fish in Lakes, Ponds, Reservoirs and Streams

## SPECIMEN LABEL

### ACTIVE INGREDIENTS:

Rotenone ..... 5% w/w  
Cube Resins other than rotenone ..... 5%  
OTHER INGREDIENTS\* ..... 90%  
TOTAL: ..... 100%

\*Contains Petroleum Distillates

### KEEP OUT OF REACH OF CHILDREN WARNING

See Additional First Aid, Precautionary Statements and Directions for Use including Storage and Disposal Instructions

EPA Reg.No. 89459-48

EPA Est. No. (A) 44616-MO-1 (B) 44616-MO-2

### PRECAUTIONARY STATEMENTS – HAZARDS TO HUMANS AND DOMESTIC ANIMALS – WARNING

May be fatal if inhaled. Do not breathe the vapors or spray mists. May be fatal if swallowed. Causes moderate eye irritation. Harmful if absorbed through skin. Do not get in eyes or on skin or clothing.

### FIRST AID

Have product container or label with you when obtaining treatment advice.

<b>If inhaled</b>	<ul style="list-style-type: none"><li>• Move person to fresh air.</li><li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible.</li><li>• Call a poison control center or doctor for further treatment advice.</li></ul>
<b>If swallowed</b>	<ul style="list-style-type: none"><li>• Call a poison control center or doctor immediately for treatment advice.</li><li>• Do not give any liquid to the person.</li><li>• Do not induce vomiting unless told to do so by the poison control center or doctor.</li><li>• Do not give anything by mouth to an unconscious person.</li></ul>

### If in eyes

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for treatment advice.

### If on skin or clothing

- Take off contaminated clothing.
- Rinse skin immediately with plenty of water for 15-20 minutes.
- Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may contact 1-800-248-7763 for emergency medical treatment information. You may also contact the National Pesticide Telecommunication Network at 1-800-858-7378 for information including health concerns, medical emergencies or pesticide incidents.

**NOTE TO PHYSICIAN:** Contains petroleum distillate. Vomiting may cause aspiration pneumonia. Symptoms of exposure include numbness, lethargy and incoordination. Decontamination, symptomatic and supportive treatment is recommended.



#### **Personal Protective Equipment (PPE)**

Some materials that are chemical resistant to this product are Barrier Laminate, Nitrile Rubber, Neoprene Rubber or Viton. If you want more options, follow the instructions for Category E on EPA chemical-resistance category selection chart.

All mixers, loaders, applicators, and other handlers (except pilots) must wear at a minimum, the following PPE: (1) coveralls, over long-sleeved shirt and long pants; (2) chemical-resistant gloves; (3) chemical-resistant footwear plus socks; (4) protective eyewear; and (5) a dust/mist respirator.

In addition, mixers, loaders, and others exposed to the concentrate, through cleaning equipment or spills must wear a chemical-resistant apron.

Exception: waterproof waders may be worn in place of coveralls, chemical-resistant apron and chemical-resistant footwear.

See Engineering Controls for additional requirements and exceptions.

#### **User Safety Requirements**

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate; do not reuse them. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

#### **Engineering Controls for Mixing/Loading/Applying Liquid Formulations Packaged in Containers > 5 Gallons**

Mixers/loaders/applicators must either:

- (1) Use a closed system that meets the requirements listed in Worker Protection Standard (WPS) for dermal protection of agricultural pesticides [40 CFR 170.240(d)(4)], or
- (2) Use the Semi-Closed Probe Mixing/Loading/Applicator System described below.

Remove plug from bung of drum containing this product only when drum is sitting on the ground or on a secure level platform, with the drum pointed up. Do not pour this product from its drum.

Transfer product from the drum of the mixing tank by use of a suction hose connected to one end of the suction pump on the mixing tank and connected at the other end to a probe/dip tube. Remove the plug from the bung of the drum and insert the probe/dip tube into the bung of the drum until the foam ring/gasket fits snugly around the bung opening to minimize leakage of liquid rotenone. The probe/dip tube should be specifically sized to insure a snug fit into the bung which incorporates an anti-drip flange to remove excess liquid rotenone when the probe/dip tube is removed. In addition, the foam ring/gasket on the probe/dip tube insures a snug fit to minimize leakage of liquid rotenone. Do not handle the probe/dip tube in a manner that allows dripping or splattering of the product onto yourself or any other person. Do not touch the portion of the probe/dip tube that has been in contact with this product until the probe has been triple rinsed with water. See Rotenone SOP Manual (SOP 8) for further information on the operation of the Semi-Closed Probe system.

If the entire product is removed from the drum, then triple rinse the probe while it remains inside of the drum if possible. If not, remove the aspirator probe and triple rinse it and all parts of the aspirator in site water. If an unrinsed probe must be removed from the drum, triple rinse it and all parts of the aspirator in treated site water. The anti-drip flange must be designed to remove excess rotenone product from the probe as it is extracted from the drum. Take the following steps if the probe must

be disconnected from the suction hose before both the probe and the hose have been triple rinsed: (1) equip the probe end of the hose with a shutoff valve; (2) install a dry-brake coupling between the valve and the probe, and then close the shut off valve before disconnecting the probe. See Rotenone SOP Manual (SOP 8) for further information on unrinsed probes.

Mixers/loaders/applicators using all systems must wear PPE as required in the PPE section of this labeling for mixers/loaders. All systems must be capable of removing the pesticide from the shipping container and transferring it into mixing tanks and/or application equipment. At any disconnect point, the system must be equipped with a dry disconnect or dry-couple shutoff device to minimize drips.

#### **Transferring (Mixing/Loading) Liquid Formulations**

Mixers and loaders must transfer product from original to mixing tank or secondary container using a measuring device, inside a plastic-lined bermed area or other secondary confinement area capable of recovering spilled product. Wash plastic liner or other secondary confinement area and dispose of into treated site water. Do not handle this product in a manner that drips or splatters the product onto yourself or any other person. See Rotenone SOP Manual (SOP 10) for further guidance.

**Product Containers ≤ 5 Gallons** – Transfer product from original container into measuring device, within secondary confinement area, by pouring or using pump or pipette-type device. See Rotenone SOP Manual (SOP 10) for further guidance.

**Product Containers > 5 Gallons** – Do not pour rotenone concentrate from containers > 5 gallons. Transfer product from original container into measuring device, within secondary confinement area, using hand or electric drum pump. See Rotenone SOP Manual (SOP 10) for further guidance.

#### **Engineering Controls for Applying Liquid Formulations**

Applications using a boom or other mechanized equipment must release this product below the water surface. Applications made with aircraft, backpack sprayer, drip can, or handheld or hand-directed nozzle may release this product above the water surface.

#### **Engineering Controls for Aerial Applications**

Open cockpits are prohibited. Pilots must use a cockpit that has a nonporous barrier that totally surrounds the cockpit occupants and prevents contact with pesticides outside the enclosed area. Pilots in enclosed cockpits may wear a long-sleeved shirt, long pants, shoes, and socks instead of the PPE required for applicators in the PPE section of this labeling.

#### **Engineering Controls for Boat Applications**

When boat pilots or others on the application boat are located within an enclosed area that has a nonporous barrier that totally surrounds the occupants and prevents contact with pesticides outside the enclosed area; they: (1) may wear long-sleeved shirt, long pants, shoes, and socks, instead of the PPE required for applicators in the PPE section of this labeling; (2) must be provided and have immediately available in the use of an emergency when they must exit the enclosed area while the application is taking place, the PPE required for applicators of the PPE section of this labeling; (3) must take off any PPE that is worn while outside the enclosed area before reentering the enclosed area; and (4) store all used PPE in a chemical-resistant container, such as a plastic bag, to prevent contamination of the enclosed area.

#### **User Safety Recommendations**

Certified Applicators applying or supervising any aspect of the application of this product should attend a training program for the Rotenone SOP Manual. The American Fisheries Society offers this training: go to [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone) for current schedule of training.

Users should remove clothing/PPE if pesticide gets inside. Then wash thoroughly and put on clean clothing. Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

#### **ENVIRONMENTAL HAZARDS**

This product is extremely toxic to fish and other aquatic organisms. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency and other agencies before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate water outside of the treatment area by cleaning of equipment or disposal of equipment washwaters. Do not contaminate water outside of the treatment area, food or feed by storage or disposal. Do not discharge effluent containing this pesticide into sewage systems without notifying the sewage treatment plant authority (PTOW).

#### **PHYSICAL AND CHEMICAL HAZARDS**

**Flammable.** Keep away from heat and open flame.

#### **DIRECTIONS FOR USE**

##### **RESTRICTED USE PESTICIDE**

IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING, INCLUDING BOTH THE CONTAINER LABEL AND THE ROTENONE STANDARD OPERATION PROCEDURES MANUAL (SOP) available from the registrant or the American Fisheries Society at [www.fisheries.org/units/rotenone](http://www.fisheries.org/units/rotenone). THIS PRODUCT MUST BE ACCOMPANIED BY AN EPA-APPROVED ROTENONE SOP MANUAL. READ THE CONTAINER LABEL AND ROTENONE SOP MANUAL PRIOR TO USE. THE APPLICATOR IS RESPONSIBLE FOR FOLLOWING THE DIRECTIONS FOR USE CONTAINED WITHIN BOTH THE CONTAINER LABEL AND THE SOP MANUAL.

This product is registered for use by or under permit from, and after consultation with State and Federal Fish and Wildlife and/or Natural Resource Agencies.

#### **GENERAL INFORMATION**

This product is a specially formulated product containing rotenone to be used in fisheries management for the eradication of fish from lakes, ponds, reservoirs, rivers and streams. 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 ½ mile upstream of an irrigation water intake in a standing body of water such as a lake, pond, or reservoir.

**General Application Precautions and Restrictions:** The Certified Applicator supervising the treatment must remain on site for the duration of the application. Do not allow recreational access (e.g., wading, swimming, boating, and fishing) within the treatment area while rotenone is being applied (see Placarding of Treatment Areas). In streams/rivers/lakes/reservoirs/ponds, do not apply this product in a way that will result in active rotenone concentrations > 200 parts per billion/0.2 ppm (> 4.0 ppm 5% rotenone formulation). Do not apply this product in a way that will contact workers or other persons, either

directly or through drift. Only protected handlers may be in the area during application (see Placarding Treatment Areas and Re-entering of Treatment Area). This product must not be applied to estuarine or marine environments. Where practical, users should collect and bury dead fish.

Applications using a boom or other mechanized equipment must release this product below the water surface. Applications made with aircraft, backpack sprayer, drip can, or hand-held or hand-directed nozzle may release this product above the water surface.

Mixers/loaders of liquid rotenone product containers of 5 gallons or less should not handle more than 25 gallons of undiluted product per day.

**Re-entering the Treatment Area:** For applications that result in concentrations greater than 0.09 ppm active rotenone (when applying at a rate of > 1.8 ppm of 5% rotenone formulation), handlers reentering treated water, must wear, at a minimum, the following PPE: (1) coveralls over long-sleeved shirt and long pants; (2) chemical-resistant gloves; (3) chemical-resistant footwear plus socks; and (4) Chemical-resistant apron. Duration of PPE requirements for handlers re-entering treated water exactly corresponds to duration of placarding requirements (e.g., PPE requirements end when placards are removed; see Placarding of Treatment Areas section of this labeling). Exception: waterproof waders may be worn in place of coveralls, chemical-resistant apron and chemical-resistant footwear.

**Placarding of Treatment Areas:** The Certified Applicator in charge of the application (or someone under his/her supervision) must placard all access areas to the treatment area. Detailed instructions for placarding are presented in the Rotenone SOP Manual. Placards must be placed every 250 feet along the shoreline of the treated area OR, at public access points (e.g., trailheads, roads and trails). Placards must contain the following information: (1) DANGER/PELIGRO; (2) DO NOT ENTER WATER/NO ENTRE AGUA; Pesticide Application; (3) CTF Legumine Fish Toxicant; (4) the purpose of the application; (5) the start date and time of application; (6) end date and time of application; (7) "Recreational access (e.g., wading, swimming, boating, fishing, etc.) within the treatment area is prohibited while rotenone is being applied"; (8) "Do not swim or wade in treated water while placard is displayed"; (9) "Do not consume dead fish from treated water"; and (10) the name, address, and telephone number of the responsible agency or entity performing the application.

Signs must remain legible during the entire posting period. For lotic (flowing water) and lentic (standing water) applications of ≤ 0.09 ppm active rotenone (≤ 1.8 ppm 5% formulation), signs can be removed once application is complete. For lotic applications > 0.09 ppm active rotenone (> 1.8 ppm 5% rotenone formulation), signs can be removed 72 hours after application is complete. For lentic applications > 0.09 ppm active rotenone (> 1.8 ppm 5% rotenone formulation), signs can be removed following 24-hour bioassay demonstrating survival of bioassay sentinel fish or 14 days, whichever is less.

**Monitoring and Notification Requirements for Water Aquaculture:** For treated water bodies used for aquaculture, the Certified Applicator or designee under his/her direct supervision must prohibit the restocking of fish unless monitoring samples confirm rotenone concentrations are below the level of detection for 3 consecutive samples taken no less than 4 hours apart. Detailed guidance for monitoring levels of rotenone in water is presented in the Rotenone SOP Manual (SOP 16).

**Drinking Water:** For applications > 40 ppb or 0.04 ppm active rotenone (> 0.8 ppm 5% rotenone formulation) in waters with drinking water intakes or hydrologic connections to wells, 7 to 14 days prior to

application, the Certified Applicator or designee under his/her direct supervision must provide notification to the party responsible for the public water supply or individual private water users against the consumption of treated water until: (1) active rotenone < 0.04 ppm as determined by analytical chemistry, or (2) fish of the *Salmonidae* or *Centrichidae* families can survive for 24 hours, or (3) dilution with untreated water yields a calculation that active rotenone is < 0.04 ppm, or (4) distance or travel time from the application sites demonstrates that active rotenone is < 0.04 ppm. See Rotenone SOP Manual (SOP 16) for guidance on notification and bioassay and chemical analysis techniques and dilution, distance, and travel time criteria.

#### Specifications to Control Spray Drift

**RELEASE HEIGHT:** Spray must be released at the lowest height consistent with pest control and flight safety.

**BOOM LENGTH:** The boom length must not exceed 75% of the wing span or 90% of the rotor blade diameter. Orient nozzles backward with minimal downward angle into slip stream.

**SWATH ADJUSTMENT:** When applications are made with cross wind, the swath will be displaced downwind. The applicator must compensate for this displacement at the downwind edge of the application area by adjusting the path of the aircraft upwind. Leave at least one swath unsprayed at the downwind edge of the treated area.

**DROPLET SIZE:** Use low drift nozzles designed to produce larger spray droplets with fewer driftable fines. Apply as a medium or coarser spray (ASAE standard 572).

**WIND SPEED:** Do not apply when wind speeds are >12 miles per hour.

### DETERMINING TREATMENT RATE

Use this product only at locations, rates, and times authorized and approved by appropriate State and Federal Fish and Wildlife and/or Natural Resource Agencies. The actual treatment rate and rotenone concentration needed to control fish varies widely, depending on the type of water environmental factors including pH, temperature, depth, turbidity, and the target species. The tables below are a general guide for the proper rates and concentrations for complete kills of target species. The Certified Applicator must conduct bioassays using site water (or water of similar quality) and target species (or surrogate species of similar sensitivity) to refine the treatment rate with the maximum limit allowed. Detailed guidance bioassays and designing treatment for complete kills of target species are presented in the Rotenone SOP Manual (SOP 5). Rates must be within the range specified on the label.

### FOR USE IN PONDS, LAKES, AND RESERVOIRS

The tables in this booklet are a general guide for the proper rates and concentrations. This product disperses readily, laterally and vertically. For complete coverage, it is best to apply this material to water bodies that are not thermally-stratified. However, this material will eventually penetrate below the thermocline in thermally-stratified bodies of water.

**Computation of Water Body Volume:** To determine volume of any given body of water, make a series of transects across the body of water taking depths at regular intervals. Add the depths and divide by the number of measurements made to determine the average depth. Multiply this average depth by total surface area in order to determine the volume to be treated. Volume is expressed as acre-feet (AF) or cubic meters (m<sup>3</sup>). Surface area can be determined by Global Positioning System (GPS) instrumentation and topographic maps. See Rotenone SOP Manual for further guidance.

**Amount of CFT Legumine Fish Toxicant Needed for Specific Uses:** To determine the approximate number of gallons (or liters) needed, find your "Type of Use" in the first column of the tables below and then divide the corresponding numbers in the fourth column, "AF (or m<sup>3</sup>)

per Gallon (or Liter) Liquid" into the number of AF or m<sup>3</sup> in your body of water. For example, a normal use of 0.05 ppm active rotenone will require 33 gallons of 5% active rotenone liquid for 100 AF.

**Table – Recommended rotenone treatment concentrations and number of acre-feet (AF) standing water covered by one gallon (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.**

Type of Use	Parts per Million (ppm)		AF Per Gallon Liquid
	Product (5% A.I.)	Active Rotenone	
Normal	0.5 – 1.0	0.025 – 0.05	6.0 to 3.0
Tolerant Species	1.0 – 3.0	0.05 – 0.15	3.0 to 1.0
Tolerant Species in Organic Ponds	2.0 – 4.0	0.10 – 0.20	1.5 to 0.75

**Table – Recommended rotenone treatment concentrations and number of cubic meters (m<sup>3</sup>) standing water covered by one liter of (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.**

Type of Use	Parts per Million (ppm)		m <sup>3</sup> per Liter Liquid
	Product (5% A.I.)	Active Rotenone	
Normal	0.5 – 1.0	0.025 – 0.05	2000 to 1000
Tolerant Species	1.0 – 3.0	0.05 – 0.15	1000 to 333
Tolerant Species in Organic Ponds	2.0 – 4.0	0.10 – 0.20	500 to 250

**Recommended Pre-Mixing and Method of Application:** Pre-mix with water at a rate of 10% of product to site water. Uniformly apply over water surface or through underwater lines. Divide water body into manageable sections, delineated by marker buoys or flags or GPS coordinates, and treat within 48 hours to avoid deactivation. See Rotenone SOP Manual (SOP 8) for additional guidance.

**Deactivation:** Water treated with this product will deactivate (neutralize) under natural conditions within one week to one month depending upon temperatures, alkalinity, etc. Rapid deactivation can be accomplished by adding potassium permanganate to the water at the same rate as CFT Legumine Fish Toxicant in parts per million, plus enough additional to meet the organic demand of the untreated water. See Rotenone SOP Manual (SOP 6 and 7) for guidance.

**Restocking after Treatment:** Typically, wait 2 to 4 weeks after treatment prior to restocking. 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 AND RIVERS

In order to treat a stream you must: (1) Select the concentration of active rotenone; (2) Compute the flow rate of the stream; (3) Select an exposure time; (4) Select dilution of product and calculation of application rate; (5) Estimate the amount of product needed; and (6) Follow the method of application. For practicality, flows > 25 ft<sup>3</sup>/s (> 0.708 m<sup>3</sup>/s) should have undiluted product applied, and flows < 25 ft<sup>3</sup>/s (< 0.708 m<sup>3</sup>/s) should have diluted product applied. For streams associated with a treatment of a standing body of water, to prevent movement of fish from the pond, lake, or reservoir, the stream treatment should begin before and continue throughout treatment of the pond, lake or reservoir until mixing has occurred.

#### Concentration of Active Rotenone

Select the concentration of active rotenone based on the type of use from those listed on the tables on the next page. Example: If you select "normal use", you could select a concentration of 0.025–0.05 parts per million.

**Table** – Recommended rotenone treatment concentrations and number of cubic feet per second (ft<sup>3</sup>/s) flowing water treated for 4- and 8-hour periods with one gallon of (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		ft <sup>3</sup> /s per Gallon (4-hr)	ft <sup>3</sup> /s per Gallon (8-hr)
	Product (5% A.I.)	Active Rotenone		
Normal	0.5 – 1.0	0.025 – 0.05	18.4 to 9.2	9.2 to 4.6
Tolerant Species	1.0 – 3.0	0.05 – 0.15	9.2 to 3.1	4.6 to 1.6
Tolerant Species in Organic Waters	2.0 – 4.0	0.10 – 0.20	4.6 to 2.3	2.3 to 1.2

**Table** – Recommended rotenone treatment concentrations and number of cubic meters per second (m<sup>3</sup>/s) flowing water treated for 4- and 8-hour periods with one liter of (5% A.I.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on Label.

Type of Use	Parts per Million (ppm)		m <sup>3</sup> /s per Liter (4-hr)	m <sup>3</sup> /s per Liter (8-hr)
	Product (5% A.I.)	Active Rotenone		
Normal	0.5 – 1.0	0.025 – 0.05	0.138 to 0.069	0.069 to 0.034
Tolerant Species	1.0 – 3.0	0.05 – 0.15	0.069 to 0.024	0.034 to 0.013
Tolerant Species in Organic Waters	2.0 – 4.0	0.10 – 0.20	0.034 to 0.018	0.018 to 0.008

#### Measurement of Flow Rate for Stream

Select a cross section of the stream where the banks and bottom are relatively smooth and free of obstacles and the flow appears laminar. Best discharge measurements are achieved with an electronic flow meter and use of the United States Geological Survey *Weighted Area Method*. Alternatively, divide the stream surface width into 3 equal sections and determine the water depth and surface velocity at the center of each section. Determine the velocity by dropping a float and measure the time required to move 10 feet or more. 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 (ft<sup>3</sup>/s or m<sup>3</sup>/s), Ws = surface width (ft or m), D = mean depth (ft or m), L = mean distance traveled by float (ft or m), C = Constant (0.8 for rough bottoms and 0.9 for smooth bottoms), T = mean time (s) for float to travel distance.

#### Exposure Time and Spacing

Apply rotenone as a drip for 4 to 8 hours to the flowing portion of the stream. Multiple application sites are used along the length of the treated stream, spaced approximately ½ to 2 miles apart depending on the water flow travel time between sites. Multiple sites are used because rotenone is diluted and detoxified with distance. Application sites are spaced at no more than 2 hours or at no less than 1-hour travel time intervals. This assures that the treated stream remains lethal to fish for a minimum of 2 hours. A non-toxic dye such as Rhodamine-WT or fluorescein can be used to determine travel times. Cages containing live fish placed immediately upstream of the downstream application sites can be used as sentinels to assure that lethal conditions exist between sites.

#### Amount of Product and Calculation of Application Rate of Undiluted Product:

$$X = F1 (1.699 B) \text{ or } X = F2 (59.99 B)$$

X = ml per minute of undiluted CFT Legumine Fish Toxicant applied to the stream, F1 = the flow rate (ft<sup>3</sup>/s) and F2 the flow rate (m<sup>3</sup>/s) (see Measurement of Flow Rate for Stream on this labeling), B = parts per million desired concentration of CFT Legumine Fish Toxicant. Total amount of product needed:

$$Y = X(60)H$$

Y = total ml of undiluted CFT Legumine Fish Toxicant required for treatment, X = ml per minute of undiluted product, and H = duration (hours) of treatment.

#### Amount of Product in Drip Can and Flow Rate of Diluted Product:

$$Y = B(102 F1)H \text{ or } Y = B(3, 602 F2)H$$

Y = ml of undiluted product in the reservoir, B = parts per million desired concentration of CFT Legumine Fish Toxicant, F1 = the flow rate (ft<sup>3</sup>/s) and F2 = flow rate (m<sup>3</sup>/s) (see Measurement of Flow Rate for Stream in this labeling), and H = duration (hours) of treatment.

Discharge of the diluted product:

$$X = Z/60/H$$

X = ml per minute of diluted CFT Legumine Fish Toxicant applied to the stream from drip can, Z = volume (ml) of drip can, and H = duration (hours) of treatment.

#### Method of Application

The unique nature of every application site could require minor adjustments to the method and rate of application. Should these unique conditions require major deviation from the use directions, a Special Local Need 24(c) registration should be obtained from the state. Before application, authorization must be obtained from state or federal Fish and Wildlife and/or Natural Resource agencies. Since local environmental conditions will vary, consult with the state Fish and Wildlife and/or Natural Resource agency to ensure the method and rate of application are appropriate for that site.

Contact the local water department to determine if any water intakes are within one mile downstream of the section of stream, river, or canal to be treated. If so, coordinate the application with the water department to make sure the intakes are closed during treatment and detoxification.

CFT Legumine Fish Toxicant can drain directly into the center of the stream. Flow should be checked at least hourly. Backwater, stagnant, and spring areas of streams should be sprayed by hand with a 1 to 2 % v/v solution of 5% rotenone product to assure complete coverage. Streams should be treated for 4 to 8 hours in order to clear the treated section of stream of fish. See Rotenone SOP Manual for detailed guidance on application equipment, methods, and strategies.

#### DEACTIVATION

Flow in a stream and outflow from a treated lake beyond the treatment area must be deactivated with potassium permanganate to minimize exposure beyond the treatment area unless unnecessary. (See Rotenone SOP Manual [SOP 6] for the definition of treatment area, examples when deactivation with potassium permanganate is unnecessary and detailed guidance for deactivating with potassium permanganate [SOP 7].)

Within 1 to 2 hours travel time from the furthest downstream rotenone application site, the rotenone can be deactivated with a potassium permanganate solution or granules at a resultant stream concentration of 2 to 4 parts per million, depending on rotenone concentration and organic demand of the water. A 2.5% (10 pounds potassium

permanganate to 50 gallons of water) permanganate solution is dripped in at a continuous rate using the equation:

$$X = Y(70 F1) \text{ or } X = Y(2, 472 F2)$$

X = ml of 2.5% permanganate solution per minute, Y = ppm of desired permanganate concentration, F1 = stream flow (ft<sup>3</sup>/s) or F2 = stream flow (m<sup>3</sup>/s) or, granular potassium permanganate is applied at a continuous rate using the equations:

$$Z = Y(1.7 F1) \text{ or } Z = Y(60.02 F2)$$

Z = grams of granular potassium permanganate per minute, Y = ppm of desired permanganate concentration, F1 = stream flow (ft<sup>3</sup>/s) or F2 = stream flow (m<sup>3</sup>/s).

Flow of permanganate should be checked at least hourly. Live fish in cages placed immediately above the permanganate application site will show signs of stress signaling the need for beginning deactivation. Deactivation can be terminated when replenished fish survive and show no signs of stress for at least four hours.

Deactivation of rotenone by permanganate requires between 15 to 30 minutes contact time (travel time). Cages containing live fish can be placed at these downstream intervals to judge the effectiveness of deactivation. At water temperatures less than 50°F, deactivation may be retarded, requiring a longer contact time.

### STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

**PESTICIDE STORAGE:** Store only in original containers, in a dry place inaccessible to children and pets. This product 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 HANDLING:** Nonrefillable container. Do not reuse or refill this container. Clean container promptly after emptying.

*(For Containers equal to or less than 5 Gallons:)* Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Offer for recycling, if available or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

*(For Containers greater than 5 Gallons:)* Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

### 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. To the extent consistent with applicable law, the buyer must assume all responsibility, including injury or damage, resulting from its misuse as such, or in combination with other materials.

Circled letter in front of the EPA Est No. corresponds to the first letter in lot number on bottom of container.

Central Garden & Pet Company, 1501 East Woodfield Road, 200W, Schaumburg, Illinois 60173

**NOTE:** This specimen label is for informational purposes only. All uses may not be approved in all states. See product labeling for use directions.

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VEC 15-036

December, 2015  
Schaumburg, IL

## **Appendix 13. Safety Plans**

Page 1 of 14

### **Purpose**

These safety plans are intended to identify and mitigate the potential safety hazards associated with the TRPL project. The plans are specifically designed for ADFG employees. The plans describe the safety procedures and equipment that will be utilized during the TRPL project.

This project will have two project leaders. Project leader duplicity is intentional so if one project leader becomes unavailable the other can continue to move the project forward. The project leaders have the primary authority to monitor and assess hazardous and/or unsafe situations and develop measures for assuring personnel safety. The project leaders will be available on site during the application phase of the project to oversee that project safety plans are adhered to and project objectives are met. The potential hazards associated with this project can be categorized into the following groups: (1) pesticide safety, (2) spills, (3) general safety hazards, and (4) heat stress to workers.

Safety training will ensure that all treatment team members are appropriately trained for their assigned tasks. All formal training shall be documented using ADFG's "Safety Certification Form" (Supplement A on page 47). All training records will be maintained and archived by the project leader.

### **1. Pesticide Safety**

#### **A. Supervision/Notification/Access Control**

Pesticide applications must be supervised by an ADFG employee who has obtained his or her Qualified Applicator Certificate in the Aquatic Category from the Alaska Department of Environmental Conservation. During the treatment phase of the project, access to TRPL waters and work sites (loading areas, equipment and supply staging areas) will be limited to appropriately trained personnel. Because nearly all of the land surrounding the treatment area is private, notifications will be given to all landowners with property adjacent to a TRPL waterbody advising them stay away from the treatment area (lakes) and to not contact or drink TRPL waters until rotenone detoxification is confirmed by ADFG. At least one week prior to treatment public notification signage will be placed at potential TRPL access locations in accordance to ADEC regulations and the Rotenone SOP Manual.

#### **B. Pesticide Safety Training**

All TRPL team members will receive pesticide safety training specific to the use of CFT Legumine™ and will work under the direct supervision of a Certified Applicator. Training is based on Hazard Communication Standard (29 CFR 1910.1200). All the information in the

training will be provided in both written form and classroom/field instruction. Team members must sign a written record verifying their training in a Record of Pesticide Training and Training Outline (Supplement A).

The training will consist of the following topics listed below (see Supplement B for material references):

- A) verbal warning of the information and warnings on the product(s) label and SDS documents
- B) review of the information on the products labels and the Rotenone SOP that include what chemicals are in the products, first aid and health warnings, proper use of PPE, and directions of applying rotenone should include instruction on 1) application site, 2) dosage rate, 3) application methods and equipment, 4) dilution instructions, 5) application timing and frequency, and 6) restricted entry interval
- C) Review of the products SDS that includes 1) how rotenone can affect health, 2) what to do in an emergency (first aid) listed on the MSDS, 3) information on the need to wear PPE, how to care for PPE and what PPE cannot protect from (Found on MSDS), 4) information on the meaning of safety statements and safety rules for handling pesticides (See Supplement B), and 5) rights as an employee and where to find out more information on rotenone to include job safety information, safety leaflets, SDS information, when and where the pesticide will be applied, the name of the pesticide(s) and the EPA registration number.
- D) Instruction on the Application of Rotenone – review how application equipment works, application timing and calibration, and the proper use of PPE listed on the product label.

## Supplement A

**Training certification.** The following employees have received on-the-job training on those subjects listed in the attached training outline:

This training has provided me adequate opportunity to ask questions and practice procedures to determine and correct skill deficiencies. I understand that performing these procedures/practices safely is a condition of employment. I fully intend to comply with all safety and operational requirements discussed. I understand that failure to comply with these requirements may result in progressive discipline (or corrective actions) up to and including termination.

Employee Name (Print)	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

*(use another sheet for additional trainees if needed)*

**Trainer certification.** I have conducted orientation/on-the-job training to the employees(s) listed above. I have explained related procedures, practices and policies. Employees were each given opportunity to ask questions and practice procedures taught under my supervision. Based on each student's performance, I have determined that each employee trained has adequate knowledge and skills to safely perform these procedures/practices.

Trainer Name (Print)	Signature	Date
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Supervisor validation. On (date) I conducted a formal observation of the above and certify that they are demonstrating adequate knowledge and skills to safely perform the procedures/practices covered in this training.

Supervisor (Print)	Signature	Date
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## ADFG Training Outline

### Tote Road Pike Eradication Project Safety Training

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#### **The following information was discussed with employees:**

(Enter the topics of the discussion/training here)

- Project Overview: objectives, timeline, site map, driving directions, contact lists
- Safety Procedures: PPE use, engineering controls, heat-related illness, equipment used
- Pesticide Labels, signal words, precautionary statements, first aid instructions, mixing and application instructions
- Pesticide Handling Procedures: container handling, storage, transport, disposal, mixing and application equipment, triple rinse containers, site safety
- First Aid and Decontamination: for eyes and skin and location of first aid supplies and emergency contact numbers
- Symptoms of overexposure: common symptoms of pesticide poisoning and ways poisoning can occur
- Exposure Hazards: including both acute and chronic effects
- Environmental Concerns: drift, runoff and wildlife hazards
- Laws and Regulations: applicable laws and regs, MSDS, Pesticide Info Series, label requirements
- Employee Rights: receive info on pesticides they might be exposed to, rights against discharge or discrimination due to exercise of those rights
- Location of Documents: Hazard Communication Program plans, pesticide use records, Pesticide Safety Information Service, MSDS and training records
- Review Spill and Emergency Plans, precautions specific to site and chain-of-command
- Communication protocol
- Employer responsibilities/accountability
- Employee responsibilities/accountability

#### **The following procedures were practiced or demonstrated:**

(Enter the practiced/demonstrated procedures here)

- PPE use
- Application equipment use (onsite instruction)

## Supplement B

### Safety Training References

Reference Material	Training Topic
Rotenone product labels and Rotenone SOP Manual (pages 73-111), Soldotna Creek Drainage Restoration Plan (Treatment Section)	explain what chemicals are in the products, first aid and health warnings, proper use of PPE, and directions for applying rotenone
Rotenone products MSDS, <a href="http://www.cdpr.ca.gov/docs/whs/pdf/hs1742.pdf">www.cdpr.ca.gov/docs/whs/pdf/hs1742.pdf</a> ; <a href="http://www.cdpr.ca.gov/docs/whs/pdf/hs1749.pdf">www.cdpr.ca.gov/docs/whs/pdf/hs1749.pdf</a>	health effects, what to do in a medical emergency, PPE ( how to wear it, take care of it and what it can't protect), pesticide safety statement and rules
pgs 71-74 of NPACCM	routes and symptoms of pesticide overexposure
Emergency Response Chart for actions required for various rotenone exposures found in the Soldotna Creek Restoration Safety Plan and product MSDS	actions and phone numbers for emergency medical care for rotenone exposure
pgs 142-145 of NPACCM	decontamination procedures
pgs 87-98 of NPACCM	how to use the required safety equipment
pgs 88-100 of NPACCM	use and cleaning of personal protective equipment and clothing
N/A	must pass a respirator medical and fit testing conducted by Beacon Training Center in Kenai, Alaska and review proper respirator use with team leader
N/A	instruction and hands-on practice with specific rotenone application equipment, safety and PPE required for individual team member

**C. PPE Use**

All ADFG employees who apply CFT Legumine™ including all mixers, loaders, applicators, cleaners and other handlers (except pilots) must wear at a minimum, the following PPE: (1) coveralls, over long-sleeved shirt and long pants; (2) chemical-resistant gloves; (3) chemical-resistant footwear plus socks; (4) protective eyewear; and (5) a dust/mist respirator. In addition, mixers, loaders, and others exposed to the concentrate, through cleaning equipment or spills must wear a chemical-resistant apron. Exception: waterproof waders may be worn in place of coveralls, chemical-resistant apron and chemical-resistant footwear.

All PPE must be clean and in good repair at the start of each work day. Each employee who handles rotenone products will be issued coveralls, gloves, goggles and if needed, boots or waders. Ripped or damaged PPE must be replaced immediately. Extra PPE (equal to approximately 50% of the total number of rotenone handlers) will be available onsite. Dust/mist masks must be changed daily or when dirty.

The loading of rotenone containers will occur in a loading zone which will be delineated with orange cones. No employee will be allowed within the loading zone without appropriate PPE. Anyone working on a boat or dock will also be required to wear a life vest in addition to PPE. Team members engaged in fish cleanup and sentinel fish monitoring will be required to wear, at a minimum, waders and disposable nitrile gloves.

**D. First aid and washing supplies**

First aid kits, clean water, soap, and single-use towels for routine washing of the hands and face and emergency washing of the entire body will be available at the staging area of each lake being treated. First aid kits, eyewash solution and disposable wipes will also be available on all watercraft actively engaged in the treatment. Similarly, eyewash and disposable wipes will be available to all backpack applicators and are located in fanny pack kits that must be worn by the applicators.

**E. Pesticide Exposure Medical Care**

See Emergency Response Chart below for actions required for various types of rotenone exposure.

**Exposure Response Chart**

Type of Exposure	Action	Emergency Contact	Number
CFT Legumine® is swallowed	Call poison control or doctor immediately for treatment advice.	Local Emergency Services	911
	Do not give any liquid to the person	National Pesticide Information Center	1-800-858-7378
	Do not induce vomiting unless told to do so by the poison control center or doctor Do not give anything by mouth to an unconscious person	National Poison Control Center	1-800-222-1222
CFT Legumine® is inhaled	Move person to fresh air If person is not breathing, call 911, then give artificial respiration, preferably mouth to mouth, if possible Call a poison control center or doctor for further treatment advice		
CFT Legumine® in eyes	Hold eye open and rinse slowly and gently with water for 15-20 minutes Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye Call a poison control center or doctor for treatment advice		
CFT Legumine® on skin or clothing	Take off contaminated clothing  Rinse skin immediately with plenty of water for 15-20 minutes Call a poison control center or doctor for treatment		

Copies of all rotenone product labels and safety data sheets (SDS) documentation will be available to all team members and extras copies available at the onsite staging location to be provided to any medical professionals as needed

Team members who are exposed to CFT Legumine should follow the directions found in the Exposure Response Chart listed above. All pesticide exposure emergencies should be reported as soon as possible to the project leader. Each team member will be issued a miniaturized Exposure Response Chart to carry with them in the field for reference. All pesticide applicators working beyond the line of sight of the project leader must either have a cell phone or walkie-talkie in their possession or in the possession of a team member working alongside them.

**F. Pesticide Storage and transport**

Long term storage of pesticide will occur in an enclosed locked area with appropriate ADEC warning signage posted on the entry door. The storage area must be temperature controlled to stay above 40F. The pesticide containers must be kept inside a bermed spill containment system. In the storage area there must be a spill control kit (including PPE), emergency contact numbers and product SDS and Specimen Label documents. Long term storage will be at the ADFG Crooked Creek Maintenance and temporary warm weather storage may be in the fenced in storage compound at eh Soldotna ADF&G office.

Onsite storage of rotenone, regardless of amount, requires storage either on a tarp that slopes towards the treatment waterbody so runoff must enter the treatment area or inside a spill containment system. A spill kit must be present whenever more than five gallons is present.

Federal codes regulating transport of hazardous materials exempts state agencies from many requirements regarding hazardous materials training, license endorsements and placarding as described below:

In accordance with federal Hazardous Materials Regulations (HMR) § 49 CFR 171.1 (d)(5), which states:

(d) Functions not subject to the requirements of federal Hazardous Material Regulations (HMR).

...(5) Transportation of a hazardous material in a motor vehicle, aircraft, or vessel operated by a federal, state or local government employee solely for noncommercial Federal, state, or local government purposes.

The Alaska Department of Fish and Game is exempt from HMR (§ 49 CFR 171 through 180) as it applies to Packaging, Pretransportation, and Transportation functions of hazardous materials. For questions contact the Alaska Department of Transportation and Public Facilities (907-365-1210).

However, the following travel precautions will be implemented for this project:

All vehicles transporting rotenone will:

- A) tether pesticide containers securely to the vehicle or trailer to prevent movement
- B) carry a document stating the state operated vehicle is in compliance with (HMR) § 49 CFR 171.1 (d)(5) (see supplement C)
- C) have spill kit present (fifty gallon plastic container, garbage bags, shovels, absorbent pads, activated charcoal (five gallons), eye wash, first aid kit, flagging, and PPE for at least two people
- D) have the product SDS available
- E) have emergency contact phone numbers available including an ADEC Spill Prevention and Response contact and an emergency contact number for someone in the Department serving as the project leader
- F) all vehicles transporting rotenone will slow down at least five miles an hour below the posted speed limit while crossing any bridge or culvert over water to reduce the chance of an accident occurring that could lead to an unintentional discharge into water.

Supplement C



THE STATE  
of **ALASKA**  
GOVERNOR BILL WALKER

**Department of Fish and Game**

**DIVISION OF SPORT FISH**  
Soldotna

43961 Kalifornsky Beach Rd, Suite B  
Soldotna, AK 99689-8276  
Main: 907.262.9368  
Fax: 907.262.4709

January, 15, 2017

To Whom it May Concern

This vehicle may be transporting a fish pesticide called CFT Legumine. The Alaska Department of Fish and Game is exempt from HMR (§ 49 CFR 171 through 180) as it applies to Packaging, Pretransportation, and Transportation functions of hazardous materials. For questions contact the Alaska Department of Transportation and Public Facilities (907-365-1210).

Sincerely,  
Rob Massengill,  
Fisheries Biologist II

## **2. Spills**

### **Spill Response**

If a rotenone spill occurs, the sequence in a workers response should be to Control, Contain and Clean up the spill (when practical). Workers should not expose themselves unnecessarily to chemicals from a spill and should wear full PPE before attempting to address a spill. If a spill is large and dangerous, call for help first. The project supervisor must be notified as soon as possible.

**Control:** When possible, workers should take immediate steps to control the release of the product being spilled such as stopping a leak by uprighting a turned over container, putting a leaking container into a larger container (i.e. garbage can, spill containment area or boat), or by pumping liquid from a leaking container into another container.

**Contain:** Contain the spill when practical; sand/dirt can be used to berm around a spill area and absorbent pads, sand or charcoal can be placed on the spill to help absorb it. Absorbent materials will be located in all application boats and at the staging area.

**Clean up:** Once a spill is contained, clean up the spill by sweeping or shoveling the contaminated material into a container lined with a heavy plastic bag. Bleach, chlorine or charcoal can be used to neutralize the spilled area.

To reduce the possibility of an accidental spill during transport, all product containers will be tethered securely into the transporting vehicle or trailer. To move the product containers to vehicles or boats, loading ramps or a forklift will be used to move the containers > five gallons. If a spill occurs, a spill response kit must be with the transporting vehicle or the loading area. The spill response kit will contain shovels to remove contaminated soil, a large plastic container to hold contaminated material/soil (50 gallon volume), absorbent pads, activated charcoal (10 gallons), dry sand (10 gallons), plastic garbage bags, personnel protective equipment for at least two people, a 100-foot roll of 3-6 foot impervious barrier, pesticide transfer hand pump and a gallon of bleach, caution flagging, spill emergency numbers, eyewash, disposable wipes and some form of warning sign or signal. (orange cones, warning signage etc.).

Any recovered contaminated soil will be treated as if it were the pure rotenone pesticide, and PPE will be worn to clean up the spill. If there is a spill outside of the treatment area and there is a chance it could enter surface waters out of the project area, then the disposal of the contaminated soil to an approved landfill may be required. For any spill onto soil near a treatment area, the contaminated soil will be removed and treated as if it were the pure pesticide and applied to the treatment area. Activated charcoal will be mixed into the soil where it was excavated at a rate of 100 to 1 (charcoal to active ingredient) as suggested online at [www.buyactivatedcharcoal.com](http://www.buyactivatedcharcoal.com).

Washing of equipment contaminated from a spill or equipment leaks can be accomplished by washing first with water from the treatment area then with a solution of bleach (1:10 ratio bleach to water) followed by washing with a strong soap and water solution.



Accidental pesticide spills of any size that result in the pesticide not entering the treatment area will be immediately reported by the project supervisor and to:

- 1) the ADEC hazardous spill number (1-907-269-3063),
- 2) the local ADEC Office (1-907-262-5210),
- 3) Kenai Peninsula Borough Emergency Services (1-907-262-4792),
- 4) Kenai Borough Emergency Management Office (1-907-262-4910).

In addition CHEMTREC provides access to emergency response information and technical assistance from chemical industry experts and can be contacted for emergency assistance at 1-800-424-9300. Local and State Law enforcement should be notified if a spill occurs on a public highway. For rotenone product information, the National Pesticide Information Center can also be contacted at 1-800-858-7378. These emergency phone numbers will be provided to all project personnel and should be with them at all times when working on the project.

### **3. Heat Stress**

Heat stress is a potential hazard to rotenone handlers due to the requirement to wear personal protective equipment. All team members will be informed of the symptoms and hazards related to heat stress. Further, all pesticide handlers will be encouraged to drink liquids frequently (~every 20 minutes of work) take appropriate work breaks and participate in heat stress monitoring.

Team members that suspect that they are suffering from the effects of heat stress will be instructed to immediately stop working, rehydrate and remove excessive clothing. The project supervisor shall be immediately notified, and if necessary, the affected person be given medical care.

### **4. Pesticide Storage/Staging Areas and Transport**

Storage of large quantities of rotenone product(>30 gallons liquid product or 110 lbs. of powdered product) when the storage arrangement is not capable of draining spilled product into a waterbody destined for treatment, the product will be stored within a bermed area lined with a plastic fabric capable of containing all the rotenone product. A spill response kits and PPE will be onsite at all storage locations including emergency contact numbers.

When possible, onsite storage of rotenone delivered to individual lakes/streams will be stored in such a way that an accidental spill would drain towards the waterbody destined to be treated.

Federal codes regulating transport of hazardous materials exempts state agencies from many requirements regarding hazardous materials training, license endorsements and placarding, however as explained below:

In accordance with § 49 CFR 171.1 (d)(5), which states:

- (d) Functions not subject to the requirements of federal Hazardous Material Regulations (HMR).



...(5) Transportation of a hazardous material in a motor vehicle, aircraft, or vessel operated by a federal, state or local government employee solely for noncommercial Federal, state, or local government purposes.

The Alaska Department of Fish and Game is exempt from HMR (§ 49 CFR 171 through 180) as it applies to Packaging, Pretransportation, and Transportation functions of hazardous materials.

Please contact the Alaska Department of Transportation and Public Facilities (907-365-1210) if there are any concerns regarding this exception.

However, the following travel precautions will be implemented for this project:

All vehicles transporting rotenone will:

- G) have pesticide containers tethered securely to prevent movement
- H) carry a document (page two) stating their compliance with federal Hazardous Materials Regulations
- I) have spill response equipment (fifty gallon plastic container, garbage bags, shovels, absorbent pads, activated charcoal (five gallons), eye wash, first aid kit, flagging, and PPE for at least two people
- J) have the product MSDS available
- K) have emergency contact phone numbers available including an ADEC Spill Prevention and Response contact and an emergency contact number for someone in the Department serving as the project leader
- L) all vehicles transporting rotenone will slow down at least five miles an hour below the posted speed limit while crossing any bridge or culvert over water to reduce the chance of an accident occurring.

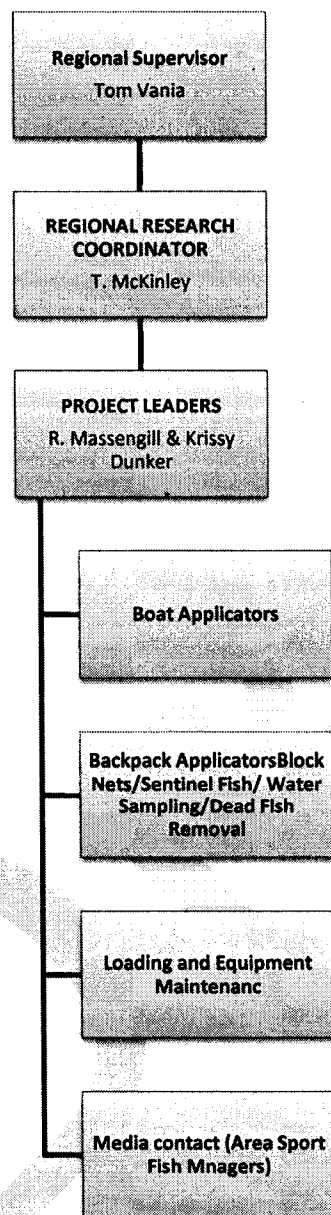
#### **4. Incident/Crisis Command**

A crisis typically results from adverse public reaction to, or excessive media interest in, an unplanned event during or following a rotenone treatment (Finlayson 2000). All incidents such as such as spills, accidents or any potential crisis should be immediately reported by the worker observing it to project leader and emergency services (911) if necessary. The project leader will assess the situation and respond with assistance (if prudent) and/or recruit emergency services or other support. The project supervisor will decide if additional actions should be taken including notifying the Regional Research Coordinator or emergency services.

In the event of a crisis related to this project, an Incident Command System will be implemented. The incident plan consists of the following:

- 1) Who the worker should report to (see Incident Organizational Chart).
- 2) Define the problem, identify issues, selection of a crisis team, gather facts, identify a spokesperson (responsibility of Project Leader and Research Supervisor)
- 3) Centralize control of information (responsibility of Project Leader and Research Supervisor)
- 4) Communicate and negotiate at the highest level of authority (dictated by Regional Supervisor or higher)
- 5) Contain the problem quickly

Appendix 13 page 14 of 14  
**Incident Organizational Chart**



#### Appendix 14. ADEC signage requirements for treatment site.

**18 AAC 90.630. Public notification and posting of pesticide applications to public places.** (a) A person may not apply a pesticide in a public place without first posting a written notice on the application site. The notice

(1) must be conspicuously posted at each point of customary access to each public place or each portion of each public place requiring a written notice;

(2) must be at least 8 ½ x 11 inches and be reasonably designed to remain legible for the longest of the following time periods:

(A) at least 24 hours after the application;

(B) the period until, according to the product label, entering the application site will be safe;

(3) if posted outdoors and not on a structure, must be posted at least 12 inches above ground level;

(4) if posted indoors or on a structure, must be

(A) posted no less than three and no more than four feet above floor level; and

(B) attached so as to remain in place;

(5) must be posted immediately before the pesticide application begins and remain in place for the longest period of time set out in (2)(A) and (B) of this subsection; and

(6) must contain the following wording, in substantially the following format, along with the date and time of application, the name, address, and telephone number of the contact person, and the time at which the pesticide will be dry, or if entering the application site is not yet safe when the pesticide is dry, the time when, according to the label, entering the site will be safe:

<p style="text-align: center;"><b>ATTENTION!</b></p> <p style="text-align: center;"><b>Pesticide Application</b></p> <p>Date _____ &amp; Time _____ of application</p> <p style="text-align: center;">Details available from (Name) at <u>(address)</u> or <u>(phone number)</u></p> <p style="text-align: center;">KEEP OUT UNTIL _____ (until dry or other time req'd by label)</p>
---

(b) Before beginning the application, the applicator or the applicators agent shall make available to the contact person a written statement containing

(1) the name, address, and telephone number of the applicator, or of the applicator's employer;

(2) the common or trade name, EPA registration number, amount used, and target pests for each pesticide applied;

(3) adjuvants used, if any; and

(4) any post-application re-entry precautions, including at a minimum those contained on the label.

(c) The contact person shall make the statement required under (b) of this section available to a person upon request.

(d) The following pesticide applications are not subject to the notification or posting requirements of this section:

(1) applications of antimicrobial pesticides;

(2) applications of rodenticides in tamper resistant bait stations;

(3) applications of silica gels and other ready-to-use pastes, foams, or gels.

(e) The contact person may authorize an immediate pesticide treatment without prior posting or notification if the contact person determines that an emergency exists. An emergency is an immediate and unanticipated threat to the health and safety of humans or the environment at the public place. An emergency does not exempt the applicator or the applicator's agent from the requirements of (b) of this section or the contact person from the requirements of (c) and (f) of this section.

(f) The contact person shall keep accurate written records of all pesticide applications that are subject to the posting and notification requirements of this section. Those written records must

(1) contain all the information required under (b) of this section;

(2) be kept for at least two years; and

(3) be made available to the department or any person directly affected by the application upon request during the two-year period. (Eff. 9/30/2007, Register 183; am 9/30/2007, Register 183)

Authority:	AS 46.03.010	AS 46.03.320	AS 46.03.730
	AS 46.03.020	AS 46.03.330	

## Appendix 15. ADEC pesticide recordkeeping requirements

**18 AAC 90.415. Recordkeeping requirements for other applicators of restricted-use pesticides.** An applicator of restricted-use pesticides who is not subject to 18 AAC 90.400 or 18 AAC 90.410 shall keep accurate written records of all purchases and uses of restricted-use pesticides for at least two years after each purchase or use. The records must be available to the department upon request and must contain

- (1) for each purchase of a restricted-use pesticide by the applicator,
  - pesticide: (A) the product or brand name and EPA registration number of the
  - and (B) the company name and address where the pesticide was purchased;
  - (C) the date and the amount of pesticide purchased; and
- (2) for each use of a restricted-use pesticide by the applicator,
  - pesticide: (A) the product or brand name and EPA registration number of the
  - (B) the date and location of use;
  - (C) the rate of application;
  - (D) the dilution of the pesticide applied;
  - (E) the amount of pesticide product used;
  - (F) the target pests and site of the application;
  - (G) the name of the person applying the pesticide; and
  - (H) if the pesticide is a fumigant, instead of the information required by (C) and (D) of this paragraph,
    - (i) the temperature and duration of the exposure period; and

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Prentox CFT Legumine Fish Toxicant

Safety Data Sheet



Section 1: Identification

Product identifier

Product Name • Prentox CFT Legumine Fish Toxicant

Synonyms • 100209000; 100209001; EPA Reg. No.: 89459-48

Product Description • Orange viscous liquid.

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Piscicide.

Restrictions on use •  
KEEP OUT OF THE REACH OF CHILDREN. Avoid contact with eyes, skin and clothing. Do not use or store near heat or open flame. Avoid release to the environment. Use in well ventilated area. Avoid inhalation of vapors or fumes. For use by certified applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

Details of the supplier of the safety data sheet

Manufacturer • Central Garden & Pet Company  
1501 E. Woodfield Road, Suite 200W  
Schaumburg, IL 60173  
United States  
  
www.central.com

Emergency telephone number

Manufacturer (Transportation) • 1-800-424-9300 - CHEMTREC

Manufacturer (Transportation) • 1-703-527-3887 - Chemtrec - Outside US collect calls accepted

Manufacturer • 1-800-248-7763

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Eye Irritation 2A  
Flammable Liquids 4  
Skin Irritation 2  
Acute Toxicity Oral 4  
Acute Toxicity Inhalation 2  
Reproductive Toxicity 1B  
Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects

Label elements

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**DANGER**



- Hazard statements**
- Causes serious eye irritation
  - Causes skin irritation
  - Combustible liquid
  - Fatal if inhaled
  - Harmful if swallowed
  - May damage fertility or the unborn child.
  - May cause drowsiness or dizziness

**Precautionary statements**

- Prevention**
- Wash thoroughly after handling.
  - Wear protective gloves/protective clothing/eye protection/face protection.
  - Obtain special instructions before use.
  - Do not handle until all safety precautions have been read and understood.
  - Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.
  - Do not eat, drink or smoke when using this product.
  - Use only outdoors or in a well-ventilated area.
  - Do not breathe dust, fume, gas, mist, vapours and/or spray.
  - In case of inadequate ventilation wear respiratory protection.
  - Keep away from flames and hot surfaces. - No smoking.
  - Wear respiratory protection.
- Response**
- IF ON SKIN:** Wash with plenty of soap and water.
  - Specific treatment, see supplemental first aid information.
  - If skin irritation occurs: Get medical advice/attention.
  - Take off contaminated clothing and wash before reuse.
  - IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
  - IF SWALLOWED:** Immediately call a POISON CENTER or doctor/physician.
  - Do NOT induce vomiting.
  - If eye irritation persists: Get medical advice/attention.
  - In case of fire: Use appropriate media Water fog, foam, dry chemical or carbon dioxide (CO2) for extinction.
  - Immediately call a POISON CENTER or doctor/physician.
  - If exposed or concerned: Get medical advice/attention.
  - IF INHALED:** Remove person to fresh air and keep comfortable for breathing. Call a poison control center or doctor if you feel unwell.
- Storage/Disposal**
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.
  - Store in a well-ventilated place. Keep cool.
  - Store locked up.
  - Keep container tightly closed.

**Other hazards**

OSHA HCS 2012

- This product is extremely toxic to fish. Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

**Section 3 - Composition/Information on Ingredients**

**Substances**



Prenox CFT Legumine Fish Toxicant

- Material does not meet the criteria of a substance.

## Mixtures

Composition		
Chemical Name	Identifiers	%
Rotenone	CAS:83-79-4	5%
Cubé Resins other than Rotenone	NDA	5%
2-Pyrrolidinone, 1-methyl-	CAS:872-50-4	10%
Diethylene glycol monoethyl ether	CAS:111-90-0	56.7%
Other ingredients	NDA	Balance

## Section 4: First-Aid Measures

### Description of first aid measures

#### Inhalation

- IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CONTROL center or doctor.

#### Skin

- IF ON SKIN: Wash with plenty of soap and water. If irritation or rash occurs, get medical advice/attention. Take off contaminated clothing and wash before reuse.

#### Eye

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

#### Ingestion

- IF SWALLOWED: Immediately call a poison control center or doctor. Aspiration hazard - if swallowed, do NOT induce vomiting.

### Most important symptoms and effects, both acute and delayed

- Harmful if swallowed, fatal if inhaled, causes dizziness or drowsiness if inhaled at non-lethal doses, causes serious eye irritation, causes skin irritation, may damage fertility or the unborn child. Refer to Section 11 - Toxicological Information.

### Indication of any immediate medical attention and special treatment needed

#### Notes to Physician

- Treat symptomatically and supportively.

## Section 5: Fire-Fighting Measures

### Extinguishing media

Suitable Extinguishing Media • Use water spray, alcohol-resistant foam, carbon dioxide, or dry chemical.

#### Unsuitable Extinguishing Media

- Avoid heavy hose streams.

#### Firefighting Procedures

- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.  
Do not allow fire fighting water to escape into waterways or sewers.  
LARGE FIRES: Dike fire control water for later disposal; do not scatter the material.  
LARGE FIRES: Move containers from fire area if you can do it without risk.

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Stay upwind.  
Ventilate closed spaces before entering.  
Do not breathe gas/fumes/vapor/spray.  
Keep unauthorized personnel away.

### Special hazards arising from the substance or mixture

- |                                    |  |
|------------------------------------|--|
| Unusual Fire and Explosion Hazards | • Combustible liquid.<br>Containers may explode when heated. |
| Hazardous Combustion Products      | • Carbon monoxide and carbon dioxide.                        |

### Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA).

## Section 6 - Accidental Release Measures

### Personal precautions, protective equipment and emergency procedures

#### Personal Precautions

- Do not walk through spilled material. Ventilate enclosed areas. Wear appropriate personal protective equipment, avoid direct contact. Avoid breathing fumes. Keep all sources of ignition away.

#### Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Ventilate closed spaces before entering. Avoid release into the environment. Keep out of low areas. Keep unauthorized personnel away. Stay upwind. Take precautionary measures against static discharge. Turn off electric power to area.

### Environmental precautions

- LARGE SPILLS: Prevent entry into waterways, sewers, basements or confined areas.

### Methods and material for containment and cleaning up

#### Containment/Clean-up Measures

- Absorb spills with an inert material, clay granules or other inert absorbent material and put in container for disposal.  
LARGE SPILLS: Dike far ahead of spill for later disposal.  
Stop leak if you can do it without risk.  
SMALL SPILLS: Take up with sand or other non-combustible absorbent material and place into containers for later disposal.  
Wear appropriate personal protective equipment, avoid direct contact.

## Section 7 - Handling and Storage

### Precautions for safe handling

#### Handling

- Keep away from fire - No Smoking. Avoid breathing fumes. Use only in well ventilated areas. Wear appropriate personal protective equipment, avoid direct contact. Avoid contact with skin or eyes.

### Conditions for safe storage, including any incompatibilities

#### Storage

- Store locked up. Store in a cool/low-temperature, well-ventilated dry place away from heat and ignition sources. Keep from freezing. Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F Do not store at temperatures below 4.4°C/40°F. Keep container tightly closed. Store only in original container.

#### Incompatible Materials or Ignition Sources

- Heat, sparks, open flame. Strong acids, oxidizing agents and toxic materials.

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**Other Information**

- See product label for additional information.

**Section 8 - Exposure Controls/Personal Protection****Control parameters**

Exposure Limits/Guidelines • No data available.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Rotenone (83-79-4)	TWAs	5 mg/m <sup>3</sup> TWA (commercial)	5 mg/m <sup>3</sup> TWA	5 mg/m <sup>3</sup> TWA

**Exposure Limits Supplemental**

ACGIH

• Rotenone (83-79-4): TLV Basis - Critical Effects: (CNS impairment; eye and upper respiratory tract irritation)

**Exposure controls****Engineering Measures/Controls**

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values.

**Personal Protective Equipment****Pictograms****Respiratory**

- Wear a dust/mist (or particulate) respirator.

**Eye/Face**

- Wear chemical splash safety goggles.

**Hands**

- Impervious gloves. Some materials that are chemical resistant to this product are Barrier Laminate, Nitrile Rubber, Neoprene Rubber or Viton.

**Skin/Body**

- Coveralls, over long-sleeved shirt and long pants will be needed. Mixers, loaders, and others exposed to the concentrate, through cleaning equipment or spills must wear a chemical-resistant apron.

**Environmental Exposure Controls**

- Refer to Section 13 - Disposal Considerations.

**Other Information**

- See product label for specific use PPE instructions.

**Section 9 - Physical and Chemical Properties****Information on Physical and Chemical Properties**

Material Description			
Physical Form	Liquid	Appearance/Description	Orange viscous liquid.
Color	Orange	Odor	Solvent
Odor Threshold	No data available		
General Properties			

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Boiling Point	No data available	Melting Point/Freezing Point	No data available
Decomposition Temperature	No data available	pH	4.5 (1% aqueous solution)
Specific Gravity/Relative Density	= 1.09 Water=1	Density	No data available
Water Solubility	No data available	Viscosity	No data available
Critical Temperature	No data available		
<b>Volatility</b>			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
<b>Flammability</b>			
Flash Point	192 °F(88.8889 °C)	UEL	No data available
LEL	No data available	Autoignition	No data available
Flammability (solid, gas)	No data available		
<b>Environmental</b>			
Octanol/Water Partition coefficient	No data available		

## Section 10: Stability and Reactivity

### Reactivity

- Non-reactive under normal handling and storage conditions.

### Chemical stability

- Stable under normal temperatures and pressures.

### Possibility of hazardous reactions

- Hazardous polymerization will not occur.

### Conditions to avoid

- Excessive heat >110°F. Heat, sparks, open flame, other ignition sources, and oxidizing conditions. Keep away from fire. Do not allow product to freeze.

### Incompatible materials

- Strong oxidizing agents and strong acids.

### Hazardous decomposition products

- Thermal decomposition may produce oxides of carbon.

## Section 11 - Toxicological Information

### Information on toxicological effects

Components		
Rotenone (5%)	83-79-4	Acute Toxicity: Ingestion/Oral-Rat, adult female LD50 • 39.5 mg/kg; Ingestion/Oral-Rat, adult male LD50 • 102 mg/kg; Inhalation-Rat LC50 • 0.0212 mg/L 4 Hour(s); Skin-Rabbit LD50 • >5000 mg/kg; Irritation: Eye-Rabbit • Essentially non-irritating; Skin-Rabbit • Essentially non-irritating

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation 2; Acute Toxicity - Oral 4
Skin corrosion/Irritation	OSHA HCS 2012 • Skin Irritation 2

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Serious eye damage/Irritation	OSHA HCS 2012 • Eye Irritation 2A
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met - Not classified - data lacking
Toxicity for Reproduction	OSHA HCS 2012 • Toxic to Reproduction 1B
STOT-SE	OSHA HCS 2012 • Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects
STOT-RE	OSHA HCS 2012 • Classification criteria not met

**Potential Health Effects****Inhalation****Acute (Immediate)**

- Fatal if inhaled. May affect the central nervous system. Symptoms may include dizziness or drowsiness. May cause respiratory irritation.

**Chronic (Delayed)**

- No data available

**Skin****Acute (Immediate)**

- Causes skin irritation.

**Chronic (Delayed)**

- No data available

**Eye****Acute (Immediate)**

- Causes serious eye irritation.

**Chronic (Delayed)**

- No data available

**Ingestion****Acute (Immediate)**

- Harmful if swallowed.

**Chronic (Delayed)**

- No data available

**Mutagenic Effects**

- Rotenone is not mutagenic.

**Carcinogenic Effects**

- No component in this product present at 0.1% or greater is listed by IARC, OSHA or NTP.

**Reproductive Effects**

- Rotenone has been tested and does not cause birth defects. Rotenone does not have adverse effects on reproduction. 2-Pyrrolidinone, 1-methyl- caused adverse effects on sexual function and fertility and/or development based on animal experiments.

**Section 12 - Ecological Information****Toxicity**

Components		
Rotenone (5%)	83-79-4	Aquatic Toxicity-Fish: 96 Hour(s) LC50 <i>Rainbow Trout</i> 0.00194 mg/L [Acute]
		NOEC <i>Rainbow Trout</i> 0.00101 mg/L [Chronic]
		Aquatic Toxicity-Crustacea: NOEC <i>Daphnia magna</i> 0.00125 mg/L [Chronic]
		96 Hour(s) EC50 <i>Daphnia magna</i> 0.0037 mg/L [Acute]

**Persistence and degradability**

- Rotenone is not persistent in the environment and its low vapor pressure ( $6.9 \times 10^{-10}$  torr) and Henry's Law constant ( $1.1 \times 10^{-13}$  atm-m<sup>3</sup> mol<sup>-1</sup>) limit its volatility. If released

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to water, rotenone generally degrades quickly through abiotic (hydrolytic and photolytic) mechanisms.

### Bioaccumulative potential

- Rotenone has a relatively low potential for bioconcentrating in aquatic organisms.

### Mobility in Soil

- Rotenone is mobile to moderately mobile in soil and sediment with a half-life of a few days to several weeks or longer depending on water temperature.

### Other adverse effects

#### Potential Environmental Effects

- Extremely toxic to fish and aquatic invertebrates.

## Section 13 - Disposal Considerations

### Waste treatment methods

#### Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Never place unused product down any indoor or outdoor drain.

#### Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. See product label for disposal instructions. Nonrefillable container.

## Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class(es)	Packing group	Environmental hazards
DOT	NA1993	Bulk packaging only: Combustible liquid, n.o.s. (Diethylene glycol monoethyl ether)	Comb. Liq.	III	Marine Pollutant
IMO/IMDG	UN 3082	Environmentally hazardous substance, liquid, n.o.s. (Rotenone)	9	III	Marine Pollutant
IATA/ICAO	UN 3082	Environmentally hazardous substance, liquid, n.o.s. (Rotenone)	9	III	Acute Aquatic Toxicity

Special precautions for user • None specified.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code • No data available

#### Other information

IMO/IMDG • No data available

IATA/ICAO • No data available

## Section 15 - Regulatory Information

### Safety, health and environmental regulations/legislation specific for the substance or mixture

**SARA Hazard Classifications** • Acute, SARA Title III Section 313, Chronic

**FIFRA – Pesticide Labeling**

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

**WARNING**

**Precautionary Statements** • KEEP OUT OF THE REACH OF CHILDREN.

**Hazards to Humans and Domestic Animals**

May be fatal if inhaled. Do not breathe the vapors or spray mists. May be fatal if swallowed. Causes moderate eye irritation. Harmful if absorbed through skin. Do not get in eyes or on skin or clothing.

**First Aid** •

Have product container or label with you when obtaining treatment advice. If inhaled • Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice. If swallowed • Call a poison control center or doctor immediately for treatment advice. • Do not give any liquid to the person. • Do not induce vomiting unless told to do so by the poison control center or doctor. • Do not give anything by mouth to an unconscious person. If in eyes • Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice. If on skin or clothing • Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor at for treatment advice.

**Environmental Hazards** •

This product is extremely toxic to fish and other aquatic organisms. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency and other agencies before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate water outside of the treatment area by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water outside of the treatment area, food or feed by storage or disposal. Do not discharge effluent containing this pesticide into sewage systems without notifying the sewage treatment plant authority (PTOW).

**Physical or Chemical Hazards** • FLAMMABLE Keep away from heat and open flame.

Inventory		
Component	CAS	TSCA
Diethylene glycol monoethyl ether	111-90-0	Yes
2-Pyrrolidinone, 1-methyl-	872-50-4	Yes
Rotenone	83-79-4	No

**United States**

**Environment**

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Diethylene glycol monoethyl ether

111-90-0

Not Listed

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• 2-Pyrrolidinone, 1-methyl-	872-50-4	1.0 % de minimis concentration
• Rotenone	83-79-4	Not Listed
U.S. - EPA - Designated Generic Categories - Certain Glycol Ethers		
• Diethylene glycol monoethyl ether	111-90-0	
• 2-Pyrrolidinone, 1-methyl-	872-50-4	Not Listed
• Rotenone	83-79-4	Not Listed

### Section 16 - Other Information

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Preparation Date	• 20/June/2016
Disclaimer/Statement of Liability	• The information and statements herein are believed to be reliable but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE.