Tote Road Pike Lakes Restoration Project: Environmental Assessment

Alaska Department of Fish and Game

Division of Sport Fish

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1.0 INTRODUCTION

Northern pike *Esox lucius* are an invasive species in Southcentral Alaska and are implicated in the decline of native fisheries throughout the region (Rutz 1999; Sepulveda et. al. 2013; Sepulveda et. al. 2014; Glick and Willette 2016; Patankar and Von Hippel 2006). Northern pike were first documented on the Kenai Peninsula in the Soldotna Creek drainage in the 1970's (ADF&G unpublished (a)). Subsequent dispersal and more illegal introductions resulted in northern pike establishing populations in 23 Kenai Peninsula waterbodies.

Beginning in 2008, the Alaska Department of Fish and Game (ADF&G) initiated a program to eradicate northern pike from the Kenai Peninsula. Initial work began by removing northern pike from landlocked lakes (Massengill 2014a; 2014b) and progressed to removing northern pike from more complex open waterbodies within the Swanson River and Soldotna Creek drainages between 2012 through 2017. To date, the only known northern pike populations remaining on the Kenai Peninsula are found in a group of eight small lakes located about five miles south of Soldotna and collectively referred to as the Tote Road Pike Lakes (TRPL). The TRPL area is within Township 4N Range R11W Sections 15, 20, 21, 22 and 28. ADF&G first documented northern pike in one lake within the TRPL during a 1983 survey. Survey work conducted between 2007and the present has confirmed pike now exist in eight area lakes. The TRPL contains seven stream-linked lakes and one isolated lake. In total, the TRPL cover about 92 surface acres and contain 1,200 acre-feet of water. Seven of the eight TRPL are near Stubblefield Drive, Rex Road, and Leisure Lake Drive and one lake is just north of Gruber Road. Threespine stickleback *Gasterosteus aculeatus* are believed to be the only fish species native to the TRPL although, in the seven stream-linked TRPL lakes, their populations appear to be extirpated by northern pike predation. Rainbow trout *Oncorhynchus mykiss* and chinook salmon (*Oncorhynchus tshawytscha) were* reported by some locals to have been present in some of the lakes decades ago, but they apparently resulted from undocumented stockings and were not self-sustaining.

The Alaska Department of Fish and Game (ADF&G) developed this Environmental Assessment (EA) to address eradicating the illegally introduced northern pike population in the TRPL area. The objective is to completely remove the northern pike population from the TRPL area and restock the lakes with salmonids (i.e., coho salmon *Oncorhychus kisutch* and/or rainbow trout) and threespine stickleback to any TRPL waters where they have been extirpated. These efforts would restore native threespine stickleback populations and ecosystem function to these waterbodies while providing a replacement sport fishery to the existing northern pike fishery. Three alternatives for accomplishing this are discussed in this EA. The first, the no action alternative, would not achieve the objective as the northern pike population would remain in the TRPL area. The second alternative would involve long-term gillnetting of all TRPL lakes to reduce or possibly remove the northern pike population and the third alternative would involve using a piscicide (rotenone) to remove all northern pike.

1.1 Purpose and Need for Action

The purposes of this EA are to: (1) present and evaluate alternative approaches for northern pike eradication in the TRPL; (2) propose selection of the alternative that best meets the needs of the Alaska Department of Fish and Game northern pike eradication objectives while minimizing potential environmental impacts; (3) provide an opportunity for public input on eradication options; and (4) determine whether the scope and magnitude of impacts expected from implementation of the preferred alternative warrants preparation of an environmental

impact statement (EIS). If significant impacts are expected, an EIS would be prepared. If not, the ADF&G would select the preferred alternative. In either case, the U.S. Fish and Wildlife Service (USFWS; the agency tasked with granting Federal authority for the preferred alternative) will disclose its final decision and supporting rationale in a separate decision document.

1.2 Background

The northern pike is native to Alaska north and west of the Alaska Mountain Range and near Yakutat in the southeast. Northern pike do not naturally occur in Southcentral Alaska (Figure 1) and first arrived there from an illegal introduction to Bulchitna Lake in the Yentna River drainage in the 1950's (ADF&G 2007). Kenai Peninsula northern pike are believed to have originated from an illegal introduction to the Soldotna Creek drainage (Kenai River Tributary) during the 1970s and quickly spread from the initial introduction site, both on their own and aided by additional illegal introductions (McKinley 2013; ADF&G unpublished (a)). The current status of Kenai Peninsula water where northern pike have been detected is shown in Figure 2.

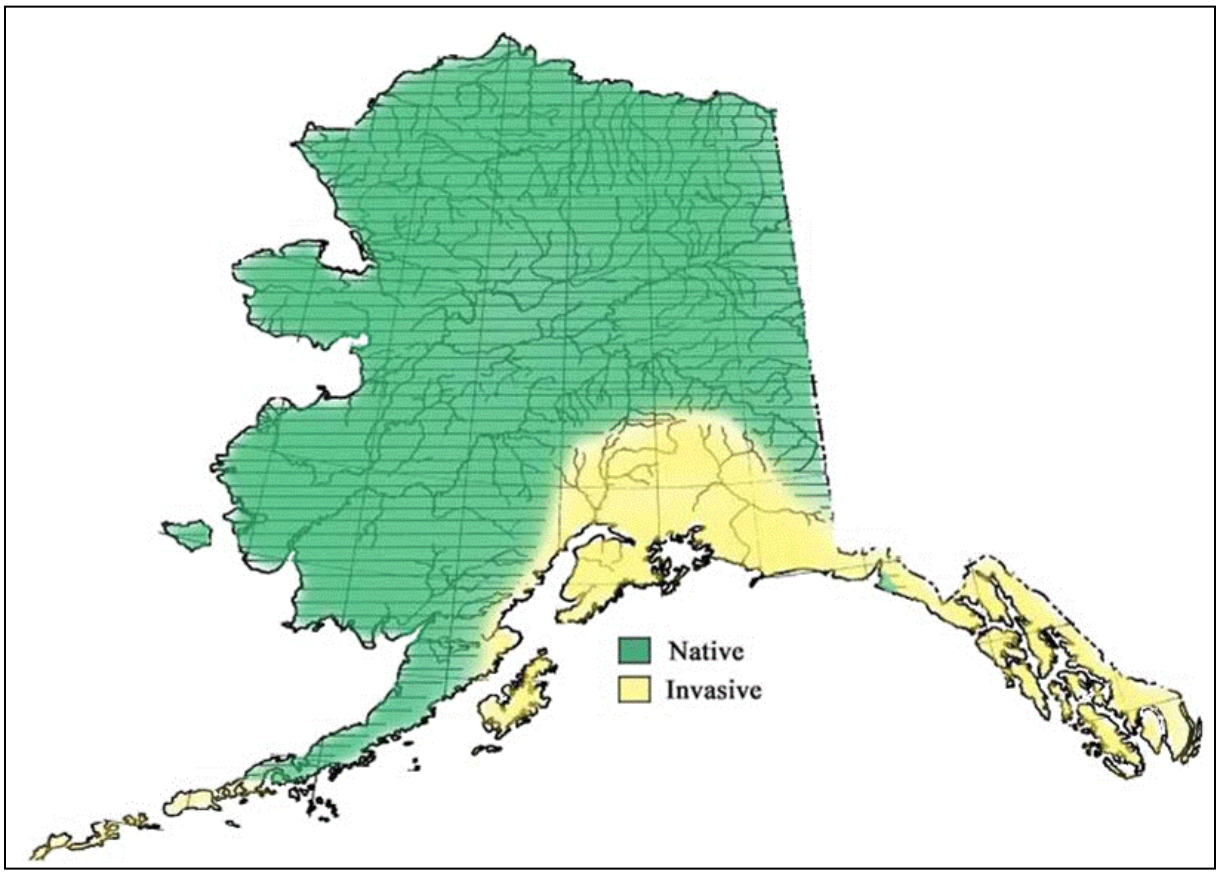

Figure 1. Map of Alaska showing native and invasive range of northern pike.

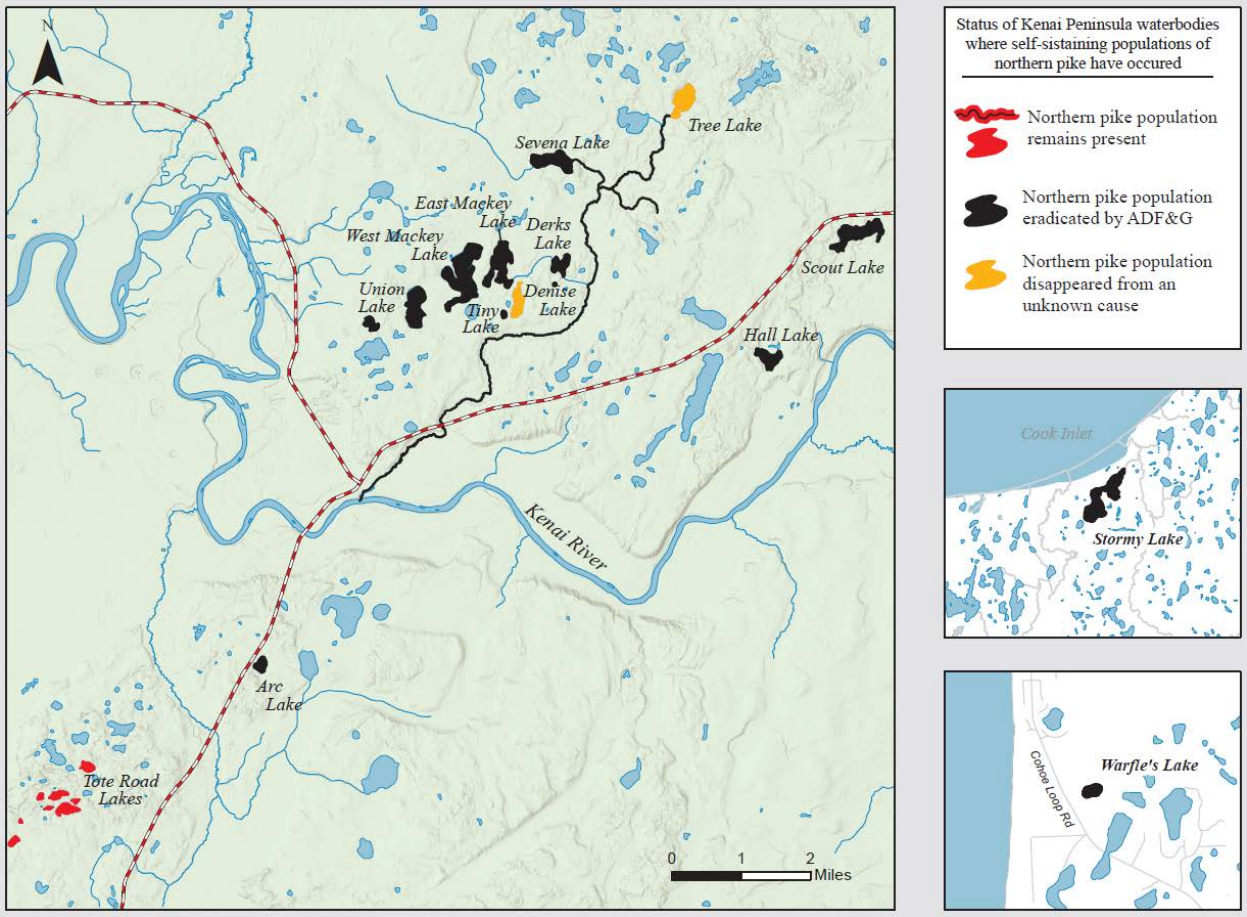

Figure 2. Status of Kenai Peninsula waterbodies where self-sustaining populations of northern pike have occurred.

Northern pike are considered an invasive species in Southcentral Alaska because they are not native to the region and their introduction has the ability to cause economic and/or environmental harm (ADF&G 2002). Northern pike predation is suspected of causing localized salmonid reductions in Southcentral Alaska (Sepulveda et. al. 2013; Sepulveda et. al. 2015; Rutz 1999; Glick and Willette 2016), and northern pike appear to prefer soft-finned juvenile salmonids over other available prey species (Sepulveda et. al. 2013; Pankatar 2008). 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, Dunker et. al. 2017). 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, 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 less deep water refugia for northern pike prey to avoid predation. Northern pike habitat preference is shallow vegetated waters (Cook and Bergersen 1988, Inskip 1986) and pike predation influence on salmonids appears greatest in these habitats (Dunker et. al. 2017).

Introduced northern pike on the Kenai Peninsula have reduced or eliminated native wild fish populations from some lakes (McKinley 2013) and caused the cessation of ADF&G fish stocking in three other lakes.

With the exception of threespine stickleback, the TRPL northern pike population does not pose a direct threat to local fisheries as no surface water connection exists to other waterbodies and no other fish species are native to the TRPL. The nearest anadromous waters are 1km to the southeast of Hope Lake. However, TRPL northern pike do pose a very serious indirect threat to other wild Kenai Peninsula fisheries because these northern pike can be a source for illegal introductions elsewhere. For example, illegally introduced northern pike were detected in Arc Lake in 2000 which is located just a few miles northwest of the TRPL area. In 2017, four new Kenai Peninsula waters were found to have northern pike in them, and two of these were within the TRPL area and two were outside. The pike populations of the two waters found outside the TRPL in 2017 were removed that year. The Kenai River drainage, which supports major sport, commercial and personal use/subsistence fisheries for salmon, flows just 8km to the north. The TRPL contains the last known northern pike population on the Kenai Peninsula following years of eradication efforts by ADF&G. Not removing the TRPL northern pike population unnecessarily jeopardizes Kenai Peninsula wild native and stocked fisheries. Besides the TRPL, no other northern pike populations are currently known to exist on the Kenai Peninsula.

1.3 Legal Authorities

By consent of the Alaska Board of Fisheries, the ADF&G is authorized to perform acts leading to the eradication of fish populations per Alaska Statute (AS 16.35.200). Further, ADF&G is mandated by law to "Manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state…" (Alaska Fish and Game Laws and Regulations, Section 16.05.020). Removing northern pike from the TRPL would serve to: restore native wild stickleback populations and aquatic habitat, allow for an alternative sport fishery in the lakes, reduce the likelihood that northern pike expand elsewhere on the Kenai Peninsula, and support ADF&G' s long-term goal of eradicating northern pike from the entire Kenai Peninsula. It is the ADF&G's legal responsibility to remove the threat imposed by northern pike when feasible.

The ADF&G Division of Sport Fish has developed planning documents to guide the Department's actions regarding northern pike. These documents include the Management Plan for Invasive Northern Pike located online at: http://www.ADF&G.alaska.gov/static/species/nonnative/invasive/pike/pdfs/invasive_pike_management_plan.pdf and the Alaska Aquatic Nuisance Species Management Plan located online at: http://www.ADF&G.alaska.gov/static/species/nonnative/invasive/pdfs/ak_ansmp.pdf .

These plans aid in identifying specific threats from northern pike, lists the statues and regulations pertinent to invasive species, and outlines the processes to follow when planning projects that evaluate, prevent, control, and/ or eradicate northern pike. The Division's strategic plan has a specific objective to: "minimize impacts of invasive species on sport fish stocks and habitat: (http://www.ADF&G.alaska.gov/static/fishing/PDFs/sport/StrategicPlan2015Final.pdf). Finally, the Division's invasive northern pike planning team has identified the TRPL as a priority for the Kenai Peninsula.

1.4 Issues

1.4.1 Issues Selected for Detailed Analysis

In 2017, ADF&G began a public scoping meeting process to solicit public comment on a course of action regarding northern pike removal or control in the TRPL area. The first meeting was held on December 11, 2017 at the Kenai National Wildlife Refuge Visitor Center. The second meeting was held on February 7, 2018 at the same location. Among the participants of the

scoping process, opinions varied greatly and ranged from adamant support for the project to strong disapproval. Concerns expressed during public scoping were considered in ADF&G' s analysis of the alternative actions, and a summary of the public meeting scoping comments and concerns can be found in Appendix 1.

In the spring of 2018, ADF&G will run a public notice in a local newspaper (Peninsula Clarion) announcing a 30 day public commenting period for the Soldotna Creek drainage Environmental Assessment. After this notice has run, a copy of that notice will be presented in Appendix 2. A media release will also be issued by ADF&G announcing the public commenting periods for both this environmental assessment and for a related Pesticide Use Permit application required by the Alaska Department of Environmental Conservation (ADEC). Once available, a copy of that public notice will be presented in Appendix 3. Public comments received for this environmental assessment during the commenting period will be summarized in Appendix 4.

Specific to rotenone, the primary concerns received during both the public scoping meetings and written comments received during the commenting period for this EA will be summarized in this section following the conclusion of the public scoping period.

2.0 ALTERNATIVES

In this section, a range of alternatives are described for management of northern pike from the TRPL. A "no action" alternative and two eradication/control alternatives are presented.

2.1 Alternative 1: No Northern Pike Eradication (no action alternative)

Alternative 1 would take no management action for eradicating or controlling northern pike from the TRPL. ADF&G would not make any attempt to remove northern pike from the TRPL, restore its native stickleback populations, or provide an alternative fishery through the stocking of salmonids to these lakes.

2.2 Alternative 2: Mechanical Removal

This alternative would involve deploying gill nets and/or trap nets under the ice to remove northern pike. Once all northern pike were removed, these lakes would be restocked with salmonids.

Under specific conditions, gillnets have been used successfully to remove unwanted fish from lakes. Bighorn Lake, a 2.1 ha lake located in Banff National Park in Alberta, Canada, was gillnetted from 1997 to 2000 to remove an invasive population of brook trout (Parker et al. 2001). Over 10,000 net nights (1 net night = 1 net set overnight for at least 12 hours) were conducted over a four-year period to remove the population that totaled 261 fish. The researchers concluded that the removal of nonnative trout using gillnets was impractical for larger lakes (> 10 Ha). In clear lakes, fish have the ability to acclimate to the presence of gillnets and avoid them. These researchers reported observing brook trout avoiding gillnets within 2 hours of being set.

Knapp and Matthews (1998) reported that Maul Lake, a 1.6 ha lake in the Inyo National Forest in California, was gillnetted from 1992 to 1994 to remove a brook trout population. The population consisted of 97 fish that were removed after 108 net days of effort. Following the removal of brook trout, Maul Lake was mistakenly restocked with rainbow trout. Efforts to remove them using gillnets were implemented immediately. From 1994 through 1997, 4,562

net days were required to remove 477 rainbow trout from the lake. Knapp and Matthews (1998) reported that gillnets could be used as an alternative to chemical treatment, but they acknowledged that the small size and shallow depth of Maul Lake leant itself to a successful fish eradication using gillnets. Their criteria for successfully eradicating fish with gillnets included targeting lakes less than 1.6 ha, less than 5.8m deep, little or no inflow or outflow to perpetuate reinvasion, and no natural reproduction of the fish population.

ADF&G's experience using long-term gillnetting to remove northern pike from Kenai Peninsula lakes has yielded mixed results. During 2013 and 2014, ADF&G simultaneously gillnetted four lakes in the Soldotna Creek drainage (Union Lake (34 ha), West Mackey Lake (68 ha), East Mackey Lake (40 ha) and Derks Lake (15ha)). A total of 68 gillnets were fished in these lakes from fall ice-up to spring ice-out totaling 293,645 hours of netting effort. Subsequent sampling revealed that northern pike were still prevalent in all the lakes following this effort (Dunker et. al. 2016). Successful removal of northern pike in very small closed lakes with low northern pike populations (<30 individuals) did occur at three lakes (Tiny Lake (2.2 ha), Warfle Lake (3.04 ha) and Hall Lake (17 ha)) following intensive gillnetting effort totaling 17,895, 4,376 and 57,638 hours, respectively. It should be noted that at Hall Lake and Warfle Lakes no juvenile northern pike were detected suggesting northern pike reproduction had been unsuccessful in recent years (ADF&G Soldotna Office, unpublished data (b)).

TRPL northern pike have been reproducing for decades. The total two-day catch from ten gillnets set in a single TRPL lake during the spring of 2013 was 110 northern pike with many fish <2 years old (ADF&G Soldotna Office, unpublished data (c)). It is unlikely long-term gillnetting could eradicate northern pike from the TRPL as most of the lakes are interconnected and the total surface area (37.1 ha) and volume (147 ha/m) is far greater than areas where gillnetting has been successful at eradication.

2.3 Alternative 3: Rotenone Treatment (Preferred Alternative)

ADF&G's preferred alternative involves using rotenone (CFT Legumine™) (Appendices 5 and 6) to remove northern pike from the TRPL. Following a rotenone treatment, the TRPL would be restocked with native threespine sticklebacks using individuals collected from southcentral Alaska. Also, salmonids (i.e., rainbow trout and/or coho salmon) would also be stocked by relocating wild fish from nearby anadromous waters (i.e. Soldotna Creek, Slikok Creek). Depending on whether stocked wild fish eventually reproduce successfully in the TRPL, additional stocking options may be considered in the future (hatchery-reared fish or ADF&G Salmon-in-the-Classroom reared fish).

Alternative 3 offers the highest probability of achieving the goals of removing northern pike from the TRPL, restoring lost native stickleback populations and providing a replacement sport fishery.

2.3.1 Description of Rotenone

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.).These species are found in Australia, Oceania, southern Asia, and South America (Ling 2003). People have used 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), and it has been used in fisheries management in North America since the 1930s (Finlayson et al. 2000).

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. Mammals and other non-gill breathing animals do not have this rapid absorption route into the bloodstream and can tolerate exposure to concentrations much higher than those used to kill fish. Most non-target organisms that do not have this rapid absorption route are not negatively affected at rotenone concentrations used for fish management (Finlayson 2000, Ling 2003, NPS 2006, USEPA 2007, MFW&P 2008).

2.3.2 Description of the Proposed Rotenone Treatment

The boundary for this treatment area would be all waterbodies containing northern pike within a 2.4km radius of Hope Lake located in the Tote Road/Stubblefield Drive area south of the city of Soldotna. Currently, ADF&G has identified eight lakes in this area with northern pike including small ephemeral streams that connect seven of the lakes and a one mile outlet stream that drains westward from the lake complex. It is possible more waters could be included in the treatment area if future fish surveys discover new populations of northern pike. The eight known pike lakes currently comprising the TRPL lakes covers approximately 37.1 ha including all lake-connected ephemeral streams (totaling~ 1.6km in length).

All waters would be treated with CFT Legumine™ (EPA reg# 75338-2) (Appendices 5 and 6), which is a liquid rotenone formulation containing 5% rotenone (ingredients described in detail in section 4.3.3). The proprietary formulation of CFT Legumine™ increases dispersion and emulsification in water with minimal petroleum distillates. The target concentration for the treatment would be within the product label guidelines for both liquid and powder rotenone and is anticipated to be about 0.8 parts per million (ppm) of formulated product (.04 ppm active ingredient/rotenone).

The entire treatment is anticipated to take about four days to complete and ideally would occur just prior to ice-up during October 2018. This timing is preferred because the relatively cold water available that time of year will prolong the rotenone persistence (i.e., 3-7 months) ensuring a long exposure period for northern pike while minimizing impact to recreationists. There is a possibility that piscivorous birds (e.g., Eagles, Cormorants, Kingfishers, etc.) present at the TRPL during October could be temporarily displaced because of the removal of the northern pike prey base. However, there are many nearby lakes for these animals to relocate to, and it is expected any impact would be temporary in nature.

Prior to the treatment, signage would be placed at all common access locations to the TRPL in compliance with all applicable legal requirements. All landowners with property adjacent to treatment waters will be notified beforehand. Materials and equipment required to conduct the rotenone application would be transported to most TRPL waterbodies by highway vehicles although some lakes access may require boats and treatment supplies to be transported by ATV or manually carried. Secured onsite storage of all rotenone products would be accomplished by containing them inside an enclosed locked cargo container. To control any spill onsite, an impermeable ground liner that has a berm around its perimeter would be used to store rotenone product lakeside while an application is occurring. No overnight or unattended rotenone storage would occur at the TRPL.

Rotenone would be primarily applied by applicators using an outboard-powered motorboat. The application boat(s) would be equipped with a gas-powered pumping system that would premix lake water with the rotenone product and discharge the premixture to the surface waters and propeller wash of the boat. Applicators would also utilize backpack sprayers to apply rotenone to heavily vegetated nearshore areas and adjacent inundated wetlands. Backpack sprayers would apply rotenone to any streams connected to TRPL waterbodies. Battery-powered drip stations and/or backpack sprayers would be used to treat streams linked to the TRPL. All applicators will work under the supervision of a certified pesticide applicator.

Post-treatment, periodic lake water and well water samples would be collected and analyzed for rotenone content by a laboratory with extensive experience in testing rotenone. Rotenone product labeling states that recreational contact with treated water (<90 ppb rotenone) is allowed after the rotenone is applied, however, the Department would advise, via landowner notices and signage, that all such contact be avoided until the rotenone is no longer present as determined by analytic lab results of water samples and/or twenty-four hour survival of caged sentinel fish held in the treated waterbodies. After the rotenone completely deactivates, an evaluation of the treatment's success would be done by conducting gillnet and environmental DNA (eDNA) surveys. To ensure compliance with the Migratory Bird Treaty Act, gillnets would be set at ice-up in 2018 and removed immediately at ice-out in 2019 to reduce the chance that waterfowl or other birds could be caught.

Water quality and macroinvertebrates would be sampled periodically before and after the treatment to document any major changes in species diversity or water quality. If the TRPL treatment successfully eradicates the northern pike population (as determined by post-treatment evaluations) the lake would be restocked with wild threespine stickleback collected from southcentral Alaska and with wild salmonids (rainbow trout and/or coho salmon) collected from the Kenai River drainage. If live northern pike are detected in the TRPL posttreatment, affected waters may be retreated with rotenone as soon as feasible.

3.0 AFFECTED ENVIRONMENT

3.1 Land Status

The TRPL Restoration Project is located in T4N, R11W, within Sections 15, 20, 21, 22 and 28 (Seward Meridian, Kenai Peninsula). The TRPL are located about 8km southwest of the Kenai River Bridge in Soldotna and about 2.4km west of the Sterling Highway and near the vicinity of Tote Road, Rex Road, Stubblefield Drive and Gruber Road. The lands surrounding TRPL waters are mostly privately owned (Figure 3).

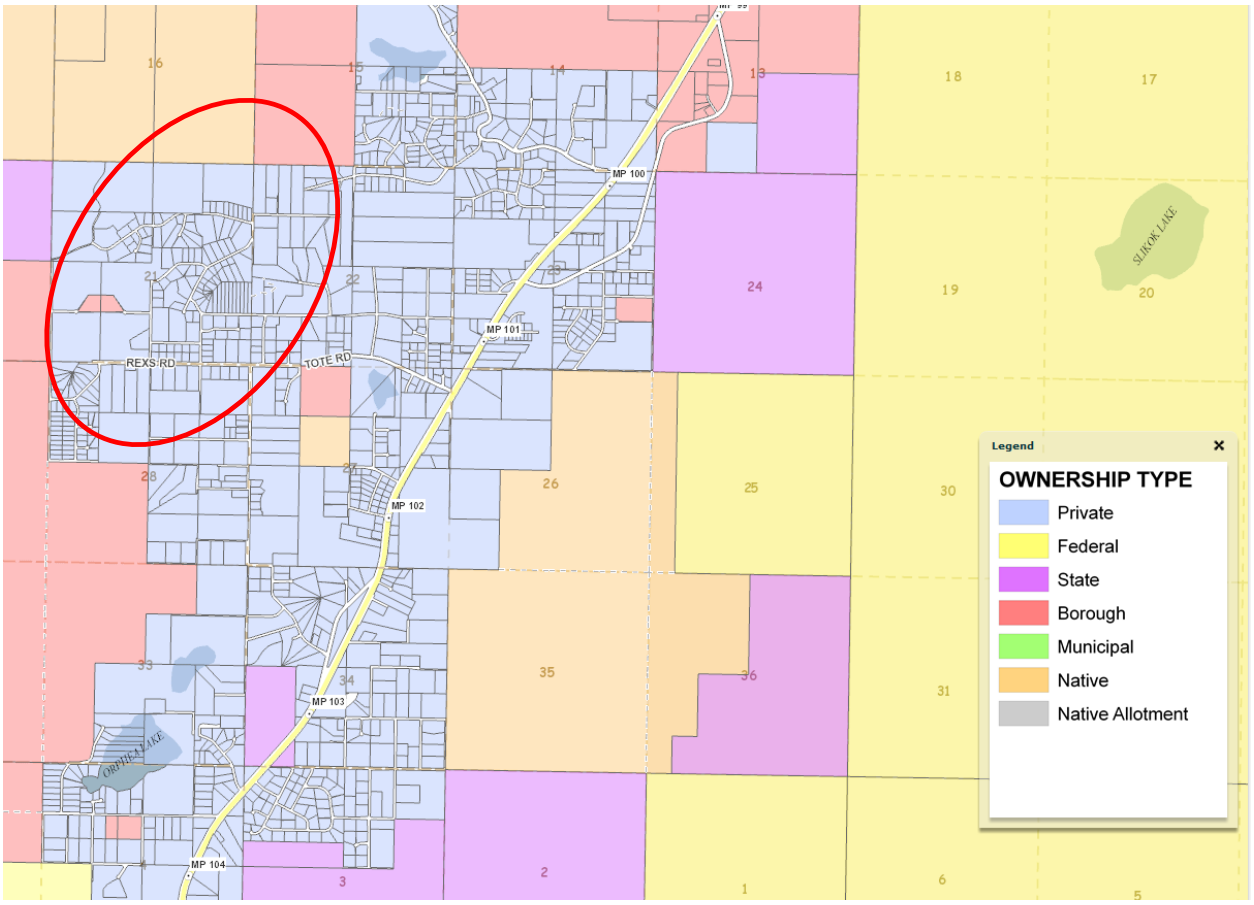

Figure 3. Kenai Peninsula Borough land ownership map depicting the TRPL area (red encircled).

3.2 Physical Environment

There are eight natural kettle lakes/ponds in the TRPL that contain northern pike covering a total of 37.1 hectares, have maximum depths ranging between 1.5 to 10m, and a cumulative water volume of 147 ha/m. The TRPL also includes short streams linking seven of the eight pike waters. The outlet of Fred's Lake drains the entire lake complex and flows westward where it diffuses into a vast bog and appears to percolate into the ground. (Figure 4).

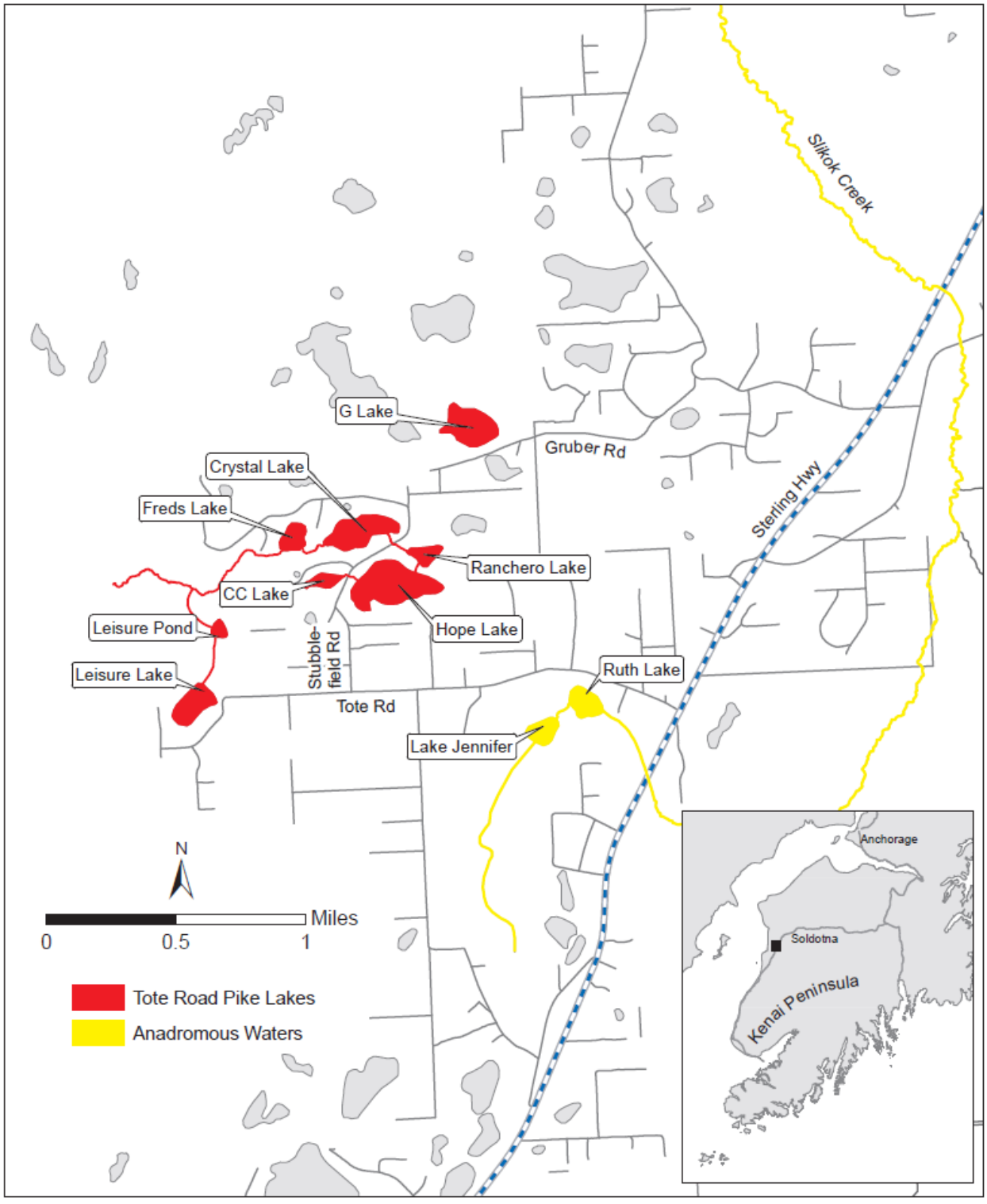

Figure 4. The TRPL treatment area indicated by red shading and unofficial lake names.

3.3 Biological Environment

3.3.1 Vegetation

Vegetation within the TRPL area consists mostly of lowland boreal forest and wetlands interspersed with some low-relief ridges. Most lakes have lily pads in shallow areas (< 3 meters) and lake shorelines consist of a mix of floating bog and boreal forest. Residential development has caused some lakeside vegetation changes (i.e., grass lawns, timber/brush removal, dock installation).

3.3.2 Aquatic resources

Fish

Fish native to the TRPL are threespine stickleback although some locals report rainbow trout and chinook salmon were present decades ago, likely from unauthorized stocking.

Invertebrates

There are robust populations of numerous aquatic invertebrate species in the lake, with evaluations of the aquatic invertebrate diversity are planned for the summer of 2018.

Amphibians

The wood frog is the only amphibian in TRPL.

3.3.3 Wildlife

Mammals found in the area surrounding TRPL include brown and black bears, moose, caribou, wolves, coyotes, snowshoe hare, lynx, muskrats, beaver, river otter, weasel, red squirrels, porcupine, flying squirrels, shrews, voles and domesticated dogs and cats. Piscivorous birds common to the area include bald eagles, herring gull, Bonaparte's gull, belted kingfisher, parasitic jaeger, common loon, horned grebe, red-necked grebe, crow, raven, magpie, stellar jay, gray jay and osprey. In addition, several non-piscivorous species of birds including various passerines, woodpeckers, geese, ducks, plovers, owls, etc. are present in the area.

3.3.4 Threatened and Endangered Species

To identify the existence of potential EPA pesticide use limitations for endangered species protection within a treatment area, and to help address those concerns if any exist, an EPA resource called the "Endangered Species Protection Bulletin" can be accessed online at: http://www.epa.gov/oppfead1/endanger/bulletins.htm_3. A query of this site yielded no rotenone use limitations. The USFWS also provides an online tool for determining whether endangered or threatened species are present in an area which can be viewed online at: http://ecos.fws.gov/ecp0/reports/species-listed-by-state-report?state=AK. No threatened or endangered species are listed for the TRPL area although threated Beluga whale are present in nearby Cook Inlet.

3.4 Human Environment

3.4.1 Economy

The nearest municipality to the TRPL is Soldotna. This area supports a diverse economy that includes oil and gas development, tourism, sport and commercial fishing and numerous service and retail businesses.

3.4.2 Recreational Use

Public access to some TRPL waterbodies exists via road right-of-way or section line easements. Sport fishing for northern pike in the TRPL area generates modest effort and is important for some anglers who appreciate such fishing opportunity. Water recreation, such as swimming and canoeing, also occur in the TRPL area.

4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this section is to identify and describe the ecological and human health impacts of the alternatives. Potential impacts are discussed within three broad subject areas: physical environment, biological environment, and human environment. The discussion, especially pertaining to the preferred alternative, focuses largely on issues that were identified during public scoping from this or similar restoration projects or that ADF&G recognizes as potential concerns likely to arise.

4.1 Physical Environment

4.1.1 Impacts from Alternative 1 to Soils

The soils underlying TRPL would not be affected if the northern pike population remained in the lake.

4.1.2 Impacts from Alternative 2 to Soils

No impacts to TRPL area soil would be expected from Alternative 2 (gillnetting).

4.1.3 Impacts from Alternative 3 to Soils

No rotenone contamination of soils and/or groundwater is anticipated from this project. Rotenone binds readily to sediments and is ultimately broken down in soil and water (Skaar 2002; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone is not expected to leach from soils (Augustijn-Beckers 1994) and it penetrates approximately one inch vertically in most soil types http://www.azgfd.gov/h_f/documents/Rotenone_Review_Advisory_Committee_Final_Report_12_31_2011_version2.pdf The only exception is sandy soil where movement is about three inches (Hisata 2002). Long-term monitoring of groundwater wells in treatment areas in California (10 years) and short-term monitoring of wells in Montana never detected rotenone, rotenolone, or any formulation products (Skaar 2002; Ridley et al. 2007; McMillin and Finlayson 2008) after application in nearby waters. The primary soil types in the TRPL area consists of decaying organics (0-4 inches from the surface) overlaying a fine sandy and/or silt loam (2-22 inches) and loamy sand/sandy/clay loam with gravel (22-60 inches) with soil permeability ranging from .06 to 20 inches/hour. (USDA 2005). Therefore, it is expected that, at the very maximum, rotenone would only penetrate soil about three inches.

Rotenone degradation rates in soil are dependent on soil temperature, soil physicochemical properties and sunlight exposure. Rotenone embedded on soil surfaces but exposed to sunlight has been shown to degrade 50% after five to seven hours (Cavoski et. al. 2007). Rotenone embedded in soil without sunlight exposure was shown to degrade 50% in 8 days at 20C° and 25 days at 10C° (Cavoski et. al. 2008).

4.1.4 Impacts from Alternative 1 to Water Quality

Allowing northern pike to remain in the TRPL would not negatively affect water quality. However, northern pike extirpation of native stickleback in the TRPL may have increased

zooplankton abundance (zooplankton serve as food for stickleback) leading to a corresponding decrease in phytoplankton abundance which can increase water clarity. Although anecdotal, lakeside residents at other Kenai Peninsula northern pike lakes have reported water clarity increased following the introduction of northern pike. Trophic cascade effects, including water quality changes and changes in zooplankton communities, can result from fish introductions (Tanner 2005; Duggin 2015; Walsh et. al. 2016; Skov and Nilsson 2007)

4.1.5 Impacts from Alternative 2 to Water Quality

Alternative 2 (under-ice gillnetting) could temporarily increase nutrient availability in TRPL waterbodies from fish carcass decomposition, similar to that described in the next section (4.1.6). Fish carcasses can act as fertilizer to stimulate production of phytoplankton and ultimately zooplankton. No drastic changes in water quality have been observed by ADF&G following other Kenai Peninsula northern pike eradication projects (Massengill 2014 a, b).

4.1.6 Impacts from Alternative 3 to Water Quality

This project would intentionally introduce rotenone, a botanically based piscicide, to surface waters to kill invasive fish, but impacts would 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 would result in a maximum rotenone concentration 0.04 ppm active ingredient (rotenone), but likely less. According to the EPA's re-registration of rotenone, there are no adverse environmental or human health effects expected from rotenone when used at this concentration (USEPA 2007).

There are three ways in which rotenone can be detoxified once applied. The first detoxification method involves dilution. This may be accomplished by groundwater or surface water inputs diluting the rotenone below 2.0 parts per billion (ppb), a concentration threshold requiring deactivation if the rotenone leaves a treatment area (i.e., flushing downstream) (Finlayson et al. 2010). Because seven of the eight TRPL lakes are ephemerally linked with low-flow stream connections (<.05 cfs), water inputs causing dilution would not be expected to contribute significantly to detoxification.

The second method of detoxification involves the application of potassium permanganate ($KMnO_4$) which is an oxidizing agent. Detoxification using $KMNO_4$ is typically used for flowing waters where rotenone must be detoxified before traveling downstream and outside of a treatment area (Finlayson et. al. 2010). Detoxification is normally accomplished within 60 minutes after $KMN0_4$ is in contact with rotenone at a 1:1 ratio. Less contact time is required with higher water temperatures or higher ratios of $KMNO_4$ to rotenone. $KMN0_4$ detoxification of rotenone in the TRPL is not appropriate because rotenone will be confined to the treatment area and not flow into other waters supporting wild fish populations. The treatment area includes eight lakes and ponds and ephemeral creeks totaling about one mile in length that eventually drains the lake system westward and terminates in a bog.

The third and most common method for rotenone detoxification is through natural environmental processes. Rotenone is susceptible to natural degradation through a variety of mechanisms; however, warm temperatures and sunlight exposure are the two factors with the greatest influence (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 rotenone specialist, personal communication). However, ADF&G's experience with cold

water rotenone applications, when rotenone is applied to Kenai Peninsula lakes just days or hours before ice cover forms, resulted in the persistence of rotenone for 3-7 months (Massengill 2014 a, b). The degradation of rotenone can result in at least 20 different byproducts of which only one is considered toxic (rotenolone) (Cheng et al. 1972). Rotenolone is approximately an order of magnitude less toxic than rotenone (CDFG 1991).

CFT Legumine™ is a liquid rotenone formulation. Its additives facilitate the emulsification and dispersion of rotenone in water. The formulation of CFT Legumine™ was analyzed for the California Fish and Game Department (CDF&G) in 2007 (Environ 2007). This analysis showed that the primary ingredients (carrier compounds) are soluble organic compounds (SOCs) such as diethylene glycol ethyl ether (DGEE) (61.1%), Fennedefo 99™ (17.1%), N-methyl 2-pyrrolidone (9.8%), rotenone (5.12%) and rotenolone (0.72%). Some additives would naturally biodegrade in TRPL to undetectable levels within a week to several weeks. However, N-methyl 2-pyrrolidone and DGEE would be expected to dissipate more slowly because they are water soluble and would not readily dissipate through volatilization. A thorough description of the toxicity or these compounds can be found in section 4.3.3. Studies indicate that the other compounds in liquid rotenone formulations have not been detected at harmful levels in groundwater associated with rotenone application (Finlayson et al. 2000; Ridley et al. 2006; Environ 2007).

Case studies in Montana have concluded that rotenone movement through groundwater does not occur (MFWP 2008). ADF&G collected representative well water samples from six residences in the Soldotna Creek Drainage following rotenone treatments to the Mackey Lake system (2014) and Soldotna Creek (2016). Samples were collected periodically until the rotenone fully degraded in the treated waterbodies based on analytic testing. No rotenone or its less toxic degradation product (rotenolone) was detected in any well. Also, 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 never 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.

Private water wells exist in the TRPL area. Available well log data for the TRPL area were evaluated by an Alaska Department of Natural Resources hydrologist for potential groundwater concerns related to treating TRPL with rotenone (Appendix 7). This review summarizes surface and subsurface hydrology within the TRPL and assesses the risk of rotenone applied to surface waters to drinking water aquifers. This assessment indicates 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.
Following a 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 fish from surfacing are cooler water (<10° C) and deep water (> 5 meters). TRPL lakes have maximum depths ranging between 1.5-10 meters, and the desired treatment period (mid-October) would likely result in water that is <10C°.

Bradbury (1986) reported that 9 of 11 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

from dead fish would 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 would be short-term and minor. Nonetheless, ADF&G personnel would recover and dispose of all feasibly recoverable dead fish following a rotenone treatment and monitor water quality for one year post-treatment.

In summary, the rotenone treatment would be confined to the TRPL treatment area and natural degradation processes would fully detoxify rotenone over a period of months. As required by state regulation, ADF&G would submit a Pesticide Use permit application to the Alaska Department of Environmental Conservation (ADEC) which must be approved prior to treating the TRPL area. Similarly, this project would be conducted in compliance with Section 402 of the federal Clean Water Act (CWA), where permitting authority in Alaska has been transferred to the ADEC through the Alaska Pollution Discharge Elimination System (APDES) program.

4.2 Biological Environment

4.2.1 Impacts from Alternative 1 to Vegetation

Vegetation in the TRPL area would not be affected if northern pike remain in the lakes.

4.2.2 Impacts from Alternative 2 to Vegetation

Most terrestrial vegetation in the TRPL area would not be affected by long-term gillnetting. Some temporary vegetation trampling could occur at areas used to access the lakes with a boat moved manually or by an all-terrain vehicle (ATV). To minimize ATV trampling, ADF&G will utilize an ATV modified by the addition of JWheelz™ that double the tire footprint to distribute weight over a larger area where soft ground conditions exist. Any trampling effects are expected to be minimal and short-term and would occur at a time of year when vegetation growth is not occurring. In most of the lakes, emergent aquatic vegetation (i.e., lily pads beds) is prevalent and it is expected that some damage to aquatic vegetation may occur from boat propellers. However, nets would be deployed near freeze-up and removed immediately at ice out which would reduce the amount of damage to actively growing vegetation. Lily pads and most other emergent aquatic plants undergo senescence in which they seasonally die-back. Lily pads have both root rhizomes and seeds in the lake substrate capable of regenerating new plants each year.

4.2.3 Impacts from Alternative 3 to Vegetation

Rotenone is not suspected of causing adverse effects to vegetation (Finlayson et. al. 2010). Impacts to terrestrial and aquatic vegetation would be similar to Alternative 2 as temporary foot and/or ATV access to each lake will be needed. At least one application boat will have a high-pressure application spray hose capable of spraying rotenone up to 10 meters horizontally. This will increase the coverage swath reducing the need to operate in emergent beds of aquatic plants.

4.2.4 Impacts from Alternative 1 to Wildlife

Northern pike are apex predators in aquatic environments, and they are very opportunistic in their diet. Besides fish, northern pike will prey on invertebrates, frogs, mice, muskrats, ducklings and small birds. Northern pike are non-native predators in the TRPL area, so if their population remains, predation on native animals will continue. Anecdotal information and some

minnow trapping data suggest native sticklebacks are no longer present in most of the TRPL following the introduction of northern pike. TRPL minnow trapping surveys planned for 2018 will confirm this assumption.

4.2.5 Impacts from Alternative 2 to Wildlife

Wildlife species characteristic to the area are described in 4.2.6. Netting the lake could displace wildlife such as piscivorous birds (e.g., loons, terns, etc.) because there would be fewer or perhaps no fish left after the netting is completed. Despite that the netting would mostly occur under the ice, there would remain some risk for the incidental take of birds and small mammals (muskrat, otter, etc.). It could take years to eliminate northern pike from the TRPL by netting alone. If all the northern pike were removed, it could take a year or more before reintroduced sticklebacks would be sufficiently abundant for reliable forage for other animals. Also, long-term changes in the abundance of some animals that utilize the TRPL (invertebrates, birds, small mammals) could occur from direct or indirect effects related to netting efforts.

4.2.6 Impacts from Alternative 3 to Wildlife

Large Mammals: Brown bears, black bears, and wolves are occasionally found in the TRPL area but are not dependent on these lakes for food. The removal of exposed dead fish resulting from this project would reduce the potential for dead fish serving as an attractant for bears or for scavengers to consume rotenone-killed fish. Even if rotenone-killed fish were consumed by mammals, there likely would be no adverse effects because rotenone at low dosage is expected to be degraded by enzymes in the animals' digestive tracts (Finlayson et al. 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). Based on EPA calculations (EPA 2007), the rotenone dosage that a 100kg (220 pound) mammal might receive by eating 3.4% of its bodyweight (3.4kg) in rotenone-killed fish would be 3.7mg, which is about 824 times below the calculated median lethal dose (3040mg). No evidence of carcinogenicity from rotenone exposure has been documented in mice/rat studies (National Toxicology Program 1986).

There is a year-round presence of moose at TRPL and seasonal presence of caribou. It is possible that any of these species may ingest water from the TRPL during the treatment period or that moose feed on aquatic vegetation in the treated waters. EPA-approved bioassays indicate that, at the proposed concentrations, rotenone would have no effect on mammals that drink the treated water (Schnick 1974a, 1974b; Herr et al. 1967). Ingestion of treated waters by terrestrial wildlife would 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 rating; in rabbits, the lethal dose that kills half the test animals (LD50) is >5000mg/kg (USEPA 2007). Risk of inhalation exposure to rotenone from the liquid CFT Legumine™ to wildlife is nonexistent because the vapors rapidly dissipate. In conclusion, this project would have no significant impact on game mammals.

Other mammals: 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 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 concentrations of rotenone fed to rats and dogs, the chemical did not cause tumors or reproductive problems in these mammals. A notable exception for rotenone tolerance is that swine have been shown to be very sensitive to rotenone compared to cattle. (Thompson 1985).

The State of Washington reported that a half-pound mammal (red squirrel size) would 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 would use a rotenone product containing 5% active rotenone. Assuming the primary way an animal may consume the compound under field conditions is by drinking lake water, a half-pound animal would need to drink over 80 gallons of TRPL water treated at 0.04 ppm rotenone within 24 hours to receive a lethal dose. Based on this information, the Department expects the impacts to non-target organisms to range from non-existent to short-term.

Migratory Birds: Birds that could potentially consume dead fish following treatment include bald eagle, osprey, artic tern, herring gull, Bonaparte's gull, parasitic jaeger, common loon, pacific loon, red-throated loon, horned grebe, red-necked grebe, crow, raven, magpie, stellar jay, and gray jay. Additionally, non-piscivorous birds such as passerines, woodpeckers, geese, ducks, plovers, owls, etc. are present in the area. During the proposed treatment period, some piscivorous birds will have migrated from TRPL, others may be temporarily displaced by application activities for a day or two, but the availability of non-treated waters in close proximity to the project area should minimize any impacts. Following the treatment, it is likely that some birds would remain 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).

A bird weighing 4 ounces would 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 would 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 and1680 mg/kg, respectively, as found 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 would minimize risks to these birds; thus, impacts should be negligible.

Human activity associated with the application of rotenone in TRPL and subsequent monitoring work could temporarily disrupt bird use in the area. Specifically, during pre and post-treatment evaluations using gillnets, some birds could be drowned by net entanglement. To reduce this possibility, netting will be conducted primarily under the ice to reduce the incidental take of birds. Northern pike are known to opportunistically prey on birds (Solman 1945, Brown 2005) so eradicating northern pike from the TRPL should actually benefit avian populations in the long-term. Restocking the TRPL with native sticklebacks and salmonids following the rotenone treatment would supply new prey for piscivorous birds over the long-term.

Threatened or Endangered Species: The Cook Inlet beluga whale is the only endangered species found in the Cook Inlet area. No direct impacts to beluga whales are expected because the TRPL treatment area is not accessible to beluga whales. Rotenone will remain within the treatment area and will not enter Cook Inlet.

4.2.7 Impacts from Alternative 1 to Aquatic Resources

Though northern pike are opportunistic feeders, their preference is for fish. Northern pike have decimated stickleback populations in the TRPL. As long as northern pike remain in the TRPL, stickleback populations will remain absent or severely depressed. If northern pike remain in the TRPL area, affected waterbodies cannot be considered candidates for ADF&G fisheries enhancement activities such as stocking wild salmonids.

4.2.8 Impacts from Alternative 2 to Aquatic Resources

Because northern pike are currently the only fish species found in most of the TRPL waters, netting would not pose a threat to any other fish species. Aquatic invertebrates and wood frogs would not be impacted because their small size prevents efficient gillnet recruitment.

4.2.9 Impacts from Alternative 3 to Aquatic Resources

Fish: This project is designed to eradicate northern pike using rotenone. It is anticipated that all northern pike within the TRPL will be killed including any sticklebacks that may still persist in some waterbodies. The present sport fishery in TRPL is only for northern pike, although rainbow trout and Chinook salmon were reportedly present in some TRPL waterbodies decades ago, likely the result of unauthorized stocking. Sport fishing in the TRPL would be temporarily impacted by this project. Removing northern pike would result in the permanent loss of fishing opportunity for that species and a temporary delay (1-2 years post-treatment) before an alternative stocked salmonid fishery becomes viable.

Following the rotenone treatment, native threespine stickleback will be introduced to all TRPL waterbodies and wild juvenile salmonids (i.e., rainbow trout and/or coho salmon) will be stocked in all TRPL waters. ADF&G proposes to stock wild salmonids annually for up to five years following the removal of northern pike and then assess these populations. Stickleback populations are expected to become naturally self-sustaining in the TRPL but rainbow trout reproductive success is questionable because spawning habitat (aeriated gravel beds) is extremely limited. Coho salmon are not expected to reproduce in the TRPL regardless of spawning habitat availability. After five years of wild salmonid stocking, ADF&G will assess whether rainbow trout are reproducing in the TRPL. If they are not, ADF&G will consider a different strategy that could include making spawning habitat improvements and /or stocking hatchery-reared salmonids and/or coho salmon reared by the ADF&G Salmon in the Classroom program. Stocking of hatchery-reared fish could require changes to public access so fishery managers would first work with area landowners to determine whether doing so is an acceptable alternative. At this time there are no plans to develop or improve public access at any TRPL waters to support a stocking strategy; as per clear land owner preferences voiced at the public scoping meetings.

Invertebrates: Generally, adult zooplankton are more vulnerable to rotenone than fish or macro invertebrates (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 following a rotenone treatment is unlikely (Kiser et al. 1963, Melass et al. 2001). Zooplankton populations have been observed to fully recover to pre-treatment levels within one to three years of post-treatment in Southcentral Alaska with no observed loss of

species (Chlupach 1977). Recent rotenone treatments at Arc Lake and Scout Lake on the Kenai Peninsula indicate invertebrate diversity remained comparable to pretreatment levels less than one year post-treatment, but zooplankton abundance was temporarily reduced (Massengill 2014a,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 would be assisted by aerial dispersal of adult invertebrates from adjacent areas near the project area (e.g., mayflies and caddis flies).

Amphibians: Wood frogs are the only amphibians on the Kenai Peninsula and 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.ADF&G.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 would not suffer an acute response to rotenone, but larval and tadpole stages could be affected by rotenone at fish killing concentrations. These authors recommended rotenone treatments occur at times when the larva are not present, such as in the early spring or later in the fall. It is anticipated that surrounding ponds and wetlands that are not treated would help restore any potential depletion of wood frog populations at TRPL. Active wood frog tadpoles were captured and observed in Scout Lake (Sterling, Alaska) in the spring of 2010 following a fall 2009 rotenone treatment (Massengill 2014 (b)).

4.3 Human Environment

4.3.1 Impacts from Alternative 1 to Public Safety and Health

Leaving the northern pike population in TRPL would not result in any human health or safety impacts.

4.3.2 Impacts from Alternative 2 to Public Safety and Health

Netting northern pike in the TRPL would likely not result in significant public safety and health impacts because the nets would be deployed mostly under the ice to avoid conflicts with water recreationists and other users.

4.3.3 Impacts from Alternative 3 to Public Safety and Health

Although pesticides are widely used to control unwanted species, legitimate public concerns have been raised regarding health and human safety. As with any pesticide, direct exposure or consumption of piscicides can potentially have harmful or sometimes fatal effects on humans. Rotenone is an EPA-registered pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (USEPA 2007). Rotenone is also registered for use in Alaska by the Alaska Department of Environmental Conservation. Although Alaska does not have established water quality criteria for rotenone, the EPA's re-registration eligibility decision for rotenone (USEPA 2007) provides human health risk conclusions.

An EPA assessment of acute dietary risk to humans was based on the maximum solubility of rotenone in water (200 ppb). The EPA concluded that acute dietary exposure estimates for

drinking water and eating fish from rotenone treated waters was below the EPA's level of concern. The EPA's chronic dietary exposure assessment of rotenone was performed for only drinking water because rotenone degrades rapidly and has a low propensity to bioaccumulate in fish (the mechanism of potential exposure to human consumers of the fish). The EPA estimated the drinking water level of concern (DWLOC) to be 40 ppb (rotenone) for the most sensitive subgroup (infants and children). Therefore, at the maximum rotenone concentration planned for TRPL (40ppb), the DWLOC would not be exceeded. The DWLOC (40 ppb) is for chronic long-term dietary exposure and is a scenario not likely to occur at TRPL because there are no drinking water intakes in the lake and the timing of the treatment (just prior to freeze-up) greatly reduces water recreation and incidental ingestion of lake water. As a precaution, signage will be posted in the TRPL area to warn the public to avoid drinking rotenone-treated water or eating rotenone-killed fish from the lake and to avoid contacting treated water until monitoring ensures the rotenone has completely degraded. However, as an example of rotenone toxicity relative to levels of concern, a 160-pound adult would have to drink thousands of gallons of treated lake water at one sitting to receive a lethal dose (Gleason et al. 1969).

Studies have indicated that rotenone is a strong mitochondrial inhibitor and, under some conditions, produces features of Parkinson's disease (PD) (Betarbet et al. 2000). A review of published data since the initial study by Betarbet et al (2000) suggests that the rotenone-treated rat models used in the Betarbet study are based on atypical parkinsonism rather than idiopathic Parkinson's disease (PD), and that such studies are not applicable to piscicidal uses of rotenone (Höglinger et al. 2006). Hollingworth (2001) in his chapter on inhibitors of oxidative phosphorylation (including rotenone) does not consider rotenone a cause of PD. A study by Montojo et al. (2010) suggests that mice exposed to rotenone mixed with chloroform and injected through a feeding tube developed Parkinson-like symptoms, however dosages were administered for three months at dosages far exceeding those used in fishery applications.

Rotenone has a history of being used as an insecticide for agricultural uses but is no longer used in the United States for those purposes. Finlayson et. al. 2012 provides an assessment of the epidemiology evidence some studies have used for associating farmer's exposure to rotenone to developing PD as follows: "The Agricultural Health Study (Kamel et al. 2006; Tanner et al. 2011) evaluated the previous use of pesticides by farmers and their incidence of PD. Questionnaires were sent to American farmers to gain information on their pesticide use and medical history (Kamel et al. 2006). The study concluded that increased pesticide use was associated with increased PD risk in farmers, and that the use of personnel protection equipment (PPE) decreased this risk. From follow-up investigations of these data, Tanner et al. (2011) concluded that rotenone and paraquat use were associated with increased risk of PD. However, the study participants were exposed to all pesticides, not just rotenone and paraquat, and pesticide exposures were not actually measured, rather pesticide exposures were based solely on self-reporting methods. Raffaele et al. (2011) discussed the problems associated with using epidemiological data in environmental risk assessments, specifically citing as examples studies on pesticide exposure contributing to the increased risk of PD. They found inconsistent findings between studies, generic categorization of pesticide exposure, and the use of dichotomous exposure categories (e.g., ever versus never) as reasons for difficulty in applying the findings of these studies. They also noted the difficulty in using epidemiological studies to evaluate a disease such as Parkinson's where multiple causal factors (genetic susceptibility, age, and environmental exposures) are present." The authors concluded that standard operating procedures for fishery management uses of rotenone such as applicators wearing PPE and restricting public contact with treated waters until rotenone concentrations subside greatly reduces or eliminates human exposure risk.

As discussed in section 4.1.6, CFT Legumine™, the liquid rotenone mixture that would be used in TRPL, contains additives to facilitate its emulsification and dispersion in water. CFT Legumine™ was analyzed for the CCDF&G in 2007 (Environ 2007), and the toxicities of the individual ingredients identified during that analysis are described below:
Diethylene glycol ethyl ether (DEGEE) is the primary ingredient of CFT Legumine™ contributing an average of 57% to the formulation. DEGEE is a solvent with a wide range of industrial applications including the manufacturing of coatings, cleaners and dyes. DGEE is also commonly used in manufacturing pharmaceuticals, cosmetics and food additives. With respect to the environmental fate of this compound, volatilization, photolysis, and hydrolysis are not expected to significantly occur in surface waters (SPECTRUM, Chemical Fact Sheet, 2008). Rather, biodegradation is the most likely degradation mechanism for the compound and 48-87% degradation would be expected in 20 days; DEGEE was observed to degrade greater than 90% after 28 days (information found online at: https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+111-90-0 . Because DGEE is water soluble, it will not bind to sediments and it has a low ability to bioconcentrate in aquatic organisms: https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+111-90-0 .

A product safety assessment for DEGEE by Dow Chemical is available online at: http://msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_096d/0901b8038096db71.pdf?filepath=productsafety/pdfs/noreg/233-00344.pdf&fromPage=GetDoc. This assessment states: "Exposure to DEGEE may cause moderate eye irritation; however, corneal injury is unlikely. Prolonged skin exposure is not likely to cause significant irritation or result in absorption of harmful amounts. No adverse effects are anticipated from single exposure to vapor and DEGEE has a low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. The effects of repeated exposure to DEGEE in animals have been reported on the following: blood, kidney, liver, testes. Studies in laboratory animals indicate that DEGEE is not a reproductive toxicant even when given in large amounts (a few percent in the drinking water). However, at the highest doses tested, it caused some toxic effects in the offspring of treated animals, such as: increased liver weight, decreased brain weight and reduced sperm motility. DEGEE did not cause cancer, birth defects or any other fetal effects in laboratory animals. In vitro genetic toxicity studies were predominantly negative. Animal genetic toxicity studies were negative".

In a lake treated to a concentration of 0.8 µl/L of CFT Legumine™, such as that proposed for the TRPL, the concentration of DEGEE would be 0.49 µl//L (0.8 µl//L X 61%). Based on extrapolation from animal data, it has been suggested that 91,000µl of DEGEE could be lethal to a 70 kg person: https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+111-90-0 . A 70-kg person drinking two liters of water from the lake (normal daily water intake) would consume 0.97 µl//L of DEGEE, which is about 0.00001% of a fatal dose (0.97 µl//L ÷ 91,000 µl//L). A lethal dose for a cat is around 1,000 µl/kg, while for rats and mice, the LD50 is 5,500-8,700 µl/kg bw.

Fennedefo 99™ is an emulsifier in the CFT formulation containing fatty acid esters and polyethylene glycol (PEG) mix. On average it represents about 17% of the CFT Legumine formulation. The fatty acid ester mixture is likely derived from "tall oil". Tall oil fatty acids are a byproduct of wood pulp. More information on tall oil is available at: http://www.weyerhaeuser.com/download_file/31546/ . PEGs are common ingredients in a variety of consumer products, including soft-drink syrups (as an antioxidant), lotions and antifreeze (Environ 2007). PEGs are highly soluble, have low volatility and rapidly degrade

within days. The fatty acids in the fatty acid ester mixture do not exhibit volatility, are virtually insoluble, and are readily biodegraded, although over a slightly longer time period than the PEGs (Environ 2007). PEGs are not considered as hazardous substances, priority pollutants, or toxic pollutants under the Clean Water Act (CWA) or Toxic Substances Control Act (TSCA). (Environ 2007). Animal toxicological data for PEG compounds indicate there is mild to no irritation from dermal exposure, minimal eye irritation and it is not genotoxic or mutagenic. Rat oral toxicity LD50 ranges between 2g to >25g/kg bw: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4505343/table/T002/

N-Methyl 2-pyrrolidone (NMP) represents 10% of the CFT Legumine formulation. It is typically used as a solvent for many applications including the manufacture of pharmaceuticals for oral ingestion (Ott 2008). NMP has low hazard for ecological receptors and low persistence if released into aquatic or terrestrial environments: https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-n-methylpyrrolidone-nmp#what. The substance is not transformed by chemical hydrolysis but is rapidly biodegraded under aerobic conditions. The substance is not expected to bioconcentrate: http://www.inchem.org/documents/cicads/cicads/cicad35.htm#10.1 The persistence of this compound in water has not been reported, but it has been found to have a half-life of 4.0, 8.7 and 11.5 days in clay, loam or sand, respectively. NMP has been classified as readily biodegradable under aerobic conditions: http://www.inchem.org/documents/cicads/cicads/cicad35.htm).
For rats, the no-observed-adverse-effect (NOAEL) and lowest-observed-adverse-effect level (LOAEL) were 514 and 1028 mg/kg body weight, respectively: http://www.inchem.org/documents/cicads/cicads/cicad35.htm#8.3.2. The LD50 of NMP is similar to DGEE, but its concentration following lake treatment is expected to be only 1/6th that of DGEE, and acute toxic conditions should not arise for mammals drinking the water following treatment. The International Programme on Chemical Safety (IPCS) has evaluated the oral carcinogenicity data for NMP, and concluded that this chemical did not show any clear evidence for carcinogenicity in rats exposed to concentrations up to 400 mg/m3 and that the mutagenic potential is weak: https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~FioCc1:7.

The CFT Legumine label (Appendix 5) states NMP has caused adverse effects on sexual function and fertility and/or development based on animal experiments. A 2008 study on rats demonstrated that sub-chronic exposure of male rats to NMP at 1000 mg/kg/day produces gonadotoxic effect and brings about infertility. Administration at lower doses of 100 and 300 mg/kg did not impair male fertility, but only the lowest dose of 100 mg/kg was found to have no influence on the prenatal development of the progeny https://www.ncbi.nlm.nih.gov/pubmed/18468972. Results from short-term tests on aquatic species (fish, crustaceans, algae, and bacteria) and terrestrial species (birds) indicate that NMP has low acute toxicity: http://www.inchem.org/documents/cicads/cicads/cicad35.htm#10.1

Other trace compounds The remaining compounds in CFT Legumine™ include polycyclic aromatic hydrocarbons, hexanol and alkylated benzenes. While these chemicals are more volatile than the primary carriers, they comprise less than one percent of the formulation and are not expected to significantly impact the overall fate and transport of CFT Legumine (CDFG 2007). None of the constituents identified appear to be at concentrations that suggest human health risks through water, or ingestion exposure scenarios and no relevant regulatory criteria are exceeded in estimated exposure concentrations (CDFG 2007).

Regarding exposure to the trace constituents in CFT Legumine™, trichloroethylene and naphthalene are known carcinogens. Both have been detected in CFT Legumine™; however,

trichloroethylene was absent from most product lots analyzed (Environ 2007) and the estimated concentration of trichloroethylene and naphthalene at treatment concentration is ~0.0000073 mg/L and 0.000255 mg/L, respectively, which is far below the Human Based Screening Level (HBSL) for exposure to surface waters for a child (CDFG 2007).

A study of airborne drift associated with two rotenone products (a liquid and a powdered formulation) was conducted in California (CARB, 1997), and results showed that the rotenone levels adjacent to a treatment area immediately following a treatment, were, at the highest, 1,000 fold lower than the estimated no observed effect level (NOEL) of 0.43 mg. of rotenone per cubic meter collected over a 24-hour period.

CFT Legumine™ formulation has a low solvent odor (Appendix 6). Compared to other liquid rotenone formulations, CFT Legumine™ contains fewer hydrocarbons resulting in less odor (USDA 2009). Nonetheless, relatively "heavy" organic solvent compounds tend to sink or remain close to the ground and move downwind. The California Department of Pesticide Regulation (CDPR 1998, cited in Finlayson et al. 2000) found no health effects from odors from rotenone formulations that consisted of greater solvent concentrations than those found in current supplies of CFT Legumine™. The northern pike carcasses resulting from this project may cause objectionable odors. Collecting and removing visible carcasses coupled with the likelihood many would sink (Bradbury 1986) should help mitigate odor concerns. Finally, because outboard motors would be used with the boat applications, there would be emissions from four-stroke outboard motors, but these would dissipate rapidly. Any impacts caused by objectionable odors from the rotenone, fish carcasses, or outboard emissions are expected to be short-term and minor.

Recreational contact (swimming, wading, etc.) or drinking treated lake water would be advised against with ADF&G signage and issuance of a news release that would remain in effect until the rotenone fully deactivated which is expected to take 3-9 months. The product labeling states that recreational contact with treated water (<90 ppb rotenone) is allowed after the rotenone is applied; however, Department would advise that all such contact be avoided until the rotenone is no longer present as determined by analytic lab results of water samples and/or 24- hour survival of caged sentinel fish held in the treated waterbodies. As mentioned, exposed dead fish would be collected and removed as practical from the treatment area. The lake closure and clean-up efforts would eliminate any reasonable route for rotenone exposure and subsequent human health concerns.

4.3.4 Impacts from Alternative 1 to Worker Safety and Health

There would not be any project activities with the “no action” alternative, so there would not be any impacts to worker safety and health.

4.3.5 Impacts from Alternative 2 to Worker Safety and Health

Impacts to worker safety and health from netting operations would be negligible and mitigated by workers adhering to standard safe boating practices and wearing personal floatation devices.

4.3.6 Impacts from Alternative 3 to Worker Safety and Health

Any potential threats to worker safety and health (i.e., the rotenone applicators) would be greatly reduced with proper use of safety equipment including personal protective equipment (PPE). PPE that would be worn at all times by applicators and handlers working in direct contact with the rotenone. The PPE includes Tyvek suits or raingear tops and bottoms (waders could substitute for bottoms), N-95 half-mask respirators, safety goggles, and rubber or nitrile gloves.

CFT Legumine™ is a liquid, and the product Material Safety Data Sheet (MSDS) states “do not breathe spray mist” and identifies appropriate respirators for use by the product handlers/applicators. Only individuals working with the concentrated product could be at risk, and they would be protected with the appropriate protective respirators. Although volatile and semi-volatile organic compounds and ethylene glycol-based compounds have been identified in the CFT Legumine™ formulation, when compared to Health Based Screening Levels (HBSL) values, no compound in CFT Legumine™ exceeded the HBSLs. This indicates there are no significant inhalation risks from the vapors of this product (CDFG, 2007).

In general, the greatest human health risks associated with a rotenone treatment are associated with the applicators because they work directly with the undiluted, concentrated rotenone products. To minimize exposure risk to applicators, all applicators will be supervised by a certified pesticide applicator that will ensure that all safety protocols are adhered to and PPE is properly utilized.

4.4 Conclusion

Although no decision has been reached, factors that led to the identification of a preferred alternative are discussed in this section.

The no action alternative would allow the status quo to continue. As long as northern pike remain in TRPL, ADF&G would not have the ability to successfully restore the native stickleback populations vital to the aquatic ecology of this lake system. Also, the TRPL northern pike population would continue to pose a threat to valuable fisheries elsewhere should individuals from this population be used for new illegal introductions. ADF&G has a legal responsibility to protect, maintain, and improve fishery resources, and choosing to leave northern pike in the TRPL is contradictory to this responsibility. The no action alternative was not identified as the preferred alternative.

Long-term netting within TRPL would be an inefficient and far less reliable method to eradicate the northern pike from the TRPL area. The TRPL’ s large cumulative area and habitat complexity would make complete removal by netting difficult, if not impossible. Netting has rarely been an effective eradication tool for unwanted fish and the scale of the TRPL area is beyond that where mechanical removal alone has been successful. Long-term netting is a costly and labor-intensive alternative and carries with it an increased risk for incidental take of birds and other wildlife. Long-term netting was not identified as a preferred alternative.

ADF&G’s goal is to eradicate the northern pike population from the entire Kenai Peninsula including the TRPL. This would allow the Department to reintroduce native stickleback to the area to restore ecological lake functions and allow the introduction of a new salmonid sport fishery. ADF&G has made solid progress at removing northern pike populations from the Kenai Peninsula, primarily by using carefully managed rotenone treatments. The TRPL contains the last known populations of northern pike on the Kenai Peninsula and their presence jeopardizes the region’s wild native fisheries.

ADF&G evaluated the human health and ecological effects associated with the use of rotenone in this document and concluded that, in piscicidal concentrations and in accordance with label requirements and FIFRA, rotenone would not pose any unreasonable adverse ecological or human health risks. The treatment would be designed so that the peak rotenone concentration would be <40ppb, a level below which the EPA considers safe for drinking and far below the 90ppb concentration considered safe for swimming.

To further minimize risk, ADF&G would advise against contacting treated waters until the rotenone fully degrades. This would be accomplished with signage, landowner notices and media releases. The timing of the treatment (late fall) would reduce impacts to water recreationists as ice cover would be present shortly after the treatment. The only tangible human health risks associated with the rotenone treatment would be to the applicators because they would be working with the undiluted rotenone product. However, that risk would be minimized by proper use of personal protective equipment and by following best management practices. Several ADF&G pike biologists have been formally trained in the use of rotenone through the National Conservation Training Center or American Fisheries Society. In addition, several ADF&G personnel are also State of Alaska-certified aquatic pesticide applicators. If a rotenone application occurs, all assisting personal would either be directly supervised by a certified pesticide applicator. Emergency protocols would be established prior to the treatment activities in the event of an accident. Those protocols would be described in a detailed "treatment plan" that would be reviewed by all assisting project personal before the project begins.

The ecological impacts from a rotenone treatment in TRPL would be short in duration and pose less of a risk to wildlife than the second alternative. As described in detail in this document, rotenone naturally breaks down, ultimately into carbon dioxide and water, and does not impact most organisms without gills when used in fisheries management concentrations. Rotenone has been used on ten other northern pike eradication projects in Southcentral Alaska since 2008. In seven of these treatments, rotenone was applied late in the fall prior to ice-up so as not to interrupt open water recreation for the public and to maximize the duration that rotenone would remain toxic to fish. In some cases, the rotenone persisted for eight months (mainly while the lakes were frozen).

Even with eight months of rotenone persistence, invertebrate populations were found to quickly rebound, and other species such as wood frogs and waterfowl also returned immediately after ice out. Based on the vast literature available on rotenone projects and the Department's previous experience with the piscicide, ADF&G would expect no unreasonable long-term negative ecological impacts from treating the TRPL with rotenone. Therefore, the rotenone treatment alternative was identified by ADF&G as the preferred alternative to accomplish the goal of eradicating northern pike from TRPL and preventing this northern pike population from being used for illegal introductions elsewhere.

5.0 CONSULTATION AND COORDINATION

As mentioned in section 1.4, ADF&G conducted a public scoping process to solicit input on the alternatives described in 2.0. The public scoping process completed to date is found in Appendix 1. There will also be a 30-day public commenting period for this environmental assessment in which a summary of public comments will be presented in Appendix 4.

Following the public notice period for this environmental assessment, ADF&G will incorporate public comments received and subsequent ADF&G responses into this document. Next, the revised EA document will be submitted to the USFWS to comply with the National Environmental Policy Act (NEPA) process to determine whether a Finding of No Significant Impact (FONSI) will be issued for the preferred alternative. Other authorizations required to approve the preferred alternative include ADEC issuance of a Pesticide Use Permit, compliance with the Alaska Pollutant Discharge Elimination System (APDES), and approval by the Alaska Board of Fisheries and ADF&G Division of Sport Fish Director. To date, both the APDES permit and BOF approval have been obtained.

To commence with the proposed action, this National Environmental Policy Act (NEPA) process will have to conclude the review of this EA with a Finding of No Significant Impact (FONSI).

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Appendix 1. Summary report of public scoping and comments received during the TRPL Restoration public scoping period.

Tote Road Pike Lakes

Public Meeting Scoping Summary

Scoping Meeting Process

In 2017, the Alaska Department of Fish and Game (ADF&G) initiated a public scoping process to gather input to guide the Department's response to northern pike in the TRPL area. This memo presents a summary of public input gathered during that process:

- **Property owner mailing:** ADF&G obtained addresses of 84 waterfront property owners in the Tote Road Pike Lake area that owned land adjacent to waters containing northern pike. Each property owner was mailed letters notifying them of the public meetings and encouraging them to participate in the scoping process.
- **Stakeholder contacts:** In addition to mailings to waterfront property owners, a notice of the meeting was placed at the Soldotna Sportsman's Warehouse bulletin board and the notice board at TJ Seggy's gas station near the TRPL area. Email notices were sent to addresses representing about twenty individual, governmental and non-governmental organizations that were identified as having potential interest in general fishery issues or pike fishing, specifically.

  In December of 2017, the project leader went door-to door to hand deliver courtesy notices to all residences adjacent to known pike waters in the TRPL area. The notices informed residents of ADF&G's interest in addressing the local northern pike issue and that public meeting announcements would be forth coming later in the year. The door-to-door contacts allowed for some direct contacts with residents and provided an informal opportunity to share information related to the project. The project leader was contacted several times by local residents who either called or emailed to express their viewpoints regarding the proposed pike removal program.

  Prior to each scoping meeting a news release was issued by ADF&G announcing the scoping meeting details and inviting the public to participate. The news release was made available on the ADF&G website and was utilized by local media both in newspaper and radio messaging.

- **Public meetings:** Two public scoping meetings were held at the Kenai National Wildlife Refuge's Visitor Center in Soldotna, a location easily accessible to TRPL area property owners, interested citizens, and organizations. An effort was made to enable broader participation by hosting two separate meetings at varied times:

  Scoping Meeting #1, Dec 11, 2017 *- 6:00 pm to 7:30 pm*

  Scoping Meeting #2, February 8, 2018 *- 5:30 pm to 7:30 pm*

  33 individuals attended the first meeting and 10 individuals attended the second meeting, which had a consistent format as outlined following:

Meeting Agenda

1. WELCOME, INTRODUCTIONS AND GROUND RULES (≈ 8 minutes, facilitated by Jack Sinclair, Executive Director of the Kenai Watershed Forum).

The meeting began with a statement of the meeting purpose, a review of ADF&G's meeting objective and agenda, meeting ground rules and how to provide verbal or written input.

Meeting Purpose: ADF&G's Objective

1) Exchange information with stakeholder about a proposed ADF&G project to remove northern pike from the Tote Road area

Attendees were encouraged to ask questions, seek clarification, and provide thoughts following staff presentations. ADF&G staff and participants then all introduced themselves as follows:

a) Staff

Rob Massengill, Fisheries Biologist for ADF&G Sport Fish Division

Tim McKinley, Regional Research Supervisor for ADF&G Sport Fish Division[1]

Brian Marston, Area Management Biologist for ADF&G Sport Fish Division

Jason Pawluk, Assistant Area Management Biologist for ADF&G Sport Fish Division

Kristine Dunker, Regional Invasive Species Coordinator for ADF&G Sport Fish Division

Robert Begich, Area Research Supervisor for ADF&G Sport Fish Division

Jeff Milton, Regional hatchery Supervisor for ADF&G Sport Fish Division[1]

Tom Vania, Regional Supervisor for ADF&G Sport Fish Division[1]

Jerry Strait, Fish and wildlife Technician III for ADF&G Sport Fish Division[1]

Parker Bradley, incoming Fisheries Biologist for ADF& Sport Fish Division[2]

Jeff Anderson, USFWS Supervisor for the Kenai Field Office in Soldotna[1]

Andy Wizik, Cook Inlet Aquaculture biologist, Soldotna

Kyle Graham USFWS Biologist for the Kenai Field Office in Soldotna[2]

1 Only attended the first meeting

2Only attended the second meeting

b) Attendees

Scoping meeting attendees were asked to sign-in as they entered the meeting and to list their affiliation (i.e. landowner, interested angler, etc.).

MEETING AGENDA

PRESENTATIONS (≈ 50 minutes)

Three slide shows were presented. The first (approx. 10 minutes by Kristine Dunker) defined what an invasive species is and provided an overview of the

history and environmental/economic consequences of northern pike in southcentral Alaska.

The second presentation (approx. 8 minutes by Andy Wizik) informed the audience about the history and consequences of northern pike to Shell Lake and other fisheries.

The third presentation (approx. 20 minutes by Rob Massengill) provided specific information about Kenai Peninsula invasive northern pike, details of the various alternatives to address the pike problem in the TRPL area, and emphasized the preferred action of chemically treating the TRPL.

The last presentation was a talk (approx. 15 minutes by Brain Marston) who spoke about the options to provide an alternative fishery to the TRPL area following the successful removal of northern pike.

2. INPUT AND INFORMATION OPEN HOUSE (≈ 40 minutes)

An open discussion was held where participants could ask questions, voice concerns or share information and experiences related to the proposed project. Notes summarizing stakeholder input were recorded manually during these scoping meetings.

- **Input forms/written comments:** One meeting attendee provided a written comment in a comment drop box.

Scoping Meeting Public Input Summary

During the scoping process several major categories of input and public opinion emerged. Following is an aggregated summary, specific to broader categories, covering the issues and public opinions shared by members of the public and interested organizations. The statements that follow are directly based from individual's comments and opinions provided over the course of the public scoping process.

1. ***TRPL Lake Access Issues:*** Some people expressed concerns about public access to the waters in the TRPL area. A primary issue was whether improvements to develop public access would occur in the TRPL area following the creation of a new salmonid fishery following the removal of northern pike. Most input reflected that the majority of residents do not want developed access to any TRPL waters as it could change the character of the private lake settings they enjoy now and cause issues like litter and disruption.

2. ***Property Rights:*** One property owner said he opposes the proposed rotenone treatment because it is a violation of the property rights of the owners of the land surrounding the TRPL lakes.

3. ***Non-Target Effects:*** Some individuals voiced concern that the use of rotenone could impact non-target wildlife and wondered how long it could take for rotenone-treated lakes to return to a natural, productive state where wildlife and birds would again be plentiful. One person asked if a rotenone treatment is really necessary. Others

expressed support for removing pike from the TRPL in the belief it will restore bird and wildlife populations which may currently be suppressed by pike predation. A commonly expressed belief was that sticklebacks and other species (frogs, birds, etc.) have disappeared or decreased from pike predation. One resident spoke of his desire to see waterfowl, particularly loons, benefit from pike removal and the subsequent return of stickleback as a forage item for loons.

4. ***Need for Project:*** Some people felt that because the pike in the TRPL area are in landlocked lakes, they do not pose a risk to wild fisheries so there is no need to remove them. Others voiced an opposing opinion that these pike could serve as a source for illegal introductions elsewhere and therefore are a threat to native fisheries. The lone written comment received during the public scoping meetings suggested a preference for not removing the pike because the lakes are landlocked, people enjoy fishing for pike, and pike will continue to be introduced despite having these lakes as a source for pike.

5. ***Likelihood for success:*** One landowner voicing opposition to the project stated that he knew of waterbodies where northern pike exist (and ADF&G did not) and that the proposed TRPL eradication project would fail because pike would be reintroduced to the TRPL area.

6. ***Monitoring Plans:*** Several residents were curious about testing of lake water following a rotenone treatment and how testing results could be obtained. Another concern was whether and how the Department would monitor fish populations in the TRPL area post-treatment. One person wanted to know if the Department could identify the origin of a pike if a live one was to be discovered in the TRPL after removal efforts.

7. ***Health Concerns:*** A commonly expressed theme was the potential for health concerns related to the use of rotenone in the TRPL area. One resident expressed that regardless of exposure controls and EPA drinking water guidelines for rotenone safety, the Department could not guarantee complete safety and that “what we don’t know can hurt us” and “do not do this project”. One meeting attendee simply asked on the behalf of his wife who could not attend the meeting ”will it be safe for our kids and pets to be exposed to rotenone-treated water”.

8. ***Technical Questions:*** One person wanted to know if landowners impacted by the proposed project have a choice about whether the project is allowed and if the decision to remove the pike can be put to a vote. Another individual wanted clarification about what delivery method would be used to apply the rotenone (e.g., boat, helicopter, etc.)

9. ***Information Availability:*** Several people asked how project-related information can be accessed both before and after a treatment occurs. Another inquired about what authority or statues guide invasive species removal.

10. ***New Fishery Options:*** There was great interest by stakeholders, particularly landowners, over options to establish a new fishery in the TRPL following the removal of northern pike. Those options included stocking wild fish for a 3-5 year period or stocking hatchery-reared fish indefinitely. One resident said he and neighbors wanted to know if private funding could be used to support hatchery stocking in the TRPL area. Others

asked if the Department could restore the TRPL waters to a natural state (pre-development) and indicated only sticklebacks were present then. Other concerns raised were: 1) what fish species would be released, 2) who determines what is stocked 3) how long would stocking continue 4) will the lakes be stocked with wild or hatchery fish, 5) will the public have a say in the stocking options, 6) how long will it take sticklebacks to recolonize to pre-pike levels, 7) how long will it take wild salmonids to grow to a catchable size and 8) would char or grayling be suitable to release into the TRPL area?

11. ***Wanton Waste:*** One individual expressed his belief that killing northern pike in the TRPL area would be unethical because of wanton waste concerns. He suggested that despite planned efforts to salvage fish prior to a rotenone treatment; too many pike would not be salvaged and be wasted.

12. ***Testimonials:*** Two individuals, one at each meeting, shared their personal experience and observations related to living next to a lake that was treated with rotenone in 2014 to remove pike. Their stories indicated that they felt the overall ecology of the lake improved post-treatment and they appreciated the restoration of native fauna. Both individuals indicated they were satisfied with how ADF&G conducted the project and communicated with landowners.

Proposed Rotenone Treatment to address Pike in the TRPL Area

The public scoping meeting process focused to a large extent on ADF&G sharing what they believe to be the only potentially effective pike eradication option for the TRPL area: a rotenone treatment combined with measures to introduce native fish stocks to re-populate the lakes. Eradication and other measures to eliminate pike risks are being considered by ADF&G in response to the departments' legal mandate to:

- Protect Alaska's fisheries within Alaska Fish and Game Laws and Regulations (Section 16.05.020);
- Control invasive species in its *2010-2014 Sport Fish Division Strategic Plan*; and
- Provide sustained yield fisheries within the State of Alaska Constitution.

Appendix 2. TRPL environmental assessment public notice printed in the Peninsula Clarion.

To be completed after the EA public commenting period concludes.

Appendix 3. ADF&G press release announcing the public commenting periods for the TRPL environmental assessment and related ADEC pesticide use permit application.

To be completed after the EA public commenting period concludes

Appendix 4. Summary of comments received during the TRPL Environmental Assessment public commenting period and department responses.

To be completed after the EA public commenting period concludes

Appendix 5. CFT Legumine™ FishToxicant Safety data Sheet.

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 supervisionand 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

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 (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

- 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/m3 TWA (commercial)	5 mg/m3 TWA	5 mg/m3 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			

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		
Volatility			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
Flammability			
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		
Environmental			
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

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 *Rainbow Trout* 0.00194 mg/L [Acute] NOEC *Rainbow Trout* 0.00101 mg/L [Chronic] **Aquatic Toxicity-Crustacea:** NOEC *Daphnia magna* 0.00125 mg/L [Chronic] 96 Hour(s) EC50 *Daphnia magna* 0.0037 mg/L [Acute]

Persistence and degradability

- Rotenone is not persistent in the environment and its low vapor pressure (6.9x10-10 torr) and Henry's Law constant (1.1x10-13 atm-m3 mol-1) 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 atrecommended rates. Consult your State Fish and Game Agency and other agencies beforeapplying 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 ofequipment wash waters. Do not contaminate water outside of the treatment area, food or feed bystorage or disposal. Do not discharge effluent containing this pesticide into sewage systemswithout 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
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

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.

Appendix 6. CFT Legumine™ Fish Toxicant Specimen Label

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*

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. Ⓐ 44616-MO-1 Ⓑ 44616-MO-2

PRECAUTIONARY STATEMENTS – HAZARDS TO HUMANS AND DOMESTIC ANIMALS – WARNING

May be fatal if inhaled. Do not breath 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 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/drip 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 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. 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^3). 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^3) per Gallon (or Liter) Liquid" into the number of AF or m^3 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^3) 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^3 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^3/s (> 0.708 m^3/s) should have undiluted product applied, and flows < 25 ft^3/s (< 0.708 m^3/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^3/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^3/s per Gallon (4-hr)	ft^3/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^3/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^3/s per Liter (4-hr)	m^3/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^3/s or m^3/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^3/s) and F2 the flow rate (m^3/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^3/s) and F2= flow rate (m^3/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) 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^3/s) or F2 = stream flow (m^3/s) or, granular potassium permanganate is applied at a continuous rate using the equations:

Z = Y(1.7 F1) or Z = Y(60.02 F2)

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

VEC 15-036

December, 2015
Schaumburg, IL

Appendix 7. Memo on groundwater risk for the TRPL area.

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 [1] 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 course 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 aquafers. A review of local groundwater wells reinforces the regional geologic maps. 40 well logs were found in the vicinity of the Tote Lakes[2]. 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

[1] Water Right and Temporary Water Use Authorizations database, http://dnr.alaska.gov/mlw/mapguide/water/wr_start_tok.cfm, retrived 4/3/17
[2] Well Log Tracking System, https://dnr.alaska.gov/welts, retrieved 3/27/17

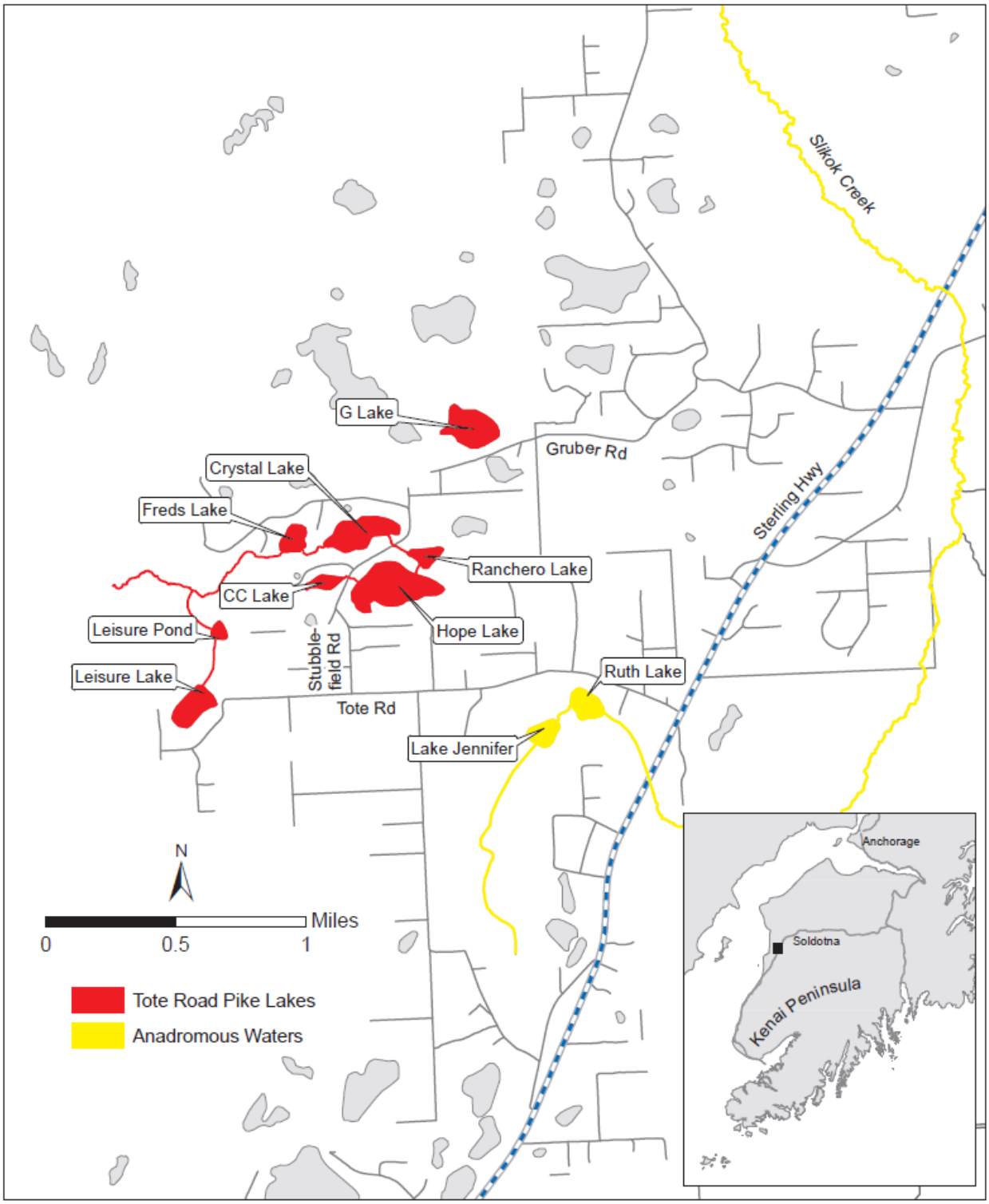
Slikok Creek
G Lake
Gruber Rd
Crystal Lake
Freds Lake
Sterling Hwy
Ranchero Lake
CC Lake
Leisure Pond
Hope Lake
Stubble-field Rd
Leisure Lake
Ruth Lake
Tote Rd
Lake Jennifer
N
Miles
0
0.5
1
Tote Road Pike Lakes
Anadromous Waters
Anchorage
Soldotna
Kenai Peninsula

Figure 1.

	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.[3] They have taken some incidental discharge measurements in this set of channels and all measurements have been below ½ 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.

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ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd,
Anchorage AK 99518 (907) 267-2375.