Draft Environmental Assessment

Northern Pike Management in the Miller Creek Watershed on Kenai NWR

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Draft Environmental Assessment for Miller Creek Pike Management

Date: March 15, 2021

This Draft Environmental Assessment (EA) is being prepared to evaluate the effects associated with the proposed action and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (43 CFR 46; 516 DM 8) and U.S. Fish and Wildlife Service (550 FW 3) regulations and policies. The National Environmental Policy Act requires examination of the effects of proposed actions on the natural and human environment. Appendix A outlines all laws and executive orders evaluated through this EA.

Proposed Action

The U.S. Fish and Wildlife Service (Service) is proposing to work with partners including the Alaska Department of Fish and Game (ADF&G) and Kenai Watershed Forum (KWF), to protect and restore native fish populations in the Miller Creek watershed (MCW) by eradicating invasive Northern pike (*Esox lucius*, 'pike', hereafter). Part of the MCW lies within the Kenai National Wildlife Refuge (Refuge), and the proposed action is in accordance with the Refuge's Comprehensive Conservation Plan (CCP) (USFWS 2010). Pike were first confirmed in Vogel Lake in 2019, which is in the northern portion of the Refuge and pose a threat to the biological integrity, diversity and environmental health of the Miller Creek watershed, as well as adjacent watersheds (See Appendix B-1 for Project Map).

Background

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual. The refuge was established as the Kenai National Moose Range pursuant to Executive Order 8979 on December 16, 1941, with a primary purpose of *". . . protecting the natural breeding and feeding range of the giant Kenai moose on the Kenai Peninsula, Alaska, which in this area presents a unique wildlife feature and an unusual opportunity for the study, in its natural environment, of the practical management of a big-game species that has considerable local economic value…"* New establishment purposes were provided by Congress under the Alaska National Interest Lands Conservation Act (ANILCA) of 1980, which also renamed the Moose Range the Kenai National Wildlife Refuge: (i) To conserve fish and wildlife populations and habitats in their natural diversity, including, but not limited to, moose, bears, mountain goats, Dall sheep, wolves and other furbearers, salmonoids and other fish, waterfowl and other migratory and nonmigratory birds; (ii) To fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats; (iii) To ensure, to the maximum extent practicable

and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the Refuge; (iv) To provide, in a manner consistent with paragraphs (i) and (ii), opportunities for scientific research, interpretation, environmental education, and land management training; and (v) To provide, in a manner compatible with these purposes, opportunities for fish and wildlife-oriented recreation.

ANILCA also designated 1.35 million acres (of the now 1.98 million-acre Refuge) as the Kenai Wilderness, to be managed as part of the National Wilderness Preservation System. The Wilderness Act of 1964 (Public Law 88-577) created additional purposes for the Kenai NWR. Section 2(a) of the Wilderness Act states in part that "… *it is hereby declared to be the intent of Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness ...*" and designated wilderness areas are to be managed "… *for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.*"

The mission of the NWRS, as outlined by the National Wildlife Refuge System Administration Act (NWRSAA), as amended by the National Wildlife Refuge System Improvement Act (16 U.S.C. 668dd et seq.), is

"... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Additionally, the NWRSAA mandates the Secretary of the Interior in administering the NWRS (16 U.S.C. 668dd(a)(4)) to

- Provide for the conservation of fish, wildlife, and plants, and their habitats within the NWRS;
- Ensure that the biological integrity, diversity, and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans;
- Ensure that the mission of the NWRS described at 16 U.S.C. 668dd(a)(2) and the purposes of each refuge are carried out;
- Ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the states in which the units of the NWRS are located;
- Assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the NWRS and the purposes of each refuge;
- Recognize compatible wildlife-dependent recreational uses as the priority general public uses of the NWRS through which the American public can develop an appreciation for fish and wildlife;
- Ensure that opportunities are provided within the NWRS for compatible wildlife- dependent recreational uses; and
- Monitor the status and trends of fish, wildlife, and plants in each refuge.

The MCW contains the last known pike population on the Kenai Peninsula following years of collaborative eradication efforts. Not removing the MCW population unnecessarily jeopardizes Kenai Peninsula wild native and stocked fisheries, as there is a threat to these fisheries posed by natural dispersal and illegal introductions of MCW pike to other watersheds.

Purpose and Need for the Action

The purpose of this proposed action is to restore and protect native fish communities in the MCW by eradicating invasive pike on and adjacent to the Refuge. Pike are native to Alaska north and west of the Alaska Mountain Range and near Yakutat in the southeast. Pike do not naturally occur in Southcentral Alaska (see Appendix B-2) and are believed to have first arrived there from an illegal introduction to Bulchitna Lake in the Yentna River drainage in the 1950's (Alaska Department of Fish and Game 2002). Kenai Peninsula 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 and in many instances, extirpated native fish populations (McKinley 2013, Massengill *in prep. a, and b*., ADF&G unpublished (a)). The current status of Kenai Peninsula waters where pike have been detected is shown in (see Appendix B-3).

Pike are considered an invasive species in Southcentral Alaska because they are not native to the region and are an apex predator capable of causing dramatic changes to fish assemblages outside of their native range (Dunker et al. 2018). Their introduction can cause economic and/or environmental harm (ADF&G 2002). Pike predation is suspected of causing localized salmonid reductions in Southcentral Alaska (Rutz 1999, Sepulveda et al. 2013, Sepulveda et al. 2015, Glick and Willette 2016), and pike appear to prefer soft-finned juvenile salmonids over other available prey species (Pankatar 2006, Sepulveda et al. 2013). Consumption of native juvenile salmonids by introduced pike has also been observed elsewhere in the northwestern United States (Dunker et. al. 2018). In Southcentral Alaska, prey of pike may be particularly vulnerable because they evolved in the absence of these predators. Also, prevalent shallow lake morphology throughout much of southcentral Alaska offers less deep water refugia for pike prey to avoid predation. Pike habitat preference includes shallow, vegetated, low flow waters (Inskip 1982, Cook and Bergersen 1988), and pike predation influence on salmonids appears greatest in these habitats (Dunker et al. 2018). The need of the proposed action is to meet the Service's priorities and mandates, specifically Refuge purposes as outlined by the ANILCA and the Wilderness Act, and the NWRSAA to "ensure that the biological integrity, diversity and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans" (16 U.S.C. 668dd(a)(4)). Introduced pike on the Kenai Peninsula have reduced or eliminated native wild fish populations from some lakes (McKinley 2013, Massengill 2017, Massengill *In Prep*.) and caused the cessation of ADF&G fish stocking in three other lakes. Pike were confirmed in the MCW in 2019 by ADF&G. The infested areas identified include Vogel Lake, North Vogel Lake, Upper Miller Creek, and wetlands adjacent to these waters in the upper MCW (see Appendix B-4). Temporary fish barriers were placed at the outlets of Sandpiper Lake, Bird Pond, Vogel Pond, and outlet of North Vogel Lake in 2019 to reduce the chance that pike can expand into other connected lakes in the Watershed. None of these barriers are associated with the Vogel Lake outlet into

Miller Creek. Evidence to date suggests their invasion was relatively recent and their impact to native fish populations has not had time to fully express. Based on the multiple experiences of pike invasions at similar areas in southcentral Alaska, catastrophic impacts to native fish in the MCW are expected if the pike population is left uncontrolled (Jalbert 2018).

Alternatives

Alternative A – No Action

The No Action Alternative would serve as a baseline of what would happen if no action would be taken to manage pike within the MCW. Although this population of pike is in its incipient stages, the population is expected to grow rapidly and could potentially extirpate the rainbow trout population in the invaded waters by 2030 and would continue, over time, to cause similar outcomes elsewhere in the drainage (Boersma 2020). Not taking action to manage this population would undermine the Service's ability to meet Refuge purposes, including its wilderness purposes. Additionally, KNWR is mandated to address invasive species under Executive Orders 13112 and 13751 and invasive species compromise the biological integrity, diversity, and environmental health (USFWS policy 601 FW 3) of the area. Not addressing pike would not address actions specified in the policy.

Alternative B – Netting and Containment

Removing invasive pike with suppressive gillnetting is an option for management. Under this management alternative, an excessive number of gill net hours would have to be fished to remove a significant proportion of the pike population from Vogel Lake. Suppressive gill netting under manageable levels of effort likely have to be continued in perpetuity, and may never completely remove pike from the project area (Boersma 2020). A second part of this management alternative would be to place experimental barriers at strategic locations of Vogel Lake with hydrological connection to adjacent water bodies to ensure that pike could not enter the system, or leave the system and potentially impact other systems. These barriers would remain in place for the duration of the time that the netting would occur and then be removed.

Alternative C – Rotenone

One technique used by fisheries managers to control invasive fish species is the application of a commonly used pesticide (Rotenone). Rotenone acts by inhibiting oxygen transfer needed for cellular respiration. Fish die from tissue anoxia due to cardiac and neurological failure (Ling 2003). It is effective at low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Typically, non-target organisms that do not have this rapid absorption route are not negatively affected at the concentrations necessary to kill fish (Ling 2003, National Park Service 2006, US Environmental Protection Agency 2007, Finlayson et al. 2018). Quantification of stream flow and lake volume in the treatment area, and water quality monitoring before, during and after treatment would be done to ensure that a lethal concentration of Rotenone for pike is achieved. All state and federal permits needed to apply an aquatic pesticide would be acquired prior to implementation. Implementation would occur in fall 2021 to minimize impacts to

runs of salmonids that may be in the system throughout other parts of the year. Fall treatments offer better timing in that invertebrates are naturally senescing at that time of year, there are no wood frog tadpoles, and piscivorous waterbirds have migrated south so they are not immediately displaced by temporary prey loss. A combination of application methods would be needed to apply the rotenone to the MCW and would include aerial (helicopter), boat, backpack, and drip station applications; such an approach could complete a treatment in a matter of days. Project staff would collect dead fish (as well as non-target species) post-application from areas where carcasses could become a nuisance (i.e., near the KNWR public use cabin or other dwellings).

Alternative D – Integrated Pest Management

Integrated pest management, US Fish and Wildlife Service policy 569 FW 1, is a sustainable approach to managing pests that uses biological, cultural, physical, and/or chemical methods. This science-based decision-making process incorporates management goals, consensus building, pest biology, monitoring, environmental factors, and selection of the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment and preventing unacceptable levels of pest damage (USFWS 2010).

Utilizing this approach, the project would begin with native fish rescue to safeguard as many native fish from the project area as possible by temporarily relocating them to a nearby waterbody outside of the project area. Temporary barriers would be maintained, and others added, as needed, in the upper part of the watershed to keep pike from moving beyond the project area. The next step would be applying rotenone, a commonly used fish pesticide, to the project area in fall 2021. This pesticide would work by inhibiting the ability of fish to utilize oxygen and would dispatch the invasive pike in the project area. Gill nets would be placed in the project area over winter 2021/2022 to both evaluate the success of the treatment and remove any pike that that may have avoided exposure to the pesticide. Temporary barriers could be removed after absence of pike is confirmed. Water quality would be monitored in future years. An additional temporary picket weir may be installed in Miller Creek to prevent possible pike re-entry into the system and left in place until 2023. Over the summer 2022-23 field seasons the project area would be stocked with representative native fish previously collected and held in a safe waterbody. Native fish species could potentially include rainbow trout (*Oncorhynchus mykiss*), juvenile coho salmon (*Oncorhynchus kisutch*), juvenile sockeye salmon (*Oncorhynchus nerka*), and threespine stickleback (*Gasterosteus aculeatus*). Rainbow trout are the dominant fish species in surrounding watersheds and would also be expected to naturally recolonize the area. Restocking with all life stages of fishes would expedite the recolonization process. Other native fish species of importance, such as the threespine stickleback, are present in surrounding watersheds and would be expected to naturally recolonize the MCW via natural pathways from surrounding lakes and streams. The population of rainbow trout is projected to reach its 2021 levels by 2030 after their reintroduction (Boersma 2020).

Alternative(s) Considered, But Dismissed from Further Consideration

- None

Affected Environment and Environmental Consequences

This section is organized by affected resource categories and for each affected resource discusses both (1) the existing environmental and socioeconomic baseline in the action area for each resource and (2) the effects and impacts of the proposed action and any alternatives on each resource. The effects and impacts of the proposed action considered here are changes to the human environment, whether adverse or beneficial, that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives. This EA includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an "affected resource." Any resources that will not be more than negligibly impacted by the action have been dismissed from further analyses.
The refuge consists of approximately 3000 square miles in the Kenai Peninsula Borough, Alaska. The MCW consists of 3568 acres of Refuge, State of Alaska, Kenai Peninsula Borough, and private property (See map at Appendix B-4).

Kenai National Wildlife Refuge has a variety of habitat types including: transitional boreal forest with wetlands, rivers, and lakes, mountain tundra, ice fields, and glaciers. The proposed action is located in the Miller Creek watershed on the northern portion of the Refuge, which is comprised of transitional boreal forest with wetlands and lakes. (See map of the general area and proposed project site at Appendix B-1).

See sections 1.3 - 1.6 of the Refuge's Comprehensive Conservation Plan for more information regarding and the general characteristics of the refuge's environment (USFWS 2010).

The following resources are not analyzed as, either (1) they do not exist within the project area or (2) they would either not be affected or only negligibly affected by the proposed action:

- Air quality
- Refuge Management and Operations
- Visitor Use and Experience
- There are no known cultural resources in the proposed area of operations, as confirmed though consultation in compliance with National Historic Preservation Act Consultation, Section 106 in winter/spring 2021.
- The Cook Inlet beluga whale (*Delphinapterus leucas*) is the only endangered species found in the Cook Inlet area. No direct impacts to beluga whales are expected because the project area is not accessible to beluga whales. Additionally, if rotenone is part of the management strategy that is selected, the chemical will remain within the treatment area and will not enter Cook Inlet at a concentration detrimental to fish or any species dependent upon them. Any rotenone discharging into Cook Inlet from Miller Creek will quickly dilute to <2.0 ppb and is considered deactivated (Finlayson 2010). Rotenone will not have population level impacts to Beluga food resources (Salmonids). Due to this aforementioned information, a full analysis of impacts to threatened and endangered species will not be included below, as confirmed through consultation in compliance with ESA (Endangered Species Act) in winter/spring 2021.

Natural Resources

Species of Management Concern – Northern Pike

Affected Environment

Description of Affected Environment for the Affected Resource

The MCW currently supports native anadromous and resident fish populations which are abundant and well distributed. The status of pike in the MCW is consistent with a population early in its invasion process. Data supportive of this assumption include: (1) relatively low gillnet capture-per-unit-of-effort (fish/hour) for pike (0.025) compared to native salmonids (0.313) (ADF&G 2020a), (2) microchemistry analysis of the inner ear bone (otolith) for the largest pike captured from Vogel Lake revealed a strontium isotope signature indicative of Cook Inlet migration and consistent with the fish being a population founder (Wooler 2020), (3) the first report of a pike observed in the MCW was received in 2018 (ADF&G 2018a), (4) a lack of pike angler catch or harvest reports from the MCW as reported in the Alaska Statewide Sport Harvest Survey (SWHS), an annual ADF&G mail-in sport angler survey (Romberg 2014, Romberg 2016a, Romberg 2016b, Romberg et al. 2016, Romberg et al. 2017, Romberg et al. 2018, Romberg et al. 2020a, Romberg et al. 2020b), (5) lack of pike detections in the MCW during fish surveys prior to 2019 (Allin 1955, Baxter 1956, Tobin and Palmer 1997, Friedersdorff and Jakubas 1984, Friedersdorff 1986, ADF&G 2021a), and (6) limited distribution of pike within the MCW, based on 2019 gillnet survey results wherein pike were not detected in eight lakes and ponds ephemerally linked to the lakes with pike (ADF&G 2020b).

Description of Environmental Trends and Planned Actions

The native fauna and flora of the MCW remains intact but is threatened by recent biological invasions, most notably are two aquatic invasive species that can be very impactful, one is an apex predator (pike) and the other an aquatic plant, waterweed (Elodea sp., hereafter). Elodea sp. can easily spread via fragmentation and hitchhiking and can quickly dominate native aquatic vegetation communities, impede navigation and may facilitate other invasive species such as pike (Thiébaut 2005, Heikkinen et al., 2009, Mjelde et al. 2012, Schultz and Dibble, 2012, Suresh et al. 2017). Fortunately, efforts to eradicate Elodea sp. on the Kenai Peninsula have so far been successful, including current work to eradicate a population in Sandpiper Lake that is within the MCW (ADNR 2020, Kenai Peninsula Cooperative Weed Management Area 2021). Having two highly impactful invasive species within the same drainage at the same time poses serious sustainability threats to the biodiversity of the of the MCW.

Impacts on Affected Resource

Alternative A – No Action Alternative

Multiple lines of evidence indicate the MCW pike population is currently at a low abundance and has a high potential for population expansion due to the underexploited prey and habitat available

in the drainage. In nearly all other lentic waters on the Kenai Peninsula where invasive pike have invaded, resident native fish populations eventually became depleted or extirpated (Begich and McKinley 2005, Begich 2010, Massengill 2011, McKinley 2013, Massengill 2014a, Massengill 2014b, Massengill 2017). It is probable that a similar collapse of native fish would occur in the MCW barring any action to control the pike population (Boersma 2020). Native fish provide an abundant and rich prey resource for pike, but once depleted, pike typically shift to less nutritious prey such as invertebrates (Chapman et al. 1989, Venturelli and Tonn 2006, Glick and Willette 2016). This often results in pike stunting in size (Venturelli and Tonn 2006) and reduces the quality of the sport fishery for those interested in fishing for them (Pierce et al. 1995, Pauckert et al. 2001).

Alternative B – Netting and Containment

To date, there has been variable success at using mechanical methods (including netting and containment) to control invasive pike in southcentral Alaska. Some have been successful in the short-term at removing pike and increasing salmonid abundance and distribution (Begich and McKinley 2005, Begich 2010, Massengill 2010, Massengill 2011, McKinley 2013, Glick and Willette 2016, DeCino and Willette 2017, Massengill 2017, Courtney et al. 2018, Bradley et al. 2020, Rutz et al. 2020, Wizik *In Prep.,* Robert Decino, ADF&G Commercial Fish Division Biologist, Soldotna Office, personal communication).

There have been only three instances in Alaska where invasive pike populations have been successfully eradicated by gillnetting efforts alone. Those instances include Hall, Tiny and Warfle lakes, all located on the Kenai Peninsula (Dunker et al. 2020). These removal efforts involved intensive long-term under-ice gillnetting and no other native fish were present except stickleback at Hall and Tiny lakes. Shared characteristics of these lakes that potentially contributed to the successful eradication of pike include: (1) all lakes were < 40 surface acres, (2) the pike population at each lake was < 30 individuals based on removal counts,
(3) the lakes were closed to native fish immigration, (4) few if any juvenile pike (< 2 years old) were present indicating recruitment was poor and, (5) no juvenile salmonids were available as a rich prey source. Pike gillnet suppression efforts at Vogel and North Vogel lakes would not be expected to eradicate the pike population because the lakes they inhabit, including Miller Creek, share few of the characteristics of the lakes where eradication using gillnets was successful.

Containment of the MCW pike population to prevent expansion of its distribution within and out of the MCW would entail installing fish passage barriers in tributaries feeding the lakes that pike occupy (i.e., Vogel and North Vogel lakes). There are temporary passage barriers now in place in some of these tributaries, but they are incapable of preventing fish passage during exceptionally highwater events, are insufficient to stop juvenile movement, and are easily damaged. Long-term barriers within the lake system would not be feasible due to maintenance issues and cost based on previous work (ADF&G 2009).

Consideration of non-structural containment/barrier options would include electrified, acoustic, or pneumatic (air blast/bubble), and chemical barriers, to name a few. All non-structural barrier options require significant installation and ongoing maintenance costs. Few, if any, non-structural barrier options are well researched for their applicability at preventing pike passage and all would

require a permanent and reliable power source.

Alternative C – Rotenone

Alternative C would apply a fish piscicide (rotenone) to all waters in the MCW containing pike to eradicate them. At a minimum, the treatment area would include the Miller Creek mainstem, Vogel and North Vogel lakes and all adjacent inundated wetlands. Rotenone treatments have a reliable record for pike eradication in Alaska (Massengill 2014 a, b, Massengill 2017, Dunker et al. 2020, Massengill *In Preparation*). The anticipated outcome of such a rotenone treatment would be the eradication of all pike and native fish within the treatment area.

Alternative D – Integrated Pest Management

Alternative D utilizes multiple strategies including temporary containment, rotenone, and native fish restoration to address the pike issue in the MCW. Temporary barriers installed would be intended to prevent the spread of pike from their current location in the watershed. Impacts of rotenone to pike are summarized above. Native fish restoration would have no impact on pike, as this step would be taken after the pike had been eradicated. A final piece of this alternative could be utilization of a picket weir for at least two years after the rotenone application to decrease the likelihood of reinvasion of pike from the saltwater of Cook Inlet. A two-year operation of a weir would also provide time for ongoing research on the physiological limits of pike to be completed by a USFWS-sponsored graduate student. That research may be useful for informing fishery managers who are considering options for a long-term barrier in Miller Creek to selectively inhibit upstream pike passage. In summary, Alternative D uses an IPM approach to: (1) eradicate the pike population in the MCW, (2) actively aid in the preservation and restoration of native fish populations, (3) protect the watershed's ecological integrity, and (4) explore options to ensure pike are kept out of the MCW.

Non-Target Aquatic Wildlife Species

Affected Environment

Description of Affected Environment for the Affected Resource

The native fish assemblage of the MCW includes rainbow trout, coho salmon, sockeye salmon, pink salmon (*Oncorhynchus gorbuscha*), dolly varden (*Salvelinus malma*) threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*) and sculpin (*Cottus* Sp.) (Allin 1955, Baxter 1956, Tobin and Palmer 1997, Friedersdorff and Jakubas 1984, Friedersdorff 1986, Boersma 2020, ADF&G 2021a). None of the aforementioned species is listed as threatened or endangered. The primary sport fishery is focused on rainbow trout, the most abundant game fish species in the MCW. Fly-in guide camps were historically permitted on some of the more productive lakes in the MCW and visitor logs at a KNWR public-use cabin near the Vogel Lake outlet indicate a moderate take of rainbow trout by private anglers. Commercial fishing harvest of salmon natal to the Miller Creek drainage is likely a very small component of the total Cook Inlet harvest, but likely an important stock to local operators at the mouth of Miller Creek.

Description of Environmental Trends and Planned Actions

Continued presence of pike in the MCW would be detrimental to the long-term viability of native fish species, and other fish and wildlife species that depend on the native fish assemblage. Local fishers, both recreational and commercial, may lose out on fishing opportunities for native fish species. The presence of Elodea in the watershed, although it is undergoing treatment, would combine with the presence of pike to reduce the natural qualities of the designated Wilderness on KNWR.

Impacts on Affected Resource

Alternative A – No Action

The introduction of pike into the MCW will likely be significant for the watershed's ecosystem and native fish assemblage and the fisheries dependent on them. Stochastic age-structured population dynamics models were used to investigate the impacts of a pike invasion on native populations. Based on the population growth rate of the newly established pike population and the demography and productivity of the system there is an exceedingly high probability that, within a decade, pike abundance and distribution will increase in the drainage and result in the extirpation of native fish populations in the affected water bodies (Boersma 2020). This finding is consistent with most other Kenai Peninsula waters invaded by pike where native fish populations have typically collapsed in one to two decades following their introduction (McKinley 2013, Massengill 2017). In addition to local impacts, the presence of a pike population anywhere on the Kenai Peninsula increases the risk of illegal stocking, and/or, the population naturally expanding to neighboring drainages.

Alternative B – Netting and Containment

Modeling of the population growth rate of the invasive pike and the productivity of the native fish populations suggest the level and frequency of netting efforts would be prohibitively expensive and likely result in the eventual extirpation of native fish populations under most scenarios (Boersma 2020). This finding is consistent with other netting removal efforts in South-Central Alaska where successful efforts were limited to small individual lakes with no immigration of native fish and small pike populations (Dunker et al. 2020).

The instillation of permanent barriers impassible to all fish in the inlets and outlets of the lakes that pike occupy would likely impair native fish populations. Suitable salmonid spawning habitat appears extremely limited in most of the MCW. The lower main stem of Miller Creek is thought to provide some of the best salmonid spawning habitat in the drainage and likely acts as an important spawning area for native species, particularly salmonids, that rear throughout the MCW (Friedersdorff and Jakubas 1984). Some tributaries of Vogel Lake also appear to provide some potential salmonid spawning habitat. Inhibiting these migration corridors could therefore disrupt recruitment and negatively impact native fish populations not just in the pike infested lakes but throughout the MCW.

Alternative C – Rotenone

The appropriate prescription and application of rotenone, a fish pesticide, to all waters in the MCW containing northern pike would result in the eradication of all invasive pike and native fish within the treatment area. Although the treatment would temporally remove native species, the recruitment dynamics and interconnectedness of the lake system provides a resilience to the native fish populations to this type of treatment. In fact, a previous rotenone treatment within the watershed (Bird Pond) has appeared to have fully recovered with no restocking efforts or other mitigations (Allin 1955, ADF&G 2021a).

Alternative D – Integrated Pest Management

The integrated pest management alternative utilizes multiple strategies including temporary containment, rotenone, and native fish restoration. The temporary nature of the barriers would moderate the concerns stated above and provide added assurance that pike will not inadvertently spread during the treatment period. Population modeling suggests that a modest restocking effort could result in the recovery of resident game fishes within a ten-year timeline (Boersma 2020) and would provide assurances of a timelier restoration of the natural ecosystem function of the MCW.

Non-Target Terrestrial Wildlife Species

Affected Environment

Description of Affected Environment for the Affected Resource

BIRDS
The upland habitat supports a variety of breeding passerines. Most prominent species utilizing the area are varied thrush (*Ixoreus naevius*), American robin (*Turdus migratorius*), Swainson's thrush (*Catharus ustulatus*), yellow-rumped warbler (*Setophaga coronata*), ruby-crowned kinglet (*Regulus calendula*), fox sparrow (*Passerella iliaca*), and dark-eyed junco (*Junco hyemalis*). The herbaceous/peatlands along Miller Creek and around the apron of Vogel Lake support bird populations that include savannah sparrow (*Passerculus sandwichensis*) and Lincoln's sparrow (*Melospiza lincolnii*), as well as wading species like greater yellowlegs (*Tringa melanoleuca*) and Wilson's snipe (*Gallinago delicata*), and spotted sandpiper (*Actitis macularius*) utilizing the water's edge. The lake, stream, and wetland habitat supports several diving and dabbling duck species, trumpeter swan (*Cygnus buccinator*) and common loon (*Gavia immer*).

AMPHIBIANS
Wood frog (*Lithobates sylvaticus*) is the only amphibian known to occur on the Kenai Peninsula and presumed to be common in the MCW. 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 (Broderson and Tessler 2008).

MAMMALS
Large mammal species found within the MCW include moose (*Alces alces*), black bear (*Ursus americanus*),

brown bear (*Ursus arctos*), wolf (*Canis lupus*), and coyote (*Canis latrans*). Moose forage in riparian and upland habitats, primarily in riparian and birch stands within upland habits. Brown and black bears within the MCW primarily forage in riparian and aquatic habitats where they consume salmonids and other fish within Miller Creek and the shore of Vogel Lake. Wolves and coyotes are ephemerally present within the MCW.

Mesocarnivore species within the MCW include North American river otter (*Lontra canadensis*), American mink (*Neovison vison*), ermine (*Mustela erminea*), American marten (*Martes americana*), and lynx (*Lynx canadensis*). River otter primarily inhabit aquatic environments within the MCW where they consume salmonids and other fish species. Mink primarily forage along stream shores and shallow aquatic habitats where they primarily feed on aquatic invertebrates and fish. Ermine and lynx may be found throughout all habitats within the MCW.

Rodents and lagomorphs present within the MCW include North American beaver (*Castor canadensis*), North American porcupine (*Erethizon dorsatum*), red squirrel (*Tamiasciurus hudsonicus*), and several species of vole and shrew. Beaver primarily inhabit the aquatic environments within the MCW and forage in riparian areas near these aquatic environments. Several species of vole and shrew inhabit all habitats within the MCW. The presence and densities of specific vole and shrew species varies among microhabitats within the MCW. Red squirrel, porcupine, and snowshoe hare (*Lepus americanus*) are primarily found in mature white/Lutz spruce forests within the MCW.

INVERTEBRATES

According to the Global Biodiversity Information Facility (2021), terrestrial invertebrates known to occur within the MCW include multiple species of worms, flies, mosquitos, yellowjackets, beetles, and butterflies.

In the wetlands, expected species include the common mesh-weaver (*Dictyna arundinacea*), which was found to be characteristic of the shrub-sedge bog community by Bowser et al. (2020); the four-spotted skimmer (*Libellula quadrimaculata*); the American emerald (*Cordulia shurtleffii*); the ringed emerald (*Somatochlora albicincta*); the northern bluet (*Enallagma annexum*); the marsh meadow grasshopper (*Pseudochorthippus curtipennis*); the red-disked alpine (*Erebia discoidalis*); the green comma (*Polygonia faunus*); a big-headed fly (*Eudorylas slovacus*), which was found to be characteristic of the shrub-sedge bog community by Bowser et al. (2020); and another big-headed fly (*Tomosvaryella sylvatica*).

Description of Environmental Trends and Planned Actions

Other non-native species exist in the MCW that are detrimental to the ecology and qualities of the Wilderness in the MCW within the boundaries of KNWR. Two non-native earthworm species, nightcrawlers (*Lumbricus terrestris*) and octagonal-tail worms (*Dendrobaena octaedra*), have been introduced at Vogel Lake cabin already resulting in loss of leaf litter at this site (Bowser 2019, Global Biodiversity Information Facility 2021). Because earthworms disperse extremely slowly, the effects of these worms on the MCW as a whole are expected to be small for decades to centuries.

Impacts on Affected Resource

Alternative A – No Action

The presence of pike within the MCW can have significant deleterious effects on salmonid and

other native fish populations within the drainage. Salmonids are an important food resource for numerous terrestrial mammal species including black bear, brown bear, mink, and river otter. Other species such as wolf and coyote may also exploit these resources whenever available in great abundance. It is likely that the presence of pike has already negatively affected the food source for waterbirds in this system and the removal of pike will promote greater abundance of food for these species in the future.

Alternative B – Netting and Containment

Land birds, land mammals and invertebrates have the potential to be impacted by gill nets or temporary containment barriers. Amphibian larvae may be partially blocked from movement throughout the watershed by temporary barriers, which would be a minimal impact. No impact to amphibians would be anticipated from gill nets. Waterbirds and some aquatic mammals have the potential to become trapped in gill nets which could negatively impact a small proportion of these species, but would not be impacted by temporary barriers. The level of netting needed under this alternative would increase the likelihood of negative impacts to non-target species.

Alternative C – Rotenone

AMPHIBIANS
Adult frogs have been found to be more resistant to the effects of rotenone than fish. Laboratory studies conducted on Columbia spotted frog (*Rana luteiventris*), and Rocky Mountain tailed frog (*Ascaphus montanus*) and long-toed salamander (*Ambystoma macrodactylum*) concluded that in the adult stage these species would not suffer an acute response to rotenone, but larval and tadpole stages could be affected by rotenone at fish killing concentrations (Grisak 2007). 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 within the MCW. Active wood frog tadpoles were captured and observed in Scout Lake (Sterling, Alaska) in the spring of 2010 following a fall 2009 rotenone treatment (ADF&G 2018b).

BIRDS
All the upland bird species utilize invertebrates in their diet but would likely be only slightly affected by the project as most glean and flycatch from the forest and none would be solely utilizing invertebrates from the affected waterway. The bird species most likely affected from this habitat type would be western wood-pewee (*Contopus sordidulus*), alder flycatcher (*Empidonax alnorum*), olive-sided flycatcher (*Contopus cooperi*), tree swallow (*Tachycineta bicolor*), and violet-green swallow (*Tachycineta thalassina*). Their ability to feed in adjacent unaffected freshwater systems makes it unlikely that there would be any significant impacts to these species, even at a local level.

Any loss of aquatic insects related to the treatment that could potentially reduce this food source for wading bird species would not be impactful (Massengill 2014 a, b; Massengill 2017). These species nest in small numbers adjacent to the majority of similar waterbodies found throughout the Refuge so any localized impacts would not be of major concern at the Refuge population level. There are also similar waterbodies that are adjacent to the project area that would be untreated and

likely be utilized by waterbirds and could possibly negate any possible short-term negative impacts to nesting success. Invertebrate and fish populations preyed upon by waterbirds in these untreated habitat types would be approximately 300 meters from the project area.

MAMMALS

Removal of pike from the drainage would likely have eventual positive effects on salmonid and other native fish abundance and distribution within the drainage. Salmonids are an important food resource for numerous terrestrial mammal species including black bears, brown bears, mink, and river otters. Other species such as wolves and coyotes may also exploit these resources whenever available in high abundance. Increased salmon abundance within the drainage would likely have positive impacts on these and other terrestrial mammal species by increasing food availability, particularly seasonal food availability.

Increased salmonid abundance within this drainage can increase the deposition of salmon carcasses in nearby forests by mammals such as black and brown bear. These nutrients from the decomposing carcasses have positive effects on terrestrial vegetation through increased inputs of nitrogen and other marine-derived nutrients (Hilderbrand 1999). Such increased vegetation growth could also increase food availability for terrestrial mammals such as moose, beaver, and a variety of small mammals.

Alternative D – Integrated Pest Management

All impacts of alternative C would be expected under alternative D, as rotenone is a component of both alternatives. Re-stocking of native fish under alternative D would accelerate the recovery of this species in the MCW. An accelerated recovery of native fish would benefit the vertebrate species that directly prey upon fish, invertebrates and vertebrate species that utilize fish carcasses.

Habitat and Vegetation (including vegetation of special management concern)

Affected Environment

Description of Affected Environment for the Affected Resource

Tree species in the MCW include: black spruce (*Picea mariana*), white spruce (*Picea glauca*), Alaska birch (*Betula pendula* ssp. *mandshurica*), and cottonwood (*Populus × hastata*) (Baxter 1956, Jakubas and Firman 1984). The tall shrubs Sitka alder (*Alnus alnobetula* ssp. *sinuata*) and Scouler's willow (*Salix scouleriana*) are present in the MCW as well (Baxter 1956).
Vegetation in wetlands within the project area are characterized by black spruce, mosses, and herbaceous plants such as grasses, forbs, and shrubs. Baxter (1956) listed from this area Alaska iris (*Iris setosa*). Thinleaf alder (*Alnus incana*) is expected to be common in MCW wetlands, particularly along streams.

Predominant aquatic vegetation species include: broad-leaved pondweed (*Potamogeton natans*), small pondweed (*Potamogeton berchtoldii*), Robbins' pondweed (*Potamogeton robbinsii*), flat-stem pondweed (*Potamogeton zosteriformis*), rushes (*Schoenoplectus* sp.), Rocky Mountain pond-lily (*Nuphar polysepalum*), pygmy water-lily (*Nymphaea tetragona*), water milfoil (*Myriophyllum*

sp.), narrowleaf bur-reed (*Sparganium angustifolium*), and water horsetail (*Equisetum fluviatile*) (Global Biodiversity Information Facility 2021). *Elodea*, a non-native aquatic plant, is present in Sandpiper Lake within the watershed, and is currently undergoing treatment for eradication (Alaska Department of Natural Resources 2020, Global Biodiversity Information Facility 2021, Kenai Peninsula Cooperative Weed Management Area 2021).

Description of Environmental Trends and Planned Actions

White spruce forests on the northern Kenai Peninsula have been severely affected in recent years by outbreaks of spruce bark beetles; a cycle that may shift under a warming climate (Sherriff et al. 2011, US Forest Service 2020).

Non-native sawflies that are now assumed to be ubiquitous on the western Kenai Peninsula defoliate birch and thinleaf alder (Lundquist and Soper 2010, Kruse et al. 2012). Birches in the area appear to be able to cope with these sawflies well, but thinleaf alder have experienced considerable dieback in recent decades due in part to defoliation by sawflies and in part by alder canker (*Valsa melanodiscus*) and other fungal diseases (US Forest Service 2020).
Only a small, apparently incipient population of invasive Elodea was found in Sandpiper Lake in 2019. Eradication began in 2020 and is expected to be eradicated by 2022 before it can significantly alter the ecology of this system.

The presence or absence of pike in the MCW should have little effect on terrestrial and aquatic vegetation and habitats. Their effects on any part of this system are expected to be indirect by altering food webs and by changing how humans use the area. Human use is already an important source of change for this area, bringing in other non-native species and plants [e.g. Autumn Hawkbit (*Scorzoneroides autumnalis*)] into this system (Bowser 2020). Pike remaining in the system would add to impacts from other invasive plants and invertebrates which move the MCW further away from management goals of biological integrity, diversity, and environmental health (US Fish and Wildlife Service 2006).

Impacts on Affected Resource

Alternative A – No Action

Taking no action on the pike would have little direct impact on the vegetation and habitat resources of the area.

Alternative B – Netting and Containment

Of the three alternatives, netting and containment is the most likely to damage the vegetation and habitat resources of the area. Because this alternative requires more person-hours and travel to and from the MCW, and especially because this would have to be repeated indefinitely, the likelihood of inadvertently transporting additional invasive species into the watershed is greatest with this alternative. Repeated trampling of wetlands to service nets and maintain barriers would create new trails and disturbance in these wetlands.

Alternative C – Rotenone

Application of rotenone is not known to harm plants, so the use of rotenone is not expected to have any lasting effect on vegetation and habitat (Finlayson et al. 2018). Even though a large effort would be undertaken in 2021, only limited follow-up would be required, making this alternative the least impactful in terms of trampling and potentially inadvertently transporting invasive species.

Alternative D – Integrated Pest Management

Impacts of alternative D (rotenone as part of IPM) would be similar to alternative C (rotenone). Limited trampling of vegetation may occur during restocking efforts, but the impacts would be minimal.

Geology and Soils

Affected Environment

Description of Affected Environment for the Affected Resource

The predominant soil type in the project area is Cohoe dry silt loam. Soils in this classification typically have a shallow organic layer of moderately decomposed plant material (0-2 inches below surface), two layers of silt loam (2-24 and 24-52 inches below surface, respectively), and a layer of very gravelly sandy loam (52-60 inches below surface). Soils are typically well drained with a restrictive feature greater than 80 inches below the surface. This type of soil is well-draining with a soil permeability ranging from 0.57 to 1.98 inches/ hour (USDA - NRCS 2021).

Description of Environmental Trends and Planned Actions

If rotenone is incorporated into the selected alternative, no rotenone contamination of soils is anticipated from this project. Rotenone binds readily to sediments and is ultimately broken down in soil and water (Engstrom-Heg 1971, Engstrom-Heg 1976, Skaar 2001, Ware and Whitaker 2004). Rotenone is not expected to leach from soils, and it penetrates approximately one inch vertically in most soil types (Augustijn-Beckers et al. 1994, Arizona Department of Fish and Game, 2011). The only exception is sandy soil where movement is about three inches (Hisata 2002).

Impacts on Affected Resource

Alternative A – No Action

No impacts to soils would be expected under the no action alternative.

Alternative B – Netting and Containment

No impacts to soils would be expected under the netting and containment alternative.

Alternative C – Rotenone

It is expected that, at the very maximum in sandy soils that are most easily penetrated by rotenone, the rotenone would only penetrate about three inches total. 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).

Alternative D – Integrated Pest Management

Implementation of the other tools including netting, native fish rescue, and/or re-stocking would not be expected to have impacts on the geology/soils of the MCW. Impacts of rotenone on soils are discussed above in the section for alternative C.

Water Quality

Affected Environment

Description of Affected Environment for the Affected Resource

Water resources in the Vogel Lake project area include a series of connected lakes and wetlands draining into Miller Creek. Vogel Lake is approximately ten miles from the nearest road and sees light recreational use by anglers year-round arriving by either floatplane or snowmobile. Water quality in the project area is not currently affected by local anthropogenic development, with invasive pike presenting the primary disturbance to the aquatic ecosystem.

Observations from other lakes in the region with invasive pike populations suggest that pike may act as an indirect driver of changes to lotic water quality. Although anecdotal, lakeside residents at other Kenai Peninsula lakes with invasive pike have reported increased water clarity following their introduction. Trophic cascade effects, including water quality changes and changes in zooplankton communities, can result from fish introductions (Tanner et al. 2006, Skov and Nilsson 2007, Duggan 2015, Walsh et al. 2016). Due to its remote location, pre-existing water quality data for the MCW is not available, thus it is not possible to determine if such changes in water quality are underway there.

Baseline water quality data fieldwork in the MCW initiated in January 2021 and will continue through Fall 2022. Water quality data from lake depth profiles will be collected on an approximately monthly basis, with measurements at one-meter depth intervals for temperature, pH, dissolved oxygen, conductivity, and turbidity. Initial data in January 2021 indicates stratified patterns in temperature, pH, dissolved oxygen, and conductivity, with virtually zero turbidity except at the benthic surface.

Baseline water quality data and site photos may be accessed in an online web map and report (Kenai Watershed Forum 2021a, Kenai Watershed Forum 2021b). Maps and data will be updated

throughout the project as more data becomes available.

Description of Environmental Trends and Planned Actions

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. No other chemicals are known to be present in the water of the MCW that could have a compounding impact if rotenone were used.

Impacts on Affected Resource

Alternative A – No Action

Allowing northern pike to remain in the MCW would not negatively affect water quality. Although anecdotal, lakeside residents at other pike-infested lakes have reported water clarity increased following the introduction of pike. However, trophic cascade effects, including water quality changes and changes in zooplankton communities, are known to result from fish introductions and could possibly occur with continued presence of pike (Tanner 2006, Skov and Nilsson 2007 Duggan 2015, Walsh et. al. 2016).

Alternative B – Netting and Containment

Under the Proposed Action Alternative B, changes to water quality are expected to be minor. Potential changes in water quality as a result of pike removal and resultant trophic effects would be monitored through Fall 2022. Fish carcasses that may be present after netting can act as fertilizer to stimulate production of phytoplankton and ultimately zooplankton. However, no drastic changes in water quality have been observed by ADF&G following other northern pike eradication projects (Massengill 2014 a, b).

Alternative C – Rotenone

Under the Proposed Action Alternative C, water quality will be temporarily affected by the application of rotenone. 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 the lake connections are ephemeral and low flow (<1 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. 2018). Detoxification is normally accomplished within 60 minutes after $KMnO_4$ 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. $KMnO_4$ detoxification of rotenone in the MCW is unlikely to be needed because rotenone will be confined to the treatment area and not flow into other waters supporting wild fish populations. 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 (Loeb and Engstrom-Heg 1970, Engstrom-Heg 1972, Gilderhus et. al. 1986, Ware and Whitaker 2004, ODFW 2008). 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 has been applied to other pike 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 one 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 the MCW 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 on the product label and safety data sheets in appendix C. 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).

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). The treatment period (early-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.

In summary, the rotenone treatment would be confined to the MCW natural degradation processes would fully detoxify rotenone over a period of months. As required by state regulation, ADF&G will apply for and comply with the Alaska Department of Environmental Conservation (ADEC) Pesticide Use Permit for this project. 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. Finally, a Service Pesticide Use Permit for Rotenone would be completed and sent to the national Service office for review and approval prior to treatment.

Water samples would be collected at minimum bimonthly intervals post-application until undetectable and analyzed for rotenone concentrations as well as other parameters if requested by ADF&G. Potential changes in water quality associated with pike removal and resultant trophic effects will be monitored through Fall 2022.

Alternative D – Integrated Pest Management

Alternative D includes a combination of netting and rotenone application to eradicate pike, as well as restocking with native fish. Water quality may be temporarily affected by these activities as described in Alternative C. The elimination of pike and reintroduction of native fish would be expected to gradually approximate water quality conditions that were present prior to pike infestation. Potential changes in water quality as a result of pike removal and resultant trophic effects will be monitored through Fall 2022.

Floodplains

Affected Environment

Description of Affected Environment for the Affected Resource

The area encompassing the MCW is defined in Appendix B-4 via spatial data. ADF&G aerial and ground observations and review of satellite imagery indicates some neighboring surface waters located south of the watershed boundary may have linkage to the MCW, or, share linkage to both the MCW and the Seven Egg Creek Drainage. The Seven Egg Creek drainage is an adjacent drainage south of the MCW. Both drainages drain west into Cook Inlet.

There is scant discharge data for any flowing waters in the MCW, but visual observations done periodically in 2019 suggests the typical discharge of Miller Creek is low (<10 cfs) with high seasonal variability. Stream flow in Miller Creek in early August 2012 was undetectable, but likely

has the potential to be > 10cfs during rare highwater events based on visual estimates. Higher order streams within the drainage probably have peak seasonal discharges ranging from 5.0 – 0.5 cfs. Mid-summer discharge at Sandpiper Lake, which flows into North Vogel Lake, was estimated at 1 cfs (Baxter 1956) and discharge was undetectable in early September 2019. Discharge at Bird Pond, which flows into Vogel Lake, was estimated at only 6 cubic feet per hour during summer (Allin 1955).

Description of Environmental Trends and Planned Actions

All waterbodies with surface water linkage within the MCW are highly vulnerable to pike invasion, particularly those south of Vogel Lake that are tenuously protected by beaver dams in their outlet streams which likely serve as a barrier to upstream pike movement.

Impacts on Affected Resource

Alternative A – No Action

No impacts to the floodplains would be expected if pike are allowed to remain in the MCW.

Alternative B – Netting and Containment

Utilization of gill nets for removing pike would not have impacts on the floodplains. Placing barriers to pike movement in or out of the system could potentially impact the natural flow regime, but not to a level considered adverse within the scope of Executive Order 11988 (Code of Federal Regulations 1977).

Alternative C – Rotenone

Use of rotenone as a standalone management action would not impact the natural flow regime of the watershed to a level considered adverse within the scope of Executive Order 11988 (Code of Federal Regulations 1977).

Alternative D – Integrated Pest Management

Placing barriers to pike movement in or out of the system could potentially impact the natural flow regime, but not to a level considered adverse within the scope of Executive Order 11988 (Code of Federal Regulations 1977). Implementation of the other tools including netting, rotenone, native fish rescue, and/or re-stocking would not be expected to have impacts on the floodplain.

Wilderness or Other Special Designation

Affected Environment

Description of Affected Environment for the Affected Resource

All Refuge lands and waters within the project area are part of the Congressionally-designated Kenai Wilderness. In order to meet the Refuge's wilderness purpose, the Wilderness Act provides that each agency administering wilderness areas "*...shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise noted in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.*"

Description of Environmental Trends and Planned Actions

As previously noted, the pike population in the MCW has high potential to grow and expand, and to have substantial adverse impacts to native resident and anadromous fish populations. Without management action, pike would therefore have substantial long-term negative impacts on wilderness character within this portion of the Kenai Wilderness, specifically to its natural quality. However, management actions under all Alternatives considered would also negatively impact the untrammeled, undeveloped, and natural qualities of the Kenai Wilderness, and would temporarily reduce opportunities for primitive and unconfined recreation, as discussed below. The untrammeled quality would be negatively impacted as all management actions would involve manipulation of natural ecological processes. Physical barriers would negatively impact the undeveloped quality while in place. Rotenone treatment, netting and placement of barriers would have temporary negative impacts on the natural quality through short-term effects on native fauna and/or flora.

Impacts on Affected Resource

Alternative A – No Action

Under this alternative, the presence of non-native pike would negatively impact the native fish community, which would impact the natural qualities of the Kenai Wilderness and reduce opportunities for primitive and unconfined recreation.

Alternative B – Netting and Containment

Under this Alternative, management actions involving netting and installation of barriers would negatively impact the untrammeled, undeveloped, and natural qualities of the Kenai Wilderness in perpetuity because these actions would have to be repeated periodically to achieve suppression of pike populations. Assuming the effectiveness of these treatments, the natural quality of the Kenai Wilderness within the MCW would be maintained by reducing impacts of pike predation on native fish populations. Management activities (i.e. gill netting), while being conducted, would temporarily reduce opportunities for primitive and unconfined recreation in the project area. If netting for pike occurred at the level needed for suppression, the native fish populations would be negatively impacted as a result of being caught in the nets as bycatch.

Alternative C – Rotenone

Under this Alternative, management action involving application of rotenone would have negative

impacts on the untrammeled and natural qualities of the Kenai Wilderness within the MCW. These impacts would be short-term if rotenone application is successful in eradication of pike throughout the MCW. Assuming effectiveness of this treatment, the natural quality of the Kenai Wilderness within the MCW would be restored and maintained by preventing impacts of pike predation on native fish populations. Management activities while being conducted would temporarily reduce opportunities for primitive and unconfined recreation in the project area but maintaining healthy native fish populations would provide for highly valued recreational fishing opportunities over time.

Alternative D – Integrated Pest Management

Under this Alternative, management actions involving application of rotenone, netting and installation of barriers would negatively impact the untrammeled, undeveloped, and natural qualities of the Kenai Wilderness. These impacts would be short-term if this integrated pest management approach is successful in eradication of pike throughout the MCW. Assuming the effectiveness of these treatments, the natural quality of the Kenai Wilderness within the MCW would be restored and maintained by preventing impacts of pike predation on native fish populations. Management activities while being conducted would temporarily reduce opportunities for primitive and unconfined recreation in the project area but maintaining healthy native fish populations would provide for highly valued recreational fishing opportunities over time.

<u>Socioeconomics</u>

Local and Regional Economies

Affected Environment

Description of Affected Environment for the Affected Resource

Multiple stakeholders in local and regional economies would be impacted by the continued presence of pike in the project area (ADF&G 2021b). Charter businesses fly recreational fishers to the project area for trout and salmon fishing opportunities year-round. These businesses may lose the current salmonid fishery for their clients to fish. Recreational fishers who access the watershed year-round and target pike would lose a fishing opportunity if pike were eradicated. However, recreational fishers who access the watershed year-round who target native rainbow trout and other salmonid species would benefit from increased populations of these species post-eradication.

Description of Environmental Trends and Planned Actions

Decline of native rainbow trout and other salmonid species in the project area resulting from pike could result in declines in business for these local companies, as well as tackle and processing facilities that may be impacted by declines in business as well. Pike in the project area have the possibility of moving to other watersheds in the upper Kenai Peninsula area and predating on salmonids and other native fish species. Salmon in this portion of the Kenai Peninsula are harvested by set netters and declines in salmon due to pike predation could result in minor

economic loss to these commercial fishers.

Impacts on Affected Resource

Alternative A – No Action

Continued presence of pike in the MCW would threaten the integrity and long-term viability of the fish community. Reductions in opportunity for both recreational and commercial fishers to catch native and economically important species would be reduced.

Alternative B – Netting and Containment

Gill nets are not species-specific and have the potential to impact all fish species of susceptible size. This will result in native fish species (e.g. trout and salmon) being caught. Any native sportfish caught in gill nets would result in loss of opportunity for recreational and commercial fishers and the businesses that serve them.
Containment barriers may not be specific to pike, and thus potentially negatively impact the migration native resident and anadromous species. Reduced native fish abundance in the system could result in reduced opportunity for recreational and commercial fishers and the businesses that serve them.

Alternative C – Rotenone

Rotenone alone would impact the entire fish community in the system, leaving very few fish of any species (native or invasive) post-treatment within the treatment area. This reduction in fish abundance would only be counteracted by immigration of native fish species from other neighboring waters and ocean-returning adult salmon if rotenone were used as a stand-alone management action. The process of natural recolonization of the treatment area could take many years and result in many years of lost opportunity for recreational fishers and the businesses that serve them.

Alternative D – Integrated Pest Management

Containment barriers may not be specific to pike, and thus potentially negatively impact the migration of salmonids into the system. Reduced native fish abundance in the system could result in reduced opportunity for recreational and commercial fishers and the businesses that serve them.
Rotenone alone would impact the entire fish community in the treatment area, likely removing all fish (native or invasive) post-treatment. This reduction in fish abundance would be counteracted by restocking of native salmonids in conjunction with native fish dispersal from nearby untreated water. Restocking with native fish species in 2022 is projected to more quickly return native rainbow trout and other salmonids to pre-treatment abundance by 2030 (Boersma 2020). Restocking would reduce the number of years that the native fishery was impacted and thus, the number of years that local fishers and the businesses that serve them would see impacts from the management action.

Monitoring

Pre-project implementation monitoring in 2019-2021 has included: a video weir at the mouth of Miller Creek to better understand native salmonid run timing, electrofishing surveys to describe the juvenile fish community in Miller Creek, fish distribution netting surveys in lentic waters and water quality monitoring. Monitoring for project efficacy will be scheduled depending on the alternative that is selected for implementation. No monitoring would be conducted under Alternative A. Alternative B would result in gill netting Vogel Lake, North Vogel Lake, and potentially other lakes in the watershed to confirm presence or absence of pike and an index of abundance of native fish species, potentially in perpetuity. Alternative C and D would result in more extensive monitoring post rotenone application including post-treatment success evaluation using gillnets, rotenone persistence, water quality/quantity, invertebrate sampling, and minnow trapping and would conclude in summer 2023. Monitoring of some of these parameters may be continued post-2023 contingent on funding availability. This suite of parameters being monitored would allow evaluation of treatment efficacy at multiple trophic levels.

Summary of Analysis

Alternative A – No Action

Taking no action to reduce abundance of pike in the MCW would be detrimental for many reasons. Native fish species (both resident and anadromous) would continue to face the threat of predation with some resident fish species likely becoming extirpated from the watershed. Pike left in the watershed could also expand to neighboring watersheds via natural movement and illegal introductions to other waterbodies on the Kenai Peninsula. This would greatly increase both the negative ecological impacts and economic costs of control. Recreational and commercial fishers would lose an opportunity to catch native fish species which would have negative economic impacts. The Wilderness qualities of the portion of the MCW within KNWR would have permanent and negative impacts from pike. Although some items analyzed above would not be impacted by the continued presence of pike, the potential ecological and economic consequences of no action are much greater than any of the other alternatives.

Alternative B – Netting and Containment

As described above, netting and containment would reduce the pike population in the MCW. However, this would require extensive labor that would need to be conducted on an annual basis. Native fish would be impacted negatively by the gillnets and inability to pass through waterways temporarily blocked for the duration of the netting activities. Waterbirds could potentially be impacted by a long-term netting effort. None of the other natural resources analyzed above would be significantly negatively impacted by the netting and containment. Recreational fishers in the MCW will be negatively impacted by loss of native fish species as bycatch in gillnets, and additional losses of native fish that were predated upon by pike not caught in gillnets. This

alternative would partially meet the purpose and need of the project by reducing the number of pike, but not fully meet the purpose and need of the project, as eradication would not be achieved and no restocking of native fish for restoration to account for native fish bycatch in gillnets would occur. Finally, under this Alternative, the netting and containment barriers would impact qualities of the Refuge Wilderness, as they would have to be done periodically and in perpetuity to achieve suppression of the pike.

Alternative C – Rotenone

As described above, the purpose and needs of the project would be partially met under Alternative C. Rotenone would eradicate pike from the area. Water quality and soils may be minimally and temporarily impacted by the application of rotenone but would return to normal as the rotenone degraded. Native fish currently in the application area would be negatively impacted by Rotenone until natural recolonization of the waterbody from native fish occurred. No significant impacts to other natural resources would be anticipated. Non-commercial anglers and angling-related businesses would lose a fishing opportunity in the area, and natural recolonization of native species would be a long process. The purpose and needs would be partially met under this alternative. While eradication would be achieved, restoration of the native fish community would be less certain, as multiple extraneous ecological factors could influence natural recolonization. Finally, under this Alternative, the impacts of the management actions on Wilderness would be short-term and subside as native fish naturally recolonized the watershed.

Alternative D – Integrated Pest Management

As described above, the integrated pest management alternative would both eradicate pike and help restore the native fish community in the MCW. Rotenone would eradicate pike and restocking of native fish would hasten the recovery trajectory of the native fish community. Water quality and soils may be minimally and temporarily impacted by the application of Rotenone but would return to normal as the Rotenone degraded. No significant impacts to other natural resources would be anticipated. In conclusion, the purpose and needs for the project along with compliance with regulations directing management of the MCW (see Appendix A for regulations) would most fully be achieved under the integrated pest management alternative. Finally, under this Alternative, the impacts of the management actions on Wilderness would be short-term and subside most quickly as native fish were both stocked and naturally recolonized the watershed.

List of Sources, Agencies and Persons Consulted

Native Organizations
Alaska Regional Office - Indian Affairs
Christopher Monfor, Salamatof Native Association, Inc.
Crystal Collier, Seldovia Village Tribe
Frank Standifer III, Native Village of Tyonek (IRA)
Gwen Kvasnikoff, Native Village of Nanwalek
Kimberly Kashevarof, Seldovia Native Association, Inc.

Leo Barlow, Tyonek Native Corporation
Lloyd Stiassny, Port Graham Corporation
Patrick Norman, Native Village of Port Graham
Penny Carty, Village of Salamatof
Richard Encelewski, Ninilchik Village and Ninilchik Native Association
Sophie Minich, Cook Inlet Region, Incorporated
Susan Magee, State ANILCA Program Coordinator
Wayne Wilson, Kenaitze Indian Tribe (IRA)

Local Organizations/Media

11 News - KTVA
Alaska Dispatch
Alaska Outdoor Journal (Gary Barnes)
Anchorage Daily News
AP Anchorage
Homer News
Homer Tribune
Juneau Empire
KBBI
KDLL
KRSA
KTUU
Kwave FM
News Miner
Peninsula Clarion
Radio Kenai
Seward Journal

Local Sportfish/Guiding Associations

Kenai River Professional Guide Association
Kenai River Sportfishing Association (Ben Mohr, Executive Director)

Local Conservation Organizations

Cook Inletkeeper (Bob Shavelson, Advocacy Director)
Kenai Peninsula Cooperative Invasive Species Management Area (Katherine Schake)
The Nature Conservancy
Trout Unlimited Kenai Peninsula Chapter (Maggie Harrings, President)

Local Commercial Fishing Organizations

Cook Inlet Aquaculture Association
Cook Inlet Aquaculture Association - Lisa Ka'aihue
Kenai Peninsula Fishermen's Association
Upper Cook Inlet Drift Association

Private Individuals

Removed for privacy

Kenai Borough Mayor

Charlie Pierce

Kenai Borough Land Manager

Marcus Mueller

Kenai Borough Assembly Members

Bill Elam
Brent Hibbert
Brent Johnson
Jesse Bjorkman
Kenn Carpenter
Lane Chesley
Richard Derkevorkian
Tyson Cox
Willy Dunne

Private Landowners along Miller Creek

Removed for privacy

Air Charters

Alaska West Air
Rust's Flying Service

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Matt Bowser, US Fish and Wildlife Service
Mark Laker, US Fish and Wildlife Service
Parker Bradley, Alaska Department of Fish and Game
Rob Massengill, Alaska Department of Fish and Game
Steve Miller, US Fish and Wildlife Service

State Coordination

Interagency Project Coordination Meetings held to date:

- April 2020
- November 2020 (2 meetings)
- January 2021
- February 2021 (2 meetings)

Tribal Consultation

See Appendix D-1 for initial letters sent for ANCSA consultation, and Appendix D-2 for tribal consultation.

Public Outreach

An initial scoping period was opened in January 2021 to gather input from the public to inform the drafting of this environmental assessment. A radio interview was conducted in January 2021 with KSRM to announce the initial comment period and describe the project and goals in greater detail. See Appendix E-1 for Initial Scoping Notice and Appendix E-2 for the News Article. See Appendix F-1 for public comments on initial scoping notice.

Determination

This section will be filled out upon completion of the public comment period and at the time of finalization of the Environmental Assessment.

- ☐ The Service's action will not result in a significant impact on the quality of the human environment. See the attached **"Finding of No Significant Impact".**
- ☐ The Service's action **may significantly affect** the quality of the human environment and the Service will prepare an Environmental Impact Statement.

Signatures

Submitted By:

Project Leader Signature:

Date:

Concurrence:

Refuge Supervisor Signature:

Date:

Approved:

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Appendix A – Laws, Orders, and Policies

This appendix describes federal laws, executive orders, and Service policies that address or affect invasive species management. The appendix also describes legal authorities of the ADF&G. The Service has authority to work with partners to manage invasive species under the National Invasive Species Act, the National Wildlife Refuge System Administration Act, the National Wildlife Refuge System Improvement Act (which amended the National Wildlife Refuge System Administration Act), the Endangered Species Act, and Executive Orders 13112 and 13751. The Service's Integrated Pest Management Policy, the Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy, the KNWR Comprehensive Conservation Plan, and other National Wildlife Refuge System policies direct how invasive species should be managed. The Fish and Wildlife Coordination Act is also an important federal legislation that also impacts

invasive species management. The aforementioned laws, Executive Orders, and policies are discussed here in detail. Additional laws, policies, and guidance that apply to invasive species or the potential management actions are discussed in the Affected Environment Section of this document.

The National Invasive Species Act (NISA) was passed in 1996 amending the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA). The 1990 NANCPA established the Aquatic Nuisance Species (ANS) Task Force to coordinate nationwide ANS activities. The ANS Task Force is co-chaired by the Service's Assistant Director for Fisheries and Aquatic Conservation and the Undersecretary of Commerce/NOAA. The NISA furthered the ANS activities by calling for ballast water regulations, the development of State aquatic nuisance species management plans and regional panels to combat the spread of ANS, and additional ANS outreach and research. The NANPCA encourages the use of environmentally sound methods for invasive species management. In the NANPCA, environmentally sound is defined as methods, efforts, actions or programs to prevent introductions or control infestations of aquatic nuisance species that minimize adverse impacts to the structure and function of an ecosystem and adverse effects on non-target organisms and ecosystems and emphasize integrated pest management techniques and nonchemical measures.

The National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge System Improvement Act, establishes a unifying mission for the Refuge System, a process for determining compatible uses of refuges, and a requirement for preparing comprehensive conservation plans. The Act states, first and foremost, that the mission of the National Wildlife Refuge System be focused singularly on wildlife conservation. The Act provides authority for regulations and policy that are directly related to invasive species management. For example, the Act provides authority for 50 CFR 27.52 which identifies prohibited acts in the National Wildlife Refuge System, including the introduction of plants and animals. The regulations stipulate that "Plants and animals or their parts taken elsewhere shall not be introduced, liberated, or placed on any national wildlife refuge except as authorized." The Act also provides authority for the Services BIDEH policy discussed below. The Endangered Species Act (ESA) provides for conserving endangered and threatened species of plants and animals. The ESA also requires that federal agencies consult with the USFWS and NMFS to ensure that any actions that they authorize, fund, or carry out are not likely to jeopardize the continued survival of a listed species or result in the adverse modification or destruction of its critical habitat. The goal of the ESA is the recovery of endangered and threatened species and the ecosystems on which they depend. Recovery is the process by which the decline of an endangered or threatened species is halted or reversed, and threats removed or reduced. In many instances threats to an ESA listed species may come from invasive species.

They may either directly harm the species by causing mortality or may threaten a species by modifying or destroying the habitat or food source on which that species depends. A variety of methods and procedures are used to recover listed species, such as reduction of threats (including invasive species), protective measures to prevent extinction or further decline, consultation to avoid adverse impacts of Federal activities, habitat acquisition and restoration, and other on-the ground activities for managing and monitoring endangered and threatened species. It is not likely that pike are currently impacting listed species or their habitats in Alaska, but impacts are possible in the

foreseeable future. KNWR Staff conducted Section 7 paperwork in winter/spring 2021 to further address lack of foreseeable impacts to listed species or their habitats.

Executive Order 13112, signed in 1999 by President Clinton, directed Federal agencies to conduct, as appropriate, activities related to invasive species prevention; early detection, rapid response, and control; monitoring; restoration, research; and education. This EO also directed Federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Executive Order 13751, signed in December of 2016, amended EO 13112. Executive Order 13751 directs continued coordinated Federal prevention and control efforts related to invasive species. This order maintains the National Invasive Species Council (Council); expands the membership of the Council; clarifies the operations of the Council; incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into Federal efforts to address invasive species; and strengthens coordinated, cost-efficient Federal action.

The Service's IPM Policy, 569 FW 1, establishes strategies, procedures, and responsibilities for pest management activities on and off Service lands. This IPM Policy directs the Service to manage pest species when the following conditions are met: a) the pest causes a threat to human or wildlife health or private property; action thresholds for the pest are exceeded; or Federal, State, or local governments designate the pest as noxious; b) the pest is detrimental to site management goals and objectives; and c) the planned pest management actions will not interfere with achieving site management goals and objectives (USFWS 2010). Pike meet the definition of a pest and have met each of the aforementioned conditions.

The Service's Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy, 601 FW 3, provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on Refuges and associated ecosystems. Further, it provides Refuge managers with an evaluation process to analyze their Refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate and in concert with the mission of the Refuge system and individual Refuge purposes, restore lost or severely degraded components. The BIDEH Policy also directs Refuges to prevent the introduction of invasive species, detect and control populations of invasive species, and provide for restoration of native species and habitat conditions in invaded ecosystems.

The Fish and Wildlife Conservation Act encourages federal agencies to conserve and promote the conservation of non-game fish and wildlife species and their habitats. Native non-game species can be affected by pike.

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 pike from MCW would serve to: protect and restore native wild fish populations and aquatic habitat, provide for the continuation of existing sport fishery in the lakes, reduce the likelihood that pike expand elsewhere on the Kenai Peninsula, and support ADF&G' s long-term goal of eradicating pike from the entire Kenai Peninsula. It is the ADF&G's legal responsibility to remove the threat imposed by pike when feasible.

The ADF&G Division of Sport Fish has developed planning documents to guide the Department's actions regarding 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 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 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 pike planning team has identified Vogel Lake as the priority for the Kenai Peninsula.

Cultural Resources

Kenai NWR staff completed Section 106 clearance in winter/spring 2021 to ensure compliance with the following regulations pertaining to cultural resources:

- American Indian Religious Freedom Act, as amended, 42 U.S.C. 1996 - 1996a; 43 CFR Part 7
- Antiquities Act of 1906, 16 U.S.C. 431-433; 43 CFR Part 3
- Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470mm; 18 CFR Part 1312; 32 CFR Part 229; 36 CFR Part 296; 43 CFR Part 7
- National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810
- Paleontological Resources Protection Act, 16 U.S.C. 470aaa-470aaa-11
- Native American Graves Protection and Repatriation Act, 25 U.S.C. 3001-3013; 43 CFR Part 10
- Executive Order 11593 – Protection and Enhancement of the Cultural Environment, 36 Fed. Reg. 8921 (1971)
- Executive Order 13007 – Indian Sacred Sites, 61 Fed. Reg. 26771 (1996)

Natural Resources

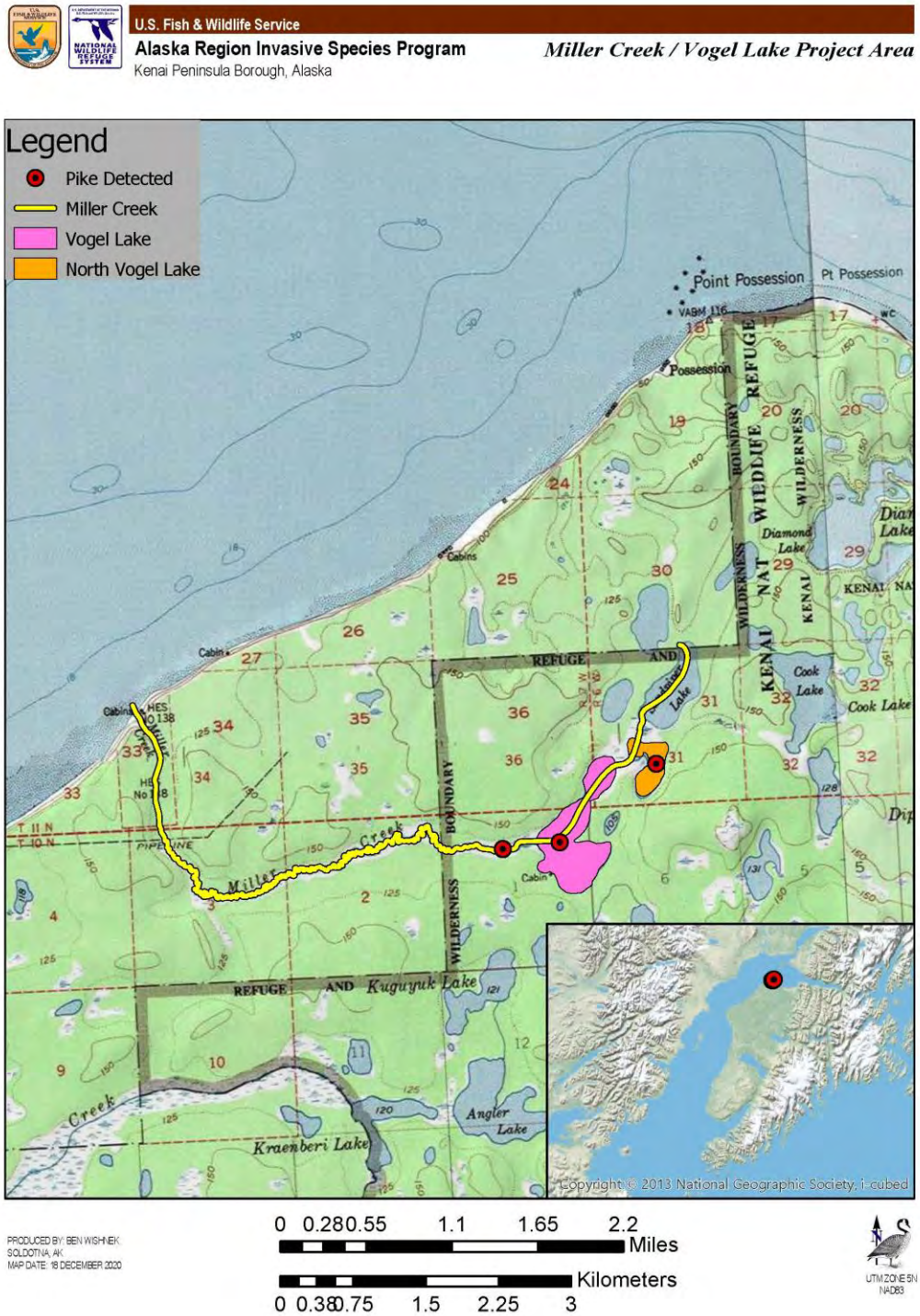
Kenai NWR staff completed a Minimum Requirements Analysis (MRA) using the Minimum Requirements Decision Guide (MRDG) in winter/spring 2021 to ensure compliance with the

following regulations pertaining to wilderness:

- Wilderness Act, 16 U.S.C. 1131 et seq.

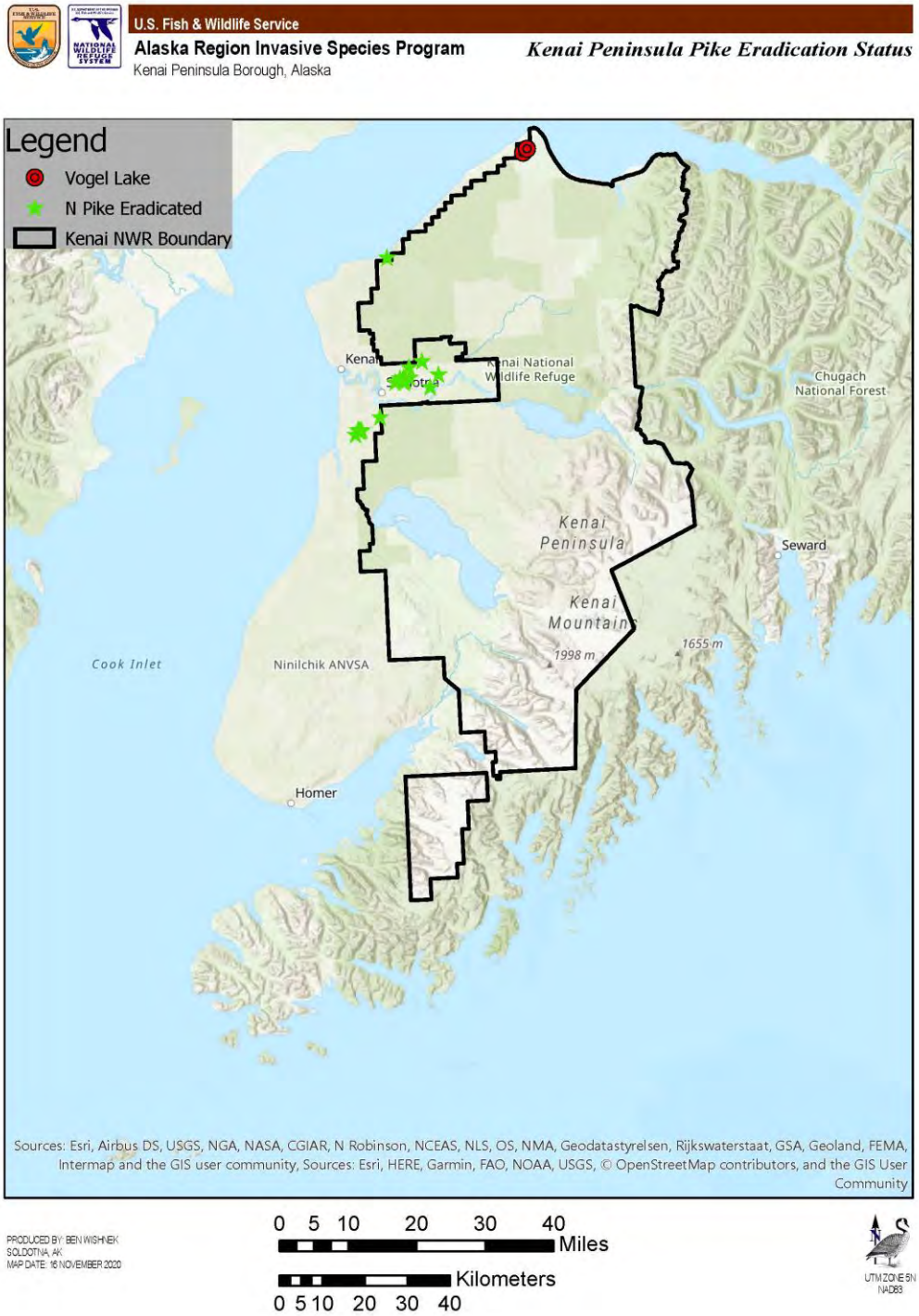
Appendix B – Project Maps

B-1: Project Map

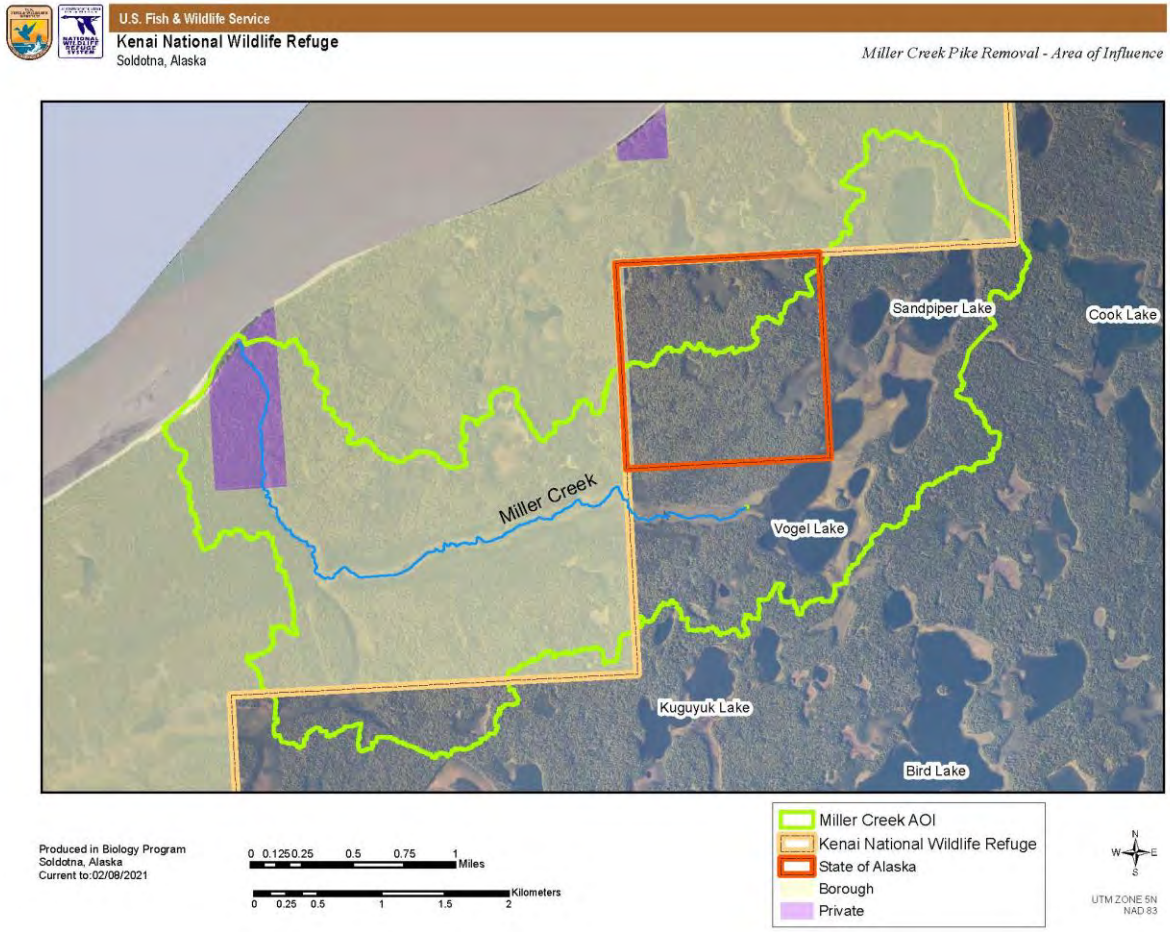


B-2: Pike Native vs. Invasive Status in Alaska

B-3: Pike Eradicated and Infested Waters on the Kenai Peninsula



B-4: Miller Creek Watershed Map



Appendix C – Rotenone Label and Safety Data Sheet

C-1: Rotenone 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 hand-held 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), handler re-entering 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:

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

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

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

Z = grams of granular potassium permanganate per minute, Y= ppm of desired permanganate concentration, F1 = stream flow (ft^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.

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PCO 17-034

May, 2017
Schaumburg, IL

C-2: Rotenone Safety Data Sheet

Safety Data Sheet

Section 1: Identification

Product identifier

Product Name • **CFT Legumine Fish Toxicant**

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

Product Description • Orange viscous liquid.

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

Recommended use • Piscicide.

Restrictions on use •

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

Details of the supplier of the safety data sheet

Manufacturer • Central Garden & Pet Company

1501 E. Woodfield Road, Suite 200W
Schaumburg, IL 60173
United States

www.central.com

Emergency telephone number

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

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

Manufacturer • 1-800-248-7763

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

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

Label elements

OSHA HCS 2012

DANGER

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

Precautionary statements

Prevention •
Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Do not breathe dust, fume, gas, mist, vapours and/or spray.
In case of inadequate ventilation wear respiratory protection.
Keep away from flames and hot surfaces. - No smoking.
Wear respiratory protection.

Response •
IF ON SKIN: Wash with plenty of soap and water.
Specific treatment, see supplemental first aid information.
If skin irritation occurs: Get medical advice/attention.
Take off contaminated clothing and wash before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
Do NOT induce vomiting.
If eye irritation persists: Get medical advice/attention.
In case of fire: Use appropriate media Water fog, foam, dry chemical or carbon dioxide (CO_2). 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

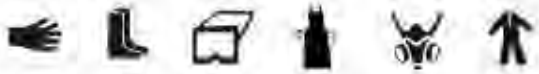
Exposure Limits Supplemental
ACGIH
- Rotenone (83-79-4): TLV Basis = Critical Effects: (CNS impairment; eye and upper respiratory tract irritation)

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	UN2902	Pesticides, liquid, toxic, n.o.s. (Rotenone)	6.1	II	Marine Pollutant
IMO/IMDG	UN2902	Pesticides, liquid, toxic, n.o.s. (Rotenone)	6.1	II	Marine Pollutant
IATA/ICAO	UN2902	Pesticides, liquid, toxic, n.o.s. (Rotenone)	6.1	II	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

The calculated 1-hour acute toxicity for inhalation LC50 = 0.876 mg/L.

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	• 4/January/2018
Last Revision Date	• 15/May/2017
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.
Revision Statement:	Updated Section 1

Appendix D – Tribal Consultations

D-1: Initial ANCSA Consultation Letter

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021

IN REPLY REFER TO:
20029sam

November 23, 2020

REDACTED

Subject: Public Scoping Period and Environmental Assessment Development for Northern Pike Control and/or Eradicaiton within the Miller Creek Drainage (Including Vogel Lake), Kenai National Wildlife Refuge, Alaska

Dear Alaska Native Corporation Leader:

The U.S. Fish and Wildlife Service (Service), in accordance with the National Environmental Policy Act (NEPA), is preparing an Environmental Assessment (EA) of the Service's management strategy for northern pike (*Esox lucius*) in the Miller Creek Watershed (MCW), including the waters of Vogel Lake, on the Kenai Peninsula. Northern pike is an invasive fish species in Alaska south of the Alaska range that predates upon many salmon and other native fish species. Much work has been done to eradicate northern pike from the Kenai Peninsula by the Alaska Department of Fish and Game and partners to date. This population of northern pike in the MCW is the last remaining population of this invasive species known on the Kenai Peninsula. Under NEPA, one of the first steps a federal agency should take when developing an EA such as this is soliciting input from interested parties regarding the scope of the EA. By way of this letter, the Service is seeking your input to help identify the important impacts and issues to consider when evaluating the suite of alternatives found in the draft EA.

The alternative ultimately selected for implementation will comply with the Service's Integrated Pest Management (IPM) Policy and is not intended to replace prevention as the first line of defense against invasive species. Any selected action will use the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment. Various methods may be used alone or in conjunction with each other depending on management goals and public input. The Service and our partners have achieved eradication of northern pike in the past by applying IPM strategies to infested watersheds. IPM strategies have included physical, mechanical and chemical components. Some of the issues that will be analyzed in depth include the alternative's effects on water quality, fish and wildlife, subsistence, human health, recreation, and cultural resources. Other social, economic, and environmental effects of the action alternatives will also be analyzed. The ultimate goal of the northern pike management activities is to prevent negative impacts to native fish species, aquatic ecosystems, recreational activities, commercial activities, property values, and subsistence uses throughout the Kenai

Peninsula. The draft EA will analyze the Service's overall management strategy employed for the northern pike population in the MCW.

The Service would welcome any comments you may have, and is offering an opportunity to schedule government to government consultation with us by phone or in-person. Government to government consultation will continue to be available throughout this process. Your input and guidance are important, and we are committed to creating opportunities for meaningful and respectful consultation between ANCSA Corporation leadership and Service officials.

To set up a time to consult, please contact Andy Loranger, Refuge Manager at Kenai National Wildlife Refuge, at REDACTED andy_loranger@fws.gov as soon as possible. If you have questions regarding government to government consultation, please contact Crystal Leonetti, Alaska Native Affairs Specialist, at REDACTED crystal_leonetti@fws.gov.

Sincerely,

REDACTED

Andy Loranger
Refuge Manager
Kenai National Wildlife Refuge

D-2: Initial Tribal Consultation Letter

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021

IN REPLY REFER TO:
20030sam

November 23, 2020

REDACTED

Subject: Public Scoping Period and Environmental Assessment Development for Northern Pike Control and/or Eradicaiton within the Miller Creek Drainage (Including Vogel Lake), Kenai National Wildlife Refuge, Alaska

Dear Tribal Leader:

The U.S. Fish and Wildlife Service (Service), in accordance with the National Environmental Policy Act (NEPA), is preparing an Environmental Assessment (EA) of the Service's management strategy for northern pike (*Esox lucius*) in the Miller Creek Watershed (MCW), including the waters of Vogel Lake, on the Kenai Peninsula. Northern pike is an invasive fish species in Alaska south of the Alaska range that predates upon many salmon and other native fish species. Much work has been done to eradicate northern pike from the Kenai Peninsula by the Alaska Department of Fish and Game and partners to date. This population of northern pike in the MCW is the last remaining population of this invasive species known on the Kenai Peninsula. Under NEPA, one of the first steps a federal agency should take when developing an EA such as this is soliciting input from interested parties regarding the scope of the EA. By way of this letter, the Service is seeking your input to help identify the important impacts and issues to consider when evaluating the suite of alternatives found in the draft EA.

The alternative ultimately selected for implementation will comply with the Service's Integrated Pest Management (IPM) Policy and is not intended to replace prevention as the first line of defense against invasive species. Any selected action will use the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment. Various methods may be used alone or in conjunction with each other depending on management goals and public input. The Service and our partners have achieved eradication of northern pike in the past by applying IPM strategies to infested watersheds. IPM strategies have included physical, mechanical and chemical components. Some of the issues that will be analyzed in depth include the alternative's effects on water quality, fish and wildlife, subsistence, human health, recreation, and cultural resources. Other social, economic, and environmental effects of the action alternatives will also be analyzed. The ultimate goal of the northern pike management activities is to prevent negative impacts to native fish species, aquatic ecosystems, recreational activities, commercial activities, property values, and subsistence uses throughout the Kenai

Peninsula. The draft EA will analyze the Service's overall management strategy employed for the northern pike population in the MCW.

The Service would welcome any comments you may have, and is offering an opportunity to schedule government to government consultation with us by phone or in-person. Government to government consultation will continue to be available throughout this process. Your input and guidance are important, and we are committed to creating opportunities for meaningful and respectful consultation between Tribal leadership and Service officials.

To set up a time to consult, please contact Andy Loranger, Refuge Manager at Kenai National Wildlife Refuge, at REDACTED andy_loranger@fws.gov as soon as possible. If you have questions regarding government to government consultation, please contact Crystal Leonetti, Alaska Native Affairs Specialist, at REDACTED crystal_leonetti@fws.gov.

Sincerely,

REDACTED

Andy Loranger
Refuge Manager
Kenai National Wildlife Refuge

Appendix E – Initial Project Scoping

E-1: Initial Project Scoping Notice

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021

January 4, 2021

PUBLIC NOTICE

SUBJECT: Management of Invasive Pike in the Miller Creek Watershed

The U.S. Fish and Wildlife Service is seeking input on management strategies for Northern Pike (*Esox lucius*) in the Miller Creek Watershed (MCW) on the Kenai Peninsula. Northern Pike is an invasive fish species in Alaska south of the Alaska Range that predates upon many salmon and other native fish species. Much work has been done to eradicate Northern Pike from the Kenai Peninsula by the Alaska Department of Fish and Game (ADF&G) and partners to date. This population of Northern Pike in the MCW is the last remaining population of this invasive species known on the Kenai Peninsula. A substantial portion of the MCW lies within the Kenai National Wildlife Refuge (see attached map).

By way of this letter, the Service is seeking your input as part of identifying the important issues related to Northern Pike Management in the MCW. We intend to use your comments to identify the range of alternatives, impacts and, important issues to consider when evaluating the suite of actions that could possibly be implemented to manage Northern Pike in the MCW.

The ADF&G and partners, including the Service, have achieved eradication of Northern Pike in the past by applying Integrated Pest Management (IPM) strategies to infested watersheds. IPM strategies have included physical, mechanical and chemical components, such as the use of gillnets to catch and remove as many pike as possible, installation of temporary barriers to prevent pike from spreading to vulnerable waters, and using rotenone (a fish pesticide) to eradicate entire invasive pike populations. Some of the issues that will be analyzed in depth include the action alternative's effects on water quality, fish and wildlife, subsistence, human health, recreation, wilderness and cultural resources. Other social, economic, and environmental effects of the action alternatives will also be analyzed. The ultimate goal of the Northern Pike management activities is to prevent negative impacts to native fish species, aquatic ecosystems, recreational activities, commercial activities, property values, and subsistence uses throughout the Kenai Peninsula.

Ultimately, the actions selected for implementation will comply with the Service's IPM Policy and is not intended to replace prevention as the first line of defense against invasive species. The selected action will use the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment. Various methods may be used alone or in conjunction with each other depending on management goals and public input.

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021

Those wishing to provide input are encouraged to do so by January 19, 2021 by any one of the following methods:

- U.S. Postal Mail – Comments should be sent to:
  - Ben Wishnek, US Fish and Wildlife Service, Kenai National Wildlife Refuge, P.O. Box 2139 Soldotna, Alaska 99669
- Electronic Mail –
  - benyamin_wishnek@fws.gov

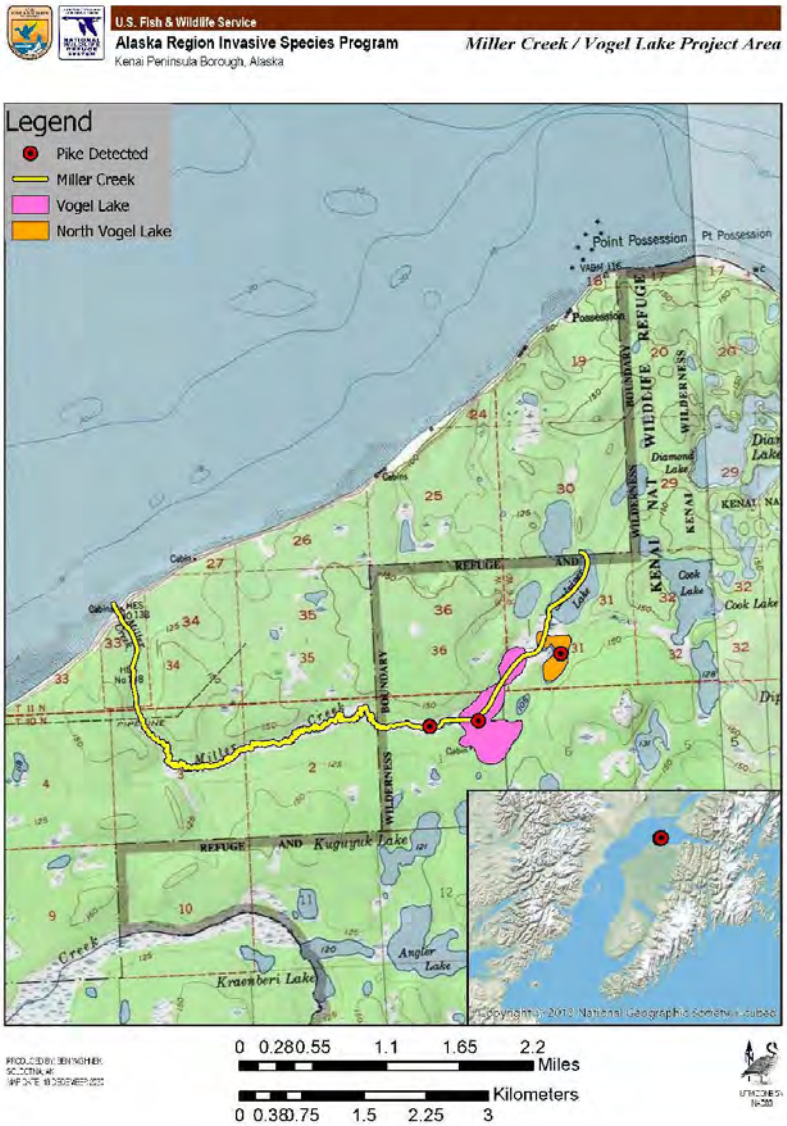
Please also be advised that the Service and its partners will be hosting a virtual public meeting early in 2021 to provide further information on this project and to solicit additional input from the public. Details on this meeting will be provided in the coming weeks.

For further information, please contact Mr. Steve Miller at 907-260-2805 or Stephen_a_miller@fws.gov. General background and information on invasive northern pike in Alaska can be found at: Invasive Northern Pike, Alaska Department of Fish and Game. We look forward to hearing from you and to your participation in our planning efforts. Thank you.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service. For more information on our work and the people who make it happen, visit www.fws.gov. Connect with our Facebook page at www.facebook.com/usfws, follow our tweets at www.twitter.com/usfwshq, watch our YouTube Channel at http://www.youtube.com/usfws and download photos from our Flickr page at http://www.flickr.com/photos/usfwshq.

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021



E-2: Initial Scoping News Article

Management Of Invasive Pike In The Miller Creek Watershed On Kenai Peninsula

radiokenai.net/management-of-invasive-pike-in-the-miller-creek-watershed-on-kenai-peninsula/

January 7, 2021

Invasive Northern Pike in the Miller Creek Watershed on the Kenai Peninsula has become a problem as of late.

The U.S. Fish and Wildlife Service is seeking public input on management strategies to manage northern pike in the Miller Creek Watershed. Ben Wishnek with the US Fish and Wildlife Service for the Kenai National Wildlife Refuge spoke to KSRM, "*We are considering*

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taking steps this summer and fall to eradicate the invasive Northern Pike in the Miller Creek Watershed to help preserve the native fish community there. We're seeking the public's ideas on the issues and alternatives that we should consider while we're developing our management strategies for the project."

Wishnek says the pike are aggressive predators that prey on native fish species like rainbow trout and salmon, "*What we want to ensure is that the area has a healthy native rainbow trout and salmon population to benefit the ecology of the area as well as ensure continued fishing opportunities for the public. Something that's of note is that the Miller Creek Watershed is the last confirmed infestation of Northern Pike on the Kenai Peninsula. Once we're able to take a management action on these, we'll have that invasive species gone from the Kenai Peninsula. That's following a lot of work that's been done by the Alaska Department of Fish & Game over the last number of years.*"

The ultimate goal of the northern pike management activities is to prevent negative impacts to native fish species, aquatic ecosystems, recreational activities, commercial activities, property values and subsistence uses throughout the Kenai Peninsula.

Wishnek says, "*In order to achieve that goal, there are a bunch of different methods that we could potentially use. We have a bunch of different tools in our toolbox to eradicate the invasive northern pike and ultimately achieve our goal of restoring the native fish. That includes potentially using gill nets to remove the pike or we could put temporary barriers in strategic places in the system to keep the pike from spreading. We could use a commonly used fish pesticide. We could restock the area with native fish. There are a bunch of different tools. We could use those individually or in combination. What we're looking for is the public's input. Once we have the public's input, we're going to draft what we think we're going to be doing moving forward, then we'll have another opportunity in March for the public to comment. Once we have everything lined up, there will be a document they can read with all the different possibilities. There will be a second comment period open at that point. This is part of it, being able to include the public's comments and make sure that they have a say in how we manage their resources.*"

Those wishing to provide input are encouraged to do so by January 19, 2021 by any one of the following methods:

- **U.S. Postal Mail** – Comments should be sent to:
  Ben Wishnek, US Fish and Wildlife Service, Kenai National Wildlife Refuge, P.O. Box 2139 Soldotna, Alaska 99669
- **Electronic Mail** –

News Director -
Read All Posts By Anthony Moore

2/2

Appendix F – Initial Project Scoping Responses

F-1: Public Comments on Initial Scoping Notice

Comment 1

1/8/2021 Mail - Wishnek, Benyamin K - Outlook

[EXTERNAL] Miller Creek Pike

REDACTED

Thu 1/7/2021 9:09 PM

To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

I'm for the removal of these Northern Pike.
Is the rumor that these fish came from another watershed in the Cook Inlet correct?

https://outlook.office365.com/mail/inbox/id/AAQkADBhYzk1NWNjLWNlNDEtNDkwNy05YTRiLTlhNjdkZDYxZjBlMwAQAILd7mQbR%2FNLu953ks32PV... 1/1

Re: [EXTERNAL] Miller Creek Pike

Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Fri 1/15/2021 12:48 PM
To: REDACTED

Hi [redacted],

Your comments have been received. Thank you for taking the time to respond to our request for comments. It is a good possibility that the fish came from another watershed in the Cook Inlet, and are still uncertain about where they came from.

Best,
Ben

~~~~~~

Ben Wishnek, Fish and Wildlife Biologist, AWB®
U.S. Fish and Wildlife Service
Alaska Region Invasive Species Program
PO Box 2139
33398 Ski Hill Road
Soldotna, Alaska 99669

https://www.fws.gov/alaska/pages/invasive-species

Like and follow us on Facebook!

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect."
-Chief Seattle

From: REDACTED
Sent: Thursday, January 7, 2021 9:08 PM
To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Subject: [EXTERNAL] Miller Creek Pike

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

I'm for the removal of these Northern Pike.
Is the rumor that these fish came from another watershed in the Cook Inlet correct?
~~~~~~

Comment 2

[EXTERNAL] Pike Project

REDACTED

Mon 1/11/2021 12:09 PM

To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

My first comment would be to remind you to focus on the ultimate goal of the northern pike management activities. Specifically this is to prevent negative impacts to native fish species aquatic ecosystems and recreational activities.

I want to remind those making these decisions that just because we have identified a problem, northern pike, doesn't mean that we have to do everything possible to exterminate it. Perhaps a viable solution would be to monitor the situation and see how it is impacting the native fish species, aquatic ecosystems and recreational activities.

It has been my experience that on the Kenai Peninsula anytime pike have been identified in a watershed, almost anything has been justified in the name of eradicating them. This has led to some decisions that I think have had negative impacts on native fish species.

I was involved with the Alaska Department of Fish and Game in the later stages of the pike eradication program for Soldotna Creek. One thing that I observed was that the entire native nursery population in Soldotna Creek was poisoned in an effort to exterminate the pike. This did not yield a single pike being killed but probably led to the demise of hundreds of thousands of juvenile salmon.

I packrafted Soldotna Creek with then mayor Pete Sprague a week before the rotenone was applied. We did not see a single pike in the entire trip down from Sevena Lake (where we parked on Northern Pike Boulevard) but we did see uncounted numbers of salmon smolt and spawning Lamprey eels. I wonder if the Rotenone effort was similar to some campaigns during the Vietnam war where we were told that we had to destroy a village in order to save it.

While we did achieve pike eradication of the Soldotna Creek drainage I have to wonder if the benefits were worth the costs. Time will tell whether those ever become productive recreational fisheries again, but so far it is taking an awfully long time for Daniels and Stormy Lake to repopulate with native species. We'll see how long it takes for the Mackey, Derks, Union, or Sevena Lakes to become good sport fisheries.

We also have to remember that the eradication is very fragile. All it takes is one landowner importing pike or muskie into his apparently landlocked lake to start the process all over again. One float ping plane pilot can easily fly to someplace within range that has native pike in Alaska and transport them back.

While I was on the project it was learned that muskie had been introduced into a lake on the Kenai Peninsula. There was absolutely no enforcement of the prohibition against this nor was there any indication that any penalty would be paid for this action.

It takes an awful lot of time and effort to eradicate pike but in literally one day somebody can

undo all that effort. I think that should be considered in the management plan.
I know that Soldotna Creek has since returned to being a valuable nursery stream. In fact I was able to help with the effort to restock those five lakes with rainbow trout smolt from Soldotna Creek. There were indeed many juvenile salmon in Soldotna Creek during that minnow trapping. I just wonder if the long-term benefits were worth the cost.
My recommendation would be to monitor the situation in the Miller Creek watershed to see whether or not the pike are increasing or decreasing and what the effects on the ecosystem in the Miller Creek drainage are. It would be prudent to have baseline data on the native fish populations in the drainage before we embark on any programs to eradicate the pike, especially if we are considering poisoning the entire drainage. It could well be that leaving the situation alone may produce the best results in terms of the goals of the program.
Pike had been identified in Soldotna Creek at least a decade prior to the eradication effort. Pike have been identified in the Moose River drainage for many decades. If they were such a dire threat to our ecosystems, I would expect that would have manifested by now.
Thank you, REDACTED

Re: [EXTERNAL] Pike Project

Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Fri 1/15/2021 12:43 PM
To: REDACTED

Hi [redacted],

Your comments have been received and will be considered as we move forward in the planning process. Thank you for taking the time to provide detailed information.

Best,
Ben

~~~~~~

Ben Wishnek, Fish and Wildlife Biologist, AWB®
U.S. Fish and Wildlife Service
Alaska Region Invasive Species Program
PO Box 2139
33398 Ski Hill Road
Soldotna, Alaska 99669

https://www.fws.gov/alaska/pages/invasive-species

Like and follow us on Facebook!

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect."
-Chief Seattle

From: REDACTED
Sent: Monday, January 11, 2021 12:09 PM
To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Subject: [EXTERNAL] Pike Project

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

My first comment would be to remind you to focus on the ultimate goal of the northern pike management activities. Specifically this is to prevent negative impacts to native fish species aquatic ecosystems and recreational activities.
I want to remind those making these decisions that just because we have identified a problem, northern pike, doesn't mean that we have to do everything possible to exterminate it. Perhaps a viable solution would be to monitor the situation and see how it is impacting the native fish species, aquatic ecosystems and recreational activities.
~~~~~~

It has been my experience that on the Kenai Peninsula anytime pike have been identified in a watershed, almost anything has been justified in the name of eradicating them. This has led to some decisions that I think have had negative impacts on native fish species.

I was involved with the Alaska Department of Fish and Game in the later stages of the pike eradication program for Soldotna Creek. One thing that I observed was that the entire native nursery population in Soldotna Creek was poisoned in an effort to exterminate the pike. This did not yield a single pike being killed but probably led to the demise of hundreds of thousands of juvenile salmon.

I packrafted Soldotna Creek with then mayor Pete Sprague a week before the rotenone was applied. We did not see a single pike in the entire trip down from Sevena Lake (where we parked on Northern Pike Boulevard) but we did see uncounted numbers of salmon smolt and spawning Lamprey eels. I wonder if the Rotenone effort was similar to some campaigns during the Vietnam war where we were told that we had to destroy a village in order to save it.

While we did achieve pike eradication of the Soldotna Creek drainage I have to wonder if the benefits were worth the costs. Time will tell whether those ever become productive recreational fisheries again, but so far it is taking an awfully long time for Daniels and Stormy Lake to repopulate with native species. We'll see how long it takes for the Mackey, Derks, Union, or Sevena Lakes to become good sport fisheries.

We also have to remember that the eradication is very fragile. All it takes is one landowner importing pike or muskie into his apparently landlocked lake to start the process all over again. One float ping plane pilot can easily fly to someplace within range that has native pike in Alaska and transport them back.

While I was on the project it was learned that muskie had been introduced into a lake on the Kenai Peninsula. There was absolutely no enforcement of the prohibition against this nor was there any indication that any penalty would be paid for this action.

It takes an awful lot of time and effort to eradicate pike but in literally one day somebody can undo all that effort. I think that should be considered in the management plan.

I know that Soldotna Creek has since returned to being a valuable nursery stream. In fact I was able to help with the effort to restock those five lakes with rainbow trout smolt from Soldotna Creek. There were indeed many juvenile salmon in Soldotna Creek during that minnow trapping. I just wonder if the long-term benefits were worth the cost.

My recommendation would be to monitor the situation in the Miller Creek watershed to see whether or not the pike are increasing or decreasing and what the effects on the ecosystem in the Miller Creek drainage are. It would be prudent to have baseline data on the native fish populations in the drainage before we embark on any programs to eradicate the pike, especially if we are considering poisoning the entire drainage. It could well be that leaving the situation alone may produce the best results in terms of the goals of the program.

Pike had been identified in Soldotna Creek at least a decade prior to the eradication effort. Pike have been identified in the Moose River drainage for many decades. If they were such a dire threat to our ecosystems, I would expect that would have manifested by now.

Thank you, REDACTED

Comment 3

Cook Inlet
AQUACULTURE ASSOCIATION

40610 Kalifornsky Beach Road, Kenai, AK 99611
907-283-5761 907-283-9433
info@ciaanet.org www.ciaanet.org

Ben Wishnek
US Fish and Wildlife Service
Kenai National Wildlife Refuge
P.O. Box 2139
Soldotna, Alaska 99669

January 15, 2021

Re: Input on management strategies for Northern Pike in the Miller Creek Watershed on the Kenai Peninsula

Dear Mr. Wishnek,

Cook Inlet Aquaculture Association (CIAA) is a private, non-profit corporation organized under the laws of the State of Alaska, engaged in salmon enhancement work throughout the Cook Inlet region. The purpose of this letter is to submit our comments on the management strategies for Northern Pike in the Miller Creek Watershed (MCW) on the Kenai Peninsula.

Since 1976, CIAA has worked to protect and enhance wild salmon stocks for the common property fishery in the Cook Inlet region. We clearly understand the threat invasive northern pike pose to our wild salmon stocks if left unchecked in Alaska lakes. It is believed that northern pike were probably introduced on purpose in the Susitna region in the 1950s. They have been illegally released into other lakes and systems in the region and have spread through connected waterways. It was illegal stocking that introduced northern pike to the Soldotna Creek drainage in the 1970s. There are now over 100 lakes and systems in the Cook Inlet region where invasive pike populations have been reported, and salmon declines have been noted in many of the systems that lack ample deep water refuge. If northern pike are allowed to spread unchecked in Southcentral Alaska, salmon production is expected to be severely curtailed in many of the lakes that have historically been contributors to the salmon run.

On the Kenai Peninsula, the Alaska Department of Fish and Game (the Department) has been a leader in northern pike eradiation, using rotenone to remove the pike, while putting into place plans to safely protect native fish and fauna. The Department has been highly successful with their rotenone projects such as the Stormy Lake, Tote Road lakes, and Soldotna Creek drainage projects here on the Kenai Peninsula—ensuring the restoration and/or protection of our highly-valued native salmon and other fish populations. The Department worked in cooperation with agencies and land owners to ensure transparent and thoughtful outreach prior to treatments, which helped make these projects successful.

The northern pike infestation in the MCW is the last remaining invasive pike infestation on the Kenai Peninsula. We believe eradication by the use of rotenone is the only appropriate management strategy for eradicating this population and ensuring the protection of nearby salmon populations. Eradication by this method of northern pike on the Kenai Peninsula has been proven effective and safe. Our concern with any other option other than eradication is that the MCW northern pike population will be given the opportunity to spread into other systems on the Kenai Peninsula. The previous work put into eradicating northern pike populations in other Kenai Peninsula systems absolutely needs to be preserved by ensuring this last known infestation in the MCW is eradicated. Complete eradication will ensure our Kenai Peninsula salmon and other native fish populations are safeguarded from this highly-predatory species. There is too much at stake to not choose eradication.

Thank you for the opportunity to provide input into management options. Let me know if we can further assist with this important project.

Sincerely,

REDACTED

[EXTERNAL] Miller Creek/Vogel Lake Pike Management Project

REDACTED

Fri 1/15/2021 12:01 PM

To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Cc: REDACTED

1 attachments (418 KB)

Miller Creek Pike Management Input CIAA 210115.pdf;

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Good afternoon Ben,

Enclosed please find input from the Cook Inlet Aquaculture Association on the Miller Creek/Vogel Lake Pike Management Project. We appreciate the opportunity to weigh in on the management options for this northern pike infestation.

Best,

REDACTED

REDACTED

Check out CIAA's 2019 Annual Report!

Re: [EXTERNAL] Miller Creek/Vogel Lake Pike Management Project

Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Fri 1/15/2021 12:39 PM
To: REDACTED
Cc: REDACTED

Hi all,

Your comments have been received. Thank you for taking time to assist us in planning this project.

Best,
Ben

~~~~~~

Ben Wishnek, Fish and Wildlife Biologist, AWB®
U.S. Fish and Wildlife Service
Alaska Region Invasive Species Program
PO Box 2139
33398 Ski Hill Road
Soldotna, Alaska 99669

REDACTED

https://www.fws.gov/alaska/pages/invasive-species

Like and follow us on Facebook!

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect."
-Chief Seattle

From: REDACTED
Sent: Friday, January 15, 2021 11:58 AM
To: REDACTED
Cc: REDACTED
Subject: [EXTERNAL] Miller Creek/Vogel Lake Pike Management Project

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Good afternoon Ben,

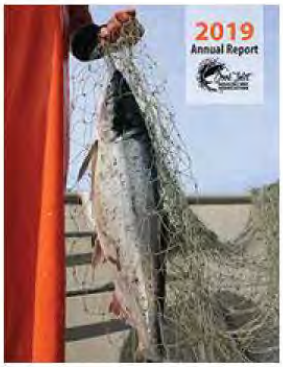
Enclosed please find input from the Cook Inlet Aquaculture Association on the Miller Creek/Vogel Lake Pike Management Project. We appreciate the opportunity to weigh in on the management options for this northern pike infestation.
~~~~~~

Best,

[redacted]

REDACTED [redacted]

Check out CIAA's 2019 Annual Report!



Comment 4

Kenai Peninsula Cooperative Invasive Species Management Area

Ben Wishnek
US Fish and Wildlife Service
Kenai National Wildlife Refuge
PO Box 2139 Soldotna, AK 99669

January 19th, 2021

Re: Management of Invasive Pike in the Miller Creek Watershed

Dear Ben Wishnek,

The Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA) is writing to provide comment on the management of invasive pike within the Miller Creek Watershed (MCW). We support having a variety of Integrated Pest Management (IPM) techniques available for eradicating pike populations on the Kenai Peninsula, including physical, mechanical and chemical options of control.

The KP-CISMA is a highly organized partnership of agencies and organizations seeking to prevent the spread of the most detrimental non-native species on the Kenai Peninsula. Since our inception as a Cooperative Weed Management Area in 2003, we have worked diligently to reduce the negative effects of invasive plants within the region, using a variety of Integrated Pest Management (IPM) strategies. With the increased threats posed by a variety of non-native taxa, the partnership chose to broaden our scope to become the KP-CISMA in 2020, allowing us to collaborate and coordinate on such infestations as the pike found within the MCW.

By promoting an *Early Detection and Rapid Response* (ED&RR) approach to invasive species, the KP-CISMA prioritizes the most efficient, effective, and economical solutions for managing infestations. In the *Management Plan for Invasive Northern Pike in Alaska,* a comprehensive document created by the Southcentral Alaska Northern Pike Control Committee, detailed assessments are documented concerning a variety of treatment options for invasive pike. We support the data and recommendations found in this document, and promote the techniques most feasible and effective for eradicating invasive pike from the MCW. It has been proven that concerted efforts to eradicate invasive pike on the Kenai Peninsula have been hugely successful in the past, and we believe this expertise will be applied to eradicate the MCW population of invasive pike.

Miller Creek and other adjacent watersheds are highly valued by the KP-CISMA, as they are known to support a variety of salmonid species seen to be directly threatened by the presence of invasive pike. The timely implementation of the appropriate ED&RR technique for eradicating invasive pike from the MCW will not only preserve and restore the MCW, but will also prevent invasive pike from spreading into nearby watersheds. Recent data suggesting the ability of pike to move through saltwater increases the threat and urgency to eliminate this population, as the outlet of Miller Creek into Cook Inlet is close to other highly valued watersheds.

The KP-CISMA urges land managers and decisions makers to move forward with eradication efforts. We support the use of a variety of IPM practices that allow for the safest and most effective removal of invasive pike from the MCW system.

Thank you for the opportunity to comment and for considering priorities of the KP-CISMA.

Sincerely,

REDACTED

[EXTERNAL] Comment Letter from KP-CISMA regarding Invasive Northern Pike Management at Kenai NWR

REDACTED

Tue 1/19/2021 1:43 PM

To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>

1 attachments (85 KB)

KP-CISMA_CommentLetter_USFWS_MillerCreek_NorthernPike_Final.pdf;

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Dear Ben,

Thank you for the opportunity to comment on the Invasive Northern Pike Management in the Miller Creek Drainage, located on the Kenai National WIldlife Refuge. Please accept this letter of support for invasive pike eradication efforts, on behalf of the Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA).

Sincerely,

REDACTED

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REDACTED

Re: [EXTERNAL] Comment Letter from KP-CISMA regarding Invasive Northern Pike Management at Kenai NWR

Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Wed 1/20/2021 11:51 AM
To: REDACTED

Hi REDACTED,

Your comments have been received and will be incorporated as we move forward with the planning process. Thank you for taking time to assist us in planning this project.

Best,
Ben

~~~~~~

Ben Wishnek, Fish and Wildlife Biologist, AWB®
U.S. Fish and Wildlife Service
Alaska Region Invasive Species Program
PO Box 2139
33398 Ski Hill Road
Soldotna, Alaska 99669

REDACTED

https://www.fws.gov/alaska/pages/invasive-species

Like and follow us on Facebook!

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect."
-Chief Seattle

From: REDACTED
Sent: Tuesday, January 19, 2021 1:41 PM
To: Wishnek, Benyamin K <benyamin_wishnek@fws.gov>
Subject: [EXTERNAL] Comment Letter from KP-CISMA regarding Invasive Northern Pike Management at Kenai NWR

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Dear Ben,
Thank you for the opportunity to comment on the Invasive Northern Pike Management in the Miller Creek Drainage, located on the Kenai National Wildlife Refuge. Please accept this letter of support for
~~~~~~

invasive pike eradication efforts, on behalf of the Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA).

Sincerely,

REDACTED

Comment 5

I Bought land in Grey Cliff 1982
And moose pt 1984 snowmached in miller
Creek DRAinage Fished vogel Lake, used
Cabin on vogel Lake signed logbook
At cabin like others that either flew in
or snow mached in There were no reports
of pike Then, I have a educational fishery
At moose pt And have caught A pike
in salt water in Gill Net And Also A
lump sucker These invasive Fish Also Travel
inlet, I was surprised About This. The
Only way I can see To Remove Pike
is (Fish pesticide,

My input

REDACTED

United States Department of the Interior

KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139
Soldotna, Alaska 99669-2139
(907) 262-7021

January 26, 2021

REDACTED

SUBJECT: Management of Invasive Pike in the Miller Creek Watershed

Dear REDACTED:

Your comments regarding invasive Pike management in the Miller Creek/Vogel Lake area have been received and will be considered as we move forward in the planning process. Thank you for taking the time to provide detailed information.

Sincerely,

Ben Wishnek

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service. For more information on our work and the people who make it happen, visit www.fws.gov. Connect with our Facebook page at www.facebook.com/usfws, follow our tweets at www.twitter.com/usfwshq, watch our YouTube Channel at http://www.youtube.com/usfws and download photos from our Flickr page at http://www.flickr.com/photos/usfwshq.

Appendix G – Acronyms

ADF&G – Alaska Department of Fish and Game
ADNR – Alaska Department of Natural Resources
ANILCA – Alaska National Interest Lands Conservation Act
CCP – Comprehensive Conservation Plan
CFS – Cubic Feet per Second
EA – Environmental Assessment
EO – Executive Order
FWS – U.S. Fish and Wildlife Service
IPM – Integrated Pest Management
KNWR – Kenai National Wildlife Refuge
MCW – Miller Creek Watershed
NEPA – National Environmental Policy Act
NWR – National Wildlife Refuge
NWRS – National Wildlife Refuge System
NWRSAA – National Wildlife Refuge System Administration Act
PPM – Parts Per Million