

**NOTICE OF DECISION**  
**and**  
**FINDING OF NO SIGNIFICANT IMPACT**

**Proposed Karluk Lake Nutrient Enrichment  
Environmental Assessment**

This Finding of No Significant Impact (FONSI) for the Environmental Assessment (EA) and 810 Evaluation were prepared by the U.S. Fish and Wildlife Service (Service) in response to a proposal for a nutrient enrichment (fertilization) project on Karluk Lake within the Kodiak National Wildlife Refuge (Kodiak Refuge, Refuge), Alaska. The Kodiak Regional Aquaculture Association (KRAA) applied for a special use permit to conduct this activity. The Service's purpose in considering KRAA's application is to determine if the Proposed Action (lake nutrient enrichment) is consistent with the purposes of Kodiak Refuge and furthers the goals and management of Kodiak Refuge. This FONSI documents my decision and includes a summary of the alternatives considered, public involvement in the decision making process, and the basis for making this decision.

**Background/Summary**

Karluk Lake is the largest lake in the Kodiak Archipelago, with a surface area of approximately 9,630 acres, and has historically been Kodiak's largest producer of sockeye salmon (*Oncorhynchus nerka*) (Foster 2014). The south half of the lake is surrounded by Kodiak Refuge lands administered by the Service; the north half of the lake is surrounded by private lands owned and managed by Koniag, Inc. The Alaska Department of Fish and Game (ADF&G) manages the commercial fishery within the drainage. Karluk Lake and Karluk River and their associated tributaries (the Karluk System) drain a watershed of 106 square miles (Uchimaya and others 2008) which supports all five species of Pacific salmon.

From 2008 to 2011, the early-run sockeye salmon stock failed to meet ADF&G escapement goals for Karluk Lake. In response, the KRAA submitted a nutrient enrichment proposal to the Service in 2012 to restore the stocks. The proposed restoration program would extend nine years: five years of fertilizer application, as needed, along with two years each of pre- and post-treatment monitoring of the lake. KRAA linked lower adult sockeye salmon abundance from 2008 to 2011 to reduced lake nutrient concentrations (KRAA 2012) and proposed that active intervention, through nutrient enrichment, would increase plankton productivity and could increase salmon productivity. The ADF&G believes that smaller run sizes were the result of a number of factors, including over-escapement between 1985 and 2007, which resulted in large numbers of juveniles that overgrazed and reduced the number of zooplankton available to subsequent broods (Foster 2014).

Based on the results of scoping, the Service and representatives from ADF&G and Koniag, Inc. identified specific areas of concern, referred to as issues, for consideration in this EA. The following eight issues were evaluated prior to making a decision with respect to KRAA's proposal. The primary concern regarded aquatic productivity and its relationship to sustainable salmon, and the following questions address this concern: a) Is nutrient deficiency in Karluk

Lake an issue?; b) Is the variability of nutrients outside of historical ranges?; c) Is there an adult sockeye salmon productivity issue?; and d) Is the current sockeye salmon run size adequate to achieve self-sustaining population at historic levels? The remaining seven issues raised were: effects to fisheries, especially other salmon species and to lower trophic levels; effects to fish-eating wildlife; effects to water quality, especially the increased potential for eutrophication; effects to subsistence resources and users; effects to Refuge recreation; effects to socioeconomics of local communities and individuals; and effects to cultural resources and traditional cultural properties.

## **Decision**

It is my decision to select Alternative A: Current Management (No Action Alternative), for implementation on Kodiak Refuge. In making my decision, I reviewed and carefully considered the information from, and impacts identified in, the Final EA; relevant issues, concerns, opportunities, public input received during the process; and relevant laws, regulations and policies. I have determined that the No Action Alternative is not a major Federal action that would significantly affect the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969, as amended, and no mitigation is required. This Alternative reflects my intent to manage Kodiak Refuge to best meet the statutory mandates of the Refuge System Administration Act (as amended, 1997) and the Alaska National Interest Lands Conservation Act (ANILCA), further the Refuge purposes and the mission of the National Wildlife Refuge System (NWRS), and comply with the Service's Biological Integrity, Diversity, and Environmental Health (BIDEH) policy. Under this alternative, the Service would not issue a special use permit to KRAA for nutrient enrichment of Karluk Lake.

In 1980, ANILCA established the purposes of Kodiak Refuge to conserve fish and wildlife populations and their habitats in their natural diversity, to provide opportunities for continued subsistence uses by local residents, and to ensure water quality and quantity on Refuge lands. These purposes guided the goals and management direction in the 2008 Comprehensive Conservation Plan for Kodiak Refuge (CCP). The Refuge contributes to sound fishery management by maintaining high quality habitat for returning sockeye salmon to sustain their populations within historic range of variation and to provide sufficient food resources for Refuge trust species. Continuing current management direction best accomplishes the goal to conserve the abundance of natural salmonid populations for continued human and wildlife use and maintain their natural diversity in the Karluk watershed.

Under Current Management, the Service would continue to work with ADF&G to manage habitat at Karluk Lake to protect and provide for fish, wildlife and aquatic resources and to better understand and maintain the genetic diversity found in the "fishery portfolio" described by Schindler and others (2010). Sockeye salmon stocks would be maintained with a minimum of disruption to allocations between industry, subsistence, and the ecological services on which other Refuge trust species (e.g., Kodiak brown bear, bald eagles) depend. This decision would result in conserving sockeye populations while allowing for appropriate levels of fish and wildlife-dependent recreation, subsistence use, and other traditional uses.

## **Other Alternatives Considered in Detail**

The EA presents the proposed fertilization project (Alternative B) and three other reasonable alternatives. The alternatives include the “No Action” alternative (A: Current Management), an alternative to stock Karluk Lake with sockeye fry (C), and an alternative to combine fry stocking and fertilization (D). Several alternatives were eliminated from consideration in the EA and these are listed in the EA.

### **Alternative B: Proposed Action: Lake Nutrient Enrichment**

KRAA proposed to enrich of Karluk Lake through systematic application of aqueous fertilizer with the objective increase primary productivity of the lake (i.e., phytoplankton growth) which in turn could potentially increase smolt and adult sockeye salmon survival. KRAA would apply an aqueous nutrient solution consisting of inorganic phosphorus and nitrogen using two different formulations: 28-0-0 and 10-34-0. As needed, a fixed-wing aircraft would distribute the solution to the surface of the lake over the Main, Thumb, and O’Malley Basins weekly during a 14-week period from mid-May through mid-August for 5 years. Fertilizer targets would seek to maintain an annual mean phosphorus load of 90% of “permissible” levels. The project would also include two years each of pre- and post-treatment monitoring as an integral component. Monitoring would occur annually prior to, during, and following fertilization.

### **Alternative C: Fry Stocking**

Under Alternative C, KRAA would implement a sockeye salmon fry stocking program at the Upper Thumb River and Thumb River (as necessary in low run years) if sockeye salmon escapement and (commercial) harvest are low but nutrient levels are sufficient to support a higher sockeye salmon run. This alternative would occur in three phases: broodstock collection and ripening at the confluence of the Upper Thumb River and Thumb Lake; egg collection, incubation, and rearing at the Pillar Creek Hatchery in Kodiak, Alaska; and stocking of salmon fry in the Upper Thumb River. In this alternative, KRAA proposes to establish a camp near a small embayment south of the confluence of Upper Thumb River and Thumb Lake to house seasonal workers, build temporary holding pens, and collect ripe eggs and milt. The project would consist of five years of fry stocking and two years each of annual pre- and post-treatment monitoring to assess project effectiveness.

### **Alternative D: Fertilization and Fry Stocking**

Alternative D is a combination of Alternatives B and C, applying aqueous nutrients and stocking sockeye salmon fry.

## **Public Involvement**

The Service conducted initial scoping with representatives from ADF&G and Koniag, Inc. Eight specific issues were identified for consideration in the EA. On December 4, 2014, the Service released the Preliminary EA for a 60-day public review and comment period. We notified the public with informational postcards mailed to 466 interested persons, a Notice of Availability in the Kodiak and Homer newspapers, and a posting on the Kodiak Refuge website. We also held an open house in Kodiak on January 13, 2015; 26 people from the community attended. In

addition to discussions during the open house, 39 written comments were received. Both individuals and organizations contributed comments, representing Kodiak fishermen, KRAA, ADF&G, the Alaska Congressional Representatives, several local Tribal organizations, and several conservation organizations. A Planning Update, consisting of a summary of comments and a proposed completion date was posted to the Refuge website and sent to the mailing list on March 18, 2015. Comments addressed concerns about the nature of the proposed action - whether it represented enhancement or restoration under Service policy; the potential social and economic effects of reduced fish numbers; the status of Karluk sockeye salmon and need for the project; overall lake productivity and past enrichment efforts; sockeye management by ADF&G; concern about the resources at risk in the Karluk basin, particularly brown bears and salmon; and concern over whether or not the proposed action was compatible with refuge purposes. Changes were incorporated into the final document, where appropriate.

## **Findings and Basis for the Decision**

Restoration actions proposed in Alternatives B-D must demonstrate a need for the action based on the criteria for restoration and a strong likelihood of success. Under Section 303(5)(B) of ANILCA Kodiak Refuge managers are mandated to “conserve fish and wildlife populations (and) habitats in their natural diversity...”. Through land management, the Service evaluates proposed activities that may degrade habitat on which wildlife and fish populations depend. The Refuge’s Management Policies and Guidelines in the 2008 CCP set criteria for fishery restoration to provide self-sustaining fish populations within historic levels, to consider restoration when fishery resources have been severely adversely affected; and to use restoration strategies that are least intrusive to the ecosystem and do not compromise the genetic integrity of the depleted population(s). The Service also evaluates the appropriateness of activities within land management categories (i.e., minimal, moderate). Minimal management areas provide the highest resource protection. Karluk Lake falls exclusively within the minimal management designation where we allow habitats to change and function through natural processes and maintain the natural environment with very little evidence of human-caused change. Fishery restoration may be allowed in minimal management areas of the Refuge under these guidelines.

When determining the need for action, we must determine the extent to which the resources, in this case the sockeye salmon stocks of Karluk Lake, have been “severely adversely affected”. To do this, we reviewed the historic range of sockeye salmon abundance to determine whether the current levels of abundance fall within the historic range. Data presented in the EA show that the stocks are within their historic range of returns/run size and demonstrate resilience to low population cycles (i.e. rebound). Our analysis of the data indicates that the population is sustainable in the long-term and is not severely adversely affected under current management. Therefore, the proposed project does not demonstrate a sufficient need, as defined. Also, the potential effectiveness of the proposed project was demonstrated by results from a previous enrichment project at Karluk Lake. Escapement data in the 1980s show that recovery began before the start of the past project and no peer-reviewed literature credits the enrichment of the lake with an increase in adult returns. On the contrary, the natural deposition of decomposed carcasses within the drainage is credited as the main driver of in-drainage productivity. For these reasons, we conclude the Karluk Lake sockeye salmon population does not meet the criteria for

implementing a restoration activity (Alternative B, C, and D) in a minimal management area on Kodiak Refuge.

Under current management, the Service seeks to accomplish Refuge purposes, in part, through contributing to sound fishery management by maintaining high-quality habitat for fish and aquatic resources with minimal human interference. Nutrients from returning sockeye salmon sustain the population within the range of historic variation and provide nourishment for Refuge wildlife and aquatic resources. Recent literature by Schindler and others (2010, 2015) suggest that maintaining fish and aquatic resources is best achieved through the “portfolio effect,” which is analogous to a stock market portfolio that diversifies risk while maintaining returns. The portfolio effect, when comprised of all populations, has been shown to dampen variations in stock abundance cycles (low populations) and reduce associated fishery closures when compared to stocks that have lost component populations. Genetic variability allows some populations to flourish under certain environmental conditions while other populations do better when conditions change spreading out risk and providing more resilience overall. The Karluk Lake portfolio is made up of 23 genetically separate populations (personal communication, Birch Foster, ADF&G) within the two managed sockeye salmon stocks, early and late. To maintain the ‘portfolio’ of the genetic populations (23) that make up these Karluk stocks, we want to proceed with caution when considering proposals to intensively manipulate the lake environment. Maintaining the genetic diversity of salmon populations benefits Refuge purposes by providing more stable wildlife food resources (e.g., for Kodiak brown bear, bald eagles) and, historically, a harvestable surplus of fish (e.g., for subsistence).

The selected alternative also best supports the Service’s BIDEH policy which includes the variety of life and its processes and the composition and the structure and functioning of species at genetic, organismic and community levels, including a consideration of historic conditions. Biological integrity, diversity, and environmental health are critical components of wildlife conservation and we maintain the biological integrity, diversity, and environmental health of each refuge, and where appropriate, restore lost or severely degraded components. The policy recognizes that natural densities are relatively stable for some species and variable for others and we manage populations for natural densities and levels of variation that are sufficient for maintaining viable populations.

The Service expects that Karluk stocks will continue to fluctuate under the Current Management Alternative, due to the inherent complexity of the system. Rogers and others (2012) concluded that for fishery management, “models that assume time invariant parameters (e.g., for carrying capacity or intrinsic productivity) are unrealistic representations of the biology in the systems.” It is an unrealistic expectation, therefore, to completely stabilize stocks by removing the highs and lows of fluctuating total returns. If carrying capacity and productivity are variable, working within that variability is the best way to maintain the component stocks to accomplish Refuge purposes, to meet the requirements of Refuge trust species, and provide for human harvest. The proposed action may be implemented immediately.

**SIGNATURE APPROVAL:**

/S/ Mitch Ellis

01/20/2016

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Mitch Ellis

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Date

Chief of Refuges, Alaska Region

U.S. Fish and Wildlife Service

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