National Park Service
US Department of the Interior

Glacier National Park
Montana
Waterton-Glacier International Peace Park

Finding of No Significant Impact

Westslope Cutthroat and Bull Trout Preservation in Gunsight Lake

July 2023

Recommended:

DAVID ROEMER Digitally signed by DAVID ROEMER
Date: 2023.08.08 11:34:24 -06'00'

David M. Roemer, Superintendent — Date

Glacier National Park

National Park Service

Approved:

KATHARINE HAMMOND Digitally signed by KATHARINE HAMMOND
Date: 2023.08.10 16:56:47 -06'00'

Kate Hammond, Regional Director — Date

Interior Regions 6, 7, & 8

National Park Service

CONTENTS

APPENDICES

INTRODUCTION

In compliance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) prepared an Environmental Assessment (EA) to examine alternative actions and environmental impacts associated with proposed Westslope Cutthroat and Bull Trout Preservation in Gunsight Lake. The project is needed to remove the ongoing risk of hybridization to native westslope cutthroat trout downstream of Gunsight Lake and provide westslope cutthroat and bull trout with habitat that is secure from the threats of hybridization and climate change.

The statements and conclusions reached in this finding of no significant impact (FONSI) are based on documentation and analysis provided in the EA and associated decision file. Relevant sections of the EA are summarized and incorporated by reference below. The EA is available at https://parkplanning.nps.gov/GunsightLake.

BACKGROUND

Essential to Glacier's aquatic ecosystems are the historically native fish species bull trout (*Salvelinus confluentus*), a federally listed threatened species under the Endangered Species Act (ESA), and westslope cutthroat trout (*Oncorhynchus clarkia lewisi*), listed by the state of Montana as a species of concern (Liknes and Graham 1988; Behnke 1992; Shepard et al. 2005; Muhlfeld et al. 2016). Glacier supports approximately one-third of the remaining bull trout populations in the United States inhabiting natural lakes (Fredenberg et al. 2007). Westslope cutthroat trout and bull trout are essential to maintaining biodiversity throughout the Crown of the Continent Ecosystem, are part of a historic fishery that is fundamental to Glacier's designation as a biosphere reserve and World Heritage Site and have long been integral to the culture of native peoples as well as the park and surrounding communities.

Westslope cutthroat trout and bull trout are increasingly at risk from the severe, negative effects of non-native fish through competition, hybridization, and predation. Non-native fish were introduced to Glacier via fish stocking that began soon after the park was established in 1910 (and perhaps earlier) and continued until the early 1970s. Non-native fish have also migrated into park waters from lakes and streams outside the park. Gunsight Lake, at the headwaters of the St. Mary River, was historically fishless but stocked in 1916 with 35,000 non-native cutthroat trout and again from 1920 to 1936 with 224,000 rainbow trout (*Oncorhynchus mykiss*). The rainbow trout established a self-sustaining population and are currently the only fish species present at the lake, since downstream waterfalls are barriers to upstream fish migration. The non-native rainbow trout at Gunsight Lake can migrate downstream and hybridize with native westslope cutthroat trout. Hybridization degrades native genetics, lowering adaptability and fitness within populations which can result in lower reproductive rates and individuals that are less resilient to disease and environmental stressors.

The St. Mary River drainage is the only drainage in the United States where bull trout are found east of the Continental Divide. There are multiple threats to bull trout populations throughout the park, including non-native fish, juvenile bull trout mortality from irrigation systems outside the park, and climate change related habitat degradation (Mogen et al. 2011). There is increased evidence that hybridization between bull trout and brook trout (*Salvelinus fontinalis*) is threatening the genetic lineage of St. Mary bull trout. Climate change compounds the stressors to native fish, as changes in stream flow and warmer water temperatures stress native trout, degrade habitat, and favor non-native species. Given its high elevation, Gunsight Lake has a high likelihood of sustaining the cold-water habitat necessary for westslope cutthroat and bull trout to persist in a changing climate.

SELECTED ACTION AND RATIONALE FOR DECISION

Selected Action

Based on the analysis presented in the EA, the NPS selected Alternative A, the proposed action and NPS preferred alternative (described on pages 4 through 9 of the EA). The selected action best meets the purpose and need for action without causing significant impacts to park resources. The selected action is divided into two stages. Stage 1 includes removing[1] non-native rainbow trout from Gunsight Lake via rotenone treatment and subsequent detoxification. Stage 2 includes translocating native westslope cutthroat, bull trout, and mountain whitefish (*Prosopium williamsoni*) into Gunsight Lake. The action will also include post-project monitoring.

Other alternatives considered but dismissed from detailed analysis are described in Appendix D of the EA.

The project area is the Gunsight Lake drainage, from the head of Gunsight Lake extending approximately three miles downstream, near Mirror Pond. Please refer to ***Figure 1: Project Area.*** This area encompasses the proposed rotenone treatment area and detoxification site. Gunsight Lake is located on the east side of Glacier National Park in the headwaters of the St. Mary River drainage and is within the park's 1974 recommended wilderness boundary. The rotenone treatment area includes Gunsight Lake and a segment of the St. Mary River extending downstream from the foot of the lake to the detoxification site below an unnamed waterfall near Mirror Pond. The detoxification site will be approximately three miles downstream of the lake (***Figure 1***).

The project area also includes potential native fish donor source locations under consideration for Gunsight Lake translocation efforts and includes several waters within the larger St. Mary River drainage. These streams include Canyon Creek, Jule, Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, Midvale, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes.

PROJECT STAGE 1: REMOVE RAINBOW TROUT

Rotenone Application

The project will remove non-native rainbow trout from Gunsight Lake by means of rotenone. Rotenone is an EPA registered and approved fish toxicant applied with the intent of killing fish in water. Rotenone is the only fish toxicant that is currently registered and approved for use by the EPA (EPA 2007). It is proposed for this project because it will remove non-native fish in a period of days as opposed to years and will have the best chance at achieving a complete removal compared with mechanical methods of removing fish (e.g., netting, trapping, electrofishing, and angling). Rotenone removal will be supplemented by nets and electrofishing as necessary. Electrofishing will be employed in tributaries to augment and evaluate the success of tributary rotenone treatments. Electrofishing uses a battery to produce electrical current that is applied to water in a metered fashion using an electrical control box. Fish caught within the electrical field are temporarily stunned and immobilized, thereby allowing them to be netted. Similarly, gill nets may also be set in areas of freshwater input, like tributary mouths where rainbow trout might otherwise find refuge from the rotenone in the lake. Gill nets will be set in pre-designated areas and anchored in place with anchors placed in the water at both ends of the net, with no digging or disturbance to the stream bed. Nets will be checked periodically and cleared of fish to augment the effectiveness of the rotenone in areas of freshwater influence. Only non-native rainbow trout will be caught in the nets because this is the only species present.

[1] Removal means the lethal elimination of rainbow trout by chemical or mechanical means; carcasses will remain in the lake or stream but will be sunk to remove them as wildlife attractants.

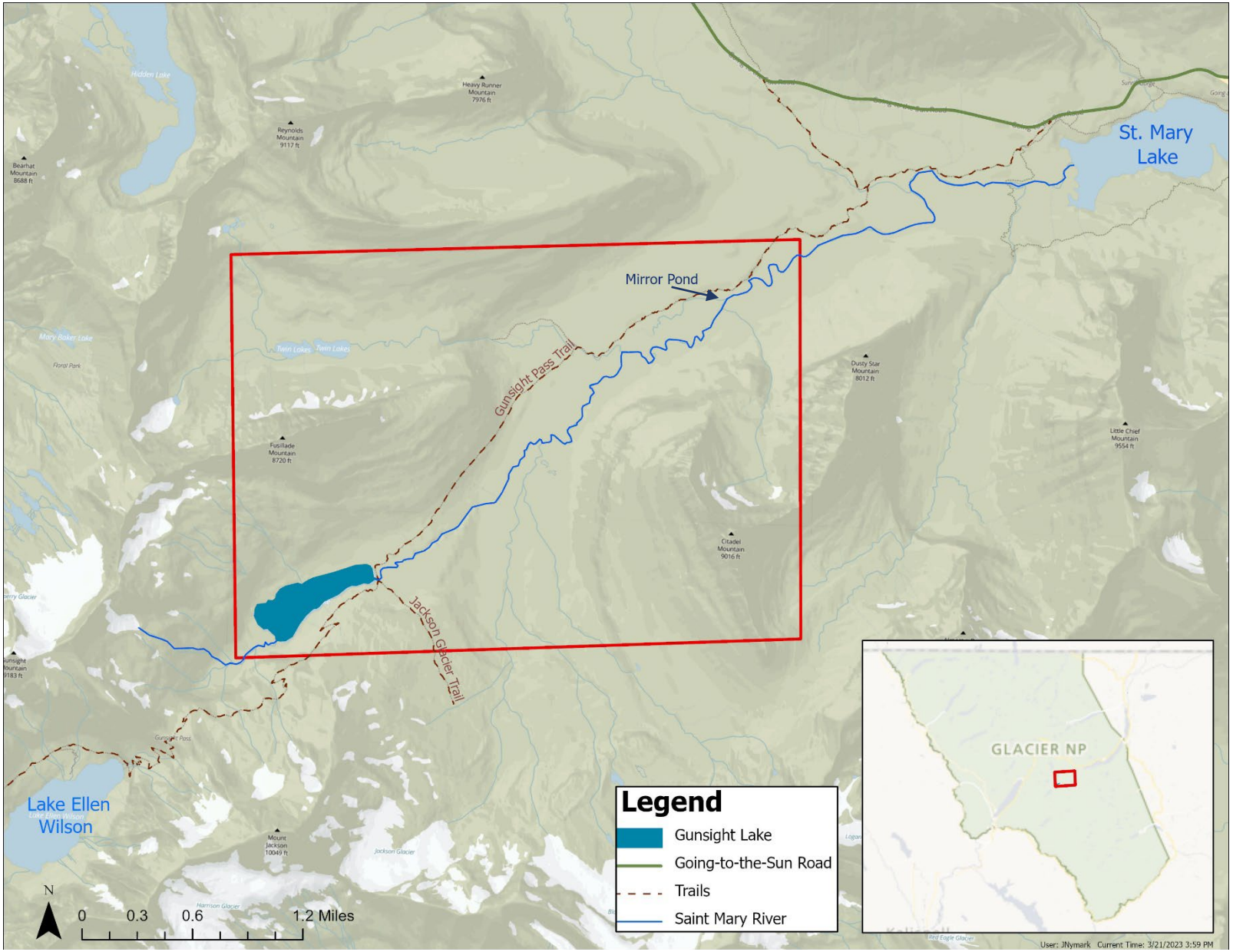

Figure 1: Project Area

Rotenone is extracted from the roots of several plant species in the bean family (*Leguminosae*). The chemical deprives aquatic gilled organisms of oxygen by interfering with cellular respiration and is highly toxic to fish. Ingestion of rotenone has no effect on land animals and adult stage amphibians because the enzymes and acids of the digestive system break it down, thus limiting absorption into the bloodstream. Rotenone is naturally degraded by sunlight and water movement because it binds quickly (one to five hours) to sediments or organic matter in the water (Skaar et al. 2017), resulting in a relatively rapid dissipation of rotenone from the environment; detoxification will be hastened with the addition of a neutralizing agent, potassium permanganate ($KMnO_4$) (USFWS 2015), as discussed below. During rotenone applications and mechanical removal, many of the dead fish typically remain submerged. Any dead fish that come to the surface will be collected and sunk in the lake.

The amount of rotenone used will be in accordance with product labeling and will be calculated based on lake volume derived from bathymetric mapping, stream flow measurements, and calculations of travel time (the amount of time it would take rotenone to flow a given distance). Prior to the application of rotenone, fluorescein, a non-toxic dye, will be applied to the stream and tracked to confirm the flow rate. Fluorescein dye is routinely used to study surface and groundwater flow patterns and is inert and non-toxic. The amount of dye used will be in accordance with accepted industry standards, product labeling, and protocols, and is estimated to be less than a gallon. It is currently estimated that a total of approximately 1,200 gallons[2] of rotenone will be required to achieve 1 part per million (ppm) concentration.

The fish toxicant will be applied to the lake from motorized watercraft (such as an inflatable boat with an outboard motor or other small motorboat) by means of tubing extending into the water from a container in the boat, and to the stream from drip stations and backpack sprayers. One or two motorized boats will run intermittently for an estimated 8 to 12-hour period each day of the rotenone application period, estimated at two to four days. Approximately six drip stations are anticipated; the approximate locations are depicted in ***Figure 2: Approximate Rotenone and Detoxification Station Locations***. Drip stations are generally a simple, non-motorized apparatus such as a 5-gallon bucket or drip bag with tubing extending into the stream. Backpack sprayers will be used to apply rotenone to any off-channel fish-bearing habitat. Water pumps will be used to help distribute the rotenone to the deeper portions of the lake as needed. Slow-release rotenone mixtures consisting of rotenone and an inert substance (such as sand and unflavored gelatin) will be used in areas of upwelling to prevent target fish from avoiding exposure. The rotenone will be released as the mixture breaks down in the water; the mixture will be contained (in a burlap bag, for example) and removed at the end of the treatment.

Rotenone is often applied during low water periods, in late summer or early fall to reduce the volume of water that needs to be treated and minimize the likelihood of non-target organisms, such as larval amphibians, being present in the treatment area. The rotenone treatment is anticipated to occur in early September of 2023. Given the extreme toxicity of rotenone to fish, it is expected that the majority (if not all) of rainbow trout will be removed. Some individual fish may survive in areas of groundwater inflow where the rotenone is unable to reach them. Post-treatment sampling (with nets, electrofishing, angling, and/or sampling DNA from the aquatic environment, for example) will be done to assess the effectiveness of the treatment. If rainbow trout are present during post-treatment sampling, a second application may be employed during the same or a following year to remove the remaining fish. Also, translocating westslope cutthroat on top of any remaining rainbow trout will result in genetic swamping, which will reduce the reproductive potential of any remaining rainbow trout (see discussion below for ***Project Stage 2: Translocate Native Westslope Cutthroat Trout and Bull Trout***). Genetic swamping is the replacement of one population or species with another through repeated, multi-year stocking of a waterbody. Over generations, the reproduction of the stocked fish overtakes any remaining species genes (MFWP 2021). If a reapplication of rotenone is needed, reapplication methods and protocols (e.g., chemical concentrations and application methods, treatment areas, timeframes, etc.) will be as described above. If reapplication procedures change, resource management staff

[2] This amount is approximate and could change as final calculations are made closer to the time of application.

at the park will review them prior to implementation. Should review determine that impacts from reapplication would exceed those identified in this EA, separate environmental analysis and compliance will be completed.

DETOXIFICATION

Following application of the rotenone, potassium permanganate will be used to detoxify the stream and neutralize the rotenone before it reaches downstream native fish populations in the lower reaches of the St. Mary River and St. Mary Lake. Potassium permanganate is an odorless oxidizing agent, often used to remove foul tastes and odors from drinking water and reduce odors at wastewater treatment plants. Potassium permanganate is one of the most widely used inorganic chemicals for the treatment of municipal drinking water and wastewater. At the anticipated concentration of a 3:1 ratio of potassium permanganate to rotenone, it can be toxic to fish (USFWS 2015).

The potassium permanganate will be applied to the St. Mary River below a waterfall approximately three miles downstream of Gunsight Lake (***Figure 2***). Rotenone treated water will flow downstream for approximately three miles. Due to localized freshwater inputs in the reach downstream of the falls, the toxicity of the rotenone will likely be dramatically reduced by the time it reaches the detoxification site. The natural dilution of the rotenone will reduce the amount of detoxification by potassium permanganate that will be required. The potassium permanganate will be applied by means of an auger dispenser powered by a generator (anticipated to be 1000-3000 watts in size). The generator will operate continuously (24 hours a day, 7 days a week) until the rotenone detoxifies as determined by the survival of sentinel fish placed in cages in the creek both upstream and downstream of the detoxification site. Detoxification will occur at the same time as the rotenone treatment and continue afterwards for an anticipated three to four weeks. The anticipated concentration will be a ratio of 3:1 potassium permanganate to rotenone (USFWS 2015). An estimate of approximately 2,500 pounds of potassium permanganate will be needed for detoxification. Detoxification will continue until sentinel fish survive for 24 hours without showing signs of distress at the detoxification site. Certified Piscicide Applicators and trained staff will oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, Montana Fish, Wildlife, and Parks (MFWP), and NPS policy (2006 Management Policies, Section 4.4.5.3).

Project Stage 2: Translocate Native Fish

Following the removal of rainbow trout from Gunsight Lake, westslope cutthroat, bull trout, and mountain whitefish will be translocated into the lake. This will establish secure populations of westslope cutthroat and bull trout (since non-native fish cannot access the lake due to a downstream waterfall that prevents upstream fish migration), and conserve at-risk genetic diversity found in local St. Mary westslope cutthroat trout and bull trout populations. It will also serve to genetically swamp any remaining rainbow trout (remaining rainbow trout are anticipated to be at extremely low numbers) with genetically pure westslope cutthroat trout and reduce the reproductive potential of any remaining rainbow trout. Mountain whitefish will provide an important forage species for bull trout and provide a buffer against bull trout predation on westslope cutthroat trout.

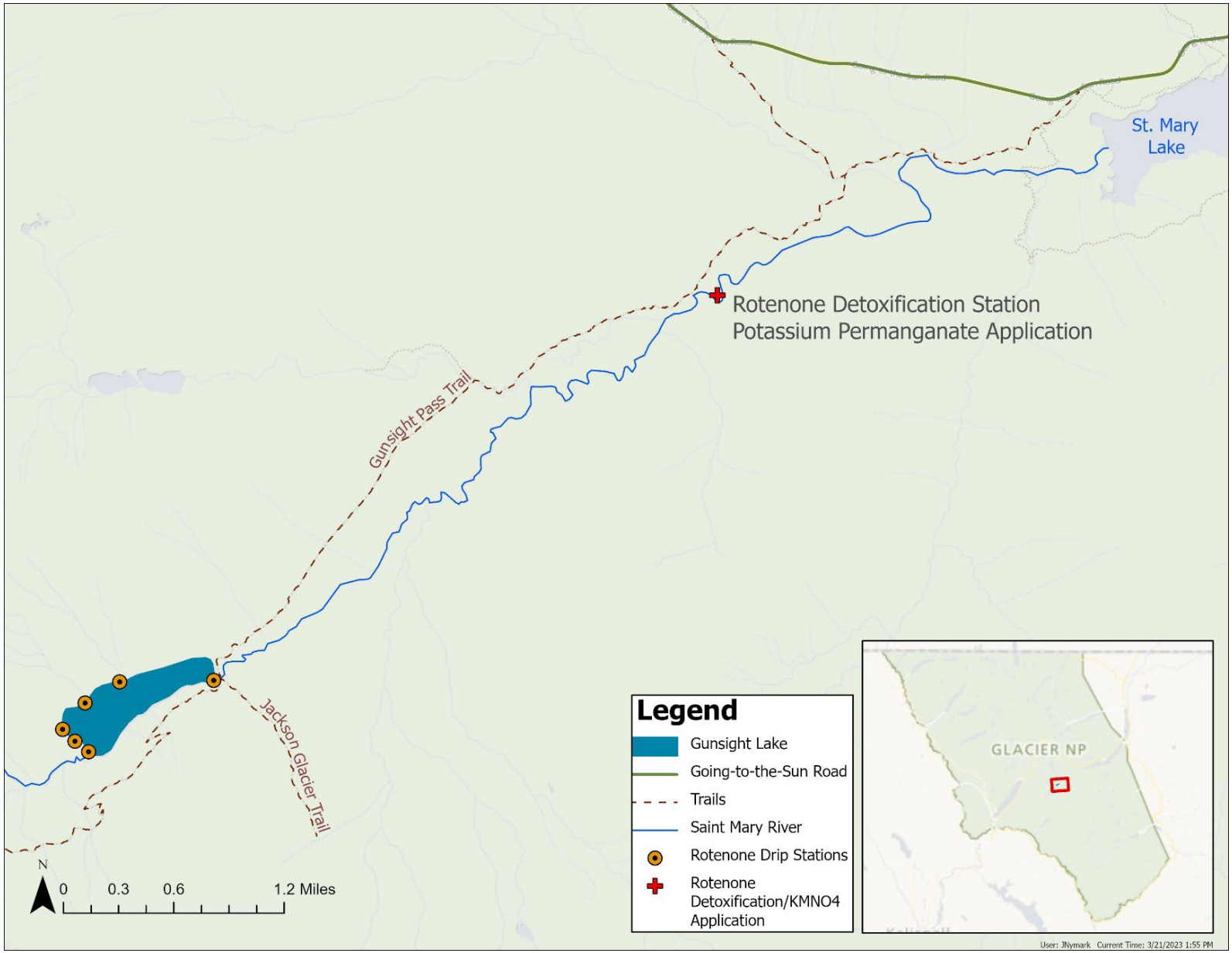

Figure 2: Approximate Rotenone and Detoxification Station Locations

Translocation will involve the collection of individual trout or trout gametes from donor streams inside and outside the park and propagating the fish in a hatchery outside the park before stocking them in Gunsight Lake, and/or directly moving the fish to the lake without hatchery propagation. The lake will be restocked with genetically pure individuals, but if local donor sources in the St. Mary drainage can no longer provide fish of this level of purity due to ongoing hybridization, individuals of lesser genetic purity may be used. There is conservation value in protecting slightly hybridized populations (less than 90%). Conservation of genetic diversity decreases if only 100% genetically pure fish are protected, since there are so few pure individuals and/or populations remaining. Donor streams could include Canyon Creek[3], Jule, Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, Midvale, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes. Each potential donor stream was genetically tested once by park biologists and geneticists between 2015 and 2022. Streams for translocation were chosen based on security of genetic diversity of the westslope cutthroat population, population size, conservation value, and disease-free status.

Bull trout will likely be spawned and released onsite, and the spawned/fertilized bull trout eggs will be taken to the hatchery to be hatched and raised. Westslope cutthroat trout will likely be taken to the hatchery where they will be spawned. Juvenile westslope cutthroat trout will also be stocked back into the donor source population to offset the removal of adults and swamp existing hybridized trout in the donor population(s). Hybrids will be removed from donor streams, identified through genetic analysis to reduce the hybrid abundance and contribution. Both actions will increase the genetic "purity" of the donor population(s). Mountain whitefish will be likely be directly transferred to Gunsight Lake (i.e., sub-adult or juvenile whitefish will be taken directly to Gunsight Lake from the donor stream).

Other spawning and rearing strategies may also be attempted, including streamside spawning and rearing in egg incubators. Streamside incubators are typically a small (approximately 8-inch x 8-inch) plastic basket or bucket or similar container that will be filled with gravel and eggs. Incubators will not require the use of any motorized equipment. If used, incubators will be in place until the eggs hatch (estimated at approximately two months) and will be checked approximately every two weeks and manually packed out upon fish dispersing. Fish health testing will be conducted before translocation, consistent with state and federal fish stocking requirements.

Collection of the donor fish for translocation will likely begin in 2023 using manual methods such as angling, dip netting, trapping, electrofishing and/or seining[4]. Selected donor water bodies[5] within the St. Mary River drainage are similar or near enough on the landscape to have undergone similar evolutionary pressures as the project area. Donor fish will be sourced from populations where evaluations have shown they are demographically strong enough to support the removal (i.e., the populations are large enough to withstand the removal of some fish) and no more than 10 percent of the population will be removed annually for three consecutive years (C. Downs, personal communication).

Project personnel (an estimated five to ten-member crew) will be onsite collecting the donor fish from source populations over an approximately one to two-week period. Donor native fish collection could occur any time during spring, summer, or fall. Donor fish will be transported from the stream on foot and then by vehicle to the hatchery. The collection of donor fish may need to be repeated each year for an estimated three years depending on the success of hatchery propagation and the number of fish that can be translocated to Gunsight Lake at a given time.

Westslope cutthroat trout and mountain whitefish will be translocated to the lake first, possibly in 2024 at the earliest, three to four years before bull trout are introduced. This will allow the westslope cutthroat trout and whitefish to reach sexual maturity and establish a reproducing population before adding additional competition and/or predation

[3] Canyon Creek, a tributary to Sherburn Reservoir, will likely be used as the donor stream for mountain whitefish.

[4] Seining is a method of fishing that employs a net that hangs vertically in the water with its bottom edge held down by weights and its top edge buoyed by floats, and then moved through the water manually or by boat.

[5] These streams include Jule, Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes.

from bull trout. We anticipate introducing two to four-year classes of westslope cutthroat trout and whitefish followed by two to four-year classes of bull trout. Translocation would take place over multiple years (estimated six to eight) to establish multiple age classes of all three species. Equipment used to transport fish (such as coolers) will be cleaned ahead of time in accordance with State of Montana rules and regulations for live fish transport. Translocated fish will be monitored, which could require marking them with tags, fin clips, or other means as well as periodic netting and electrofishing surveys. Personnel (an estimated two to five-member crew) may need to stay at one of the campgrounds if translocation cannot be completed in one day. No area closures will be required during fish translocation or collection.

MONITORING AND CLOSURES

Post-project monitoring of Gunsight Lake will be done, likely in 2024 through 2026 or longer, to evaluate aquatic organism (i.e., native fish, macroinvertebrates, zooplankton, and amphibians) response and recovery rates and will follow established monitoring protocols in the American Fisheries Society Rotenone Treatment Manual Standard Operating Procedures (SOP). The donor populations' abundance and genetic composition will also be monitored for three to five years after the donor fish are removed.

Pre-treatment biological surveys and monitoring for macroinvertebrates, zooplankton, and amphibians took place through 2022 to assess baseline community conditions in advance of post-project monitoring. Montana Natural Heritage Program (MNHP) was consulted for a list of species of concern that could be present in the project area. Lake volume was measured using sonar to create a bathymetric map to ensure that rotenone is not over-applied to the lake. Similarly, stream volumes were measured to ensure the precise treatment levels of both rotenone and potassium permanganate.

Approximately 15 project personnel will likely be on site during removal of rainbow trout and chemical applications. Personnel will camp at the wilderness campground at Gunsight Lake and near Mirror Pond near the detoxification site for the duration of the rotenone application and detoxification period (anticipated two to four days for rotenone application and three to four weeks for detoxification with potassium permanganate).

The treatment area will be temporarily closed to the public during rotenone application and detoxification. The Gunsight Lake wilderness campground will be closed for the duration of the project, from early September 2023 to spring 2024. The Gunsight Pass Trail will be closed temporarily during rotenone treatment. At this time, the park anticipates closing the Gunsight Pass trail for approximately one week around the site preparation and rotenone treatment application period[6]; however, the trail closure may need to be in place longer depending on variables that could affect the length of the application period such as weather, equipment failures, etc. The closure will extend from Reynolds Campground junction on the east and from just east of Gunsight Pass from the west. The treatment area will be posted with no drinking water or recreating in water warning signs that will be posted along the trail and shoreline of Gunsight Lake. The public will be informed of the project prior to implementation by means of media releases, postings on the park's website, and at the wilderness permit office and visitor centers. Signs informing visitors of any temporary trail closures will be posted throughout the rotenone application timeframe at the Ellen Wilson and Reynolds Campgrounds, on the trail beyond Gunsight Pass from the west, and west of Reynolds Campground, and postings at Jackson Glacier Overlook and Sperry trailheads will be placed before and during the project. The closures will be a one-time event, possibly occurring a second season if reapplication of rotenone is necessary.

[6] Closure period does not equate to the rotenone application period, which is two to four days.

PROJECT TRANSPORTATION NEEDS

Project personnel will hike to the project area for all stages of the project (i.e., removal of rainbow trout, collection of donor fish, translocation of native fish, monitoring, etc.).

Equipment and gear will be packed to the lake on foot or by livestock whenever feasible (e.g., depending on weight and size of equipment, whether equipment can be safely packed on livestock, and whether trail conditions are conducive to livestock use). Helicopters will be necessary to transport boats, rotenone, the generator, water pumps, and possibly other equipment to and from the project area. Items to be packed versus flown-in by helicopter will be at the discretion of the NPS packers. Fish for translocation will likely need to be transported to the lake by helicopter to reduce the risk of mortality compared with transport on foot or with livestock; juvenile mountain whitefish will likely be directly transported to Gunsight Lake by foot or on livestock, but if excessive mortality occurs during transport a helicopter will be used. Helicopters will deliver and pick up equipment and fish by means of long-line sling loads, and/or fish could be aerially stocked.

The number of flights will depend on the size of helicopter available at the time (i.e., smaller helicopters could carry less weight resulting in more flights). At this time, approximately 15 flights (estimated) may be required for the rotenone application and detoxification phases of the project. The number of flights for fish translocation is estimated at one to two flights per year over a period of approximately six to eight years. Glacier National Park limits administrative flights to 50 flights each year. The park will make every effort to include helicopter flights for this project within the 50-flight limit on administrative flights; however, for the purposes of impacts analysis, the EA evaluated flights for this project as if they will be in addition to the 50-flight limit. Every effort will be made to combine flights for this project with other administrative flights. This will also be the case if reapplication of the rotenone is necessary.

Summary of Project Phase Duration (estimated):

- Project Stage 1: Remove Rainbow Trout
    - Rotenone application: 2 to 4 days; will begin September 2023
    - Detoxification: 3 to 4 weeks; will begin during and after rotenone application
- Project Stage 2: Translocate Native Westslope Cutthroat, Bull Trout, and Mountain Whitefish
    - Collection of donor fish: 1 to 2 weeks per year for three years; may begin in 2023 at the earliest
    - Translocation: 6 to 8 years; may begin in 2024 at the earliest

Rationale for Decision

The NPS has selected Alternative A because it best meets the project purpose and need without causing significant impact to park resources. Other alternatives were considered but were not fully analyzed in the environmental impacts assessment.; see EA for rationale for dismissal.

The selected action meets the purposes of:

- Conserving native, locally adapted, and genetically pure westslope cutthroat trout in the St. Mary River drainage.
- Conserving the genetic diversity of bull trout and westslope cutthroat trout east of the Continental Divide.
- Expanding the long-term distribution and security of native westslope cutthroat and bull trout in the St. Mary River drainage and range wide.

- Complementing ongoing native fish conservation efforts of MFWP, US Fish and Wildlife Service (USFWS), and the Blackfeet Nation.
- Protecting and enhancing recreational opportunities for anglers to fish for native westslope cutthroat trout in the St. Mary River drainage.

CHANGES TO THE SELECTED ACTION

The following adjustment has been made to Alternative A since the EA was released for public review.

- Mountain whitefish will also be translocated to Gunsight Lake to increase conservation value of the project by providing additional forage for bull trout and to protect or "buffer" westslope cutthroat from predation by bull trout. The change comes from three separate comments that the NPS received during the EA public comment period. Changes to the impacts analysis in the EA include impacts to mountain whitefish from the removal of individuals from donor populations during translocation, interspecies competition with westslope cutthroat trout, beneficial effects to westslope cutthroat trout as a predation buffer against bull trout, and some additional predation pressure on aquatic macroinvertebrates at Gunsight Lake. Impacts to the untrammeled quality of recommended wilderness remain as currently described, since the analysis in the EA already includes impacts from the collection and translocation of native fish. Juvenile mountain whitefish will likely be transferred directly to Gunsight Lake on foot or with livestock. If excessive mortality occurs during transfer and whitefish need to be flown in, there will be no increase to the number of flights estimated for the EA.

MITIGATION MEASURES

The NPS strongly emphasizes avoiding, minimizing, and mitigating potentially adverse environmental impacts. Therefore, the NPS will require multiple mitigation measures and best management practices to protect environmental and cultural resources potentially affected by the project. These measures and practices are described in Appendix B of the EA and Appendix B of this document.

The authority for mitigation for this project comes from laws and policies, including:

- NPS Organic Act (16 USC § 1)
- The Redwood Act (HR 3813 (95th)
- 1978 National Parks and Recreation Act
- Endangered Species Act, as amended (16 USC § 1531 et seq.)
- Director's Order 41: *Wilderness Stewardship* (2013)
- NPS *Management Policies 2006* (chapters 4, 5, and 6)

AGENCIES AND PERSONS CONSULTED

The public was provided two opportunities to comment on the project. The NPS accepted public comments during scoping from 27 September until 26 October 2022. The EA for the project was released to the public for review on 15 May 2023 and was open for comment until 14 June 2023. A summary of substantive public comments received and responses from the NPS are provided in Appendix C of this document.

On 27 September 2022, Glacier National Park notified the USFWS of public scoping for the project. In a biological assessment (BA) and letter submitted on 15 May 2023 to the USFWS in compliance with section 7 of the Endangered

Species Act (ESA), the NPS determined that the selected action will have no effect on whitebark pine (*Pinus albicaulis*), meltwater lednian stonefly (*Lednia tumana*), western glacier stonefly (*Zapada glacier*), Canada lynx (*Lynx canadensis*) critical habitat, or the candidate monarch butterfly (*Danaus plexippus*); may affect but is not likely to adversely affect the grizzly bear (*Ursus arctos*) and Canada lynx; and is not likely to jeopardize the continued existence of the wolverine (*Gulo gulo*). The USFWS concurred with park's determinations on 7 June 2023. The effects on bull trout within the donor streams from handling and egg collection were assessed under a separate research and recovery permit under section 10 of the ESA, as authorized by Programmatic Intra-Service Consultation, TAILS No. 01EOFW00-2020-F-0082.

Scoping was initiated with the Blackfeet Nation, Confederated Salish and Kootenai Tribes (CSKT), Chippewa Cree Tribe, and Montana State Historic Preservation Office (SHPO) on 27 September 2022. Blackfeet Nation Fish and Wildlife, Blackfeet Nation Tribal Historic Preservation Office, CSKT Tribal Historic Preservation Office, and CSKT Tribal Fish and Game were contacted for comments by phone and email on 26 October 2022. CSKT responded in support of the project. The park met in person with Blackfeet Nation Tribal Historic Preservation Office on 16 November 2022 and provided an update on the proposed project. Similarly, the park met with the CSKT Historic Preservation Office on 15 December 2022 and provided an update. No comments were provided by either tribal preservation office during these meetings. The park met with the Blackfeet Nation Environmental Office and Blackfeet Nation Fish and Wildlife on 15 February 2023 by phone with project updates; no comments were provided. The park contacted the Montana SHPO on 12 April 2023 by phone and provided an update on the project. No comments were provided. Consulting parties received an email and a printed copy of the EA on 15 May 2023. Park staff met with Blackfeet Nation Fish and Wildlife on 12 June 2023. Comments received from the Blackfeet Fish and Wildlife Office during that meeting are incorporated into the comments and responses in Appendix C of this FONSI. No further comments were received by consulting parties.

FINDING OF NO SIGNIFICANT IMPACT

Potentially Affected Environment

Under the selected action, the project area is defined as the Gunsight Lake drainage, from the head of Gunsight Lake extending approximately three miles downstream, near Mirror Pond. This area encompasses the proposed rotenone treatment area and detoxification site. Gunsight Lake is located on the east side of Glacier National Park in the headwaters of the St. Mary River drainage and is within the park's 1974 recommended wilderness boundary. Gunsight Lake is 114 surface acres in size and sits at an elevation of 5,324 feet. Lake volume is estimated at 3,605 acre-feet and the lake has a maximum depth of 55 feet. The rotenone treatment area includes Gunsight Lake and a segment of the St. Mary River extending downstream from the foot of the lake to the detoxification site below an unnamed waterfall. The detoxification site will be approximately three miles downstream of the lake. The project area also includes potential fish donor source locations under consideration for Gunsight Lake translocation efforts and includes several waters within the larger St. Mary River drainage. These streams include Jule, Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, Midvale, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes. Recreational facilities within the project area include the Gunsight Pass Trail and one wilderness campground. The Gunsight Pass Trail begins at the Jackson Glacier Overlook trailhead on the east side of the Going-to-the-Sun Road and parallels the St. Mary River for a majority of its distance. The trail meets the foot of and then parallels Gunsight Lake to the south until it crests the Continental Divide, ultimately connecting to the Sperry Trailhead on the west side of the Going-to-the-Sun Road. It is a popular point-to-point, through-hike for visitors. The wilderness campground sits at the foot of Gunsight Lake and includes six tent sites, a food prep area, and pit toilets.

AQUATIC SPECIES

BULL TROUT – ESA LISTED THREATENED, MONTANA SPECIES OF CONCERN

Bull trout are a large char[1] native to the northwestern US and western Canada and are a top aquatic predator. Once abundant in the Columbia River basin, bull trout have declined in distribution and abundance in recent decades (USFWS 1999). The imperiled status of bull trout led the USFWS to list the species as threatened under the ESA in 1998. Glacier's waters are an important stronghold for bull trout, since the park contains approximately one-third of the remaining natural (i.e., undammed) lake core habitat areas supporting bull trout in the US (USFWS 2015).

The St. Mary River drainage is the only drainage in the US where bull trout can be found east of the Continental Divide. As such, these "east-side" bull trout populations have high conservation value. The St. Mary River Core Area supports several bull trout populations including Kennedy Creek, Boulder Creek, and Divide Creek. The Kennedy Creek bull trout population is currently in dramatic decline, apparently driven by habitat and climate impacts, including an absence of spawning gravel and declining stream flows. The Boulder Creek population appears fairly stable (approximately 100 spawning adults), but this stability is linked to adequate stream flow conditions (Kaeding and Mogen 2022) and climate driven changes are a risk. The Boulder Creek population also suffers losses of sub-adult/juvenile bull trout out-migrating from Boulder Creek into the St. Mary irrigation diversion system near Babb. Cracker and Slide Lakes are physically secured by barrier falls but their bull trout populations are small and non-migratory. Recent genetic evidence shows that hybridization with brook trout is threatening the genetic lineage of St. Mary bull trout. Hybridization between bull trout and brook trout has been recently documented in Boulder Creek and is particularly alarming as Boulder Creek represents the only remaining migratory bull trout population of any notable size in the St. Mary River drainage (J. Mogen, USFWS, personal communication). Red Eagle Lake's bull trout population is vulnerable to invasive brook trout as there is no barrier blocking brook trout access. A warming climate increases the potential for brook trout to further expand their distribution in the St. Mary system, increasing the risk.

The threats to bull trout are being compounded by climate-related habitat alterations. Climate driven changes in precipitation patterns resulting in altered flow regimes have been shown to adversely impact bull trout populations in the St. Mary River drainage (Kaeding and Mogen 2022). Bull trout require among the lowest water temperatures for optimal growth of any North American trout or salmon species (Selong et al. 2001). Bull trout also require stable stream channels with gravel and cobble bottoms for spawning and rearing young; these conditions are at risk from climate-induced increases in sedimentation in the wake of more frequent forest fires and channel instability during rain-on-snow events. There is anecdotal information suggesting channel instability and the inability of the stream to retain appropriate size spawning gravel could be playing a role in reduced bull trout spawning activity in Kennedy Creek (J. Mogen, personal communication).

Future planned actions include periodic interagency native fish population assessments and Glacier fisheries management projects, which involve gill net surveys and annual electrofishing monitoring.

WESTSLOPE CUTTHROAT - MONTANA SPECIES OF CONCERN

Historically the most abundant and widely distributed subspecies of cutthroat trout throughout the west, the westslope cutthroat trout currently occupies less than 30 percent of its historic range in Montana (Muhlfeld et al. 2016). Population declines are due to a variety of factors, including habitat loss or degradation, excessive harvest by anglers, and effects from non-native fish (Liknes and Graham 1988). Hybridization with non-native rainbow trout is one of the primary threats to westslope cutthroat trout (Muhlfeld et al. 2016). Non-hybridized populations of westslope cutthroat trout occupy less than ten percent of their historic range in the US (Shepard et al. 2005), and less than three percent in Montana (Liknes and Graham 1998). In the St. Mary River drainage, all but one (Roberts Creek) of the remaining westslope cutthroat trout populations have some level of hybridization with either rainbow or Yellowstone cutthroat trout. Non-native rainbow trout and brook trout are also believed to compete with

westslope cutthroat trout for food and space (Shepard 2004; Hitt et al. 2003; Muhlfeld et al. 2016). Lake trout (*Salvelinus namaycush*) pose a major predation risk to westslope cutthroat trout in Glacier. These influences threaten the long-term persistence of westslope cutthroat trout throughout their occupied habitat in the park.

Climate change-induced habitat alterations are also impacting westslope cutthroat through increased rates of hybridization (Muhlfeld et al. 2014). Warmer stream temperatures may give non-native invasive fish an advantage, as with rainbow and brook trout, which tolerate higher water temperatures than native westslope cutthroat (Kovach et al. 2017). In the northern Rocky Mountains, warmer water temperatures may hasten or facilitate the ability of rainbow trout to spread and hybridize with native westslope cutthroat trout, likely due to multiple physiological, biological, and life-history factors, such as spawning and incubation times, combined with decreases in spring precipitation and runoff (Kovach et al. 2017). In areas near historical rainbow trout stocking areas, hybridization with native westslope cutthroat trout was more likely in waters with warmer water temperatures, lower spring precipitation and runoff, and higher rainbow trout numbers; cold-water sites were also susceptible to invasion (Kovach et al. 2017).

Westslope cutthroat trout are not currently present in the project area. The nearest known populations are in the tributaries to St. Mary Lake, such as Rose Creek, Wild Creek, and Divide Creek.

Future planned actions include periodic interagency native fish population assessments and Glacier fisheries management projects, which involve gill net surveys and annual electrofishing monitoring.

MOUNTAIN WHITEFISH

Mountain whitefish are a member of the trout family, Salmonidae, and found across much of western Montana. They are generally common in rivers and lakes of northwest Montana (Montana Field Guide accessed 6/26/2023; Mountain Whitefish - Montana Field Guide (mt.gov)) and are native in the St. Mary drainage. The typical mountain whitefish is 10 to 16 inches in length. Whitefish have a sub-terminal mouth adept at feeding on or near the bottom of streams and lakes where they feed on macroinvertebrates. They are known to provide forage for larger trout, including bull trout.

Future planned actions include periodic interagency native fish population assessments and Glacier fisheries management projects, which involve gill net surveys and annual electrofishing monitoring.

AMPHIBIANS

Surveys conducted by US Geological Survey (USGS) staff have documented the presence of the western toad (*Anaxyrus boreas*), long-toad salamander (*Ambystoma macrodactylum*), and the Columbia spotted frog (*Rana luteiventris*) in the upper St. Mary River drainage (B. Hossack, USGS, personal communication). In 2020, Glacier National Park conducted an amphibian survey at the outlet of Gunsight Lake and the headwaters of the St. Mary River in the vicinity of the rotenone treatment area. These surveys documented the presence of the Rocky Mountain tailed frog (*Acaphus montanus*), western toad, and Columbia spotted frog; two other amphibians known to exist in the park, the boreal chorus frog (*Pseudacris maculate*) and the long-toed salamander were not detected at Gunsight Lake. Of these amphibians, the western toad is listed as a species of concern in the state of Montana. Given their physiological requirements, limited dispersal abilities, and hydrologically sensitive habitats, amphibians are likely to be highly sensitive to future climatic changes (Lawler et al 2010).

Future planned actions include continued research, monitoring, and surveys.

AQUATIC MACROINVERTEBRATES

Glacier supports a diversity of aquatic macroinvertebrates including mayflies, stoneflies, caddisflies, midges, mollusks, and worms, among others. Recent stream surveys have provided information on the distribution and abundance of several species at the parkwide scale (NPS data 2022; Giersch et al. 2017). The NPS sampled benthic macroinvertebrates (species inhabiting the bottom of water environments) in Gunsight Lake and the upper St. Mary River in 2019, 2021, and 2022 (NPS, unpublished data). Samples were evaluated to the genus level; species were not identified because there were not sufficient diagnostic physical features for definitive identification of larval and nymph stages. Results included a diversity of mayflies, stoneflies, caddisflies, midges, mollusks, and worms, among others. Aquatic macroinvertebrates in Gunsight Lake have likely been impacted by predation from introduced rainbow trout since the 1920s and 30s. Future planned actions include continued research, monitoring, and surveys.

Two aquatic macroinvertebrates listed by the state of Montana as species of concern that could be present in the project area include the cordilleran forestfly (*Zapada cordillera*) and a rhyacophilan caddisfly (*Rhyacophila ebria*). Other state-listed aquatic macroinvertebrate species that were not detected in recent surveys and are highly unlikely to be present in the project area were dismissed from detailed analysis in the EA.

Future planned actions include continued research, monitoring, and surveys.

ZOOPLANKTON

Ellis et al. (1992) compared zooplankton abundance and species composition in both fish-bearing and fishless backcountry lakes in the park and noted populations of smaller zooplankton species (i.e., rotifers) in lakes where fish were introduced (similar to Gunsight Lake). Fish tend to graze on larger plankton species (copepods and cladocerans), impacting the relative abundance of zooplankton in a body of water and causing a shift in species that favors smaller species. Ellis et al. (1992) did not report sampling zooplankton in Gunsight Lake. More recent sampling was conducted in Gunsight Lake by the NPS in 2021 to 2022 in early September of each year. The more recent plankton sampling results revealed a dominance of cladocerans and copepods, with rotifers also present but at a much lower density (C. Downs, NPS, personal communication). Climate warming and increased climatic variability are expected to alter snowpack, ice-free season length, and summer water temperatures in unproductive high-elevation ecosystems, thereby affecting their biodiversity and functioning (Parker et al. 2008). Predation of zooplankton by non-native rainbow trout is likely occurring at Gunsight Lake but it is not known to what degree zooplankton communities at the lake have changed since the lake was stocked with rainbow trout in the 1920s and 30s.

There are no planned actions that would affect zooplankton in the analysis area.

WILDLIFE

GRIZZLY BEARS - ESA LISTED THREATENED, MONTANA SPECIES OF CONCERN

Glacier is part of the Greater Glacier Area (GGA) in the northern third of the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear (*Ursos arctos*) Recovery Zone. The GGA is defined from north to south by the Canadian border and the park's southern boundary, and from east to west by the Blackfeet Indian Reservation and the Whitefish Mountains (Kendal et al. 2008). Genetic analysis of hair samples collected during 1998 to 2000 resulted in a population estimate of 241 grizzly bears in the GGA (Kendall et al. 2008). No population estimate has been developed exclusively for Glacier. Data from the NCDE grizzly bear population trend monitoring project indicates that the ecosystem's grizzly bear population trend is increasing at 2.3 percent per year (data from 2004-2011; Costello et al. 2017).

The remote, expansive backcountry in the upper St. Mary River drainage provides travel corridors, valuable habitat, and seclusion from human activity for resident and non-resident bears. Grizzly bear habitat modeling indicates high-value grizzly bear habitat in the upper St. Mary River drainage, especially in the spring (CEM 2004, based on findings from Mace et al. 1999). In summer and fall, habitat values are high in the upper drainage in the vicinity of Gunsight Lake, with decreased values in the lower and middle portions of the drainage. The Gunsight Lake area contains excellent bear habitat including numerous avalanche chutes and watering areas, and grizzly bears are routinely observed in the project area. Future planned actions include five-needle pine restoration, invasive plant control, fire management, bear management, and certain resource monitoring and research activities (such as those that involve specimen collection).

COMMON LOONS – MONTANA SPECIES OF CONCERN

Common loons have been documented in the St. Mary River drainage, with the majority of these observations being documented on St. Mary and Lower St. Mary Lakes. Detections at Gunsight Lake are fewer; documented observations of common loons occurred in 2008, 2016, and 2019. Nesting activity has not been documented on either St. Mary or Gunsight Lakes; both lakes are thought to be primarily used for supplemental foraging or by migratory individuals in the fall (J. Belt, NPS, personal communication).

Future planned actions include continued surveys and monitoring.

WATER BIRDS (DUCKS, SWANS, GEESE, GREBES, CORMORANTS, AND COOTS)

Most of the lakes and streams in Glacier provide prime breeding and foraging habitat for water birds (ducks, swans, geese, grebes, cormorants, and coots). Many of these species are migratory, arriving in April and May, whereas others such as Canada geese, common mergansers, goldeneyes, buffleheads, and mallards are year-round residents if waters remain ice-free. Breeding among these species typically begins in May, with nesting beginning in May or June and finishing by late July. The brood-rearing period, when chicks are out of the nest but still dependent on the adults, typically extends into August/September depending on the species.

In the St. Mary River drainage, primarily in St. Mary and Lower St. Mary Lakes, Barrow's goldeneyes (*Bucephala islandica*), common goldeneyes (*Bucephala clangula*), mallards (*Anas platyrhynchos*), common mergansers (*Mergus merganser*), buffleheads (*Bucephala albeola*), green-winged teals (*Anas carolinensis*), and Canada geese (*Branta canadensis*) have been documented (NPS files), but other species could use the area. While some water bird species feed almost exclusively on fish, some feed primarily on insects, and others are omnivorous, feeding also on aquatic vegetation. Although Glacier is important for breeding and foraging waterfowl, it is not known as a stopover location for migrating waterfowl.

Waterfowl are sensitive to human disturbance, especially those associated with loud noise and visible features, and are most vulnerable during the nesting, brood-rearing, molting, migration, and wintering periods of their annual cycle (Korschgen and Dahlgren 1992). In addition, climate change is expected to alter the bird communities, including waterbirds, within the park. Glacier is, or may become, home to 32 species that are highly sensitive to climate change across their range. Thirteen of these species may be extirpated from the park in at least one season (winter and/or summer) by 2050 (Langham et al. 2015).

Future planned actions include continued research, monitoring, and studies to better understand bird population trends, including through the ongoing Monitoring Avian Productivity and Survivorship project.

WATER QUALITY

The water quality at Gunsight Lake is excellent and reflects "the pristine attributes that stimulated the creation of Glacier National Park and its designation as a Biosphere Reserve." Gunsight Lake is oligotrophic, meaning it has very low productivity and clear, clean water, similar to many alpine lakes in the park.

There are no future planned actions that would affect water quality in the project area. In general, water temps at waters in the park and surrounding region are predicted to increase with climate change (Jones et al. 2017).

RECOMMENDED WILDERNESS

In 1973, Glacier completed a wilderness study and environmental impact statement (EIS) to comply with the 1964 Wilderness Act. The Wilderness Study/EIS identified 927,550 acres in Glacier (over 90 percent of the park) for Wilderness designation (NPS 1974) and resulted in a recommendation of same by the President of the United States to Congress. Congress has not enacted legislation to formally designate Glacier's wilderness recommendation as Wilderness. The NPS manages recommended wilderness to ensure that wilderness character is preserved and will take no action that would diminish the wilderness eligibility of any area possessing wilderness characteristics until the legislative process of wilderness designation has been completed (NPS Management Policies 2006). The upper St. Mary River drainage and entire project area are within recommended wilderness.

Future planned actions include five-needle pine restoration, invasive plant control, fire management, bear management, and certain resource monitoring and research activities (such as those that involve specimen collection).

Untrammeled Quality

Recommended wilderness in Glacier, including the Gunsight drainage and project area, is a largely untrammeled, unmanipulated landscape. Some management of the biophysical environment occurs to protect other park resources and preserve the natural condition of wilderness character, including controlling the spread of non-native invasive plants, fire suppression, and bear management.

Undeveloped Quality

The majority of Glacier's recommended wilderness is undeveloped, despite the presence of historic, administrative, and scientific structures and installations. The park uses non-motorized, traditional hand tools and non-mechanical transport for administrative activities in recommended wilderness whenever feasible, but motorized equipment (i.e., chainsaws, portable generators, motorized trail brushers, etc.) must sometimes be used during trail and campsite maintenance. Motorboats are currently used at four lakes in the park's recommended wilderness, including Quartz and Logging Lakes for lake trout suppression (NPS 2014), and Bowman and Kintla Lakes where NPS Park Rangers maintain boats for administrative purposes (such as shuttles for trail crews and researchers) and emergencies. Motorboats have not previously been used at Gunsight Lake. Helicopters may also be used in the park's recommended wilderness to fly materials and equipment to remote project areas. Helicopter activity in the Gunsight drainage is relatively infrequent, but helicopters may fly over the area when travelling to other destinations. Landings have also been documented at Gunsight Lake for emergency purposes.

Natural Condition

The natural condition of recommended wilderness in Glacier is characterized by native plants and animals, healthy terrestrial and aquatic ecosystems, biodiversity, air and water quality, geologic processes, and other natural

processes. The natural quality of the park's wilderness character is degraded by several influences, including non-native species, which can put the long-term persistence of native species and ecological integrity at significant risk.

Solitude or Primitive and Unconfined Recreation

Glacier's recommended wilderness provides numerous outstanding opportunities for primitive and unconfined recreation including hiking, fishing, and backcountry camping. The park's recommended wilderness also gives visitors the opportunity to experience solitude and self-reliance. Gunsight Lake and the St. Mary River drainage offer excellent opportunities for solitude and primitive recreation, even though the area is popular among visitors. Recreational facilities include the Gunsight Pass and Jackson Glacier Trails, and backcountry camping is regulated through permits at the designated campground at the base of Gunsight Lake.

THE DEGREE OF EFFECTS OF THE ACTION

The following topics have been considered in evaluating the degree of the effects (40 CFR 1501.3(b)(2)) for the selected action.

Beneficial, Adverse, and Short- and Long-term Effects of the Proposed Action

As described in the EA (and text changes for mountain whitefish in the errata of this FONSI), the selected action has the potential for adverse impacts on bull trout, westslope cutthroat trout, mountain whitefish, amphibians, aquatic macroinvertebrates, zooplankton, grizzly bears, common loons, water birds (ducks, swans, geese, grebes, cormorants, and coots), water quality, recommended wilderness, natural soundscapes, and visitor use and experience; however, no potential for significant adverse impacts was identified.

Bull trout (ESA listed threatened species and Montana species of concern), Westslope Cutthroat (Montana species of concern), and Mountain Whitefish

For westslope cutthroat trout, bull trout, and mountain whitefish, the impacts will primarily be beneficial and long-term, since the selected action will remove a risk of hybridization, provide habitat refugia, and further the conservation of bull and westslope cutthroat trout locally and at a range-wide scale. There is no potential for adverse impacts to westslope cutthroat, bull trout, or mountain whitefish from the use of rotenone and potassium permanganate because these species are not present in the rotenone treatment area. There will be some adverse impacts during translocation from capturing and handling adult fish (one to two weeks per year for an estimated three years) as well as the removal of eggs from the donor systems. Population level impacts are not expected from the removal of eggs. This is because the removal of the eggs will be mitigated by partially spawning each female (only about 50 percent of the eggs will be taken from each female handled) to allow for some natural reproduction, producing only enough eggs to fully seed the available juvenile rearing habitat or supply the fish hatchery for rearing. Population-level impacts will also not be expected because donor fish will come from populations that are demographically strong enough to support the removal (i.e., the populations are large enough to withstand the removal of some fish) and no more than 10 percent of the population will be removed. This level of removal presents minimal chance of decreasing natural reproduction or the available genetic pool for the population.

Amphibians, Macroinvertebrates, and Zooplankton

For amphibians, macroinvertebrates, and zooplankton, the impacts from the selected action will be adverse and temporary, lasting until populations recover in two to four seasons. Impacts will be adverse since amphibian larvae, some aquatic macroinvertebrates, and zooplankton will be killed during rotenone and potassium permanganate applications. Based on post-treatment monitoring of other MFWP applications that indicate the persistence of amphibian populations following treatment, and because amphibian mortality will likely be limited to the larval

stage, local amphibian population abundance will likely recover within a year or two. Local aquatic insect population abundance will likely recover in two to four years. If necessary, amphibian and aquatic insect populations will be re-established by translocating individuals from nearby, similar habitat. Collection of donor fish could cause individual mortality of some aquatic macroinvertebrates from trampling as personnel are walking through the stream. Any impacts will be limited to the individual level, with no changes to species distribution or abundance. Zooplankton densities have been shown to recover within a few months of rotenone application, with no change in species diversity, as evidenced by MFWP sampling (Schnee et al. 2021) associated with treatments elsewhere and their egg structure. Based on this, zooplankton communities will likely recover from any effects from the rotenone by the following spring (Anderson 1970; Kiser et al. 1963). Since zooplankton primarily inhabit lakes, most will not be in the stream where they could be exposed to potassium permanganate and, therefore, will not be affected by it (potassium permanganate will only be applied to the stream).

Translocating westslope cutthroat trout, bull trout, and mountain whitefish will not result in predatory influences on amphibians, aquatic macroinvertebrates, or zooplankton that are noticeably different from that of the rainbow trout that are currently present in the lake. Mountain whitefish could create more feeding pressure on bottom-dwelling invertebrate species, but not enough to meaningfully change aquatic macroinvertebrate species composition, abundance, and distribution.

Grizzly Bears (ESA listed Threatened species and Montana species of concern)

For grizzly bears, the impacts from the selected action will be adverse and temporary, lasting until project activities cease. Impacts will be adverse since increased human activity and noise from the use of motorboats and helicopters could disturb or displace grizzly bears. If present, grizzly bears could be displaced from travel routes and foraging areas. Some bears may avoid the project area and peripheral habitat. The potential for disturbance will be highest during helicopter long-line sling-load operations, aerial planting of native fish with a helicopter, the use of motorized watercraft, and other motorized equipment such as generators and water pumps. Adverse impacts during rotenone application and the detoxification process will be temporary, ending once treatment and detoxification is complete (after an estimated three to four weeks in the fall of 2023). The potential for disturbance impacts during helicopter long-line sling load operations will be highly intermittent, for a few minutes at a time for each flight, estimated at approximately 15 flights for the rotenone application and detoxification phase. Subsequent impacts from helicopter operations during native fish translocation will be intermittent and infrequent, with one to two flights anticipated every year over a period of approximately six to eight years. Impacts will occur at the individual level; there will be no population effects and no effects to the overall distribution of bears since project activity will be localized to Gunsight Lake and the stream during project implementation, with transitory effects along helicopter flight paths, leaving the vast majority of grizzly bear habitat in the park unaffected. The potential for disturbance to bears along flight paths will be mitigated by requiring helicopters to follow suggested flight paths away from sensitive areas and along road corridors and over developed areas whenever feasible (Appendix B, Mitigation Measures). No grizzly bear habitat will be lost because of the project and there will be no potential for grizzly bear mortality.

There is potential for grizzly bears to encounter project personnel, possibly increasing the risk of dangerous bear-human encounters as personnel work off trail in densely vegetated riparian areas and/or near rushing water where surprise encounters could occur. Gunsight Pass trail and Gunsight Lake campground are high-use visitor areas, however, and the campground is often fully booked throughout peak summer months. Therefore, the risk of a negative grizzly encounter with project personnel will not be meaningfully different from the existing risk presented by hikers, campers, and anglers. Bear safety training will be required for all project personnel, which will reduce the risk of dangerous encounters. The chance of a grizzly bear obtaining human sources of food will be extremely low, given the park's strict enforcement of attractant storage requirements.

The removal of rainbow trout and the establishment of native fish in Gunsight Lake will not change forage for grizzly bears; there are no records of grizzly bears foraging on rainbow trout at Gunsight Lake and, in general, there is little to suggest that fish provide much of a food source for grizzly bears within Glacier (J. Waller, NPS, personal communication). During the removal of rainbow trout, sinking dead fish that do not remain submerged will eliminate much of the potential for grizzly bears to scavenge carcasses, but some scavenging could occur. Grizzly bears will not be affected by any consumption of fish killed by rotenone, nor by potassium permanganate, since treatment

concentrations will be far below levels that are toxic to mammals (EPA 2007) (as described in Appendix E of the EA, Issues and Impact Topics Dismissed from Detailed Analysis, Wildlife). California Department of Fish and Game (1994) studies of risk for terrestrial animals estimated that a 22-pound dog would have to drink 7,915 gallons of lake water within 24 hours or eat thousands of pounds of rotenone-killed fish to receive a lethal dose.

Common Loons (Montana Species of Concern) and Water Birds (ducks, swans, geese, grebes, cormorants, and coots)

For common loons and waterbirds, the impacts from the selected action will be adverse because the mortality of fish, amphibian larvae, and some aquatic macroinvertebrates will remove a source of prey and noise from motorboats and helicopters could cause temporary disturbance or displacement. Adverse impacts from the loss of prey will be temporary, lasting until translocated westslope cutthroat trout, mountain whitefish, and bull trout become established and amphibian and aquatic insect populations recover (estimated at two to four seasons). Common loons will not likely be rearing young at Gunsight Lake and many birds typically migrate out of the park by late summer/early fall. Displacement habitat at nearby lakes will remain unaffected, and rotenone treatments will not begin until after the critical nesting/brood rearing period. Therefore, any disturbance or displacement due to project noise will not meaningfully alter the availability of resting or foraging habitat for common loons or other water birds, nor observably change common loon and water bird abundance, distribution, or species composition. If present in the treatment area, common loons and other water birds will not be directly affected by rotenone or potassium permanganate, since treatment concentrations will be far below levels that are toxic to birds.

Water Quality

For water quality, the impacts from the selected action will be adverse and temporary (resolved by the following spring) from the application of rotenone and potassium permanganate, a potential increase in dissolved oxygen from decomposing fish, and a small number of hydrocarbons deposited into the lake during operation of motorized watercraft. There will be no lasting impacts given the degradability of the chemicals; rotenone and potassium permanganate's toxicity will decline rapidly as they react with the natural stream environment and will not be expected to persist for more than 10 to 15 minutes of flow time (Engstrom-Heg 1971 and 1972). Both rotenone and potassium permanganate will dissipate to the point where there will be no detectable long-term changes to water quality. Potassium permanganate will produce a temporary dark purple color to the creek, which usually dissipates in a few hundred yards or approximately 30 minutes. Case studies in Montana have concluded that rotenone movement through groundwater does not occur. There will be no impacts to water quality from the dye test with fluorescein because fluorescein is inert, non-toxic, and completely degradable.

Decomposing dead fish in the lakes could potentially decrease dissolved oxygen in the immediate vicinity of the carcasses. Amphibian larvae and aquatic macroinvertebrates that survive the rotenone may be susceptible to changes in dissolved oxygen; however, since the fish carcasses will likely be spread out and not concentrated in any one area, areas of low dissolved oxygen will be small, and there will be areas in the lake where oxygen levels are unchanged. Oxygen sags large enough to cause meaningful impacts will be unlikely in Gunsight Lake due to the volume of water (3,600 acre-feet) that will compensate for changes. Any oxygen sags will be temporary, recovering to normal levels by the following spring.

A small number of hydrocarbons will be deposited into Gunsight Lake during operation of motorized watercraft. This impact will be unavoidable because outboard motors emit exhaust under water through the propeller. Water volumes in the lakes (3,600 acre-feet at Gunsight Lake) and water exchange through the inlets and outlets will be sufficient to dilute any hydrocarbon emissions to levels that will not be measurable or affect water quality in any meaningful way.

Recommended Wilderness

The selected action will have short and long-term adverse impacts to recommended wilderness from: 1) the manipulation of the biophysical environment through the removal of non-native rainbow trout and the translocation of native fish (adversely impacting the untrammeled and natural qualities) 2) temporary installation of rotenone application equipment, detoxification equipment, streamside incubators, and fish monitoring devices (adversely impacting the undeveloped quality); 3) the temporary use of motorized watercraft, water pumps, a generator, and helicopters (causing temporary impacts to the undeveloped quality and opportunities for solitude); 4) temporary closure of the treatment area (temporarily impacting unconfined recreation); and 5) mortality of native aquatic organisms (adversely impacting the natural condition).

Following treatment (2 to 4 days for rotenone application and 3 to 4 weeks for detoxification) and translocation (6 to 8 years), the intensity of adverse impacts to the untrammeled quality will dissipate over time as the area becomes once again "affected primarily by the forces of nature." Impacts to the undeveloped quality and opportunities for solitude will be temporary, ceasing once the rotenone has been detoxified and equipment can be removed from the project area (estimated three to four weeks). After this, adverse impacts will be infrequent and punctuated, occurring during long-line sling load and helicopter fish planting operations for translocation (estimated at one to two flights per year for approximately six to eight years). Post-treatment monitoring devices for translocated fish (e.g., the fish could be marked with tags) will be in place for several years but will be too small and concealed to noticeably change the undeveloped quality of wilderness character and will be removed when monitoring is complete. While the selected action could cause the number of administrative helicopter flights to exceed the park's annual limit of 50, any increase will not be permanent, occurring for one season, two at most if reapplication is necessary, and then infrequently for native fish translocation. Adverse impacts to opportunities for unconfined recreation will be temporary, ending once area closures are lifted. Adverse impacts to the natural quality from mortality of native aquatic organisms will be temporary, lasting until amphibian, aquatic macroinvertebrate, and zooplankton populations recover in two to four seasons.

Minimum Requirements Analysis

Because the selected action will affect wilderness character and include uses prohibited under Section 4c of the Wilderness Act (motorized equipment, installations, and helicopter landings) within recommended wilderness, a minimum requirements analysis (MRA) is required by NPS policy. The MRA has been prepared and approved. The MRA is available on the project PEPC site at https://parkplanning.nps.gov/GunsightLake with this FONSI.

Natural Soundscapes

The selected action will have short-term adverse impacts to natural soundscapes due to noise from the temporary use of motorized watercraft, water pumps, helicopters, and generators. Noise will generally be sporadic, occurring intermittently over an estimated 8 to 12-hour period each day for approximately two to four days during rotenone application, when motorized watercraft and water pumps are in use, and for a few minutes at a time during helicopter long-line sling-load operations (estimated at 15 flights during the rotenone and detoxification phase) and fish translocation (estimated at one to two flights per year over a period of approximately six to eight years). Continuous noise will occur during rotenone detoxification since the generator will run 24 hours a day, seven days a week to power the auger dispensing the potassium permanganate, for an estimated three to four weeks. Project noise will be loudest at the source and attenuate over distance until it reaches background natural ambient sound levels, estimated at 1.1 to 1.2 miles for the motorboat, 0.2 mile for the generator, and 1.6 to 4.4 miles for the helicopter depending on the model (as derived from an attenuation calculator/sound modeling tool developed by the NPS Natural Sounds and Night Skies Division). Since project noise will attenuate to ambient levels within approximately 3.5 miles (at most) of the treatment area, soundscapes in the majority of the park will remain unaffected. Noise will be masked by the ambient sounds of moving water and weather and blocked by terrain shielding, reducing its audibility outside the project area. Noise will be too sporadic or too localized and sufficiently masked to meaningfully change the overall character of soundscapes in the upper St. Mary River drainage.

Visitor Use and Experience

For visitor use and experience, the impacts from the selected action will be short-term and adverse from temporary closures of recreational resources during the project and from project noise. While the label requirements for rotenone state that public entry into the treatment area could occur immediately after application, the Gunsight Lake wilderness campground will be closed the duration of the project (anticipated September 1, 2023 to spring 2024), and the Gunsight Pass Trail will be closed temporarily during rotenone treatment. The park anticipates closing the Gunsight Pass Trail for approximately one week around the site preparation and rotenone treatment application period[7]; however, the trail closure may need to be in place longer depending on variables that could affect the length of the application period such as weather, equipment failures, etc. Visitors will still be able to access the high point of Gunsight Pass Trail from the Sperry Trailhead. The campground closure will not begin until September 1 when the number of backcountry campers begins to decrease to notably fewer campers in mid- to late-fall. With 65 wilderness campgrounds in the park totaling 223 campsites and approximately 734 miles of trail that provide access to the park's backcountry, all but one (Gunsight Lake) of the 65 wilderness campgrounds and trails will remain open and available, and most backcountry campers and hikers will not be affected. Signs warning against drinking or recreating in the water will be posted along the trail and shoreline of Gunsight Lake, and news releases will be issued ahead of time to minimize the chance of public exposure. The public will also be informed of implementation of the project through the park's website, wilderness permit office, and visitor centers.

Since the trail and campground will be closed during rotenone application, most visitors will not be near enough to detect most of the project noise during the application period. Noise will be temporary, ending after an estimated two to four days for rotenone application and three to four weeks for detoxification. After that, project noise from helicopter flights during translocation will be highly intermittent (estimated at one to two flights per year for approximately six to eight years). The presence and activities of personnel will not be notably different from that of campers, hikers, and anglers. The occurrence of a dark purple color to the water during detoxification, from the application of potassium permanganate could be visually disruptive but will likely go largely unnoticed given the separation of the stream and the trail and because the color to the creek usually dissipates in a few hundred yards or approximately 30 minutes. The park will provide educational information to visitors to the area explaining the project and potential visual effects of potassium permanganate.

The loss of opportunities to fish for rainbow trout at Gunsight Lake will adversely impact some anglers who choose to harvest fish since, since unlike native fish, non-native fish (i.e., rainbow trout) can be harvested. However, most angling opportunities throughout the park will remain unaffected. The translocation of westslope cutthroat trout and bull trout will benefit anglers by providing future opportunities to fish for native trout.

Degree to Which the Selected Action Affects Public Health and Safety

There will be no significant impacts on public health, public safety, or unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Some commenters raised the issue of using the selected action's chemicals in lakes and their potential effects on human health. Based on the literature and how rotenone will be used (see description of the selected action, Appendix E of the EA, and response to public comment #6), public health and safety will not be affected by using rotenone at Gunsight Lake. Based on the label requirements for the chemicals, public entry into the treatment area could occur immediately after application, the treatment area will be temporarily closed to visitors, warning signs will be posted, and news releases will be issued ahead of time to minimize the chance of public exposure. Any risk to human safety during application will be avoided through training, personal protective equipment, and adherence to the Montana Department of Agriculture application requirements.

[7] Closure period does not equate to the rotenone application period, which is two to four days.

Effects That Would Violate Federal, State, Tribal, or Local Law Protecting the Environment

The selected action does not threaten or violate applicable federal, state, or local environmental laws or requirements imposed for the protection of the environment.

The selected action will not violate any provision or requirement identified under legislation addressing Glacier National Park, the National Park Service Organic Act, or any other subsequent legislation. Further details can be found in the non-impairment determination below.

Regarding compliance with section 7 of the Endangered Species Act, the USFWS concurred with the park's determinations of effect on 7 June 2023 (see "Agencies and Persons Consulted" section of this FONSI for details.)

Regarding compliance with Section 106 of the National Historic Preservation Act, the Montana SHPO and Blackfeet Nation THPO did not comment on the project during scoping or public review of the EA; the Blackfeet Nation Fish and Wildlife office commented the EA and their comments have been incorporated into the project design; and the Confederated Salish and Kootenai Tribes THPO responded in support of the project during scoping.

CONCLUSION

Considering the criteria for significance (40 Code of Federal Regulations 1501.3[b]), both regarding the affected environment and the degree of the effects described in the EA and this FONSI, the NPS has determined that the selected action does not constitute a major federal action having a significant effect on the human environment. Additionally, the selected action does not constitute an action that normally requires preparation of an EIS (see Section 1.5.E of the NPS NEPA Handbook). Therefore, an EIS will not be required.

NON-IMPAIRMENT DETERMINATION

Westslope Cutthroat and Bull Trout Preservation in Gunsight Lake
Glacier National Park

The NPS Organic Act of 1916 directs the NPS to "conserve the scenery, natural and historic objects, and wild life in the System units and to provide for the enjoyment of the scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 USC 100101). NPS Management Policies 2006, Section 1.4.4, explains the prohibition on impairment of park resources and values:

> *"While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the National Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them."*

An action constitutes impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise will be present for the enjoyment of those resources or values" (NPS 2006, Section 1.4.5). To determine impairment, the NPS must evaluate the particular resources and values that will be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts. An impact on any park resource or value may constitute impairment, but an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance (NPS 2006, Section 1.4.5).

The purpose of Glacier National Park is to preserve the landscape, wildlife, natural processes, and cultural heritage of the area. Fundamental resources and values of Glacier National Park identified in the park's foundation document (2016) are glaciated landscape, clean air and water, diverse habitats to support iconic wildlife, tribal connections, recreational opportunities, and designation as an international, cross-boundary, peace park. Resources that were carried forward for detailed analysis in the EA, and for which a non-impairment determination has been made include bull trout, westslope cutthroat trout, mountain whitefish, amphibians, aquatic macroinvertebrates, zooplankton, grizzly bears, common loons and other water birds (ducks, swans, geese, grebes, cormorants, and coots), water quality, and natural soundscapes. All of these resources are considered necessary to fulfill specific purposes identified in the park's establishing legislation; are key to the natural or cultural integrity of the park; and/or identified as a goal in relevant NPS planning documents. A non-impairment determination is not necessary for recommended wilderness and visitor use and experience because these impact topics are not generally considered park resources or values subject to the non-impairment standard (see NPS 2006, Section 1.4.6).

This non-impairment determination has been prepared for the selected action, as described above in "Finding of No Significant Impact."

Bull Trout, Westslope Cutthroat Trout, and Mountain Whitefish

Long-term beneficial impacts to westslope cutthroat and bull trout will result from the implementation of the project through the removal of a non-native invasive fish species and establishment of habitat refugia that is secure from the threats of hybridization and climate change. There is no potential for adverse impacts to westslope cutthroat, bull trout, or mountain whitefish from the use of rotenone and potassium permanganate because these species are not present in the rotenone treatment area. Westslope cutthroat, bull trout, and mountain whitefish may experience

some adverse impact during translocation from capturing and handling adult fish as well as the removal of eggs from the donor system. This will not result in population level impacts because donor fish will come from populations that are demographically strong enough to support the removal (i.e., the populations are large enough to withstand the removal of some fish) and no more than 10 percent of the population will be removed annually for three consecutive years. This level of removal presents minimal chance of decreasing natural reproduction or the available genetic pool for the populations. Therefore, these species will continue to be present for the enjoyment of current and future generations, and the NPS has determined that impacts from the selected action will not result in impairment of bull trout, westslope cutthroat trout, or mountain whitefish in Glacier National Park.

Amphibians, Aquatic Macroinvertebrates, and Zooplankton

Amphibian larvae, some aquatic macroinvertebrates (aquatic insects), and zooplankton will be killed during rotenone and potassium permanganate applications. Mortality to amphibians will be reduced by implementing the project in late summer/fall, when many amphibian species have developed into terrestrial adults and are not susceptible, and results from other MFWP applications indicate the persistence of amphibian populations following treatment; therefore, local amphibian population abundance will likely recover within a year or two. Studies also show little lasting effect on aquatic insect communities since some individuals are likely to survive and downstream drift and overland migration from untreated waters will aid recolonization; therefore, local aquatic insect population abundance is expected to recover in two to four years. Zooplankton densities have been shown to recover within a few months of rotenone application, with no change in species diversity; therefore, zooplankton communities are expected to recover from any effects from the rotenone by the following spring. Translocating westslope cutthroat trout, bull trout, and mountain whitefish will not result in predatory influences to amphibians, aquatic macroinvertebrates, or zooplankton that are noticeably different from that of the rainbow trout that are currently present in the lake. Therefore, amphibians, aquatic macroinvertebrates, and zooplankton will continue to be present for the enjoyment of current and future generations, and the NPS has determined that impacts from the selected action will not result in impairment of amphibians, aquatic macroinvertebrates, and zooplankton.

Grizzly Bears

Project noise and activity could disturb or displace grizzly bears. Adverse impacts during rotenone application and the detoxification process will be temporary, ending once treatment and detoxification is complete (after an estimated three to four weeks). The potential for disturbance impacts during helicopter long-line sling load operations will be highly intermittent, for a few minutes at a time for each flight, estimated at approximately 15 flights for the rotenone application and detoxification phase. Impacts from helicopter operations during native fish translocation will be infrequent, with one to two flights anticipated every year over a period of approximately six to eight years. Impacts will occur at the individual level; there will be no population effects and no effects to the overall distribution of bears since project activity will be localized to the project area. Gunsight Pass trail and Gunsight Lake campground are high-use visitor areas and the risk of a negative grizzly encounter with project personnel will not be meaningfully different from the existing risk presented by hikers, campers, and anglers. Bear safety training will be required for all project personnel and the chances of a grizzly bear obtaining human sources of food will be extremely low given the park's strict enforcement of attractant storage requirements. The removal of rainbow trout and the establishment of native fish in Gunsight Lake will not change forage for grizzly bears, as there is little to suggest that fish provide much of a food source for grizzly bears within Glacier. Grizzly bears will not be affected by any consumption of fish killed by rotenone, nor by potassium permanganate, since treatment concentrations will be far below levels that are toxic to mammals (EPA 2007). Sinking dead fish that do not remain submerged will eliminate much of the potential for grizzly bears to scavenge fish carcasses. No grizzly bear habitat will be lost because of the project and there will be no potential for grizzly bear mortality. Therefore, grizzly bears will continue to be present for the enjoyment of current and future generations, and the NPS has determined that impacts from the selected action will not result in impairment of grizzly bears in Glacier National Park.

Common Loons, Water Birds (ducks, swans, geese, grebes, cormorants, and coots)

If present in the treatment area, common loons and other water birds will not be directly affected by rotenone or potassium permanganate, since treatment concentrations will be far below levels that are toxic to birds (Al-Zubaidy

and Mohammad 2012). The mortality of fish, amphibian larvae, and some aquatic macroinvertebrates will remove a source of prey for common loons and other water birds that may forage at the lake. Such impacts will be temporary, lasting until translocated native fish become established and amphibian and aquatic insect populations recover. Common loons will not likely be rearing young at Gunsight Lake as there is no evidence of loons nesting at the lake. Noise from motorboats and helicopters could disturb or displace common loons and other water birds, but many birds typically migrate out of the park by late summer/early fall, displacement habitat at nearby lakes will remain unaffected, and rotenone treatments will not begin until after the critical nesting/brood rearing period. Any disturbance or displacement will not meaningfully alter the availability of resting or foraging habitat nor observably change species abundance, distribution, or composition. Therefore, common loons and water birds will continue to be present for the enjoyment of current and future generations, and the NPS has determined that impacts from the selected action will not result in impairment of common loons and water birds in Glacier National Park.

Water Quality

Given their degradability, rotenone and potassium permanganate's toxicity will decline rapidly as they react with the natural stream environment and will not be expected to persist for more than 10 to 15 minutes of flow time (Engstrom-Heg 1971 and 1972). Both rotenone and potassium permanganate will dissipate to the point where there will be no detectable long-term changes to water quality. There will be no impacts to water quality from the dye test with fluorescein because fluorescein is inert, non-toxic, and completely degradable. Oxygen sags large enough to cause meaningful impacts will be unlikely in Gunsight Lake due to the volume of water (3,600 acre-feet) that will compensate for changes, and because there will be areas in the lake where oxygen levels are unchanged and fish carcasses will likely be spread out and not concentrated in any one area. Any oxygen sags will be temporary, recovering to normal levels by the following spring. A small number of hydrocarbons will be deposited into Gunsight Lake during operation of motorized watercraft. Water volumes in the lakes (3,600 acre-feet at Gunsight Lake) and water exchange through the inlets and outlets will be sufficient to dilute any hydrocarbon emissions to levels that will not affect water quality in any meaningful way. The risk of contamination from gasoline or motor oil will be low due to mitigation measures requiring equipment inspections and absorbent supplies to address any spills. Therefore, the excellent and pristine water quality of Gunsight Lake will continue to be present for the enjoyment of current and future generations and the NPS has determined that the selected action will not result in impairment of water quality.

Natural Soundscapes

Project noise will have adverse impacts to natural soundscapes. Noise will occur sporadically over an estimated 8 to 12-hour period each day for approximately two to four days during rotenone application; continuously during rotenone detoxification when the generator will run 24 hours a day for an estimated three to four weeks; and intermittently for a few minutes at a time during helicopter long-line sling-load operations (estimated at 15 flights during the rotenone and detoxification phase) and fish translocation (estimated at one to two flights per year over a period of approximately six to eight years). Since project noise will attenuate to ambient levels within approximately 3.5 miles (at most) of the treatment area, soundscapes in the majority of the park will remain unaffected. Environmental factors, such as weather, the ambient sound of moving water near the stream, and terrain shielding due to topography, will influence the amplitude of noise produced and have a masking effect. Noise will be too sporadic or localized to meaningfully change the overall character of soundscapes in the upper St. Mary River drainage. Therefore, natural soundscapes will continue to be present for the enjoyment of current and future generations and the NPS has determined that the selected action will not result in impairment of natural soundscapes.

Conclusion

In conclusion, based on the preceding analysis and in consideration of the park's purpose and significance, it is the Superintendent's professional judgment that these resources will continue to be present for enjoyment by current and future generations. Therefore, implementation of the selected action will not constitute an impairment of the resources or values of Glacier National Park.

APPENDICES

Appendix A – References

Anderson, R.S. 1970. Effects of rotenone on zooplankton communities and a study of their recovery patterns in two mountain lakes in Alberta. *Journal of the Fisheries Research*. Board of Canada. Vol 27, no. 8, 1335-1355.

Al-Zubaidy, M. H. I., and F. K. Mohammad. 2012. Effects of acute manganese neurotoxicity in young chicks. Dept. of Physiology, Biochemistry and Pharmacology, College of Veterinary Medicine, University of Mosul, Mosul, Iraq.

Behnke, R. 1992. Native trout of western North America. Monograph No. 6. *American Fisheries Society,* Bethesda, MD.

California Department of Fish and Game. 1994. Rotenone Use for Fisheries Management, July 1994: Final Programmatic Environmental Impact Report (subsequent). The Resources Agency, Department of Fish and Game. *Piscicides*.

Cook, S.F. and R.L. Moore. 1969. The effects of a rotenone treatment on the insect fauna of a California stream. *Transactions of the American Fisheries Society*, 83 (3):539-544.

Cushing, C.E. and J.R. Olive. 1956. Effects of toxaphene and rotenone upon the macroscopic bottom fauna of two northern Colorado reservoirs. *Transactions of the American Fisheries Society*, 86:294-301.

Engstrom-Heg, R. 1971. Direct measure of potassium permanganate demand and residual potassium permanganate. *New York Fish and Game Journal*, vol. 18, no. 2:117-122.

Engstrom-Heg, R. 1972. Kinetics of rotenone-potassium permanganate reactions as applied to the protection of trout streams. *New York Fish and Game Journal*, vol. 19, no. 1:47-58.

Environmental Protection Agency (EPA). 2007. Reregistration eligibility decision for rotenone EPA 738-R-07-005. U.S. EPA, Prevention, Pesticides, and Toxic Substances, Special Review and Reregistration Division, March 2007.

Fried, L.M., M.C. Boyer, and M.J. Brooks. 2017. Amphibian response to rotenone treatment of ten alpine lakes in Northwest Montana. *North American Journal of Fisheries Management 38*: pg. 237–246.

Fredenberg, W., M. Meeuwig, and C. Guy. 2007. Action plan to conserve bull trout in Glacier National Park. U.S. Fish and Wildlife Service, Creston, Montana.

Grisak, G. 2003. South Fork Flathead watershed westslope cutthroat trout conservation program. Specialist report for environmental impact statement. Montana Fish, Wildlife and Park, Kalispell, MT.

Kiser, R.W., J.R. Donaldson, and P.R. Olson. 1963. The effect of rotenone on zooplankton populations in freshwater lakes. *Transactions of the American Fisheries Society.*92(1): pg. 17-24.

Korschgen, C. E. and R. B. Dahlgren. 1992. Human Disturbances of Waterfowl: Causes, Effects, and Management. Waterfowl Management Handbook.

Langham, G.M., J.G. Schuetz, T. Distler, C.U. Soykan, C. Wilsey. 2015. Conservation Status of North American Birds in the Face of Future Climate Change. Plos One 10(9): e0135350 Accessed 3 May 2023 from https://doi.org/10.1371/journal.pone.0135350

Liknes, G.A. and P.J. Graham. 1988. Westslope cutthroat trout in Montana: Life history, status, and management. *American Fisheries Society Symposium* 4: pg. 53-60.

Mogen, J.T., E. Best, J. Sechrist, and C. Hueth. 2011. Fish entrainment at the St. Mary Diversion, Montana with a review of the impacts of project operations on bull trout and other native fishes. A report of investigations conducted during the water diversion periods of 2002-2006. Report to the Bureau of Reclamation, Billings, Montana.

Muhlfeld, C. C., V. S. D'Angelo, C. Downs, J. Powell, S. Amish, G. Luikart, R. Kovach, M. Boyer, and S. Kalinowski. 2016. Genetic status and conservation of westslope cutthroat trout in Glacier National Park. Transactions of the American Fisheries Society, 145:5, 1093-1109, DOI: 0.1080/00028487.2016.1173587. To link to this article: http://dx.doi.org/10.1080/00028487.2016.1173587

National Park Service (NPS). 2006. Management Policies 2006. Department of the Interior; National Park Service, Lakewood, Colorado.

____. 2021. Natural Sounds and Night Skies Division. Department of the Interior. Lakewood, Colorado. Accessed 3 April 2023 at https://www.nps.gov/orgs/1050/index.htm

Negherbon, W.O. 1959. Handbook of toxicology, Volume III: Insecticides, a compendium. Division of Biology and Agriculture, National Academy of Sciences, National Research Council, W. B. Saunders Company, Philadelphia, PA.

Schnee, M.E, Clancey, N.G., Boyer, M.C., and S. Bourret. 2021. Recovery of freshwater invertebrates in alpine lakes and streams following eradication of non-native trout with rotenone. *Journal of Fish and Wildlife Management*: 12(2): 475-484.

Shepard, B.B., B.E. May, and W. Urie. 2005. Status and conservation of westslope cutthroat trout within the Western United States. North American Journal of Fisheries Management, 25:4, 1426-1440, DOI: 10.1577/M05-004.1

US Fish and Wildlife Service (USFWS). 2015. Rotenone and antimycin use in fish management training manual. National Conservation Training Center, Shepherdstown, WV.

Appendix B – Mitigation Measures

Westslope Cutthroat and Bull Trout, Amphibians, Macroinvertebrates, & Zooplankton

- To minimize impacts to bull trout from the removal of eggs during translocation, females will be only partially spawned, with only about 50 percent of the eggs taken from each female handled. This will allow for some natural reproduction, producing enough eggs to fully seed the available juvenile rearing habitat.
- Genetically pure juvenile westslope cutthroat trout raised in the hatchery may be returned to the donor stream(s) to offset population losses from taking adult westslope cutthroat into the hatchery system.
- During native fish collection and transport, the oxygen levels and cold-water temperatures of containers will be maintained to prevent fish mortality (e.g., fish could be temporarily held in tubs submerged in stream water during collection until they are transported in coolers to the hatchery, and/or containers transporting fish will contain sufficient water to maintain oxygen and temperature levels).
- Monitor post-treatment to ensure recovery of aquatic macroinvertebrates.
- If post treatment sampling indicates populations of aquatic macroinvertebrates or amphibians have been lost from the treatment area, efforts will be made to re-establish the populations using a nearest neighbor approach (i.e., translocate individuals from nearby, similar habitat).
- A spill plan will be developed and followed in case of a fuel or hazardous material leak. The plan will be reviewed by the Glacier's Safety Office. Personnel will inspect boat engines, fuel lines, and fittings as well as other equipment for leaks prior to beginning project activities each day. Appropriate absorbent supplies will be on site to address a spill on shore and on the water. Petroleum products will be properly stored, to include the use of spill-proof and bear-proof containers.
- Treat at the lowest effective rotenone concentration for trout (1ppm) to minimize impacts to the western glacier stonefly, other aquatic macroinvertebrates, amphibians, and zooplankton.
- Treat the inlet streams for the shortest effective duration to minimize impacts to non-target aquatic organisms.
- Treat only those areas where field sampling has confirmed the presence of non-native rainbow trout to minimize impacts to non-target aquatic species.
- A site-specific plan for collecting bull trout gametes from the St. Mary drainage will be created in consultation with USFWS.

Water Quality

- The cleanest burning outboard motors feasible (reduced emission 4-stroke technology) to minimize the release of hydrocarbons will be used.
- A spill plan will be developed and followed in case of a fuel or hazardous material leak. The plan will be reviewed by the Glacier's Safety Office. Personnel will inspect boat engines, fuel lines, and fittings as well as other equipment for leaks prior to beginning project activities each day. Appropriate absorbent supplies will be on site to address a spill on shore and on the water. Petroleum products will be properly stored, to include the use of spill-proof and bear-proof containers.
- Protocols to prevent aquatic invasive species (AIS) (such as zebra and quagga mussels, and Eurasian watermilfoil) from entering the St. Mary River drainage will be followed at all times, in accordance with Glacier's AIS Action Plan (NPS 2018a).

- Prior to being loaded with fish and water from the hatchery, helicopter tanks and all fish transport containers will be cleaned in accordance with state of Montana rules and regulations for live fish transport. Only hatcheries that are regularly inspected for AIS, certified to be free of pathogens, and/or treat the holding water to remove or kill any pathogens (such as with filters or UV light, for example) will be used.

Wetlands

- The project area will be surveyed for wetland resources before the project begins to identify the presence and extent of wetlands; sensitive wetland resources will be marked and avoided.
- All equipment and materials will be cleaned and inspected prior to entering the park to prevent the spread of non-native invasive plants and AIS.
- Best Management Practices listed in NPS Procedural Manual #77-1, Appendix 2, will be followed.

Wildlife

- Prior to applying rotenone, the park will survey Gunsight Lake for common loons. In the off chance that loons have nested on the lake and are raising chicks, the application of rotenone will be scheduled as late as possible, allowing more time for the juvenile birds to acquire the ability to fly to nearby lakes for forage. Rotenone will not be applied earlier than September 1, by which time any juvenile loons will likely be able to fly.
- Project personnel will be trained on appropriate behavior in the presence of bears and other wildlife and will adhere to Glacier's regulations concerning proper storage of food, garbage, and other attractants.

- The following conservation measures as agreed to with the USFWS in Glacier's programmatic BA for administrative flights (NPS 2023) are required for all park administrative flights and will be followed for any flights associated with this plan:

    - Flights will follow suggested flight paths away from sensitive areas. Where possible, flight paths will follow road corridors and occur over developed areas. The flight manager will be responsible for coordinating with the park biologist to identify sensitive sites prior to the flight.

    - Flights will occur one hour after sunrise and one hour before sunset from 1 May to 1 October to minimize impacts to grizzly bears. Grizzly bear denning activity peaks during den emergence from 15 March to 15 May and during den construction from 15 October to 15 November. No flights will occur over known dens or potential den habitat during den emergence and den construction. In order to conserve prey species, flights will avoid ungulate winter range from 15 January to 1 May when wintering ungulates are most vulnerable.
    - Restricting flights to the 1 May to 1 October period, or minimizing them outside that period, will eliminate or minimize impacts to sensitive wildlife.
    - The helicopter will fly at a minimum of 2000 feet AGL over the park whenever possible, depending on mountainous topography, weather, and except when it is landing or taking off or when it is delivering supplies via long line or during fish planting operations.
    - To minimize impacts on denning Canada lynx, no flights will be permitted over known den sites from 1 May to 30 Aug.
    - Flight paths will be designated so as to avoid open alpine meadows, talus slopes, or other areas where grizzly bears congregate but do not have access to cover. If a low-level flight or landing is needed in an alpine area and a bear is seen, the flight will be postponed. If the flight cannot be postponed, the flight will keep a maximum distance from the bear(s).

Recommended Wilderness

- Motorized equipment will not be used for overland transport.
- Project personnel will enter the project area on foot or by livestock.
- Project personnel will practice principles of "Leave No Trace" outdoor ethics in order to minimize impacts to park resources and visitor experiences.
- Project personnel will report all Wilderness Act Section 4(c) prohibited uses including motorized or mechanical use (including helicopter use), trammeling actions, and installations to the park's Wilderness Coordinator for purposes of wilderness character monitoring.

Vegetation

- The project area will be surveyed for rare plants before work begins; locations of rare plants will be marked and avoided.
- The project area will be surveyed for non-native, invasive plant species (the Gunsight Lake area has known populations of orange hawkweed, Canada thistle, and yellow toadflax) before work begins; locations of identified invasive species will be treated prior to project implementation or avoided during implementation to prevent further spread.
- Project personnel will stay on trails, rocky surfaces, or bare ground whenever possible and avoid the creation of social trails.
- If necessary, areas of disturbance will be rehabilitated and restored through consultation with the park's Vegetation Management Specialist. Only seeds and plants originating from the park or from approved sources will be used in restoration activities.
- All equipment and materials will be cleaned and inspected prior to entering the park to prevent the spread of non-native invasive plants.

Natural Soundscapes

- To minimize administrative flights over recommended wilderness, the park will make every effort to include helicopter flights for this project within the 50-flight limit on administrative flights as described above. Flights will be considered with other proposed administrative flights, coordinated with other projects, and combined with other hauling needs whenever possible.
- Boat motors and other motorized equipment will be selected for the lowest possible noise production while still using equipment that will meet project objectives. Equipment will also be selected to reduce the number of flights required to implement the project.

Visitor Use and Experience

- The public will be informed of the project prior to implementation by means of media releases and postings on the park's website, backcountry permit office, and visitor centers. Signs informing visitors of the project and temporary area closures will be posted at the Sperry, Gunsight Pass, and Jackson Glacier Trail trailheads before and during the project.
- Interpretive programs and materials will be considered to educate visitors about project activities and native aquatic ecosystem conservation.

- Glacier's Wilderness Permit Office will be notified in advance of the projected rotenone application dates for Gunsight Pass Trail closures so visitors can be notified before their wilderness itineraries commence in order to minimize inconvenience for visitors.

Health and Human Safety

- All appropriate personal protective equipment (PPE) will be worn by applicators when handling chemicals.
- All product guidelines and instructions will be followed according to product labels.
- Warning signs notifying the public to not consume or recreate within Gunsight Lake or the St. Mary River will be placed frequently along the whole Gunsight Pass Tail downstream of Gunsight Lake and along the lake shoreline, as recommended by product labels.

Appendix C – Errata Sheet and Response to Public Comment

The Westslope Cutthroat and Bull Trout Preservation in Gunsight Lake EA was released on the NPS PEPC webpage for a 30-day public review period from 15 May 2023 to 14 June 2023. The park sent notification letters to numerous public officials, regulatory agencies, and interested parties on the project mailing list, and distributed a press release to several media outlets. The park received a total of 26 comment letters. Two emails were received requesting information and one email acknowledged receipt of the EA. The NPS reviewed and considered comments and suggestions and incorporated several minor clarifications and one modification to alternatives into the EA, as described in this Errata. None of the commentors provided additional, new, or substantive information that changed the determination of effects in the EA.

TEXT CHANGE ERRATA

In reference to changes to the EA, the topic heading and page number are shown in underlined italics. Original text from the EA is included to provide context and to allow for comparison to the text change. Additions to the text are shown in **bold** and deleted text is shown in ~~strikethrough~~.

Text changes to the EA have been made for the following reasons:

- Include translocation of mountain whitefish to Gunsight Lake and add Canyon Creek as a donor source for mountain whitefish.
- Remove Roberts Creek as a native fish donor source for translocation due to concerns over small population size and high degree of conservation value.
- Clarify how and why donor streams/populations for translocation were selected.
- Clarify timelines for collection of donor fish and translocation.
- Clarify why native westslope cutthroat trout that are slightly hybridized (less than 90% pure) could be translocated.
- Clarify pre- and post-monitoring plans.
- Clarify impacts to donor populations of bull trout.
- Further definition and clarification of site-specific impacts to the natural condition of recommended wilderness.
- Add an analysis of impacts to mountain whitefish, westslope cutthroat trout, amphibians, aquatic macroinvertebrate, and zooplankton from translocating mountain whitefish to Gunsight Lake.
- Clarify permits that will be obtained for implementation of the project.
- Correct the distance over which effects will occur to the untrammeled quality downstream of Gunsight Lake and clarify impacts to the natural condition.
- Add a Recommended Wilderness mitigation measure to Appendix B.
- Clarify (in Appendix D) that native fish are not present in the rotenone treatment area.
- Provide additional explanation about why electric trolling motors were dismissed from detailed analysis.
- Provide additional explanation about why rotenone will not affect plants and reiterate existing mitigation measure requiring pre-project surveys for rare or sensitive plants and marking and avoiding any that are found.
- Minor editorial corrections.

Page 1, paragraph 1 (Chapter 1, The Proposed Action)

Following removal of rainbow trout, genetically pure westslope cutthroat (*Oncorhynch larkiakii lewisi*), ~~and~~ bull trout (*Salvelinus confluentus*)**, and mountain whitefish (*Prosopium williamsoni*)** (**all** ~~both~~ native to the Saint [St.] Mary Drainage) would be translocated (i.e., stocked) into Gunsight Lake to establish the lake as secure habitat (i.e., refugia) for **westslope cutthroat and bull trout** ~~both species~~.

Page 2, paragraph 4 (Chapter 1, Project Area)

These streams include **Canyon Creek,** Jule, ~~Roberts~~, Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, Midvale, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes.

Page 2, footnote #3 (Chapter 1, Project Area)

~~Roberts creek is located entirely on Blackfeet Tribal lands; Blackfeet are a potential partner in this project.~~

Page 2, new footnote (Chapter 1, Project Area)

[3]Canyon Creek, a tributary to Sherburn Reservoir, would likely be used as the donor source for mountain whitefish.

Page 4, Paragraph 21 (Chapter 2, Alternatives, Alternative A)

Alternative A has two components: 1) the removal of non-native rainbow trout from Gunsight Lake, followed by 2) the translocation of native westslope cutthroat and bull trout, **and mountain whitefish** to Gunsight Lake.

Page 7, paragraph 3 (Chapter 2, Alternatives, Monitoring and Closures)

Post-project monitoring would be done, likely in 2024 through 2026 **or longer**, to evaluate aquatic organism **(i.e., native fish, macroinvertebrates, zooplankton, and amphibians)** response and recovery rates **and will follow established monitoring protocols in the American Fisheries Society Rotenone Treatment Manual Standard Operating Procedure (SOP)**. **The donor populations' abundance and genetic composition will also be monitored for three to five years after the donor fish are removed.** Pre-treatment biological surveys and monitoring for macroinvertebrates, zooplankton, and amphibians took place through 2022 to assess baseline community conditions in advance of post-project monitoring. **Montana Natural Heritage Program (MNHP) was consulted for a list of species of concern that could be present in the project area. Lake volume was measured using sonar to create a bathymetric map to ensure that rotenone is not over-applied to the lake. Similarly stream volumes were measured to ensure the precise treatment levels of both rotenone and potassium permanganate.**

Page 7, header and paragraph 6 (Chapter 2, Alternatives, Alternative A Project Stage 2)

Translocate Native **Fish** ~~Westslope Cutthroat and Bull Trout~~)

Following the removal of rainbow trout from Gunsight Lake, westslope cutthroat, bull trout, **and mountain whitefish** would be translocated into the lake... **Mountain whitefish would provide an important forage species for bull trout and provide a buffer against bull trout predation on westslope cutthroat trout.**

Page 8, paragraph 2 (Chapter 2, Alternatives, Alternative A Project Stage 2)

The lake would be restocked with genetically pure individuals, but if local donor sources in the St. Mary drainage can no longer provide fish of this level of purity due to ongoing hybridization, individuals of lesser genetic purity may be used. **There is conservation value in protecting slightly hybridized populations (<90%). Conservation of genetic diversity decreases if only 100% genetically pure fish are protected, since there are so few pure individuals and/or populations remaining.** Donor streams could include **Canyon Creek,** Jule, ~~Roberts,~~ Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, Midvale, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes.

…Juvenile westslope cutthroat trout would also be stocked back into the donor source population to offset the removal of adults, and swamp existing hybridized trout in the donor population(s). **Hybrids would be removed from donor streams, identified through genetic analysis to reduce the hybrid abundance and contribution. Both actions would increase the genetic "purity" of the donor population(s).**

Page 8, paragraph 3 (Chapter 2, Alternatives, Alternative A Project Stage 2)

Collection of the donor fish for translocation would likely begin in **2023** ~~2024~~ … Donor fish would be sourced from populations where evaluations have shown they are demographically strong enough to support the removal (i.e., the populations are large enough to withstand the removal of some fish) and no more than 10 percent of the population would be removed **annually for three consecutive years**. **Each potential donor stream was genetically tested once by park biologists and geneticists between 2015 and 2022. Streams for translocation were chosen based on security of genetic diversity of the westslope cutthroat population, population size, conservation value, and disease-free status. Mountain whitefish would likely be directly transferred to Gunsight Lake (i.e., sub-adult or juvenile whitefish would likely be taken directly to Gunsight Lake from the donor stream).**

Page 8, paragraph 6 (Chapter 2, Alternatives, Alternative A Project Stage 2)

Westslope cutthroat trout **and mountain whitefish** would be translocated to the lake first, possibly in ~~2025~~ **2024** at the earliest, three to four years before bull trout are introduced. This would allow the westslope cutthroat trout **and whitefish** to reach sexual maturity and establish a reproducing population before adding additional competition and/or predation from bull trout. We anticipate introducing two to four-year classes of westslope cutthroat trout **and whitefish** followed by two to four-year classes of bull trout. Translocation would take place over multiple years (estimated six to eight) to establish multiple age classes of **all three** ~~both~~ species.

Page 8, footnote #8, (Chapter 2, Alternatives, Alternative A Project Stage 2)

These streams include Jule, ~~Roberts,~~ Rose, Two Dog, Wild, Divide, Boulder, Swiftcurrent, Kennedy, Otatso, and Lee Creek drainages, among other streams, as well as Slide and Red Eagle Lakes. **Canyon Creek, a tributary to Lake Sherburne, would likely be used as the donor source for mountain whitefish.**

Page 9, paragraph 3 ((Chapter 2, Alternatives, Alternative A Project Transportation Needs)

Fish for translocation would likely need to be transported to the lake by helicopter to reduce the risk of mortality compared with transport on foot or with livestock**; juvenile mountain whitefish would likely be directly transported to Gunsight Lake by foot or on livestock, but if excessive mortality occurs during transport a helicopter would be used.**

Page 9, paragraph 6 (Chapter 2, Alternatives, Alternative A Summary of Project Phase Duration)

- Project Stage 2: Translocate Native Westslope Cutthroat and Bull Trout, **and Mountain Whitefish**
    - Collection of donor fish: 1 to 2 weeks per year for three years; may begin in ~~2024~~ **2023** at the earliest
    - Translocation: 6 to 8 years; may begin in **2024** ~~2025~~ at the earliest

Page 9, paragraph 7 (Chapter 2, Alternatives, Alternative B)

Under Alternative B, the NPS would not remove rainbow trout from Gunsight Lake and would not translocate westslope cutthroat trout**,** ~~or~~ bull trout**, or mountain whitefish** to the lake.

Page 11, paragraph 4 (Chapter 3, Affected Environment and Environmental Impacts, Bull Trout)

Population-level impacts would also not be expected because donor fish would come from populations that are demographically strong enough to support the removal (i.e., the populations are large enough to withstand the removal of some fish) and no more than 10 percent of the population would be removed **annually for three consecutive years**. This level of removal presents minimal chance of decreasing natural reproduction or the available genetic pool for the population. **Fish populations have the ability to recover from the loss of individuals by increasing reproduction and/or individual survival (Ricker 1975). Stream dwelling salmonids, such as cutthroat and bull trout, are often limited by juvenile rearing habitat availability because they are territorial (Chapman 1962). Survival of bull trout has been demonstrated to be density dependent, where individual survival is higher at lower abundance, allowing them to compensate for increased mortality or harvest (Johnston et al. 2007). The annual over-abundance of young fish produced each year as eggs hatch results in increased intraspecies competition for food and space, meaning a proportion of the individuals must move out of the system or die. Johnston et al. (2007) documented the rapid recovery following cessation of allowed angler harvest of a bull trout population after severe overharvest. The removal of some fish for translocation is analogous to harvest, and due to their ability to compensate through increased survival and high reproductive potential (hundreds to thousands of eggs per female), the removal of a small proportion of the population over a fixed amount of time (e.g., 10% annually for three consecutive years) is not likely to harm the populations.**

Page 13, new paragraph (Chapter 3, Affected Environment and Environmental Impacts, Westslope Cutthroat)

Also translocating whitefish to Gunsight Lake would result in some interspecies competition through dietary overlap as westslope cutthroat trout and mountain whitefish both rely primarily on aquatic invertebrates and zooplankton at various life-stages. Some competition for food with westslope cutthroat trout would likely occur but not to the extent to jeopardize the establishment of a healthy westslope cutthroat trout population for the long term. Enough dissimilarity exists between feeding and habitat use that both species would be expected to occupy slightly different niches in the lake, as they do in most of the naturally fish-bearing lakes across the park (Ellison 1980 and DosSantos 1985). Bull trout, westslope cutthroat trout, and mountain whitefish co-exist in most waters that support native trout in the park. Mountain whitefish are not thought to be a strong competitor with native trout because mountain whitefish are known to rely heavily on chironomids on the bottom of lakes and streams whereas trout often feed in areas higher in the water column (Montana Field Guide accessed 6/26/2023; Mountain Whitefish - Montana Field Guide (mt.gov); Ellison 1980; DosSantos 1985). Gunsight Lake and its tributaries contain a wide variety of aquatic macroinvertebrates, including chironomids (NPS file data). Since bull trout prey on mountain whitefish, the addition of mountain whitefish will benefit westslope cutthroat trout by providing a buffer against bull trout predation.

Page 13, Addition of Mountain Whitefish (Chapter 3, Affected Environment and Environmental Impacts)

Mountain Whitefish

Mountain whitefish are a member of the trout family, Salmonidae, and found across much of western Montana. They are generally common in rivers and lakes of northwest Montana (Montana Field Guide accessed 6/26/2023; Mountain Whitefish - Montana Field Guide (mt.gov)) and are native in the St. Mary drainage. The typical mountain whitefish is 10 to 16 inches in length. Whitefish have a sub-terminal mouth adept at feeding on or near the bottom of streams and lakes where they feed on macroinvertebrates. They are known to provide forage for larger trout, including bull trout. Mountain whitefish reach maturity around between the ages of 2 and 4 years old and spawn in the fall or early winter in large congregations, typically in streams and along shorelines of lakes (Brown, 1971; Brown, 2022). Eggs typically hatch in late winter and early spring.

Environmental Impacts – Mountain Whitefish

Alternative A – Preferred Alternative

There is no potential for adverse impacts to mountain whitefish from the use of rotenone and potassium permanganate because there are currently no mountain whitefish present in the rotenone treatment area.

The collection of individual juvenile or sub-adult mountain whitefish for translocation would adversely impact the species from the removal of individuals from the donor populations. However, individuals would only be removed from populations large enough to support the removal of a small fraction (i.e., less than 10 percent per year) of the population. This level of removal presents minimal chance of decreasing natural reproduction or the available genetic pool for the population. Because of this, donor populations are expected to recover rapidly from the removal of a small number of individuals. Adverse impacts from translocation would be too low to change the long-term abundance or distribution of the donor population in any meaningful way and would not threaten its existence. The donor stream for mountain whitefish is anticipated to be Canyon Creek, a tributary to Lake Sherburne with an abundant juvenile mountain whitefish population (J. Mogen, USFWS, pers. Comm). Impacts would occur for one to two weeks per year for an estimated three years.

Alternative B – No Action Alternative

Under Alternative B, current management would continue. As a result, impacts to mountain whitefish would be the same or similar to what is described in the Affected Environment, which contains a description of the current and expected future conditions of current management.

Page 15, paragraph 4 ((Chapter 3, Affected Environment and Environmental Impacts, Amphibians)

The change in fish species composition following translocation of westslope cutthroat trout**,** ~~and~~ bull trout, **and mountain whitefish** to Gunsight Lake would not result in new predatory influences that are noticeably different from that of the rainbow trout currently present.

Page 17, addition to paragraph 4 (Chapter 3, Affected Environment and Environmental Impacts, Aquatic Macroinvertebrates)

Aquatic macroinvertebrates would be impacted through additional foraging by mountain whitefish on both the lake bottom and in the water column. These impacts would be similar to those described for westslope cutthroat and bull trout. Mountain whitefish would create more feeding pressure on bottom-dwelling

invertebrate species such as chironomids and other aquatic worm species, than top column invertebrate species, but not enough to meaningfully change aquatic macroinvertebrate species composition, abundance, and distribution.

Page 17, paragraph 1 (Chapter 3, Affected Environment and Environmental Impacts, Aquatic Macroinvertebrates)

Extensive pre- and post-treatment monitoring from 13 alpine lakes and associated stream networks in the South Fork Flathead watershed have documented aquatic macroinvertebrate recovery in abundance and community composition within two to four years following piscicide application for even the most rare and sensitive taxa (~~Bourret et al. 2018;~~ Schnee et al. 2021).

Page 18, paragraph 4 (Chapter 3, Affected Environment and Environmental Impacts, Zooplankton)

Translocating westslope cutthroat trout**,** ~~and~~ bull trout**, and mountain whitefish** to Gunsight Lake would not noticeably change predation influences on zooplankton. This is because westslope cutthroat trout **and mountain whitefish** have similar feeding preferences as rainbow trout, and because bull trout do not typically forage on zooplankton as adults.

Page 25, new paragraph Chapter 3, Affected Environment and Environmental Impacts, Water Quality)

The application of pesticides into or over surface water is regulated as a discharge of a pollutant which requires a surface water discharge permit. The Montana Department of Environmental Quality (MTDEQ) permits discharges to state surface water under the Montana Pollutant Discharge Elimination System (MPDES) program. The park has filed the DEQ Notice of Intent application for Montana Pollutant Discharge Elimination System General Permit for Pesticide Application (MTG870000) (form NOI 87) requesting coverage under the State of Montana's Pesticide General Permit. The project will not proceed until the park is notified that permit coverage has been granted by MTDEQ.

Page 26, paragraph 3, (Chapter 3, Affected Environment and Environmental Impacts, Recommended Wilderness)

The natural condition of recommended wilderness in Glacier is characterized by and encompasses naturally occurring biological and physical elements of the wilderness, including native plants and animals, soil, water, and air. Natural condition also includes the interactions among these elements including healthy terrestrial and aquatic ecosystems, biodiversity, air and water quality, geologic processes, and other natural processes.

Page 27, paragraph 3 (Chapter 3, Affected Environment and Environmental Impacts, Recommended Wilderness)

Alternative A would adversely impact the untrammeled quality of recommended wilderness because it would intentionally manipulate the biophysical environment in the project area through the removal of non-native rainbow trout, collecting donor fish, and translocating native westslope cutthroat and bull trout, **and mountain whitefish** to Gunsight Lake. The intensity of impact would initially be dramatic, because rotenone would lethally remove all fish and other gill-breathing organisms from Gunsight Lake downstream to approximately Mirror Pond in a matter of days. These effects would be highly localized; limited to Gunsight Lake and approximately **three** ~~five~~ miles downstream.

Page 28, paragraph 3 (Chapter 3, Affected Environment and Environmental Impacts Recommended Wilderness, Natural Condition)

Introducing the three native fish species to Gunsight Lake would cause site specific impact to the natural condition at Gunsight Lake because it would represent a change in the biophysical elements; however, to manage wilderness holistically, introducing these species would have a positive impact to wilderness

character and the natural quality of recommended wilderness as a whole within Glacier and the wider St. Mary River drainage. Translocation of westslope cutthroat and bull trout and mountain whitefish would not noticeably change ecological processes of the lake since rainbow trout are already present and have been since the 1930s and because predation impacts to other aquatic organisms from native fish would be similar to those of rainbow trout (as explained in the analysis of impacts to amphibians, aquatic macroinvertebrates, and zooplankton).

Page 28, paragraph 3 (Chapter 3, Affected Environment and Environmental Impacts Recommended Wilderness)

Alternative A would also have adverse impacts to the natural condition from the mortality of aquatic invertebrates **and** amphibians **during rotenone and potassium permanganate applications**, and individual native fish **through donor collection and translocation efforts**. **Although not anticipated, mortality to native fish associated with collection of the donor fish and transport to Gunsight Lake could occur due to handling stress.**

Page 34 paragraph 6 and page 35 paragraph 1 (Chapter 3, Affected Environment and Environmental Impacts Cumulative Impacts)

Westslope Cutthroat **Trout,** ~~and~~ Bull Trout**, and Mountain Whitefish**

Past, present, and reasonably foreseeable actions with impacts to westslope cutthroat trout**,** ~~and~~ bull trout**, and mountain whitefish** include periodic interagency native fish population assessments and Glacier fisheries management projects, which involve gill net surveys and annual electrofishing monitoring…Alternative A could contribute incremental adverse impacts from the effects to bull trout**,** ~~and~~ westslope cutthroat trout**, and mountain whitefish** of capture and handling during translocation.

Page 35, paragraph 2 (Chapter 3, Affected Environment and Environmental Impact, Cumulative Impacts)

When the impacts of Alternative B are combined with those of past, present, and reasonably foreseeable actions, the cumulative impacts to westslope cutthroat trout**,** ~~and~~ bull trout**, and mountain whitefish** would primarily be adverse since Alternative B would not offset ongoing impacts.

Appendix B, page B-2 (Mitigation Measures, Wildlife)

Rotenone **would** ~~could~~ not be applied **earlier** ~~later~~ than September 1 ~~due to fall weather considerations,~~ by which time any juvenile loons would likely be able to fly.

Appendix B, page B-3 (Mitigation Measures, Recommended Wilderness)

- **Project personnel would report all Wilderness Act Section 4(c) prohibited uses including motorized or mechanical use (including helicopter use), trammeling actions, and installations to the park's Wilderness Coordinator for purposes of wilderness character monitoring.**

Appendix D, heading on page D-1 (Elements of Alternatives Considered but Dismissed from Detailed Analysis)

Appendix D – **Alternatives and** Elements of Alternatives Considered but Dismissed from Detailed Analysis

Appendix D, page D-1, paragraph 3 (Alternatives and Elements of Alternatives Considered but Dismissed from Detailed Analysis)

Gill netting also rarely achieves complete removal of the target population and is generally more useful for suppressing non-native fish numbers (i.e., reducing them such that they pose a decreased threat to native species but are not necessarily eliminated). ~~This is especially the case for lakes that are also inhabited by native fish, since non-native fish can be targeted while native fish are avoided.~~ Complete ~~removal~~ **elimination** of the rainbow trout population from the lake is necessary to reduce the overall risk of hybridization downstream and to provide secure habitat for translocated westslope cutthroat and bull trout. ~~The mortality of individual native fish downstream would be a tradeoff that would not affect native fish at the population level (Please refer to Chapter 3, Bull Trout and Westslope Cutthroat Trout and Other Native Fish in Appendix E) and would be mitigated by collecting and moving as many native fish as possible to untreated waters.~~

Appendix D, page D-2, paragraph 1 (Alternatives and Elements of Alternatives Considered but Dismissed from Detailed Analysis)

Lake trout fishing regulations on Flathead Lake have been relaxed and annual fishing contests (Mack Days) with substantial cash prizes have been held since 2002, yet the lake trout population has not declined (CSKT 2014). **Angling alone would not achieve** ~~C~~**c**omplete removal of the rainbow trout population from the lake**, which** is necessary to reduce the overall risk of hybridization downstream and to provide secure habitat for translocated westslope cutthroat and bull trout.

Appendix D, page D-2, paragraph 3 (Alternatives and Elements of Alternatives Considered but Dismissed from Detailed Analysis)

Each barrel of rotenone weighs almost 300 pounds and is dispersed through a venturi pump off a moving boat, powered by a small outboard motor. An electric trolling motor would not have sufficient power to accomplish this in a timely fashion and in general battery life would not be sufficient. The helicopter would only be used on the first and last days of the operation and would not be available to continually shuttle batteries to the project. More noise would be generated by increased use of the helicopter to deliver batteries. In addition, helicopter use would add to project airborne emissions.

Appendix E, page E-2, paragraph 4 (Issues and Impact Topics Dismissed from Detailed Analysis)

Potential impacts to soils and vegetation from trampling and measures to mitigate any impacts would be as described above for Wetlands. **Rotenone would be applied in liquid form to the water and would not be available to be absorbed onto the surface of plants as powdered rotenone may do.** The project area would be surveyed for non-native invasive plant species (the Gunsight Lake area has known populations of orange hawkweed, Canada thistle, and yellow toadflax) **and sensitive and rare plant species** before work begins; locations of identified invasive species would be treated prior to project implementation or avoided during implementation to prevent further spread. **Sensitive or rare plants would be marked and avoided if found**.

SUBSTANTIVE COMMENTS AND NPS RESPONSES

The NPS must consider all comments that are timely received. The standard NPS practice is to respond to substantive comments submitted during the public review period of the EA. Substantive comments raise, debate, or question a point of fact or analysis. Comments that merely support or oppose a proposal or that merely agree or disagree with NPS policy are not considered substantive and do not require a formal response. This section summarizes comments received during public review of the EA that are substantive or otherwise warranted a response. Comments are condensed into the following concern statements, and a response to each statement is provided below.

Use of a Fish Toxicant

1) **Concern Statement:** *The NPS did not develop a range of alternatives and should consider alternatives other than chemical removal, such as gill netting, electrofishing, and angling, as well as leaving the lake fishless and not using helicopters.*

NPS Response: Alternative means of removal (including electrofishing, gill nets, and recreational angling), leaving the lake fishless, and not using helicopters were considered but dismissed from detailed analysis in Appendix D of EA, pages D-1 through D-4.

Alternatives considered but eliminated from detailed analysis are considered part of the range of alternatives (CEQ NEPA Regulations, 40 CFR 1502.14). The term "range of alternatives" in reference to NEPA refers to the set of all reasonable alternatives as well as other alternatives considered but eliminated from detailed analysis (46.420(c); Q1a). Alternatives and alternative elements may be eliminated from detailed analysis for a variety of reasons including inability to resolve the purpose and need for taking action and technical or economic infeasibility.

2) **Concern Statement:** *The Montana Bull Trout Scientific Group's paper "Assessment of Methods for Removal or Suppression of Introduced Fish to Aid in Bull Trout Recovery" concluded that toxicant use in lakes is more difficult in lakes with springs and inlet and outlet streams. The EA does not disclose whether Gunsight Lake is a spring-fed lake. How does the NPS know this project will successfully remove all rainbow trout?*

Repeated use of toxicants for successful removal was not analyzed in the EA. The EA needs to consider the direct, indirect, and cumulative effects of repeated rotenone applications if the first application does not achieve complete removal.

NPS Response: There have been numerous very successful projects removing invasives and translocating native fish. While it is not possible to list all rotenone actions that have ever taken place, MFWP implemented 74 applications on 63 lakes in the Flathead Basin from 1948 to 2001. Recently, the agency completed a 15-year project to remove hybrid trout from headwater areas in the South Fork Flathead River drainage in Montana to protect genetically pure populations of westslope cutthroat trout. Rotenone was used in 21 lakes, followed by the reintroduction of genetically pure westslope cutthroat trout. Rotenone has also been used in other NPS units, including Rocky Mountain National Park, Northern Cascades National Park, Yosemite National Park, Yellowstone National Park, and Glen Canyon National Recreation Area. Post-treatment monitoring times vary but will occur for a minimum of two to three years for this project, consistent with the MFWP rotenone treatments in the South Fork of the Flathead River.

The paper *Assessment of Methods for Removal or Suppression of Introduced Fish to Aid in Bull Trout Recovery* is from 1996 and since then much has been learned regarding improved success of rotenone treatments in lakes such as Gunsight. The park is fortunate to have assistance from MFWP Region 1 fisheries staff in Kalispell in planning and implementation of the Gunsight Lake project. MFWP staff have demonstrated broad success in conducting similar projects in the South Fork of the Flathead River drainage and those projects are widely viewed as one of the most important conservation efforts ever implemented for westslope cutthroat trout. Fish removal from lakes or streams with spring inflow requires additional effort to ensure that these areas do not provide a refuge for fish to avoid the rotenone. The Gunsight system has some spring areas, and we will be using approaches such as drip

stations on the streams and placing slow-release rotenone mixtures (sometimes referred to as "dough balls," a mix of sand, rotenone, and unflavored gelatin) in the spring-influenced areas so that the rotenone is released more slowly and from as close to the spring source as possible to minimize the ability of fish to avoid it (page 5 of the EA). We will also be walking these areas with backpack sprayers spraying directly into the spring areas. The size and nature of Gunsight Lake makes it a good candidate for complete removal of rainbow trout and reapplication is not anticipated. Rainbow trout cannot reinvade the lake after treatment because of natural barrier waterfalls below the lake.

While the intent is to avoid a second rotenone application, the EA includes this as a possibility (on pages 5 and 7, Chapter 2, Alternatives) and considers the impacts (pages 14, 17, 18, 20, 25, 28, 29, 31 and 33 in Chapter 3, Affected Environment and Environmental Impacts, and on pages E-1 and E-3 in Appendix E, Issues and Impact Topics Dismissed from Detailed Analysis). The EA does not consider more than two rotenone applications because the need for multiple applications is not anticipated. Varying methods of rotenone application (page 5) such as slow-release mixtures in upwelling and groundwater areas, are anticipated to remove all rainbow trout from the lake. In addition, rainbow trout cannot reinvade the lake because of natural barrier falls downstream. As stated in the EA, all impacts from a second application of rotenone will be the same as the first. If post-project monitoring indicates more than two treatments of rotenone are needed, additional consultation and NEPA analysis will be completed.

Cumulative effects are analyzed for the project and include past, ongoing, and reasonably foreseeable actions (page 34 of the EA). Reasonably foreseeable future actions do not include those actions that are highly speculative (NPS NEPA Handbook, 2015). To analyze the effects of multiple applications beyond what is anticipated for this project and included in the EA (one application, two at most) would be speculative. Multiple applications are not anticipated and are therefore not reasonably foreseeable or included in the selected action.

3) **Concern Statement:** *The EA did not provide details on whether a recent rotenone project in the North Fork drainage was effective. Was that project successful?*

NPS Response: This comment refers to a similar project at Camas and Evangeline Lakes (approved June 10, 2019) to remove non-native Yellowstone cutthroat trout and translocate native westslope cutthroat trout and bull trout. The project at Camas and Evangeline Lakes has been successful so far. Only a few non-native Yellowstone cutthroat trout were found to have survived the rotenone treatment; surviving fish had likely been in areas that were more challenging to treat, such as wetlands. These fish were removed from a short reach of stream channel by electrofishing before native fish were translocated. The park recently translocated four-year classes of westslope cutthroat trout to the lakes from Hay and Starvation Creeks and will monitor their survival over the next several years as the fish mature to reproductive age and reproduction can be monitored (the success of translocated native fish establishing a population of measured through reproductive success, which cannot be evaluated until the fish are reproductively mature). Additionally, bull trout recently translocated to Grace Lake have survived and are growing in size, and the park is currently monitoring reproduction.

4) **Concern Statement:** *The EA does not state exact locations for chemical applications such as drip station locations, backpack sprayers, variations of chemical concentrations, nozzle size of sprayers, exact personal protective equipment (PPE) gear, and safety data sheets for chemicals.*

NPS Response: This level of detail would amount to needless detail; NEPA reviews should avoid amassing "needless detail" (CEQ regulations 40 CFR Part 1500.1(b)). The level of detail and depth of analysis should normally be limited to the minimum needed to determine whether there would be significant environmental effects (43 CFR part 46.310(e)).

Site conditions do not vary in any meaningful way between possible drip locations, and using one site over the other will not change the analysis of impacts or project outcomes. Concentrations of chemicals to be used are stated in the EA (page 5) and will not vary. Safety data sheet information is on file and has been used in the development of application protocols, including applicator PPE, and has informed the analysis in the EA.

Impacts to Park Resources

5) **Concern Statement:** *The EA identified rocky mountain tailed frogs as more susceptible to rotenone treatment because of their life cycle. How will the tailed frog population be monitored? The NPS should include a mitigation measure that would collect individuals with electrofishing before treatment and replace collected individuals after treatment to reduce mortality.*

NPS Response: The suggested mitigation measure would be difficult logistically given the terrain and the location of the treatment area compared to untreated waters suitable for tailed frogs. There are also disease concerns in moving animals from one stream to another. Tailed frogs are anticipated to return to pre-treatment abundance in several years. Should this not occur, the park would consider translocation from nearby areas (per mitigation measures in Appendix B of the EA, page B-1) and would consult with appropriate specialists regarding disease concerns. Post-treatment, visual monitoring for amphibians, including the tailed frog, will occur for a minimum of two years post-project, likely beginning in 2024, as stated on page 7 of the EA.

6) **Concern Statement:** *The analysis in the EA is insufficient. The EA does not adequately address direct, indirect, and cumulative environmental impacts of rotenone and potassium permanganate on habitat, wildlife, threatened, endangered, or sensitive species, biodiversity, ecosystem health and composition, human health, macroinvertebrates, amphibians, vegetation, water quality, and wetlands in the project area and downstream of the project area. The EA does not assess impacts to reaches of the stream that may have unique characteristics or special species that are not known to be present in the park.*

NPS Response: The EA addresses impacts of rotenone and potassium permanganate to westslope cutthroat trout and bull trout (page 10-13); amphibians (pages 13-15); aquatic macroinvertebrates including two state listed aquatic macroinvertebrate species (*Zapada cordillera* and *Rhyacophila ebria*) (pages 16-18); zooplankton (page 18); common loons and other water birds (pages 21-23); grizzly bears (pages 19-21); and water quality (pages 23-25). In addition, impacts to wetlands, soils and vegetation, wild and scenic rivers, floodplains, wildlife, other native fish, cultural and visual resources, night skies, human health and safety, and climate change are described and dismissed from detailed analysis in Appendix E. Cumulative impacts are described on page 34 of the EA.

Analysis in an EA should focus on pivotal issues or issues of critical importance (CEQ Regulations, 40 CFR 1502.2(b). Issues and topics should be analyzed in detail if:

- the environmental impacts associated with the issue are central to the proposal or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- there are potentially significant impacts to resources associated with the issue.

If these considerations do not apply, the issue should be dismissed from detailed analysis. The EA lists impact topics dismissed from detailed analysis in Appendix E and provides an explanation of how the project could affect these resources and why they are dismissed from detailed analysis.

The ecological characteristics of the project area have been thoroughly studied during pre-treatment surveys, and it is highly unlikely that species or unique characteristics not known to the park are present. Impacts to unknown species and characteristics have not been evaluated in the EA for this reason, and because doing so would be highly speculative with no meaningful information on which to base a prediction.

The rotenone product that will be used is CFT Legumine. Following requirements set forth in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the EPA conducts thorough scientific reviews of approved registered products to reassess potential hazards arising from the currently registered uses, to determine the need for additional data on health and environmental effects, and to determine whether the pesticide meets the "no unreasonable adverse

effects" criteria of FIFRA. EPA has a current Reregistration Eligibility Decision for rotenone and has concluded that applying the product according to label instructions does not pose a serious risk of adverse impacts to people or the environment (as stated in Appendix E page E-4).

Vasquez et al. (2012) reported on the environmental fate of the rotenone product CFT Legumine following treatment of Lake Davis, California in 2007. The authors reported half-lives for the primary constituents listed on the products SDS sheet: rotenone, methyl pyrrolidone (MP), and diethylene glycol monethyl ether (DEGEE). MP and DEGEE are used as solvents to aid in the dissolution of the rotenone. None of these components are considered persistent in the environment nor subject to bioaccumulation (Vasquez et al. 2012). The authors reported the concentrations of these constituents rapidly declined in Lake Davis following treatment. Specifically, "the more water-soluble components, the MP and the DEGEE most likely degraded in place via microbes or sunlight because their physiochemical properties would have limited volatilization, sorption, and bioaccumulation". The half-life of rotenone in Lake Davis water was 5.6 days. MP and DEGEE had similar half-lives to the rotenone. After 212 days there was no trace of the treatment in the water or the lake sediments of Lake Davis. Toxicity studies for rotenone indicate mammalian toxicity at levels of greater than 39 ppm. When rotenone is applied to waters at the 1 ppm target concentration (the application rate for this project), the concentration of rotenone, once mixed, will initially be as high as 0.050 ppm. Thus, during the time of piscicide application, concentrations of rotenone will be nearly 800 times less than documented mammalian toxicity concentrations.

Discussion of water quality and the nature of potassium permanganate is on page 24 of the EA and its effects on wildlife are discussed on page E-3 of Appendix E. The recommended daily allowance for potassium is 4,700 mg/day for an average adult. An average banana has about 422 mg of potassium. At a concentration of 1-3 mg/liter potassium permanganate that will be applied to the treatment area for this project, the amount of potassium will be far too low to present any threat of toxicity. Manganese is an essential element in humans and is required at low levels but can be harmful at high levels. Fruits and nuts are naturally rich in manganese. The reference dose (RfD) (the consumption level below which no adverse impacts are expected over a lifetime of exposure) for manganese in food is about 10 mg/day (USEPA 2003). Manganese may be more readily absorbed by the body from water, so the RfD for manganese in drinking water reflects the application by EPA of a safety factor of 3. This results in the consumption RfD in water of 3.29 mg/day for an average size person (USEPA 2003). At the concentrations that will be used for this project (2-4 milligrams per liter), a person would have to drink more than three liters of water from the treatment area every day for life at undiluted levels (the concentration will dilute over time) for a potential effect. Since we are only going to be applying the potassium permanganate for an estimated two to three weeks, this level of exposure is not possible. In addition, the treatment area will be closed to the public, so humans will not be exposed to water treated with potassium permanganate.

When it comes to smaller mammals, the USEPA identified several manganese dietary studies of rats and reported an LD50 (acute lethal dose that kills 50% of the rats in the study) of 379mg/kg in one study. Other studies showed higher LD50s. Using this value, an average rat weighing about 0.5-pound would need to drink, at one time, between 84-253 liters of potassium permanganate-treated water to receive a lethal dose. Other research investigating the effects of manganese neurotoxicity in 7-day old chicks documented an LD50 between 21.3-28.1 mg per kilogram of body weight for intraperitoneal, intramuscular, and subcutaneous exposure, and 469.5 mg per kilogram of oral exposure (Al-Zubaidy and Mohammad 2012). Therefore, at the 3-ppm neutralization rate (approx. 2-4 milligrams per liter) that will be used for this project, it will not be possible for birds or mammals in the treatment area to receive an acute dose. Toxic effects are also not possible over the long term because potassium permanganate will only be applied for a period of approximately two to three weeks, and its components will completely dissipate over time (by the following spring if not sooner).

The safety data sheets (SDS) for rotenone and potassium permanganate are available upon request. All product labels would be followed, and personal protective equipment would be required for project personnel, and warning signs not to consume or recreate within Gunsight Lake or the St. Mary River will be placed along the whole Gunsight Pass Trail, as recommended by product labels. Certified Piscicide Applicators and trained staff would oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, MFWP, and NPS policy (2006 Management Policies, Section 4.4.5.3).

7) **Concern Statement:** *The NPS must completely assess impacts to all wildlife present in the project area and downstream of the project area, and the level of protection that will be given to wildlife, biodiversity, all streams and waterbodies, and the general health of the overall ecosystem. The analysis must assess impacts to grizzly bears, Canada lynx, the northern three-toed woodpecker and northern goshawk since these species could eat poisoned fish. Wildlife, including birds, will be displaced and lose a source of food. The EA must assess changes to the food web and available forage for wildlife species following rotenone treatment and the subsequent removal of rainbow trout. The NPS must formally consult with the USFWS on grizzly bears, Canada lynx, and wolverine.*

NPS Response: The EA considered impacts to grizzly bears on page 20. Impacts to Canada lynx, the northern goshawk, and wildlife (which includes the three-toed woodpecker) are discussed and dismissed from detailed analysis in Appendices E and F. These sections and the analysis of impacts to common loons and other water birds (pages 21-23), include displacement and impacts to forage.

The NPS submitted a BA to the USFWS; USFWS concurred with the NPS's determinations of effect (see the Public Involvement and Agency Consultation section of this FONSI). For those species and resources that could be affected, impacts were carried forward for detailed analysis. Impact topics for which there will be no or negligible impacts were dismissed from detailed analysis. See also NPS response to concern statement no. 6.

8) **Concern Statement:** *The EA does not adequately assess impacts to reptiles or migratory birds. The EA must fully analyze these impacts, including a monitoring plan for birds that are affected by exposure to rotenone or the impacts of an altered food source.*

NPS Response: Glacier only contains three confirmed species of reptile, all of which are terrestrial species and/or do not occur in the project area; reptiles will not be impacted by the project. The EA describes impacts to common loons and water birds (including migratory species) on pages 21-23. Impacts to other migratory birds are described in Appendices E and F, Issues and Impact Topics Dismissed from Detailed Analysis. These discussions explain why birds will not be affected by exposure to rotenone and why there will be no measurable effects to foraging opportunities; for these reasons, a monitoring plan for birds is not necessary. See also NPS response to concern statement no. 2.

9) **Concern Statement:** *Some species, especially invertebrate taxa, will be totally eradicated and may not return to the project area. Some macroinvertebrate species may be eliminated or greatly reduced while others that are more resistant to rotenone or are colonizer species will increase after rotenone poisoning. Altered species compositions could result in decreased species diversity. Recovery of some invertebrate taxa will not be possible to document. The EA should include a list of all species of macroinvertebrates in the project area at all stages of life.*

NPS Response: The EA explains why affected non-target species, including invertebrates, are expected to persist and recover and cites several sources supporting this conclusion (page 15, 17, and 18 in Chapter 3). There are no indications from previous studies that certain macroinvertebrate species colonize and out-compete other more sensitive species after rotenone treatment. Extensive pre- and post-treatment monitoring from 13 alpine lakes and associated stream networks in the nearby South Fork Flathead watershed have documented aquatic macroinvertebrate recovery in abundance and community composition for even the most rare and sensitive taxa (Schnee et al. 2021).

Macroinvertebrate pre-project surveys were completed by the NPS in 2019, 2021, and 2022. A list of every macroinvertebrate and life stages would amount to needless detail and would not alter the impact analysis; NEPA reviews should avoid amassing "needless detail" (CEQ regulations 40 CFR Part 1500.1(b)). The level of detail and depth of analysis should normally be limited to the minimum needed to determine whether there would be significant environmental effects (43 CFR part 46.310(e)), as the EA currently does.

Species recovery will be determined by comparing post-treatment survey results with pre-treatment survey results. Mitigation measures in Appendix B of the EA are in place such that if post treatment sampling indicates populations of aquatic macroinvertebrates have been lost from the treatment area, efforts will be made to re-establish the populations using a nearest neighbor approach (i.e., translocate individuals from nearby, similar habitat).

10) **Concern Statement:** *The EA needs to use monitoring data from a similar project (such as at Camas and Evangeline Lakes) to clarify the estimated effects to water quality, macroinvertebrates, and scavengers from sinking dead fish. The sinking of dead fish could cause oxygen sags, and wildlife that scavenge on dead fish could become poisoned. If the dead fish become an attractant for grizzly bears, the park must be ready to close the area to the public after the application period.*

NPS Response: The potential for decreased dissolved oxygen levels (i.e., oxygen sags) and the effects to water quality and macroinvertebrates are discussed on page 25 of the EA. No data on oxygen sags has been collected at Camas or Evangeline Lakes after treatment because it is not an environmental concern. Dissolved oxygen levels naturally fluctuate within a lake, such as when ice-over causes declines, and ice-off causes rebounds in the spring. Temporary oxygen sags from dead fish will not meaningfully change the oxygen levels in Gunsight Lake. For other projects that involve the disposal of dead fish in the lake (e.g., Quartz and Logging Lakes), there have been no indications that dissolved oxygen sag is a concern.

As stated on page 4 of the EA, dead fish typically remain submerged or will be sunk to the bottom of the lake should they rise. As stated in the EA on page 20, sinking dead fish that do not remain submerged will eliminate much of the potential for grizzly bears to scavenge carcasses, but some scavenging could occur. Grizzly bears will not be affected by any consumption of fish killed by rotenone, since treatment concentrations will be far below levels that are toxic to mammals. As stated in Appendix E of the EA on page E-2, there will be insufficient quantities of rotenone to represent a risk of acute effects in terrestrial animals that may scavenge and consume fish killed by rotenone or rotenone treated water (EPA 2007). The number of fish carcasses that are not successfully sunk and could become available for scavenging will likely be too low to create a long-term attractant for bears. The park will implement additional area closures if warranted.

11) **Concern Statement**: *How will the NPS keep wildlife from drinking from the lake and eating the dead fish?*

NPS Response: As explained in the EA, during rotenone applications many of the dead fish remain submerged; any that come to the surface will be collected and sunk in the lake (see Chapter 2, page 4 of the EA and Appendix E, page E-2). Some scavenging may occur, and wildlife cannot be prevented from drinking from the lake during rotenone application but, as explained in Appendix E on page E-2, the concentration of rotenone will be too low to represent a risk of acute effects.

12) **Concern Statement:** *The EA does not adequately assess impacts to wetlands or vegetation. The project will create pooling, alterations in flow and water patterns, the loss of wetlands, and the compaction of wetland soils from lake and streambed alterations, barrier construction, and diversion of sediments into wetlands, and streams. The NPS needs to consult with the USFWS regarding effects to listed plants.*

NPS Response: Impacts to wetlands and vegetation are described in Appendix E, pages E-1 and E-2. Impacts to wetlands and vegetation are associated with possible trampling. As stated in Appendix E, rotenone is not known to be toxic to plants at the concentration that will be used (Finlayson et al. 2010); the potential for impacts to wetlands and plants from potassium permanganate is also described. As explained in the EA on page 24, rotenone is not persistent in the environment as it readily breaks down under natural conditions. Rotenone will be applied in liquid form to the water and will not be available to be absorbed onto the surface of plants as powdered rotenone may do. Text has been added to include this explanation and reiterate an existing mitigation measure to mark and avoid any rare plants found during pre-project surveys (see text change above to Appendix E, page E-2).

No mechanical work within wetlands or streams, ground disturbance, dredging, fill placement, stream bank alterations, barrier construction, or alterations of stream flow will occur and were not proposed in the project scope.

The NPS submitted a BA to the USFWS evaluating the effects to ESA-listed species (see also Public Involvement and Agency Consultation section of this FONSI). Whitebark pine is the only federally listed plant species in the park (threatened) and could be present in the project area. Whitebark pine will not be affected because there will be no alteration of whitebark pine habitat or to individual trees.

13) **Concern Statement:** *Completion of weirs and fish barriers will have continued effect on aquatic species seasonally because of alterations in substrate, hydrology, food sources, suitability of habitat, and flow regimes. This is a permanent alteration to habit and a permanent impairment to these species and to the natural stream. Other fish barriers and alterations to substrate will have similar effects. Weirs and fish barriers require permits.*

NPS Response: No barrier construction or alterations of stream flow or substrate will occur with the project and were not proposed in the project scope.

14) **Concern Statement:** *The EA should thoroughly assess the effects of rotenone and potassium permanganate on people. These waters are municipal water supplies. Rotenone is known to be linked to Huntington's disease and Parkinson's disease. How will the project affect backpackers filtering drinking water from the lake?*

NPS Response: Gunsight Lake is not a municipal water supply and there are no municipal water supplies associated with this project. Human health and safety are discussed in ***Appendix E*** page E-4 of the EA. See also NPS response to concern statement no. 6. The rotenone formulation proposed for use is approved by the EPA. Neither study often cited for a link between rotenone and Parkinson's disease (Betarbet et al. 2000; Tanner et al. 2010) is a valid comparison to using a 5% active ingredient liquid formulation of rotenone to remove fish from lakes and streams, applied by trained applicators wearing required personal protective equipment. All product labels will be followed, and PPE will be required for project personnel. Warning signs not to consume or recreate within Gunsight Lake or the St. Mary River will be placed along the whole Gunsight Pass Trail, as recommended by product labels.

Huntington's disease is genetically inherited which means it is passed from parent to child through a mutation (a change) in a particular gene; it is not caused by exposure to chemicals (NIH 2023). Studies have used rotenone and other compounds to induce Huntington disease-like symptoms in small animals for research, but there is no link between application and causing Huntington's disease in humans (Deshmukh et al. 2012).

The general public will not be exposed to rotenone because the treatment area and trail will be closed during application. Certified Piscicide Applicators and trained staff will oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, MFWP, and NPS policy (2006 Management Policies, Section 4.4.5.3).

Long-term Survival/Establishment of Genetically Pure Native Populations

15) **Concern Statement:** *Could the NPS introduce native whitefish and sculpin to Gunsight Lake as an added prey source for bull trout and to minimize predation on westslope cutthroats by bull trout?*

NPS Response: Based on this and other similar comments received during the EA public comment period, NPS has added mountain whitefish as a native species to translocate to Gunsight Lake. The addition of mountain whitefish to the species of fish being translocated involves minor additions to the environmental analysis; specifically, consideration of impacts to mountain whitefish, westslope cutthroat trout, amphibians, aquatic macroinvertebrates, and zooplankton (see text changes to pages 13, 15, 17, and 18).

Introducing mountain whitefish to Gunsight Lake along with westslope cutthroat and bull trout will increase the conservation value of the project by securing another native salmonid and providing an additional forage source for bull trout. Mountain whitefish have a much higher reproductive potential (Boyer et al. 2017) than westslope cutthroat trout (Downs et al. 1997; Travis Slivka, USFS hatchery manager, personal communication) and will be expected to have a larger overall population size in the lake compared to westslope cutthroat trout. Grace Lake in the North Fork area of Glacier contains bull trout and Yellowstone cutthroat trout and does not contain mountain whitefish as a buffer forage species. Following the successful introduction of bull trout, Yellowstone cutthroat trout numbers have declined dramatically in Grace Lake (C. Muhlfeld, USGS, personal communication). This is likely because of increased predation pressure on Yellowstone cutthroat from the introduced bull trout. Mountain whitefish will provide an additional source of prey for bull trout and buffer predation on westslope cutthroat trout in Gunsight Lake, providing benefit to both species.

There will be some interspecies competition through dietary overlap as westslope cutthroat trout and mountain whitefish both rely primarily on aquatic invertebrates and zooplankton at various life-stages. Some competition for food with westslope cutthroat trout will likely occur but not to the extent to jeopardize the establishment of a healthy westslope cutthroat trout population for the long term. Enough dissimilarity exists between feeding and habitat use that both species will be expected to occupy slightly different niches in the lake, as they do in most of the naturally fish-bearing lakes across the park (Ellison 1980 and DosSantos 1985). Bull trout, westslope cutthroat trout, and mountain whitefish co-exist in most waters that support native trout in the park. Mountain whitefish are not thought to be a strong competitor with native trout because mountain whitefish are known to rely heavily on chironomids on the bottom of lakes and streams whereas trout often feed in areas higher in the water column (Montana Field Guide accessed 6/26/2023; Mountain Whitefish - Montana Field Guide (mt.gov); Ellison 1980; DosSantos 1985). Gunsight Lake and its tributaries contain a wide variety of aquatic macroinvertebrates, including chironomids (NPS file data).

Introducing mountain whitefish will provide a valuable opportunity for Glacier to research the growth rates and population interactions in comparison to previous fish preservation projects in the park where whitefish were not introduced including Camas, Evangeline, and Grace Lakes.

The species of sculpin native to the St. Mary Lake/River system are the spoonhead sculpin (*C. ricei*) and rocky mountain sculpin (*C. bondi*). Sculpin are not proposed for translocation because they are not necessary to the success of the project, as westslope cutthroat trout and mountain whitefish will provide sufficient forage for bull trout. The rocky mountain sculpin is a stream dwelling sculpin, and we don't expect they would be a primary prey item due to their habitat preferences. The spoonhead sculpin occupies deep lakes and has been identified as a prey item for lake trout, but previous efforts by NPS staff to capture lake dwelling sculpin in St. Mary Lake were largely unsuccessful. More information is needed on this species with regard to abundance, distribution, habitat use, and trapping methods to fully evaluate the potential to translocate spoonhead sculpin. Should monitoring data or new information come to light regarding the importance of sculpin in supporting bull trout populations, the park would consider this through a separate NEPA process.

16) **Concern Statement:** *The EA did not analyze if there is sufficient spawning and rearing habitat in the inlet or outlet streams for bull trout to establish a self-sufficient population. If there is not habitat, bull trout should not be translocated; recommend evaluating spawning and rearing habitat as an additional mitigation measure and only translocating bull trout if there is sufficient spawning gravels and groundwater upwelling to support about 30 redds (estimated).*

The EA did not analyze the probability that bull trout will not stay at Gunsight Lake and spawn but will instead return to their natal streams. Will this require construction of a fish barrier to keep bull trout in the lake?

NPS Response: Bull trout occupy park lakes where they have adapted to spawn in lake inlets, lake outlets, and likely some shoreline spawning where ground-water exchange occurs (where streams or seeps come in). There is ample opportunity for bull trout to spawn in the inlet and outlet of Gunsight Lake as they do in Upper Kintla Lake and more recently, Grace Lake. The physical habitat setting for spawning and rearing of Gunsight Lake is very similar to nearby Cracker Lake where an abundant bull trout population exists. Given the wide range of life-histories found in Glacier, bull trout are adaptable, and are expected to be successful at Gunsight Lake.

Thirty bull trout redds are not likely in Gunsight Lake; this number is more likely to occur in larger lakes with healthy bull trout populations, such as Quartz Lake. It won't take much reproductive success to maintain a bull trout population in Gunsight because the bull trout will occur in relatively low densities as an apex predator. Bull trout will be monitored once they are introduced by conducting spawning surveys (redd surveys) in accessible stream and lakeshore areas as well as through electrofishing surveys for juvenile bull trout.

Some bull trout may leave Gunsight Lake, and some will also die. But enough bull trout will be translocated to the lake over enough time for bull trout to successfully establish a population. A downstream barrier would not prevent fish from migrating out of the lake (barriers prevent upstream migration, but downstream migration is still possible); construction of a barrier downstream would also not be feasible due to terrain, flows, and maintenance needs.

17) **Concern Statement:** *Gunsight Lake is very oligotrophic with limited nutrients available. How is the NPS certain westslope cutthroat and bull trout can establish self-sustaining populations in Gunsight Lake?*

The EA does not analyze impacts of bull trout predation on westslope cutthroat trout.

NPS Response: Most park lakes are oligotrophic; other lakes in the park have similar nutrients status and productivity and support healthy native trout populations (Ellis et al. 1992). Rainbow trout, which have similar habitat requirements as westslope cutthroat trout and bull trout, have established a self-sustaining population in Gunsight Lake since they were introduced almost a century ago. Multiple year classes will be stocked to ensure enough fish are present over multiple years to give them the best chance for success. In addition, westslope cutthroat trout will be translocated to the lake first, possibly in 2024 at the earliest, three to four years before bull trout are introduced. This will allow the westslope cutthroat trout to reach sexual maturity and establish a reproducing population before adding additional competition and/or predation from bull trout. Two- to four-year classes of westslope cutthroat trout will likely be introduced first followed by two- to four-year classes of bull trout.

The EA acknowledges in the discussion of the preferred alternative that bull trout will prey on westslope cutthroat trout (page 8); as stated, westslope cutthroat trout will be translocated to Gunsight Lake ahead of bull trout so they may establish a reproducing population before predation from bull trout. In response to public comment, native mountain whitefish will also be translocated to provide prey for bull trout and buffer the predation effects to westslope cutthroat trout (see text changes to pages 1, 4, 8, and 13, among others). The EA does not analyze predation effects to westslope cutthroat trout because predation has been accounted for in the project design and bull trout predation of westslope cutthroat trout at Gunsight Lake will not affect westslope cutthroat trout donor populations.

18) **Concern Statement:** *Slide and Cracker Lakes already have bull trout – why can't those lakes serve as habitat refugia for bull trout, rather than experimenting with something that may fail (translocating to Gunsight) and that would deplete existing strongholds?*

NPS Response: Slide and Cracker Lakes do already serve as thermal refugia for bull trout. The project is intended to increase the number of lakes that provide thermal refugia. The EA explains that the bull trout populations at Cracker and Slide Lakes are small and non-migratory (pages 10-11). On page 11, the EA explains why removing individual bull trout from donor waters will not deplete the existing bull trout population at the source.

19) **Concern Statement:** *The preferred alternative does not accomplish objectives stated in the EA. The EA states that if local donor sources cannot provide genetically pure native fish, individuals of lesser genetic purity may be used. This means the project won't conserve the genetic diversity of bull trout and westslope cutthroat trout because native fish that are already hybridized with non-native fish could be transplanted into Gunsight Lake, which would expand the range of hybridized fish. If the rotenone application doesn't kill all the rainbow trout, the remaining rainbow trout will hybridize with the translocated westslope cutthroat trout despite the project goals to prevent hybridization. Rainbow/cutthroat hybrids will likely still be present since the success of rotenone treatments in high mountain lakes is questionable. Rainbow trout could also get back into the lake from downstream sources.*

How many westslope cutthroat trout must be introduced for genetic swamping to effectively remove the rainbow trout? The EA also needs to clearly define genetic swamping.

NPS Response: The goal is to preserve genetically unaltered westslope cutthroat trout but there is conservation value in conserving slightly hybridized populations. The State of Montana classifies westslope cutthroat trout populations that are at least 90% "pure" westslope cutthroat as "conservation populations" while those that are at least 99% "pure" as considered "core" populations and receive higher conservation status. It is important to conserve genetically pure populations because these fish reflect successful evolution to fit their environment and represent the unaltered native genome, adapted to be successful under local environmental conditions. However, there is broader conservation value in preserving westslope cutthroat that are at least 90% pure because they contain a substantial amount of the remaining native genetic diversity in westslope cutthroat trout needed to adapt to changes in their environment over time. Giving

up on slightly hybridized populations would result in significant genetic diversity loss of the species over time and reduce their adaptive capacity. Unfortunately, all the remaining westslope cutthroat trout populations in the St. Mary drainage in the park have some level of hybridization, but fortunately most still have pure individuals. If the project resulted in establishing a westslope cutthroat trout that was 98% pure over time, it would be a conservation success and a vast improvement over having a persistent threat from 100% pure rainbow trout in Gunsight Lake. The EA states, on page 1, that all efforts will be made to use donor fish with less than one or two percent non-native genes when reasonable. There are barrier water falls immediately below the lake outlet that will prevent rainbow trout from re-entering the lake and causing hybridization (stated in the EA on pages 1, 7, 12, and in Appendix D), though westslope cutthroat and bull trout can migrate out of Gunsight and into the wider drainage, providing benefits to downstream genetics. Regarding the potential for success of the rotenone treatment, please refer to NPS responses to concern statements nos. 2 and 3.

The EA defines genetic swamping as the replacement of one population or species with another through repeated, multi-year, stocking of a waterbody and explains that, over generations, the reproduction of the stocked fish overtakes any remaining species genes (see page 5 of the EA). The success of swamping as a tool to replace undesirable fish populations/species with desirable ones depends entirely on the stocked fish having a high degree of physical interaction (including reproductive) with the existing population. The proportional makeup of the stocked species to the overall population of fish in the waterbody then increases through time due to 1) competition/predation, and 2) hybridization. Consequently, swamping is a generational process that takes several years, sometimes decades, to play out. Successful swamping case studies in the South Fork Flathead drainage were initiated more than 30 years ago by stocking high densities (300 fry/lake surface acre vs. the typical 100 fry/surface acre stocking rate) of genetically pure westslope cutthroat trout roughly every 1-4 years in alpine lakes. MFWP reported that swamping does not always work but in 2009 swamping was resumed in 6 South Fork Flathead lakes as an alternative to piscicide treatment; currently all 6 lakes are meeting objectives by harboring westslope cutthroat trout populations with only small amounts of nonnative genetic ancestry. By treating the lake with rotenone first, the benefits of swamping will be increased because few (or none) rainbow trout will exist in the lake compared to the number of westslope cutthroat trout fry that will be planted.

20) Concern Statement: *The NPS action should include restoration measures in adjacent systems to restore degraded stream quality from sediment, runoff, bank erosion, loss of vegetation, nutrient runoff, etc. so that bull trout have a better chance at establishing a population.*

NPS Response: The suggested restoration measures in adjacent areas are outside of the scope of the project.

<u>Donor Populations</u>

21) Concern Statement: *The EA does not adequately disclose how and where (i.e., what hatchery) the fish will be propagated.*

NPS Response: The techniques for fish collection, rearing, propagation, and translocation are described on page 8 of the EA. The names of the hatcheries were not included in the EA because this level of detail is not necessary to evaluate the alternatives and impacts to park resources. NEPA reviews should focus on important environmental issues and avoid "amassing needless detail" (40 CFR Part 1500.1(b)).

22) Concern Statement: *The EA is not clear about whether population estimates for the potential donor source populations are accurate. The EA also needs to clarify whether the 10 percent threshold for the number of fish that would be removed from the donor population is referring to 10 percent of the population in one year or over several years, and whether population estimates are based on sampling or modeling.*

NPS Response: Text has been added to the EA on page 11 to clarify the 10 percent threshold. Each potential donor stream was genetically tested once by park biologists and geneticists between 2015 and 2022. Streams for translocation were chosen based on security of genetic diversity of the westslope cutthroat population, population size, conservation value, and being disease-free. Roberts Creek, located entirely on Blackfeet Reservation lands,

was considered in the EA but has since been ruled out because of concerns of the small population size and the extreme conservation value of this population.

23) **Concern Statement:** *There is no NEPA analysis of the impacts to the donor fish populations. Are they ecologically able to cope with the removal of fish, especially since their numbers are not very high to begin with and they too are under pressure from climate change? Are permits and consultation with USFWS required?*

NPS Response: The EA addresses impacts to donor fish populations on pages 11 and 13; text has been added to consider impacts to donor populations of mountain whitefish (see text changes to page 13).

Fish populations have the ability to recover from the loss of individuals by increasing reproduction and/or individual survival (Ricker 1975). Stream dwelling salmonids, such as cutthroat and bull trout, are often limited by juvenile rearing habitat availability because they are territorial (Chapman 1962). Survival of bull trout has been demonstrated to be density dependent, where individual survival is higher at lower abundance, allowing them to compensate for increased mortality or harvest (Johnston et al. 2007). The annual over-abundance of young fish produced each year as eggs hatch results in increased intraspecies competition for food and space, meaning a proportion of the individuals must move out of the system or die. Johnston et al. (2007) documented the rapid recovery following cessation of allowed angler harvest of a bull trout population after severe overharvest. The removal of some fish for translocation is analogous to harvest, and due to their ability to compensate through increased survival and high reproductive potential (hundreds to thousands of eggs per female), the removal of a small proportion of the population over a fixed amount of time (e.g., 10% annually for 3 consecutive years) is not likely to harm the populations. Further, in the case of westslope cutthroat trout, we intend to replace fish removed for translocation by returning excess juveniles produced at the hatchery back to the donor stream as stated on page 8 of the EA.

There have been no adverse impacts to the Quartz Lake bull trout population following the use of that population as a donor source in efforts to create a bull trout population in Grace Lake. In those efforts the NPS collected gametes from approximately 8% of the adult spawning population.

The NPS submitted a BA to the USFWS and the USFWS concurred with the NPS's determinations of effect to federally listed species (refer to the Public Involvement and Agency Consultation section of this FONSI).

24) **Concern Statement:** *Page 8 of the EA states "Selected donor water bodies within the St. Mary River drainage are similar or near enough on the landscape to have undergone similar evolutionary pressures as the project area". This is an incorrect characterization of the watershed because some lakes evolved to have fish but others, including Gunsight, were fishless.*

NPS Response: Gunsight Lake was fishless because barrier falls downstream prevented fish from migrating upstream and populating the lake. Other ecological characteristics of the donor water bodies, such as elevation, size, prey composition, etc. are similar to those of Gunsight Lake.

<u>Recommended Wilderness</u>

25) **Concern Statement:** *Using poison, restocking a lake that was naturally fishless, using motorized equipment such as generators, water pumps, motorboats, and helicopters, and trammeling is inconsistent with wilderness management and violates the Wilderness Act. The public must be able to evaluate the adequacy of the MRA prior to a decision.*

NPS Response: A minimum requirements analysis (MRA) was prepared for the project in accordance with the NPS Policy. The MRA determined that the methods under the EA's preferred alternative are the minimum required for the administration of the park's recommended wilderness. The EA describes the impacts to the untrammeled quality on page 27; the action is not a violation of the Wilderness Act because as determined in the MRA, taking action is necessary for the management of the area as wilderness and the preferred alternative in the EA is the minimum activity.

There are no public review requirements for an MRA. An MRA may be referenced in the FONSI or Record of Decision (ROD) if the park anticipates possible changes to the preferred alternative between the EA and FONSI, such as during public comment. The MRA was prepared concurrently with the EA and the findings are consistent with those of the EA. The MRA will be posted to the NPS PEPC site with this FONSI.

26) **Concern Statement:** *The NPS should minimize motorized equipment use in any way possible such as bringing supplies in by porter, packers, or rowers, using vented covers over generators, and using the largest helicopters available to limit the number of flights needed. The project should comply with the park limit of 50 administrative flights per year*.

NPS Response: The EA states that all personnel would hike to the project area (page 5), equipment would be brought by pack stock whenever possible (page 5), and that all efforts would be made to include the project flights in the 50 administrative flights limit (page 9). Environmental impacts to natural soundscapes are discussed on pages 31-33 and mitigation measures for impacts to natural soundscapes are in Appendix B, page B-3.

27) **Concern Statement:** *The EA should have analyzed a third alternative to remove rainbow trout and restore the lake and upper St. Mary watershed to a historically fishless condition (i.e., do not translocate native fish to the lake once the rainbow trout are removed). Analysis of this alternative is needed to clarify whether the rainbow trout in Gunsight Lake are causing the decline in westslope cutthroat trout in the watershed and should model or estimate how removing rainbow trout will reduce their presence below the barrier falls. The EA is not clear on whether there is a scientifically established link between rainbow trout in Gunsight Lake and downstream hybridization with westslope cutthroat trout.*

NPS Response: An alternative to remove the rainbow trout from Gunsight Lake without also translocating native fish was considered but dismissed from detailed analysis; the reasons for dismissing this alternative are described in Appendix D, page D-1. The risk non-native rainbow trout at Gunsight Lake present to native westslope cutthroat trout is explained in Chapter 1, page 1. There is no data to definitively state that the ongoing hybridization of westslope cutthroat trout is from the rainbow trout in Gunsight Lake, but Gunsight is the only rainbow trout population connected to these hybridized populations within the St. Mary watershed. Gunsight Lake is located in the headwaters of the St. Mary River drainage, contains only introduced rainbow trout and poses a clear risk to the remaining downstream westslope populations. Rainbow trout have been shown to radiate out of strongholds and spread hybridization within westslope cutthroat trout populations (Muhlfeld et al. 2009 and 2017). Hybridization is spreading in this manner in response to rainbow trout population abundance, increasing water temperatures resulting from climate change, and proximity to the source. It is highly probable that rainbow trout move out of Gunsight Lake and swim downstream where they would be able to further hybridize native cutthroat populations resulting in genetic losses. As water temperatures increase from climate change, it is anticipated that hybridization will increase as the warmer temperatures favor rainbow trout (Muhlfeld et al. 2017). This is an unacceptable risk, especially given ongoing efforts to protect westslope cutthroat trout populations from hybridization.

28) **Concern Statement:** *The project should utilize electric boat motors instead of gas motors to minimize potential spills, emissions, and noise. Batteries could be recharged or replaced with helicopter flights since they will be entering and exiting the project area during treatment.*

NPS Response: Each barrel of rotenone weighs almost 300 pounds and it is dispersed through a venturi pump off a moving boat, powered by a small outboard motor. An electric trolling motor would not have sufficient power to accomplish this in a timely fashion and in general battery life would not be sufficient. The helicopter will only be used on the first and last day of the operation and would not be available to continually shuttle batteries to the project. More noise would be generated by increased use of the helicopter to deliver batteries. In addition, helicopter use would add to project airborne emissions. Risk of fuel spill will be mitigated by having the appropriate absorbent materials to clean up small spills as discussed in Appendix B.

29) **Concern Statement:** *Recreational angling should not be allowed until the translocated populations are established, with multiple viable age classes and reproduction for at least three years. Any recreational angling that does occur should be with artificial flies only, with no streamers, to avoid harvesting bull trout.*

NPS Response: Fishing is a traditional use of Gunsight Lake and will be permitted according to the park's fishing regulations. Current regulations are catch and release for all native fish species across the park, with exception being St. Mary Lake. Since angling would be catch and release, angling is not expected to negatively affect the establishment of the translocated populations. Bait fishing and intentional targeting of bull trout are already prohibited by park regulations.

30) **Concern Statement:** *The EA made an error in assessing impacts to the natural condition of wilderness character. All qualities except natural condition are analyzed on a site-specific level, but natural condition is analyzed on a park-wide scale. This error is a shift in scale that should be corrected. The NPS is claiming that the project will benefit the natural condition by removing non-native species while ignoring that at the project level the natural condition will be impacted by introducing fish to historically fishless waters. The EA needs to analyze the impacts of artificially raising bull trout in a lake that is naturally fishless.*

NPS Response: The EA explains that benefits to the natural condition of recommended wilderness will extend regionally because removing non-native rainbow trout will reduce the overall risk of hybridization in the broader St. Mary system and translocation will expand the distribution of the species (page 28). As explained in the EA (pages 27-29), impacts to the other qualities of wilderness character will be site-specific. The EA describes site-specific impacts to the natural condition from the mortality of aquatic invertebrates and amphibians during rotenone application (page 28). Gunsight Lake was historically fishless but has supported non-native rainbow trout since they were introduced to the lake from 1920 to 1936. Text has been added (see text changes, page 28) to describe site-specific impacts to the natural condition at Gunsight Lake from the change in fish species. The EA describes the effects to amphibians, macroinvertebrates, and zooplankton from the change in fish species composition (i.e., from the translocation of native fish, including bull trout) on pages 15, 17, and 18. Translocation efforts will impact the natural condition of the donor streams through removal, handling, and possible mortalities of individual native fish.

31) **Concern Statement:** *Please consult on the impact of helicopter trips on wolverines, grizzly bears, lynx and lynx critical habitat and other wildlife. Please include an alternative that doesn't use helicopters.*

NPS Response: The NPS submitted a BA to the USFWS evaluating the effects to ESA-listed species from project activities including helicopter flights. The USFWS concurred with the determination of effects. See also Public Involvement and Agency Consultation of this FONSI above. Appendix D of the EA describes why using pack stock only to transport materials instead of a helicopter was considered but dismissed from detailed analysis (page D-2).

<u>Pre- and Post-project Monitoring</u>

32) **Concern Statement:** *NPS has not effectively assessed the pre-project conditions.*

NPS Response: As stated on page 7 of the EA, pre-treatment biological surveys and monitoring for macroinvertebrates, plankton, and amphibians took place 2019 through 2022 to assess baseline community conditions in advance of post-project monitoring. Montana Natural Heritage Program web-based species of concern reports were generated for a list of animal and plant species of concern that could be present in the project area. Visual surveys were conducted for amphibians in late August and September from 2020 through 2022. Over the three survey years, we documented three species of amphibians: the western toad (*Anaxyrus boreas*), Columbia spotted frog (*Rana luteiventris*), and the Rocky Mountain tailed frog (*Ascaphus montanus*) (page 15 of the EA). The two other amphibians known to exist in the park, the boreal chorus frog (*Pseudacris maculate*) and the long-toed salamander (*Ambystoma macrodactylum*) were not detected. Zooplankton were monitored with vertical plankton tows in September of 2020 through 2022. A total of 60 plankton samples were collected and evaluated. Rotifers, Copepods, and Cladocerans were identified (page 20 of the EA). Aquatic macroinvertebrate sampling was conducted

in the inlet to Gunsight Lake as well as the upper St, Mary River below Gunsight Lake. A total of 19 quantitative benthic samples were collected and analyzed. Twenty-nine aquatic macroinvertebrate taxa were identified (pages 17-18 of the EA). The lake volume was measured using sonar to create a bathymetric map to ensure that rotenone is not over-applied to the lake. Similarly, stream volumes were measured to ensure the precise treatment levels of both rotenone and potassium permanganate.

33) **Concern Statement:** *The EA does not include a monitoring plan for the project and does not commit to a duration of a monitoring plan. The project should include monitoring the donor populations for three years and monitoring Gunsight Lake with specific measurable goals and objectives. Aquatic macroinvertebrates should be monitored in the project area for 10-15 years.*

Data from post-project monitoring should be made available to the public each year on the park's website. Does the project have funds to augment populations if needed? Will this information be available to the public?

NPS Response: The EA describes post-project monitoring and monitoring of translocated fish on pages 7-9 and in Appendix B, Mitigation Measures, page B-1. Post-treatment monitoring will likely begin in 2024 and continue through 2026 or longer to evaluate aquatic organism (native fish, macroinvertebrates, zooplankton, and amphibians) response and recovery. Monitoring will follow established monitoring protocols in the American Fisheries Society Rotenone Treatment Manual SOP; a text change has been made to the EA on page 7 to clarify. A specific target number is not necessary and would not be meaningful, because the success of the project is not measured by a given number of fish per unit area. Rather, the measurable goal for success is establishing self-sustaining populations of westslope cutthroat and bull trout in Gunsight Lake. This will be documented using standard fish population sampling approaches including spawning surveys, netting, trapping, snorkeling, and/or electrofishing. If successful natural reproduction and population maintenance can be demonstrated over time, the project will have been successful.

The donor populations will also be monitored for three to five years after the donor fish are removed, monitoring abundance and genetic composition; text changes to page 7 also include this clarification.

A long-term funding source is not identified, but this is often the case for ongoing resource management projects in the park. The park is committed to the success of the project and anticipates funding as needed. Monitoring data will generally be made available through NPS reports during the year following the collection of the data.

<u>Regulatory and Administrative Concerns</u>

34) **Concern Statement:** *Rotenone projects must be in compliance with the Clean Water Act (CWA). Meaning there must be a National Pollutant Discharge Elimination System (NPDES) permit. Will there be an application for a NPDES permit?*

NPS Response: The State of Montana has delegated authority to implement the CWA and the NPS will secure all necessary water related permits before implementing the project. Text has been added to page 25 to clarify.

35) **Concern Statement:** *The EA has not clearly defined the full extent or scope of the project which limits public engagement.*

NPS Response: The project area and scope are clearly defined in the EA in Chapters 1 and 2.

36) ***Concern Statement:*** *The EA states (on page B-2 under Mitigation Measures) that 'Rotenone could not be applied later than September 1…" Rotenone should be applied as late in the season as possible to minimize impacts to non-target species, like amphibians.*

NPS Response: This was a typographical error that has been corrected. See text changes to page B-2 in Appendix B. As stated on page 5 of the EA, rotenone is typically applied in late summer or early fall to reduce effects to larval amphibians; the project is anticipated to begin in early September.

37) **Concern Statement:** *The EA does not say how the rainbow trout got to Gunsight Lake in the first place. Is there ability for invasive species to recolonize Gunsight Lake after treatment?*

NPS Response: This information is located on page 1, paragraph 3 of the EA.

38) **Concern Statement:** *The EA does not assess impacts from spills. How NPS will prevent and remedy spills of rotenone or potassium permanganate? The EA does not describe the rotenone application process, including how and when it will be applied, equipment used, precautions for wind, and personal protective equipment.*

NPS Response: Mitigation measures listed in Appendix B of the EA include development of a spill plan (page B-1). The EA does not assess impacts from spills of rotenone or potassium permanganate because spills are not anticipated and impacts would be speculative and highly unlikely given measures to prevent spills. The EA describes how and when the rotenone will be applied on pages 4-5, Chapter 2, Alternatives. We will be following the American Fisheries Society Rotenone Standard Operation Procedures Manual which addresses these issues. Certified Piscicide Applicators and trained staff will oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, Montana Fish, Wildlife, and Parks (MFWP), and NPS policy (2006 Management Policies, Section 4.4.5.3). A liquid formula will be used instead of powder, so will not be at risk from wind.

39) **Concern Statement:** *Federal and state laws protecting water, aquatic habitats, human health, natural resources, and wildlife will be violated. The ecosystems and their inhabitants will be impaired in violation of National Forest Management Act, the ESA, the CWA, and NEPA. The EA should assess whether streams in the project area are already impaired and if the project will cause further impairment.*

NPS Response: No laws will be violated. Any required permits will be obtained before project implementation. The effects of the project do not constitute impairment. See the Non-Impairment Determination in this FONSI. Streams in the project area are not already impaired.

40) **Concern Statement:** *The EA does not state the concentration of antimycin, rotenone, or potassium permanganate that will be used and what the effects of different concentrations would be.*

NPS Response: The project will not use antimycin and the chemical was not included in the project scope (Chapter 2, Alternatives). The EA describes concentrations of rotenone to be used on page 5 and potassium permanganate on page 5. Concentrations applied will not vary.

41) **Concern Statement**: *The EA points to irrigation diversions including the Bureau of Reclamation (BOR) Milk River Irrigation Project, Sherburne Dam, and the St. Mary Diversion Works near Babb as a source of habitat impacts; however, in the case Alliance for the Wild Rockies v. Burman (10/30/20) BOR has successfully tested an adult fish screen and will not operate the St. Mary canal until fish screens are installed on all gates conveying water. This minimizes effects to bull trout outside the park without the need for the project at Gunsight Lake.*

NPS Response: This is inaccurate information. The case against Burman was dismissed by the court (*All. for Wild Rockies v. Burman*, 499 F. Supp. 3d 786 (D. Mont. 2020)). Temporary fish screens were installed on the St. Mary Diversion Dam in 2020. The dam and canals are currently operating and construction on a permanent solution has not begun (BOR 2023).

42) **Concern Statement:** *The park should complete the Fisheries Management, Aquatics Restoration, and Climate Change Response Plan/Environmental Impact Statement (EIS) that was scoped in 2016 instead of splitting the program into*

individual projects. Separate projects may result in missing the cumulative effects analysis, the impacts of the project, and other effective alternatives. Under NEPA, the analysis for site-specific projects should tier off a programmatic EIS. The NPS must prepare an EIS for this project instead of an EA.

NPS Response: The park's Fisheries Management, Aquatics Restoration, and Climate Change Response Plan/EIS was terminated in favor of focused and targeted fisheries management projects that can be analyzed in site-specific detail and for which funding is available. Individual, site-specific review for this project has not resulted in failure to analyze impacts, including cumulative impacts, or to consider other alternatives; impacts from this project are described in Chapter 3 of the EA (pages 9-37) and alternatives considered but dismissed from detailed analysis are described in Appendix D. There is no requirement that site-specific projects must tier off an EIS.

The project does not require an EIS. The CEQ regulations require that agencies designate actions that normally require preparation of an EIS (1507.3(b)(2)(i)). For the NPS, an EIS is normally required for the following types of actions (516 DM 12):

- Proposals to designate Wild and Scenic Rivers, National Trails, or Wilderness;
- General Management Plans for major national park system units;
- Grants, including multi-year grants whose size and/or scope will result in major natural or physical changes, including interrelated social and economic changes and residential and land use changes within the project area or its immediate environs; and
- Grants which foreclose other beneficial uses of mineral, agricultural, timber, water, energy, or transportation resources important to national or state welfare.

This project does not fall under any of the above categories normally requiring an EIS, is not a major federal action, and will not cause significant adverse environmental impacts as documented in this FONSI.

43) Concern Statement: *The analysis is insufficient, and the EA does not use best available science for analysis of all impact topics. The likelihood of project failure is high and is not disclosed in the EA.*

NPS Response: The NPS disagrees with this assertion. The best available science has been used in the development of the project and the analysis of impacts. See NPS response to concern statements 2 and 3 regarding successful applications of rotenone in the treatment of invasive species.

References Used in Text Changes and Comment Responses

Al-Zubaidy, M.H.I., and F.K. Mohammad. 2012. Effects of acute manganese neurotoxicity in young chicks. Dept. of Physiology, Biochemistry and Pharmacology, College of Veterinary Medicine, University of Mosul, Mosul, Iraq.

Betarbet, R., T.B. Sherer, G. MacKenzie, M. Garcia-Osuna, A.V. Panov, and J.T. Greenamyre . Chronic systemic pesticide exposure reproduces features of Parkinson's disease. *Nat Neurosci*. 2000 Dec;3(12):1301-6. doi: 10.1038/81834. PMID: 11100151.

Boyer, J.K., C.S. Guy, M.A.H. Webb, T.B. Horton, and T.E. McMahon. 2017. Reproductive Ecology, Spawning Behavior, and Juvenile Distribution of Mountain Whitefish in the Madison River, Montana. *Transactions of the American Fisheries Society.* 146:939–954, 2017 © American Fisheries Society 2017 ISSN: 0002-8487 print / 1548-8659 online DOI: https://doi.org/10.1080/00028487.2017.1313778

Bureau of Reclamation (BOR). 2023. *St. Mary Diversion Dam and Canal*. Accessed on 22 June 2023 from https://www.usbr.gov/gp/mtao/stmary/index.html

Casetext. 2020. *All. for Wild Rockies v. Burman*, 499 F. Supp. 3d 786 (D. Mont. 2020)

Deshmukh RS, Chaudhary RK, and Roy I. Effect of pesticides on the aggregation of mutant huntingtin protein. *Mol Neurobiol*. 2012 Jun;45(3):405-14. doi: 10.1007/s12035-012-8252-2. Epub 2012 Mar 14. PMID: 22415443.

DosSantos, J. 1985. Comparative food habits and habitat selection of mountain whitefish and rainbow trout in the Kootenai River, Montana. MS Thesis. Montana State University.

Downs, C.C., B. Shepard, and R.G. White. 1997. Age at Sexual Maturity, Sex Ratio, Fecundity, and Longevity of Isolated Headwater Populations of Westslope Cutthroat Trout. *North American Journal of Fisheries Management*. 17(1): 85-92.

Ellis, B.K., J.A. Stanford, J.A. Craft, D.W. Chess. 1992. Monitoring of water quality in selected lakes in Glacier National Park, Montana: Analysis of data collected, 1984-1990. Open File Report 129-92 in Conformance with Cooperative Agreement CA 1268-0-9001, Work Order 6, National Park Service, Glacier National Park, West Glacier, Montana. Flathead Lake Biological Station, The University of Montana, Polson.

Ellison, JP. 1980. Diets of mountain whitefish, Prosopium williamsoni (Girard), and brook trout, *Salvelinus fontinalis* (Mitchill), in the Little Walker River, Mono County, California. *California Fish and Game* 662: 96-104.

Environmental Protection Agency (EPA). 2003. Office of Water (4304T) Health and Ecological Criteria Division Washington, DC 20460 www.epa.gov/safewater/ccl/pdf/manganese.pdf EPA 822-R-03-003 February 2003

Finlayson, B. J., S. Siepmann, and J. Trumbo. 2001. Chemical residues in surface and ground waters following rotenone application to California lakes and streams. Pages 37–53 in R. C. Cailteux, L. DeMong, B. J. Finlayson, W. Horton, W. McClay, R. A. Schnick, and C. Thompson, editors. Rotenone in fisheries: are the rewards worth the risks? *American Fisheries Society, Trends in Fisheries Science and Management 1*. Bethesda, Maryland

Johnston, F.D., J.R Post, C. Mushens, J.D. Stelfox, A.J. Paul, and B. Lajeunesse. 2007. The demography of recovery of an overexploited bull trout, *Salvelinus confluentus*, population. *Canadian Journal of Fisheries and Aquatic Sciences*. Vol. 64: 113-126.

Knapp, R. A., D.M. Boiano, and V.T. Vredenburg. 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*). *Biological Conservation*, 35:11–20.

Melquist, W. E., and M. G. Hornocker. 1983. Ecology of River Otters in west central Idaho. Wildlife Monographs 83:6–57.

Muhlfeld, C.C., R.P. Kovach, R. Al-Chokhachy, S.J. Amish, J.L. Kershner, R.F. Leary, W.H. Lowe, G. Luikart, P. Matson, D.A. Schmetterling, B.B. Shepard, P.A.H. Westley, D. Whited, A. Whiteley, and F.W. Allendorf. 2017. Legacy introductions and climatic variation explain spatiotemporal patterns of invasive hybridization in a native trout. *Global Change Biology* 2017; 1-11.

Muhlfeld, C.C., T.E. McMahon, M.C. Boyer, R.E. Gresswell. 2009. Local habitat, watershed, and biotic factors influencing the spread of hybridization between native westlope cutthroat and introduced rainbow trout. *Transactions of the American Fisheries Society*. Vol. 138: 1036-1051. Accessed 27 June 2023 from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.montana.edu/mcmahon/documents/Muhlfeld%20TAFS%2009%20hybrid.pdf

National Institute of Neurological Disorders and Stroke (NIH). 2023. Huntington's Disease. Accessed 23 June 2023 from https://www.ninds.nih.gov/health-information/disorders/huntingtons-disease#:~:text=Huntington's%20disease%20(HD)%20is%20an,as%20well%20as%20other%20areas.

Pacas, C. and M.K. Taylor. 2015. Nonfish toxicant eradication of an introduced brook trout from a headwater complex in Banff National Park, Canada. *North American Journal of Fisheries Management* 35:748-754.

Paul, A. J, J.R. Post, and J.D. Stelfox. 2003. Can anglers influence the abundance of native and nonnative salmonids in a stream from the Canadian Rocky Mountains? *North American Journal of Fisheries Management* 23:109–119.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. *Bulletin of the Fisheries Research Board of Canada*. Bulletin 191, Ottawa. Accessed 27 June 2023 from http://www.dfo-mpo.gc.ca/Library/1485.pdf

Rumsey, S., Cavigli, J. and J Fraley. 1997. Ross and Devine lakes invertebrate and zooplankton results 1994-1996. MFWP, Kalispell.

Schnee, M.E, Clancey, N.G., Boyer, M.C., and S. Bourret. 2021. Recovery of freshwater invertebrates in alpine lakes and streams following eradication of non-native trout with rotenone. *Journal of Fish and Wildlife Management*: 12(2): 475-484.

Shepard, B.B., R. Spoon, and L. Nelson. 2002. A native westslope cutthroat trout population responds positively after brook trout removal and habitat restoration. *Intermountain Journal of Science* 8:191-211.

Van Daele, L. J., and H. A. Van Daele. 1982. Factors affecting the productivity of Ospreys nesting in west-central Idaho. The Condor 84:292–299

Vasquez, M. E., J. Rinderneck, J. Newman, S. McMillin, B. Finlayson, A. Mekebri, D. Craine, and R. S. Tjeerdema. 2012. Rotenone formulation fate in Lake Davis following the 2007 treatment. *Environmental Toxicology and Chemistry*, Vol. 31, No. 5, pp. 1032-1041.

Vredenburg, V. T. 2004. Removal of brook and rainbow trout from small lakes less than 15 acres in Kings Canyon National Park using gill nets only: Reversing introduced species effects: experimental removal of introduced fish leads to rapid recovery of a declining frog. *Proceedings of the National Academy of Sciences of the USA* 1001:4646–7650