Montana Fish, Wildlife & Parks

2300 Lake Elmo Drive
Billings, MT 59105
July 8, 2010

TO: Environmental Quality Council
Director's Office, Dept. of Environmental Quality
Montana Fish, Wildlife & Parks*

Director's Office	Lands Section
Parks Division	Design & Construction
Fisheries Division	Legal Unit
Wildlife Division	Regional Supervisors

Mike Volesky, Governor's Office *
Sarah Elliott, Press Agent, Governor's Office*
*
Montana Historical Society, State Preservation Office
Janet Ellis, Montana Audubon Council
Montana Wildlife Federation
Montana State Library
George Ochenski
Montana Environmental Information Center
Wayne Hirst, Montana State Parks Foundation
FWP Commissioner Shane Colton*
Montana Parks Association/Our Montana (land acquisition projects)
Richard Moore, DNRC Area Manager, Southern Land Office
County Commissioners
Other Local Interested People or Groups
* (Sent electronically)

Ladies and Gentlemen:

The enclosed addendum to an environmental assessment (EA) entitled *Yellowstone Cutthroat Trout Restoration in Sage Creek* issued in April 2008 has been prepared to identify several modifications to the original decision notice. Questions and comments will be accepted through August 11, 2010.

If you need additional copies of the EA addendum, please contact Montana Fish, Wildlife & Parks at 247-2940. Questions about this project should be directed to Ken Frazer (247-2963) or Carol Endicott (222-3710). Please send any written comments by mail to: Ken Frazer at Montana Fish, Wildlife & Parks, 2300 Lake Elmo Drive, Billings MT 59105; or by e-mail to kfrazer@mt.gov by August 11, 2010.

Thank you for your interest,

Ken Frazer
Region 5 Fisheries Manager

Enclosure

YELLOWSTONE CUTTHROAT TROUT RESTORATION IN SAGE CREEK

Environmental Assessment Addendum

July 12, 2010

FWP Region 5 Office
2300 Lake Elmo Drive
Billings, MT 59105

Montana Fish, Wildlife & Parks

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List of Abbreviations

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CNF	Custer National Forest
DEGEE	Diethyl glycol monoethyl ether
DEQ	Montana Department of Environmental Quality
EA	Environmental assessment
EPA	Environmental Protection Agency
FWP	Montana Fish, Wildlife & Parks
$KMnO_4$	Potassium permanganate
MCA	Montana Code Annotated
MOU	Memorandum of understanding
MSDS	Material data safety sheet
NHP	Montana Natural Heritage Program
PEG	Polyethylene glycol
ppm	Parts per million
USFS	US Forest Service
USFWS	US Fish and Wildlife Service

Executive Summary

This document is an addendum to an environmental assessment (EA) entitled *Yellowstone Cutthroat Trout Restoration in Sage Creek* issued in April of 2008[1] (FWP 2008). The purpose of the proposed action was to remove nonnative rainbow trout and brook trout from portions of the upper Sage Creek watershed in the Pryor Mountains. Following reclamation of these waters, Montana Fish, Wildlife & Parks (FWP) would reintroduce native Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). On June 2008, FWP issued a decision notice to proceed with this project, citing agreement in the findings of the EA, and a lack of public opposition (http://fwp.mt.gov/publicnotices/notice_1759.aspx).

Subsequent planning identified several modifications to the proposed project that will increase cost-effectiveness, and augment the amount of habitat for Yellowstone cutthroat trout through partnership with the Crow Tribe and Bureau of Indian Affairs (BIA). The objective of this addendum is to reevaluate the potential effects of the project in light of these proposed modifications. Notably, the modifications call for increasing the stream miles treated to 3 miles downstream of the Crow Reservation boundary, whereas the original proposal called for stopping treatment at the reservation border. This will increase the amount of habitat available for Yellowstone cutthroat trout from 17 miles to 28 miles.

Other changes include modifications in the timing of piscicide treatment. The EA had called for a phased approach, with treatment of the upper 1.1 miles of Sage Creek during the first year, then treatment of the remaining 7 miles during the second year, along with 4 miles of North Fork Sage Creek. The modification calls for treating the entire length of Sage Creek and North Fork Sage Creek within the newly expanded project area during the first year. Treatment may be repeated in two subsequent years if monitoring finds the initial treatment did not result in complete eradication of rainbow trout and brook trout. The final changes call for detoxification of rotenone at the downstream end of the project area if surface flows are present, and implementation of a monitoring program to evaluate the response of macroinvertebrates to rotenone treatment.

A popular US Forest Service campground lies within the project area, and recreational fishing is a valued activity at this site. To mitigate for loss of fishing opportunities immediately after piscicide treatment, FWP will stock this area with catchable Yellowstone cutthroat trout. These fish will suffer mortality if a subsequent treatment occurs because of incomplete fish kill, but will provide the public with angling opportunities before the project is complete. Fishing regulations will be unchanged, and anglers will be allowed to keep Yellowstone cutthroat trout according to possession limits detailed in FWP's fishing regulations.

[1] http://fwp.mt.gov/publicnotices/notice_1559.aspx

As the Crow Tribe and BIA have become partners in this project, this revised EA includes description of tribal and BIA authority in implementing fish conservation projects on tribal lands. In addition, this document includes programmatic considerations that will allow the Crow Tribe and BIA to approve project implementation under their environmental review policies.

Evaluation of the potential impacts of the proposed action to the environment and human health found this action would result in minor and temporary effects on water quality. The effects of this project on fisheries would be elimination of nonnative brook trout (*Salvelinus fontanalis*) and rainbow trout (*Oncorhynchus mykiss*) from treated waters. Aquatic invertebrates would also be affected; however, these populations would recover in biomass over the short-term, and species diversity would recover from dispersal over the course of several years. Alterations to the length of treated habitat and treatment schedule will result in increase in the spatial effects of piscicide treatment; however, these impacts are still minor and temporary. These actions would have a positive effect on native Yellowstone cutthroat trout, as this species would be reintroduced into Sage Creek, restoring up to 28 miles of native range for this fish.

FWP has established a second public comment period to allow evaluation of this new information by interested parties. The 30-day public comment period will extend from July 12, 2010 to August 11, 2010. A public meeting may occur if public interest in the project warrants this additional forum. Interested parties should send comments to:

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Regional Fisheries Manager
Montana Fish, Wildlife & Parks
2300 Lake Elmo Drive
Billings, MT 59105
(406) 247-2961
kfrazer@mt.gov

1.0 PROPOSED ACTION DESCRIPTION

1.1. Type of Proposed Action

This proposed action is part of native fish restoration efforts aimed at restoring Yellowstone cutthroat trout in its historic range in Montana. The Sage Creek trout reintroduction project would chemically remove nonnative brook and rainbow trout in Sage Creek using the piscicide rotenone. Subsequent to successful removal of nonnative fish, pure strain Yellowstone cutthroat trout would be reintroduced into these waters.

1.2. Agency Authority for Proposed Action

Authority to conduct the proposed actions comes from the Montana Administrative Code, (87-1-702). Specifically, this statue authorizes Montana Fish, Wildlife & Parks "to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects.

The Bureau of Indian Affairs (BIA) as the Trustee for acreage within the Crow Reservation is obligated to protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion. As such, approval of the proposed project will be necessary for the restoration project. In order to authorize this funding an assessment complying with the National Environmental Policy Act is necessary. This EA provides that assessment, and the BIA is a joint lead Agency with the FWP in preparation of this document.

The Crow Tribal Fish and Wildlife Department also has jurisdiction over fisheries conservation projects. The department's responsibilities include management of Crow Tribal fish and wildlife resources on the Crow Reservation. The Crow Tribal Fish and Wildlife Department is also contributing $3,000 towards the project, in addition to staff resources during treatment.

1.3. Name and Location of Project

Sage Creek Native Yellowstone Cutthroat Trout Reintroduction Project. Sage Creek is an isolated drainage about 40 miles south of Billings, Montana in Carbon and Big Horn counties (Figure 1-1). This stream flows from private in holdings within the Custer National Forest, through Crow Indian Reservation and Bureau of Land Management administered lands, private lands and into Wyoming. The proposed treatments would affect the upper 28 miles of stream including its north fork. The original EA called for treating waters to the where Sage Creek entered the Crow Indian Reservation. This addendum examines the potential impacts of expanding treatment to 3 miles downstream of where Sage Creek leaves the Crow Indian Reservation. The length of stream slated for treatment within the Crow Reservation is 7.8 miles.

1.4. Name and Address of Project Sponsor

Ken Frazer

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1.5. Estimated Commencement Date and Schedule

Piscicide treatment is slated for the late August through early September 2010. This timing coincides with the window when young-of-the-year rainbow trout are out of the gravel, and vulnerable to piscicide, and before brook trout spawn. In addition, the irrigation season is typically over by this time. If sampling finds treatment did not result in complete removal, piscicide application would be repeated in up to two subsequent years (2011 and 2012), with treatment occurring within the late August through early September timeframe. Reintroduction would occur soon after monitoring finds treatment was successful in removing all nonnatives.

1.6. Location Affected by Proposed Action

Sage Creek flows through Big Horn County to the Wyoming border and is a headwater stream in the Shoshone River hydrologic unit (10080014). Piscicide treatment would occur in Sage Creek, from near its headwaters to 3 miles downstream of where Sage Creek leaves the Crow Reservation (Figure 1-1). Sage Creek tends to go subsurface in late summer, so treatment may not extend that far if no water is present. Piscicide protocols also call for detoxification. If water is present at the downstream end of the proposed treatment area, potassium permanganate would be applied to limit the extent of the treatment to the proposed reach. Potassium permanganate requires from 15 minutes to 30 minutes contact time to detoxify rotenone, which equates to a distance of less than 0.5 miles.

1.7. Project Size (Acres Affected)

	Acres		Acres
(a) Developed	0	(d) Floodplain	0
Residential	0		
Industrial	0	(e) Productive	0
		Irrigated cropland	0
		Dry cropland	0
(b) Open space/Woodlands/Recreation	0	Forestry	0
		Rangeland	0
(c) Wetlands/Riparian areas	28 miles	Other	0

1.8. Project Map

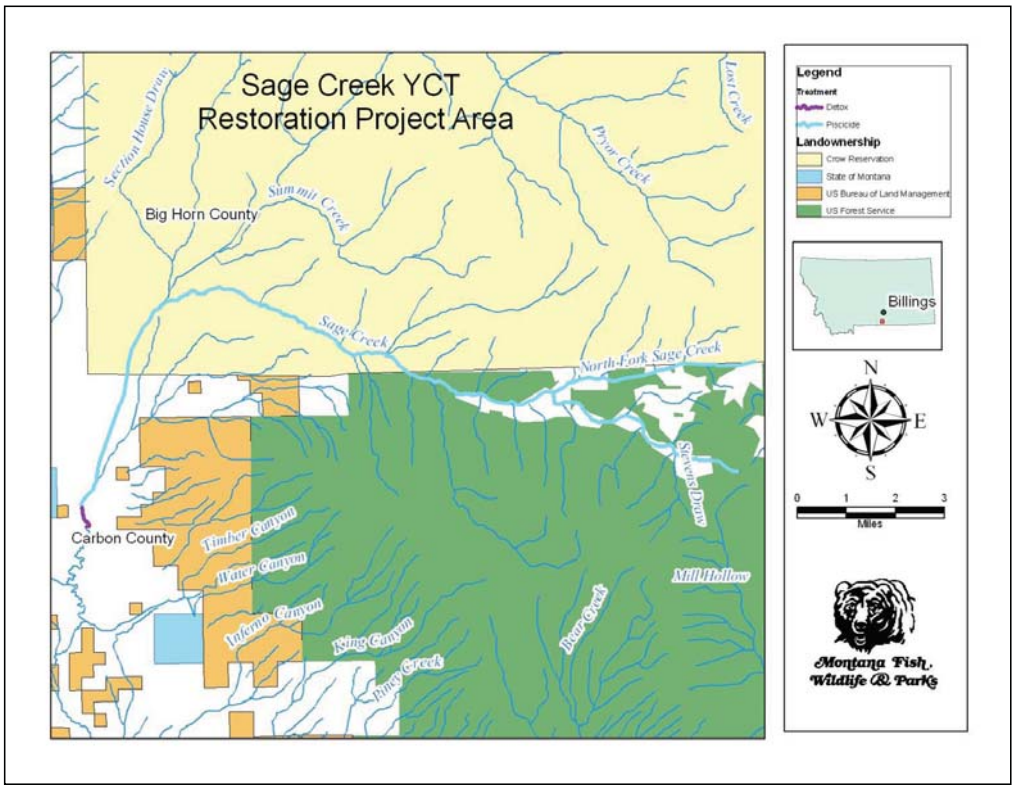

Figure 1-1: Project map.

1.9. Narrative Summary of the Proposed Action and Purpose of the Proposed Action.

This action is a native fish restoration project aimed at reestablishing a pure Yellowstone cutthroat trout population in Sage Creek, a headwater stream in the Shoshone River watershed, within the Yellowstone River basin (Figure 1-1). The Yellowstone cutthroat trout is native to Montana and several neighboring states: Wyoming, Idaho, Utah, and Nevada. In Montana, Yellowstone cutthroat trout historically occupied streams and lakes in the Yellowstone River watershed having suitable habitat, water quality, and thermal regime. Like many native salmonids, Yellowstone cutthroat trout have experienced dramatic declines in abundance and range. Conservation populations of Yellowstone cutthroat trout (> 90% genetically pure) now occupy about 34% of its historic range in Montana (May et al. 2007) with the western portion of the Yellowstone River basin being the stronghold. In the Shoshone River watershed, less than 2% of historically occupied habitat currently supports Yellowstone cutthroat trout (May et al. 2007). Reintroduction of Yellowstone cutthroat trout to streams where they have been extirpated, such as Sage Creek, is one component of the overall strategy to restore this native fish (FWP 2007).

An understanding of the threats to the persistence of Yellowstone cutthroat trout and its conservation status supports the rationale for this proposed action. Reductions in Yellowstone cutthroat trout populations are the result of several factors. Introduction of nonnative fishes is perhaps the greatest threat to this subspecies (Gresswell 1995, Kruse et al. 2000). Rainbow trout hybridize with Yellowstone cutthroat trout, resulting in a loss of genetic integrity, and hybridization is a leading cause of loss of Yellowstone cutthroat trout populations (Kruse and Hubert 2004). Brown trout (*Salmo trutta*) and brook trout have displaced native cutthroat trout, including Yellowstone cutthroat trout, throughout the western US (Behnke 1992). The combined threats of hybridization, competition, and predation provide justification for removal of nonnative species to increase the probability of persistence of reintroduced populations of Yellowstone cutthroat trout.

Habitat degradation is another category of disturbance linked to decreases in Yellowstone cutthroat trout populations. Types of habitat degradation include decreased channel and stream bank stability, increased streambed siltation, and reduced health and function of riparian vegetation. These perturbations relate to a host of activities including excessive livestock pressure, streamside logging, and residential development. Fish passage barriers, such as dams, culverts, and irrigation diversions, have also contributed to declines, as some Yellowstone cutthroat trout populations have strong migratory tendencies, and restricting access to spawning, rearing, or overwintering habitats can have a population level effect. Dewatering poses another threat, especially in tributaries used for spawning, and can have far reaching implications for main stem fisheries.

Because of reductions in range and abundance of Yellowstone cutthroat trout, state, federal, and tribal entities have assigned special status ratings to Yellowstone cutthroat trout, which guide management activities to promote conservation and restoration of this species. Montana lists Yellowstone cutthroat trout within its borders as an S2 species of special concern. This ranking

applies to species "at risk because of very limited and potentially declining numbers, extent and/or habitat making it vulnerable to global extinction or extirpation (NHP and FWP 2006). Likewise, the Bureau of Land Management (BLM) and US Forest Service (USFS) consider Yellowstone cutthroat trout to be a sensitive species. BLM lists a species as sensitive when it is proven to be imperiled in at least part of its range and documented to occur on BLM lands (NHP and FWP 2006). The USFS applies sensitive status to species that the Regional Forester has determined concerns exist for population viability within the state relating to a significant current or predicted downward trend in population or habitat. Similarly, the Crow Tribe lists Yellowstone cutthroat trout as a species of special concern, citing the rarity of pure populations and potential to list Yellowstone cutthroat trout under the Endangered Species Act as rationale.

Concerns over the status of Yellowstone cutthroat trout have prompted advocacy groups to petition the US Fish and Wildlife Service to list this subspecies as a threatened or endangered species. In two decisions, the US Fish and Wildlife Service decided listing Yellowstone cutthroat trout was unwarranted, citing the presence of stable, viable, and self-sustaining populations throughout its historic range (USFWS 2001, USFWS 2006). Nonetheless, plaintiffs submitted a notice of intent to sue in 2006, indicating legal challenges are likely.

Sage Creek is particularly well suited for establishing a secure refuge for Yellowstone cutthroat trout. Chronic dewatering downstream of the targeted reach presents a barrier to expansion of competing species from below. Habitat quality is another factor. Sage Creek and its headwater tributaries are Rosgen C-type channels (Rosgen 1996), controlled by bedrock, and beaver dam complexes. Stable riffle/pool habitats and dense riparian vegetation characterize most of the stream. Excellent habitat and water quality support a thriving cold-water fishery comprised of brook trout and rainbow trout. The isolation and high quality habitat will increase probabilities that a reintroduced Yellowstone cutthroat trout population will persist over the long-term.

The same features promoting suitability of Sage Creek for reintroduction of Yellowstone cutthroat trout necessitate removal of the existing fishery with piscicide, rather than mechanical means. Notably, the quality and complexity of the habitat is a constraint to the efficacy of mechanical removal through electrofishing. Habitat complexity increases the refugia available to avoid capture. Moreover, the reproductive capacity of rainbow trout and brook trout in this stream is high, and these species would rebound quickly from the fish that eluded removal. Yellowstone cutthroat trout introduced into the stream would face competition from brook trout, and more importantly, introgression with rainbow trout, which would preclude attainment of a genetically pure population of Yellowstone cutthroat trout.

Habitat complexity also affects efficiency of piscicide. In reaches with simple habitat, only one treatment of piscicide may be required to eliminate the existing fishery. In other cases, two or more treatments would be required. The number of treatments would follow results of fish sampling efforts to minimize piscicide application events, while ensuring complete removal. Even with the need for more than one treatment, piscicide is more cost effective than electrofishing in removing fish.

The proposed piscicide for this action is CFT Legumine™, a relatively new formulation using rotenone as the active ingredient. CFT Legumine has several advantages over other formulations of rotenone, including a new emulsifier and solvent that reduce the presence of petroleum hydrocarbon solvents. The hydrocarbons in other rotenone formulations are highly volatile, resulting in a distinct chemical odor during treatment. Fish may be able to detect the hydrocarbons in other formulations, and avoid treated waters, resulting in incomplete fish kills. Because of the lack of hydrocarbons, the new formulation is expected to have fewer of these drawbacks.

Application of piscicide would follow established methodologies, consistent with the product's labeling, as required by federal law. The general approach to piscicide application is as follows. Piscicide is applied to achieve a concentration of 1 ppm of rotenone. A gravity-fed, constant head drip station (Figure 1-2) delivers diluted chemical at a rate calculated from the instructions. Drip stations are allowed to run for at up to 8 hours. Application of piscicide to backwater areas or areas not connected to the main creek entails the use of backpack sprayers.

Figure 1-2: Example of a drip station used to deliver piscicide to streams.

Breakdown of rotenone is related to a number of factors, such as water chemistry (pH, alkalinity), temperature, and turbulence, which affects the required drip station spacing. In general, drip stations would likely be spaced ¼ to 1-miles apart; the required distance would be determined through a bioassay. A bioassay is a trial run, where the chemical is applied to the

target water or one of its tributaries and allows determination of the distance the chemical would travel and effectively produce a 100% fish kill (termed travel time). Drip station spacing would follow the results of a bioassay investigation along Sage Creek to ensure adequate application of piscicide along the stream's length.

Travel of rotenone beyond the target reach would be unlikely, as severe dewatering downstream of the project is typical during late summer through early fall, the proposed timing for piscicide application. In the event that water is present, a detoxification station stocked with potassium permanganate ($KMnO_4$) would be used. $KMnO_4$, a highly soluble crystalline powder, quickly detoxifies rotenone. $KMnO_4$ is commonly used in water treatment to oxidize metals, kill bacteria and viruses, and remove unpleasant tastes.

The behavior of sentinel or caged fish would indicate the need for application of $KMnO_4$ to Sage Creek. Observers would monitor caged fish at the lower end of treatment reaches. If these fish show evidence of toxicity, such as loss of equilibrium or death, $KMnO_4$ would be added to the water to detoxify the remaining rotenone, and limit the downstream effect of piscicide treatment. Sentinel fish in cages above the $KMnO_4$ application site will signal the need for beginning detoxification. Detoxification would be terminated when replenished fish survive and show no signs of stress for at least four hours. As $KMnO_4$ requires between 15 to 30 minutes contact time to detoxify rotenone, sentinel cages would be placed at sites located 15 and 30 minutes of travel time downstream of the detoxification station. In Sage Creek, this should be a distance of ¼ to ½ stream miles. Survival of the caged fish would be indicative of successful detoxification. In addition, a supplemental detoxification station would be placed downstream of the initial station in the event that rotenone was not completely detoxified where planned

Efforts to reintroduce Yellowstone cutthroat trout to Sage Creek would entail several phases involving initial piscicide treatment, and re-treatment of areas where chemical removal was incomplete. Fish removal efforts would encompass the North Fork Sage Creek and the main stem from its origin to 3 miles downstream of the Crow Reservation Boundary (Figure 1-1).

Sage Creek provides a recreational fishery to visitors to the Custer National Forest. To mitigate for the loss of this opportunity following the first treatment, FWP will stock catchable Yellowstone cutthroat trout into Sage Creek near the public campground. These fish would suffer mortality if a second treatment is required in the following year; however, subsequent reintroduction of Yellowstone cutthroat trout to Sage Creek following the final treatment would mitigate for this loss. Fishing regulations for Sage Creek will allow possession of Yellowstone cutthroat trout following established bag limits.

Monitoring is an important component of this type of management activity (Meronek et al. 1996), and allows evaluation of the short-term and long-term effects of piscicide treatments. For example, in 2005, FWP conducted extensive monitoring of piscicide treatment in Martin Creek and Martin Lakes, near Olney, Montana. The stream naturally detoxified from degradation and dilution within 48 hours, and detoxification with $KMnO_4$ effectively contained treatment to within the established project boundary. Monitoring the following spring found Columbian spotted frogs (*Rana luteiventris*) depositing eggs in the reclaimed lake.

Monitoring proposed for this project involves a basic approach to document fish, macroinvertebrates, reptiles, and amphibians, before treatment with rotenone. These surveys would be repeated in the subsequent two years. Monitoring of fish populations would then occur on a 5 year basis, with the intent of evaluating the recovery of Yellowstone cutthroat trout, and determining the genetic status of the protected Yellowstone cutthroat trout population.

In summary, the primary benefit of this project would be restoration of a genetically pure Yellowstone cutthroat trout population. Major components of the project would include removal of nonnative brook trout and rainbow trout, which pose significant threats to the persistence of Yellowstone cutthroat trout, and reintroduction of pure Yellowstone cutthroat trout. Ultimately, this project would expand the distribution and safeguard Yellowstone cutthroat trout in south central Montana. In turn, this project would help achieve the goals and objectives listed in the memorandum of understanding (MOU) and conservation agreement for Yellowstone cutthroat trout in Montana (MCTSC 2007) and provide protection consistent with the Montana Administrative Code. Implementation of this and other similar projects would reduce the threats of extinction for Yellowstone cutthroat trout. The social benefit of this effort would be the ability of future generations of Montanans to use and enjoy this important component of Montana's natural heritage.

1.10. Agencies Consulted during Preparation of the EA

Agency consultation was considerable during preparation of the EA, and included signatories of the cutthroat trout restoration strategy and MOU (FWP 2007). The Montana Department of Environmental Quality (DEQ) was consulted, both as a signatory on the MOU, and the agency responsible for water quality permits. Other agencies were landholders in the basin, including the USFS Custer National Forest and the Crow Tribe, who were also collaborators in the process.

State statute provides clear direction to FWP to implement conservation projects for species with potential to be listed under the Endangered Species Act. Specifically, the Montana Code (MCA 87-1-201 [9ai]) requires FWP to manage fish, wildlife, game, and nongame animals in a manner that prevents the need for listing under state law or the federal Endangered Species Act. Further, FWP has the responsibility to manage species that have potential for listing in a manner that assists in the maintenance or recovery of those species. The Sage Creek Yellowstone cutthroat trout restoration project would return this sensitive, native fish to its historically occupied waters, which is consistent with FWP's responsibilities under state law.

Conservation of Yellowstone cutthroat trout is a priority for fisheries managers across state, federal, and tribal entities. In 2007, the Montana Cutthroat Trout Steering Committee (MCTSC) completed an MOU and conservation agreement for Yellowstone cutthroat trout and westslope cutthroat trout (MCTSC 2007), which replaces an expired MOU and conservation strategy for Yellowstone cutthroat trout (FWP 2000). The goals of both documents include the following: 1) ensure the long-term, self-sustaining persistence of each subspecies distributed across their historic ranges, 2) maintain the genetic integrity and diversity of non-introgressed (genetically pure) populations, and 3) protect the ecological, recreational, and economic values of each subspecies. Signatories of this MOU include several of the collaborators on this project: FWP,

the Custer National Forest, and Crow Tribe. This project is consistent with the goal of ensuring the long-term persistence of Yellowstone cutthroat trout, and the signatories' commitment to finding collaborative opportunities to restore and expand populations of Yellowstone cutthroat trout within their historic range.

This project is also consistent with USFS management plans for Yellowstone cutthroat trout. The Custer National Forest's management standards for wildlife and fisheries management mandate the following:

> "[M]anage the land to maintain at least viable populations of existing native and desirable nonnative vertebrate species, promote the conservation of federally listed threatened and endangered species, and coordinate with appropriate state, federal, and private agencies in the management of habitats for major interest species" (USDA 1986).

Additionally, the Custer Forest Plans standards for management of fisheries resources include the following directives:

1. Fish species and habitats will be managed in cooperation with state and other federal agencies.
2. An inventory will be made of warm and cold water fisheries potential. In suitable areas, activities will be designed to maintain, develop, or create cold and warm water fisheries. Streams and lakes supporting pure strains of fish species will be managed to maintain or expand these populations.

The Crow Tribe also has a stated commitment to conservation of Yellowstone cutthroat trout, both through its inclusion in the MOU, and a joint action resolution aimed at conserving Yellowstone cutthroat trout populations within the reservation (Joint Action Resolution No. JAR0231). The resolution requires protection of Yellowstone cutthroat trout through conservation practices until scientific evidence warrants it no longer needs protection. As Yellowstone cutthroat trout reintroduction activities would extend downstream onto the Crow Indian Reservation, the Crow Tribe is among the collaborators on the Sage Creek Yellowstone cutthroat trout reintroduction efforts.

The Montana Natural Heritage Program (NHP) was another agency consulted in the process of preparing this EA. Queries included requests for information on distribution and natural history of numerous species.

2.0 Revised Environmental Review

This section is a revision of the environmental review presented in the original EA. It presents much of the same information, with modifications to address proposed changes to the original approach. To reiterate, these include changes in spatial extent of piscicide treatment, and alteration in the proposed schedule, which will result in treatment of the entire reach in the first year.

2.1. Physical Environment

2.1.1. Land Resources

Land Resources Would the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

2.1.2. Air

Air Would the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Emission of air pollutants or deterioration of ambient air quality?		X				
b. Creation of objectionable odors?			X			2b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally, or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

Comments on 2b:
Alternative 1: Proposed Action
According to the material safety data sheet (MSDS) for CFT Legumine, this compound has a slight solvent odor. Respiratory protection is required when working with undiluted product in a confined space. Likewise, the MSDS for n-methylpyrrolidone, an emulsifying agent in CFT Legumine does not require respiratory protection when handling in a well-ventilated area. As CFT Legumine will be applied outside, the objectionable solvent odor will likely dissipate rapidly, presenting a minor and temporary creation of objectionable odors. FWP personnel with

experience applying CFT Legumine indicate it has only a very slight odor and is not disagreeable to work with.

Alternative 2: No Action
This alternative would not result in creation of objectionable odors.

2.1.3. Water

Water	Impact					
Would the proposed action result in:	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		YES	3a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				3f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		YES	see 3f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				3j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Would the project affect a designated floodplain?			X		YES	3l
m. Would the project result in any discharge that would affect federal or state water quality regulations? (Also see 2a)			X		NO	See 3a

Comments 3a: Discharge into surface waters
Alternative 1: Proposed Action
As this project proposes discharge of a piscicide into Sage Creek, this impact would be unavoidable. Nonetheless, discussion of the nature of the piscicide, physical setting, and mitigative actions provide a framework to predict the severity and spatial extent of the impacts.

Rotenone is an insecticide commonly used in organic agriculture and home gardening, as well as being an effective piscicide. Rotenone is extracted from the roots and stems from a variety of tropical and subtropical plants in the pea family (Fabaceae). The empirical formula of this

isoflavonoid compound is $C_{23}H_{22}O_6$. Carbon comprises 70% of its molecular weight, and hydrogen and oxygen constitute 6% and 24% respectively. Compared to other piscicides, rotenone is relatively inexpensive and accessible, and has been routinely used to remove unwanted fish from lakes and streams. Rotenone acts by blocking the ability of tissues to use oxygen, which causes fish to asphyxiate quickly.

Rotenone is a highly reactive molecule, a factor favoring its quick decomposition in the environment. This degradability is in marked contrast to some pesticides used in nonorganic agriculture. Organochlorines are synthetic pesticides comprised of chlorinated hydrocarbons, and include chemicals such as DDT, heptachlor, and chlordane. These compounds persist in the environment long after their release, making the behavior and fate of organochlorine pesticides substantially different from rotenone.

Organophosphates are another class of pesticide that differs markedly from rotenone in terms of threats to human health and the environment. Commonly used organophosphate pesticides include malathion, parathion, and diazinon. Although these chemicals are considerably less persistent than the organochlorines, they are more acutely toxic, and act as potent neurotoxins. Organophosphate poisonings are one of the most common causes of poisoning worldwide. In contrast, rotenone does not share this acute toxicity to humans with the organophosphate pesticides.

CFT Legumine, is the rotenone formulation proposed for this project. This chemical is registered by the EPA (Reg. No. 75338-2) and approved for use as a piscicide. Information on its chemical composition, persistence in the environment, risks to human health, and ecological risks come from a number of sources including material data safety sheets (MSDS) and manufacturer's instructions. (An MSDS is a form detailing chemical and physical properties of a compound, along with information on safety, exposure limits, protective gear required for safe handling, and procedures to handle spills safely.) In addition, a recent study presented an analysis of major and trace constituents in CFT Legumine, evaluated the toxicity of each, and examined persistence in the environment (Fisher 2007).

The MSDS for CFT Legumine list three categories of ingredients for this formula (Table 2-1). Rotenone comprises 5% of CFT Legumine by weight. Associated resins account for 5%, and the remaining 90% are inert ingredients, of which the solvent n-methylpyrrolidone is a component. Additional information in the MSDS confirms its extreme toxicity to fish. The TVL addresses risks to human health from exposure, which is addressed in 8a.

Fisher (2007) analyzed chemical composition of CFT Legumine, including the inert fraction (Table 2-2). On average, rotenone comprised 5% of the formula, consistent with MSDS reporting. Other constituents were solvents or emulsifiers added to assist in the dispersion of the relatively insoluble rotenone. DEGEE, or diethyl glycol monoethyl ether, a water-soluble solvent, was the largest fraction of the CFT Legumine analyzed. Likewise, n-methylpyrrolidone comprised about 10% of the CFT Legumine. The emulsifier Fennedofo 99™ is an inert additive consisting of fatty acids and resin acids (by-products of wood pulp and common constituents of soap formulations), and polyethylene glycols (PEGs), which are common additives in consumer

products such as soft drinks, toothpaste, eye drops, and suntan lotions. Trace constituents included low concentrations of several forms of benzene, xylene, and naphthalene. These organic compounds were considerably lower than measured in Prenfish, another commercially available formulation of rotenone, which uses hydrocarbons to disperse the piscicide. Their presence in trace amounts is related to their use as a solvent in extracting rotenone from the original plant material.

Table 2-1: Composition of CFT Legumine from material safety data sheets (MSDS)

Chemical Ingredients	Percentage by Weight	CAS No.[1]	TLV[2] (Units)
Rotenone	5.00	83-79-4	5 mg/m^3
Other Associated Resins	5.00		
Inert Ingredients Including n-methylpyrrolidone	90	872-50-4	Not listed

[1]Chemical Abstracts Number
[2]A TLV reflects the level of exposure that the typical worker can experience without an unreasonable risk of disease or injury.

Table 2-2: Average percent concentrations and ranges of major constituents in CFT Legumine lots to be used in a piscicide project in California (Fisher 2007).

Major CFT Legumine™ Formula Constituent	***Rotenone***	***Rotenolone***	***Methylpyrrolidone***	***DEGEE[1]***	***Fennedefo 99™***
Average %	5.12	0.718	9.8	61.1	17.1
Range	4.64-5.89	0.43-0.98	8.14-10.8	58.2-63.8	15.8-18.1

[1]diethyl glycol monoethyl ether

Toxicity to nontarget organisms and persistence in the environment are important considerations in determining the potential risks to human health and the environment, and several factors influence rotenone's persistence and toxicity. Rotenone has a half-life of 14 hours at 24 °C, and 84 hours at 0 °C (Gilderhus et al. 1986, 1988), meaning that half of the rotenone is degraded and is no longer toxic in that time. As temperature and sunlight increase, so does degradation of rotenone. Higher alkalinity (>170 mg/L) and pH (>9.0) also increase the rate of degradation.

The local geology and timing of treatment will promote rapid breakdown of rotenone. Sage Creek drains a limestone catchment, a factor that promotes higher alkalinity, and therefore, favors rapid breakdown of rotenone. The available alkalinity data for Sage Creek are limited to two sampling events in the 1970s that found alkalinity of 185 and 204 mg/L[2], concentrations that promote quick breakdown. Water temperatures in late August and early September will be relatively warm, which will likewise contribute to degradation of rotenone. In this chemical and physical environment, rotenone would be reduced to nontoxic levels in one to several days due to its degradation and dilution in the aquatic environment.

[2] EPA STORET database (www.epa.gov/storet)

Mitigative activities proposed in this supplement will further reduce the spatial and temporal extent of rotenone. If surface flows are present, a detoxification station will be established immediately below the treatment reach, which will release about 4 mg/L of $KMnO_4$. This strong oxidizer rapidly breaks down rotenone into nontoxic constituents of carbon, oxygen, and hydrogen. $KMnO_4$ in turn breaks down into potassium, manganese, and water, which are common constituents in surface waters, and have no deleterious effects at the concentrations used (Finlayson et al. 2000). The result of release of $KMnO_4$ on water quality will be elimination of toxic concentrations of rotenone.

Concentration of rotenone in treated waters is another factor relating to potential effects from incidental ingestion by other organisms, including humans. The effective concentration of rotenone is 1 ppm or 1 mg/L, which is well below concentrations harmful to humans from ingestion. The National Academy of Sciences found concentrations at 14 ppm would pose no adverse effects to human health from chronic ingestion of water (NAS 1983). Moreover, concentrations associated with acute toxicity to humans are 300-500 mg per kilogram of body weight (Gleason et al. 1969), which means a 160-pound person would have to drink over 23,000 gallons in one sitting to receive a lethal dose (Finlayson et al. 2000). Similarly, risks to wildlife from ingesting treated water are low. For example, ¼ pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates within 24 hours for a lethal dose (Finlayson et al. 2000). The EPA, in their recent reregistration evaluation of rotenone (EPA 2007), concluded that there are no unacceptable risks to humans and wildlife from exposure to rotenone when applied according to label instructions. In summary, this project would have no adverse effect on humans or wildlife associated with ingesting water, dead fish, or dead invertebrates.

Bioaccumulation of rotenone would not result in threats to human health and the environment under this alternative. Rotenone bioaccumulates in the fat tissues of fish that are not exposed to toxic levels (Gingerich and Rach 1985). As a complete fish-kill is the goal, bioaccumulation would not be a problem.

Potential toxicity and persistence of the other constituents of the CFT Legumine formulation are additional considerations. Proposed concentrations of n-methylpyrrolidone (about 2 ppm) would have no adverse effects to humans ingesting treated waters. According to the MSDS, ingestion of 1000 ppm per day for three months does not result in deleterious effects to humans. In addition, given its high biodegradability, n-methylpyrrolidone will not persist in surface waters. In fact, this feature, combined with its low toxicity, makes n-methylpyrrolidone a commonly used solvent in wastewater treatment plants.

Fisher (2007) examined the toxicity and potential persistence of other major constituents in CFT Legumine, including DEGEE, fatty acids, PEGs, and trace organic compounds, (benzene, xylene, naphthalene). With proposed application of CFT Legumine, none of these compounds would violate water quality standards, nor would they reach concentrations shown to be harmful to wildlife or humans. Furthermore, persistence of these chemicals was not a concern. The trace organics would degrade rapidly through photolytic (sunlight) and biological mechanisms. Likewise, the PEGs would biodegrade in a number of days. The fatty acids are also

biodegradable, but would persist longer than the PEGs or benzenes. Nonetheless, these are not toxic compounds, so the relatively longer persistence would not adversely affect water quality. Overall, the low toxicity, low persistence, and lack of bioaccumulation indicate the inert constituents in CFT Legumine would have a minor and temporary effect on water quality.

To reduce the potential risks associated with the use of CFT Legumine the following management practices, mitigation measures, and monitoring efforts would be employed:

1. A pretreatment bioassay would be conducted to determine the lowest effective concentration and travel time.
2. Signs will be posted at trailheads and along the stream to warn people not to drink the water or consume dead fish.
3. Piscicides would be diluted in water and dripped into the stream at a constant rate using a device that maintains a constant head pressure.
4. A detoxification station would be set up downstream of the target reach. Potassium permanganate ($KMnO_4$) would be used to neutralize the piscicide at this point.
5. An additional detoxification will be established above the boundary between BLM and private land to as a safeguard.
6. Project personnel would be trained in the use of these chemicals including the actions necessary to deal with spills as prescribed in the MSDS for CFT Legumine
7. Persons handling the piscicide would wear protective gear consistent exposure control/personal protection gear as prescribed in the MSDS for CFT Legumine.
8. Only the amount of piscicide and potassium permanganate that is needed for immediate use would be held near the stream.
9. Sentinel or caged fish would be located below the detoxification station and within the target reach to determine and monitor the effectiveness of both the rotenone and potassium permanganate. Yellowstone cutthroat trout obtained from a state hatchery would be the species used in monitoring toxicity.

Alternative 2: No Action
This alternative would have not result in discharge into surface water and would have no impact.

Comment 3f: Changes in groundwater quality
Alternative 1: Proposed Action
The risk that rotenone would enter and be mobile in groundwater is minimal because it has a strong tendency to bind to organic soil particles (Dawson et al. 1991), and has a low solubility in water. Once bound to organic molecules, rotenone becomes inert and breaks down quickly in the environment without detoxification. Moreover, rotenone would be detoxified with $KMnO_4$ at the downstream boundary of the project. Even if groundwater contamination did occur, no consequences for human health would occur because the surface water concentrations to be used in this project have already been shown to have no toxic effect on humans or other mammals (see 2a). Furthermore, the chance for exposure to rotenone is minimal given the location of domestic water sources. The following factors suggest very little, if any, rotenone would reach any wells:

1. Virtually all piscicide that reaches these points would have already been broken down by natural conditions or been oxidized by KMnO4;
2. Any remaining piscicide would likely be bound up by sediments before entering groundwater; and
3. Any piscicide that enters groundwater would be diluted by water already present in the aquifer.
4. Monitoring of domestic wells adjacent to previous rotenone treatments in Montana and California has failed to detect rotenone or any inert ingredients.

Alternative 2: No Action
This alternative would have no impact of groundwater.

Comment 3j: Effects on other water users
Timing piscicide application for late summer through early fall would result in no effects on other water users. Swimming and irrigation are the only uses with potential to be affected by rotenone. Swimming in rotenone treated water is prohibited until the chemical has been thoroughly mixed. Crops should not be irrigated with rotenone treated water because of potential effects on beneficial invertebrates. As swimming and irrigation are unlikely during the treatment window, this action would have no effect on these uses.

2.1.4. Vegetation

Vegetation	Impact					
Would the proposed action result in:	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?		X				
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?		X				4c
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?			X		YES	4e
f. Would the project affect wetlands, or prime and unique farmland?		X				

COMMENT 4c: Effects on any unique, rare, threatened, or endangered species.
The NHP maintains a database detailing presence and status of species of special concern, including unique, rare, threatened, or endangered species. Included in this information is ranking information that details state and range-wide status of plants and animals (Table 3). Potential threats to plants of concern would be surface disturbance associated with trampling by fish crews.

Table 3: NHP's ranking system (G = global or range wide, S = state or within Montana

Code	*Description*
G1 S1	At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
G2 S2	At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state.
G3 S3	Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas.
G4 S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.
G5 S5	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
B	Breeding population in Montana
T	Infraspecific Taxon (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

Three plants of special concern are known to occur within or adjacent to the Sage Creek watershed (Table 4). Both the beartooth large-flowered goldenweed and the Cary's beardtongue are endemic to the Pryor Mountains. Their restricted native distribution provides the rationale for inclusion as species of special concern. Both species are typical of uplands, and would be unlikely to be encountered by fish crews operating near the stream. The goldenweed is likely tolerant of mechanical disturbance as it benefits from livestock grazing.

Jove's buttercup has been observed in the adjacent Crooked Creek watershed, which suggests its occurrence in the Sage Creek watershed is possible. Nonetheless, suitable habitat for this species includes sagebrush grasslands and open forest slopes, so field crews working streamside would be unlikely to encounter this plant. In addition, this plant completes its sensitive reproductive stages (flowering and fruiting) by early June.

Overall, potential impacts to sensitive plant species would be negligible. All three species tend to occur in uplands; whereas, the bulk of the activity would occur immediately adjacent to the stream. Nevertheless, field personnel would be provided field guide information on these special plants to avoid inadvertent impacts during application of piscicide.

Table 4: Plant species of special concern known to occur in or adjacent to the Sage Creek watershed.

Common Name	*Scientific Name*	*Natural Heritage Ranks*	*Known Distribution*
Beartooth large-flowered goldenweed	*Haplopappus carthamoides* var. *subsquarrosus*	State: S1S2 Global:G4G5T2T3	Occurs in Sage Creek drainage (T7S, R26E, Section 30)
Cary's beardtongue	*Penstemon caryi*	State:S3 Global: G3	Occurs adjacent to Sage Creek drainage (T7S, R27E, Section 31)
Jove's buttercup	*Ranunculus jovis*	State: S2 Global: S4	Occurs adjacent to Sage Creek drainage (T7S, R27E, Section 32)

COMMENT 4e: Establishment or spread of noxious weeds
Alternative 1: Proposed Action
Trucks and four wheelers transporting gear and personnel have potential to spread noxious weeds from seeds transported in the undercarriage. To mitigate and reduce the risk of invasion or spread of noxious weeds, all vehicles would be cleaned before arrival on site, including an undercarriage wash.

Alternative 2: No action.
This alternative would have no effect on spread on establishment or spread of noxious weeds.

2.1.5. Fish and Wildlife

Fish and Wildlife	**Impact**					
Would the proposed action result in:	**Un-known**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		YES	5b
c. Changes in the diversity or abundance of nongame species?			X		NO	5c
d. Introduction of new species into an area?		X				
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X		YES	5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				
h. Would the project be performed in any area in which T&E species are present, and would the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Would the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)		X				

Comment 5b: Changes in the diversity or abundance of game animals or bird species?
Alternative 1: Preferred Action

This proposed action would alter fish community composition in Sage Creek. Currently, this portion of Sage Creek supports nonnative brook trout and rainbow trout. This project would remove these species; however, reintroduction of Yellowstone cutthroat trout would mitigate the loss of these species.

As discussed in 2.1.3 Water, exposure to rotenone through ingestion of treated water or dead fish presents no threat to wildlife because of its low toxicity when ingested. Nonetheless, reductions in aquatic prey species, both fish and sensitive macroinvertebrates, may have a negative effect on species relying on prey of aquatic origin. Reintroduction of Yellowstone cutthroat trout, and recovery of the population would restore the forage base for predators relying on fish within a few years.

Mink (*Mustela vison*) are semi-aquatic predators, and the Sage Creek watershed is within their range in Montana. (Northern river otter [*Lontra canadensis*], another semi-aquatic predator, has an inferred range that encompasses the upper Sage Creek watershed; however, as a small stream, habitat suitability for otters is marginal at best.) As opportunistic predators, mink prey on a variety of terrestrial and aquatic species, including small mammals, birds, reptiles, and amphibians, allowing flexibility in response to temporary reductions in fish abundance. Over the short-term, mink would have reduced availability of fish; however, recovery of the reintroduced Yellowstone cutthroat trout population would restore fish as a food source within 3 to 4 years.

Invertivorous birds would also have potential to be affected by reductions in macroinvertebrate populations. The American dipper (*Cinclus mexicanus*) is the species typically considered in effects analysis relating to rotenone treatment, as this species consumes benthic macroinvertebrates as its primary food source. The NHP does not extend the breeding range of the American dipper into the Pryor Mountains, although another source provides incidental evidence of dippers breeding in the general area (Bergeron et al. 1992), and an active dipper nest was observed in 2008 in neighboring Crooked Creek (FWP, unpublished data). If present in the Sage Creek watershed, impacts on dippers would be minor and temporary. First, not all invertebrates would succumb to piscicide treatment, resulting in a remaining forage base in treated waters. Non-gill bearing invertebrates and those in the egg phase would still be present in Sage Creek. In addition, macroinvertebrate populations recover biomass rapidly following this type of disturbance, making the decrease in forage availability a short-term alteration. Project timing would also limit the effect on other invertivorous birds, as many of these migratory species would not be present in late summer through early fall.

Implementing the project in late summer through early fall would also reduce potential effects on birds that consume aerial invertebrates with an aquatic life history stage. Many neotropical passerines begin their southward migration in late August, and would be no longer present, or leaving the project area during treatment.

Alternative 2: No Action
This alternative would have no impact on game or bird species.

Comment 5c: Changes in the diversity or abundance of nongame species?

Alternative 1: Proposed Action

In addition to the nonnative game species targeted for removal, Sage Creek likely supports numerous vertebrates, primarily reptiles and amphibians, and associated aquatic life such as benthic macroinvertebrates. Rotenone is toxic to organisms that respire through gills, which include fish, larval amphibians, and some macroinvertebrates such as mayflies, caddis flies, and stone flies.

Fish surveys in upper Sage Creek have found only brook trout and rainbow trout; however, warm water fishes may extend into the lower portions of the project area. Before treatment, these waters would be surveyed

Detailed surveys of amphibian distribution are lacking for this part of Montana; however, several sources allow inference on the potential for species to occur in upper Sage Creek. First, range maps provided by the NHP's field guide provide a coarse indication of species potentially present. Next, examination of the database of observations maintained by the NHP allows identification of observations with the Sage Creek or neighboring drainages. Finally, habitat preference information allowed evaluation of the suitability for aquatic habitat in the project area to support adult or larval forms.

Amphibians with potential to occur in the project area include toads, frogs, and a salamander (Table 5). Plains spadefoot, boreal chorus frogs, and tiger salamanders have been observed in or near a reservoir on an unnamed tributary of Sage Creek, about 14 miles downstream of the project area. Although the reservoir may contribute to clustering of three species there, as some of the only public land in the lower drainage, this also represents an opportunity for state biologists to sample without needing permission, which contributes to clustering of observations. Northern leopard frogs have been observed in the Pryor Creek drainage, at an elevation similar to the project area. Woodhouse's toads have been frequently seen along the Clark's Fork of the Yellowstone, to the west of the Sage Creek drainage. Overall, amphibians likely to occur within Sage Creek probably make incidental use of the stream, as most prefer standing waters for breeding or foraging. Amphibians with the greatest potential for exposure to rotenone will be those using the seeps in the stream's headwaters, which may provide habitat for both adult and juvenile amphibians.

Table 5: Amphibians likely to occur in the Sage Creek watershed, timing for metamorphosis, and nearest observation to the Sage Creek Yellowstone cutthroat trout reintroduction project (information from NHP field guide.

Common Name	*Scientific Name*	*Metamorphosis Timing*	*Nearest Observation*
Plains spadefoot	*Spea bombifrons*	Variable	Sage Creek drainage
Woodhouse's toad	*Bufo woodhousii*	Tadpoles present to early September	Clark's Fork of the Yellowstone drainage
Boreal chorus frog	*Pseudacris maculatua*	8 weeks	Sage Creek drainage,
Northern leopard frog	*Rana pipiens*	July to September	Pryor Creek watershed
Tiger salamander	*Ambystoma tigrinum*	2 to 3 years at higher elevation	Sage Creek drainage

The influence of piscicides on amphibians varies with reproductive strategy, life history stage, and, in the case of tiger salamanders, life form. (Under conditions of a secure water source, usually a lake or reservoir, tiger salamanders may retain gills as adults. This life form is unlikely to occur in Sage Creek.) Similar to other gill-bearing organisms, amphibian larvae are sensitive to rotenone, and exposure to rotenone at levels used to kill fish is acutely toxic to Columbian spotted frog larvae (Grisak et al. 2007). Timing application of piscicide in late summer to fall would be protective of most amphibians, as they would be past their vulnerable, gilled stage of development. Moreover, frogs and salamander prefer standing waters for reproduction and rearing, so their presence in Sage Creek would be unlikely or incidental, with seeps in the stream's headwaters being the only likely locations for larval frogs and salamanders. The plains spadefoot relies on ephemeral waters following large storm events for reproduction, making presence of larvae highly unlikely in the marshy, seeps area.

Tiger salamanders have a considerably longer period as gill-retaining larvae, which may extend to three years. Nonetheless, consideration of key life history strategies suggests that tiger salamander populations that may be present in the marshy seeps in upper Sage Creek, will be minor and temporary. Notably, tiger salamanders are resilient to loss of a year class (Bryce Maxell, NHP, personal communication). Frequently, the older year class of tiger salamander larvae will cannibalize the newer generation. This strategy ensures the success of the older year class, resulting in staggered year class success.

Toxicity of rotenone to adult amphibians is comparatively low and relates to the species aquatic respiration, and their probability of entering or occurring in treated waters (Maxell and Hokit 1999). Although no information is available on the toxicity of rotenone on species potentially present in Sage Creek is available, investigations on other adult amphibians indicate adult amphibians do not suffer an acute response to trout killing concentrations of Prenfish, another commonly used formulation of rotenone (Grisak et al. 2007). Effects on adult Woodhouse's toads would be negligible given their impermeable skin and terrestrial affinities. Northern leopard frogs can respire through their skin; however, they are not wholly dependent on the aquatic environment and can leave, making them less likely to suffer mortality (Maxell and Hokit 1999). Although this species has declined in the western portion of Montana, it is relatively secure in the eastern portions of the state, which suggests this project would have minor, if any effect, on northern leopard frogs.

No observational data or other records were available documenting painted turtles in Sage Creek and only one observation was available for the Montana portion of the Shoshone hydrologic unit (Maxell et al. 2003). Nonetheless, the NHP includes the Sage Creek watershed within its range. According to Maxell and Hokit (1999), piscicides can be toxic to turtles, especially those capable of aqueous respiration such as snapping turtles (*Chelydra serpentina*) and spiny softshell (*Trionyx spiniferus*), species not present in Sage Creek. Most probably, painted turtles are less vulnerable than snapping turtles and spiny softshells, as they were not included among turtles capable of aquatic respiration, and are more likely to transverse terrestrial environments. Because of its secure status throughout its range, its presumed rarity in Sage Creek, and its ability to leave contaminated waters, impacts on painted turtles would likely be minimal.

Three species of snake with affinity for water have ranges that encompass the Sage Creek watershed. All are gartersnakes, and consume a variety of prey items, including amphibians. As timing of piscicide application will not coincide with sensitive, early life history stages of their amphibian prey, and risks to exposure from ingestion are low, this project will not adversely affect the three gartersnake species with potential to occur along Sage Creek.

Table 6: Vertebrates present or potentially present in Sage Creek (MFISH database, Maxell et al. 2003, Montana Natural Heritage field guide [http://fieldguide.mt.gov/])

Class	*Species*	*Scientific Name*	*Use of Sage Creek*	*Abundance*
Osteichthyes (bony fishes)	Rainbow trout	*O. mykiss*	Year round resident	Abundant
	Brook trout	*S. fontinalis*	Year round resident	Abundant
Amphibia (amphibians)	Tiger salamander	*Ambystoma tigrinum*	Potentially present, prefer lentic waters. Two observations are available for a reservoir on a tributary of Sage Creek (T8NR24Esection24)	Unknown
	Woodhouse's toad	*Bufo woodhousii*	Potentially present, adults partly terrestrial but found near water	Unknown
	Northern leopard frog	*Rana pipiens*	Potentially present, prefer densely vegetated sedge-meadows or cattail marshes	Unknown
Reptilia (reptiles)	Painted turtle	*Chrysemys picta*	Potentially present, prefer environments with soft, mud bottoms, and little to no current	Unknown
	Common gartersnake	*Thamnophis sirtalis*	Potential present around streams	Unknown
	Plains gartersnake	*T. radix*	Potential present around streams	Unknown
	Terrestrial gartersnake	*T. elegans*	Potential present around streams	Unknown

Rotenone is lethal to benthic invertebrates with gills such as mayflies, stone flies, and caddis flies. The predicted effect would be a temporary decrease in some invertebrate taxa. These populations rebound quickly from many types of disturbance through two primary mechanisms. Invertebrates drift as a normal component of their life history strategies, so untreated, fishless headwaters would provide a source of invertebrates. Likewise, aerial adults would supplement drift by laying eggs in Sage Creek allowing for recovery of sensitive invertebrates within one year. Additionally, applying piscicide in late summer or early fall would coincide with relatively low numbers of gilled invertebrates, as most would have emerged to complete their life cycle. A large proportion of taxa will be present in the stream as eggs, which are tolerant of rotenone.

Information specific to macroinvertebrate community composition in upper Sage Creek is lacking; however, investigations in nearby streams allow inference on potential for Sage Creek to support rare or unique invertebrates. Neighboring streams tend to have similar water quality, geology, and thermal regime, which result in a tendency to support similar macroinvertebrate

communities. Moreover, as most of the sensitive, gill-bearing invertebrates disperse as winged adults, nearby streams will share the same species.

Dry Head Creek lies to the east of the divide between the Shoshone and Big Horn River hydrologic units (Figure 3). In 1999, US Forest Service personnel collected macroinvertebrate samples from Dry Head Creek within the Custer National Forest. This site was within two miles of the headwaters of Sage Creek. Species composition was typical of healthy mountain streams in Montana. No unknown or unique invertebrates were present in the three kick samples collected (McGuire 2000).

Punch Bowl Creek is adjacent to Sage Creek, and is a tributary of Dry Head Creek (Figure 3). Macroinvertebrate data collected for this stream in 2004 (FWP, unpublished data) showed an assemblage consistent with a healthy, mountain Montana stream. Similar to Dry Head Creek, no rare or unique invertebrates were present in the sample.

In summer of 2007, NHP personnel sampled the upper reach of Pryor Creek (Figure 3). This stream is also a close neighbor of Sage Creek, and likely to share many of its invertebrate taxa. Similar to Dry Head Creek, invertebrates present in Pryor Creek were typical of healthy mountain streams (NHP unpublished data). Moreover, no rare or unique taxa were present in samples. Combined, the Dry Head Creek, Punch Bowl Creek, and Pryor Creek macroinvertebrate data suggest piscicide treatment of Sage Creek would not affect rare macroinvertebrate taxa in Sage. Furthermore, these neighboring streams provide a source for recolonization from winged adults.

Monitoring will allow evaluation of the effects of piscicide treatment on macroinvertebrates in Sage Creek. Macroinvertebrates will be sampled before treatment in 2010, and monitored yearly afterwards for 2 years to evaluate the effects on community composition and abundance.

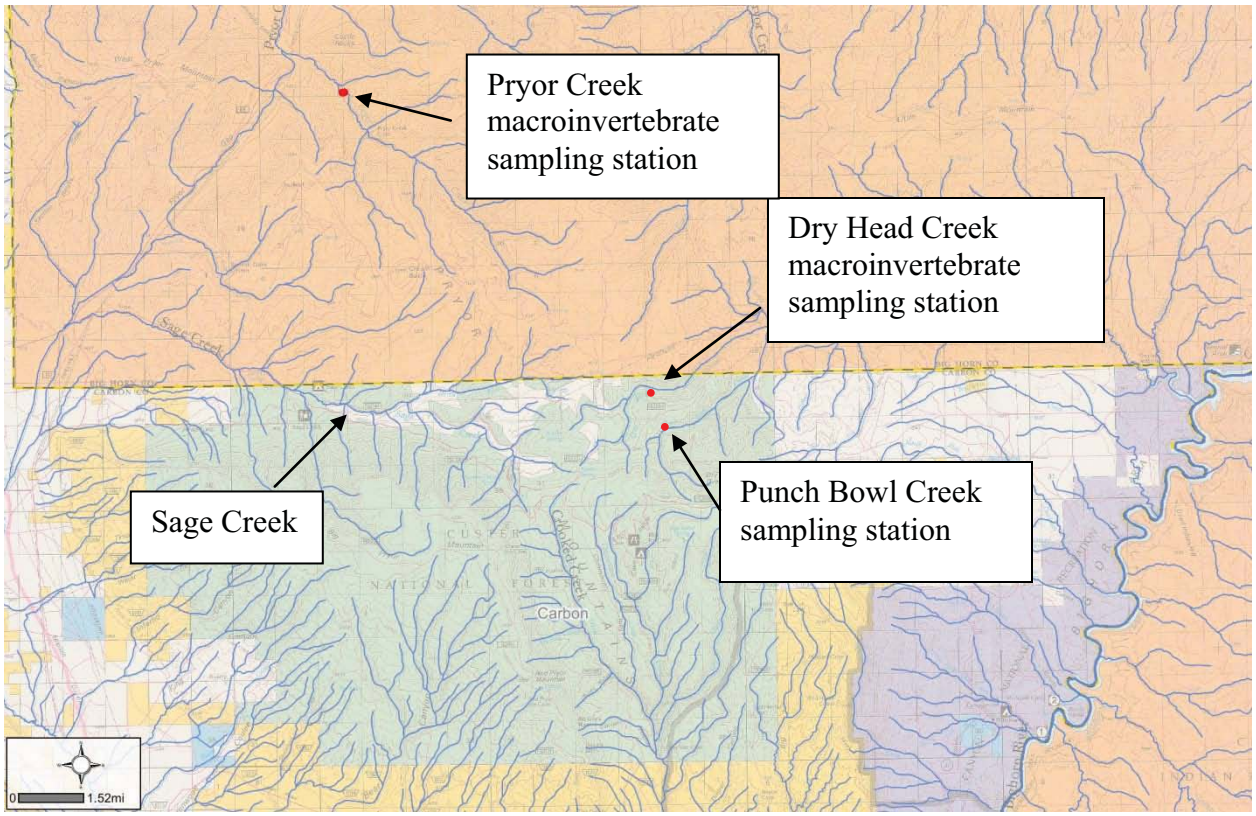

Figure 2-1: Map of Sage Creek, Pryor Creek, and Dry Head Creek showing proximity of macroinvertebrate sampling stations to Sage Creek.

Comment 5f: Adverse effects on any unique, rare, threatened, or endangered species
The NHP database lists several vertebrate species of special concern as occurring in or near the Sage Creek watershed (Table 2-7). Field guide information provided by the NHP website allows inference on potential impacts to these species. Evaluation of their habitat needs, forage base, presumed distribution, and migration timing suggests impacts to these species would be nonexistent or negligible.

Bald eagles have wide distribution in Montana, and are likely to make at least incidental use of Sage Creek. As discussed in Comment 5b, effects of the project on bald eagles would be minor and temporary given their preference for larger streams.

Three species of bat listed as species of special concern have inferred distributions that encroach close to, but do not enter the Sage Creek watershed. As bats feed on aerial insects, a temporary reduction in invertebrates produced in Sage Creek has potential to affect bats. Habitat observations and diet information provided by the NHP suggest that these species do not rely on invertebrates with an aquatic life history stage. Spotted bats (*Euderma maculatum*) forage over mesic to arid environments and specialize on moths. Likewise, Townsend's big-eared bats (*Corynorhinus townsendii*) consume mostly moths, although other taxa listed in their diet preferences include terrestrial invertebrates such as wasps and beetles. Although some moths have an aquatic early life history stage, most are of terrestrial origin. The pallid bat (*Antrozous*

pallidus) also tends to forage over arid to mesic shrublands or forests. Its diet is varied, with terrestrial invertebrates comprising the bulk of the listed taxa. Given the arid to mesic habitat affinities of these three species of bats, combined with the apparent lack of reliance on invertebrates with an aquatic life history stage, the preferred option would likely have a negligible affect on these species. Moreover, the other species of bat occurring in this area would suffer minor if any impact owing to a lack of reliance on invertebrates of aquatic origin.

Songbird species of special concern occurring near the project area include the sage thrasher and bobolink. The preferred alternative would unlikely to have an impact on either species for a host of reasons. Timing piscicide application to late summer or early fall would avoid sensitive nesting and breeding periods. Moreover, both species begin their fall migration in mid-August, so few if any birds would remain during treatment. Habitat suitability is another issue. As the name suggests, sage thrashers prefer mesic sagebrush and grasslands, making their presence near Sage Creek incidental. Likewise, bobolinks are a grassland bird, preferring open meadows. The combination of project timing and narrow extent of human activity (within the riparian corridor) makes adverse affects on either species highly unlikely.

The Plains spadefoot is a species of special concern documented to be present in the Sage Creek watershed. As noted in Comment 5c, the Plains spadefoot would be highly unlikely to experience adverse effects from piscicide treatment. This species of toad has impermeable skin and is not capable of aquatic respiration. Moreover, its reproductive strategy involves use of ephemeral standing waters formed by large storm events. Therefore, no larval spadefoot would likely be present in Sage Creek, including its marshy headwaters.

The western hognose snake is a species of special concern with limited potential to occur in the Sage Creek watershed. The NHP considers its range to encompass most of the eastern two-thirds of Montana; however, relatively few records are available for the state (Maxell et al. 2003). None are in or near the Sage Creek watershed. Little is known about its preferred habitat or habits in Montana, although this species typically consumes toads as its primary prey. If western hognose snake does occur in the upper Sage Creek watershed, negative effects on this species would likely be negligible. Piscicide treatment would have little effect on its forage base, as application would occur after the sensitive larval stage of toads and frogs.

Table 2-7: Vertebrate species of special concern known to occur in or near the Sage Creek watershed.

Common Name	*Scientific Name*	*Natural Heritage Ranks*	*Known/Inferred Distribution*
Bald eagles	*Halieatus leucocephalus*	G5S3	Nearest known nest is about 14 miles away.
Spotted bat	*Euderma maculatum*	G4S2	Higher elevations in Sage Creek watershed (T8S R26E Sections 1-5)
Pallid bat	*Antrozus pallidus*	G5S2	Adjacent to Sage Creek watershed (T7S, R27E, Section 32)
Townsend's big-eared bat	*Corynorhinus townsendii*	G4S2	Higher elevations in Sage Creek watershed (T7S, R27E Sections 29, 31, and 32)
Bobolink	*Dolichonyx oryzivorus*	G5S2B	Uplands to the northwest of project area.
Sage thrasher	*Oreoscoptes montanus*	G5S3B	Uplands to the southwest of the project area.
Plains spadefoot	*Spea bombifrons*	G5S3	Documented in the Sage Creek watershed
Western hognose snake	*Heterodon nasicus*	G5S2	Known from several sightings in the neighboring, Big Horn River basin

2.2. Human Environment

2.2.1. Noise and Electric Effects

	Impact					
Would the proposed action result in:	**Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Increases in existing noise levels?		X				
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

2.2.2. Land Use

Would the proposed action result in:	Impact: Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?		X				
d. Adverse effects on or relocation of residences?		X				

2.2.3. Risks/Health Hazards

Would the proposed action result in:	Impact: Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		YES	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?		X				
c. Creation of any human health hazard or potential hazard?			X		YES	see 8c
d. Would any chemical piscicides be used?			X		YES	see 8a and 3a

Comment 8a: Risk of explosion or release of hazardous substances
Alternative 1: Proposed Action
Use of rotenone constitutes a release of a substance hazardous to fish and other gill-respiring organisms. See comments 3a on risks to the environment and human health, and mitigative actions to minimize adverse effects.

MSDSs for CFT Legumine and $KMnO_4$, describe risks of explosion for these compounds. With a flashpoint of 192 °F (89 °C), CFT Legumine has a low risk of combustion or explosion. Special caution is required for transporting and using materials with a flashpoint of less than 140 °F (60 °C). Nevertheless, foam or CO_2 fire extinguishers would be available during transport and handling or undiluted product. $KMnO_4$ is nonflammable, but has an explosion hazard when in contact with organic or readily oxidizable compounds. Such materials would not be at the project site, which eliminates the risk of explosion from $KMnO_4$ reacting with other chemicals.

Alternative 2: No Action
This alternative presents no risk of explosion or release of hazardous substances.

Comment 8b: Creation of a human health hazard or potential hazard.
Alternative 1: Proposed Action
Hazards to human health relate to handling non-dilute CFT Legumine and $KMnO_4$. (As described in 2.1.3 Water, application of CFT Legumine or $KMnO_4$ to surface waters according manufacturer's instructions does not present a risk to human health from exposure to treated water.) To prevent health risks associated with skin contact and inhalation, workers handling full strength CFT Legumine would follow exposure controls/personal protection requirements detailed in the MSDS and the label. Workers with potential to be exposed to non-dilute CFT Legumine would wear chemical resistant gloves, boots, protective eyewear and respirators.

$KMnO_4$ presents a potential human health hazard with skin contact, inhalation, or ingestion. Personnel working with the non-dilute product would follow safety practices detailed in the MSDS for $KMnO_4$. This includes gloves and eye protection.

Accidental spills present another potential avenue for threats to human health from either CFT Legumine or $KMnO_4$. In the event of a spill, workers would follow accidental release measures detailed in the MSDSs for each compound, which involve containment and disposal Protective eyewear and gloves are required to handle spills.

Alternative 2: No Action
This alternative would not create a human health hazard or potential hazard.

2.2.4. Community Impact

Would the proposed action result in:	Impact: Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

3.0 ALTERNATIVES

Four alternatives received consideration during preparation of the environmental assessment. The proposed alternative (alternative 1) and no action (alternative 2) were evaluated in detail. Two additional alternatives were eliminated from full consideration, as they were more expensive, less feasible, and would have a low probability of meeting project objectives, namely establishment of a genetically pure population of Yellowstone cutthroat trout.

3.1. Alternatives Given Detailed Study

3.1.1. Alternative 1: Nonnative fish eradication followed by native fish introduction

The proposed action includes removal of brook and rainbow trout in a 28-mile reach of Sage Creek using piscicide. Removal of nonnative fishes would eliminate the threats associated with predation, competition, and hybridization. The anticipated outcome would be complete removal of brook and rainbow trout from the project area, because piscicides have been demonstrated to be 100% effective with use of proper techniques. The predicted consequence of alternative 1 is establishment of a genetically pure, self-sustaining population of Yellowstone cutthroat trout.

This alternative differs from the original (FWP 2008), in that the treated area is expanded from 10 miles to 28 miles of stream. In addition, instead of a phased treatment, where the upper 1.1 miles would be treated the first year, and the remainder treated in subsequent years, the entire length would be treated the first year. Additional treatments may occur in two subsequent years if monitoring found incomplete removal of nonnatives.

A primary consequence of increasing the amount of stream habitat treated and elimination of the phased approach is a reduced forage base of predators on aquatic invertebrates and fish over a greater area beginning in the first year. As biomass of invertebrates rebounds quickly following disturbance, the effect would be minor and of short duration. Timing treatment during fall coincides with a period when many macroinvertebrate taxa have completed their life cycle, and the next generation is within eggs and not vulnerable to piscicide. Drift and dispersal of aerial adults from neighboring drainages would result in recovery of the diversity of invertebrate assemblage within a few years. Predators consuming fish would have a longer period without this forage base; however, reintroduction of Yellowstone cutthroat trout would restore this food source within 4 years.

Mitigative measures associated listed under the comments in the environmental review would minimize the amount of piscicide used and reduce the risk of exposure to humans and livestock. Consequently, this alternative would have a minor effect on state waters while being economically, environmentally, and technologically feasible. Compared to electrofishing or angling (alternative 3), the use of piscicide takes less time and money in removing nonnative fish, which gives this option the greatest economic feasibility. Likewise, the combination of low persistence of these chemicals in the environment, and the mitigative steps to reduce environmental impacts, makes this an environmentally feasible alternative. As piscicides can be 100% effective in removal, this alternative is also technically feasible.

3.1.2. Alternative 2: No action.

The predicted consequence of the "No Action" alternative is that a Yellowstone cutthroat trout population in Sage Creek would not be restored, and brook and rainbow trout would flourish.

3.2. Alternatives Considered but Not Given Detailed Study

3.2.1. Alternative 3: Introduction of Yellowstone cutthroat trout without removal of existing fish populations.

This alternative would not allow attainment of the purpose of the project, namely establishment of a genetically pure population of Yellowstone cutthroat trout. Rainbow trout are well established in this portion of Sage Creek, and would likely hybridize with reintroduced Yellowstone cutthroat trout. To a lesser extent, the abundance of brook trout is also likely to limit the success of this project, given the high reproductive potential of brook trout in Sage Creek, and the tendency of brook trout to displace Yellowstone cutthroat trout in small streams. Because the continued presence of brook trout and rainbow trout is incompatible with establishment of a sustainable, pure population of Yellowstone cutthroat trout, this alternative was not evaluated in detail. These factors render this alternative technically and economically infeasible.

3.2.2. Alternative 4: Introduction of Yellowstone cutthroat trout with mechanical removal of existing fish populations.

This alternative is the same as the proposed action, except no piscicides would be used. Removal of fish would be by mechanical means only, including both electrofishing and angling. Angling is the least effective of these methods, and an estimated 20% of fish can be removed this way on an annual basis. Reproduction from year-to-year would nullify much of this effect. Angling is also a particularly inefficient method for removing small fish. Electrofishing is also inefficient at removing small fish, and effectiveness on Sage Creek would likely to be 5-80% depending upon the staff and the amount of cover in the stream. Habitat complexity in Sage Creek would provide refugia from the electrical current and netting, which would prevent full removal of brook trout and rainbow trout. The remaining rainbow trout would spawn with Yellowstone cutthroat trout resulting in hybridization. Similarly, competition with the remaining brook trout would jeopardize persistence of Yellowstone cutthroat trout.

This alternative is economically and technologically infeasible because of the uncertainties associated with the success, and the number of years that would be required before efforts even close to 100% success could be guaranteed. This would need to be conducted continually on a one or two year basis. Costs would be $6,000 to $12,000 per year and provisions would have to be made to staff this project on an annual or biannual basis. These time delays would not only cost more money, but would also slow the process of Yellowstone cutthroat trout recovery.

4.0 ENVIRONMENTAL ASSESSMENT CONCLUSION SECTION

4.1.1. Evaluation of Significance Criteria and Identification of the Need for an EIS

Evaluation of potential impacts on the physical and human environment in 2.0 Revised Environmental Review provides the basis for determining the need for an environmental impact statement (EIS), which is a more rigorous evaluation of potential impacts to human health and the environment from the proposed action. If evaluation of these significance criteria suggests the proposed action would result in significant impacts, an EIS would be required.

This environmental review demonstrates that the impacts of this proposed project are not significant. The proposed action would benefit Yellowstone cutthroat trout in Sage Creek with minimal impact on the physical, biological, or the human environment.

4.1.2. Level of Public Involvement

Several factors influence the appropriate level of public involvement for a given proposed action. Risks to human health, the environment, local economics, as well as the seriousness of the environmental issues are key considerations. This project will include a 30-day public comment period. The public will be informed of the potential project through press releases in local newspapers and through a notice on FWP's website (http://fwp.mt.gov/news/default.aspx). If public interest is considerable, FWP will host a public meeting.

4.1.3. Public Comments

The public comment period will extend from July 11, 2010 through August 11, 2010.

Send comments to:

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4.1.4. Parties Responsible for Preparation of the EA

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