Environmental Assessment for the Conservation of Native Westslope Cutthroat Trout in Cottonwood Creek by removal of Non-native Brook and hybrid Rainbow x Cutthroat Trout with Rotenone

Draft Environmental Assessment

4 June 2021

Montana Fish, Wildlife & Parks
Region 3 Office
1400 South 19th Avenue
Bozeman, MT 59718

MONTANA FISH, WILDLIFE & PARKS

Executive Summary

The conservation and inherent value of native Westslope Cutthroat Trout (WCT) is substantial. WCT have experienced marked reductions in numbers and distribution; genetically unaltered WCT presently occupy 3.7% of their historic habitat within the Beaverhead watershed (Bateman et al. 2019). Cottonwood Creek is one of eight streams within the Beaverhead watershed that still supports an unaltered WCT population; however, the population is only comprised of about 520 fish confined to the upper 0.6 miles of stream above a natural waterfall at river mile (RM) 4.7 (Bateman et al. 2019). Below the waterfall, there are 2.2 miles of mainstem habitat and 0.5 miles of tributary habitat which contain a hybridized population of cutthroat and nonnative brook trout. A man-made fish barrier was constructed at river mile (RM) 2.5 in 2020. Protecting a population of nonhybridized WCT in Cottonwood Creek would secure an invaluable component of the Beaverhead watershed's natural heritage for future generations to enjoy. Moreover, conservation of native WCT brings a range of benefits to local communities and is required under state and federal law.

WCT in the Beaverhead watershed face multiple threats including reduced distribution and abundance, stream and riparian habitat conditions, and spatial isolation; however, the single largest threat to the long-term persistence of WCT is the presence of non-native trout. Since the late 1800's, numerous nonnative fish species have been introduced throughout the Beaverhead watershed, and nonnative brook, brown, rainbow, Yellowstone cutthroat, and hybrid trout have become the dominant species in most streams historically occupied by WCT. Brook and brown trout displace WCT through competition or predation. Rainbow and Yellowstone cutthroat trout readily hybridize with WCT which results in populations entirely comprised of hybrid individuals (hybrid swarm) or mixed populations of hybrid and genetically unaltered fish. Currently, the strongest remaining WCT populations are those isolated from nonnative species by natural or manmade barriers. Populations not protected by barriers have reduced distribution and densities or are irreversibly hybridized. The likelihood of long-term persistence of WCT populations not protected by barriers is low.

Removal of non-native trout from lower Cottonwood Creek would secure and expand its unaltered WCT population. In 2020, Montana Trout Unlimited and FWP installed a barrier structure approximately 2.2 miles downstream from the natural waterfall. Removing non-native trout between the man-made barrier and the waterfall and restoring with unaltered WCT would likely increase the population of unaltered WCT by greater than 2,100 fish. This would bring the total number of unaltered WCT in the drainage to >2,500 fish which would greatly increase the population's probability of long-term persistence. Fish from above the waterfall in Cottonwood Creek would initially be used to recolonize the lower creek. If low abundances or genetic diversity delay recolonization, then the population may be supplemented by transferring small numbers (5-25) of live, wild genetically unaltered WCT from neighboring populations within the Beaverhead sub-basin (e.g., Jake Canyon, Teddy Creek).

Environmental Assessments (EA) are a requirement of the Montana Environmental Policy Act (MEPA) which require state agencies to consider the environmental, social, cultural, and economic effects of proposed actions. This EA considers potential consequences of three alternatives to conserve fish in Cottonwood Creek. Angling as a suppression tool was not

considered because of the inefficiency of that technique, the difficulty of public access, and the small, brushy nature of the creek. The three alternatives considered are:

1. Alternative 1 (Preferred): Chemical removal of nonnative fish in Cottonwood Creek with eventual replacement by unaltered WCT.
2. Alternative 2: No action
3. Alternative 3: Mechanical suppression

Alternative 1 is the preferred alternative. It would have short-term, minor effects on wildlife, recreation, and vegetation. This alternative would be highly beneficial to Westslope cutthroat trout and would be a substantial contribution to the long-term conservation of the species in the Beaverhead watershed.

MEPA requires public involvement and opportunity for the public to comment on projects undertaken by the act's agencies. A 30-day public comment period will extend from May 15 to June 15, 2021. Interested parties should send comments to:

Montana Fish, Wildlife & Parks – Region 3
c/o Cottonwood Creek Westslope Cutthroat Trout Conservation
1400 S. 19th Ave. Bozeman, MT 59718

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List of Abbreviations

ARM	Administrative Rules of Montana
CGNF	Custer Gallatin National Forest
DEGEE	diethyl glycol monoethyl ether
DEQ	Montana Department of Environmental Quality
EA	Environmental Assessment
EPT	Ephemeroptera, Plecoptera, Trichoptera (mayflies, stone flies, & caddis flies)
FS	Forest Service
FWP	Montana Fish, Wildlife & Parks
GMU	Geographic management unit
$KMnO_4$	potassium permanganate
MCA	Montana Code Annotated
MCTSC	Montana Cutthroat Trout Steering Committee
MEPA	Montana Environmental Policy Act
MNHP	Montana Natural Heritage Program
NEPA	National Environmental Policy Act
SNF	Shoshone National Forest
WFGD	Wyoming Fish and Game Department
YNP	Yellowstone National Park
MOU	Memorandum of understanding
MRDG	Minimum Requirements Decision Guide
MSDS	Material data safety data sheet
NPS	National Park Service
USEPA	United States Environmental Protection Agency

1 PROPOSED ACTION and BACKGROUND

1.1 *Type of Proposed Action*

Conservation Action for Westslope Cutthroat Trout.

1.2 *Agency Authority for the Proposed Action*

Montana state law provides FWP with the authority for implementation of fish management and restoration projects (MCA § 87-1-702; § 87-1-201[9][a]). In addition, Montana state law authorizes FWP to manage wildlife, fish, game and nongame animals to prevent the need for listing under the Endangered Species Act or ESA, and listed, sensitive, or species that are candidates for listing under the ESA must be managed in manner that assists in the maintenance or recovery of the species (MCA§ 87-5-107). In waters where FWP is seeking to remove or control unauthorized species, FWP must endeavor to protect the previously existing fishery and suppress or eradicate the unauthorized species to maintain the existing management objectives for that fishery (ARM 12. 7. 1501[4]). Montana state law also allows the use of chemicals to remove fish (ARM 12. 7. 1503[1][f][ii]).

Planning documents and strategies developed by agencies and collaborating entities also provide official justification for the proposed project (Table 1). These include conservation agreements among stakeholder groups, state and federal laws, and agency plans designed to conserve, secure and protect WCT within the Ruby Sub-basin (i.e., restore WCT to 20% of historic range).

Table 1. Planning and strategy documents with relevance to Conservation of WCT in Cottonwood Creek.

Agency	*Citation*	*Website*
Montana Cutthroat Trout Steering Committee (MCTSC)	Memorandum of Understanding and Conservation Agreement for Westslope Trout and Yellowstone Cutthroat Trout in Montana (2007)	http://fwp. mt. gov/fishAndWildlife/management/yellowstoneCT/
FWP	Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (2019)	Internal document
FWP	Statewide Fisheries Management Plan (2019)	http://fwp.mt.gov/fishAndWildlife/management/fisheries/statewidePlan/
FWP	Wild Fish Transfer Policy (1996)	http://fwp. mt. gov/fishAndWildlife/management/westslopeCT/default. html
FWP	Piscicide Policy (2017)	Internal document

1.3 *Estimated Commencement Date*

The estimated commencement date is July 20, 2021.

1.4 *Name and Location of the Project*

Conservation of Native Westslope Cutthroat Trout in Cottonwood Creek by removal of Nonnative Brook and hybrid Rainbow x Cutthroat with Rotenone.

Cottonwood Creek is in the Beaverhead River watershed. The project is in Beaverhead County, approximately 20 miles southeast of Dillon, Montana (Figure 1). The legal description is T10S, R7W, sections 26, 27, 28, 33 and 34.

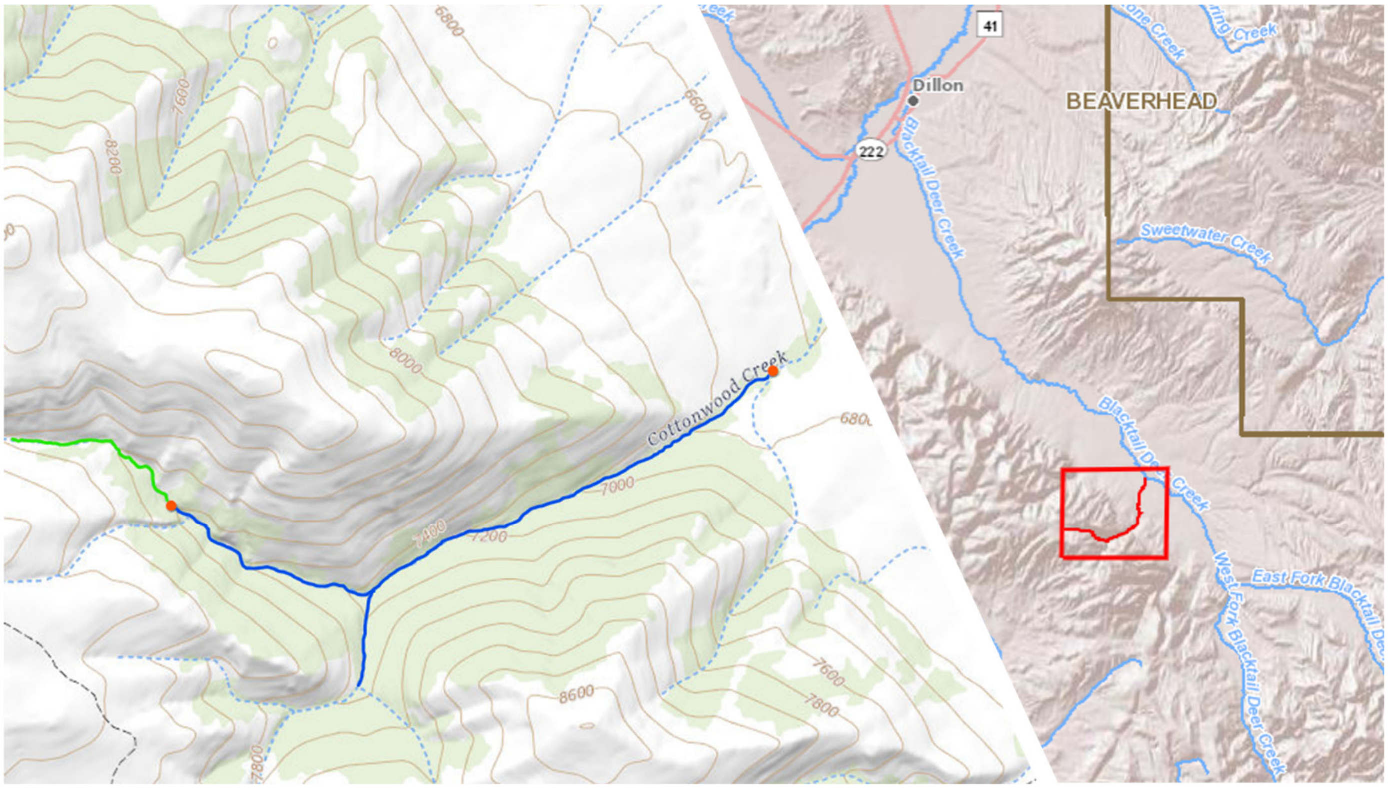

Figure 1. Map of Cottonwood Creek showing upper (natural) and lower (man-made) barriers. Highlighted colors indicate current distribution of genetically unaltered WCT (green) and the current distribution of hybridized rainbow X cutthroat and brook trout (blue). The area in blue would be treated and replaced with genetically unaltered WCT.

1.5 *Project Size (Affected Area)*

1.	Developed/residential	0 acres
2.	Industrial	0 acres
3.	Open space/woodland/recreation	0 acres
4.	Wetlands/riparian areas	3.9 miles*
5.	Floodplain	0 acres
6.	Irrigated cropland	0 acres
7.	Dry cropland	0 acres
8.	Forestry	0 acres
9.	Rangeland	0 acres

* 2.7 miles of fish-bearing stream would be treated with an additional 1.2 miles of typically non-fish-bearing stream also treated.

The project area includes 2.2 miles of mainstem Cottonwood Creek and 0.5 miles of fish-bearing stream in an unnamed tributary. An additional 1.2 miles of typically non-fish bearing stream would also be treated for a total of 3.9 miles (in high-flow years, fish can move into areas upstream of their typical distribution). At baseflow, discharge in Cottonwood Creek ranges from <1 cubic feet per second (cfs) to almost 2 cfs. In 2019, flow measurements taken between August and October showed an average discharge of 1.7 with a range of 1.5-1.8 cfs. Flows were lower in 2020, as a single flow measurement in early September produced an estimate of 0.9 cfs.

1.1 *Narrative Summary of the Proposed Action and the Purpose of the Proposed Action*

1.1.1 Summary and Background

Westslope cutthroat trout (WCT), Montana's state fish, have declined in abundance, distribution, and genetic diversity throughout their native range (Shepard et al. 2003). Reduced distribution of WCT is particularly evident in the Missouri River drainage of Montana where genetically pure populations are estimated to persist in about 4% of habitat they historically occupied. Major factors contributing to this decline include competition with nonnative brook, brown, and rainbow trout that were first introduced in Montana in the 1890's, hybridization with rainbow and Yellowstone cutthroat trout, habitat changes, and isolation to small headwater streams. Due to these threats, most remaining WCT populations in the Missouri River drainage are considered to have a low likelihood of long-term (100 years) persistence unless conservation actions are implemented (Shepard et al. 1997). The U.S. Fish and Wildlife Service has been petitioned to list WCT as a Threatened species on two occasions but found listing was not warranted stating "The conservation efforts presently being accomplished as part of the routine management objectives of State and Federal agencies, and as part of formal interagency agreements and plans, provide substantial assurance that the WCT subspecies is being conserved." Nevertheless, the species remains a Species of Concern in Montana with projects like the proposed conservation of WCT in Cottonwood Creek contributing to such decisions.

Completion of the proposed project would increase the amount of protected WCT habitat in the Beaverhead River sub-basin by 7% (from 33.9 miles to 36.6 miles) and is expected to increase the number of protected WCT by 18% (from 9,629 fish to 11,729 fish; Bateman et al. 2019). Objective 3 of the *Memorandum of Understanding and Conservation Agreement for Westslope*

Cutthroat Trout and Yellowstone Cutthroat Trout in Montana is "Seek collaborative opportunities to restore and/or expand each cutthroat trout subspecies into selected suitable habitats within their respective historic ranges." The *Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana* was cooperatively developed and signed by American Wildlands, Blackfeet Tribe, Crow Tribe, Confederated Salish and Kootenai Tribes, Federation of Fly-Fishers, Glacier National Park, Greater Yellowstone Coalition, Montana Chapter of the American Fisheries Society, Montana Department of Natural Resources & Conservation, Montana Farm Bureau, Montana Fish, Wildlife & Parks, Montana Stockgrowers Association, Montana Trout Unlimited, Montana Wildlife Federation, Natural Resource Conservation Service, Plum Creek, private landowners, the Bureau of Land Management, the U.S. Fish & Wildlife Service, the U.S. Forest Service, and Yellowstone National Park.

Cottonwood Creek is presently occupied by native WCT, non-native brook trout, and rainbow x cutthroat hybrid trout. It is one of eight streams within the Beaverhead watershed that still supports an unaltered WCT population; however, the population is only comprised of approximately 520 fish confined to the upper 0.6 miles of stream above a natural waterfall (Bateman et al. 2019; Figure 2). The likelihood of extirpation of isolated cutthroat trout populations in small stream fragments is high due to random environmental events (e.g., drought, fire; Roberts et al. 2013). In 2020, Montana Trout Unlimited and FWP installed a wooden drop structure which serves as an upstream fish passage barrier at river mile (RM) 2.5 (Figure 3). Removing non-native trout between the constructed barrier and natural waterfall (RM 4.7) would increase the amount of protected mainstem habitat by 2.2 miles with an additional 0.5 miles of suitable habitat in an unnamed tributary. At the end of this project, Cottonwood Creek would contain 3.3 miles of protected habitat for unaltered WCT. Because of the existing high densities of fish in Cottonwood Creek (50 per 100 m), it is expected that this project would protect greater than 2,500 pure WCT.

No irrigation water is withdrawn from Cottonwood Creek upstream of the barrier. There is a diversion/ditch downstream of the barrier, but it is more than one-hour travel time from the project area and would be detoxified by then. The water users are the landowners working with FWP on this project and will be notified when the project is occurring. Land management activities by the BLM and USFS are consistent with native trout conservation goals (see Attachment 1 – letter from BLM). There are no amphibian or invertebrate Species of Concern in the Cottonwood creek drainage.

Figure 2. Natural waterfall barrier on Cottonwood Creek at river mile 4.7. Pure westslope cutthroat trout exist in 0.6 miles of stream above the waterfall.

Figure 3. Man-made fish barrier on Cottonwood Creek at river mile 2.5. The proposed treatment (Alternative 1) would end at this barrier.

1.1.2 Proposed Action

This project would secure a nonhybridized population of WCT in Cottonwood Creek by removing nonnative brook trout and rainbow X cutthroat hybrids with rotenone, followed by re-establishment of unaltered WCT. Fish from above the waterfall in Cottonwood Creek would initially be used to recolonize the lower creek. If low abundances or genetic diversity delay recolonization, then the population may be supplemented by transferring small numbers (5-25) of live, genetically unaltered wild WCT from neighboring populations within the Beaverhead such as Jake Canyon or Teddy creeks. It is expected that the Cottonwood Creek WCT population would recolonize the available habitat and expand to over 2,500 individuals.

1.1.3 Method of Fish Removal

The chemical proposed for removal of fish uses rotenone as its active agent. Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Rotenone has been used by native people for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s

1.1.4 How Does It Work?

Rotenone is applied to the water and enters the fish through the gills. It is effective at very low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals, birds, and other non-gill breathing organisms do not have this rapid absorption route into the bloodstream and are not affected by consuming treated water or dead fish at concentrations used in fisheries management. Rotenone kills fish by interrupting the Krebs Cycle in individual cells.

1.1.5 Treatment Area

Rotenone would be applied to Cottonwood Creek between the natural waterfall at RM 4.7 and the constructed barrier at RM 2.5. It would also be applied to the unnamed tributary which enters Cottonwood Creek from the south. Rotenone would be actively detoxified at the irrigation diversion and confirmed to be neutralized within 30 minutes of travel time downstream (Figure 4.)

Waters within the project area would be treated with CFT Legumine at concentrations following the label recommendations, which is typically within the range of 0.5 and 1.0 ppm. The exact concentration of the selected formulation would be determined in the field by conducting bioassays on caged fish with the intent of determining the lowest dose that will meet the project objective of eradication of fish in the project area.

Access to the treatment area would be closed during the application of rotenone (1 day). Signs would be placed at public access points, trail and road crossings, and other avenues where access to the treatment area can be readily obtained.

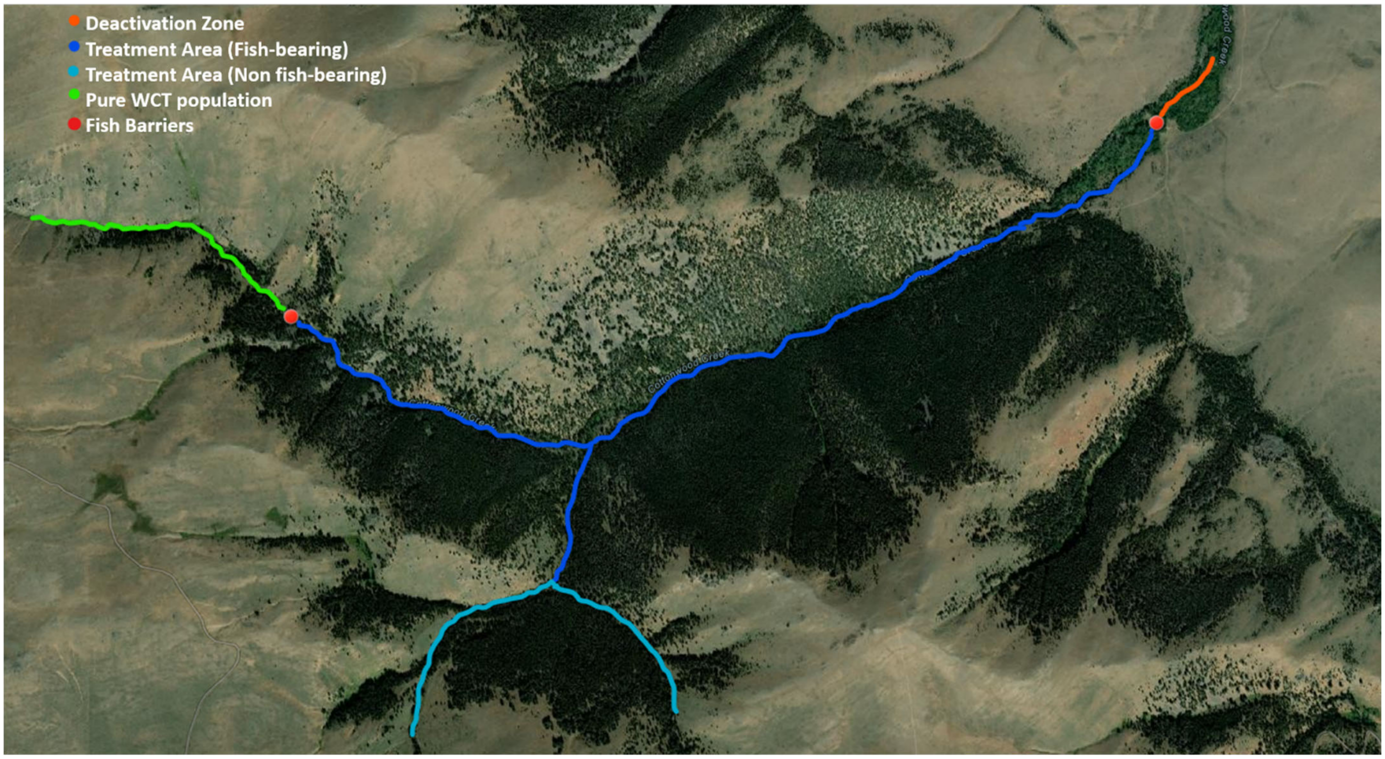

Figure 4. Treatment details of proposed Cottonwood Creek nonnative fish removal project (Preferred Alternative).

1.1.6 Method of Application

Drip stations would be used to dispense the rotenone. A drip station is a small container that dispenses a measured amount of liquid rotenone to a stream at a constant rate for a specific period of time. FWP would apply rotenone to the backwaters of the stream with backpack sprayers. The materials and equipment would be transported to the site by vehicle.

Treatment would last for approximately 8 hours. When the stream treatment ends, freshwater entering the stream would dilute rotenone, contributing to its degradation. Treating the streams in this watershed would take 1 day.

1.1.7 Deactivation

Potassium permanganate is a strong oxidizer that when applied to water readily neutralizes rotenone. Potassium permanganate would be applied to the stream at the lower end of the treatment area beginning at least two hours before the projected arrival time of rotenone, stopped only when the last of the rotenone has theoretically passed the neutralization station (calculated as the time of last application of rotenone plus the travel time to reach the station), and then stopped only after all sentinel fish immediately above the neutralization station survive an additional 4 hours without stress. A block net would be installed at the end of the deactivation zone to prevent dead fish from drifting downstream of the project area unless high discharge or water velocity precludes the effective use of a block net.

1.1.8 Fate of Dead Fish

Dead fish that surface would be left on site in the water. Bacteria and aquatic invertebrates promote rapid decay of fish carcasses, and nutrients contributed from dead fish stimulate

recovery of zooplankton and other aquatic invertebrates. Terrestrial scavengers contribute to the disappearance of carcasses, and piscicide-killed fish do not present health risks to organisms consuming them. Previous treatments have shown that fish killed by rotenone rapidly decay and are difficult to find even after a few days post treatment. Information regarding animal and human consumption of rotenone exposed fish is discussed in sections 3.1.5 and 3.2.3 below.

2.6.9 Duration of project

A second treatment would occur approximately one year after the first treatment to ensure achievement of the desired objective of eradicating nonnative brook and hybrid rainbow x cutthroat Trout. Effectiveness of the treatment would be ascertained through electrofishing and environmental DNA surveys of the treated sections of Cottonwood Creek and its tributary. The same treatment, safety measures, and precautions used during the first treatment would be utilized during the second treatment if it is necessary.

2.6.10 Monitoring

Effectiveness of the treatment would be determined through electrofishing and environmental DNA surveys of the treated sections of Cottonwood Creek and its tributary.

Recovery of benthic macroinvertebrate species would be evaluated over two successive years by collecting kick samples in three sites in the treatment area, one in the deactivation zone, and one in a control (above the waterfall).

Expansion of the Cottonwood Creek WCT population would be monitored annually following treatment by electrofishing. WCT may be translocated downstream to expedite recolonization and expansion. If low abundances or genetic diversity delay recolonization, then the population may be supplemented by transferring small numbers (5-25) of live, wild genetically unaltered WCT from neighboring populations within the Beaverhead such as Jake Canyon or Teddy creeks. All translocations of fish from within or outside of Cottonwood Creek would follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock, and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy.

2 Environmental Review

2.1 *Physical Environment*

2.1.1 Land Resources

LAND RESOURCES **Will 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 Water

WATER **Will the proposed action result in:**	**IMPACT 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	2a
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				2f
g. Changes in the quantity of groundwater?		X				

h. Increase in risk of contamination of surface or groundwater?			X		YES	see 2af
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	X	X			See 2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		YES	2m

Comment 2a

The proposed project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short term and minor. CFT Legumine 5% liquid rotenone is an EPA registered pesticide and is safe to use for removal of unwanted fish when handled properly. The concentration of CFT Legumine 5% liquid proposed is 0.5 to 1.0 ppm in water but could be adjusted within the label-allowed limits based upon the results of on-site assays.

FWP expects the stream to detoxify within 48 hours after rotenone application. Several factors influence rotenone's persistence and toxicity. Warmer water temperatures promote deactivation. 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 deactivated and is no longer toxic in that time. As temperature and sunlight increase, so does deactivation of rotenone. Higher alkalinity (>170 mg/L) and pH (>9.0) also increase the rate of deactivation. Rotenone tends to bind to, and react with, organic molecules, and availability of organic matter substantially decreases the persistence of rotenone (Dawson et al. 1991). Dilution from groundwater inputs or tributary streams also contributes to deactivation of rotenone

FWP's piscicide policy requires deactivation of rotenone in streams and lake outflows using potassium permanganate ($KMnO_4$), a strong oxidizer, to minimize exposure beyond the treatment area unless the stream goes dry at the downstream end of the treatment area and there are no associated groundwater concerns. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the rotenone (2-4 ppm). Deactivation is accomplished after about 15-30 minutes of exposure time between the two compounds.

To achieve full neutralization, potassium permanganate must be continuously delivered at a rate such that a residual level of potassium permanganate of 0. 5-1.0 ppm is maintained downstream of the application the distance the water flows in 30 minutes. This distance is known as the neutralization or deactivation zone. A chlorine meter would be used to monitor the presence of potassium permanganate at the end of the 30-minute contact zone to ensure that 0.5-1.0 ppm potassium permanganate is present and that the rotenone is completely neutralized. In addition

to direct measurement of the potassium permanganate in the water, caged non-native brook and cutthroat x rainbow hybrid trout would be placed in the stream to monitor the effectiveness of the detoxification station during the treatment. Caged fish would be placed downstream of the 30-minute contact zone and monitored. Distress or the lack thereof in these caged fish indicates whether neutralizing is effective. Application of potassium permanganate would continue until the theoretical time in which all treated waters have passed the fish barrier and caged fish placed immediately upstream of the neutralization zone can survive for an additional 4 hours (for additional information on see comment 2a below).

Single-day treatments

- ***Stream treatments***

  Step 1: *Sentinel fish must be placed immediately above the detox station*

  Step 2: *Start potassium permanganate application 2 hours before the theoretical arrival time of the rotenone.*

  Step 3: *Potassium permanganate must be applied until the last of the rotenone has theoretically passed the detox station (calculated as the time of last application of rotenone plus the travel time to reach detox station), and then stopped only after all sentinel fish immediately above the detox station survive an additional 4 hours without stress. "Last application" in this case means the last time rotenone from any drip station or backpack sprayer hits the water.*

Comment 2f

No contamination of groundwater is anticipated to result from this project. Because ground water leaving Cottonwood Creek must travel through bed sediments, soil, and gravel, and rotenone is known to bind readily with these substances, FWP does not anticipate any contamination of ground water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves one inch in most soil types but up to three inches in sandy soil types (Hisata 2002). In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994).

Case studies in Montana have concluded that rotenone movement through groundwater does not occur (FWP unpublished data). For example, at Tetrault Lake, Montana, neither rotenone nor inert ingredients were detected in a nearby domestic well which was sampled two and four weeks after applying 1.8 ppm rotenone to the lake. This well was chosen because it was down gradient from the lake and drew water from the same aquifer that fed and drained the lake. FWP has sampled wells and groundwater in several piscicide projects that removed fish from ponds, and no rotenone, or the inert ingredients of the selected formulation were detected in ponds ranging from 65 to 200 feet from the treated waters. Likewise, application of piscicide to streams has not resulted in contamination of neighboring wells or groundwater. In 2015 and 2016, Soda Butte Creek flowing through Cooke City and Silver Gate, Montana, was treated with

CFT Legumine. Wells drawing water from the same open aquifer as the treated stream were sampled during and after the treatment and all found to be free of rotenone.

Comment 2j

The CFT Legumine label states… "Do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of an irrigation water intake in a standing body of water such as a lake, pond, or reservoir. For applications > 40 ppb or 0.04 ppm active rotenone (> 0. 8 ppm 5 % rotenone formulation) in waters with drinking water intakes or hydrologic connections to wells, 7 to 14 days before application, the certified applicator or designee under his/her direct supervision must notify to the party responsible for the public water supply, or individual private water users, to avoid consumption of treated water until: (1) active rotenone is < 0. 04 ppm as determined by analytical chemistry, (2) fish of the *Salmonidae* or *Centrarchidae* families can survive for 24 hours, (3) dilution with untreated water yields a calculation that active rotenone is < 0. 04 ppm, or (4) distance or travel time from the application sites demonstrates that active rotenone is < 0. 04 ppm.

Impacts to irrigation and potable water intakes would be short term and minor and would be mitigated by either detoxifying diverted irrigation water or closing the irrigation diversion for the duration of the treatment (12-24 hours).

Comment 2m

The 2016 Pesticide General Permit issued on a five-year cycle by Montana DEQ provides the authority for FWP to apply piscicides. FWP, and any other piscicide applicator, must develop a pesticide discharge management plan as a condition for coverage under this permit. For FWP, the plan consists of procedures and protocols developed by and detailed in FWP's Piscicide Policy, the AFS Rotenone Standard Operating Procedures manual, and annual training and critique of projects provided by the FWP Piscicide Committee.

2.1.3 Air

AIR **Will 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? (also see 13 (c))			X			3a
b. Creation of objectionable odors?			X		yes	3b
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. Will the project result in any discharge which will conflict with federal or state air quality regulations?		X				

Comment 3a

Vehicles and small generators used during the treatment create emissions; however, these emissions would dissipate rapidly. Any impacts from these odors would be short term and minor.

Comment 3b

CFT Legumine does not contain the same level of aromatic petroleum solvents (toluene, xylene, benzene, and naphthalene) of other rotenone formulations and does not have the same odor concerns.

Dead fish would result from this project and may cause objectionable odors (See Section 2a). FWP would expect odors from dead fish to be short term and minor as most dead decay within a few days.

2.1.4 Vegetation

VEGETATION **Will the proposed action result in:**	**IMPACT** **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			4a
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				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a

Rotenone does not affect plants at concentrations used to kill fish. Impacts from trampling vegetation at staging or detoxification areas are expected to be short term and minor and should be fully healed within one growing season.

Comment 4c. Rotenone has no impacts on plant species at fish killing concentrations. The only anticipated impacts to sensitive plant species would be a result of trampling by the personnel applying the rotenone to the stream, and any impacts from trampling are expected to be short term and minor. Any trampling impacts should be fully healed within 1 growing season. Impacts to sensitive plants can be minimized by staying as much as possible on existing road and trail systems.

2.1.5 Fish/Wildlife

FISH/WILDLIFE **Will the proposed action result in:**	**IMPACT** **Unknown**	**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		yes	5c
d. Introduction of new species into an area?		X				5d
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			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				5g
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)			X			See 5d

Comment 5b

This project is designed to kill unwanted fish. It would kill non-native brook trout and rainbow X cutthroat hybrids which are common throughout the upper Missouri River including in Blacktail

Deer Creek. It would replace them with pure westslope cutthroat trout which are uncommon compared to historical distribution. The impact of fish removal would be short term and minor because the stream would be repopulated with WCT following treatment.

Comment 5c

Fish

Rotenone is highly toxic to fish, and the objective of this project is full eradication of non-native brook and hybrid rainbow x cutthroat trout. Cottonwood Creek would be recolonized by WCT within 2-3 years following treatment. Expansion of the Cottonwood Creek WCT population would be monitored annually following treatment by electrofishing. WCT may be translocated downstream to expedite recolonization and expansion. If low abundances or genetic diversity delay recolonization, then the population may be supplemented by transferring small numbers (5-25) of live, wild genetically unaltered WCT from neighboring populations within the Beaverhead such as Jake Canyon or Teddy creeks. All translocations of fish from within or outside of Cottonwood Creek would follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock, and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy.

Mammals

Ingestion of rotenone, either from drinking rotenone-treated water or from consuming dead fish or invertebrates from rotenone-treated streams, are the likely routes of exposure for mammals. A substantial body of research has investigated the effects of ingested rotenone in terms of acute and chronic toxicity and other potential health effects. In general, mammals are not affected by rotenone at concentrations used to kill fish. Consuming treated water or rotenone killed fish does not affect mammals at fish killing concentrations because rotenone is neutralized by enzymatic action in their stomach and intestines (AFS 2002). Investigations examining the potential for acute toxicity from ingesting rotenone find that mammals would need to consume impossibly high amounts of rotenone-treated water or rotenone-killed fish to obtain a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours or eat 660,000 pounds of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). A half-pound mammal would need to consume 12.5 mg of pure rotenone or drink 66 gallons of treated water for a lethal dose (Bradbury 1986). The effective concentration of rotenone to kill fish is 0.5 to 1.0 ppm, which is several orders of magnitude lower than concentrations that result in acute toxicity to mammals. Evaluations of mammals' potential exposure to rotenone from scavenging indicate that acute toxicity from ingesting rotenone-killed fish is highly unlikely (EPA 2007).

Chronic toxicity associated with availability of dead fish over time would not pose a threat to mammals, nor would other health effects be likely. Rats and dogs fed high levels of rotenone for 6 months to 2 years experienced only diarrhea, decreased appetite, and weight loss (Marking 1988). The unusually high treatment concentrations did not cause tumors or reproductive problems. Toxicology studies investigating potential secondary effects of rotenone exposure have found no evidence that it results in birth defects (HRI 1982), gene mutations (BRL 1982; Van Geothem et al. 1981), or cancer (Marking 1988). Rats fed diets laced with 10 to 1000 ppm of rotenone over a 10-day period did not experience any reproductive dysfunction (Spencer and Sing 1982). Therefore, chronic exposure to rotenone poses no threat to mammals consuming

dead fish or treated water. Rotenone does not persist in the environment which also limits the chronic exposure to mammals or other terrestrial organisms. In Cottonwood Creek, rotenone is only expected to persist for 48 hours, so chronic exposure is unlikely.

A temporary reduction in prey of aquatic origin has the potential to influence some mammals. The American mink is a piscivorous mammal that is most likely to occur in the project area. Mink are opportunistic predators and scavengers, with fish and invertebrates comprising a portion of their diet. Therefore, the reduction in density of fish following treatment may displace mink to adjacent, untreated reaches until fish populations recover. Nonetheless, as opportunists, American mink have flexibility to switch to other prey species and have high dispersal rates.

Other mammalian predators may experience short-term and minor consequences. Opportunistic black bears (*Ursus americanus*), raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), otters (*Lontra canadensis*), and striped skunks (*Mephitis mephitis*) would likely consume dead fish immediately after piscicide treatment. The temporary reductions of aquatic prey, and the brief availability of dead fish, constitute short-term and minor effects on mammalian predators and scavengers.

Birds

Birds have the potential to be exposed to rotenone through ingestion of treated water or scavenging dead fish and invertebrates. As with mammals, rotenone breaks down rapidly within the gut of birds. Moreover, the concentrations of rotenone in waters treated for fisheries management are far below levels found to be toxic to birds. For example, a 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 concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to wildlife (EPA 2007). In summary, this project would have no adverse effect on birds that ingest water, dead fish, or dead invertebrates.

Numerous bird species rely on prey of aquatic origin, and a rotenone project has potential to temporarily decrease forage availability. Timing the project for when neotropical migrant songbirds are migrating south mitigates for loss of forage base. Like mammals, birds are highly mobile, so the project may result in short-term displacement of birds that consume fish or aquatic invertebrates.

Reptiles

Reptiles, especially garter snakes, have potential to be exposed to rotenone treated water and could scavenge dead fish. The low concentration of rotenone in water and dead fish indicates reptiles would not experience toxic exposure to rotenone. Moreover, the reptilian gut is likely as efficient, or more efficient, at breaking down rotenone given the ability of reptiles to digest bone, hair, and exoskeletons, all of which are far less degradable than the rotenone molecule.

Amphibians

Amphibians are closely associated with water and have potential to be exposed to rotenone during treatment. In general, adult, air-breathing amphibians are not affected by rotenone at fish killing concentrations (Chandler and Marking 1982, Grisak et al. (2007), but the larvae would likely be affected (Grisak et al 2007, Billman et al 2011). Billman et al. (2011) conducted

laboratory toxicity tests of the impacts of rotenone on Columbia spotted frogs and boreal toads. They found significant mortality to the larval stages of both species if they are exposed for 96 hours to 1 ppm CFT Legumine, but the mortality was less when exposed to lower dosages (0.5 ppm) or for a shorter duration (4 hours or less). In Yellowstone Park, rotenone caused nearly 100% mortality in gill-breathing, amphibian tadpoles within 24 hours, but did not affect non-gill breathing metamorphs, juveniles, or adults. In the year(s) following, tadpole repopulation occurred at all water bodies treated with CFT Legumine, and population levels were similar to or higher than pre-treatment levels (Billman et al. 2012). Olsen (2017) found that a concentration of 1 ppm rotenone in the West Fork of Mudd Creek produced 100% mortality of tailed frog tadpoles, but concentrations of 0.75, 0.5 and 0.25 mortality averaged only 33%. To mitigate for the potential impacts to larval stages of amphibians, applications can be performed later in the year when the larvae are not present, such as the fall, for shorter duration (4 hours) or at a lesser concentration. Cottonwood Creek would be treated in late summer (August), and drip stations would run for 4 hours.

No amphibian Species of Concern have been observed in Cottonwood Creek, although it is within the general range of Western Toad and Northern Leopard Frog (Montana Natural Heritage Program; http://mtnhp.org). Western toads show the same life stage sensitivity to rotenone with tadpoles suffering near total mortality to exposure to concentrations of rotenone used in current practice, but resilience to rotenone as metamorphs through adults (Billman et al. 2011). Moreover, adult western toads are likely less sensitive than frogs given their impermeable skin (Maxell and Hokit 1999). Likewise, adult toads and frogs can leave the aquatic environment which substantially reduces the potential for exposure (Maxell and Hokit 1999).

Western toads have various characteristics that make them resilient to piscicide projects. Western toads have exceptional fecundity, documentation of egg clutches averaging 5,000 in Colorado, and reaching 16,000 in Montana and 20,000 in the Pacific Northwest. Development from hatching to metamorphosis is related to temperature and can be rapid; however, populations at tree line may fail to metamorphose, and these populations may rely on immigration from lower elevations to persist.

Variability of tolerance to rotenone among species of toad and frog is unknown; however, evidence for resilience to rotenone of other species suggests a general tolerance is possible. A study in Norway examined the response of lake-dwelling amphibians, the common frog (*Rana temoraria*) and common toad (*Bufo bufo*), to treatment with CFT Legumine (Amekleiv et al. 2015). These species were observed before and one year after treatment with rotenone, with adults, eggs, and tadpoles being present following treatment. They concluded CFT Legumine had little effect on these species.

Stream-Dwelling Aquatic Invertebrates

Investigations into the effects of rotenone on benthic organisms indicate that rotenone can result in temporary reduction of gilled aquatic invertebrates in streams. Invertebrates that were most sensitive to rotenone also tended to have the highest rate of recolonization due to short life cycles (Engstrom-Heg et al. 1978). Although gill-respiring invertebrates are a sensitive group, many are far less sensitive to rotenone than fish (Schnick 1974; Chandler and Marking 1982; Finlayson et al. 2010). Due to their short life cycles (Anderson and Wallace 1984), strong dispersal ability (Pennack 1989), and generally high reproductive potential (Anderson and Wallace 1984), aquatic

invertebrates are capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et al. 1996). Following a piscicide treatment of a California stream, macroinvertebrates experienced a resurgence in numbers with black fly larvae recovering first followed by mayflies and caddisflies within six weeks after treatment (Cook and Moore 1969). Stoneflies returned to pretreatment abundances by the following spring. Studies suggesting long-term reductions in biomass and presumed absence of species following piscicide treatment examined treatments with markedly higher concentrations and durations of piscicide exposure, with a subsequent treatment occurring within a month of the first treatment (Mangum and Madrigal 1998).

A study of response of benthic invertebrates in streams in Montana and New Mexico used a concentration and duration of CFT Legumine similar to the one that is proposed in this project (Skorupski 2011). In Cherry Creek and Specimen Creek, both in Montana, rotenone resulted in minimal effects on macroinvertebrates immediately after. Rotenone had a greater effect on benthos in streams in New Mexico. Regardless of the initial response, invertebrate communities recovered in all streams within a year. In Norway, CFT Legumine was applied at of 0.5 ppm, which is lower than the 1 ppm typical of most piscicide projects in Montana, and despite initial reductions in invertebrate abundance, most taxa had recolonized with a year (KJærstad et al. 2014).

Because piscicide has potential to alter abundance and species composition of aquatic invertebrates over the short-term, FWP's Piscicide Policy requires pre and posttreatment sampling of benthic, aquatic invertebrates (FWP 2012).

The possibility of eliminating a rare or endangered species of aquatic invertebrate in the proposed streams by treating with rotenone is unlikely. During the initial information gathering phase for this document the Montana Natural Heritage Program (MNHP) was consulted to determine if there were non-target aquatic species of concern (SOC) present in the treatment area (http://mtnhp. org/SpeciesOfConcern/?AorP=a). There were no invertebrate Species of Concern observed in Cottonwood Creek.

Based on the information collected from Cottonwood Creek and the studies reviewed above, FWP would expect the aquatic invertebrate species composition and abundance in the streams/lakes proposed for treatment with rotenone to return to pre-treatment diversity and abundance within one to two years after treatment. Therefore, the impacts to aquatic invertebrate communities should be short-term and minor.

Mussels and Clams

Freshwater mussels tend to have a much higher tolerance to rotenone than fish or other aquatic invertebrates (Hart et al. 2001). Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation). Dolmen et al. (1995) found that pearl mussels exposed in a field experiment to 5 ppm rotenone for 12 hours experience no mortality. In laboratory experiments, these same authors determined the upper lethal limit for pearl mussels was 30-40 ppm rotenone which is more than 30 times the application rate for the proposed project. Experiments were conducted in the West Fork Mudd Creek in the Big Hole River drainage in 2013 on western pearlshell mussels. The results of these experiments indicated that rotenone applied to a stream at a concentration of 1 ppm for 4 hours had no acute effect on mussel mortality 24 or 72 hours after exposure (Olsen 2017).

Comment 5d

Expansion of the Cottonwood Creek WCT population would be monitored annually following treatment by electrofishing. WCT may be translocated downstream to expedite recolonization and expansion. If warranted by limited expansion, small population size, or low genetic diversity, the population may be supplemented by transferring small numbers (5-25) of live, wild genetically unaltered WCT from neighboring populations within the Beaverhead (e.g., Jakes Canyon and Teddy creeks) sub-basins. All translocations of fish from within or outside of Cottonwood Creek would follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock, and Ruby River sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy.

Comment 5f

There are no T&E or sensitive aquatic species observations within Cottonwood Creek (Montana Natural Heritage Program; http://mtnhp.org).

It is possible that great blue herons, osprey, or eagles would consume rotenone-killed fish. Conducting this project in the late summer would not impact bald eagle nesting, and there would be no impacts to herons, bald eagles, or osprey that consume rotenone-killed fish. The stream would be repopulated with fish within three years of treatment, and there are many other nearby streams with fish so there would be no impacts to bald eagles. See comment 5c for impacts to birds.

Grizzly bears and gray wolves are known to be in this area but are not dependent on the stream or fish in the stream for food. The infrequent sighting of grizzly bears and gray wolves and relatively high human activity in the area would contribute to reducing potential for these species to consume rotenone killed fish. See comment 5c for impacts to mammals. The project would not have an impact on grizzly bears or gray wolves.

Comment 5g

There would be an increased number of people (10-15) within the drainage during and for the week leading up to treatment. However, because that level of human activity is common during certain seasons within this drainage there would be no affect on stress of any wildlife species.

2.2 *Human Environment*

2.2.1 Noise/Electrical Effects

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Increases in existing noise levels?			X			6a
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				

Comment 6a

The only noise generated from this project would be from vehicles or small generators but it is consistent with present levels. The noise generated from this would be short term and minor.

2.2.2 Land Use

7. <u>LAND USE</u> Will 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			7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c

The CFT Label states: "Do not allow recreational access (e.g., wading, swimming, boating, and fishing) within the treatment area while rotenone is being applied." Therefore, during the application of rotenone, the area being treated must be closed to public access. The stream would be closed for less than 24 hours, given the concentrations FWP would use (0.5 to 1.5 ppm). Access to the stream is through private property and is not open to the public outside of hunting season. The landowners, cattle grazers, and water users have been notified of the project and are supportive. Any social impacts to individuals who use this area would be short term and minor.

2.2.3 Risks/Health Hazards

8. <u>RISK/HEALTH</u> <u>HAZARDS</u> Will 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		YES	8b
c. Creation of any human health hazard or potential hazard?			X		YES	see 8ac
d. Will any chemical toxicants be used?			X		YES	see 8a

Comment 8a

The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment required by the product label and SDS sheets. All applicators would be trained on the safe handling and application of the piscicide and potassium permanganate. Piscicide applicators become certified applicators upon passing examinations given by the Montana Department of Agriculture. Beyond this, FWP imposes additional requirements on its own employees through its internal piscicide policy (FWP 2012). An independent certified applicator must accompany each treatment with "independent" status assigned to an individual who would not be expected to work on the treatment as part of their normal duties. Therefore, at least 2 Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Materials would be transported, handled, applied, and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b

FWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring, and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP, the risk of emergency response is minimal, and any effects to existing emergency responders would be short term and minor.

Comment 8c

Information examined here includes an analysis of human health risks relating to rotenone exposure (EPA 2007, Fisher 2007). Acute toxicity refers to the adverse effects of a substance from either a single exposure or multiple exposures in a short space of time. Rotenone ranks as having high acute toxicity through oral and inhalation routes of exposure and low acute toxicity through exposure to skin (EPA 2007). Acute toxicity would be applicable to undiluted rotenone formulation, with median lethal doses for rats ranging from 39. 5 mg/kg for female rats, and 102 mg/kg for male rats. A rat would need to ingest or inhale 0.04 g of undiluted rotenone for a lethal dose. As rotenone is 5% of most rotenone formulations, a 1 kg rat would have to consume 0.63mL of formulation to receive a lethal dose. Because the treatment area would be closed to public access during rotenone application, exposure of humans to undiluted 5% rotenone formulation would not occur. Only personnel involved in the project who actively measure and

apply the chemical could be exposed. Oral or inhalation risks for these persons can be reduced or eliminated by proper use of personal protective equipment.

Chronic exposure is repeated oral, dermal, or inhalation of the target chemical (EPA 2007). In humans, chronic exposure is the length of time equivalent to approximately 10% of the life span. In piscicide treatments in streams, exposure to rotenone lasts at most 4 days. Therefore, the only people likely to experience chronic exposure are the applicators who dispense diluted CFT Legumine over multiple projects. The use of protective eyewear, gloves, and dust/mist respirators (in the case of handheld devices that dispense rotenone) is sufficient to protect worker health.

The analysis of dietary risks considered threats to the subgroup “females 13-49 years old” and examined exposure associated with consuming exposed fish and drinking treated surface water (EPA 2007). In determining potential exposure from consuming fish, the EPA used maximum residues in fish tissue. The concentrations of residue considered were conservative, meaning that they may have been an overestimate of the rotenone concentrations in muscle tissue as they included unpalatable tissues, where concentrations may be higher. The EPA concluded that acute dietary exposure estimates resulted in a dietary risk below the EPA’s level of concern; therefore, consumption of fish killed by rotenone does not present an acute risk to the sensitive subgroup.

Table 2: Toxicological endpoints for rotenone (EPA 2007)

Exposure Scenario	Dose Used in Risk Assessment, Uncertainty Factor (UF)	Level of Concern for Risk Assessment	Study and Toxicological Effects
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 aRfD = 15 mg/kg/day = 0. 015 mg/kg/day 1000	Acute PAD = 0. 015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies.		
Chronic Dietary (all populations)	NOAEL = 0. 375 mg/kg/day UF = 1000 cRfD = 0. 375 mg/kg/day = 0. 0004 mg/kg/day 1000	Chronic PAD = 0. 0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1. 9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0. 5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day
Inhalation Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification; No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

The EPA analysis of acute dietary risk for both food and drinking water concluded;

When rotenone is used in fish management applications, food exposure may occur when individuals catch and eat fish that either survived the treatment or were added to the water body (restocked) prior to complete degradation. Although exposure from this route is unlikely for the general U.S. population, some people might consume fish following a rotenone application. EPA used maximum residue values from a bioaccumulation study to estimate acute risk from consuming fish from treated water bodies. This estimate is considered conservative because the bioaccumulation study measured total residues in edible portions of fish including certain non-edible portions (skin, scales, and fins) where concentrations may be higher than edible portions (tissue) and the Agency assumed that 100% of fish consumption could come from rotenone exposed fish. In addition, fish are able to detect rotenone's presence in water and, when possible, attempt to avoid the chemical by moving from the treatment area. Thus, for partial kill uses, surviving fish are likely those that have intentionally minimized exposure.

Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater. The estimated drinking water concentration (EDWC) used in dietary exposure estimates was 200 ppb, the solubility limit of rotenone. The drinking water risk assessment is conservative because it assumes water is consumed immediately after treatment with no degradation and no water treatment prior to consumption.

Acute dietary exposure estimates result in dietary risk below the Agency's level of concern. Generally, EPA is concerned when risk estimates exceed 100% of the acute population adjusted dose (aPAD). The exposure for the "females 13-49 years old" subgroup (0.1117 mg/kg/day) utilized 74% of the aPAD (0.015 mg/kg/day) at the 95th percentile (see Table 5). It is appropriate to consider the 95th percentile because the analysis is deterministic and unrefined. Measures implemented as a result of this RED will further minimize potential dietary exposure (see Section IV).

As for evaluating the human chronic risk from exposure to rotenone treated water, the EPA acknowledges the four principle reasons for concluding there is a low risk. First, the rapid natural degradation of rotenone. Second, using active detoxification measures by applicators such as potassium permanganate. Next, properly following piscicide labels which prohibit the use near water intakes. Finally, proper signing, public notification, or area closures which limit public exposure to rotenone treated water.

No recreational access (e.g., wading, swimming, boating, and fishing) would be allowed within the treatment area while rotenone is being applied. At applications rates less than 1.8 ppm, there is no risk to human health after the chemical has been applied to the water, and once the rotenone is mixed recreational access can be restored. At application rates greater than 1.8 ppm in streams, recreational access can be removed 72 hours after application is complete. For lakes and ponds where rotenone is applied at 1/8 ppm or more, recreational access can be restored following a 24-hour bioassay demonstrating survival of sentinel fish or 14 days, whichever is less. The stream would be closed for less than 24 hours, given the concentrations FWP would use (0.5 to 1.5 ppm). The aggregate risk to human health from food, water, and swimming does not exceed the EPA level of concern (EPA 2007).

Recreationists in the area would likely not be exposed to the treatments because a temporary closure would preclude any from being in the area. Proper warning through news releases,

signing the project area, road closure, and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters. Administering application in the fall of the year would further reduce exposure due to the relatively low number of users in this area.

The occupational risks to humans are low if proper safety equipment and handling procedures are followed as directed by the product labels (EPA 2007). The major risks to human health from rotenone come from accidental exposure during handling and application. This is the only time when humans are exposed to concentrations that are greater than that needed to remove fish. To prevent accidental exposure to liquid formulated or powdered rotenone, the Montana Department of Agriculture requires applicators to be:

- Trained and certified to apply the pesticide in use
- Equipped with the proper safety gear, which, in this case, includes respirator, eye protection, rubberized gloves, hazardous material suit
- Have product labels with them during use
- Contain materials only in approved containers that are properly labeled
- Adhere to the product label requirements for storage, handling, and application

Any threats to human health during application would be greatly reduced with proper use of safety equipment. There is an inhalation risk to ground applicators. To guard against this, ground applicators would be equipped with protective clothing, eye, and respirators.

Fisher (2007) conducted an analysis of the inert constituent ingredients found in the rotenone formulation of CFT Legumine for the California Department of Fish and Game. These inert ingredients are principally found in the emulsifying agent Fennodefo[99] which helps make the generally insoluble rotenone more soluble in water. The constituents were considered because of their known hazard status and not because of their concentrations in the Legumine formulation. Solvents such as xylene, trichloroethylene (TCE), and tetrachloroethylene are residue left over from the process of extracting rotenone from the root and can be found in some lots of Legumine. However, inconsistent detectability and low occurrence in other formulations that used the same extraction process were below the levels for human health and ecological risk. Solvents such as toluene, *n*-butylbenzene, 1,2,4 trimethylbenzene, and naphthalene are present in Legumine, and when used in other applications can be an inhalation risk. However, because of their low concentrations in this formulation, the human health risk is low. The remaining constituents, the fatty acid esters, resin acids, glycols, substituted benzenes, and *1*-hexanol were likewise present but either analyzed, calculated, or estimated to be below the human health risk levels when used in a typical fish eradication project.

Methyl pyrrolidone is also found in CFT Legumine. It is known to have good solvency properties and is used to dissolve a wide range of compounds including resigns (rotenone). Analysis of Methyl pyrrolidone in CFT Legumine showed it represents about 9% of the formulation (Fisher 2007). The analysis concluded regarding the constituent ingredients in CFT Legumine;

> "…None of the constituents identified are considered persistent in the environment nor will they bioaccumulate. The trace benzenes identified in the solvent mixture of CFT Legumine™ will exhibit limited volatility and will rapidly degrade through photolytic and biological degradation mechanisms. The PEGs are highly soluble, have very low volatility, and are rapidly biodegraded within a matter of days. The fatty acids in the fatty acid ester mixture (Fennodefo99™) do not exhibit significant volatility, are virtually insoluble, and are readily biodegraded, although likely over a slightly longer period of time than the PEGs in the mixture. None of the new compounds identified exhibit persistence or are known to bioaccumulate. Under conditions that would favor groundwater exchange the highly soluble PEGs could feasibly transmit to groundwater, but the concentrations in the reservoir, and the rapid biodegradation of these constituents makes this scenario extremely unlikely. Based upon a review of the physical chemistry of the chemicals identified, we conclude that they are rapidly biodegraded, hydrolyzed and/or otherwise photolytically oxidized and that the chemicals pose no additional risk to human health or ecological receptors from those identified in the earlier analysis. None of the constituents identified appear to be at concentrations that suggest human health risks through water, or ingestion exposure scenarios and no relevant regulatory criteria are exceeded in estimated exposure concentrations…"

To limit exposure to those applying rotenone, proper safety equipment would be used according to the label requirements.

The advantage of CFT Legumine over Prenfish is that it has less petroleum hydrocarbon solvents such as toluene, xylene, benzene and naphthalene. By comparison, Prenfish has a strong chemical odor. CFT Legumine is virtually odor-free and performs almost identically to Prenfish.

Concern over a potential link between rotenone and Parkinson's disease often emerges in piscicide projects. Research into links between rotenone and PD include laboratory studies intended to induce PD-like symptoms in laboratory animals as a tool for neuroscientists to conduct PD-related research (Betarbet et al. 2000; Johnson and Bobvraskaya 2015), epidemiological studies of PD in farm workers (Kamel et al. 2006; Tanner et al. 2011), and laboratory studies evaluating risks associated with inhalation (Rojo et al. 2007). Laboratory studies inducing PD-like symptoms do not provide a relevant model for field exposure by humans. These studies entail injection into the bloodstream of extremely high concentrations of rotenone, often with a chemical carrier to facilitate absorption into tissue, for long durations. Such studies have little applicability to uses of rotenone as a piscicide.

Epidemiological studies do not provide clear evidence that rotenone has a causal link with PD. A recent study linked the use of rotenone and paraquat with the development of Parkinson's disease in humans later in life (Tanner et al. 2011). The after the fact study included mostly farmers from two states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. The results of epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011) and some have found it difficult determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking

pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD, which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of the study. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products. Laboratory studies of risks associated with inhalation of rotenone of concentrations likely encountered by fieldworkers have not found PD-like symptoms in exposed rodents (Rojo et al. 2007).

The State of Arizona conducted an exhaustive review to the risks to human health of rotenone use as a piscicide (Guenther et al. 2011). They concluded:

> "To date, there are no published studies that conclusively link exposure to rotenone and the development of clinically diagnosed PD. Some correlation studies have found a higher incidence of PD with exposure to pesticides among other factors, and some have not. It is very important to note that in case-control correlation studies, causal relationships cannot be assumed and some associations identified in odds-ratio analyses may be chance associations. Only one study (Tanner et al. 2011) found an association between rotenone and paraquat use and PD in agricultural workers, primarily farmers. However, there are substantial differences between the methods of application, formulation, and doses of rotenone used in agriculture and residential settings compared with aquatic use as a piscicide, and the agricultural workers interviewed were also exposed to many other pesticides during their careers. Through the EPA reregistration process of rotenone, occupational exposure risk is minimized by new requirements that state handlers may only apply rotenone at less than the maximum treatment concentrations (200 ppb), the development of engineering controls to some of the rotenone dispensing equipment, and requiring handlers to wear specific PPE."

To reduce the potential for exposure of the public to rotenone during the proposed treatment, areas treated with rotenone would be closed to public access. Placard signs would be placed at access points informing the public of the closure and the presence of rotenone treated waters. Personnel would be onsite to inform the public and escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by adding potassium permanganate to the stream at the downstream end of the treatment area (fish barrier). Potassium permanganate would deactivate any remaining rotenone before leaving the project area. The efficacy of the deactivation would be monitored using fish (the most sensitive species to the chemical) and a hand-held chlorine meter. Therefore, the potential for public exposure to rotenone treated waters is very minimal. The potential for exposure would be

greatest for those certified applicators and operators applying the chemical. To reduce their exposure, label mandates for personal protective equipment would be adhered to (see Comment 8a).

2.2.4 Community Impact

9. COMMUNITY IMPACT Will 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				

2.2.5 Public Services/Taxes/Utilities

10. PUBLIC SERVICES/TAXES/UTILITIES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: ______		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural		X				

gas, other fuel supply or distribution systems, or communications?						
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

2.2.6 Aesthetics/Recreation

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		yes	See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c: There would be a temporary loss of angling opportunity in Cottonwood Creek between the time of fish removal and repopulation which is expected to take 3 years. Angling pressure is estimated to be extremely low due to difficult access. Any impacts to aesthetics would be short term and minor and be directly associated with the actual treatment and immediate aftermath including dead fish in the project area. A tourism report is not necessary to quantify these impacts.

2.2.7 Cultural/Historic Resources

12. CULTURAL/HISTORIC RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c: There would be no ground-breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There would be no impacts to historical, cultural, or religious values.

2.2.8 Summary Evaluation of Significance

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				

e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X	X			yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X	X				13f
g. List any federal or state permits required.						13g

Comments 13e and f

The use of pesticides can generate controversy from some people. Public outreach and information programs can educate the public on the use of pesticides. It is not known if this project would have organized opposition; however, similar projects have received support from members of the public and stakeholder groups. The primary private landowner in the project area and Bureau of Land Management are supportive of the project (Appendix 1).

Comment 13g

The following permit would be required:

- MDEQ Pesticide General Permit

3 ALTERNATIVES

3.1 *Alternatives Evaluated*

3.1.1 Alternative 1 – Removing non-native Brook and hybrid Rainbow x Cutthroat Trout from 2.7 miles of Cottonwood Creek with rotenone.

This alternative would be highly beneficial to Cottonwood Creek WCT and would be a substantial contribution to the long-term conservation of the species in the Beaverhead Watershed. It has a high probability of success and would have short-term, minor effects on wildlife, recreation, and vegetation. FWP has numerous examples of successful projects with similar objectives. This alternative would bring FWP closer to the goal of restoring WCT into 20% of their original range within the Upper Missouri River. Additionally, securing all remaining unaltered WCT populations in place is our top priority and would allow FWP to use this population for introductions in future projects.

3.1.2 Alternative 2 – No Action.

The no action alternative would allow status quo management to continue which would maintain non-native brook and hybrid rainbow x cutthroat trout in Cottonwood Creek below the barrier. The unaltered population of WCT above the barrier exists in only 0.6 miles of stream and would not have a high likelihood of long-term persistence. Selection of this alternative would not fulfill the State's obligation to protect and expand existing remnant genetically pure WCT populations (FWP 2007) and would not reduce threats to the species that encourage requests for listing WCT under the Endangered Species Act. There would be no effect on the existing aquatic biota of Cottonwood Creek.

3.1.3 Alternative 3 – Mechanical removal of non-native fish with electrofishing.

Electrofishing has been used to remove unwanted fish from streams with limited success. Mechanical suppression by multiple-pass electrofishing has been used to eradicate unwanted trout (primarily nonnative brook trout) from short sections of several small streams in northcentral Montana (Big Coulee, Middle Fork Little Belt, and Cottonwood creeks) and in southwest Montana (Muskrat, Whites, and Staubach creeks). From 2004 through 2010, electrofishing was used annually to remove brook trout from approximately 6 miles of Dyce Creek west of Dillon. Through 2010, it is estimated that this effort reduced Dyce Creek brook trout abundance by 80-95%, but due to the complexity of the stream habitat (e.g., over hanging vegetation and debris jams), and length of the project reach (6 miles), brook trout could not be completely eradicated using only electrofishing. Continued electrofishing removal efforts in Dyce Creek would have required significant labor resources on an annual basis for an indefinite period of time. Rotenone was used to remove the remaining brook trout from Dyce Creek in August 2011 and 2012. Electrofishing efforts following treatment found no brook trout in the Dyce Creek treatment area.

Although Cottonwood Creek is small, the habitat is complex. Abundant woody debris and riparian vegetation would render a complete mechanical removal difficult. Shepard et al (2014) described conditions under which electrofishing could be successfully used to eradicate brook trout from small mountain streams in Montana. They found that it took 6-10 multiple-pass treatments to be successful at eradication. Eradication by electrofishing cost $3,500-$5,000 per km (2005 dollars) where no riparian vegetation or woody debris clearing was necessary, increasing to $8,000-$9,000 per km where clearing was necessary. These reports demonstrate that electrofishing can be successful in some instances but requires a large amount of time, specific conditions for success, and several years. Numerous examples are provided to demonstrate that it can be ineffective also. Therefore, complete removal of non-native hybrid rainbow x cutthroat and brook trout by electrofishing was determined not to be a feasible alternative for conserving WCT in Cottonwood Creek and was eliminated from further consideration.

4 Public Participation and Comments Instructions

The public will be notified in the following manners to comment on this current EA, the proposed action and alternatives:

1. Two public notices in each of these papers: Helena Independent Record, Bozeman Chronicle, Montana Standard, and the Dillon Tribune.
2. Public notice on the Fish, Wildlife & Parks web page: http://fwp.mt.gov.
3. Draft EA's will be available at the FWP Region 3 Headquarters in Bozeman and the FWP State Headquarters in Helena.
4. A news release will be prepared and distributed to a standard list of media outlets interested in FWP Region 3 issues.
5. Copies of this environmental assessment will be distributed to the neighboring landowners and interested parties to ensure their knowledge of the proposed project.

This level of public notice and participation is appropriate for a project of this scope having limited impacts, many of which can be mitigated.

A 30-day public comment period will extend from June 4 to July 5, 2021. Interested parties should send comments to:

Montana Fish, Wildlife & Parks- Region 3
c/o Cottonwood Creek Westslope Cutthroat Trout Conservation
1400 S. 19th Ave. Bozeman, MT 59718

Email: R3EAcomment@mt.gov

Prepared by: Ryan Kreiner Date: 15 April 2021

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