MONTANA FISH, WILDLIFE & PARKS
FISHERIES BUREAU

Environmental Assessment for Westslope Cutthroat Trout Restoration in Two Small Streams in the Big Hole River Drainage

PART I: PROPOSED ACTION DESCRIPTION

A. Type of Proposed Action: The proposed action would restore native westslope cutthroat trout (WCT) to the West Fork of Mudd Creek and York Gulch. Barriers precluding upstream fish movement have already been constructed in both streams. An irrigation ditch connects the West Fork of Mudd Creek to York Gulch upstream of the constructed fish barriers and fish passage is present between the West Fork of Mudd Creek and York Gulch. Brook trout present in the streams upstream of the fish barriers are proposed for removal using the piscicide rotenone. The non-hybridized WCT present in York Gulch would be captured using electrofishing prior to fish removal, held in non-treated waters and used to repopulate the stream following brook trout removal. Fish from non-hybridized populations would be used to repopulate the West Fork of Mudd Creek where westslope cutthroat trout are currently not present and may be used in York Gulch where WCT density is very low. Tailed frog tadpoles would be salvaged from the West Fork of Mudd Creek prior to brook trout removal and released back to the stream.

B. Agency Authority for the Proposed Action:

- Montana Fish, Wildlife & Parks (FWP) is required by law to implement programs that manage sensitive fish species in a manner that assists in the maintenance or recovery of those species, and that prevents the need to list the species under 87-5-107 or the federal Endangered Species Act. Section 87-1-201(9)(a), M.C.A.

C. Estimated Commencement Date: Brook trout removal: August to early September 2013 or 2014.
Potential second removal if necessary in late fall 2013 or 2014.

D. Name and Location of the Project: Westslope cutthroat trout restoration in two small streams in the Big Hole River drainage.

York Gulch is located in Deerlodge County adjacent to the West Fork of Mudd Creek: T2N R15W Sec 1, T1N R15W Sec12, T1N R14W Sec9, 17.

The West Fork of Mudd Creek is located in Deerlodge County approximately 19 miles north of Wisdom Montana: T2N R14W Sec22, 23, 25, 26, 36.

E. Project Size (acres affected)

1. Developed/residential – 0 acres
2. Industrial – 0 acres
3. Open space/Woodlands/Recreation – 0 acres
4. Wetlands/Riparian –Stream miles included in the proposed action include approximately 2 miles of the West Fork of Mudd Creek and 2.5 miles of York Gulch for a total of roughly 4.5 miles.
5. Floodplain – 0 acres
6. Irrigated Cropland – 0 acres
7. Dry Cropland – 0 acres
8. Forestry – 0 acres
9. Rangeland – 0 acres

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

The cutthroat trout is Montana's state fish. Westslope cutthroat trout *Oncorhynchus clarkii lewisi* (WCT) were first described by the Lewis and Clark Expedition in 1805 near Great Falls, Montana, and are recognized as one of 14 interior subspecies of cutthroat trout. The historical range of WCT includes Idaho, Montana, Washington, Wyoming, and Alberta, Canada. In Montana, WCT occupy the Upper Missouri and Saskatchewan River drainages east of the Continental Divide, and the Upper Columbia Basin west of the Divide. Although still widespread, WCT distribution and abundance in Montana has declined significantly in the past 100 years due to a variety of causes including introductions of nonnative fish, habitat degradation, and over-exploitation (Hanzel 1959, Liknes 1984, McIntyre and Rieman 1995, Shepard et al. 1997, Shepard et al. 2003). Reduced distribution of WCT is particularly evident in the Missouri River drainage where genetically unaltered WCT are estimated to persist in less than 4% of the habitat they once occupied, and most remaining populations are restricted to isolated headwater habitats (Shepard et al. 2003; Shepard et al. 2005). Many of these remaining populations additionally are at risk of extinction due to small population size and the threats of competition, predation and hybridization with non-native trout species.

The declining status of WCT has led to its designation as a *Species of Special Concern* by the State of Montana, a *Sensitive Species* by the U.S. Forest Service (USFS), and a *Special Status Species* by the Bureau of Land Management (BLM). A petition was submitted in 1997 to the U.S. Fish and Wildlife Service (USFWS) to list WCT as "threatened" under the *Endangered Species Act* (ESA). USFWS status reviews have found that WCT are "not warranted" for ESA listing (DOI 2003); however, this finding was in litigation until 2008 and additional efforts to list WCT under ESA are possible.

A Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana was developed in 1999 in an effort to advance range-wide WCT conservation efforts in Montana by several federal and state resource agencies (including the BLM, Montana Fish, Wildlife & Parks [FWP], the USFS, and Yellowstone National Park [YNP]), non-governmental conservation and industry organizations, tribes, resource users, and private landowners (FWP 1999: MOU). The MOU outlined goals and objectives for WCT conservation in Montana, which if met, would significantly reduce the need for special status designations and listing of WCT

under the ESA. The MOU was revised and endorsed by signatories in 2007 (FWP 2007). The MOU states, *the primary management goal for WCT in Montana is to ensure the long-term self-sustaining persistence of the subspecies in its historical range*. This goal can be achieved by maintaining, protecting, and enhancing all designated WCT "conservation" populations, and by reintroducing WCT to habitats where they have been extirpated.

There are a total of 47 remaining populations of WCT in the Big Hole drainage. Of the 47, at least 39 are considered at risk (an additional 5 have unknown population status). An at-risk population is one that is not likely to persist over the long-term because of poor habitat, small population size and the presence of non-native species. A protected population is one that is isolated from non-native species but is threatened by stochastic events such as fire or flood and because of small population size and/or limited habitat. There are four WCT populations in the Big Hole that are considered protected, but they are at risk of extinction from catastrophic/ stochastic events (e.g. fire, drought) and may eventually suffer negative consequences of genetic inbreeding (Wang et al. 2002). A secure population is one that is isolated from the threats of non-native species and occupies adequate habitat and at a high enough density to have a high probability of persisting through time. Hilderbrand and Kershner (2000) recommended a 2,500 fish minimum WCT population size for long-term persistence (>100 years). Harig and Fausch (2002) recommended the minimum amount of occupied habitat per population is 5.6 square miles (minimum watershed size) for increased likelihood of success of translocation projects. Only one population of WCT in the Big Hole drainage is considered secure and meets these minimum criteria for increased likelihood of long-term persistence. The other 46 remaining populations, including those whose status is unknown, are at risk. These rare local populations maintain the remaining genetic diversity of the species and each may perpetuate adaptive traits that are important to the species as whole (Leary et al. 1998). Data collected from streams in the Big Hole drainage over the past four years indicate that many of the WCT populations in the drainage have dramatically declined or have been completely extirpated in the past ten years (Olsen 2011). More populations will be lost if actions are not taken to conserve the fish species in the Big Hole. Projects which restore WCT are necessary to ensure the continued survival of the species in the Big Hole drainage and elsewhere. Efforts to stabilize and increase WCT populations may additionally prevent future listing of WCT under the Endangered Species Act.

The goal of the proposed projects is to secure the existing population of non-hybridized WCT in York Gulch and expand WCT into the formerly occupied West Fork of Mudd Creek by removing brook trout upstream of fish migration barriers. The action is proposed to be completed in three stages: 1) salvage of remaining WCT and other native species present in the streams, 2) removal of brook trout from the stream using the piscicide rotenone in the formulation of CFT Legumine, and 3) restocking the salvaged fish into the streams and/or importing non-hybridized WCT to the streams from other sources within the Big Hole drainage. Additional information about each stream is given below followed by a more detailed explanation of brook trout removal.

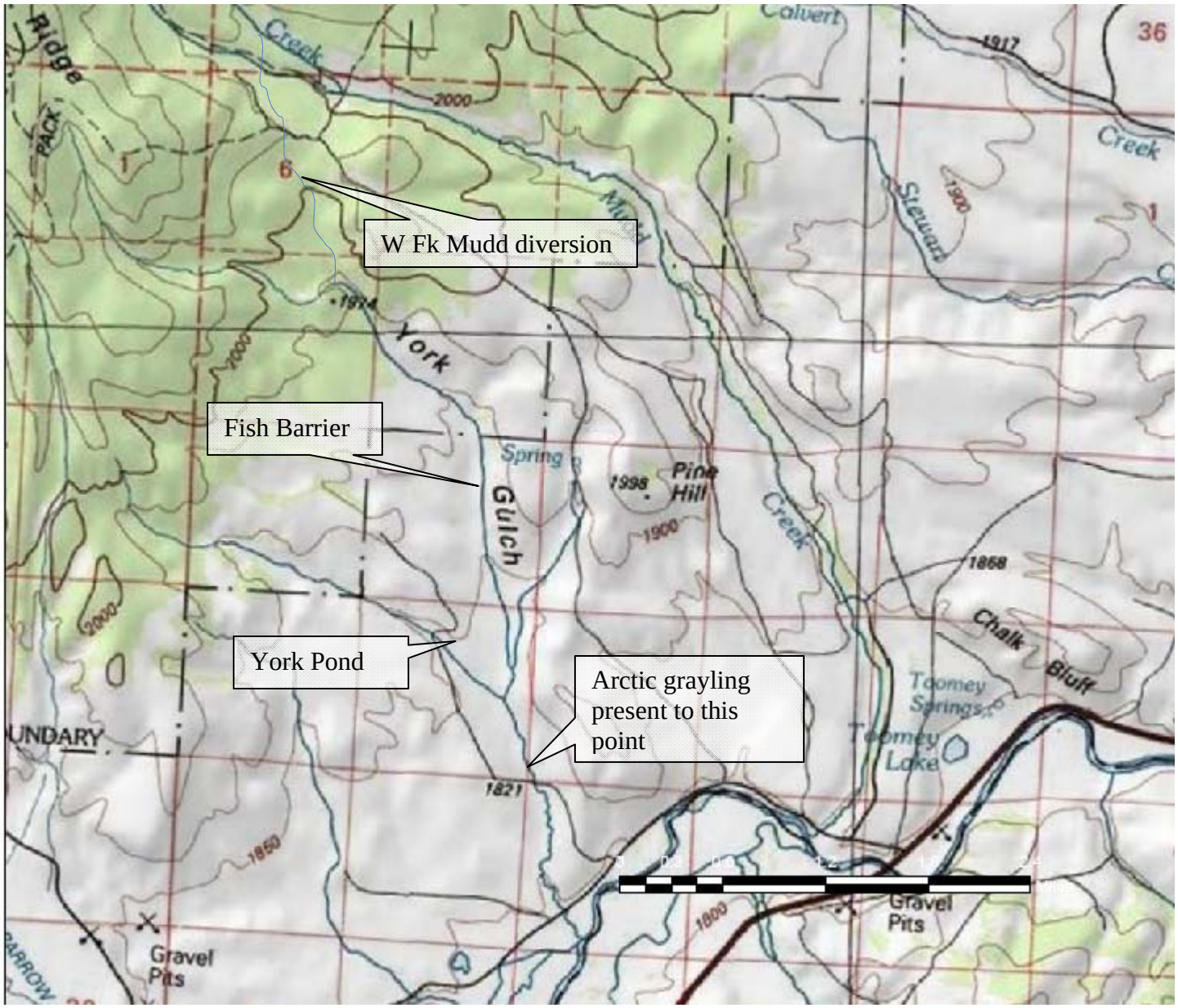
<u>York Gulch</u>

York Gulch is a small tributary to the Big Hole River located immediately to the southwest of the West Fork of Mudd Creek (Map 1). York Gulch upstream of West Fork Mudd Creek ditch is

small (base flow < 1 cfs), but has historically harbored a non-hybridized population of WCT sympatric with brook trout. The stream more than doubles in size downstream of the confluence with the ditch. Surveys conducted in 2008 verified the presence of non-hybridized WCT in York Gulch at low densities (Olsen 2011). These same surveys indicated that WCT were not present in the stream downstream of the Forest Service boundary (Map 1). A low-flow fish barrier was constructed in 2011 in York Gulch downstream of the Forest Service Boundary at the location shown on Map 1. Downstream from the Forest Service Boundary to approximately 1.5 miles upstream of the mouth, the stream is low gradient and the fisheries habitat is in poor condition. Few pools are present, and in some reaches the stream flows through a wet fen with no defined channel.

Arctic grayling are present in the lower reaches of York Gulch near the confluence with the Big Hole River. It appears that the lower reaches of York Gulch are used as a spawning tributary as only age-0 and age-1 grayling have been observed. There is approximately one mile of stream habitat between the constructed fish barrier on York Gulch and the reach of stream inhabited by Arctic grayling. In addition to Arctic grayling, white suckers, longnose suckers, mottled sculpin and longnose dace are present in the lower reaches of the stream to near the Forest Service boundary. Fisheries surveyed conducted in 2010 and 2011 failed to find WCT or brook trout in York Gulch in the reaches of stream that previously held WCT in 2008. Surveys conducted in 2012 captured only three WCT. It is unclear what has happened to the WCT population in the upper reaches of this stream.

The area proposed for WCT restoration would include York Gulch from the headwaters to the constructed barrier including the diversion from the West Fork of Mudd Creek. Brook trout would be removed from the stream using CFT Legumine, and the York Gulch fish removal would occur in conjunction with the proposed WCT restoration in the West Fork of Mudd Creek (see below). Waters treated with CFT Legumine would be detoxified at the fish barrier to prevent any potential impacts to non-target fish including Arctic grayling downstream. The treatment of York Gulch would be coordinated with the private landowner of the York Ranch such that livestock are not present in the treatment area and irrigation diversions are turned off during CFT Legumine application. The reach of stream containing WCT would be electrofished to salvage any remaining fish prior to brook trout removal. Salvaged fish would be placed into the York Ranch Pond and allowed to rear to sexual maturity. Fertilized eggs, once mature, would be collected and used to refound WCT in York Gulch and potentially the West Fork of Mudd Creek.

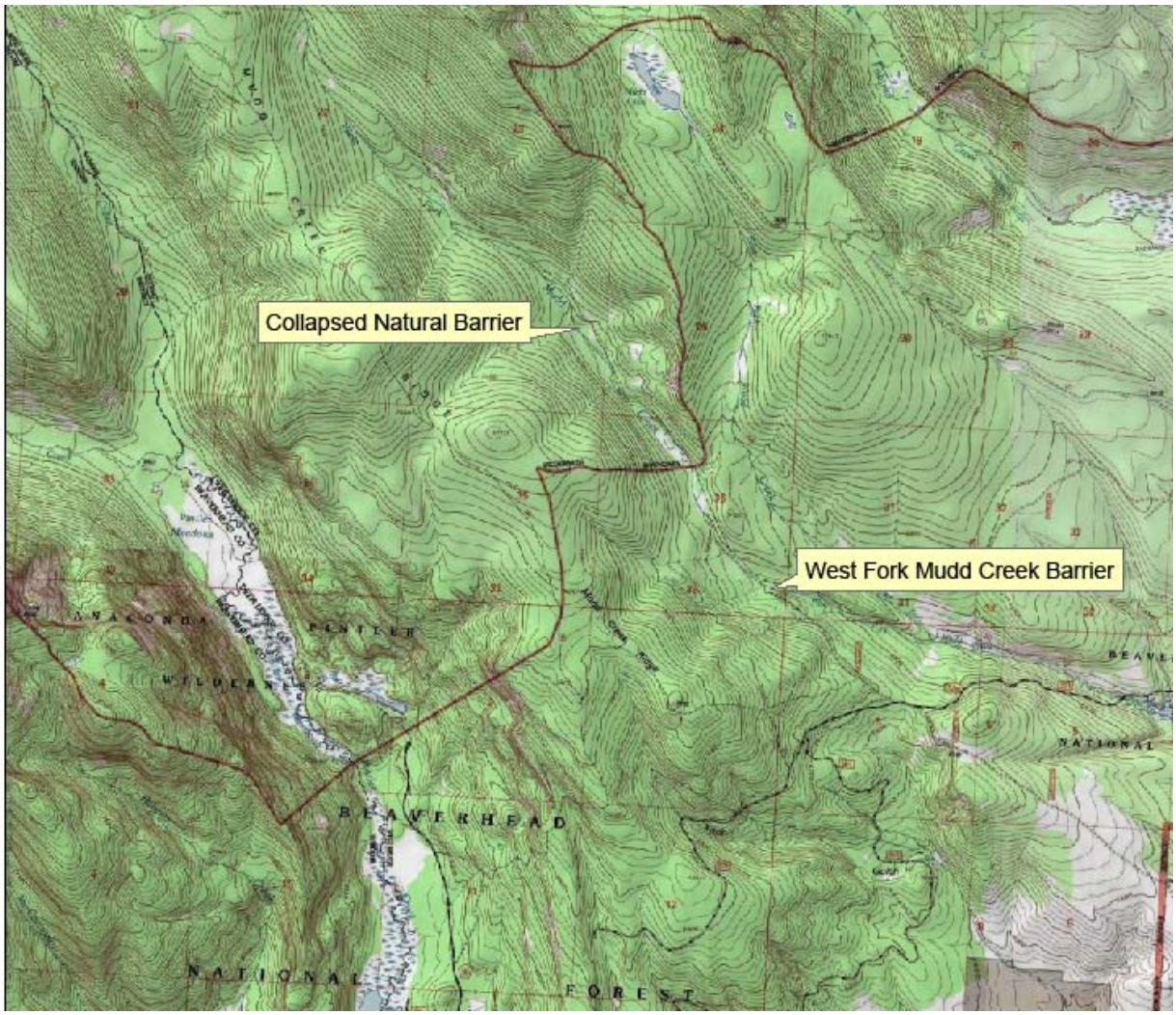


Map 1. York Gulch area showing important landmarks. The large river in the lower right is the Big Hole River running parallel to Highway 43.

West Fork Mudd Creek

The West Fork of Mudd Creek historically harbored a non-hybridized population of WCT. Sampled WCT in 1995 were present within the Anaconda-Pintler Wilderness (Map 2) sympatric with an abundant brook trout population. Surveys conducted in the West Fork of Mudd Creek in 2008 and 2011 indicated that WCT are no longer present in the stream and have been completely displaced by brook trout. The habitat in the stream can be characterized as moderate gradient with cobble and boulder substrate from the confluence with the East Fork of Mudd Creek to approximately ¼ mile downstream of the wilderness boundary. From this point upstream approximately one mile is an open meadow where the stream meanders and abundant high

quality pools are present. A natural waterfall was present on the West Fork of Mudd Creek approximately ¾ mile upstream of the wilderness boundary (Figure 1a), and the stream upstream of the waterfall was fishless; however at some time between 2006 and 2010 the adjacent large bedrock face collapsed and buried the waterfall (Figure 1b). The water is currently flowing subterranean through the rock rubble. No fish were present in the stream upstream of the falls in 2010; however, it is possible that fish passage could occur.



Map 2. West Fork of Mudd Creek.

Figure 1. Photo on left (A) of falls on the West Fork of Mudd Creek in 2006 and in 2010 on the right (B) after the cliff face above collapsed into the stream.

Flows from the West Fork of Mudd Creek are diverted approximately 2/3 mile downstream of the wilderness boundary (Map 2). Water is diverted transbasin from the West Fork of Mudd Creek to York Gulch for irrigation purposes. York Gulch is home to a non-hybridized population of WCT. Efforts have been made in York Gulch to remove sympatric brook trout through electrofishing. Electrofishing efforts have failed to completely remove brook trout, however, because the West Fork of Mudd Creek serves as a source of brook trout to York Gulch through the ditch system and diverted water,

A fish barrier was constructed on the mainstem of the West Fork of Mudd Creek in 2010 by modifying the irrigation diversion dam that diverts water to York Gulch (Map 3, Figure 2). The effectiveness of this barrier at preventing fish passage was evaluated beginning in the summer of 2011 when over 500 brook trout were captured upstream of the barrier, given a permanent fin

clip and released downstream. Eighty-nine brook trout were captured in 2012 upstream of the fish barrier. None of the fish captured were those that were previously clipped and moved downstream; therefore, the barrier appears to be functioning to prevent upstream brook trout movement. WCT restoration in the West Fork Mudd Creek would include brook trout removal using rotenone in the formulation of CFT Legumine. The area targeted for treatment would include all of the West Fork of Mudd Creek currently occupied by brook trout upstream of the fish barrier. No mechanized equipment will be used inside the wilderness area for removal of brook trout. All application equipment is non-mechanized, and it would be transported to the application sites in the wilderness by hand using existing trails.

An attempt would be made prior to brook trout removal to salvage as many tailed frog tadpoles as possible using electrofishing. Tailed frog adults and tadpoles are present in the West Fork of Mudd Creek both upstream and downstream of the former waterfall. This is significant because unlike other species of amphibians, tailed frog tadpoles live in streams for up to four years before metamorphosing into adults. Studies have shown that larval stages of amphibians are susceptible to rotenone at fish killing concentrations whereas adult amphibians are resistant. Captured tadpoles would be transported downstream to the East Fork of Mudd Creek or upstream of the waterfall in the West Fork and held until the treatment of the stream is complete (likely two to three days). It is not likely that all tailed frog tadpoles could be salvaged prior to treatment because of the difficulty capturing the small tadpoles in fast turbulent water. FWP therefore anticipates that some mortality of tadpoles would occur as a result of treatment with rotenone. The long-term impacts of tadpole mortality should be minimal because adult tailed frogs would not be affected by CFT Legumine, salvage efforts should rescue many tadpoles, and the fact that over two miles of untreated stream upstream of the waterfall supports a robust tailed frog population (assuming brook trout have not yet colonized this reach of stream).

Non-hybridized WCT from sources within the Big Hole would be used to repopulate York Gulch and the West Fork of Mudd Creek once brook trout removal is achieved. The most likely source would be the adjacent York Gulch; however, recent surveys suggest that the WCT population in York Gulch is nearly extirpated. It is likely that sources in addition to York Gulch would be incorporated to repopulate the streams given the low number of WCT remaining. The most likely candidate for introduction would be WCT from the Christiansen Creek (formerly Squaw Creek) system which includes Papoose Creek located approximately seven miles to the southeast. Past genetic samples indicate that WCT in Christiansen and Papoose are non-hybridized. The non-hybridized WCT in Christiansen Creek are declining due to competition from non-native brook trout. Currently there are no plans to perform WCT conservation in Christiansen Creek because of the lack of a suitable area to establish a fish migration barrier. Replicating the population into suitable habitat elsewhere (i.e., York Gulch/West York Mudd Creek) is the best strategy for population conservation since it may not be possible to protect WCT in Christiansen Creek from complete displacement by brook trout. Other non-hybridized populations of WCT may be used to repopulate the West Fork Mudd and York Gulch systems in addition to Christiansen Creek if circumstances should arise that would make the Christiansen Creek a less likely candidate for population replication (i.e., hybridization, presence of disease other higher priority streams).

Fish would be transferred from the donor stream(s) (Christiansen Creek) to York Gulch and the West Fork of Mudd either as live fish or as fertilized eggs that would be incubated in recipient streams in remote streamside incubators. Disease testing must occur, and approval from the FWP Fish Health Committee must be obtained prior to the movement of fish/eggs from a donor stream. Recent genetic samples must also be collected from the population to verify that the fish are not hybridized. Christiansen Creek was tested for the presence of fish pathogens in 2012 and found to be pathogen free. WCT genetic samples collected in 2012 have not yet been analyzed. A minimum of 150 fish (75 pairs) would be introduced to the streams to reduce the likelihood of future inbreeding and to capture the genetic diversity present in the donor stream(s). It may take several years to collect eggs/fish from the donor stream to accomplish this goal and may have impacts on the donor population(s).

Figure 2. West Fork of Mudd Creek fish barrier at high flows in June of 2010.

Review of Rotenone

Rotenone is a commonly used piscicide that highly targets fish and has little or no impact on other aquatic and terrestrial plants and animals at fish killing concentrations with the exception of aquatic invertebrates and larval stages of amphibians. FWP has a long history of using

rotenone to manage fish populations in Montana that span as far back as 1948. The department has administered rotenone projects for a variety of reasons but principally to improve angling quality or for native fish conservation. 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.), found in Australia, 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. Rotenone has also been used as a natural insecticide for gardening and to control parasites such as lice on domestic livestock (Ling 2002).

Rotenone acts by inhibiting oxygen transfer at the cellular level. It is especially effective at 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. The most common route of exposure to non-gill breathing animals is through ingestion. Rotenone is not well absorbed through the digestive system and is readily broken down by digestive processes. Thus terrestrial animals can tolerate exposure to concentrations much higher than those used to kill fish.

The label requirements for product concentration in streams is 1 part rotenone formulation (5% rotenone) to 1 million parts water (1ppm). The rotenone product proposed for use in York Gulch and the West Fork Mudd Creek is CFT Legumine (5% rotenone). Spring areas may also be treated with the powder formulation of rotenone (Prentox, 7% rotenone) or a sand/powder mix to prevent fish from seeking these areas as freshwater refuges during the application. The streams would be treated using drip stations which are containers that administer diluted CFT Legumine to the stream at a constant rate. These drip stations would administer Legumine to the stream at a rate of 1 ppm for 4 hours. In addition, backwaters, spring areas and small tributaries would be treated with backpack sprayers according to the CFT Legumine label specifications. The total amount of Legumine to be applied to each stream is unknown because the amount is dependent on the flow rate of the stream and the distance downstream the chemical would remain active (determined by on-site bioassay). Assuming a typical creek is flowing 1.5 cfs and there is 1.5 miles of stream within the treatment area and the chemical remains active for 0.75 miles (i.e., 0.75 mile spacing between application points), 1.2 liters of CFT Legumine would be required to treat the entire 1.5 miles of stream. It is expected that fish killing concentrations of Legumine would be present in the streams for only 24 to 48 hours after application, after which time the Legumine would have naturally detoxified and diluted to below fish killing concentrations.

There are three ways in which rotenone can be detoxified: natural oxidation, dilution by freshwater, and introduction of a neutralizing agent such as potassium permanganate. Potassium permanganate would be used to neutralize any rotenone remaining in the stream at the fish barrier site (see Comment 2a below, p 21) to prevent the CFT Legumine from traveling downstream of the proposed treatment area. The CFT Legumine label states that a minimum of 20 to 30 minutes of contact time between rotenone treated waters, and the applied neutralizing agent (potassium permanganate) is necessary to fully detoxify the rotenone. A detoxification zone would be established because the rotenone is not instantly detoxified downstream of the barrier site. The detoxification zone is defined as the distance the stream travels in 20 to 30 minutes downstream of the fish barrier as determined by a stream dye test (in the proposed

streams likely less than ¼ mile). Potassium permanganate is readily oxidized by natural processes in the stream and therefore it is imperative that adequate permanganate be applied to the stream to still be present and active at 15 to 30 minutes of travel time downstream. The determination of the appropriate amount of permanganate to fully neutralize any remaining rotenone is derived by an on-site testing. Stream discharge would be measured prior to detoxification, and the potassium permanganate would be applied at the rate specified on the Legumine label (3 to 5 ppm) and according to the on-site testing results. Neutralization would commence according the FWP Rotenone Detoxification Policy which states that detoxification with potassium permanganate should begin no less than two hours before the theoretical arrival time of treated waters at the detoxification station. A colorimeter would be used at the end of the detoxification zone to ensure adequate oxidation potential (0.5 to 1.0 ppm $KMnO_4$) is present after 30 minutes of contact time to completely neutralize the rotenone. Caged fish (westslope cutthroat trout from the Anaconda Hatchery, or brook trout captured in individual streams) would be placed in the stream to monitor the effectiveness of the detoxification station during the treatment in addition to direct measurement of the oxidation potential of the water. Distress or the lack thereof in these caged fish indicates whether or not the detoxification station is effectively neutralizing the CFT Legumine. The survival of caged fish placed in the creek immediately downstream of the detoxification station indicates when rotenone is no longer present in the stream and when detoxification is no longer required. The label states that if sentinel fish in treated stream water show no signs of distress within four hours, the stream water is considered no longer toxic and detoxification can be discontinued. Neutralization would continue until the theoretical time in which all treated waters would have passed the fish barrier and when sentinel fish can survive for an additional four hours. It is anticipated that this would occur in the proposed streams within 24 to 48 hours after rotenone application.

Dead fish resulting from the treatment with CFT Legumine in the stream would be left on-site in the water. Studies in Washington State indicate that approximately 70% of rotenone-killed fish sink and do not float (Bradbury 1986) and decompose within a week or two. Dead fish stimulate plankton and other invertebrate growth and aid in invertebrate ecological recovery following treatment.

It may be necessary to implement a second treatment to achieve the desired objectives of complete removal of non-native fish if all the brook trout are not removed during the first treatment. Streams would be electrofished following treatment to determine if complete fish removal is achieved. A second treatment would be proposed if the objectives of the project were not met and non-native fish were found in the stream. Landowners, stakeholders and other interested parties would be notified in the event that an additional treatment is necessary.

Public access would be closed during treatment to keep the public from being exposed to CFT Legumine treated waters. Public roads would be posted closed and signed during the stream treatments. Other access points (i.e., trailheads) would also be signed. Additional signs would also be placed at stream crossings informing the public of the presence of treated waters and to keep out.

Funding

Project expenses listed below would be covered under standard FWP and US Forest Service budgets including License Dollar-only budgets for the application of rotenone. Supplies and material including CFT Legumine and potassium permanganate have already been purchased under other projects, and no additional funding will be necessary. Expected expenses are reviewed in Table 2. This table does not include personnel expenses. No additional funding would be required for personnel services by FWP or USFS.

Table 2. Projected expenses for the proposed westslope cutthroat trout restoration projects.

Expenses	Units	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST
Brook trout removal	2 gal	CFT Legumine	$120.00	$120.00
	75 lbs	$KMnO_4$	$1.45	$109.00
		Project Total		$229.00

PART II. ALTERNATIVES

Alternative 1 – No action

The no action alternative would allow status quo management to continue. Brook trout fisheries in both streams would remain the same or could potentially expand. The "No Action" alternative would not fulfill the State's obligation to protect all genetically pure WCT populations (FWP 2007). The WCT in York Gulch would likely be extirpated in three to five years due to low population size and competition from brook trout. The opportunity to replicate a population of WCT in Christiansen Creek that is at risk and unprotected would further be lost. Population replication (i.e., moving fish to another fishless stream with suitable habitat) may be the only means of making sure a particular population is not extirpated. The loss of native fish populations would be a large setback for WCT conservation. Although the 'no action" alternative would not accomplish the goals of WCT conservation, it would not have the potential negative impacts of the proposed action such as temporary impacts to non-target aquatic invertebrates and to juvenile stages of tailed frogs as proposed under the preferred alternative. There would also be no loss of a brook trout fishery under the No Action alternative.

Alternative 2 - Proposed Action: Restoration of westslope cutthroat trout in York Gulch and the West Fork Mudd Creek salvaging existing WCT, removal of brook trout using rotenone in the formulation of CFT Legumine restoring non-hybridized WCT to the streams.

This alternative would involve WCT restoration in the West Fork Mudd Creek and York Gulch upstream of fish barriers. The piscicide proposed for brook trout removal would be rotenone in the formulation of CFT Legumine (5% rotenone). The rotenone would be detoxified within ¼ mile downstream of the fish migration barriers using potassium permanganate. WCT and other native species would be salvaged from the stream and held in a secure location prior to fish

removal. Salvaged fish and other species would be released back into the stream once fish removal is achieved and rotenone is no longer present in the streams, or non-hybridized WCT would be imported from other sources (i.e., Christiansen Creek). This alternative offers the highest probability of achieving the goal of conserving the WCT populations identified. Successful completion of the proposed action would result in nearly four miles of habitat that would be secured for WCT in the Big Hole drainage. The secured populations could additionally serve as egg donor sources for westslope cutthroat trout restoration in other streams.

Alternative 3 –Mechanical removal of brook trout from the West Fork Mudd Creek and York Gulch.

This alternative would involve the use of electrofishing rather than rotenone to remove brook trout from York Gulch and the West Fork of Mudd Creek. Multiple-pass electrofishing has been used to eradicate nonnative trout from several small streams in north central Montana (Big Coulee, Middle Fork Little Belt, and Cottonwood creeks) and in SW Montana (Muskrat, Whites and Staubach creeks). Electrofishing can be an effective means of capturing fish in streams, however, electrofishing has limitations. Generally it is only 50 -70% efficient at capturing fish depending on the type of habitat present. Electrofishing is inefficient at capturing juvenile fish and therefore, generally requires efforts spanning multiple years to allow juvenile fish to grow to the size where they can be captured. Electrofishing is also very labor intensive. The project reaches where electrofishing removals have been successful were generally less than three miles in length and required up to twenty-five electrofishing removal passes over several years to eradicate the unwanted species. Each electrofishing pass generally requires a crew of three to nine people. Eradication of brook trout from the proposed streams with electrofishing would be difficult because of the length of stream involved (four miles total), the small size of the streams and the complexity of the habitat (particularly in reaches of York Gulch). For example, electrofishing removal efforts in McVey Creek near the town of Wisdom in the early 1990's and from 2005-2007 were not successful at achieving a significant reduction in brook trout numbers in the stream. To achieve complete removal of brook trout from the proposed streams with electrofishing would require a four to five year commitment of three to four crews (six to twelve people) for a minimum of two weeks each year. Such an effort would be impractical and cost prohibitive. It is also unclear given the length of the stream and the complexity of the habitat, whether 100% removal of brook trout could be achieved. Removing brook trout using rotenone, on the other hand, will require six to eight people for three to four days, and the rotenone and potassium permanganate expenses will be less than $1,000. For these reasons this alternative was eliminated from further consideration. Alternative 3, though not likely to accomplish the goals of WCT conservation, would have fewer potential impacts to non-target aquatic invertebrates and to juvenile stages of tailed frogs.

Alternative 4: Construct a fish migration barrier and use angling to eliminate brook trout from the West Fork Mudd Creek and York Gulch.

FWP has the authority under commission rule to modify angling regulations for the purpose of removing unwanted fish from a lake or stream. This method, unfortunately, would not result in complete fish removal for a number of reasons; first of all because the proposed streams are small and likely currently receive little or no fishing pressure. Attracting anglers to the streams to

harvest brook trout would be very difficult because of the remoteness of the sites, small size of the streams and small size of fish. Recreational angling has been shown to reduce the average size of fish and reduce population abundance, but rarely if ever has it been solely responsible for eliminating a fish population. Using angling techniques alone in the stream would not result in removal of brook trout and would not achieve the objective of conserving non-hybridized cutthroat trout. For these reasons this method of fish removal was considered unreliable at achieving the objective of complete fish removal and was eliminated from further analysis.

PART III. ENVIRONMENTAL REVIEW

A. PHYSICAL ENVIRONMENT

1. 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. 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	2a,f
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		Yes	2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?			X		Yes	2k
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 piscicide to surface water to remove brook trout. The impacts would be short term and minor. CFT Legumine 5% rotenone is an EPA registered piscicide and is safe to use for removal of unwanted fish when handled and applied according to the product label. The concentration of rotenone proposed for use is 1 part CFT Legumine formulation to one million parts of water (ppm).

To reduce the impact of the piscicide on water quality, a detoxification station would be established immediately downstream of the fish barriers. There are three ways in which rotenone can be detoxified once applied. The most common method is to allow natural breakdown to occur. Rotenone is a compound that is susceptible to natural breakdown

(detoxification) through a variety of mechanisms such as water chemistry, water temperature, exposure to organic substances, exposure to air, and sunlight intensity (Ware 2002; ODFW 2002; Loeb and Engsrtom-Heg 1970; Engstrom-Heg 1972; Gilderhus et al. 1986). Rotenone persistence studies by Gilderhus et al. (1986) and Dawson et al. (1991) found that in cool water (temperatures of 32 to 46°F) the half-life ranged from 3.5 to 5.2 days. Gilderhus et al. (1986) reported that 30% mortality was experienced in rainbow trout exposed to degrading concentrations of actual rotenone (0.004 ppm) in 46°F pond water 14 days after a treatment. By day 18, the concentrations were sub lethal to trout. The second method for detoxification involves basic dilution by fresh water. This may be accomplished by fresh ground water or surface water flowing into a lake or stream. The final method of detoxification involves the application of an oxidizing agent like potassium permanganate. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the rotenone. Detoxification is accomplished after about 15 to 30 minutes of exposure time between the two compounds (Prentiss Inc. 1998, 2007). FWP expects the stream would naturally detoxify down to the fish migration barrier within 24 to 48 hours after application of CFT Legumine because of natural breakdown processes and dilution from freshwater sources. Potassium permanganate, at the fish barrier, would be used to detoxify any remaining rotenone present in the stream and prevent fish-killing concentrations of rotenone from traveling more than ¼ mile downstream.

Dead fish would result from this project. Bradbury (1986) reported that 9 of 11 water bodies in Washington treated with rotenone experienced an algae bloom shortly after treatment. This is attributed to the input of phosphorus to the water from decaying fish. Bradbury further notes that approximately 70% of the phosphorus content of the fish stock would be released into the water through bacterial decay. This action may be beneficial because it would stimulate algae production and would start the stream toward production of food for fish. Any changes or impacts to water quality resulting from decaying fish would be short term and minor.

Comment 2f: No contamination of groundwater is anticipated to result from this project. Rotenone binds readily to sediments and is broken down by soil and in water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves only one inch in most soil types; the only exception would be sandy soils where movement is about three inches (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. An example in Montana is Tetrault Lake, where neither rotenone nor inert ingredients were detected in a nearby domestic well which was sampled at two and four weeks after applying 90 ppb rotenone. This well was chosen because it was down gradient from the lake and also drew water from the same aquifer that fed and drained the lake. A Kalispell-area pond in 1998 was treated with Prenfish 5% rotenone. Water from a well, located 65 feet from the pond, was analyzed and no evidence of rotenone was detected. Another Kalispell-area pond in 2001was treated with Prenfish 5% rotenone. Water from a well located 200 feet from that pond was tested 4 times over a 21- day period and showed no sign of contamination. FWP treated a small pond in 2005 near Thompson Falls with Prenfish to remove pumpkinseeds and bass. A well located 30 yards from the pond was tested, and neither Prenfish nor inert ingredients were found in the well. Soda Butte Creek near Cooke City, Montana, as

well as a Forest Service campground located 50 ft from a treated stream were tested immediately following and 10 months after treatment with Prenfish, and no traces of rotenone were found (Olsen 2006). FWP does not anticipate any contamination of ground water as a result of this project since rotenone is known to bind readily with stream and lake substrates.

Comment 2j: The CFT Legumine label states "….Do not use water treated with rotenone to irrigate crops or release within 1/2 mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond or reservoir…" There are no irrigation water diversion sites located within the proposed treatment area with the exception of the York diversion on the West Fork of Mudd Creek. The irrigation ditch stemming from the West Fork of Mudd Creek to York Gulch would be temporarily closed down during the treatment of the West Fork of Mudd Creek with CFT Legumine. Any fish entrained in the ditch would be killed either by allowing remaining pools of water to dry up or by treating persisting pools with a backpack sprayer and 10% solution of CFT Legumine. As soon as all fish have been killed in the ditch and there is no CFT Legumine present in the West Fork of Mudd Creek, the irrigation diversion would be opened again. These actions would be coordinated with the water right holder on York Gulch who is a partner on this restoration project.

Comment 2m: FWP would apply rotenone under the Montana Department of Environmental Quality (DEQ) General Permit for Pesticide Application (#MTG87000). A Notice of Intent (NOI) was accepted by the Department of Environmental Quality. The NOI included the waters proposed in this EA. A letter was received from DEQ dated August 13, 2012 recognizing the Notice of Intent and allowing FWP to operate under the General Permit for Pesticide Application.

Cumulative Impacts: The proposed action of piscicide treatment would have a short term impact on water quality (piscicides) in the West Fork of Mudd Creek and York Gulch. Because of the rapid breakdown rate of CFT Legumine and active neutralization at the fish barriers, these impacts would attenuate through time and would not impact long-term water quality or the productivity of fisheries resources after restocking. FWP does not expect the proposed actions to result in other actions that would create cumulative impacts to water resources in the proposed streams nor does FWP foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts to water resources related to treatment of proposes streams with piscicides or the associated barrier construction.

3. 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				
b. Creation of objectionable odors?		X				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 regs?		X				

Comment 3b: The advantage of CFT Legumine over other rotenone products that have been used in the past is that it has less petroleum hydrocarbon solvents such as toluene, xylene, benzene and naphthalene. Prenfish, by comparison, has a strong chemical odor. CFT Legumine is virtually odor-free and performs almost identically to older products (e.g., Prenfish, Noxfish).

Cumulative Impacts: Impacts to air quality from the proposed actions would be short term and minor. FWP does not expect the proposed action to result in other actions that would create cumulative impacts to air quality in the West Fork Mudd or York Gulch, nor does FWP foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts to air quality related to treatment of the proposed streams with piscicides or associated barrier construction.

4. 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			4e
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a: There would be some disturbance of vegetation along the stream during the proposed treatment due to increased foot traffic. These impacts should be minimal because all streams have existing trails (some primitive) or roads that provide good foot and/or vehicular access to the sites. FWP anticipates any impacts to plants resulting from trampling would be unnoticeable within 1 growing season. Rotenone does not affect plants at concentrations used to kill fish. Vegetation disturbances are expected to be short term and minor.

Comment 4c: Sapphire rockcress, low spike-moss, Mulhick's buckwheat, storm saxifrage Lemhi beardtongue and Idaho sedge are listed as species of concern or potential species of concern that occur within the proposed project area. No impacts to these species are anticipated as a result of the proposed action. All rotenone products, including CFT Legumine, have no impacts on aquatic or terrestrial plant species at fish killing concentrations. Some trampling is possible due to increase foot traffic along the proposed streams; however, these impacts should be minimal because of existing trails or roads that provide good foot and/or vehicular access to the sites.

Comment 4e: Vehicles and equipment used during the project may inadvertently carry noxious weeds to the project site. Proposed mitigation includes washing all equipment and vehicles before entry onto the project site and removal of mud, dirt, and plant parts from project equipment before moving into project area. Subsequent weed monitoring and removal may be performed if warranted.

Cumulative Impacts: Impacts to vegetation from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would create cumulative impacts to vegetation in the proposed WCT restoration streams. Vegetation could potentially suffer from increase trampling if the new fisheries were to attract more recreational use. FWP would conclude, however, based on other similar WCT fisheries and their limited use, that it is very unlikely that the new WCT fisheries would attract significant interest and associated higher use levels. FWP does not foresee any other activities in the basins proposed for WCT restoration that would add to impacts of the proposed action. As such there are no cumulative impacts to vegetation related to the proposed action.

5. 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			
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		Yes	See 5f
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)			X			5i

Comment 5b: This project is designed to eradicate non-native brook trout (a game fish) in the West Fork of Mudd Creek and York Gulch upstream of established fish migration barriers. These impacts are minor and temporary, however, because the WCT (also a game fish) would be salvaged and/or restocked and would eventually repopulate the stream. There would therefore be no net loss of habitat occupied by self-sustaining populations of wild game fish. There would be no proposed changes in the fishing regulations as a result of this project; however, once WCT become established, they should be able to support some degree of harvest, and the current catch and release regulations may be modified to allow some harvest. If regulations are modified, there would still be a reduction in the harvest limit compared to the liberal brook trout limit (20 fish) to the standard fish limit (5 fish). Rotenone, when applied at fish killing concentration, has no impact on terrestrial wildlife including birds and mammals that consume dead fish or treated water.

Comment 5c: Nongame non-target species that could be impacted include some aquatic insects and potentially larval stages of amphibians. Columbia spotted frogs and western toads have been documented in or near the project area. Potential impacts to these two species can be mitigated through the delay of the treatment until metamorphosis near the end of summer. Metamorphosed amphibians that breathe air are not affected by rotenone at fish killing concentrations, however,

non-metamorphosed tadpoles that respire through their skin and/or gills are affected. The timing of these projects should mitigate any impacts to spotted frogs and western toads because most would have metamorphosed by late summer when the rotenone treatment is proposed.

Tailed frogs present in West Fork Creek and York Gulch may be impacted by the use of CFT Legumine because juvenile life stages of the amphibian are present in streams for up to four years. These impacts would be mitigated by capturing tadpoles before the stream is treated with CFT Legumine and holding them in a secure location. After the treatment is complete (one to two days), the tadpoles would be released to back to the stream.

Aquatic Invertebrates:

Numerous studies indicate that rotenone has temporary effects on aquatic invertebrates. The most noted impacts are temporary and often substantial reduction in invertebrate abundance and diversity. A study of the impacts of a rotenone treatment in Soda Butte Creek in south-central Montana found aquatic invertebrates of nearly all taxa declined dramatically immediately post rotenone treatment. However, only one year later nearly all taxa were fully recovered and at greater abundance than pre treatment (Olsen and Frazer 2006). One study reported that no long-term significant reduction in aquatic invertebrates was observed due to the effects of rotenone which was applied at levels twice as high as the levels proposed for this project (Houf and Campbell 1977). Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation). The reduction of aquatic invertebrates was temporary in all cases, and most treatments used a higher concentration of rotenone than proposed for these projects (Schnick 1974). In a study on the relative tolerance of different aquatic invertebrates to rotenone, Engstrom-Heg et al. (1978) reported that the long-term impacts of rotenone are mitigated because those insects that were most sensitive to rotenone also tended to have the highest rate of recolonization. Temporary changes in aquatic invertebrate community structure due to a rotenone treatment could be similar in magnitude to what is observed after natural (e.g. fire) and anthropogenic (livestock grazing) disturbances (Wohl and Carline 1996; Mihuc and Minshall. 2005; Minshall 2003), though the physical impacts and resulting modifications of invertebrate assemblages after these types disturbances can last for a much longer period than a piscicide treatment.

Aquatic invertebrates are capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et al.) because of short life cycles (Anderson and Wallace 1984), good dispersal ability (Pennack 1989), and generally high reproductive potential (Anderson and Wallace 1984, 1996). Headwater reaches and tributaries to the proposed WCT restoration streams that do not hold fish would not be treated with rotenone and would provide a source of aquatic invertebrate colonists that could drift downstream. Recolonization would additionally include aerially dispersing invertebrates from downstream areas (e.g. mayflies, caddisflies, dipterans, stoneflies).

The possibility of eliminating a rare or endangered species of aquatic invertebrate in the proposed streams by treating with rotenone in the formulation of CFT Legumine is very unlikely. Montana Natural Heritage lists no species of concern or potential species of concern of aquatic invertebrates in the streams proposed for WCT restoration. Aquatic invertebrates are routinely collected in southwest Montana as part of a separate MEPA process prior to WCT restoration

projects in mountains streams (e.g., Eureka, Little Tepee, Little Tizer, Elkhorn, Crazy, Whitehorse, Soda Butte creeks). These collections in all cases have shown aquatic invertebrate assemblages typical of headwater streams in southwestern Montana, and in no cases have threatened or endangered species been discovered. FWP expects that the proposed streams contain the same type of aquatic invertebrate assemblage as found in other nearby streams, and the possibility of eliminating a rare or endangered species is minimal. Aquatic invertebrates would be collected from each stream prior to treatment with CFT Legumine and one year post treatment to monitor the recovery of aquatic invertebrate populations.

Based on these studies, FWP would expect the aquatic invertebrate species composition and abundance in the streams proposed for treatment with CFT Legumine to return to pre-treatment diversity and abundance within one to two years after treatment. The impacts to aquatic invertebrate communities, therefore, should be short-term and minor.

Birds and Mammals:

Mammals are generally not affected by rotenone at fish killing concentrations because they neutralize rotenone by enzymatic action in their stomach and intestines (AFS 2002). Studies of risk for terrestrial animals found that a 22-pound dog would have to drink 7,915 gallons of treated lake water within 24 hours, or eat 660,000 pounds of rotenone-killed fish, to receive a lethal dose (CDFG 1994). The State of Washington reported that a half pound mammal would need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). A half-pound animal would need to drink 16 gallons of water treated at 1 ppm, considering that the only conceivable way an animal can consume rotenone under field conditions is by drinking lake or stream water or consuming dead fish. The EPA (2007) made the following conclusion for small mammals and large mammals:

> *When estimating daily food intake, an intermediate-sized 350 g mammal will consume about 18.8 g of food. Using data previously cited from the common carp with a body weight of 88 grams, a small mammal would only consume 21% (18.8/88) of the total carp body mass. According to the data for common carp, total body residues of rotenone in carp amounted to 1.08 µg/g. A 350-g mammal consuming 18.8 grams represents an equivalent dose of 20.3 µg of rotenone; this value is well below the median lethal dose of rotenone (13,800 µg) for similarly sized mammals. When assessing a large mammal, 1000 g is considered to be a default body weight. A 1,000 g mammal will consume about 34 g of food. If the animal fed exclusively on carp killed by rotenone, the equivalent dose would be 34 g *1.08 µg/g or 37 µg of rotenone. This value is below the estimated median lethal equivalent concentration adjusted for body weight (30,400 µg). Although fish are often collected and buried to the extent possible following a rotenone treatment, even if fish were available for consumption by mammals scavenging along the shoreline for dead or dying fish, it is unlikely that piscivorous mammals will consume enough fish to result in observable acute toxicity.*

Similar results determined that birds required levels of rotenone at least 1,000 to 10,000 times greater than is required for lethality in fish (Skaar 2001). Cutkomp (1943) reported that chickens, pheasants and members of lower orders of *Galliformes* were quite resistant to rotenone, and four-

day old chicks were more resistant than adults. Ware (2002) reports that swine are uniquely sensitive to rotenone and it is slightly toxic to wildfowl, but to kill Japanese quail required 4,500 to 7,000 times more than is used to kill fish.

The EPA (2007) made the following conclusion for birds;

> *Since rotenone is applied directly to water, there is little likelihood that terrestrial forage items for birds will contain rotenone residues from this use. While it is possible that some piscivorous birds may feed opportunistically on dead or dying fish located on the surface of treated waters, protocols for piscicidal use typically recommend that dead fish be collected and buried, rendering the fish less available for consumption (see Section IV). In addition, many of the dead fish will sink and not be available for consumption by birds. However, whole body residues in fish killed with rotenone ranged from 0.22 µg/g in yellow perch (Perca flavescens) to 1.08 µg/g in common carp (Cyprinus carpio; Jarvinen and Ankley 1998). For a 68 g yellow perch and an 88 g carp, this represents totals of 15 µg and 95 µg rotenone per fish, respectively. Based on the avian subacute dietary* LC_{50} *of 4,110 mg/kg, a 1,000-g bird would have to consume 274,000 perch or 43,000 small carp. Thus, it is unlikely that piscivorous birds will consume enough fish to result in a lethal dose.*

<u>Amphibians and Reptiles</u>:

Potential amphibians and reptiles found within the proposed treatment areas include: long-toed salamanders (*Ambystoma macrodactylum*), spotted frogs (*Rana pretiosa*), western toads *(Bufo boreas),* tailed frogs (*Ascaphus montanus*) (amphibians), and western terrestrial garter (*Thamnophis elegans*), common garter (*T. sirtalis*), and rubber boa (*Charina bottae*) snakes (reptiles). Rotenone can be toxic to gill-breathing larval amphibians, though air breathing adults are less sensitive. Chandler and Marking (1982) found that Southern Leopard frog tadpoles were between 3 and 10 times more tolerant than fish to Noxfish (5% rotenone formulation). Grisak et al. (2007) conducted laboratory studies on long-toed salamanders, Rocky Mountain tailed frogs (*Ascaphus truei*), and Columbia spotted frogs and concluded that the adults of these species would not suffer an acute response to Prenfish at trout killing concentrations (0.5-1 ppm) but the larvae would likely be affected. These authors recommended implementing rotenone treatments at times when the larvae are not present, such as the fall, to reduce the chance of exposure to rotenone treated water and potential impacts to larval amphibians. The proposed streams would be scheduled for treatment in August or September (prior to brook trout spawning) which would reduce but not eliminate potential impacts to larval amphibians. Any reduction in amphibian abundance would be expected to be short term because of the low sensitivity of adults to rotenone, and because most larval amphibians with the exception of tailed frogs would have metamorphosed by August when the treatments are planned. Impacts to juvenile tailed frogs can be mitigated by capturing as many as possible and holding them in non-treated waters then releasing them back to the streams once the treatment is complete. The headwaters of the West Fork of Mudd Creek (approximately two miles of stream) would not be treated with CFT Legumine unless brook trout are present and this reach of stream has a robust population of tailed frogs. If brook trout are present, tailed frogs would be salvaged prior to treatment. Adult frogs would not be affected by the stream treatment and would lay eggs in the stream the

following year. A reduced abundance of aquatic invertebrates may temporally impact larval and adult amphibians that prey on these species, though the aquatic invertebrate community would recover rapidly. Reptiles (air-breathing) would not be directly impacted by rotenone treatment. Some snakes are known to consume fish from streams, therefore there could be temporary reduction in available food as a result of the proposed piscicide treatment but no reptiles present are known to be fish obligates.

Based on this information, FWP would expect the impacts to non-target organisms the streams proposed for WCT restoration to range from non-existent to short term and minor.

Comment 5f:

Terrestrial Organisms:

It is possible that osprey, eagles or other birds would eat rotenone-killed fish. Bald eagles have been observed along the nearby Big Hole River. Conducting this project in the fall would not impact bald eagle nesting, and there would be no impacts to birds that consume rotenone-killed fish. See comment 5c for impacts to birds.

The project area is within potential grizzly bear habitat, but there are no known grizzly bears currently inhabiting the areas. This project should have little or no impact on grizzly bears because the bears are not dependent on fish for food. There would be no impact on grizzly bears that consume fish killed by rotenone or consume treated waters (see comment 5c for impacts to mammals). The project would not have an impact on grizzly bears other than potential short term displacement due to increased people presence along the streams.

The project sites are within the range of the gray wolf and lynx. Wolves and lynx are known to be present near the project areas and they may use these areas at times, but they are not dependant on fish from the stream as a food source. The impacts to these species may include temporary displacement during the treatment when personnel and equipment are present in the drainages. There should be no impacts, however, from consuming treated waters or fish killed by rotenone for the same reasons as previously noted. Impacts to lynx and wolves therefore should be minor and temporary. See comment 5c for impacts to mammals.

Wolverine, fisher, hoary bat, hoary marmot, Prebel's shrew, Wyoming ground squirrel, golden eagle, Clarks nutcracker, Brewer's Sparrow, black rosy-finch, and greater sage grouse are listed as species of special concern or potential species of concern present in the areas of the proposed actions. None of these species should be substantially impacted by the restoration of WCT to the proposed streams. See comment 5g for minor potential impacts.

Aquatic organisms:

Westslope cutthroat trout, including some populations of slightly hybridized WCT, are considered a sensitive species and a species of special concern. The intent of the proposed project is to conserve and augment the WCT in York Gulch and restore WCT to the West Fork of Mudd Creek. It is likely that not all WCT would be captured prior to introducing CFT Legumine to York Gulch, and it is possible that some WCT would be inadvertently killed. This

impact is considered minor because it is anticipated that 90% or greater of the WCT present would be captured prior to treatment and because these same fish would be restored to the stream once the project is complete. Restoration of WCT to the West Fork of Mudd Creek would likely require importing WCT from another nearby source given the low number of fish remaining in York Gulch. Replicating the population in Christiansen Creek would conserve this population of fish. The expected outcome of the proposed projects, therefore, would be greatly beneficial to the long-term conservation of WCT.

Western pearlshell mussels are also an aquatic species of concern that are known to occur in the vicinity of the proposed project areas. No pearlshell mussels have been found in immediate project areas proposed for WCT restoration in this document, however. Any pearlshell mussels encountered prior or during the treatment will be salvaged and held in non-treated waters and returned to the streams once the fish removal portion of the proposed project is complete. No other sensitive aquatic invertebrate species have been documented in the streams proposed for WCT restoration.

Comment 5g. There is the potential for displacement of some animals during the implementation of this project (see Comment 5f). Mule deer, elk, other big game species and species mentioned above (Comment 5f) may be temporarily displaced as crews are present in the drainage performing the proposed work. These impacts should only be minor and temporary. The total treatment should be completed within one to three days at each stream. Motorized and foot access is currently present throughout most of the two drainages proposed for WCT restoration and public access is present. Our presence would likely represent only a small and temporary increase in human activity.

Cumulative Impacts: Impacts to fish and wildlife from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would create cumulative impacts to fish and wildlife resources within the proposed WCT restoration streams. Fish and wildlife resources could potentially suffer from the increased presence of humans if the new fisheries attract more recreational use. Based on use patterns of other WCT fisheries, however, FWP would conclude that it is very unlikely that the new WCT fishery would attract significant interest and associated higher use levels. The current primarily brook trout fisheries would be replaced by WCT fisheries that occupy a similar niche and would provide similar ecological functions and provide for similar angling opportunities. There will be a decrease in harvest opportunity (i.e. 20 fish brook trout limit to catch and release for WCT), but there are ample opportunities in other streams in nearby drainages and downstream of fish barriers to harvest brook trout. FWP does not foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts to non-target organisms related to construction and the treatment of the proposed streams.

B.HUMAN ENVIRONMENT

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		Yes	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: Noise levels would increase temporarily as 4x4 trucks and ATV's are used for accessing the treatment area. No motorized or mechanized equipment would be used to access the Wilderness Area. The CFT Legumine application equipment that would be used in the Wilderness is not mechanized and produces no noise. A gasoline-powered water pump would be used to fill tanks containing diluted potassium permanganate but this pump would be operated outside the Wilderness Area and would only be operated two to three times a day for a period of five to ten minutes. These impacts should be minor and temporary as the treatment is expected to last only one to three days in each stream.

Cumulative Impacts: Increases in noise from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would create increased noise in the streams or drainages proposed for WCT restoration. FWP does not foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts related to noise from the proposed treatment of the proposed streams with piscicides.

7. LAND USE 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			7b
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?			X			See 7c
d. Adverse effects on or relocation of residences?		X				

Comment 7b: The proposed project in the West Fork of Mudd Creek lies partly within the designated Anaconda Pintler Wilderness Area. Wilderness Areas are congressionally designated and have specific mandates governing their management to maintain their wilderness qualities (e.g., no mechanized equipment, no roads, etc.). The pillars of wilderness include areas that are: natural, undeveloped, provide outstanding opportunities for solitude, primitiveness, and unconfined recreation, and/or have special features or values associated with them. The designation and management of wilderness areas are evaluated based upon these pillars. The restoration of WCT to the West Fork of Mudd Creek as proposed in this document would not negatively affect these wilderness values. The long-term natural state of the area would be unaffected by the proposed WCT restoration. There would be temporary effects on aquatic invertebrates and potentially tailed frog tadpoles as a result of using CFT Legumine to remove brook trout (see comment 5c). It is expected, however, that non target aquatic organisms would recover to pre-existing conditions within one to three years after the project is complete (see Comment5c). The salvage of tailed frogs should also reduce the potential impacts to this species and aid in their rapid recovery following project completion.

The wilderness portion of the West Fork of Mudd Creek will return to its natural state where only native WCT were present once the project objectives are achieved. There will be no development associated with the restoration of WCT to the West Fork of Mudd Creek. An existing trail provides access to the proposed project area and this trail would be the sole means used to perform the proposed work. No additional development within the wilderness would be necessary to complete the proposed action or any of the alternatives. There would be no long-term impacts on the solitude of the area or the primitiveness or opportunities for unconfined recreation. Temporary impacts to solitude would be present when performing the fish removal and restocking, but only four to six people would be present for one to two days in the Wilderness Area to complete the proposed restoration. The proposed project would not negatively affect any identified special features of the Anaconda-Pintler Wilderness Area, and it would benefit the restoration of the native fish community.

Within the Anaconda-Pintler Wilderness Management Direction (Kiaser and Richardson, 2000), there is specific direction given to fisheries management for this wilderness area. The plan states, “Management decisions will focus on protection of those streams where known or suspected pure strains of Westslope Cutthroat or Bull trout exist.” The plan, under the goals of wilderness fisheries management, also includes ideals to:

1. Where feasible, maintain and enhance indigenous fish species.

2. Seek native biological communities where possible.

3. Contribute to the conservation and restoration of native strains of fish.

4. Provide recreational angling where opportunities currently exist or where establishment of new populations of native species might contribute to the perpetuation of those species and provide recreation as well.

The proposed action of restoring the West Fork of Mudd Creek to native WCT will meet all of these goals as stated in the Anaconda-Pintler Wilderness Plan with few impacts to other wilderness management goals or objectives. It is unlikely that the West Fork of Mudd Creek will attract additional angling once restored to WCT. Other fisheries within the wilderness area, particularly in alpine lakes, attract anglers. The increase in use at these lakes can lead to increasing human impacts. It is unlikely, however, that anglers would specifically target the West Fork of Mudd Creek for angling due to its small size and the likely small size of the fish that will be present in the stream. It is anticipated that future angling will be similar to current use.

Unlike outside wilderness areas where individual states maintain the authority to manage fish and wildlife populations, both state and federal agencies are responsible for "fostering mutual understanding and cooperation in the management of fish and wildlife in wilderness" (Bozworth 2006). The Anaconda-Pintler Wilderness Management Direction document makes it clear that FWP has the statutory authority to manage fisheries and stock fish in Wilderness. The use of a piscicide is proposed within the wilderness area to restore WCT to the West Fork of Mudd Creek. The agreement between the Association of Fish and Wildlife Agencies and the Forest Service and BLM (Bozworth 2006) regarding fish and wildlife management within wilderness areas states: "Chemical treatment may be necessary to prepare waters for the reestablishment of indigenous fish species**,** consistent with approved wilderness management plans**,** to conserve or recover Federally listed threatened or endangered species, or to correct undesirable conditions resulting from human activity. Proposals for chemical treatments would be considered and may be authorized by the Federal administering agency through application of the Minimum Requirement Decision Process (MRDP) as outlined in Section E., General Policy (see Appendix A). Any use of chemical treatments in wilderness requires prior approval by the Federal administering agency." Precedents for similar cutthroat restoration projects within wilderness areas across Montana have already been set (e.g., Cherry Lake, Lee Metcalf Wilderness, Goose Creek, Absaroka-Beartooth Wilderness, among others). WCT is the only indigenous trout species to the Big Hole drainage, and they were historically (even recently) present in the West Fork of Mudd Creek prior to the introduction of brook trout in the early 1900's. The use of CFT Legumine in the wilderness to restore WCT to the West Fork of Mudd Creek would therefore correct the undesirable condition created by past stocking of non-native fish extirpating native WCT and it is within established policy for wilderness management. The proposed fisheries management action would similarly advance native fish conservation within the Anaconda-Pintler Wilderness Area, which is one of the stated goals.

Comment 7c: Public access to the project areas under rotenone treatment would be closed for several days to prevent public exposure.. The length of the closure would depend on the amount of time the treated streams remained toxic to fish but would not exceed five days. Closed roads would include FS 1223 at the York Gulch culvert and 1223A that accesses the West Fork of Mudd Creek diversion. All other roads accessing the treatment area are private and not open to the public. The label for CFT Legumine states that detoxification should be terminated when replenished fish survive and show no signs of stress for at least four hours. FWP expects the treated waters to be non-toxic to fish in 24-48 hours after the input of rotenone. It can then reasonably be expected that any closures would last two to four total days. The treatment would

be implemented in late summer (August- September). Stream water would not be toxic to wildlife or livestock at proposed treatment levels. The treatment would be coordinated to limit any potential conflict such that livestock are pastured elsewhere or livestock would be temporarily moved to adjacent pastures during the treatment period. Treated waters cannot be used for irrigation, therefore irrigation ditches originating from York Gulch will be closed during treatment with CFT Legumine.

Cumulative Impacts: Impacts on land use from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would impact land use in the proposed WCT restoration streams. FWP does not foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts related to land use from the proposed treatment of the proposed streams with piscicides.

8. RISK/HEALTH HAZARDS **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 8a,c
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 of the CFT Legumine. All applicators would wear safety equipment required by the product label and MSDS sheets. Such safety equipment may include respirator, goggles, rubber boots, Tyvek overalls, and Nitrile gloves. All applicators would be trained on the safe handling and application of the piscicide. At least one Montana Department of Agriculture certified piscicide applicator 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. See also Comment 8c for other review of risks to general public.

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, a 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 affects to existing emergency responders would be short term and minor.

Comment 8c: The EPA (2007) conducted an analysis of the human health risks for rotenone and concluded it has a high acute toxicity for both oral and inhalation routes, but has a low acute toxicity for dermal route of exposure. It is not an eye or skin irritant nor a skin sensitizer. The EPA could not provide a quantitative assessment of potentially critical effect on neurotoxicity risks to rotenone users, so a number of uncertainty factors were assigned to the rating values. An additional 10x database uncertainty factor, in addition to the inter-species (10x) uncertainty factor and intra-species (10x) uncertainty factor, has been applied to protect against potential human health effects and the target margin of exposure (MOE) is 1000. The following table summarizes the EPA toxicological endpoints of rotenone (from 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 / 1000 = 0.015 mg/kg/day	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 / 1000 = 0.0004 mg/kg/day	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

Rotenolenoids are common degradation products found in the parent plant material used to make piscicidal forms of rotenone. The EPA (2007) concluded these degradation products are no more toxic than the active ingredient.

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)..."*

The EPA acknowledges four principle reasons for concluding there is a low human chronic risk for exposure to rotenone treated water: first, the rapid natural degradation of rotenone, second, using active detoxification measures by applicators such as potassium permanganate, third, properly following piscicide labels and the extra precautions stated in this document and finally, proper signing, public notification or area closures which limit public exposure to rotenone treated water.

As for recreational exposure, the EPA concludes no risk to adults who enter treated water following the application by dermal and incidental ingestion, but requires a waiting period of three days after a treatment before toddlers swim in treated water. 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 treatment areas would be closed to public access. Signs would be in place to warn recreationists that the streams are being treated with rotenone and closed to entry. Proper warning through news releases, signing the project area, temporary road closure and administrative personnel in the project area should be adequate to keep recreationists from being exposed to any treated waters.

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. Inconsistent detectability and low occurrence in other formulations that used the same extraction process, however, 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. The human health risk is low, nevertheless, because of their low concentrations in this formulation. 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 Legumine. It is known to have good solvency properties and is used to dissolve a wide range of compounds including resins (rotenone). Analysis of Methyl pyrrolidone in Legumine showed it represents about 9% of the formulation (Fisher 2007). The analysis concluded regarding the constituent ingredients in 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 physicalchemistry 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…"*

The Legumine MSDS states, "…when working with an undiluted product in a confined space, use a non-powered air purifying respirator…and… air-purifying respirators do not protect workers in oxygen-deficient atmospheres…" It is not likely that workers would be handling Legumine in an oxygen deficient space during normal use. Proper ventilation and safety equipment would be used according to the label requirements in order to guard against this.

Teixeira, et al. (1984) reported in their description of how South American Indians prepare and apply *Timbó*, a rotenone parent plant, that the Indians extensively handled the plants during a mastication process, and then swam in lagoons to distribute the plant pulp. No harmful effects were reported. It is important to note that the primitive method of applying rotenone from root does not involve a calculated target concentration, metering devices or involve human health risk precautions as those involved with fisheries management programs.

One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). The relevance of the results to the use of rotenone as a piscicide have been challenged, however, based upon the following dissimilarities between the experimental methodology used and fisheries related applications: the continuous intravenous injection method used to treat the rats leads to "continuously high levels of the compound in the blood," unlike field applications where 1) the oral route is the most likely method of exposure, 2) a much lower dose is used and 3) potential exposure to rotenone is limited to usually only a matter of days because of the rapid breakdown of the rotenone following application. Dimethyl sulfoxide (DMSO) was used to further enhance tissue penetration in the laboratory experiment (normal routes of exposure actually slow introduction of chemicals into the bloodstream); no such chemicals enhancing tissue penetration are present in the rotenone formulation proposed for use in this treatment. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982) or cancer (Marking 1988). Rotenone was found to have no direct role in fetal development of rats that were fed high concentrations of rotenone. Spencer and Sing (1982) reported that rats that were fed diets laced with 10-1,000 ppm rotenone over a 10-day period did not suffer any reproductive dysfunction. Typical concentrations of actual rotenone used in fishery management range from 0.025 to 0.50 ppb and are far below that administered during most toxicology studies.

A recent study linked the use of rotenone and paraquat with the development of Parkinson's disease (PD) 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. Rotenone is no longer approved for agricultural uses and is only approved for aquatic application as a piscicide. The results of epidemiological studies of piscicide exposure, such as this one, have been highly variable (Guenther et al. 2011). Studies have found no correlations between piscicide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010). Some have found correlations between piscicide 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 piscicide or piscicide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recent epidemiological studies linking piscicide exposure to PD have been criticized due to the high variation among study results, generic categorization of piscicide 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. It is also unclear in the 2011 Tanner et al. study the frequency and the dose individuals were exposed to during the time period of use. It is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products without information on how much rotenone individuals were exposed to and for how long.

The state of Arizona conducted an exhaustive review of the risks of rotenone use as a piscicide to human health (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. There are substantial differences, however, 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 re-registration 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."

It is clear that to reduce or eliminate the risk to human health, including any potential risk of developing Parkinson's disease, public exposure to rotenone treated water must be eliminated to the extent possible. Areas treated with rotenone would be closed to public access during the treatment in order to reduce the potential for exposure of the public during the proposed use of CFT Legumine to restore WCT. 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 limited to the proposed treatment areas by adding potassium permanganate to the stream at the downstream end of the treatment reach (fish barriers). Potassium permanganate would neutralize any remaining rotenone before leaving the project area. The efficacy of the neutralization would be monitored using fish (the most sensitive species to the chemical) and a hand held colorimeter. The potential for public exposure to rotenone treated waters, therefore, is very minimal. The potential for exposure would be greatest for those government workers applying the chemical. All CFT Legumine label mandates for personal protective equipment would be adhered to (see Comment 8a) in order to reduce their exposure.

Cumulative Impacts: Health hazards from the proposed action would be short term and mitigated through closure of treatment areas to public and use of proper safety equipment, etc. There should be no long-term or cumulative impacts of the application of the piscicide due to the fact that rotenone in all formulations, including CFT Legumine, breaks down quickly and does not bioaccumulate. FWP does not expect the proposed action to result in other actions that would increase the risk of health hazards in the streams proposed for WCT restoration. FWP does not foresee any other activities in the basin that would add to health impacts of the proposed action. As such there are no cumulative impacts related health hazards from the proposed treatments.

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				

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 gas, other fuel supply or distribution systems, or communications?		X				
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				

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			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 the West Fork Mudd Creek and York Gulch between the time of fish removal and for several years after until introduced fish grow to the size that able to be caught by anglers. All streams are accessible to the public and lie primarily on public lands administered by the Forest Service. All the proposed streams are small, however, and receive little angling pressure. There also exist adjacent streams and areas downstream of fish barriers that would provide similar angling alternatives. The streams proposed for WCT restoration should be fully colonized with WCT within five years of project implementation and should provide the same angling opportunity to catch wild trout as pretreatment. Cutthroat trout fisheries in streams in southwest Montana in most cases are catch and release only. FWP would then evaluate whether the established fishery could support harvest. Regulations would be changed, if appropriate, to allow anglers the option of harvesting WCT for consumption from the proposed streams.

Cumulative Impacts: Impacts to recreation and aesthetics from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would impact recreation/aesthetics in the streams proposed for WCT restoration. FWP does not foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts to recreation/aesthetics from the proposed action.

12. 12/HISTORICAL 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				
d. Will the project affect historic or cultural resources?		X				

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		Yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)			X			13f
g. List any federal or state permits required.						13g

Comments 13e and f: The use of piscicide can generate controversy. Public outreach and information programs can inform the public on the use of pesticides. It is not known if this project would have organized opposition. Similar projects proposed and implemented in 2011 and 2012 and had limited opposition, but they also had substantial support.

Comment 13g: The following permit would be required:

MDEQ Pesticide General Permit NDPES Discharge Permit for application of CFT Legumine.

USDA Forest Service Pesticide Use Authorization Form

PART IV. OVERLAPPING AGENCY JURISDICTION

A. Name of Agency and Responsibility
   a. Montana Department of Environmental Quality – NDPES Discharge Permit for application of CFT Legumine.
   b. US Forest Service, Beaverhead-Deerlodge National Forest, Wisdom Ranger District for management of fish populations within wilderness and temporary closure of Forest Service roads during treatment.

PART V. AGENCIES THAT HAVE CONTRIBUTED OR BEEN CONTACTED

A. Name of Agency

   a. Montana Department of Environmental Quality.
   b. Montana Department of Fish, Wildlife & Parks – wildlife bureau
   c. US Army Corps of Engineers
   d. Montana Natural Heritage
   e. Montana State Historic Preservation Office
   f. US Forest Service, Beaverhead-Deerlodge National Forest, Wisdom Ranger District

PART VI. ENVIRONMENTAL IMPACT STATEMENT REQUIRED?

After considering the potential impacts of the proposed action and possible mitigation measures, FWP has determined that an Environmental Impact Statement is not warranted. The impacts of WCT restoration as described in this document are minor and/or temporary and mitigation for many of the impacts is possible. The primary negative impacts as a result of this project are temporary reductions in aquatic invertebrate abundance as a result of toxic effects of rotenone and impacts to tailed frog tadpoles in the West Fork Mudd Creek. Impacts to aquatic invertebrates have been shown to be short term (< 5 years) and minor and invertebrate communities are very resilient to disturbances such as treatment with rotenone. Mitigation measures such as salvage of tadpoles prior to treatment with rotenone and not treating sections of stream that do not contain fish but do contain tailed frog tadpoles and aquatic invertebrates should reduce the impacts to this non-target species. The benefit to native WCT, a species in need of conservation, would balance the potential negative impacts to other species.

Prepared by: Jim Olsen, Fisheries Biologist_____ Date: _____

Submit written comments to: Montana Fish, Wildlife & Parks
C/o West Fork Mudd Creek WCT Restoration EA comments
1820 Meadowlark Lane
Butte, MT 59701

Or via email to: jimolsen@mt.gov

Comment period is 30 days. Comments must be received by May 31, 2013.

PART V. REFERENCES

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ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE

WORKSHEETS

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– The Wilderness Act, 1964

Please refer to the accompanying *MRDG Instructions* click here for filling out this guide. The spaces in the worksheets will expand as necessary as you enter your response.

Step 1: Determine if it is necessary to take action.

Description: Briefly describe the situation that may prompt action.

Montana Fish, Wildlife and Parks proposes application of piscicides (rotenone) to the West Fork Of Mudd Creek (Anaconda-Pintler Wilderness) to remove non-native brook trout and restore westslope cutthroat trout (WCT). WCT formerly occupied the West Fork of Mudd Creek but have been extirpated within the last 20 years due to competition from brook trout. Brook trout removal in the West Fork of Mudd Creek is part of a larger project to conserve WCT in York Gulch. York Gulch and the West Fork of Mudd Creek are hydrologically connected via the York Diversion which diverts water from the West Fork of Mudd Creek to York Gulch. Brook trout are also known to migrate from the West Fork of Mudd Creek to York Gulch via this diversion. The non-hybridized WCT in York Gulch are at high risk of extirpation due to small population size, limited habitat and competition from brook trout. Without removing brook trout from the West Fork of Mudd Creek, restoration of WCT in York Gulch would be successful because brook trout would repopulate the stream via the York Diversion. After successful eradication of brook trout in the West Fork of Mudd Creek and York Gulch, native WCT in York Gulch would be conserved and WCT from other nearby sources in the Big Hole drainage will be stocked into the West Fork of Mudd Creek to establish a population conserving local genetics in York Gulch and replicating another population in the West Fork of Mudd Creek. FWP and the Forest Service are co-signatories to a variety of MOU/MOA/conservation plans which demonstrate the commitment of both parties to this kind of activity.

A. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Are there valid existing rights or is there a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of action involving Section 4(c) uses? Cite law and section.

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain: 78 Stat. 896 (8) as it pertains to state jurisdiction in managing fish and wildlife within wilderness in the national forests; this is further interpreted in the AWFA agreement (2006), where chemical treatments for fisheries management, including to re-establish indigenous species, are recognized as a tool to be considered and authorized by the Federal administering agency.

B. Describe Requirements of Other Legislation

Do other laws require action?

Yes: ☐ **No:** ☒ **Not Applicable:** ☐

Explain:

C. Describe Other Guidance

Does taking action conform to and implement relevant standards and guidelines and direction contained in agency policy, unit and wilderness management plans, species recovery plans, tribal government agreements, state and local government and interagency agreements?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain: This action conforms with the Memorandum of understanding and conservation agreement for westslope cutthroat trout and Yellowstone cutthroat trout in Montana (hereafter, MOU; 2007) to which the FS and FWP are co-signatories. This action specifically addresses objective 3 of the MOU: Seek collaborative opportunities to restore and/or expand each cutthroat trout subspecies into selected suitable habitats within their respective historical ranges. The action is also in line with the Anaconda-Pintler Wilderness Direction document which states that the fisheries goals are:

1. Where feasible, maintain and enhance indigenous fish species.
2. Seek native biological communities where possible.
3. Contribute to the conservation and restoration of native strains of fish.
4. Provide recreational angling where opportunities currently exist or where establishment of new populations of native species might contribute to the perpetuation of those species and provide recreation as well.

The proposed action of restoring the West Fork of Mudd Creek to native WCT will meet all of these goals as stated in the Anaconda-Pintler Wilderness Plan without significant impacts to other wilderness management goals or objectives.

D. Describe Options Outside of Wilderness

Can this situation be resolved bv action outside of wilderness?

Yes: ☐ **No:** ☒ **Not Applicable:** ☐

Explain: It will be nearly impossible to protect the non-hybridized WCT in York Gulch from the threats of brook trout without removing brook trout also from the West Fork of Mudd Creek because of the hydrologic connection between the two drainages via the York Irrigation Diversion. It may be possible to install a fish screen on the diversion but such screens are not 100% reliable. Further, such a screen would likely cost > $50,000 and would require frequent maintenance to ensure its functionality. The WCT in York Gulch are at high risk of extirpation due to completion from brook trout and low population size. Further, it would be very difficult to restore WCT in the West Fork of Mudd Creek without including the portion of the stream in the wilderness area because of the location of the fish barrier (outside of wilderness). If brook trout were removed from only the non-wilderness portion of the West Fork of Mudd Creek their population would quickly expand downstream and recolonize the areas outside of wilderness and the goals of WCT restoration in the stream would not be accomplished. There are other streams outside of the wilderness area that present opportunities to restore WCT and these streams are being actively restored (i.e., McVey Creek, Cherry Creek, N Fk Divide Creek, Sixmile Creek, S Fk N Fk Divide Creek, N Fk Divide Creek); however, such projects are expensive and can be cost prohibitive because of the need to construct large fish barriers that often cost > $100,000. A fish barrier has already been constructed on the West Fork of Mudd Creek and therefore this stream is a high priority to restore to WCT.

E. Wilderness Character

How would action contribute to the preservation of wilderness character, as described by the components listed below?

Untrammeled:

WCT were native the West Fork of Mudd Creek within the Anaconda-Pintler Wilderness Area but have been extirpated by competition with brook trout. This action does manipulate (remove) a population of fish and replace it with another. Therefore, in one respect, the level of ‘untrammeled-ness’ does not change. However, this project does contribute to the conservation of a native species, which is ecologically adapted to the area; in this respect, this project thus represents a move towards less ‘trammeling’. Further, this project fulfils the stated fisheries goals within the Anaconda-Pintler Wilderness.

Undeveloped:

No development or permanent improvements will occur as result of this project.

Natural:

WCT were native the West Fork of Mudd Creek within the Anaconda-Pintler Wilderness Area but have been extirpated by competition with brook trout. Therefore, the removal of brook trout and restoration of WCT will return the stream to its natural state. This action does manipulate (remove) a population of fish and replace it with another. Therefore, in one respect, the level of ‘natural-ness’ does not change. However, this project does contribute to the conservation of a native species, which is ecologically adapted to the area; in this respect, this project thus represents a move towards more ‘natural’ conditions.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Application of piscicides in the West Fork of Mudd Creek will require a short-term loss of solitude, due to the presence of personnel applying the chemicals. However, this will be of very short duration (a day or two) and will not be permanent. Thus, nearly identical opportunities will be present before and after the project is complete. The only difference is that a native species will be present in the stream after the project, whereas a non-native species is currently present.

Other unique components that reflect the character of this wilderness:

Within the Anaconda-Pintler Wilderness there are 15 major streams on the Big Hole side of the Continental Divide. Of these 15 streams there is only 1 that contains a population of WCT (Plimpton Creek) while the other 14 contain fisheries consisting of non-native species. Therefore, restoring WCT to the West Fork of Mudd Creek will double the number of WCT populations in the wilderness and return the stream to its native state. Some of the highest quality habitats for restoring WCT exist within the Anaconda-Pintler Wilderness because of the pristine nature of the area. One of the main reasons for the decline in WCT across its range is degraded habitat and the introduction of non-native species. The West Fork of Mudd Creek within the wilderness area has high quality habitat that has sustained WCT for thousands of years until the recent introduction of brook trout.

F. Describe Effects to the Public Purposes of Wilderness

How would action support the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Explain: Recreational opportunities will remain largely as they are now, although anglers will be able to fish for native trout in the West Fork of Mudd Creek in the future, as opposed to a non-native species now. WCT generally perform better than brook trout, so some anglers may find the opportunity enhanced because of the larger fish present upon successful project completion. Scenic values will not chance as result of this project. This project will add to the scientific base of knowledge regarding fish removals and species interactions, and therefore provides educational value as well. As stated previously, this is a conservation project for WCT. Historical uses are largely unaffected by this project.

Step 1 Decision: Is it necessary to take action?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain: Conservation of the York Gulch WCT population is at extreme risk without undertaking this action.

If action is necessary, proceed to Step 2 to determine the minimum tool for action.

Step 2: Determine the minimum tool.

Description of Alternative Actions

For each alternative, describe what methods and techniques will be used, when the action will take place, where the action will take place, what mitigation measures are necessary, and the general effects to wilderness character.

Alternative # ___1__

Description: Physical Removal (via electrofishing or angling)

Effects:

Biological and Physical Resource

These methods are highly unlikely to successfully remove brook trout from the West Fork of Mudd Creek because of the difficulty in effectively capturing all of the brook trout present. Such an effort would require very large crews repeatedly entering the wilderness, and therefore may have impacts on physical resources. Biological effects on non-target organisms are short-term and minimal.

Social and Experiential Resource

As noted above, repeated entry by a large group of workers would be required, and therefore may result in social and experiential impacts.

Heritage and Cultural Resource

Very little impact would be expected to heritage or cultural resources, although it could occur inadvertently given the number of workers present.

Maintaining Contrast and Unimpaired Character

The temporal nature of the project probably wouldn't lead to issues here, although some impairment could occur with repeated use of the area.

Special Provisions

NA

Safety of Visitors, Personnel, and Contractors and Work Methods

There would not likely be a significant safety risk, although this alternative would require much more wading in the stream electrofishing and therefore the probability of a falling accident would increase.

Economic and Time Constraints

This alternative would greatly increase the time involved in reaching a successful outcome, and realistically would likely not result in a successful outcome. To feasibly remove brook trout via electrofishing would require a 4 year time commitment with multiple crews spending 4-8 days per year in the stream. Further, restoration in York Gulch could not proceed until brook trout were removed from the West Fork of Mudd Creek and it is possible that WCT in York Gulch could go extinct within a very short time frame. Finally, execution of this option would likely result in greater cost over the long-run, and would certainly be less cost-effective.

Additional Wilderness-specific Comparison Criteria

This alternative would have a greater overall impact to wilderness character than the other methods being considered.

Alternative # ___2__

Description: Chemical Removal (antimycin)

Effects:

Biological and Physical Resource

Antimycin would have similar effects to non-target organisms as rotenone (to be described in alternative 3), and more impacts than those described in alternative 1 for mechanical removal. Potential impacts to physical resources are mimimal, less than alternative 1 and slightly more than alternative 3 because more personnel are required to apply antimycin than rotenone. The comercial availablity of antimycin is also questionalble at the current time due to issues with the supplier of the chemical.

Social and Experiential Resource

This alternative would require more personnel to execute successfully than the preferred alternative (see below), and could therefore lead to a reduction in the public's wilderness experience. It is also less likely to be effective in one application than rotenone, which could thus lead to the need for multiple treatments – this again could lead to a reduction in experiential resources.

Heritage and Cultural Resource

No impacts to heritage or cultural resources are anticipated.

Maintaining Contrast and Unimpaired Character

This alternative should have no long-term impacts to these attributes; some minor short-term impacts may occur.

Special Provisions

NA

Safety of Visitors, Personnel, and Contractors and Work Methods

This alternative is safer than alternative 1, as personnel would not have to work in the dangerous conditions in-stream. Furthermore, fewer personnel are required, and for much shorter duration.

Economic and Time Constraints

This alternative would be less costly than alternative 1, but less cost-effective than alternative 3. It would require far less time to implement than alternative 1, slightly more than alternative 3 because more application stations are necessary.

Additional Wilderness-specific Comparison Criteria

This alternative would have very little long-term impacts to wilderness character.

Alternative # ___3__

Description: Chemical Removal (Rotenone – Preferred Alternative)

Effects:

Biological and Physical Resource

This alternative would have the best likelihood in successfully removing the target organisms (brook trout); it would have short-term impacts on non-target organisms (gill-breathing invertebrates and tailed frog tadpoles) as well. However, studies show that impacts on invertebrates are very short-lived, and that

impacts are ameliorated within a year. Impacts on tailed frogs will be mitigated by capturing as many tadpoles as possible using electrofishing before rotenone is applied and holding them in non-treated waters then releasing them back to the stream once brook trout are removed. Impacts will be further mitigated because adult tailed frogs will not be affected and approxitely 3 miles of habitat upstream of a natural falls on the West Fork of Mudd Creek where tailed frog tadpole are abundant will not be treated if brook trout have not colonized this reach of stream. Finally, fewer personnel are required to conduct a rotenone treatment than the other methods, so physical impacts from personnel are extremely unlikely.

Social and Experiential Resource

This alternative requires relatively very few personnel to successfully complete, and requires less time to complete, so will have the least potential for social and experiential resource issues.

Heritage and Cultural Resource

As noted for alternative 2, No impacts to heritage or cultural resources are anticipated.

Maintaining Contrast and Unimpaired Character

This alternative should have no long-term impacts to these attributes; some minor short-term impacts may occur, but would be less with this alternative than the others.

Special Provisions

NA

Safety of Visitors, Personnel, and Contractors and Work Methods

This alternative is safer than alternative 1, as personnel would not have to work in the dangerous conditions in-stream. Furthermore, fewer personnel are required, and for much shorter duration. This alternative requires even fewer personnel than the other alternatives because fewer application stations are required than alternative 2 and chemical treatment requires far less effort overall than mechanical removal.

Economic and Time Constraints

Because fewer personnel are required, for less time, this alternative is less expensive than alternative 2 (chemical costs are very similar). The commercial availability of antimycin has been in doubt the past few years due to problems within the manufacturing company. Both this alternative and alternative 2 require far less effort than Alternative 1, and have a far higher probability of success, and thus are more cost-effective than Alternative 1.

Additional Wilderness-specific Comparison Criteria

This alternative has the least amount of potential negative impacts to wilderness character, and the highest likelihood of successfully completing this project for conservation of WCT.

Step 2 Decision: What is the Minimum Tool?

The selected alternative is:

Alternative 3

Describe the rationale for selecting this alternative:

This alternative has the least amount of potential negative impacts to wilderness character, and the highest likelihood of successfully completing this project for conservation of WCT.

Describe any monitoring and reporting requirements:

FWP will need to report the amount of piscicide they ultimately use to complete this project. Fish populations in the stream will be monitored cooperatively by FWP and FS to determine success of the project.

Please check any Wilderness Act Section 4(c) uses approved in this alternative: NONE

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Be sure to record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:	/s/ Dan Downing	Dan Downing	Forest Fish Biologist	June 12, 2012
Recommended:				
Recommended:				
Approved by:				