DRAFT

ENVIRONMENTAL ASSESSMENT

Dutchman Creek

Westslope Cutthroat Trout Restoration Project

FWP-CEA-FSH-R3-24-006

February 16, 2024

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I. Compliance with the Montana Environmental Policy Act

Before a proposed *project* may be approved, environmental review must be conducted to identify and consider potential impacts of the proposed project on the human and physical environment affected by the project. The Montana Environmental Policy Act (MEPA) and its implementing rules and regulations require different levels of environmental review, depending on the proposed project, significance of potential impacts, and the review timeline. § 75-1-201, Montana Code Annotated ("MCA"), and the Administrative Rules of Montana ("ARM") 12.2.430, General Requirements of the Environmental Review Process.

FWP must prepare an EA when:

- It is considering a "state-proposed project," which is defined in § 75-1-220(8)(a) as:
  (i) a project, program, or activity initiated and directly undertaken by a state agency;
  (ii) … a project or activity supported through a contract, grant, subsidy, loan, or other form of funding assistance from a state agency, either singly or in combination with one or more other state agencies; or
  (iii) … a project or activity authorized by a state agency acting in a land management capacity for a lease, easement, license, or other authorization to act.
- It is not clear without preparation of an EA whether the proposed project is a major one significantly affecting the quality of the human environment. ARM 12.2.430(3)(a));
- FWP has not otherwise implemented the interdisciplinary analysis and public review purposes listed in ARM 12.2.430(2) (a) and (d) through a similar planning and decision-making process (ARM 12.2.430(3)(b));
- Statutory requirements do not allow sufficient time for the FWP to prepare an EIS (ARM 12.2.430(3)(c));
- The project is not specifically excluded from MEPA review according to § 75-1-220(8)(b) or ARM 12.2.430(5); or
- As an alternative to preparing an EIS, prepare an EA whenever the project is one that might normally require an EIS, but effects which might otherwise be deemed significant appear to be mitigable below the level of significance through design, or enforceable controls or stipulations or both imposed by the agency or other government agencies. For an EA to suffice in this instance, the agency must determine that all the impacts of the proposed project have been accurately identified, that they will be mitigated below the level of significance, and that no significant impact is likely to occur. The agency may not consider compensation for purposes of determining that impacts have been mitigated below the level of significance (ARM 12.2.430(4)).

MEPA is procedural; its intent is to ensure that impacts to the environment associated with a proposed project are fully considered and the public is informed of potential impacts resulting from the project.

II. Background and Description of Proposed Project

Name of Project: Dutchman Creek Westslope Cutthroat Trout Restoration Project.

Montana Fish Wildlife and Parks (FWP) proposes to restore native westslope cutthroat trout (WCT) in Dutchman Creek. Dutchman Creek is a tributary to Prickly Pear Creek in the Elkhorn Mountains near Helena, MT. Native WCT were first documented in the Elkhorn WMU by Hadley (1981), when no brook trout were observed in the 2.3 mile project area. Subsequent fishery surveys also confirmed a lack of brook trout above the boulder field "barrier" in 1999 (Nelson 2004). Invasion of brook trout appeared to occur between 1999 and 2003 upstream of a short reach of underground flow, which apparently was a barrier to upstream migration prior to 1999. From 2003 to 2022, brook trout gradually increased and WCT significantly decreased in abundance. The proposed project intends to remove brook trout from the project area and restore WCT using a combination of the fish native to Dutchman Creek and the nearby South Fork of Warm Springs Creek. The project includes the following steps:

1. Rescue remaining WCT in Dutchman Creek by transporting them to a fishless reach of stream protected by a constructed fish barrier (South Fork Sixteenmile Creek)
2. Construct a fish passage barrier downstream of underground reach to prevent future colonization by non-native fish (Figure 1)
3. Remove non-native brook trout and brown trout above the barrier
4. Restore WCT to the project area by gathering progeny of Dutchman and South Fork Warm Springs WCT, which have also been translocated to the South Fork Sixteenmile Creek, by transporting live fish to the project area.

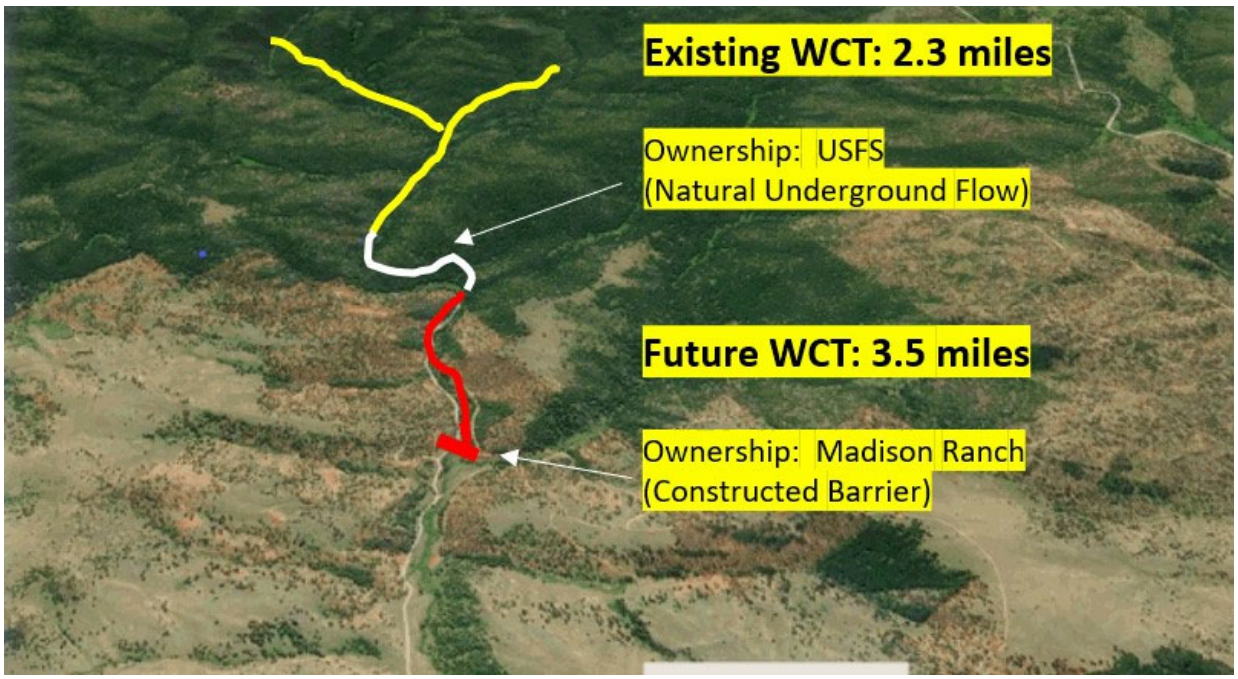

Figure 1. Aerial image of Dutchman Creek showing historic distribution in 2.3 mile reach (yellow), the underground reach that prevented non-native trout invasion prior to 1999 (white), and the proposed expansion of distribution into the downstream neighboring property of the Madison Ranch and the location of a constructed upstream fish passage barrier (red).

Figure 2. Photograph of Dutchman Creek during summer fish sampling downstream of National Forest Boundary on the private (Madison Ranch) property.

Historically, WCT were the only trout species in Dutchman Creek (Hadley 1981), but brook trout have moved upstream from Prickly Pear Creek and displaced WCT. Brook trout, which are native to eastern North America and were likely introduced throughout Southwest Montana in the late 1800's or early 1900's, outcompete WCT because of their high reproductive rate, aggressive nature, and early emergence of fry in the spring (Shepard et al. 2005, Shepard 2010).

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 the Canadian provinces of British Columbia and Alberta. 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 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 non-hybridized WCT are estimated to persist in less than 5% of formerly occupied habitat, and most remaining populations are restricted to isolated headwater habitats (Shepard et al. 2003; Shepard et al. 2005). Further, many of these remaining populations are at risk due to small population size and threats from 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). In addition, in 1997 a petition was submitted to the U.S. Fish and Wildlife Service (USFWS) to list WCT as "threatened" under the *Endangered Species Act* (ESA), 16 U.S.C. 1531, et seq. USFWS status reviews have found that WCT were "not warranted" for ESA listing (DOI 2003); however, this finding was in litigation until 2008 and additional efforts to list WCT under the ESA are possible.

To advance WCT conservation efforts in Montana, a Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana was developed in 1999 by several federal and state resource agencies (including the BLM, 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). As described in the MOU, *the primary management goal for WCT in Montana is to ensure the long-term self-sustaining persistence of the subspecies in its historical range*. To achieve this goal, the Westslope Cutthroat Trout Conservation Strategy for the Missouri River Headwaters of Southwest Montana was developed (Jaeger et al. 2022). This strategy describes specific, measurable objectives to ensure the long-term persistence of WCT in southwest Montana. The highest priority of the strategy is to secure existing, non-hybridized populations of WCT in place to conserve the remaining genetic diversity left on the landscape. Secure WCT populations are isolated from non-native species (usually by a fish barrier) and occupy enough habitat to ensure long-term persistence. Hilderbrand and Kershner (2000) recommended a minimum WCT population size of 2,500 fish for long-term persistence (>100 years), and Harig and Fausch (2002) recommended a minimum of 5.6 square miles (minimum watershed size) of occupied habitat.

The long-term goal for WCT conservation is to restore secure conservation populations of WCT to 20% of their historic tributary distribution east of the Continental Divide (Upper Missouri River Basin upstream from and including the Judith River; FWP 2019). Mainstem rivers, such as the Missouri River, support important non-native recreation fisheries (i.e. brown and rainbow trout) and are not part of this conservation goal. FWP recognizes the value of non-native trout fisheries and will continue to manage approximately 80% of the tributary streams in the upper Missouri River for non-native fish such as brook, rainbow, and brown trout. In the Upper Missouri River sub-basin, WCT historically occupied approximately 1,634 miles of tributary streams. Today there are a total of 34 remaining WCT populations in small headwater tributaries which occupy just over 115 miles of stream (~ 7% of their historic range). Of these 34 WCT populations, approximately 65% are at risk due to competition and hybridization with non-native fish. Data collected from streams in the Upper Missouri River sub-basin over the past 15 years indicate that many of the WCT populations in the drainage have dramatically declined or have been extirpated (Jaeger et al. 2021). Projects that protect at-risk populations of WCT, such as that proposed for Dutchman Creek, are necessary to ensure the continued survival of the species, conserve remaining genetic diversity, and meet statutory obligations to prevent listing under the ESA.

Dutchman Creek contains an isolated remnant population of non-hybridized WCT in its headwaters. Historically, WCT were the only trout species in Dutchman Creek (Figure 1), but brook trout have displaced them except in the headwaters where a small, isolated population remains in 2.2 miles above a boulder field where the stream flows underground 0.2 miles. During Fall 2022-23, WCT were removed from the 2.2 mile reach of stream above the partial barrier and moved to South Fork Sixteenmile Creek to prevent further loss due to brook trout competition. The project largely occurs on Helena National Forest Lands, but the fish passage barrier and about one mile of stream is located on private land. An interagency WCT recovery plan for the Elkhorn Wildlife Management Unit was prepared in 1999 (Spoon and Canfield 1999), and the current project proposal is consistent with goals and objectives established by current and previous planning efforts for the Elkhorns Mountains, the Statewide Fisheries Management Plan (MFWP 2023), and the WCT Conservation Strategy for the Missouri River Headwaters of Southwest Montana (Jaeger et al 2022). This proposal was scoped with the two downstream private landowners immediately below the project area.

Figure 3. Photograph of Westslope cutthroat trout.

FWP proposes to conserve WCT in Dutchman Creek and expand their range in the drainage by removing brook trout upstream of a constructed fish barrier (Figure 2). The proposed fish barrier is located private land approximately 1 mile below the US Forest Service property boundary. The non-native fish upstream of the fish barrier would be removed using rotenone, a naturally derived chemical from plants in the bean family that is highly effective at killing fish, with few impacts to most non-target organisms. Rotenone acts by inhibiting oxygen transfer at the cellular level. It is especially effective on fish at low concentrations because it is readily absorbed into the bloodstream through the gills. There is little risk to animals that consume rotenone treated waters or dead fish because rotenone is readily broken down by digestive processes and is not readily absorbed through the digestive system; therefore, terrestrial animals can tolerate exposure to concentrations much higher than those used to kill fish. Rotenone does have minor and temporary impacts to aquatic invertebrates, particularly those that also breath through gills. Multiple studies have shown that at the concentrations proposed for Dutchman Creek, invertebrates recover within one year after treatment with rotenone. Rotenone would be administered following requirements and guidance on the label, the Standard Operating Procedures manual, and the FWP piscicide policy. Formulated rotenone (5% active ingredient) would be applied at the label recommend rate for streams (1 part formulated rotenone to 1 million parts of stream water) with drip stations, which are containers that precisely administer diluted rotenone to the stream at a constant rate for 4 hours. In addition, backwaters, spring areas and small tributaries would be treated with backpack sprayers according to label specifications. The treatment of Dutchman Creek would likely take 1 to 2 days and would be repeated in at least one consecutive year.

To prevent rotenone from traveling downstream of the proposed treatment area and affecting fish in lower Dutchman Creek, potassium permanganate (KMnO4) would be applied to the stream to neutralize rotenone at the fish barrier. Potassium permanganate is a strong oxidizer and quickly breaks down rotenone (see Direct Impacts to Water Quality Section p 18 for more information). There is minimal risk to terrestrial wildlife and humans that come in contact with rotenone treated waters; however, per rotenone label requirements, public access to the Dutchman Creek drainage will be prohibited during the prescribed 1-2 day treatment period.

Figure 4. Example of wood crib fish barrier proposed for Dutchman Creek (Bryant Creek photo).

The year following the second rotenone treatment, environmental DNA (eDNA) sampling would be used to verify if all the brook trout in the stream were removed (Carim et al. 2020). eDNA uses genetic methods to detect the DNA of organisms shed into the environment by sequentially filtering stream water collected throughout the treatment area. If a fish is present, its DNA is collected on the filter and its location can be identified. This technique has proven effective at detecting even a single fish in an entire watershed (Carim et al. 2020). If eDNA sampling indicates that brook trout remain after 2 treatments, the stream reach in question will be re-treated with rotenone or electrofished so that theoretical detection probability is 100%. Because most streams have a detection probability of <50% during single-pass backpack electrofishing, it would be necessary to achieve three “fishless” passes over the entire reach in question to verify it as fishless using this technique.

Prior to brook trout removal, the remaining WCT in Dutchman Creek would be captured using electrofishing and transported to South Fork Sixteenmile Creek. After brook trout removal, a portion of the established South Fork Sixteenmile Creek population will be returned to Dutchman Creek to repopulate the stream. Dutchman Creek WCT will be monitored over the next 5-10 years to determine their response to restoration. Experience from other projects indicates that salvaged WCT which are released back to the stream following brook trout removal will thrive and fill the available habitat within 3-6 years (Clancy et al 2019; Olsen 2020; Feuerstein 2022). If monitoring indicates low genetic diversity is slowing recovery, genetic rescue will be performed by importing WCT (generally less than 10) from neighboring populations into Dutchman to prevent inbreeding depression (Kovach et al. 2021). Similar genetic rescue has occurred in nearby Staubach and Hall Creeks in the Elkhorn WMU with promising results.

The primary benefit of this project is the long-term conservation at-risk WCT populations in the Upper Missouri River and of WCT in Dutchman Creek. The top priority for WCT conservation in southwest Montana is to protect all remaining at-risk populations of unaltered WCT (Jaeger et al. 2021). This project would protect and expand the Dutchman Creek WCT population from 2.3 miles to 3.5 miles of occupied habitat, and it would prevent the population from being eliminated due to competition and predation by brook trout. The WCT in Dutchman Creek would shift from an "at-risk" population to one that is secure and will be resilient for generations to come. This project would conserve the unique genetic legacy of WCT in Dutchman Creek and add to the long-term conservation of the species. WCT conservation projects like the one proposed for Dutchman Creek are intended to secure a small amount of the overall fish-bearing habitat for WCT to ensure the species long-term, self-sustaining persistence while managing the vast majority of habitat (at least 80%) for non-native fish like brook trout, rainbow trout, and brown trout.

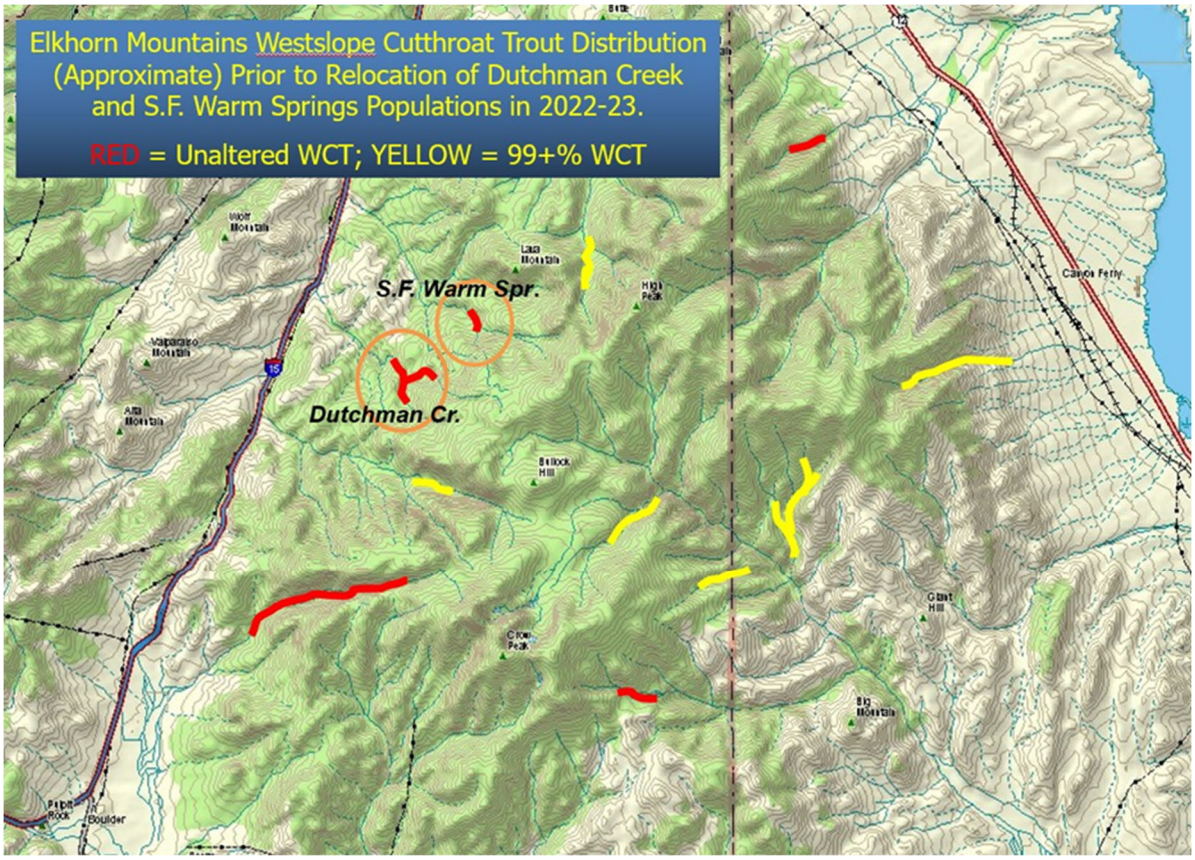

Figure 5. Map of WCT distribution in the Elkhorn Mountain. Based on the most recent genetic testing, RED indicates genetically unaltered distribution and YELLOW are populations with 99.0 to 99.9% WCT.

Affected Area / Location of Proposed Project

- Legal Description
  - Latitude/Longitude: 46.39675, -111.97354
  - Township, Range, Section for Barrier at bottom of project: T8N R3W Section 34
  - Town/City, County, Montana: 5 miles southeast of Clancy, Jefferson County, Montana

III. Purpose and Need

The purpose of this project is to conserve the native WCT population in Dutchman Creek by removing non-native brook trout upstream of a constructed fish barrier. FWP anticipates brook trout will eliminate WCT in Dutchman Creek within the next 5 years if no action is taken.

FWP is required to manage fish to prevent the need for listing under the ESA, and listed, sensitive, or species that are candidates for listing under the ESA must be managed in manner that assists in the maintenance or recovery of the species (§ 87-5-107, MCA). Montana state law provides FWP with the authority for implementation of fish management and restoration projects (MCA § 87-1-702; § 87-1-201[9][a]) and allows the use of chemicals to remove fish (ARM 12. 7. 1503[1][f][ii]). ESA listing of a species can have significant economic and political consequences. Restoration actions like the one proposed help fulfill the states obligation to conserve native species and avoid ESA listing.

Projects that restore WCT are necessary for the following reasons:

- ensure continued survival of the species
- conserve remaining genetic diversity
- meet statutory obligations to prevent listing under the ESA
- satisfy the conservation objectives of the Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana (2007), Memorandum of Understanding Concerning Arctic Grayling (2007), WCT Conservation Strategy for the Missouri Headwaters of Southwest Montana (2022), Upper Missouri River Arctic Grayling Conservation Strategy (2022), and Montana Statewide Fisheries Program and Guide (2023).
- Increase WCT fishing opportunities.

	Yes*	No
Was a cost/benefit analysis prepared for the proposed project?	☐	☒

* If yes, a copy of the cost/benefit analysis prepared for the proposed project is included in Attachment A to this Draft EA

IV. Other Agency Regulatory Responsibilities

FWP must list any federal, state, and/or local agencies that have overlapping or additional jurisdiction, or environmental review responsibility for the proposed project, as well as permits, licenses, and other required authorizations. ARM 12.2.432(3)(c).

A list of other required local, state, and federal approvals, such as permits, certificates, and/or licenses from affected agencies is included in **Table 1** below. **Table 1** provides a summary of state requirements but does not necessarily represent a complete and comprehensive list of all permits, certificates, or approvals needed. Rather, **Table 1** lists the primary state agencies with regulatory responsibilities, the applicable regulation(s) and the purpose of the regulation(s). Agency decision-making is governed by state and federal laws, including statutes, rules, and regulations, that form the legal basis for the conditions the proposed project must meet to obtain necessary permits, certificates, licenses, or other approvals. Further, these laws set forth the conditions under which each agency could deny the necessary approvals.

Table 1: Federal, State, and/or Local Regulatory Responsibilities

Agency	Type of Authorization (permit, license, stipulation, other)	Purpose
USDA Forest Service	Pesticide Use Permit	Allow the application of pesticides on FS lands
DEQ/USACE	Pesticide Discharge Permit 318/404 Permit	Discharge of Pesticide to state waters Barrier Construction/Disturbance
Department of Agriculture	Pesticide Applicator License	Authorizes rotenone application

V. List of Mitigations, Stipulations

Mitigations, stipulations, and other *enforceable* controls required by FWP, or another agency, may be relied upon to limit potential impacts associated with a proposed Project. The table below lists and evaluates enforceable conditions FWP may rely on to limit potential impacts associated with the proposed Project. ARM 12.2.432(3)(g).

Table 2: Listing and Evaluation of Enforceable Mitigations Limiting Impacts

Are enforceable controls limiting potential impacts of the proposed action? If not, no further evaluation is needed.			**Yes ☒**	**No ☐**
If yes, are these controls being relied upon to limit impacts below the level of significance? If yes, list the enforceable control(s) below			**Yes ☒**	**No ☐**
Enforceable Control	**Responsible Agency**	**Authority (Rule, Permit, Stipulation, Other)**	**Effect of Enforceable Control on Proposed Project**	
Piscicide Policy: Application rate and neutralization of Rotenone	FWP	Internal Policy	Regulates pre-project planning and neutralization of rotenone to prevent rotenone effects outside project area.	
CFT Legumine Label	MT Dept of Agriculture, US Environmental Protection Agency	The Montana Pesticides Act (MPA), Title 80, Chapter 8, Sections 80-8-101 through 80- 8-405, MCA, Federal Insecticide, Fungicide and Rodenticide Act	Regulates safety procedures, application rates and neutralization of rotenone application.	
Native and sensitive species management	FWP	Section 87-1-201(9)(a), M.C.A.	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, MCA, or the federal ESA.	
Westslope cutthroat conservation	FWP, DNRC DEQ, MT Stockgrowers, MT Farm Bureau Federation, USFS, BLM, USFWS, US Natural Resource and Conservation Service and 10 other signatories	Memorandum of Understanding	FWP is a signatory to the Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana (FWP 1999, 2007) which states: "The management goal for WCT in Montana is to ensure the long-term, self-sustaining persistence of the subspecies within each of the five major river drainages they historically inhabited in Montana, and to maintain genetic diversity and life history strategies represented by the remaining local populations."	
Westslope cutthroat conservation goal 20% of historically occupied habitat	FWP	State-Wide Fisheries Management Plan	Specifies a management goal of restoring westslope cutthroat trout int the Upper Missouri River drainage to 20% of their historically occupied habitat.	
Upper Missouri Westslope Cutthroat Conservation Strategy	FWP	Conservation Strategy	Defines conservation of WCT by securing existing populations in natal habitat as highest conservation priority.	

Pesticide Use Permit	USFS	Permit	Stipulates all personnel will either be registered as operators under this license or will be licensed applicators. b) Standard Personal Protective Equipment and appropriate signing will be used (label requirements). c) Project will be coordinated with the Beaverhead-Deerlodge National Forest d) National BMP's for Water Quality Management on NFS Lands will be implemented. Applicators and operators will adhere to FWP's Piscicide Use Policy and all product label requirements. e) Monitoring will be conducted using sentinel fish to determine the effectiveness of treatments and to ensure that rotenone is degraded to less than lethal concentration. A colorimeter will be used to measure the residual neutralizing agent below the neutralization station.
Pesticide Discharge Permit	DEQ	Permit	Regulates pesticide application to waters of Montana and requires annual reporting.
Pesticide Applicator License	Department of Agriculture	Permit	Certifies and licenses annually all pesticide applicators, enforces the label requirements, mandates pesticide use documentation.
404	ACOE	Permit	Regulates Potential Wetland Impacts. Wetland delineation completed (Geum 2024)

VI. Alternatives Considered

Alternative 1: No action

Under the "No Action" alternative, the proposed project would not occur. Therefore, no additional impacts to the physical environment or human population in the analysis area would occur because of the proposed project.

The no action alternative would result in continued status quo fisheries management in Dutchman Creek. Although the no action alternative would not conserve WCT, the brook trout fishery would remain and it is likely that WCT will be extirpated from Dutchman Creek within 5 years.

Loss of another non-hybridized WCT population would adversely impact the State's obligation to conserve native fish and may contribute to potential future listing under the ESA. Although there is limited angling in Dutchman Creek, the no action alternative would maintain the existing fisheries and provide uninterrupted opportunities for angling. The no action alternative would also avoid short-term impacts of rotenone on non-target aquatic invertebrates.

Alternative 2: Proposed Project

FWP proposes to secure Dutchman Creek WCT by removing brook trout upstream of a constructed fish barrier using the piscicide rotenone. FWP would salvage WCT prior to brook trout removal and restock them once the project is completed. Reference Section IX below for an analysis of potential impacts to the human environment associated with the proposed project.

	Yes*	No
Were any additional alternatives considered and dismissed?	☒	☐

* If yes, a list and description of the other alternatives considered, but not carried forward for detailed review is included below

Other Alternatives Not Carried Forward for Detailed Analysis

Alternative 3: Mechanically remove brook trout from the Dutchman Creek.

This alternative would attempt to conserve native WCT in Dutchman Creek by removing brook trout with electrofishing rather than rotenone. Multiple-pass electrofishing has been used to eradicate nonnative trout from several small streams in northcentral and southwest Montana. Electrofishing can be an effective means of capturing fish in streams; however, successful eradication of fish using electrofishing is limited to small, simple systems (i.e., <3 miles length, <10 feet wide, little to no instream woody debris; Shepard et al. 2014). Generally, electrofishing is only 50-70% efficient at capturing fish depending on the type of habitat and fish size distribution. Electrofishing removal is very labor intensive, inefficient at capturing juvenile fish, and requires multiple years to allow juvenile fish to grow to the size where they can be readily captured. The project reaches where electrofishing removals have been successful were generally less than 3 miles in length and required up to 25 electrofishing removal passes over several years to eradicate the target species (Shepard et al. 2014). Each electrofishing pass generally requires a crew of 3 to 9 people and would likely occur over at least 10 years. Ultimately, removing brook trout from Dutchman Creek with electrofishing would likely be unsuccessful because of the length of stream (11 miles total) and the complexity of the habitat. Such an effort would be impractical and cost prohibitive given other methods for accomplishing the same goals, such as the proposed action. Further, it is uncertain if 100% removal of non-native trout could be achieved with electrofishing given the length of the stream and the complexity of the habitat in Dutchman Creek. Finally, the reach of stream near the Forest Service boundary that flows underground requires the use of a piscicide for fish removal. For these reasons, this alternative was eliminated from further consideration.

VII. Terms Used to Describe Potential Impacts on the Physical Environment and Human Population

The impacts analysis identifies and evaluates **direct**, **secondary**, and **cumulative impacts**.

- **Direct impacts** are those that occur at the same time and place as the action that triggers the effect.
- **Secondary impacts** "are further impacts to the human environment that may be stimulated or induced by or otherwise result from a direct impact of the action." ARM 12.2.429(18).
- **Cumulative impacts** "means the collective impacts on the human environment of the proposed action when considered in conjunction with other past and present actions related to the proposed action by location or generic type. Related future actions must also be considered when these actions are under concurrent consideration by any state agency through pre-impact statement studies, separate impact statement evaluation, or permit processing procedures." ARM 12.2.429(7).

Where impacts are expected to occur, the impact analysis estimates the **extent, duration, frequency,** and **severity** of the impact. The duration of an impact is quantified as follows:

- **Short-Term**: impacts that would not last longer than the proposed project.
- **Long-Term**: impacts that would remain or occur following the proposed project.

The severity of an impact is measured using the following:

- **No Impact**: there would be no change from current conditions.
- **Negligible**: an adverse or beneficial effect would occur but would be at the lowest levels of detection.

- **Minor**: the effect would be noticeable but would be relatively small and would not affect the function or integrity of the resource.
- **Moderate**: the effect would be easily identifiable and would change the function or integrity of the resource.
- **Major**: the effect would irretrievably alter the resource.

Some impacts may require mitigation. As defined in ARM 12.2.429, mitigation means:

- Avoiding an impact by not taking a certain action or parts of a project;
- Minimizing impacts by limiting the degree or magnitude of a project and its implementation;
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment; or
- Reducing or eliminating an impact over time by preservation and maintenance operations during the life of a project or the time period thereafter that an impact continues.

FWP may, as an alternative to preparing an EIS, prepare an EA whenever the action is one that might normally require an EIS, but effects which might otherwise be deemed significant appear to be mitigable below the level of significance through design, or enforceable controls or stipulations, or both, imposed by the agency or other government agencies. For an EA to suffice in this instance, the agency must determine that all the impacts of the proposed action have been accurately identified, that they will be mitigated below the level of significance, and that no significant impact is likely to occur. The agency may not consider compensation for purposes of determining that impacts have been mitigated below the level of significance. ARM 12.2.430(4).

A list of any mitigation strategies including, but not limited to, design, enforceable controls or stipulations, or both, as applicable to the proposed project is included in **Section VI** above.

FWP must analyze impacts to the physical and human environment for each alternative considered. The proposed project considered the following alternatives:

- Alternative 1: No Action
- Alternative 2: Proposed Project

VIII. Alternative 1: No Action. Evaluation and Summary of Potential Impacts on the Physical Environment and Human Population

Under the “no action” alternative, the proposed project would not occur. Therefore, no additional impacts to the physical or human environment in the analysis area would occur. The no action alternative forms the baseline from which the potential impacts of the proposed Project can be measured.

IX. Alternative 2: Proposed Action. Evaluation and Summary of Potential Impacts on the Physical Environment and Human Population

A. Evaluation and Summary of Potential Impacts on the Physical Environment

1. Terrestrial, Avian, and Aquatic Life and Habitats

Existing Environment/No Action Alternative

The terrestrial and aquatic habitat and species present in the Dutchman Creek drainage are typical of those found throughout the Helena-Lewis and Clark National Forest. Downstream of the Forest Boundary, timber harvest and livestock grazing influence physical habitat in the area. The riparian areas of Dutchman Creek are also heavily forested with occasional reaches with small meadow habitat.

The aquatic habitat consists for the most part of moderate gradient Rosgen "B" type stream channel dominated by boulders and large cobble substrates. The fishery in Dutchman Creek is dominated by brook trout with Rocky Mountain sculpin also being present in the lower reaches of the stream. Brown Trout are present, but rare. WCT are confined to the headwaters of the stream, and under the no action alternative, the brook trout fishery would remain in reaches downstream of the Forest boundary and continue to expand upstream and eliminate the small, remaining WCT population.

The extirpation of WCT from Dutchman Creek is likely in the next 5 years. Loss of another non-hybridized WCT population would adversely impact the State's obligation to conserve native fish and prevent their potential listing under the ESA. The loss of any native WCT populations would be a setback for WCT conservation.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. The proposed project may result in impacts to terrestrial, avian, and aquatic life and habitats.

Terrestrial Habitats:

Direct, temporary impacts to terrestrial habitats would be expected and limited to trampling of vegetation by project personnel walking up and down the banks of Dutchman Creek and its tributaries during project implementation. The treatment of Dutchman Creek with rotenone would be performed by as many as 12 FWP, USFS and other partner personnel. Any trampling impacts on vegetation are anticipated to be unnoticeable within one growing season. Further, only a limited number of personnel would work on a particular section of stream each year (2-3), so potential impacts would be mitigated by a periodic lack of activity. These impacts would be further minimized by the use of existing trails and road systems to the extent practicable. Any direct impacts to terrestrial habitat would be short-term, negligible, and mitigated by personnel working primarily along the margins of the stream.

Terrestrial and Avian Life (Generally):

Terrestrial and avian life may be temporarily displaced because of the presence of personnel working in the area during the application of rotenone to Dutchman Creek and its tributaries. Further, the entire treatment is expected to last less than 5 days. Project personnel will also only be present in each affected reach of Dutchman Creek for a single day (less than 8 hours), so displaced terrestrial life would likely quickly return to the affected habitat. Any adverse direct impacts to terrestrial and avian life (generally) would be short-term, minor, and mitigated by personnel working primarily along the margins of the stream.

Mammals:

Mammals are not affected by rotenone at fish killing concentrations because, unlike fish, which are exposed to rotenone through their gills, terrestrial wildlife exposure occurs only through consuming

treated water and/or fish killed by rotenone. Ingested rotenone is rapidly broken down by enzymatic action in the stomach and intestines (AFS 2002). Therefore, the low concentrations of rotenone used to kill fish pose no risk to terrestrial wildlife. 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). Considering the only conceivable way terrestrial wildlife or domestic animals could consume rotenone under field conditions is by drinking treated water or consuming dead fish, a half-pound animal, such as a squirrel, would need to drink 16 gallons of water treated at 1 ppm rotenone in a 24 hour period to receive a lethal dose.

The EPA (2007) made the following conclusions 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). If fish were available for consumption by mammals scavenging along the shoreline for dead or dying fish, it is extremely unlikely that piscivorous mammals will consume enough fish to result in observable acute toxicity. Any direct impacts to mammals would be short-term and negligible.

Birds:

Similar results determined that birds, or avian life, 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 (avian life):

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. 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 LC50 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 extremely unlikely that piscivorous birds will consume enough fish to result in a lethal dose. Any direct impacts to avian life would be short-term and negligible.

Fish:

The purpose of the project is to remove brook trout in Dutchman Creek upstream of the fish barrier to restore native WCT. Adverse project impacts would be minor because brook trout are the most wide-spread and abundant game fish in the Elkhorn Mountain WMU, and the established fisheries management goal is to manage 80% of the available habitat in the Upper Missouri River Basin for non-native trout like brook trout (Statewide Fisheries Management Program and Guide, FWP 2019). Therefore, although the proposed action will result in the loss of a brook trout fishery, the vast majority of available fish-bearing habitat in the Dutchman Creek drainage will be managed for non-native fish, including brook trout. Also, the loss of the fishery will be temporary because WCT would repopulate the available habitat and provide a recreational fishery similar to the current brook trout fishery. The impacts to WCT will be long-term, major, and beneficial (Statewide Fisheries Management Program and Guide, FWP 2019).

Rocky Mountain sculpin are also present in the lower reaches of Dutchman Creek. Sculpin are susceptible to rotenone but have a higher tolerance than trout species. Recent studies suggest that sculpin generally survive rotenone treatments at the concentrations used to remove trout. We anticipate that sculpin will survive the rotenone treatments, but if subsequent surveys in Dutchman Creek fail to detect sculpin, fish will be capture below the fish barrier and released upstream. Any direct impacts to Rocky Mountain sculpin are anticipated to be short term and minor and can be mitigated to avoid any long-term impacts.

Aquatic Invertebrates:

Numerous studies indicate that rotenone can have acute and sometimes substantial impacts on aquatic invertebrates, but studies also show these impacts are short-term and that invertebrate communities generally rebound to pre-project abundance and diversity within 1 year. 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). Some have reported delayed recovery of taxa richness (number of taxa present) following rotenone treatments, but many of these treatments were at higher concentrations than proposed in this treatment (Mangum and Madrigal 1999). Finlayson et al. (2010) summarized high concentrations of rotenone (>100 ppb) and treatments exceeding 8 hours, typically resulted in severe impacts to invertebrate richness and abundance. Conversely, lower rotenone concentrations (<50 ppb as is proposed in Dutchman Creek) and treatments less than 8 hours (4 hours proposed in Dutchman Creek), resulted in less impact to invertebrate assemblages. Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation). In all cases, the reduction of aquatic invertebrates was temporary, and most treatments used a higher concentration of rotenone than proposed for this project (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 communities due to a rotenone treatment would be similar to what is observed after natural (e.g. fire) and anthropogenic (livestock grazing) disturbances (Wohl and Carline 1996; Mihuc and Minshall 1995; Minshall 2003), though the physical impacts and resulting modifications of invertebrate assemblages after these types of disturbances can last for a much longer period than a piscicide treatment. Because of their short life cycles (Matthaei et al. 1996), good dispersal ability (Pennack 1989), and generally high reproductive potential (Matthaei et al. 1996), aquatic invertebrates are capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et

al. 1996). Headwater reaches and tributaries that do not hold fish would not be treated with rotenone and would provide a source of aquatic invertebrate colonists that would drift downstream. In addition, recolonization would include aerially dispersing invertebrates from downstream areas (i.e., mayflies, caddis, stoneflies). Therefore, the possibility of eliminating a rare or endangered species of aquatic invertebrates by treating with rotenone is unlikely. Further, the Montana Natural Heritage Program lists no aquatic invertebrate species of concern or potential species of concern in Dutchman Creek. Based on these studies, FWP would expect the aquatic invertebrate species composition and abundance to return to pre-treatment diversity and abundance within one to two years after treatment. Therefore, any adverse impacts to aquatic invertebrate communities would be short-term and minor to moderate.

Amphibians and Reptiles:

Amphibians and reptiles potentially found within the proposed treatment area include: long-toed salamanders (*Ambystoma macrodactylum*), spotted frogs (*Rana pretiosa*), western toads (*Bufo boreas*) (amphibians), western terrestrial garter (*Thamnophis elegans*), common garter (*T. sirtalis*), and rubber boa (*Charina bottae*) snakes. Rotenone can be toxic to gill-breathing larval amphibians, though air breathing adults are less sensitive. Reptiles would not be directly affected by the rotenone treatment because they are highly resistant to rotenone at fish killing concentrations. 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 rotenone 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.

Although not confirmed, western toads are potentially present in the watershed. If present, any reduction in amphibian abundance would be expected to be short term because of the low sensitivity of adults to rotenone, and because reproductive habitats will not be targeted for treatment as they generally lack fish. For example, spotted frogs and toads generally seek out shallow lentic areas for reproduction. Such habitats are not common in Dutchman Creek which has moderate gradient with a narrow floodplain. These shallow habitats are generally found in ephemeral pools that do not have fish and therefore would not be treated with rotenone. Further, adult frogs would not be affected by the stream treatment. Any direct impacts to amphibians would be short-term and minor to moderate.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Following treatment with rotenone, short-term and minor adverse secondary impacts to mammals, birds, amphibians, and reptiles would be expected due to the temporary and minor loss or reduction of food sources, such as fish and aquatic invertebrates in Dutchman Creek. Mink, blue heron, kingfisher, and other potential piscivorous mammals and birds may be displaced for up to 2 years after treatment and fish absence from upper Dutchman Creek. Any adverse impacts would be minor because no mammal species present in the Dutchman Creek drainage are fish obligates and other potential food sources for these organisms will not be affected by the proposed action. Further, piscivorous avian species are mobile and, as such, would have access to other nearby waters where fish are more abundant. Therefore, any impacts to these species would be limited to temporary displacement until WCT repopulate the stream.

Some snakes are also known to consume fish from streams; therefore, snakes may realize a temporary and minor reduction in available food because of the proposed piscicide treatment. However, none of the reptiles known to be present in the Dutchman Creek drainage are fish obligates. Further, WCT would be available to snakes within a few years after treatment. Therefore, any adverse secondary impacts would be short-term and minor.

A reduced abundance of aquatic invertebrates may temporally impact adult amphibians and potentially some bird species that prey on these species. Bird species such as the American dipper which feeds primarily on aquatic invertebrates may be temporarily displaced to nearby streams where invertebrates would not be affected. However, the aquatic invertebrate community is expected to recover rapidly, and most amphibians and reptiles are not aquatic invertebrate obligates, relying also on terrestrial invertebrates for food. Therefore, any adverse secondary impacts would be short-term and minor.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. Cumulative impacts from the proposed project would include substantial benefits for WCT conservation. According to the Statewide Fisheries Management Program and Guide (FWP 2019), the WCT conservation goal for the Upper Missouri River basin is to restore secured WCT populations to 20% of their historical range. The highest priority of the Westslope Cutthroat Trout Conservation Strategy for the Missouri River Headwaters of Southwest Montana (Jaeger et al. 2022) is to secure existing non-hybridized populations of WCT in their natal habitat to conserve the remaining genetic diversity left on the landscape. The Dutchman Creek WCT restoration project would fulfill the two primary objectives of these strategies. Further, the proposed project would mitigate against the potential for future federal ESA-listing of WCT, as required by § 87-5-107, MCA.

FWP is unaware of any other past or present related state projects that would impact terrestrial, avian, and aquatic life and habitats in the Dutchman Creek drainage. FWP has not previously treated the affected section of Dutchman Creek with rotenone.

2. Water Quality, Quantity, and Distribution

Existing Environment/No Action Alternative

The headwaters of Dutchman Creek is a relatively pristine basin with no known water quality impairments. Downstream of the Forest Service Boundary, timber harvest and livestock grazing are ongoing. There are no domestic wells within 1.8 miles of or irrigation water use within project area.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. The proposed action would intentionally introduce the pesticide rotenone to surface water to completely remove non-native brook trout from the affected section of Dutchman Creek. CFT Legumine (5% rotenone) is an EPA registered pesticide and is deemed 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 formulation to one million parts of water (ppm).

Once applied to water, rotenone is susceptible to rapid natural breakdown through a variety of mechanisms. This first means of natural detoxification is influenced by 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 the half-life of rotenone (amount of time it takes for 50% of the compound to naturally decompose) once applied to water was 3.5 to 5.2 days. The second method of natural detoxification is dilution, which occurs when untreated ground or surface water flows into a lake or stream. The combination of natural breakdown and dilution in streams usually results in complete detoxification of rotenone with 24-48 hours. In addition to natural methods of breakdown, rotenone can be rapidly neutralized through 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 15-30 minutes of exposure time between the two compounds (Prentiss Inc. 1998, 2007).

Detoxification would be used in Dutchman Creek at the fish barrier to prevent any treated waters from traveling downstream and affecting fish outside of the treatment area. Rotenone neutralization would commence according to FWP Rotenone Deactivation Procedures found in the FWP Piscicide Policy which states that detoxification with KMnO4 will begin no less than 2 hours before the theoretical arrival time of treated waters at the detoxification station. Therefore, KMnO4 application would begin no less than 2 hours before any rotenone treated waters would be present at the fish barrier and would continue until all treated waters have passed over the fish barrier and sentinel fish placed in the stream below the barrier survive for four hours with no signs of stress.

The efficacy of the detoxification of rotenone in the stream would be measured in two ways: first, sentinel fish would be placed in the stream 30 minutes of water travel-time downstream of the fish barrier; second, residual KMnO4 levels would be measured at the 30-minute downstream location with a handheld meter. A minimum of 0.5-1.0 ppm KMnO4 residual at 30 minutes is required to fully neutralize rotenone. After the rotenone is applied, FWP would expect the rotenone to pass through the Treatment Area within a 24 to 48-hour time period and be completely broken down by KMnO4 at the Deactivation Station. Any adverse direct impacts would be short-term, mitigated by the use of KMnO4, and minor.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Dead fish (brook trout and some Rocky Mountain sculpin) would result from the proposed project. As these fish decay, they may cause secondary impacts to water quality. Bradbury (1986) reported that 9 of 11 lakes 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 and invertebrate production. Any impacts to water quality resulting from decaying fish would be short term and minor.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP is unaware of any other past, present, or future related state projects that would impact water quality, quantity, and distribution in the Dutchman Creek drainage.

3. Geology

Existing Environment/No Action Alternative

The Elkhorn Mountains are located near the northeastern portion of the Boulder Batholith. Granites exposed in the project area are a key feature of the Boulder Batholith, and nearby mining of this geologic area was common. However, no significant mining occurred in the Dutchman Creek project area.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. Minimal ground disturbance due to installation wood-crib fish barrier is expected. No direct impacts to geological resources would be expected due to the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Minimal ground disturbing activities would occur because of the proposed project and the elimination of brook trout to protect native WCT in the affected section of Dutchman Creek result in any long-term or ongoing impacts to geology. Therefore, no secondary impacts to geological resources would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP is unaware of any past or present related state projects that would impact geology in the Dutchman Creek drainage. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population from the affected stretch of Dutchman Creek, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no impacts to geology of the affected area would be expected.

4. Soil Quality, Stability, and Moisture

Existing Environment/No Action Alternative

Because of the underlying granitic geology of western Elkhorn Mountain, decomposed granitic soils are common. Roads with granitic soils near waterways cause significant stream sedimentation in this area, but no road construction or significant ground disturbance will occur with the proposed project. The placement of the fish barrier in Dutchman Creek is the primary disturbance to soils in the area.

Direct Impacts

Minor adverse direct impacts would be expected because of the proposed project due to barrier installation. The barrier location will be secured with natural, on-site granitic boulders and erosion control BMP's. Therefore, direct impact to soils will be short term and minor.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP is unaware of any past or present related state projects that would impact soils in the Dutchman Creek drainage.

5. Vegetation Cover, Quantity, and Quality

Existing Environment/No Action Alternative

Lodgepole pine, Douglas fir, and Ponderosa pine trees dominate the proposed fish passage barrier site along with light shrub cover, native and introduced grass species. Species and abundance of riparian grasses are influenced by long-term livestock grazing.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. Short-term and negligible impacts to vegetation cover, quantity, and quality may occur because of the proposed project to install a fish barrier and for human traffic during rotenone treatments. Riparian (streamside) vegetation may be adversely and directly impacted by the trampling of plants from project personnel walking up and down the banks of and its tributaries to conduct the work necessary for the proposed project. Short term vegetation disturbance during barrier installation will be mitigated via revegetation.

The rotenone treatment of Dutchman Creek would be performed by about 12 FWP, USFS, and other partner personnel. Further, only a limited number of personnel (2-3) would operate in each affected stream reach at any given time, thereby mitigating any potential impacts from trampling of plants. Two sensitive plant species are potentially present in the Dutchman Creek drainage (white bark pine and Lemhi Beardtongue); however, neither of these identified sensitive species is likely to be present in the riparian area where most foot traffic would occur to accommodate the proposed project. It is expected any impacts to plants would be unnoticeable within one growing season. Additional mitigation would occur by project personnel accessing the affected area(s) using existing trail and road systems to the extent practicable. Historically, human activity has been limited. Any adverse direct impacts would be short-term, negligible, and mitigated by personnel work practices intended to limit impacts.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Rotenone does not affect plants at concentrations used to kill fish as plants lack the rapid absorption route fish possess (gills). Disturbance of vegetation during barrier installation in a confined area will be reclaimed.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, the same potential direct and secondary impacts to vegetation, as previously described, would be expected. FWP is unaware of any other past, present, or future related state projects that would impact vegetation cover, quantity, and quality in the affected area. Further, no ground disturbing activities would occur

because of the proposed project. Therefore, no cumulative impacts would be expected because of the proposed project.

6. Aesthetics

Existing Environment/No Action Alternative

The aesthetic resources of the Dutchman Creek drainage include steep mountain forests with small, fast flowing streams. Roads, past mining activities, livestock grazing, and timber harvest have historically impacted the natural aesthetics of the drainage (see Existing Environment/No Action Alternative for Terrestrial, Avian, and Aquatic Life and Habitats above).

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. Dead fish would result from the proposed Dutchman Creek project and may cause objectionable odors. Most of the dead fish will naturally sink to the bottom and decay. Complete decomposition would be expected in 1-2 weeks. The wood fish barrier will be observed from an existing private road but will fit into the existing landscape.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Neither the elimination of brook trout to protect native WCT in the affected section of Dutchman Creek nor the installation of a fish barrier would impact the long-term aesthetic nature of the affected area. Therefore, no secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no significant adverse cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact aesthetics of the affected area.

7. Air Quality

Existing Environment/No Action Alternative:

Air quality in the area affected by the proposed project is currently unclassifiable or in compliance with applicable National ambient air quality standards (NAAQS). Further, no significant point-sources of air pollution exist in the area affected by the proposed project. Existing sources of air pollution in the area are limited and generally include unpaved county roads (fugitive dust source), vehicle exhaust emissions, and various agricultural practices (vehicle exhaust emissions and fugitive dust).

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. Under the proposed action, vehicles used to transport equipment and personnel to and from the project area will cause exhaust fumes and road dust. Such impacts would be short-term and negligible. The proposed

project would not cause or contribute to a violation of any applicable NAAQS as there are no air quality restrictions in the area and the amount and duration of the emissions would be short-term and negligible. Most roads that would be used to perform the work described above are unimproved dirt roads; therefore, as vehicles travel the roads fugitive dust would be generated. The production of fugitive dust may pose localized and negligible impacts to air quality and would not exceed those posed by typical (pre-project) vehicle and ATV traffic on the affected roads. Any impacts to air quality would be short-term, mitigated by work practices, and negligible.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The elimination of brook trout to protect native WCT in the affected section of Dutchman Creek. Therefore, no secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact aesthetics of the affected area.

8. Unique, Endangered, Fragile, or Limited Environmental Resources

Existing Environment/No Action Alternative.

The Montana Natural Heritage Program lists the Canada lynx (*Lynx canadensis)* and grizzly bear (*Ursos arctos)* as Threatened Species that may be present in the Dutchman Creek drainage. Species of Concern that may be present in the drainage include wolverine (*Gulo gulo)* (mammal), westslope cutthroat trout (aquatic), northern goshawk (*Accipiter gentilis)*, great gray owl (*Strix nebulosa)*, brown creeper (*Certhia americana), evening grosbeak (Coccothraustes vespertinus), Cassin's finch (Haemorhous cassinii), pileated woodpecker (Dryocopus pileatus)* (birds), *western toad (Anaxyrus boreas) (*amphibian*), Schreber's Dicranella (Dicranella schreberiana)* (moss)*, whitebark pine (Pinus albicaulis),* and Lemhi Beardtongue *(Penstemon lemhiensis)* (plants).

WCT are in significant peril and would likely be extirpated from the Dutchman Creek drainage due to the colonization of the headwaters of the stream by brook trout. Brook trout are known to compete with and prey upon native WCT which may result in the loss of WCT from the affected stream. Brook trout are the main cause for WCT decline in the Elkhorn Mountains. The loss of WCT from Dutchman Creek would be a significant impact to the long-term conservation goals for native WCT.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. The proposed project is located within potential grizzly bear habitat, but there are no known grizzly bears currently inhabiting the area. Further, the proposed project would have little or no impact on grizzly bears because mammals are not sensitive to rotenone at concentrations used to kill fish. There would be no impact on grizzly bears that consume fish killed by rotenone or treated waters. See analysis of impacts to *Terrestrial, Avian, and Aquatic Life and Habitats* for additional discussion of potential rotenone

impacts on mammals. Direct potential impacts to grizzly bears would include potential short-term (< one week) displacement due to increased human presence along the affected section of Dutchman Creek.

The proposed project is also within the range of the Canada lynx. Lynx are known to be present near the project area (Elkhorn Mountains), but there are no known lynx in the Dutchman Creek drainage. Adverse impacts to any lynx that may use or travel through the affected area include temporary only temporary displacement when personnel are present. The affected area, which may be used by lynx, includes multiple drainages with similar habitat structure and resources; therefore, it would be expected such areas would be readily used by any lynx or grizzly bears that may be located within or pass through the affected area.

No impacts would be expected from grizzly Bears or lynx consuming treated waters or fish killed by rotenone for the reasons previously noted. See analysis of impacts to *Terrestrial, Avian, and Aquatic Life and Habitats* for additional discussion of potential rotenone impacts on mammals. Therefore, any impacts to grizzly bears or lynx would be short-term and minor. Further, given the existing impacts of fire in the affected area, it is likely both grizzly bears and/or lynx would seek out other areas of more suitable habitat and not likely be present in the area affected by the proposed project.

Wolverine, great gray owl, brown creeper, evening grosbeak, Cassin's finch, pileated woodpecker, and sage grouse are listed as species of special concern present in the affected area. Direct impacts may include temporary displacement of these species of concern due to increased human activity in the drainage. No machinery, helicopters or other heavy equipment would be used during the project. Pickup trucks and possibly ATVs would be used on existing open roads to access the streams. Personnel would further limit potential impacts by travelling up and down the stream on foot and accessing the project area using existing roads.

Aquatic Life:

WCT are considered a Sensitive Species and a Species of Concern. The intent of the proposed project is to conserve native WCT by removing non-native brook trout from Dutchman Creek. Native WCT, which exist only in the headwaters of Dutchman Creek, would be secured within more than 3 miles of habitat. Therefore, it is anticipated any direct impacts to WCT in the affected area would be long-term, moderate, and beneficial.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The restoration of WCT to Dutchman Creek would benefit Western pearlshell mussels, if in the future Western Pearlshell were introduced into Dutchman Creek. Mussels require a fish host to complete their life cycle and their native host is WCT. Brook trout can host larval mussels on their gills, but recent studies suggest non-native fish, such as brook trout, develop a natural immunity to larval mussel colonization which does not occur for WCT. Therefore, if a remnant mussel population remains in Dutchman Creek, the restoration of WCT could benefit species reproduction and aid in its potential future restoration and/or long-term persistence in the stream. Any impacts would be long-term, moderate, and beneficial.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. Cumulatively, the proposed project would benefit WCT conservation efforts which would help FWP meet its obligation to prevent species from becoming listed as threatened or endangered under the ESA

The long-term goal for WCT conservation is to restore secure conservation populations of WCT to 20% of their historic tributary distribution east of the Continental Divide (Upper Missouri River Basin upstream from and including the Judith River; FWP 2019). Collectively, WCT conservation projects like the one proposed for Dutchman Creek are intended to secure a small amount of the overall fish-bearing habitat for WCT to ensure the species long-term, self-sustaining persistence while managing the vast majority of habitat (80%) for non-native fish like brook trout, rainbow trout, and brown trout.

FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatments are unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact aesthetics of the affected area.

9. Historical and Archaeological Sites

Existing Environment/No Action Alternative

Maintaining the existing environment would have no effect on cultural resources. The Dutchman Creek drainage, and the northern Elkhorn Mountains in general, have been home to tribes including the Crow Tribe, Blackfeet Nation, Confederated Salish and Kootenai Tribes, and the Shoshone-Bannock Tribes since time immemorial. Indigenous peoples have traditionally used these upland landscapes for hunting, fishing, and gathering abundant plant resources. Precontact sites in the general project vicinity include campsites, hunting blinds, and places where people were procuring the raw material they used to make stone tools. The Dutchman Creek drainage also falls within the historic Alhambra Mining District, which dates back to the 1860s, and included some relatively large lode mining efforts and some smaller placer mines. The historic townsite of Ruddville, which grew up around some of this mining activity, is located a few miles east of the project area. Ruddville was founded in approximately 1865 by Dr. A.F. Rudd, and many of his placer claims were later leased to Chinese-American miners who worked these claims into the 1890s. Cultural sites related to historic logging activity are also common in the northern Elkhorn Mountains.

Direct Impacts

No significant adverse effects to historic and archaeological sites would be expected because of the proposed project. In keeping with the Montana Antiquities Act and related regulations (12.8.501-12.8.510), all undertakings on state lands are assessed by a qualified archaeologist or historian for their potential to affect cultural resources. The process for this assessment may include a cultural resource inventory and evaluation of cultural resources within or near the project area in consultation with the State Historic Preservation Office. FWP also consults with all Tribal Historic Preservation Offices affiliated with each property in accordance with FWP's Tribal Consultation Guidelines. If cultural resources within or near the project area are recorded that are eligible for the National Register of Historic Places, they will be protected from adverse effects through adjustments to the project design or cancellation of the project if no design alternatives are available. If cultural resources are unexpectedly discovered during project implementation, FWP will cease implementation and contact FWP's Heritage Program for further evaluation.

Secondary Impacts

No significant adverse secondary impacts to cultural resources would be expected because of the proposed project. The elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would not result in any ongoing, long-term impacts to any cultural resources in the area affected by the proposed project. Therefore, no adverse secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts to cultural resources would be expected because of the proposed project. FWP is unaware of any other past, present, or future related state projects that would impact aesthetics of the affected area. No cumulative impacts to cultural resources would be expected because of the removal project or future WCT stocking activities; therefore, no adverse cumulative impacts would be expected because of the proposed project.

10. Demands on Environmental Resources of Land, Water, Air, and Energy

Existing Environment/No Action Alternative

The existing aquatic and terrestrial resources have been described previously in this document. Because the project area largely on the publicly owned and managed by Helena-Lewis and Clark National Forest, there are no known current demands on land, water, air, or energy.

Direct Impacts

No significant adverse impacts to demands on the environmental resources of land, water, air, and energy would be expected because of the proposed project. Fuel would be required to operate equipment used for the proposed project. However, any impacts would be limited by the anticipated short timeline of the proposed project and, as such, the amount of fuel used would be negligible. Therefore, any impacts to the demands for energy would be short-term and negligible. As identified previously through the analyses of potential impacts to water quality, quantity, and distribution; soil quality, stability, and moisture; vegetation cover, quantity, and quality; and air quality; some impacts to the environmental resources of land, water, and air may occur because of the proposed project. However, any such impacts would be short-term and negligible or minor (see cited impacts analyses above). No other impacts to the demands on environmental resources of land, water, air, and energy would be expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would not result in any ongoing, long-term impacts to demands for the environmental resources of land, water, air, and energy. Therefore, no secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial

rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact aesthetics of the affected area.

B. Evaluation and Summary of Potential Impacts of the Proposed Project on the Human Environment

1. Social Structures and Mores

Existing Environment/No Action Alternative

WCT and Yellowstone cutthroat trout (YCT) represent the two subspecies of native cutthroat found in Montana, and together they have been designated Montana's state fish. Many Montanans and visitors to the state hold high regard for WCT as an angling resource, an icon of the state, and a valuable component of the ecosystems in which they reside. As such, WCT, and associated recreational values, are deeply engrained in the customs and lifestyles of residents and visitors to Montana alike.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. The restoration of WCT to Dutchman Creek may be viewed as restoring the cultural values of the existing and historic human population in the area affected by the proposed project. As the only native trout to Dutchman Creek, restoration of WCT would revert the fishery to its aboriginal state. WCT restoration projects statewide generally have the support of indigenous tribes and many who enjoy fishing for and otherwise appreciate native species on the landscape. Others who recreate on Dutchman Creek may view the loss of the existing and invasive brook trout fishery as an adverse impact. Brook trout have been present in Dutchman Creek for decades. Any direct impacts associated with the elimination of brook trout from the affected section of the stream would be mitigated by other opportunities to fish for the species, as numerous surrounding streams will continue to provide brook trout fisheries, including the 1.5 miles of Dutchman Creek downstream of the fish barrier where the brook trout fishery would be unaffected by the proposed project.

The intent of the proposed project is to sustain native WCT by eliminating competition from non-native and invasive brook trout. Therefore, the proposed project would directly benefit any person who enjoys fishing for WCT or otherwise values the species' existence, the State of Montana, and the ecosystem in which they reside. Further loss of WCT conservation populations would result in a reduction in the remaining range of WCT and could lead to listing under the ESA, changing state management of the species, and likely limiting public opportunity to fish for and otherwise interact with and enjoy this native fish species in Dutchman Creek. It is also possible that WCT would become locally extinct (extirpated) in Dutchman Creek, thereby forever altering this valued species. Any direct impacts from the proposed project would be long-term, beneficial, and moderate.

Secondary Impacts

No significant secondary impacts would be expected because of the proposed project. The elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would not result in any ongoing, long-term impacts to current land use or human activities in the affected area. However, many Montanans, and those visiting the state for outdoor recreational purposes, hold high regard for the conservation of native species on the landscape, including WCT. Under the no action alternative, it is

likely WCT would be extirpated from Dutchman Creek within 5-10 years. Therefore, because the proposed project would sustain and improve WCT populations and associated recreational opportunities in the affected area, the proposed project would preserve important pre-project social structures, customs, values, and conventions associated with WCT in the affected area.

Again, others who recreate on Dutchman Creek may view the loss of the existing and invasive brook trout fishery as an adverse impact as brook trout have been present in Dutchman Creek for decades. However, any secondary impacts associated with the elimination of brook trout from the affected section of the Dutchman Creek would be mitigated by other opportunities to fish for the species as numerous surrounding streams will continue to provide brook trout fisheries and the 1.5 miles of Dutchman Creek downstream of the fish barrier where the brook trout fishery would be unaffected by the proposed project. Any adverse secondary impacts would be long-term and minor.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact social structures and mores of the affected human population.

2. Cultural Uniqueness and Diversity

Existing Environment/No Action Alternative

The proposed project would be largely located within the Helena-Lewis and Clark National Forest. National Forest lands provide areas of natural beauty and an abundance of free public recreational opportunities such as fishing, hunting, and hiking. The Dutchman Creek drainage and its relatively remote and natural setting would remain a desired public resource as there are no residences within the drainage and only dispersed camping and other outdoor recreational activities currently occur within the affected area.

Direct Impacts

No significant direct impacts to the cultural uniqueness and diversity of the affected human population would be expected because of the proposed project. It is not expected that the elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would result in the relocation of people into or out of the affected area. Therefore, no impacts to existing cultural uniqueness and diversity of the affected human population would be expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. It is not expected this action would result in any relocation of people into or out of the affected area. Therefore, no impacts to the existing cultural uniqueness and diversity of the affected area would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact social structures and mores of the affected human population.

3. Access to and Quality of Recreational and Wilderness Activities

Existing Environment/No Action Alternative

Under the No Action alternative there would be no change in access to and the quality of recreational activities in the Dutchman Creek drainage. Most of the Dutchman Creek watershed is located on public lands managed by the USFS. Private ownership downstream of the project area limits public access and the proposed project does not change access.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. There would be a temporary loss of angling opportunity in Dutchman Creek for a period of time to enable WCT to repopulate the stream. The lower reaches of Dutchman Creek downstream of the project area are on private property where access is gained only through landowner permission. Once WCT are established and reproducing, it would be expected they would provide the same or improved angling opportunities as the existing non-native brook trout fishery provides today. It should be noted that Dutchman Creek is small and does not receive much angling pressure. To mitigate potential impacts, anglers would have the opportunity to fish in the many adjacent streams and/or downstream of the fish barrier where angling opportunities will remain unchanged. Multiple streams of similar size, and with similar fisheries to the existing Dutchman Creek fishery, exist within 10 miles of Dutchman Creek. These streams provide ample opportunities to angle for brook trout in a small stream. Therefore, any impacts would be short-term and negligible.

Access to the Dutchman Creek drainage would be restricted during and for a period of 2-4 days after rotenone treatment to prevent human exposure to rotenone (see below). This would include closing the private road accessing the Dutchman Creek drainage. Access restrictions would impact local owners and not the general public.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. People who recreate on Dutchman Creek may view the loss of the existing and invasive brook trout fishery as an adverse impact as brook trout as brook trout have been present in Dutchman Creek for decades. However, the long-term goal for WCT conservation in Montana is to restore secure conservation populations of WCT to 20% of their historic tributary distribution east of the Continental Divide (Upper Missouri River Basin upstream from and including the Judith River; FWP 2019). Mainstem rivers and larger streams such as Prickly Pear Creek, support important non-native recreation fisheries (i.e. brown, brook, and rainbow trout) and are not part of this conservation goal. FWP recognizes the value of non-native trout fisheries and would continue to manage 80% of the streams in the upper Missouri River for

non-native fish such as brook, rainbow, and brown trout. Therefore, any secondary impacts would be short-term, adverse, and negligible and long-term, beneficial, and moderate.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatments are unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no additional cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact social structures and mores of the affected human population.

4. Local and State Tax Base and Tax Revenue

Existing Environment/No Action Alternative

Most of the land within the proposed project area are within the Helena-Lewis and Clark National Forest, which are not subject to any local or state taxes. The small portion of the project on the Madison Ranch property will have no action that impacts tax status.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project. The proposed project does not involve the acquisition of land or property, production of any products, or displacement of any existing businesses. However, the proposed project would be expected to increase state and local tax revenues from the sale of fuel, supplies and/or equipment necessary to complete the proposed project. Any direct impacts would be short-term and negligible, lasting only as long as the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The proposed project does not involve the acquisition of land or property, production of any products, or displacement of any existing businesses. However, some local businesses rely largely on recreation as a staple source of income and many people visiting the area to recreate currently seek opportunities to fish for Montana's native WCT. The proposed project would, in part, further the ongoing objective to conserve native WCT and would create a new WCT fishery in Calvert Mine Pond for the enjoyment of current and future fishing recreation. Any secondary impacts to the local and state tax base and tax revenue would be long-term, beneficial, and minor.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact local and state tax base and tax revenues.

5. Industrial, Commercial, and Agricultural Activities and Production

Existing Environment/No Action Alternative

No industrial or commercial or agricultural activities currently occurring within the Dutchman Creek watershed on private or public land will be affected by the project.

Direct Impacts

No significant direct impacts would be expected because of the proposed project. It is not expected the elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would result in any direct impact to commercial, industrial, or agricultural activities and production. Therefore, no direct impacts would be expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. It is not expected the elimination of brook trout to protect native WCT in the affected section of Dutchman Creek would result in any impact to commercial, industrial, or agricultural activities and production, including any future timber harvest and sales. Therefore, no secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact social structures and mores of the affected human population. When combined with other WCT conservation projects, beneficial impacts on agricultural activities would be expected as a result of the proposed action. Currently non-native fish pose the greatest risk to WCT conservation, not grazing or logging. Any impacts of brook trout removal on WCT would be long-term, beneficial, and moderate.

6. Human Health and Safety

Existing Environment/No Action Alternative.

There are no known human health or safety concerns within the Dutchman Creek drainage due to the relatively pristine character of the watershed.

Direct Impacts

No significant direct impacts would be expected because of the proposed project. The primary means of protecting human health from the potential impacts of rotenone application are to follow the label requirements. These include public entry restrictions into a treatment area and preventing consumption of rotenone killed fish. Applicators of rotenone face the highest probability of being exposed to rotenone. Their safety would be protected by the use of label-required PPE including gloves, waders, eye protection, and a paper respirator. The EPA (2007) conducted an analysis of the human

health risks for rotenone and concluded it has a high acute toxicity in its concentrated form for both oral and inhalation routes but has a low acute toxicity for dermal route of exposure. However, when diluted with water at concentrations proposed for the treatment of Dutchman Creek, no adverse impacts to human health and safety would be expected. Rotenone is not an eye or skin irritant nor a skin sensitizer. The EPA concluded there is a low risk for human chronic risk from exposure to rotenone treated water based on four principal reasons: 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.

Rotenone is a naturally occurring substance derived from tropical plants in the bean family such as the jewel vine *Derris spp.* and lacepod *Lonchocarpus spp.* that are 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 (Teixeira, et al. 1984). The plant roots that produce rotenone also produce other similar compounds, collectively called rotenoids. Rotenone is produced in the greatest quantity and has the greatest toxic effect on fish; the next most active rotenoid is deguelin. These two rotenoids degrade under different environmental conditions to rotenolone and tephrosin, respectively. The EPA (2007) and Fang and Cassida (1997) concluded these other rotenoids are less toxic than rotenone.

Risk to humans from recreational exposure to rotenone should be negligible. The EPA (2007) established 90 ppb as a threshold level of concern for recreational exposure, meaning there will be no health effects on humans exposed to levels in water below 90 ppb. Swimming is the primary recreational activity of concern to the EPA, and rotenone labels require the posting of placards at public access points to the treatment area prohibiting access while rotenone is being applied. If the stream is treated with less than 90 ppb rotenone, the placards can be removed immediately after the treatment is over; Dutchman Creek by comparison will be treated at 50 ppb. Also, during application, personnel would be onsite to inform the public and escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by adding KMnO4 to the stream at the existing fish barrier which 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 handheld meter. Therefore, the potential for public exposure to rotenone treated waters is minimal and no direct impacts would be expected as a result of the proposed project.

Risk to humans from drinking rotenone treated water should also be negligible. The EPA (2007) established a threshold level of concern of 40 ppb rotenone for drinking water. Although Dutchman Creek will be treated at 50 ppb, placards will prohibit entry to the water within the project area during treatment to prevent exposure. Potassium permanganate (KMnO4) will be applied at the Deactivation Station to all water flowing out of the project area to degrade and eliminate rotenone. Following deactivation with KMnO4, rotenone will be undetectable (< 1 ppb) and well below the threshold level of concern (40 ppb) making incidental consumption of this water by humans, while not expected, entirely safe. There is a possibility that domestic wells with hydrologic connectivity to treated surface waters could be contaminated by rotenone; however, there are no wells within 1.8 miles downstream of the treatment area in Dutchman Creek so this is not a relevant issue for this project. Even if there were wells in the area, contamination of groundwater is very unlikely because rotenone has a high affinity for partitioning from water to organic materials in aquifers. Extensive well sampling in areas proximal to rotenone treatments in California, Washington, and Montana has never found measurable levels of rotenone (Finlayson et al 2018).

Fisher (2007) conducted an analysis of the inert constituent ingredients found in the rotenone formulation of CFT Legumine (5% rotenone) for the California Department of Fish and Game. These inert ingredients are principally found in the emulsifying agent Fennodefo99 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 CFT Legumine. However, inconsistent detectability and low occurrence in other formulations that used the same extraction process were below the levels for human health and ecological risk. Solvents such as toluene, n-butylbenzene, 1,2,4 trimethylbenzene, and naphthalene are present in Legumine, and when used in other applications can be an inhalation risk. However, because of their low concentrations in this formulation, the human health risk is low. The remaining constituents, the fatty acid esters, resin acids, glycols, substituted benzenes, and 1-hexanol were likewise present but either analyzed, calculated, or estimated to be below the human health risk levels when used in a typical fish eradication project. Methyl pyrrolidone is also found in Legumine. It is known to have 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). Fisher 2007 concluded, "None of the constituents identified are considered persistent in the environment nor will they bioaccumulate. The trace benzenes identified in the solvent mixture of CFT Legumine™ will exhibit limited volatility and will rapidly degrade through photolytic and biological degradation mechanisms. The PEGs are highly soluble, have very low volatility, and are rapidly biodegraded within a matter of days. The fatty acids in the fatty acid ester mixture (Fennodefo99™) do not exhibit significant volatility, are virtually insoluble, and are readily biodegraded, although likely over a slightly longer period of time than the PEGs in the mixture. None of the new compounds identified exhibit persistence or are known to bioaccumulate. Under conditions that would favor groundwater exchange, the highly soluble PEGs could feasibly transmit to groundwater, but the concentrations in the reservoir and the rapid biodegradation of these constituents, makes this scenario extremely unlikely. Based upon a review of the physical chemistry of the chemicals identified, FWP concludes they are rapidly biodegraded, hydrolyzed, and/or otherwise photolytically oxidized; therefore, the affected 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 exposure to water, or ingestion exposure scenarios, and no relevant regulatory criteria are exceeded in estimated exposure concentrations…"

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). However, the relevance of the results to the use of rotenone as a piscicide have been challenged based upon the following dissimilarities between the experimental methodology used and fisheries related applications: (1) 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 a matter of days because of the rapid breakdown of the rotenone following application. Further, dimethyl sulfoxide (DMSO) was used to 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's-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 1-2 ppm and are far below that administered during most toxicology studies.

A 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 2 states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. Rotenone is no longer used for agricultural applications and is only used in aquatic applications as a piscicide. The results of epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011), and some have found it difficult determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of the study. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products from this study.

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

No significant adverse direct impacts would be expected because of the proposed project. The label restrictions on rotenone use (i.e., placarding the Treatment Area and deactivation with KMnO4) should ensure the public will be exposed to zero or negligible amounts of rotenone, resulting in no significant adverse impacts being expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. Based on the above discussion of direct impacts (and secondary impacts), no adverse secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected. FWP is unaware of any other past, present, or future related state projects that would impact local and state tax base and tax revenues.

7. Quantity and Distribution of Employment

Existing Environment/No Action Alternative

There are no known jobs that are directly related to the Dutchman Creek drainage. USGS personnel manage the land resources in the drainage and FWP manages the fish and wildlife resources. Existing staff for both agencies cover these management responsibilities.

Direct Impacts

No significant adverse direct impacts would be expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected of the proposed project.

8. Density and Distribution of Human Population and Housing

Existing Environment/No Action Alternative

The majority of the proposed project would take place in the Helena – Lewis and Clark National Forest. There are no houses within the National Forest, and limited potential for housing on private land for 1.5 miles downstream of the Forest Boundary.

Direct Impacts

No significant direct adverse impacts would be expected because of the proposed project.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project.

9. Demands for Government Services

Existing Environment/No Action Alternative.

The USFS manages the majority of land and aquatic habitat in the affected section of the Dutchman Creek drainage. FWP manages the wildlife and fisheries resources of the drainage. The loss of the Dutchman Creek WCT population and additional WCT across Montana could result in the species being listed as threated or endangered. WCT have been petitioned for listing in the past, and if conservation actions are not performed they could qualify for listing in the future. A listed species requires significantly more government resources to manage than a species that is under state jurisdiction.

Direct Impacts

No significant direct adverse impacts would be expected because of the proposed project. Under the proposed project, primarily government personnel (FWP, USFS, and BLM) would complete the WCT restoration project in Dutchman Creek. The proposed project would require about 5 days of work for between 8 and 12 employees and, once the removal of brook trout is complete and the affected WCT population has been re-established, no additional government services would be required because the WCT population would be expected to fill the habitat and become self-sustaining without government assistance.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The proposed project may modify ongoing FWP activities in the affected area to ensure the established WCT populations in the affected section of Dutchman Creek remain intact and viable. Modified activities would include periodic monitoring of the restored WCT population including genetic testing. Any secondary impacts would be long-term and minor because the existing brook trout fishery would also be monitored with roughly the same frequency and effort.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. FWP is unaware of any past or present related state projects that would impact the density and distribution of the human population and housing in the affected area. FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population from the affected stretch of Dutchman Creek, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no adverse cumulative impacts would be expected because of the proposed project.

10. Locally Adopted Environmental Plans and Goals

Existing Environment/No Action Alternative

Under the No Action Alternative, it is likely that WCT in Dutchman Creek would be extirpated within the next 5-10 years. FWP's is obligated to keep species from warranting listing under the ESA. FWP also manages WCT according to the Westslope Cutthroat Trout Conservation Strategy for the Missouri River Headwaters of Southwest Montana (Jaeger et al. 2022), Statewide Fisheries Management Program and Guide (MFWP 2019), and the Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana (MFWP 2007). Dutchman

Creek contains a non-hybridized population of WCT that is in jeopardy, and management activities are adjusted to reduce potential impacts to the species.

Direct Impacts

No significant direct adverse impacts would be expected because of the proposed project. The proposed action would adhere to existing state policy, guidelines, and strategies (MFWP 2007, MFWP 2019, Jaeger et al. 2022). Therefore, any impacts would be long-term, beneficial, and minor to moderate.

Secondary Impacts

No significant adverse secondary impacts would be expected because of the proposed project. The proposed project would preserve a conservation population of WCT in the affected section of Dutchman Creek and increase potential for persistence of WCT. Further, the proposed action would adhere to existing state policy, guidelines, and strategies (MFWP 2007, MFWP 2019, Jaeger et al. 2022), thereby furthering FWP's objectives related to long-term management of WCT. Any secondary impacts would be long-term, beneficial, and moderate.

Cumulative Impacts

No significant adverse cumulative impacts would be expected because of the proposed project. The proposed project would benefit WCT conservation efforts which would help FWP meet its obligation to prevent species from becoming listed as threatened or endangered under the ESA. The long-term goal for WCT conservation is to restore secure conservation populations of WCT to 20% of their historic tributary distribution east of the Continental Divide (Upper Missouri River Basin upstream from and including the Judith River; FWP 2019). Collectively, WCT conservation projects like the one proposed for Dutchman Creek are intended to secure a small amount of the overall fish-bearing habitat for WCT to ensure the species long-term, self-sustaining persistence while managing the vast majority of habitat (80%) for non-native fish like brook trout, rainbow trout, and brown trout.

FWP has not previously treated the affected section of Dutchman Creek with rotenone. However, if the initial rotenone treatment is unsuccessful in eradicating the invasive brook trout population, additional treatment may be deemed necessary. If additional treatment with rotenone is deemed necessary, no cumulative impacts would be expected.

X. Determining the Significance of Impacts

If the EA identifies impacts associated with the proposed action, FWP must determine the significance of the impacts. This determination forms the basis for FWP's decision as to whether it is necessary to prepare an environmental impact statement. FWP considered the criteria identified in **Table 3** below to determine the significance of each impact on the quality of the physical and human environment. ARM 12.2.431.

The significance determination is made by giving weight to these criteria in their totality. For example, impacts identified as moderate or major in severity may not be significant if the duration is short-term. However, moderate or major impacts of short-term duration may be significant if the quantity and quality of the resource is limited and/or the resource is unique or fragile. Further, moderate or major impacts to a resource may not be significant if the quantity of that resource is high or the quality of the resource is not unique or fragile.

Table 3: Determining the Significance of Impacts

	Criteria Used to Determine Significance
1	The **severity, duration, geographic extent,** and **frequency** of the occurrence of the impact **"Severity"** describes the density of the potential impact, while **"extent"** describes the area where the impact will likely occur, e.g., a project may propagate ten noxious weeds on a surface area of 1 square foot. Here, the impact may be high in severity, but over a low extent. In contrast, if ten noxious weeds were distributed over ten acres, there may be low severity over a larger extent. **"Duration"** describes the time period during which an impact may occur, while **"frequency"** describes how often the impact may occur, e.g., an operation that uses lights to mine at night may have frequent lighting impacts during one season (duration).
2	The probability that the impact will occur if the proposed project occurs; or conversely, reasonable assurance in keeping with the potential severity of an impact that the impact will not occur
3	Growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts
4	The quantity and quality of each environmental resource or value that would be affected, including the uniqueness and fragility of those resources and values
5	The importance to the state and to society of each environmental resource or value that would be affected
6	Any precedent that would be set as a result of an impact of the proposed project that would commit FWP to future actions with significant impacts or a decision in principle about such future actions
7	Potential conflict with local, state, or federal laws, requirements, or formal plans

XI. Private Property Impact Analysis (Takings)

The 54th Montana Legislature enacted the Private Property Assessment Act, now found at § 2-10-101. The intent was to establish an orderly and consistent process by which state agencies evaluate their proposed projects under the "Takings Clauses" of the United States and Montana Constitutions. The Takings Clause of the Fifth Amendment of the United States Constitution provides: "nor shall private property be taken for public use, without just compensation." Similarly, Article II, Section 29 of the Montana Constitution provides: "Private property shall not be taken or damaged for public use without just compensation..."

The Private Property Assessment Act applies to proposed agency projects pertaining to land or water management or to some other environmental matter that, if adopted and enforced without due process of law and just compensation, would constitute a deprivation of private property in violation of the United States or Montana Constitutions.

The Montana State Attorney General's Office has developed guidelines for use by state agencies to assess the impact of a proposed agency project on private property. The assessment process includes a careful review of all issues identified in the Attorney General's guidance document (Montana Department of Justice 1997). If the use of the guidelines and checklist indicates that a proposed agency project has taking or damaging implications, the agency must prepare an impact assessment in accordance with Section 5 of the Private Property Assessment Act.

Table 4: Private Property Assessment Act (Taking and Damaging Assessment)

PRIVATE PROPERTY ASSESMENT CHECKLIST			
Does the Proposed Action Have Takings Implications under the PPAA?	**Question #**	**Yes**	**No**
Does the project pertain to land or water management or environmental regulations affecting private property or water rights?	1	☐	☒
Does the action result in either a permanent or an indefinite physical occupation of private property?	2	☐	☒
Does the action deprive the owner of all economically viable uses of the property?	3	☐	☒
Does the action require a property owner to dedicate a portion of property or to grant an easement? (If answer is NO, skip questions 4a and 4b and continue with question 5.)	4	☐	☒
Is there a reasonable, specific connection between the government requirement and legitimate state interest?	4a	☐	☐
Is the government requirement roughly proportional to the impact of the proposed use of the property?	4b	☐	☐
Does the action deny a fundamental attribute of ownership?	5	☐	☒
Does the action have a severe impact of the value of the property?	6	☐	☒
Does the action damage the property by causing some physical disturbance with respect to the property in excess of that sustained by the public general? (If the answer is NO, skip questions 7a-7c.)	7	☐	☒
Is the impact of government action direct, peculiar, and significant?	7a	☐	☐
Has the government action resulted in the property becoming practically inaccessible, waterlogged, or flooded?	7b	☐	☒
Has the government action diminished property values by more than 30% and necessitated the physical taking of adjacent property or property across a public way from the property in question?	7c	☐	☐
Does the proposed action result in taking or damaging implications?		☐	☒
Taking or damaging implications exist if **YES** is checked in response to Question 1 and also to any one or more of the following questions: 2, 3, 4, 6, 7a, 7b, 7c; or if **NO** is checked in response to question 4a or 4b.			
If taking or damaging implications exist, the agency must comply with MCA § 2-10-105 of the PPAA, to include the preparation of a taking or damaging impact assessment. Normally, the preparation of an impact assessment will require consultation with agency legal staff.			
Alternatives: The analysis under the Private Property Assessment Act, §§ 2-10-101-112, MCA, indicates no impact. FWP does not plan to impose conditions that would restrict the regulated person's use of private property to constitute a taking.			

XII. Public Participation

Scoping

Because FWP determined the proposed action will result in limited environmental impact, and little public interest has been expressed, FWP determined the proposed project did not meet the criteria for a public scoping meeting. Therefore, a public scoping meeting was not held for the proposed action. Scoping was held with the landowners and other project partners. Several strategies were used to inform the public about and solicit comments on the Proposed Action. These strategies included:

- Press release

- Public open house (Montana Wild, 2668 Broadwater Avenue, Helena MT, from 6:00 to 8:00 PM on February 29, 2024).

For the proposed project, scoping efforts included queries to the following affected agencies:

- Montana Natural Heritage Program
- US Department of Agriculture
    - Forest Service

Table 5: Public Notice – Newspaper/Periodical and Date Published

Newspaper / Periodical	Date(s) Public Notice Issued

Public notice announces availability of the Draft EA for public review, summarizes the proposed project, identifies the time-period available for public comment, and provides direction for submitting comments.

- **Duration of Public Comment Period:** The public comment period begins on the date of publication of legal notice in area newspapers (see above). Written or e-mailed comments will be accepted until 5:00 p.m., Mountain Time, on the last day of public comment, as listed below:

  Length of Public Comment Period: 30 days

  Public Comment Period Begins: February 16, 2024

  Public Comment Period Ends: March 18, 2024

Comments must be addressed to the FWP contact listed below.

- **Where to Mail or Email Comments on the Draft EA:**

  Name: Ron Spoon
  Email: rspoon@mt.gov
  Mailing Address:
  Montana Fish, Wildlife & Parks
  c/o Dutchman Creek WCT Restoration EA comments
  P.O. Box 1137
  Townsend, MT 59644

  Recommendation for Further Environmental Analysis

NO further analysis is needed for the proposed action	☒
FWP must conduct **EIS** level review for the proposed action	☐

XIII. EA Preparation and Review

	Name	Title

EA prepared by:	Ron Spoon	Regional Fisheries Biologist
EA reviewed by:	Matt Jaeger	Regional Native Fish Program Manager

Appendix A: References

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