Proposal for study of trout movement to identify key resource areas and factors affecting trout in the UCFRB
November 2008

The NRDP and FWP jointly seek funding totaling $473,182 in Restoration Funds for a four-year study in the Upper Clark Fork River Basin (UCFRB). This proposal is being submitted to the Advisory Council and Trustee Restoration Council pursuant to the provision in the *UCFRB Restoration Plan, Procedures and Criteria* (*RPPC*) that the NRDP may submit restoration planning and research proposals to the Trustee Restoration Council separate from the *RPPC* grants process and that the Advisory Council may make recommendations regarding such proposals.[1]

The goal for this study is to assist in the prioritization of aquatic resource restoration activities in the UCFRB by better understanding trout use of habitat and challenges and strategies towards completing their life history. The need for this study was recognized in the NRDP's *2008 Draft Conceptual UCFRB Restoration Priorities Road Map*.[2] It continues the prioritization process initiated by a study conducted by FWP in 2007 and 2008 that surveyed fish populations and assessed riparian and stream habitat in the tributaries of the UCFRB.[3] This past work was important to document the distribution, species and ages of trout populations using the tributaries. However, many trout in these populations also use the Clark Fork River and other portions of tributaries for parts of their life cycle. Because of this connection, understanding "how" and "when" trout use other habitats is critical to understanding "why" trout populations are in the state in which they were found during tributary sampling. Radio tracking and tagging allow us to monitor movements of trout as they experience different seasons, habitat conditions, challenges to survival, and completion of their life cycle to propagate another generation. This study will also provide information that can help monitor how well cleanup and restoration activities are addressing habitats that are important to trout.

The study area includes the mainstem of Silver Bow Creek and Upper Clark Fork River and some of their selected tributaries. Fishery biologists with Montana State University would conduct the majority of the study, with assistance from FWP fishery biologists. It is likely that studies such as this one and other monitoring studies of the UCFRB fishery will continue during and after restoration activities in the Basin are completed.

Metals clearly affect trout populations in the UCFRB, as documented by the State's aquatic resource damage assessments[4] and other studies. Cleanup is addressing some of this problem and restoration funds are currently available to implement projects that will augment this cleanup. Identification of key areas is needed to begin the prioritization and implementation of projects while metals cleanup occurs. It is plausible that, in some areas, factors limiting trout production cannot be identified until the metals pollution is addressed. Nevertheless, this study

[1] This provision is in Chapter 3 of the *RPPC*, p. 28.
[2] See attachment 4, p. 15 of the draft road map document.
[3] Results of the 2007 assessment activities are provided in the *2007 Assessment of Fish Populations and Riparian Habitat in Tributaries of the UCFRB*, prepared by FWP and dated April 2008. FWP is now compiling results of the 2008 assessment activities.
[4] *Aquatic Resources Injury Assessment Report of the UCFRB*, by NRDP, dated January 1995.

will help identify protection and restoration priorities under current, changing, and subsequent water quality conditions. For example, a barrier that currently prevents adult trout from accessing spawning grounds will likely restrict more trout as the Clark Fork River becomes more hospitable. The effects of metals varies in the basin and are believed to become less influential moving downstream in the Clark Fork River. Moreover, waterborne metal concentrations continue to decrease as cleanup progresses in Silver Bow Creek. Identifying and addressing factors other than, or subsequent to, metals pollution will be the focus of corrective efforts. Finally, protection of key areas identified by this study is critical for maintaining and increasing trout numbers and species.

Goals for aquatic resource restoration activities in the entire UCFRB need to be defined to guide this study and other restoration activities. The NRDP integrated the goals already developed for the restoration of the Silver Bow Creek and Clark Fork River fisheries and their tributaries into the following overall goals for restoration aquatic resources in the UCFRB:

1) Restore aquatic resources in the Upper Clark Fork River, Silver Bow Creek and their tributaries to baseline conditions similar to those in applicable reference streams.
2) Maintain and enhance viable native trout populations in the UCFRB where practicable.
3) Acquire and replace lost angling opportunities in the UCFRB by enhancing its fisheries.

These goals for the entire UCFRB take into consideration the aquatic resource goals provided in Attachment A that are set forth in the *2005 Silver Bow Creek Watershed Restoration Plan* and the *2007 Clark Fork River Restoration Plan*, as well as the aquatic restoration goals developed by FWP for the tributary prioritization effort.[5]

To achieve these goals, successful restoration must be guided by solid biological information from which to prioritize aquatic restoration efforts. Since 2002, FWP has conducted annual fish population surveys in Silver Bow Creek as part of the State's joint remediation/restoration monitoring efforts. FWP conducted fish population surveys in basin tributaries in 2007 and 2008 and will begin fish population surveys in the Clark Fork River mainstem in 2009. The purpose of this study is to complement these population-sampling efforts by conducting a large-scale movement study of trout in the mainstem and tributaries. Radio-tracking, in combination with other movement tracking technologies, can help identify potential sites for habitat restoration and protection by identifying sources of mortality, impediments to migration, and critical habitats such as key spawning and rearing habitats. How, when, and to what extent fish use their habitat is crucial to planning restoration efforts and maximizing the benefit of restoration dollars.

This study aims to address restoration priorities by directing two types of research efforts for the Upper Clark Fork River and the Silver Bow Creek fisheries. The Upper Clark Fork River study will rely primarily on large-scale radio-tracking over the entire mainstem between Warm Springs Ponds and Milltown to locate critical spawning and rearing habitats, to assess movement of trout in relation to environmental factors, and to identify potential restoration opportunities to enhance population recovery. The Silver Bow Creek study will involve a more 'intensive' approach, using radio-tracking over the entire mainstem and passive-integrated transponder (PIT) tag technology to measure movement, habitat use, and survival in key tributaries harboring remnant

[5] See Attachment A for references to these documents.

native trout populations, with the focus of identifying limiting factors and opportunities to expand their range in the Silver Bow Creek drainage.

Primary questions for study are similar for Silver Bow Creek and the Clark Fork River, but do differ because of the level of use by trout in their mainstems.

For Silver Bow Creek, the primary study questions are:

1) To what extent are trout from select tributaries (Blacktail/Basin Creek, Browns Gulch and German Gulch) attempting to migrate to and use Silver Bow Creek?
2) What factors are associated with trout use and avoidance of Silver Bow Creek?
3) Where are the critical habitats for spawning, rearing, and over-wintering of trout in Silver Bow Creek and its tributaries?

For the Clark Fork River, the primary study questions are:

1) Where are the critical habitats for spawning, rearing, and over-wintering of trout in the Clark Fork River and its tributaries?
2) In the presence and likely absence of metals pollution, what factors contribute to depressed populations in the mainstem Clark Fork River?
3) How do trout use the Clark Fork River and what problems do they encounter to survive and propagate?

In the Silver Bow Creek drainage, radio telemetry will also be used, but in addition to passive integrated transponder (PIT) tags. PIT tags provide an inexpensive means to tag large numbers of trout, but require anticipation of where they will be going for relocation. Larger numbers of trout need to be tagged in the Silver Bow Creek tributaries because of the high uncertainty that individuals will migrate and to get a measure of outmigration rate if the preponderance of emigration is low. Monitoring movement in and out of select tributaries is a good use of PIT tag technology. PIT tags will be put in trout in the tributaries and then monitored to determine migration to the mainstem, and possibly returns to the tributaries. Because few trout use the mainstem of Silver Bow Creek, radio tagged trout will be a combination of fish captured in the mainstem and from the tributaries and placed in the mainstem. Radio tracking will be primarily via ground tracking. For PIT tagged fish, movement and distribution will be monitored at fixed antenna locations and seasonally throughout the watersheds with mobile antennas for PIT tagged fish.

In the Clark Fork River drainage, trout will be captured from the Warm Springs Ponds to Rock Creek near Clinton. About 200 trout over three years will have radio transmitters surgically implanted. Fish will be tracked using ground and aerial telemetry techniques and fixed receiver stations. Ground tracking along established routes will be performed at least once per week using a scanning receiver, a three-element directional antenna, and a handheld global positioning system. Ground tracking will be accomplished by locating fish from established roads. When a transmitter is detected, fish locations will be pinpointed by walking to the river, or if direct access is not possible, by triangulating from at least two different road points. The locations of transmitters will be recorded using a handheld GPS unit, downloaded using MapSource software,

and later input into a GIS system (ArcView and ArcMap). Habitat use will be measured by classifying river habitat type used by relocated fish, and comparing this to habitat availability as determined from aerial photographs and habitat maps. Because of the large size of the study area, fixed receiver stations will be deployed at key junctions of the river to monitor long distance movement, and aerial telemetry will be periodically used to locate missing radio tags, a not uncommon situation when monitoring a large number of radio tags over such a large area.

Budget Narrative

The cost of the four-year study is $473,182 in Restoration Funds and $146,476 in FWP cash matching funds, for a total project cost of $619,658. Attachment B is a detailed budget for the project.

ATTACHMENT A

Silver Bow Creek Fishery Aquatic Resource Restoration Goals

A. The *2005 Silver Bow Creek Watershed Plan*[6] provides the following broad vision statement for a restored Silver Bow Creek watershed:

> *In the 21st century, Silver Bow Creek Watershed is a viable place to live and recreate. The watershed is protected from adverse impacts of mining contamination. The restored watershed supports viable, self-sustaining communities of fish, wildlife and vegetation, and high-quality water resources. Native species are maintained and restored where practicable. The watershed's healthy ecosystem provides for quality education and balanced recreation, contributing to a diverse and sustainable economy, improved aesthetics, and community well-being. Stable and healthy local communities of informed citizens actively protect the watershed's resources.*

In addition to this broad vision statement, Chapter 8 of this Plan elaborates further on what factors would indicate a healthy fishery resource as follows:

> *Several indicators of a healthy fishery provide the basis to evaluate the success of remediation and restoration activities in the Silver Bow Creek watershed. Species composition is one. At a minimum, the fish community in the Silver Bow Creek watershed should, over time, move towards a composite of species similar in number and proportion to healthy streams in the region. Moreover, the vision statement emphasizes native species strategies where practicable, so priority should be placed on establishing and protecting populations of native fish where this can reasonably be accomplished. Another component of a healthy fishery is a diverse population structure, which indicates that conditions are suitable in the watershed for reproduction and maintenance of populations over the course of several years. In time, fish-bearing streams in the Silver Bow Creek watershed should include the presence of at least three year-classes for both salmonids and suckers. There should also be balance between the contaminant tolerant species such as suckers and intolerant taxa such as salmonids. Measures of fish abundance and biomass are important considerations as well. By evaluating density and biomass of juvenile and adult salmonids on reference streams, general targets can be inferred to measure restoration and remediation success in the Silver Bow Creek watershed.*

Chapter 8 of the Plan also provides a synopsis of information provided by area fisheries on the priority of fishery restoration needs in the Silver Bow Creek watershed that offer further guidance on how best to meet these specified goals.

[6] *Final Silver Bow Creek Watershed Restoration Plan*, prepared by the NRDP with assistance from Confluence Consulting and DTM Consulting, December 2005.

B. Silver Bow Creek Remedial Goals[7]

1. Fish

"provided that the upstream sources of Silver Bow Creek contaminants are eliminated, [remediation]…should attain the remedial action objective to improve the quality of Silver Bow Creek's surface water and instream sediments to the point that Silver Bow Creek could support the growth and propagation of fishes and associated aquatic life, one of the designated goals fourth I-class stream, including a self-sustaining population of trout species." The ultimate goal is to improve Silver Bow Creek over time to a condition that supports a self-reproducing fishery for trout species.

Upper Clark Fork River Aquatic Resource Restoration Goals

The *2007 Upper Clark Fork River Restoration Plan*[8] provides the following goals for aquatic restoration activities along the mainstem of the Upper Clark Fork River.

Goal 1: Restore aquatic resources in the Clark Fork River to baseline conditions[9]

Objective A: Improve water quality and reduce the rate of accumulation of metals and arsenic in bed sediments.

Goal 3: Offset the residual effects to flora and fauna from hazardous substances that are not eliminated from the aquatic system.

Objective A: Restore in-stream habitat within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.

Objective B: Improve water quality within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.

Objective C: Improve water quantity within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.

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[7] *Record of Decision for the Streamside Tailings Operable Unit of the Silver Bow Creek/Butte Area*, prepared by the DEQ and EPA, 1995, pp. 102 and 104.

[8] *State of Montana Revised Restoration Plan for the Clark Fork River Aquatic and Riparian Resources*, prepared by the NRDP, November 2007.

[9] Baseline fishery conditions in the Clark Fork River were established in consultation with area fish biologists and include the following: (a) salmonid fish density (fish per unit area) similar to reference streams; (b) fish species diversity that includes at least three species of salmonid, two species of sucker [largescale and longnose sucker], one species of sculpin [slimy sculpin], and several members of the minnow family [peamouth, northern pikeminnow, longnose dace, and redside shiner]; (c) the presence of at least three year classes of salmonids and suckers, indicating that conditions are suitable in the watershed for reproduction and maintenance of populations over the course of several years; and (d) a ratio of salmonids to suckers greater than one to indicate that baseline water quality and habitat conditions do not favor pollution tolerant species [e.g. suckers].

Draft Conceptual Framework for an Upper Clark Fork River Basin Restoration Priorities Road Map[10]

Attachment 4. Supplemental Information on Aquatic and Terrestrial Prioritization

A. Aquatic Prioritization Effort

As part of its restoration planning process for the Clark Fork River restoration damage claim, the State considered alternatives involving restoration work on the tributaries that would best help the Clark Fork River fishery reach baseline conditions. Based on its evaluation of existing information on tributary fisheries, however, the State concluded that there was insufficient information to conduct such a prioritization. Thus, in 2007, the State, through a Memorandum of Understanding (MOU) between FWP and the NRDP, began a phased tributary restoration prioritization effort as part of its ongoing litigation restoration planning process. Because this effort was conducted for the purposes of litigation, it was not subject of any public review process.

Pursuant to the MOU, FWP, in consultation with NRDP, will assess fishery populations and riparian habitat of the selected tributaries to the Upper Clark Fork River between Warm Springs Ponds and Milltown Reservoir and prioritize future restoration work in these tributaries based on following goals:

1) Restore the Clark Fork River fishery to levels similar to other area rivers.
2) Maintain and enhance viable native trout populations throughout the UCFRB.
3) Replace lost angling opportunity in the Clark Fork River by enhancing tributary fisheries.

[10] *Draft Conceptual Framework for an UCFRB Restoration Priorities Road Map*, prepared by the NRDP, May 2008.

ATTACHMENT B – Project Budget

	Cost to NRD					Cost Share from FWP				
	2009 Year 1	2010 Year 2	2011 Year 3	2012 Year 4	Total	2009 Year 1	2010 Year 2	2011 Year 3	2012 Year 4	Total
Salaries and benefits										
Faculty	9,240	9,240	9,240	-	**27,720**					
Grad Student-Clark Fork	14,322	18,822	18,822	6,160	**58,126**					
Grad Student-Silver Bow	14,322	18,822	18,822	6,160	**58,126**					
Student tech	6,930	10,080	10,080	-	**27,090**					
FWP Bio (F/R)						5,990	5,990	5,990	2,995	**20,966**
FWP Bio (UCF)						5,990	8,986	8,986	2,995	**26,957**
FWP Tech (F/R)	8,944	13,416	13,416	4,472	**40,248**					
FWP Tech (UCF)						11,180	14,758	14,758	4,472	**45,167**
Subtotal	$ 53,758	$ 70,380	$ 70,380	$ 16,792	**$ 211,310**	$ 23,161	$ 29,734	$ 29,734	$ 10,462	**$ 93,090**
Publication				1,000	**1,000**					
MSU Travel @ 0.40/mile	5,000	10,000	10,000	500	**25,500**					
Per diem @15/dayx200d/yr	1,500	3,000	3,000		**7,500**					
Lodging (trailer)	4,500				**4,500**					
Materials and Supplies										
Waders,buckets,nets	600	300	250		**1,150**					
GIS software & training	1,000	1,000			**2,000**					
Digital camera, 2@200	400				**400**					
Aerial tracking @250/hrx3hrx3/yr	750	2,250	2,250	750	**6,000**					
Misc supplies	2,000	2,000	1,000	500	**5,500**					
MSU travel and supplies sub total	$ 15,750	$ 18,550	$ 16,500	$ 1,750	**$ 52,550**					
FWP Travel @ 0.40/mile	6,000	12,000	12,000	600	**$ 30,600**	1,000	2,000	2,000	500	**5,500**
FWP Per diem	400	600	600	150	**$ 1,750**	400	600	600	150	**1,750**
Equipment										
Water Quality Rods 2@ 7,500	15,000				**15,000**					
Lotek Receiver 3@ 3,990					**0**	11,970				**11,970**
Radiotags 230 @ 300	36,000	24,000	9,000		**69,000**					
Yagi antenna 3 @ 160					**0**	480				**480**
Fixed station receivers 2 @ 5,885*					**0**	11,770				**11,770**
Fixed station supplies 2 @ 2,000					**0**	4,000				**4,000**
2 GPS units & software	750				**750**					
Thermographs 10 @ 125	1,250				**1,250**					
PIT tags 3,000 @2.50	7,500				**7,500**					
PIT tag reader 2 @250					**0**	500				**500**
Mobile PIT tag antenna					**0**	2,450				**2,450**
PIT tag station batteries 3 @150					**0**	450				**450**
Handheld data PDA(PIT)	1,450				**1,450**					
PIT antennas cable+access.					**0**	500	500	200		**1,200**
Fixed PIT-tag antenna 3 @ 2,500	7,500				**7,500**					
Laptop computer		1,000			**1,000**					
Equipment sub total	$ 69,450	$ 25,000	$ 9,000	$ -	**$ 103,450**					
Total supplies and equipment	$ 91,600	$ 56,150	$ 38,100	$ 2,500	**$ 188,350**	$ 33,520	$ 3,100	$ 2,800	$ 650	**$ 40,070**
Tuition	4,000	8,000	8,000	4,000	**24,000**					
Total Direct Cost (Cost Share)	149,358	134,530	116,480	23,292	**423,660**	$ 56,681	$ 32,834	$ 32,534	$ 11,112	**133,160**
MSU Indirect Cost @20%	12,913	16,703	16,293	3,614	**49,522**					
FWP Indirect Cost @10%					**0**	$5,668	$3,283	$3,253	$1,111	**13,316**
Total Cost (Cost Share)	$ 162,271	$ 151,233	$ 132,773	$ 26,906	**$ 473,182**	$ 62,349	$ 36,117	$ 35,787	$ 12,224	**$ 146,476**

***State equipment that will be used for the project**

Total Project Cost **$ 619,658**