FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION
All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Trout Unlimited

Mailing Address: 312 N. Higgins Suite 200

City: Missoula State: MT Zip: 59802

Telephone: 406-552-2168 E-mail: TScanlon@tu.org

B. Contact Person (if different than applicant): Tess Scanlon

Address: 312 N. Higgins Suite 200

City: Missoula State: MT Zip: 59802

Telephone: 406-552-2168 E-mail: tscanlon@tu.org

C. Landowner and/or Lessee Name (if different than applicant): Tom Rue

Mailing Address: P.O. Box 32

City: HALL State: MT Zip: 59837-0032

Telephone: E-mail: true@blackfoot.net

II. PROJECT INFORMATION

A. Project Name: Flint Creek Riparian Restoration Phase 2

River, stream, or lake: Flint Creek

Location: Township: 10N Range: 3W Section: 35

Latitude: 46.57654 Longitude: -113.19251 *within project (decimal degrees)*

County: Granite

B. Purpose of Project:

The purpose of the project is to improve and protect riparian and instream habitat that has been impaired by past land use practices on 0.5 miles of Flint Creek near Hall, MT to improve fish populations in Flint Creek and the Clark Fork River.

C. Brief Project Description (attach additional information to end of application):

The Flint Creek Riparian Restoration Phase 2 Project will protect, restore and enhance the riparian corridor on approximately one-half mile of Flint Creek on private land near Hall, MT by improving riparian vegetation, restoring instream habitat and reducing sediment loading to Flint Creek. This project is part of a larger effort in the Flint Creek watershed with multiple partners including the Montana Natural Resource Damage Program (NRDP) and Montana Fish, Wildlife and Parks (FWP) to restore fish populations and aquatic habitats in Flint Creek and the Upper Clark Fork River by engaging private landowners in projects that improve and reconnect habitat, restore streamflow, and improve water quality.

Multiple riparian habitat assessments have been completed on Flint Creek including the *Riparian Habitat Assessment for Flint Creek and Boulder Creek* by Great West Engineering (GWE) for NRDP in 2015 and a reach-focused *Flint Creek Assessment and Conceptual Design Report* completed by River Design Group (RDG) for NRDP in 2018. The GWE report identifies the reach targeted by this project as a high priority for riparian restoration and the RDG report details both the vegetative and geomorphic impairments in the reach, including sedimentation and bank erosion rates, as well as concepts to restore those impairments.

The Flint Creek Riparian Restoration Phase 2 Project builds on work completed by Trout Unlimited on the adjacent property in 2021 and includes three approaches targeted to restore natural processes to reduce sedimentation and improve habitat:

1. Grazing Management- the project will implement grazing management improvements through the entire stream corridor on the property including installation of fencing for riparian grazing exclusion/management to protect and improve riparian and floodplain vegetation and wildlife habitat and implement a grazing management plan.
2. Active Revegetation- the project will implement a revegetation plan prepared by River Design Group that includes planting of native containerized woody plants in fenced wildlife exclusion units and seeding with native riparian seed mix.
3. 3. Streambank Restoration- the project will implement a restoration design prepared by RDG to treat approximately 1,200' of eroding streambanks, reconnect a historical meander in a channelized reach, improve riparian vegetation, restore functioning channel geometry, improve fisheries habitat complexity, and reduce bank erosion.

D. Length of stream or size of lake that will be treated (project extent): 0.5 miles

Length/size of impact, if larger than project extent (e.g. stream miles opened): _____

E. Project Budget:

Grant Request (Dollars):	**$**	**43,000**
Matching Dollars:	**$**	**43,000**
Matching In-Kind Services:*	**$**	**$10,800**

**salaries of government employees are not considered matching contributions*

Other Contributions (not part of this app)	**$**	**$225,313**
Total Project Cost:	**$**	**$296,613**

F. **Attach** itemized (line item) budget – *see budget template*

G. **Insert** or **attach** a project location map showing the project area in relation to a major landmark or town. Please indicate if the project location is on public or private property.

See Map attachment. The project location is on private property.

H. **Attach** specific project plans (e.g. detailed sketches, plan views [showing location and type of channel modifications], example photographs), current condition photographs, and maps. **If project involves water leasing or water salvage complete and attach a supplemental questionnaire (fwp.mt.gov/habitat/futurefisheries/supplement2.doc).*

I. **Attach** letters or statements of support. This includes landowner consent, community or public support, and fish biologist support.

J The project agreement includes a 20-year maintenance commitment. Please indicate (yes or no) that you will ensure project protection for 20 years. Discuss your ability to meet this commitment.

Yes [X] No [ ]

TU has been working with the landowner for multiple years to develop this project and they are committed to maintaining all improvements and are aware that a formal agreement will need to be completed prior to project implementation.

K. **Describe** or **attach** land management & maintenance plans, including changing to grazing regimes, that will ensure protection of the restored area.

TU is working with the landowner on a project agreement and grazing plan that will include a riparian fencing exclosure unit. The exclosure around the restoration project ensure protection of the project site from cattle grazing and other heavy wildlife browsing for a period of at least 3 years.

III. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

Brown trout, bull trout, westslope cutthroat trout, rainbow trout, mountain whitefish and non-game species.

B. How will the project protect or enhance wild fish habitat?

The project will improve shade and overhead cover by providing the landowners with infrastructure to exclude cattle from grazing the riparian, flood prone and wetland areas of the property; improve instream habitat complexity and pool depth through installation of large wood structures; and reduce sedimentation, improve shading/overhead cover, and provide a future source of large wood through revegetation and bank treatments.

C. Will the project improve fish populations and/or fishing? To what extent? What are the expected short term and long-term benefits to the fishery?

Yes, the project is intended to improve fish populations and quality of angling by improving foraging, migration and overwintering habitat for native species, and spawning and rearing habitat for non-native sportfish. Improved habitat should increase survival and population densities over time. The project is located in a high-priority migration corridor for westslope cutthroat trout and bull trout between the Clark Fork River and high-quality spawning habitat in Boulder Creek.

The project is also intended to provide a demonstration project for neighboring ranches to assist with the long-term goal of implementing similar habitat restoration and expanding fisheries benefits to the reach scale.

D. Will the project increase public fishing opportunity for wild fish and, if so, how?

While the project is located on private land, Flint Creek is accessible to wade anglers through stream access from public bridge rights-of-way. In addition, improvements to fish populations from the project may improve angling opportunity on the rest of Flint Creek and the nearby Clark Fork River. FWP otolith microchemistry and radio telemetry studies have shown the importance of Flint Creek for recruitment to the Clark Fork River.

E. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

Habitat degradation in the area has largely been the result of past agricultural practices and channel alteration. In particular, the impacts of cattle grazing include reduced woody riparian vegetation, increased erosion and sediment loading into the stream, over-widened stream channel, and decreased pool frequency and depths. The project seeks to correct these impairments through a cost-effective combination of removing grazing pressure, restoring riparian vegetation through the reach, and actively restoring a targeted 1,200' of streambanks within the reach.

F. What public benefits will be realized from this project?

The public benefits of this project will be increased water quality and improvements to both terrestrial and aquatic wildlife habitat.

G. Will the project interfere with water or property rights of adjacent landowners? (explain):

No

H. Will the project result in the development of commercial recreational use on the site? (explain):

No. The landowners lease grazing rights on the property and have no plans for recreational development.

I. Is this project associated with the reclamation of past mining activity?

No.

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: _____ Date: 11/8/2021

Sponsor (if applicable): _____

Submittal: **Applications must be signed and received on or before November 15 and May 15 to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	FWP Future Fisheries Fish Habitat Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Future Fisheries Coordinator FWPFFIP@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov and send to mmcgree@mt.gov

Applications may be rejected if this form is modified.

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS Flint Creek riparian restoration phase 2 004-2022

Both tables must be completed or the application will be returned

PROJECT COSTS					CONTRIBUTIONS			
WORK ITEMS (Itemize by Category)	**NUMBER OF UNITS**	**UNIT DESCRIPTION***	**COST/UNIT**	**TOTAL COST**	**FUTURE FISHERIES REQUEST**	**MATCH (Cash or Services)****	**OTHER (Not part of this application)**	**Total**
Personnel* **								
Survey				$ -				$ -
Design	1	LS	$40,000.00	$ 40,000.00			40,000.00	$ 40,000.00
Engineering			$0.00	$ -			-	$ -
Permitting	40	hrs	$50.00	$ 2,000.00			2,000.00	$ 2,000.00
Oversight	1	LS	$25,000.00	$ 25,000.00		25,000.00		$ 25,000.00
Coordination	40	LS	$50.00	$ 2,000.00			2,000.00	$ 2,000.00
			Sub-Total	$ 69,000.00	$ -	$ 25,000.00	$ 44,000.00	$ 69,000.00
Travel								
Mileage	1800	miles	$0.56	$ 1,008.00			1,008.00	$ 1,008.00
Per diem			$0.00	$ -				$ -
			Sub-Total	$ 1,008.00	$ -	$ -	$ 1,008.00	$ 1,008.00
Construction Materials****								
Large Wood	1,233	trees	$35.00	$ 43,155.00			43,155.00	$ 43,155.00
Willows	14400	willows	$1.50	$ 21,600.00		10,800.00	10,800.00	$ 21,600.00
Cobbles	370	cy	$40.00	$ 14,800.00			14,800.00	$ 14,800.00
Gravel/Rock	240	cy	$20.00	$ 4,800.00			4,800.00	$ 4,800.00
Riparian Fence + water gaps, gates	3500	linear feet	$3.00	$ 10,500.00	5,500.00	5,000.00		$ 10,500.00
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 94,855.00	$ 5,500.00	$ 15,800.00	$ 73,555.00	$ 94,855.00
Equipment, Labor, and Mobilization								
								$ -
A. Equipment and labor	1	LS	$90,550.00	$131,750.00	37,500.00	12,500.00	81,750.00	$ 131,750.00
a1. site prep	*30*	*hrs*	*$240.00*	*$7,200.00*				$ -
a2. excavate new channel	*3000*	*cy*	*$10.00*	*$30,000.00*				$ -
a3. riffle construction	*200*	*linear feet*	*$15.00*	*$3,000.00*				$ -
a4. sod work	*4800*	*square feet*	*$2.00*	*$9,600.00*				$ -
a5. wood structures	*4*	*structures*	*$2,000.00*	*$8,000.00*				$ -
a6. vegetated bank structures	*1200*	*linear feet*	*$30.00*	*$36,000.00*				$ -
a7. willow trenches	*240*	*linear feet*	*$15.00*	*$3,600.00*				$ -

(Revised 11/15/2021)

a8. floodplain roughness	*0.1*	*acres*	*$3,500.00*	*$350.00*				$ -
a9. install containerized plants	*500*	*Each*	*$25.00*	*$12,500.00*			-	$ -
a10. install browse protection fencing	*1*	*LS*	*$21,500.00*	*$21,500.00*				
B. Mobilization	1	LS	$25,000.00	$ 25,000.00			25,000.00	$ 25,000.00
				$ -				$ -
			Sub-Total	$ 156,750.00	$ 37,500.00	$ 12,500.00	$ 106,750.00	$ 131,750.00
			TOTALS	$ 321,613.00	$ 43,000.00	$ 53,300.00	$ 225,313.00	$ 296,613.00

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used). Do not use government salaries as match. Describe here or in text.

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a justification or minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of $1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

Additional details: In-kind contributions- TU volunteers will harvest and install willow cuttings in trenches

APPLICATION MATCHING CONTRIBUTIONS

(do not include requested funds or contributions not associated with the application)

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
TROUT UNLIMITED	$ 10,800.00	$ -	$ 10,800.00	
NRDP	$ -	$ 43,000.00	$ 43,000.00	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ 10,800.00	$ 43,000.00	$ 53,800.00	

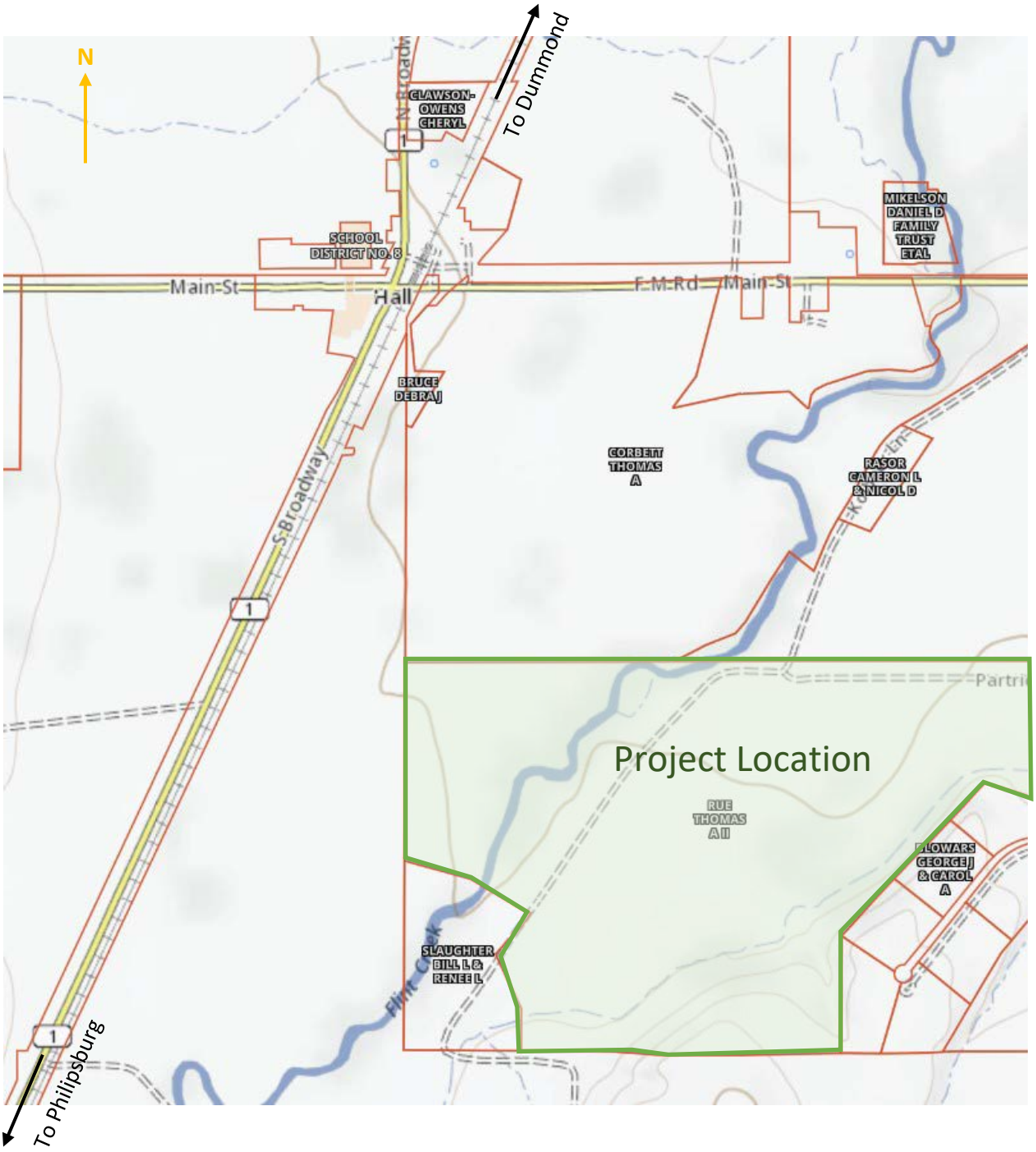
OTHER CONTRIBUTIONS

(contributions not associated with the application)

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)

NRDP	$ -	$ 68,000.00	$ 68,000.00	Y
WestSlope Chapter TU	$ -	$ 5,000.00	$ 5,000.00	Y
DEQ 319 Program	$ -	$ 141,513.00	$ 141,513.00	N
Trout Unlimited	$ 10,800.00	$ -	$ 10,800.00	Y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ 10,800.00	$ 214,513.00	$ 225,313.00	

Flint Creek Riparian Restoration Project – Phase 2
Project Map



Flint Creek Riparian Restoration Project – Phase 2
Project Map

Riparian Habitat Exclosure and Active Revegetation

Bank and Channel Treatment Reach

November 9, 2021

Michelle McGree
Future Fisheries Program
Montana Fish, Wildlife, & Parks
Fisheries Division
1420 E. Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701

Dear Ms. McGree,

Please accept this letter supporting Trout Unlimited's Flint Creek Riparian Restoration Project proposal. As the project landowner, I am excited to work with your program to improve the fisheries and wildlife habitat on our property while improving fisheries populations in Flint Creek and the Upper Clark Fork River Basin. We have been working with Trout Unlimited and the Montana Natural Resource Damage Program to begin planning for restoration of Flint Creek and improved grazing management on our property. I am hopeful that these planning efforts become a reality with funding support from the Future Fisheries Program.

Thank you for your consideration of this proposal. We look forward to working with you on this project.

Sincerely,

Tom Rue

Granite Headwaters Watershed Group
PO Box 926 Philipsburg, MT 59858 406-859-3291 ext. 101

Montana Fish, Wildlife & Parks
Fisheries Division
1420 E. Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701

To Whom It May Concern:

Granite Headwaters Watershed Group supports Trout Unlimited's Future Fisheries Grant Application for the Flint Creek Habitat Restoration Project Phase 2. Trout Unlimited is requesting funding necessary to complete active revegetation and streambank restoration activities on Flint Creek. Financial support for the implementation of this planning effort and project will help to improve and conserve fisheries and riparian habitats for wildlife in the Flint Creek watershed and serve as a demonstration project for future efforts in the area. Securing funding for this project is instrumental to the continued conservation of this watershed.

GHWG has worked with Trout Unlimited in the past, most notably on the investigation and planning efforts at the Rumsey Mill site and floodplain area on Fred Burr Creek, where mercury and other heavy metals have been detected in high concentrations in both soil and surface water.

GHWG appreciates this funding opportunity and your ongoing work in the Flint Creek watershed. If you have any questions, please contact the Conservation District, (406) 858-3291, of which we are a subcommittee, or me personally at the number below. Thank you for your consideration to complete these important projects and planning efforts.

Sincerely,

Michael L. Miller

Michael L. Miller, President
Granite Headwaters Watershed Group
(406) 859-3105

DEPARTMENT OF JUSTICE
NATURAL RESOURCE DAMAGE PROGRAM

AUSTIN KNUDSEN
ATTORNEY GENERAL

1720 9TH AVENUE

STATE OF MONTANA

(406) 444-0205 (OFFICE)
(406) 444-0236 (FAX)

PO BOX 201425
HELENA, MONTANA 59620-1425

November 10, 2021

Michelle McGree
Future Fisheries Coordinator
Montana Fish, Wildlife & Parks
Fisheries Division
1420 E. Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701

Dear Future Fisheries Review Panel,

The Montana Natural Resource Damage Program (NRDP) is writing in support of Trout Unlimited's Future Fisheries Grant Application for the Flint Creek Riparian Restoraiton Project on the Rue property on Flint Creek. NRDP, through its *Upper Clark Fork Basin Aquatic and Terrestiral Restoration Plans* (Updated February 2019) is committed to the identifying dollar match of $44,500 for riparian revegetation, $40,000 in project design, and $25,000 in project construction oversight via funding allocated ot the improvement of the riparian areas of Flint Creek. NRDP fully uspports the incorporation of the project components identified for funding thorugh the Future Fisheries Porgram.

Sincerely,

Douglas H. Martin

NRDP Restoration Program Manager

Montana Fish, Wildlife & Parks

To whom it may concern:

Montana Fish, Wildlife and Parks considers Flint Creek a high priority fishery. It serves as both a recreational fishing destination and as a tributary which produces juvenile recruitment for the Clark Fork River. Flint Creek receives moderate angling pressure and, in this reach, generally maintains approximately 3-500 catchable fish per mile. These densities are high enough to provide very high quality angling opportunities for this size of stream. Flint Creek has also been found to provide a significant number of juvenile trout to the Clark Fork River via a tributary recruitment study completed by Montana Fish, Wildlife and Parks in 2016.

The proposed restoration work on the Rue property appears to address important limiting factors to this reach. Livestock grazing and channel alterations have negatively impacted fish habitat in this reach by simplifying the habitat and removing natural stream channel function. Revegetation of adjacent banks and floodplain should significantly improve fish habitat via bank stabilization and temperature reduction. Developing a grazing management plan will also assist in maintaining quality riparian vegetation into the future. Bank stabilization using proper hydrologic techniques will likely aid in developing additional fish habitat as well as developing stabile habitats that can be successfully revegetated. This revegetation is the key to long term stability and health of this reach. Overall, Montana Fish, Wildlife and Parks feels this is a good project that will benefit the fisheries in an important drainage. Please feel free to contact me with any questions.

Sincerely,

Brad Liermann, Fisheries Biologist
Montana Fish, Wildlife and Parks
406-825-5225

United States Department of the Interior
Fish and Wildlife Service
Montana Ecological Services Office
585 Shepard Way, Suite 1
Helena, Montana 59601-6287
Phone: (406) 449-5225; Fax: (406) 449-5339

Casey Hackathorn
Upper Clark Fork Program Manager
Trout Unlimited
312 N. Higgins Ave Suite 200
Missoula, MT 59802

November 8, 2021

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) has reviewed the Future Fisheries Application for the Flint Creek Riparian Restoration – Phase 2 project. The Service fully supports the actions outlined in the proposal. The segment of Flint Creek affected by the proposed action is essential for the recovery of bull trout because it provides foraging, migration, and overwintering habitats for bull trout. The Bull Trout Recovery Plan, and Columbia Headwaters Recovery Unit Implementation Plan for Bull Trout, describe three primary threats to bull trout recovery (Habitat, Demographic, and Nonnatives). This proposal directly addresses one of those primary habitat threats specifically identified for Flint Creek (riparian management). The proposed action will improve habitat conditions by reducing the amount of eroding streambanks and increasing the amount of riparian vegetation by improving grazing management practices. Improving habitat conditions along Flint Creek is an important step for providing a functional migratory corridor. Therefore, the Service fully supports your efforts.

We appreciate Trout Unlimited's efforts to recover threatened bull trout and conserve other native fish. If you have questions or comments related to this letter, please contact Dan Brewer at dan_brewer@fws.gov or (406) 329-3951.

Sincerely,

for Jodi L. Bush
Office Supervisor

November 15, 2021

ATTN: Michelle McGree

Montana Fish, Wildlife & Parks
Fisheries Division
1420 E. Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701

Dear Future Fisheries Review Panel,

On behalf of the board of directors and our 750 members, the WestSlope Chapter of Trout Unlimited supports Trout Unlimited's Flint Creek Riparian Restoration Project Phase 2 proposal for Montana Future Fisheries Program. Our membership actively enjoys the fisheries supported by Flint Creek and the Clark Fork River and we are excited by the opportunity to partner on a volunteer restoration project that will benefit these resources and improve the fishery. Our mission is providing both funding and volunteer time to improve the habitat of our local cold water fisheries.

Our all volunteer chapter has partnered with TU staff on many successful watershed restoration efforts in western Montana in the past, including Ninemile Creek, Rattlesnake Creek and Rock Creek and many projects in the Blackfoot watershed. In 2019, we partnered with TU staff on Phase 1 of this Flint Creek Habitat Restoration Project and are excited to be engaged in the second phase of this effort. It will really make a difference for the trout and the valley.

Thank you for your consideration and we look forward to working to make this project a success.

Sincerely,

Mark Kuipers, President
WestSlope Chapter of Trout Unlimited

November 9, 2021

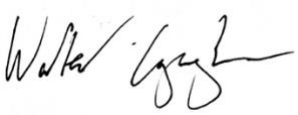
Michelle McGree
Future Fisheries Program
Montana Fish, Wildlife, & Parks
Fisheries Division
1420 E. Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701

Dear Ms. McGree,

I write on behalf of Hellgate Hunters & Anglers, a Western Montana-based rod and gun club, to express our support for Trout Unlimited's Flint Creek Riparian Restoration Phase 2 Project. This is an incredibly valuable fishery for our membership and other users. We look forward to partnering with Trout Unlimited to engage anglers and local users on this stream restoration project, which will benefit fisheries and fish and wildlife habitat in Flint Creek and the larger Clark Fork watershed.

Please note our continued support for this project. Thank you for the opportunity to comment.

Sincerely,



Walker Conyngham
President
Hellgate Hunters & Anglers

RDG RIVER DESIGN GROUP

Date: October 20, 2021

To: Casey Hackathorn, Trout Unlimited

From: Matt Daniels, P.E.
River Design Group, Inc.

Subject: Project Proposal
Lower Flint Creek – Rue Property

1. Introduction and Background

The State of Montana Natural Resource Damage Program (NRDP) has identified the Flint Creek Watershed as a priority area for restoration (NRDP 2012). River Design Group, Inc. (RDG) was contracted by NRDP to complete an assessment and develop conceptual restoration designs for approximately 242 acres along a three-mile segment of lower Flint Creek upstream of Hall, Montana (Figure 1). This memorandum summarizes results of the assessment and identifies potential conservation and restoration opportunities the Rue property along lower Flint Creek.

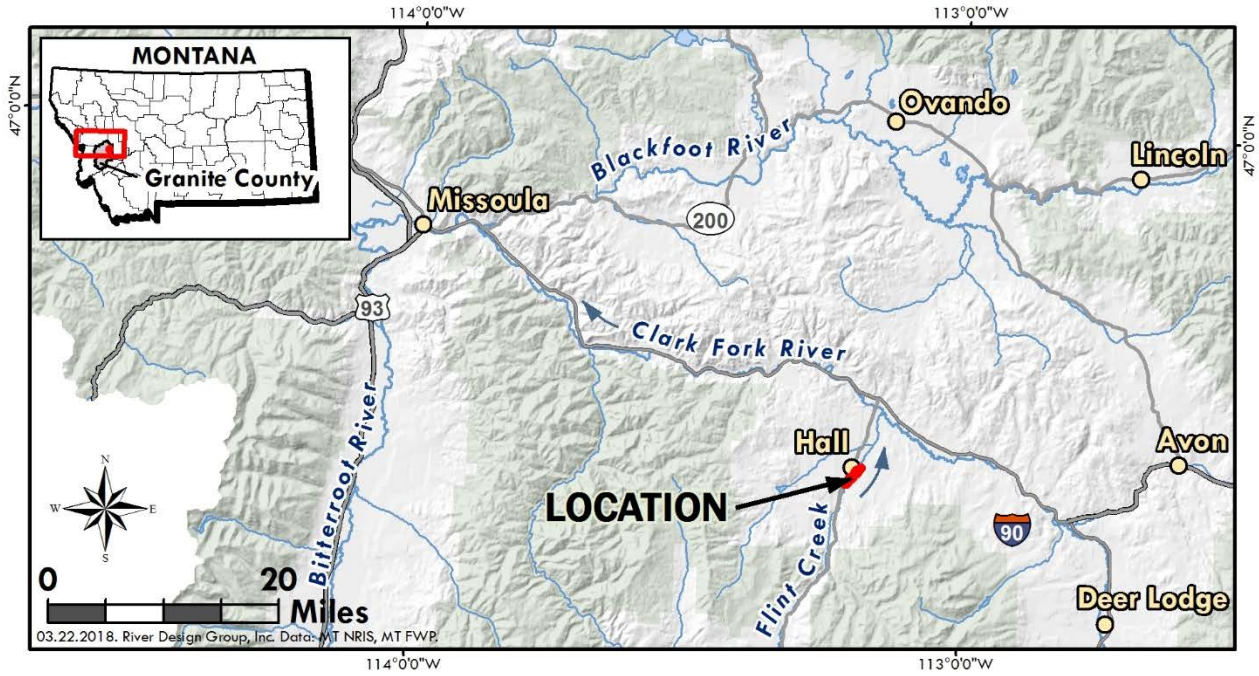


Figure 1. Project vicinity map for Lower Flint Creek restoration.

The Final Upper Clark Fork Basin Aquatic and Terrestrial Resources Plan (NRDP 2012) outlines key objectives for lower Flint Creek as outlined below:

- Improve water quantity through flow augmentation (e.g., water right purchases, water leases, and irrigation efficiency improvements);
- Reduce fish entrainment at irrigation diversions;
- Improve fish passage throughout the reach; and
- Riparian habitat improvements including fencing/protection, woody shrub and tree plantings, and off-site watering.

In addition, landowners have identified objectives that coincide with NRDP's overarching goals for Flint Creek as outlined below:

- Improve fish habitat;
- Improve terrestrial habitat for waterfowl and other wildlife; and
- Maintain a functional ranch operations and grazing leases.

2. Site Assessment and Summary of Existing Conditions

In 2016 and 2017, vegetation and geomorphic field assessments were completed for the project area. Results of the assessments were used to characterize existing conditions and identify impairments affecting stream and floodplain function. The potential condition for lower Flint Creek in the study area is a meandering, riffle-pool stream type with a connected floodplain that supports emergent wetland, willow and cottonwood vegetation communities. Limiting factors influencing the potential condition include:

- Geomorphic Limiting Factors
    - Altered flow regime from impoundments and irrigation management
    - Low channel sinuosity from channel manipulation
    - High bank erosion rates from lack of stability
    - Over-widened riffles and shallow pools
- Vegetation Limiting Factors
    - Insufficient wetland and riparian buffers from ranch operations and grazing
    - Lack of woody vegetation and riparian diversity
    - Competition from pasture grasses, noxious weeds and non-native species
- Aquatic Habitat Limiting Factors
    - Fish entrainment in irrigation ditches
    - Over-wide riffles and shallow pools
    - Gravel substrate embedded with fine sediment
    - Lack of instream cover, habitat diversity and complexity

3. Conceptual Restoration Plan

Conservation and restoration opportunities were identified to address the limiting factors identified in the assessment. The restoration plan addresses grazing management, revegetation and stream channel habitat. Restoration plan elements are illustrated and described in more detail in the following sections.

3.1. Grazing Management Plan

The grazing management plan includes recommendations for fencing and off-channel stock water locations. The grazing management plan represents a conceptual layout and is subject to revision based on stakeholder and landowner input. The plan addresses protection of sensitive riparian and wetland areas from grazing to allow native plant communities to become established. Fence locations were established based on the estimated channel migration zone, which represents a corridor that the stream channel is likely to occupy over the long term. By allowing native vegetation to become established in the floodplain and along the streambanks, stream channel stability will improve, and bank erosion will be reduced to more natural rates.

The grazing management plan identifies areas for continuous grazing, rotational grazing and grazing exclusion. In continuous grazing areas, no limit is placed on the duration or amount of grazing. In rotational grazing areas, access should be limited to 5 days of grazing followed by a 30-day period where the area can recover without grazing. In exclosure areas, no grazing should be conducted. Exclosure areas are sensitive to grazing and consist of the streambanks, channel migration zone and wetlands. The proposed fence type is four-strand barbed wire livestock fencing with 6-foot timber posts. The top and bottom strands of the livestock fence would be smooth wire for wildlife passage

The grazing management plan is a passive restoration approach that, if implemented as a stand-alone plan, only partially addresses the range of limiting factors identified in the assessment. Other limiting factors such as competition from pasture grasses and streambank stability would need to be addressed with comprehensive revegetation and streambank strategies as described in other plans in the following sections.

3.2. Revegetation Plan

The revegetation plan includes recommendations for planting, seeding and browse protection. As a conceptual layout, the revegetation plan is subject to revision based on stakeholder and landowner input. The plan includes approximately 500 plants in multiple planting. Planting units would be enclosed in 8-foot high metal wire or rigid plastic polypropylene mesh fencing to limit browse by wildlife. Planting units would vary in size from 0.004 acres to 0.95 acres and would be protected with wildlife fence.

The plan addresses establishment of native plant communities in wetland, floodplain, streambank and upland areas. Planting units were placed throughout the area with the goals of increasing connectivity for habitat between existing riparian vegetation communities and increasing the overall quantity and diversity of woody vegetation. Weed mats would be installed at the base of each plant to reduce competition from pasture grasses and weeds. Preservation

areas were also identified to highlight where existing vegetation communities are thriving, and the planting units were placed to help increase connectivity between the preservation areas.

The revegetation plan is a passive restoration approach that, if implemented as a stand-alone plan, only partially addresses the range of limiting factors identified. Other limiting factors such as streambank stability and aquatic habitat would need to be addressed with a comprehensive channel restoration plan and grazing management plan as described in the other sections.

3.3. Channel Restoration Plan

The channel restoration plan includes recommendations for streambank structures, meander re-activation, and off-channel habitat enhancement. The channel restoration plan represents a conceptual layout and is subject to revision based on stakeholder and landowner input. The channel restoration plan addresses 1,000 linear feet of eroding streambanks.

The plan addresses limiting factors related to channel planform, streambank stability and aquatic habitat. Proposed treatment locations are based on impairments observed in the field during the assessment. Streambank structures would be constructed on active channel margins with sparse vegetation and observed bank erosion. Types of streambank structures would be vegetation and wood-based structures including large wood structures and vegetated brush bank structures. Streambanks would be re-graded to gentle slopes, enhanced with floodplain roughness and revegetated with containerized plants. Surplus fill material would be used to fill ditches, narrow the channel and construct points bars. Meander bends abandoned by channel avulsions or channel straightening would be re-activated to increase channel sinuosity.

The success of the channel restoration plan is dependent upon implementation of a comprehensive grazing management plan and revegetation plan as described in previous sections. If implemented as a stand-alone plan, the channel restoration plan only partially addresses the range of limiting factors identified, and long-term stability of the treatments could be at risk.

4 Budgetary Cost Estimate

Concept Level Project Cost Estimate
Flint Creek - Rue Property near Hall, MT
10/20/2021

	Construction Cost Items	Quantity	Units	Unit Cost	Cost
1	Mobilization and Demobilization	1	Lump Sum	$ 25,000	$ 25,000
2	Site Prep, River Access, BMPs, Channel Activation, Reclamation	30	Hours	$ 240	$ 7,200
3	Furnish Logs and Brush for Streambank Structures	1,233	Trees	$ 35	$ 43,155
4	Furnish Willow Cuttings for Streambank Structures	14,400	Cuttings	$ 1.50	$ 21,600
5	Furnish Cobble for Riffles	370	Cubic Yards	$ 40	$ 14,815
5	Furnish Pit Run for Streambank Fill	240	Cubic Yards	$ 20	$ 4,800
6	Excavate New Channel and Backfill Old Channel	3,000	Cubic Yards	$ 10	$ 30,000
7	Riffle Construction	200	Linear Feet	$ 15	$ 3,000
8	Sod Salvage and Placement	4,800	Square Feet	$ 2.00	$ 9,600
9	Install Large Wood Structures	4	Structures	$ 2,000	$ 8,000
10	Install Vegetated Brush Bank Structures	1,200	Linear Feet	$ 30	$ 36,000
11	Install Willow Trenches	240	Linear Feet	$ 15	$ 3,600
12	Install Floodplain Roughness in Former Channel	0.10	Acres	$ 3,500	$ 350
13	Furnish and Install Containerized Plants and Weed Mats	500	Each	$ 25	$ 12,500
14	Furnish and Install Fencing	4,000	Linear Feet	$ 8	$ 32,000
			CONSTRUCTION SUBTOTAL		$ 251,620
			FINAL DESIGN		$ 40,000
			CONSTRUCTION OVERSIGHT		$ 25,000
			GRAND TOTAL		**$ 316,620**

Assumptions for Construction Cost Estimates

1. Costs are based on restoration concepts dated July 2017.
2. Mobilization and demobilization assumed to be $5/mile per piece of equipment
3. Assumed excavator rate of $175 per hour loader rate of $150/hr skid steer rate of $75/hr and labor rate of $65/hr.
4. Tree and rock costs have not been confirmed with local suppliers and may vary from estimate.
5. Structure installation costs based on past project data.
6. Estimate in 2021 dollars. Escalation may apply for future costs.

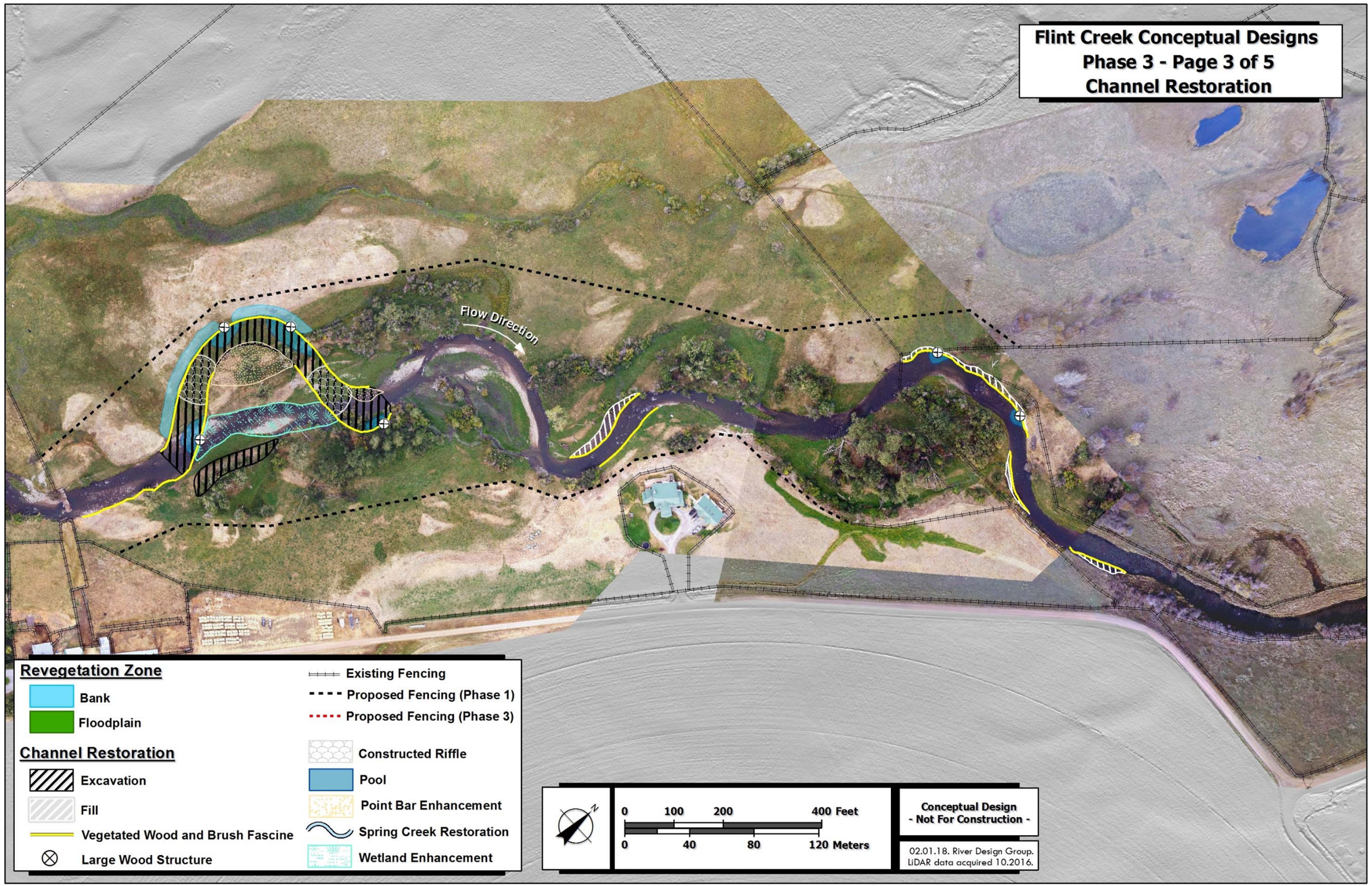


Figure 2. Conceptual restoration plan for the Rue property.

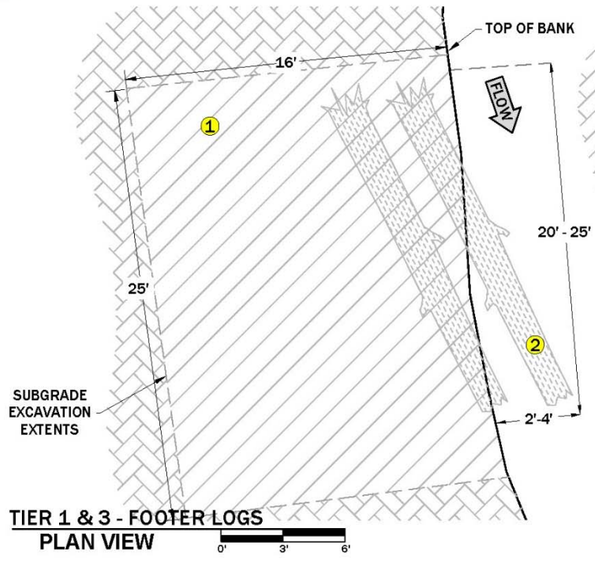
CONSTRUCTION NOTES

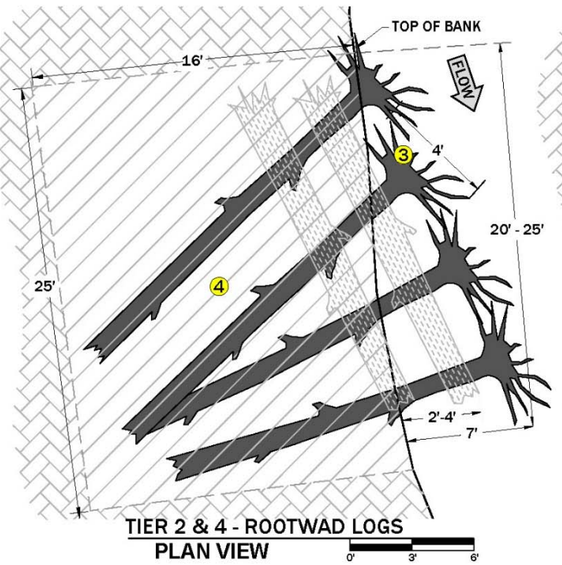
1. EXCAVATE STREAMBANK TO SUBGRADE ELEVATIONS.
2. PLACE TIER 1 FOOTER LOGS IN THE STREAMBANK POINTING DOWNSTREAM PER THE ORIENTATION SHOWN ON THE DRAWINGS.
3. PLACE TIER 2 ROOTWAD LOGS ON TOP OF FOOTER LOGS WITH ROOTWADS POINTING UPSTREAM. PLACEMENT SHALL BEGIN AT THE UPSTREAM END AND THE UPSTREAM ROOTWAD SHALL BE FLUSH WITH THE TOP OF BANK LINE. SUBSEQUENT ROOTWADS SHALL BE PLACED IN A DOWNSTREAM DIRECTION WITH GRADUALLY INCREASING PROJECTION INTO THE CHANNEL AS SHOWN ON THE DRAWINGS. ADJACENT ROOTWADS SHALL BE TOUCHING OR OVERLAPPING.
4. BACKFILL STREAMBANK TO THE TOP OF ROOTWAD LOGS WITH STREAMBANK FILL PER THE GRADATION SHOWN ON THE DRAWINGS.
5. WASH FINES AND WATER FROM ONSITE INTO THE STREAMBANK FILL TO SEAL THE VOIDS IN THE BACKFILL.
6. PLACE TIER 3 FOOTER LOGS IN THE STREAMBANK POINTING DOWNSTREAM PER THE ORIENTATION SHOWN ON THE DRAWINGS.
7. PLACE TIER 4 ROOTWAD LOGS ON TOP OF FOOTER LOGS WITH ROOTWADS POINTING UPSTREAM. PLACEMENT SHALL BEGIN AT THE UPSTREAM END AND THE UPSTREAM ROOTWAD SHALL BE FLUSH WITH THE TOP OF BANK LINE. SUBSEQUENT ROOTWADS SHALL BE PLACED IN A DOWNSTREAM DIRECTION WITH GRADUALLY INCREASING PROJECTION INTO THE CHANNEL AS SHOWN ON THE DRAWINGS. ADJACENT ROOTWADS SHALL BE TOUCHING OR OVERLAPPING.
8. PLACE TIER 5 DEFLECTOR LOGS WITHIN THE MATRIX OF LOGS. LOGS SHALL BE WOVEN BETWEEN OTHER LOGS TO PREVENT MOVEMENT. DEFLECTOR LOGS SHALL POINT DOWNSTREAM AND MAY EXTEND UP TO TWO FEET ABOVE THE TOP OF BANK ELEVATION.
9. PLACE TIER 5 BRUSH RANDOMLY WITHIN THE MATRIX OF LOGS. BRUSH SHALL BE WOVEN BETWEEN OTHER LOGS TO PREVENT MOVEMENT. BRUSH MAY EXTEND UP TO TWO FEET ABOVE THE TOP OF BANK ELEVATION.
10. BACKFILL STREAMBANK TO THE TOP OF ROOTWAD LOGS WITH STREAMBANK FILL PER THE GRADATION SHOWN ON THE DRAWINGS.
11. WASH FINES AND WATER FROM ONSITE INTO THE STREAMBANK FILL TO SEAL THE VOIDS IN THE BACKFILL.
12. GRADE THE TOP OF BANK TO MATCH FINISHED GROUND ELEVATIONS.

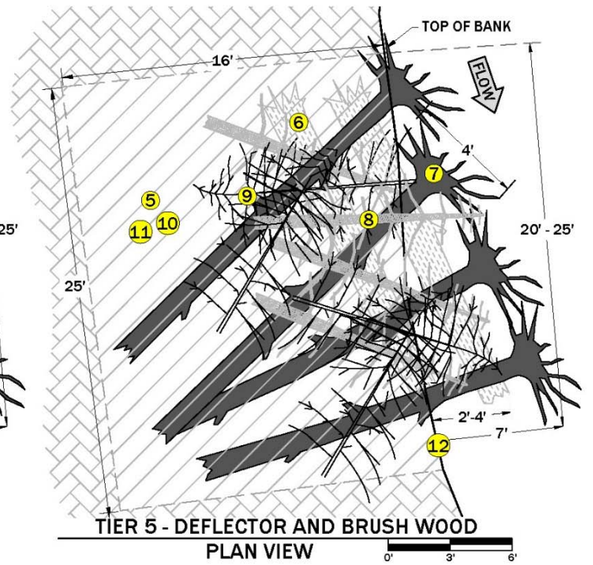
STREAMBANK FILL GRADATION*

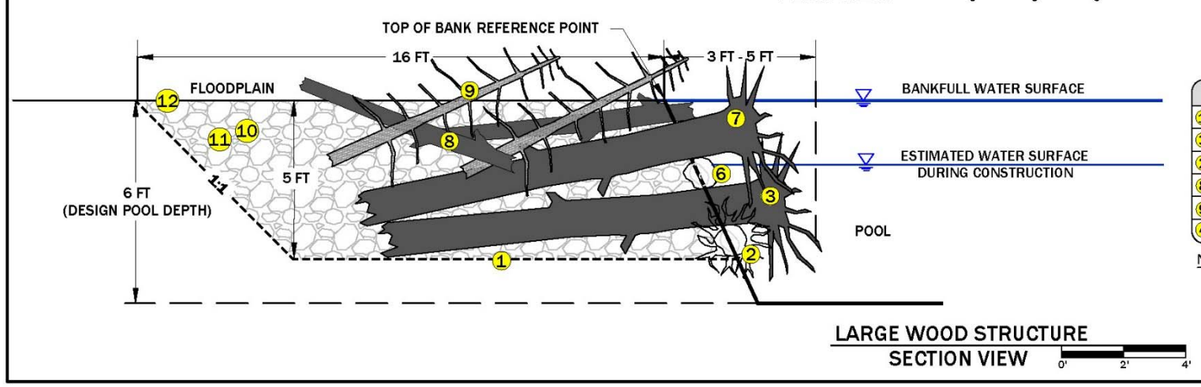
SIZE	% PASSING	SIZE CLASS
6-INCH	100	D100
4-INCH	90 - 100	D95
2-INCH	50 - 80	D65
1-INCH	30 - 50	D35
FINES	10 - 30	D15

*GRADATION MAY BE ACHIEVED BY MIXING WITH EXCAVATED MATERIAL









MATERIAL SCHEDULE (PER STRUCTURE)

ITEM	QUANTITY	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)
1 CY OF SUBGRADE EXCAVATION	65			
3 7 LARGE WOOD	8	12-18	15-20	YES-3 FT DIA. MIN.
2 6 MEDIUM WOOD	6	8-12	15-20	NO
8 SMALL WOOD	10	3-6	8-10	OPTIONAL
9 BRUSH	10	1-3	8-10	OPTIONAL
4 10 CY OF STREAMBANK FILL	50			

NOTE: USE OF BALLAST AND PUMPING MAY BE NECESSARY TO PLACE WOOD IN DEEP WATER.

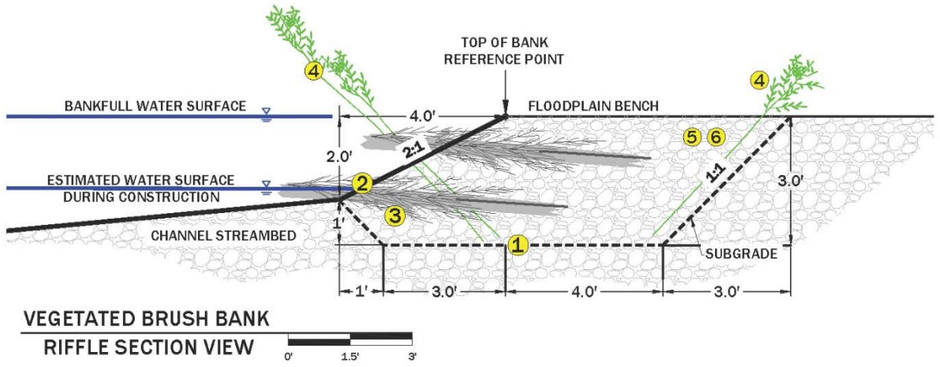
RDG RIVER DESIGN GROUP
236 Wisconsin Avenue Whitefish, MT 59937 ht:406.862.4927 fax:406-862-4963
311 SW Jefferson Avenue Corvallis, OR 97333 ht:541.738.2920 fax:541.738.8534

LARGE WOOD STRUCTURE DETAIL

NO.	DATE	BY	DESCRIPTION	CHK
1		TC	FINAL DESIGN	MD

PROJECT NUMBER
RDG-20-006

SHEET NUMBER
7.0



VEGETATED BRUSH BANK
RIFFLE SECTION VIEW
0' 1.5' 3'

CONSTRUCTION NOTES

1. EXCAVATE STREAMBANK TO SUBGRADE ELEVATIONS.
2. PLACE SMALL LOGS IN THE STREAMBANK AT SKEWED ANGLE TO THE STREAMBANK. LOGS SHALL BE PLACED BELOW THE TOP OF BANK ELEVATION. LOGS MAY OVERLAP. NO CUT ENDS SHALL BE EXPOSED.
3. PLACE BRUSH WITHIN THE MATRIX OF SMALL LOGS. BRUSH SHALL BE PLACED BELOW TOP OF BANK LINE.
4. PLACE CUTTINGS INTO THE LOG/BRUSH MATRIX WITH THE STEMS IN CONTACT WITH THE BASEFLOW WATER TABLE AND THE LEAVES AT OR ABOVE THE BANKFULL WATER SURFACE ELEVATION.
5. BACKFILL STREAMBANK WITH STREAMBANK FILL PER THE GRADATION SHOWN ON THE DRAWINGS.
6. WASH FINES AND WATER FROM ONSITE INTO THE STREAMBANK FILL TO SEAL THE VOIDS IN THE BACKFILL.

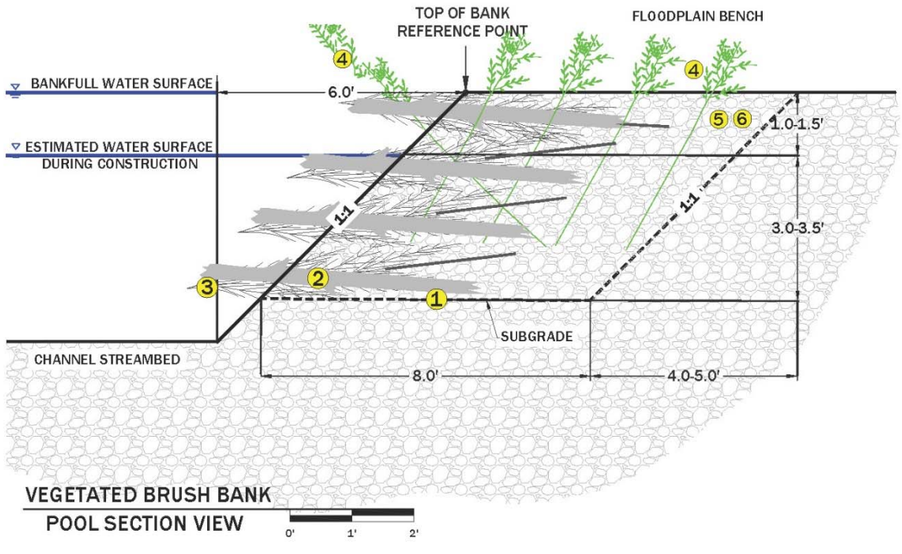
STREAMBANK FILL GRADATION*

SIZE	PERCENT PASSING	SIZE CLASS
6-INCH	100	D100
4-INCH	90 - 100	D95
2-INCH	50 - 80	D65
1-INCH	30 - 50	D35
FINES	10 - 30	D15

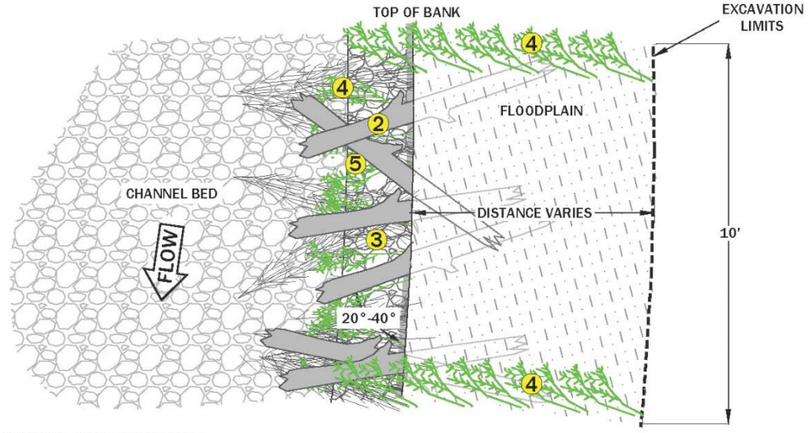
*GRADATION MAY BE ACHIEVED BY MIXING WITH EXCAVATED MATERIAL

MATERIAL SCHEDULE (PER 10 LINEAR FEET)

ITEM	RIFFLE QUANTITY	POOL QUANTITY	DIA. (IN)	LENGTH (FT)
1 CY OF SUBGRADE EXCAVATION	10	15		
6 CY OF STREAMBANK FILL	5	10		
2 SMALL LOGS	3	5	3-6	8-10
3 BRUSH	7	10	1-3	8-10
4 WILLOW CUTTINGS	20	20	0.75-1.5	6-8



VEGETATED BRUSH BANK
POOL SECTION VIEW
0' 1' 2'



VEGETATED BRUSH BANK
PLAN VIEW
0' 1.5' 3'

RDG RIVER DESIGN GROUP
236 Wisconsin Avenue
Whitefish, MT 59937
tel: 406.862.4927
fax: 406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel: 541.738.2920
fax: 541.738.8524

VEGETATED BRUSH BANK STRUCTURE DETAIL

NO.	DATE	BY	DESCRIPTION	CHK
1		TC	FINAL DESIGN	MD

PROJECT NUMBER
RDG-20-006

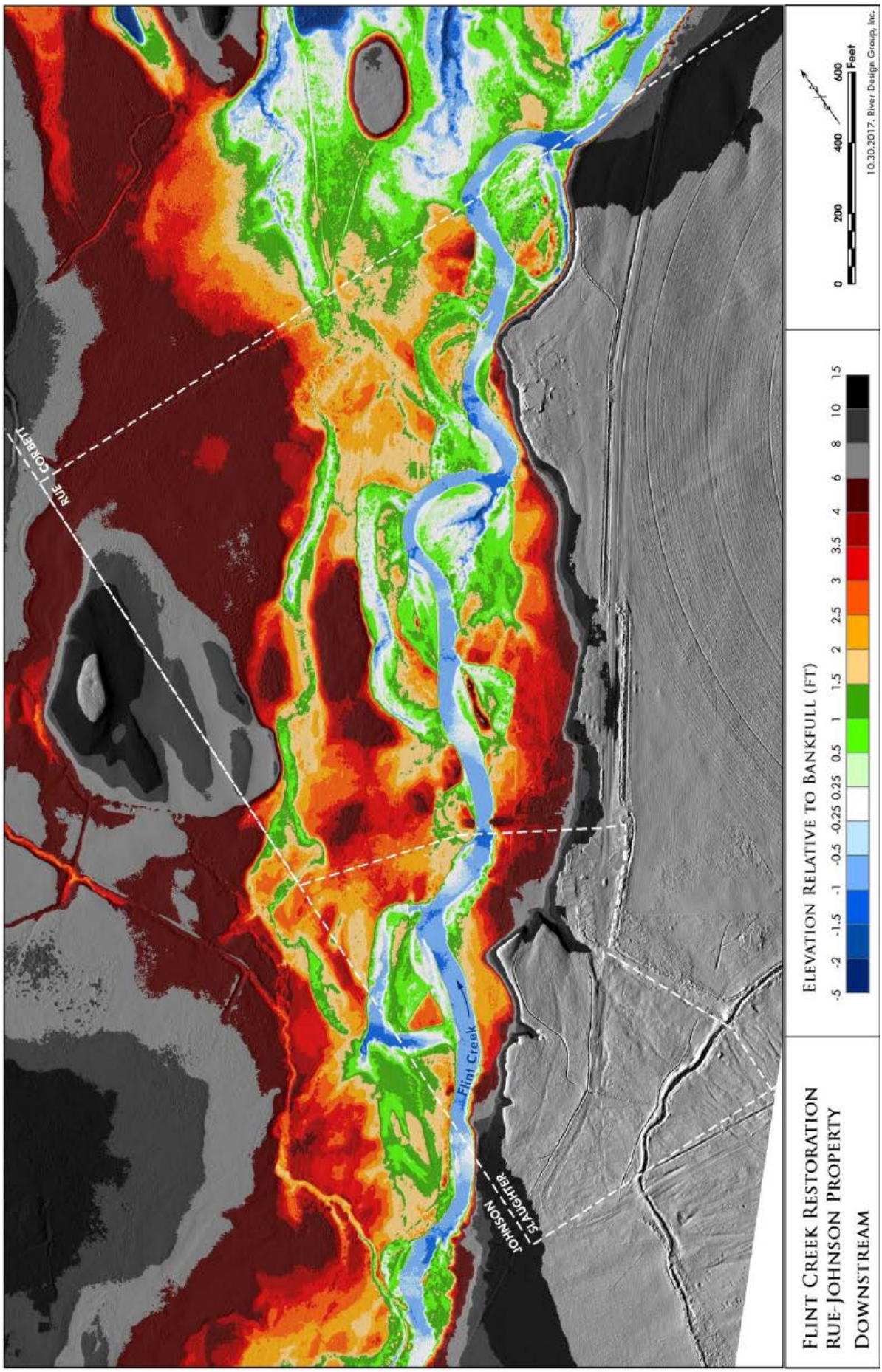
SHEET NUMBER
7.1

Flint Creek Riparian Restoration – Phase 2
Site Conditions

Right bank looking upstream at upper end of site.

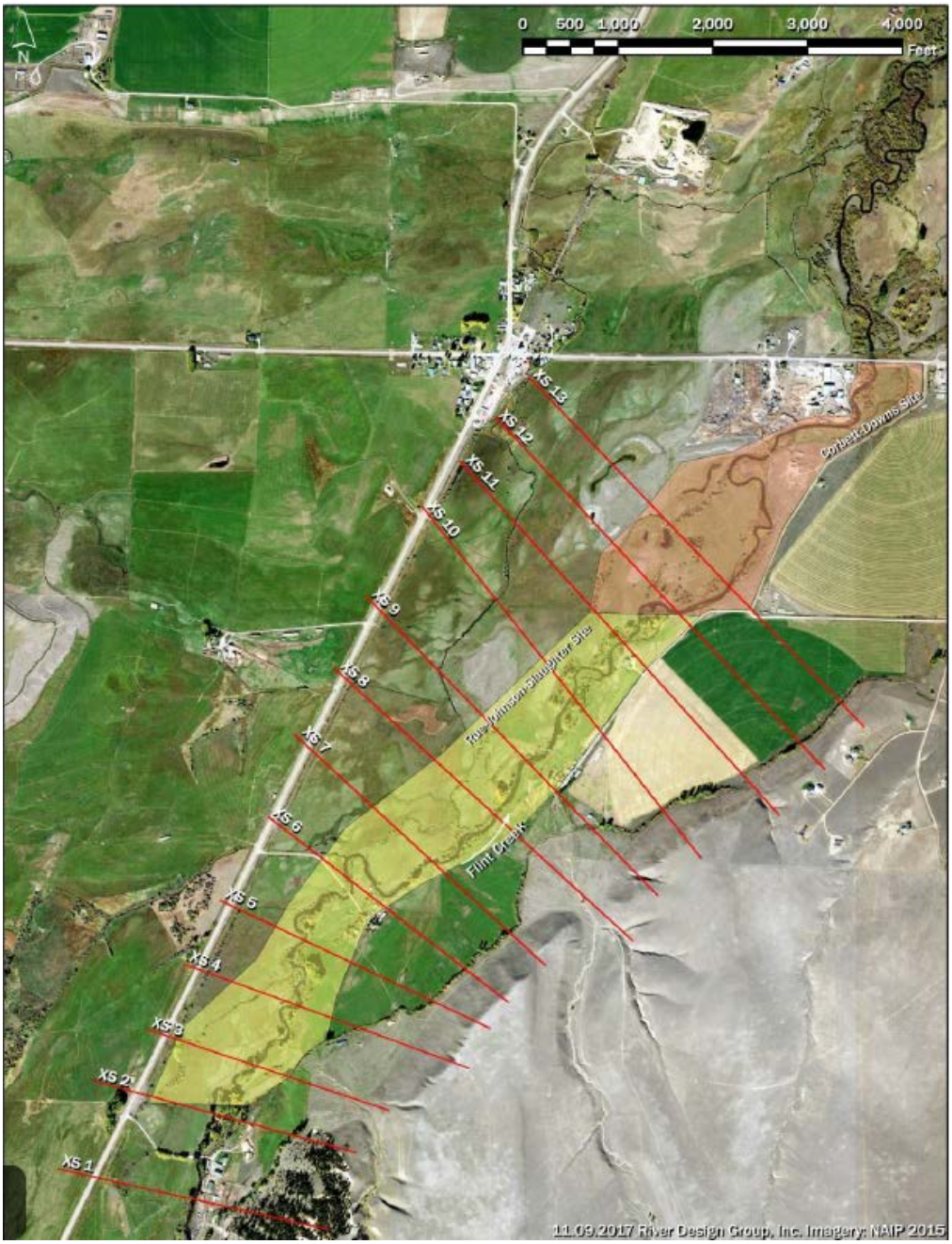
Left bank looking downstream at upper end of site.

Flint Creek Riparian Restoration – Phase 2
Site Conditions



Flint Creek Riparian Restoration – Phase 2

Site Conditions



Cross-Section Summary Table														
Metrics	XS 1	XS 2	XS 3	XS 4	XS 5	XS 6	XS 7	XS 8	XS 9	XS 10	XS 11	XS 12	Riffle	Pool
Bankfull Width (ft)	53.6	41.7	36.9	45.3	57.7	30.6	54.8	32.4	64.6	62.7	64.5	52.9	53.9	44.1
Mean Depth (ft)	1.6	1.9	2.9	1.5	3.4	3.2	1.5	2.5	1.5	2.2	0.8	1.3	1.4	2.9
Max Depth (ft)	2.6	2.7	5.8	2.1	5.3	5.0	2.4	4.0	2.3	4.3	1.9	1.9	2.3	4.9
Bankfull Area (sq ft)	83.5	78.3	107.7	68.9	197.7	98.1	80.6	80.7	95.3	138.9	50.6	69.7	75.3	124.6
Width/Depth Ratio	34.4	22.2	12.6	29.6	16.8	9.5	37.0	13.0	43.7	28.3	81.0	39.8	41.1	16.0
Hydraulic Radius	1.5	1.8	2.7	1.5	3.2	2.9	1.4	2.3	1.4	2.2	0.8	1.3	1.4	2.7
Bankfull Elevation (ft)	4249.9	4242.3	4242.2	4235.2	4234.5	4226.0	4222.6	4218.8	4206.5	4204.3	4197.9	4184.7	NA	NA
Flood-Prone Width	>120	>80	NA	>90	NA	NA	>110	NA	>140	NA	>120	>140	>115	NA
Entrenchment Ratio	>2	>2	NA	>2	NA	NA	>2	NA	>2	NA	>2	>2.2	>2	NA
Geomorphic Unit	Riffle	Riffle	Pool	Riffle	Pool	Pool	Riffle	Pool	Riffle	Pool	Riffle	Riffle	Riffle	Pool

Flint Creek Riparian Restoration – Phase 2
Site Conditions

Point bar showing natural willow and cottonwood recruitment potential

Browse on riffle bank.

Flint Creek Riparian Restoration – Phase 2
Site Conditions

Aspen stand with high regeneration potential within proposed riparian fencing.

Riparian Habitat Assessment for Flint Creek and Boulder Creek Granite County, Montana

Environmental Services Contract #SPB-12-2177V

Task Order 1.28




Prepared for
Natural Resource Damage Program
Montana Department of Justice
1301 East Lockey
Helena, MT 59620

Prepared by
Watershed Consulting, LLC
P.O. Box 17287
Missoula, MT 59808

with

Great West Engineering, Inc.
2501 Belt view Drive
Helena, MT 59604

January, 2015

Figure 1. Project Area

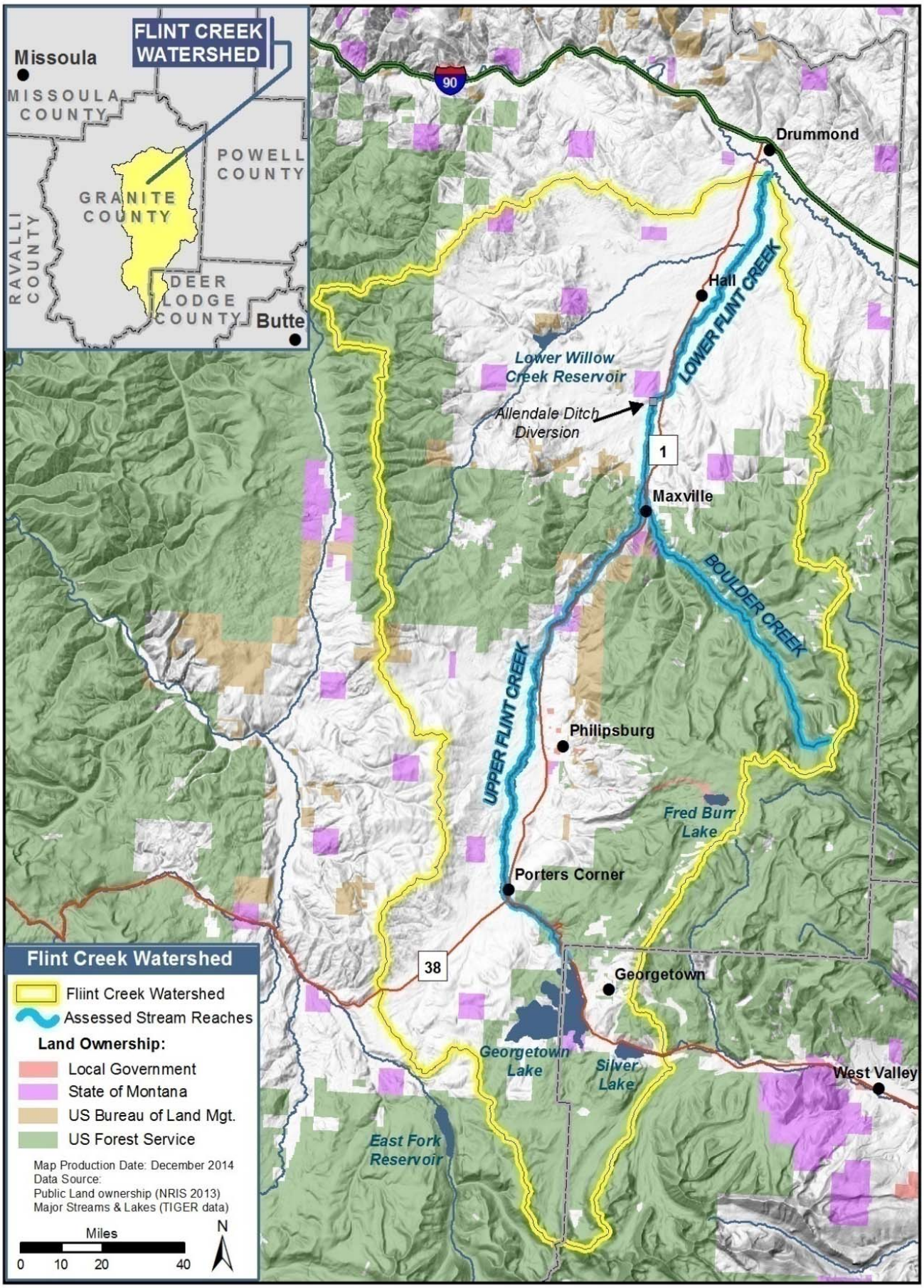
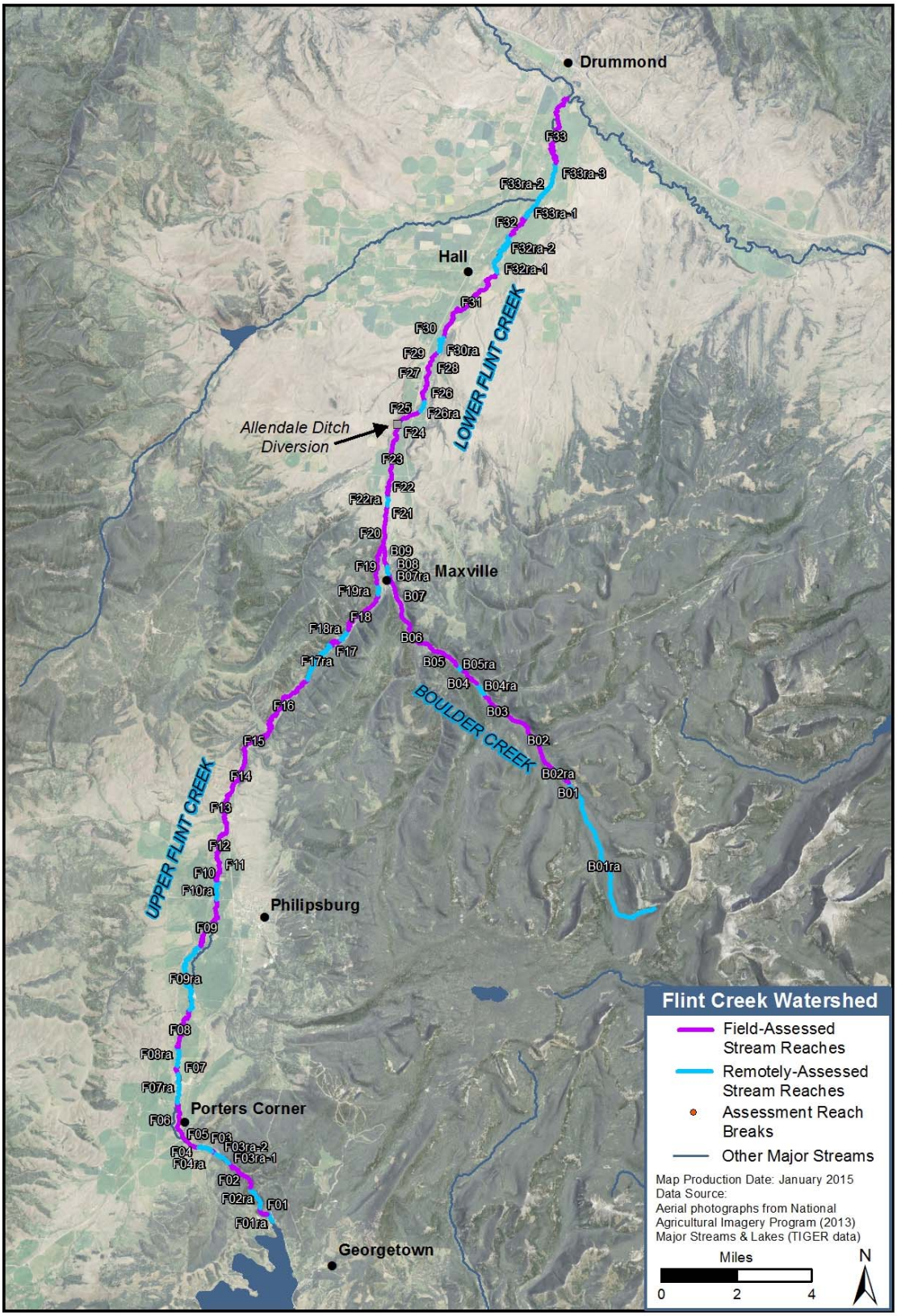


Figure 2. Remote and field assessed subreaches



intermixed with mature and sapling woody riparian vegetation including alder, willows and cottonwood galleries in the lower extent of the subreach. The riparian area is fenced but some browse was observed from horses and mules on the property, as well as wildlife. Browse intensity overall was light and cottonwood and willow regeneration was high.

One irrigation diversion was noted on site, which was determined to likely be a high entrainment concern. Armored banks, decreased understory cover and a lack of woody debris in the channel were noted as limiting factors for fish habitat.

Restoration Potential

- Conservation of streamside fencing
- Stabilization of high and bare banks on river right with bioengineering techniques, willow staking

Armored bank on river right to protect property at F30.

Typical bank conditions in F30

4.1.46 **Subreach F31**

Percentage of Linear Bank Erosion (%)	Erosion rating	NRCS Score (%)	NRCS rating	Fish Habitat Score (%)	Fish Habitat Rating	Restoration Priority Ranking
16	Moderately High	53	At Risk	57	Fair	High

Subreach F31 is 14,771 feet in length and is classified as a Rosgen C4c channel type based on a width/depth ratio of 19.4 and gravel dominated channel bed with some cobbles, as calculated in the field and a slope of 0.6%, and sinuosity of 1.4, which were calculated from aerial imagery in GIS.

This subreach is comprised of several ownerships with similar riparian and fish habitat characteristics and similar restoration priority concerns. Grazing patterns are consistent

throughout the ownerships and have significant impacts on the riparian vegetative community. The stream has moderate to high levels of lateral bank erosion, particularly on outside meander bends. These conditions have led the stream to be over-widened in many areas, perpetuated by cattle-trampled banks and minimal woody riparian vegetation. Lacking robust vegetation, banks of outside bends were regularly found cleaving off and falling into the stream. Mid-channel bars indicate a stream out of balance with its sediment and in places excessive algae was noted growing in the channel.

In the downstream-most ownership by the lumber operation, streambanks are heavily rip-rapped to protect structures and the stream may have been straightened in the past. Banks in this southernmost ownership do not exhibit the active erosion observed upstream and are stable. The stream has ready access to its floodplain on the river right.

The corrals just east of the Tuning Fork road crossing is a heavy cattle-use area with active bank erosion throughout and, in places, high eroding banks and no woody riparian vegetation. Between the Tuning Fork road and this high use area, a small length of riparian fencing on both banks provides some relief from grazing pressures and riparian vegetation is dramatically improved. This fencing is likely installed due to concern over downstream structures near the stream.

Bank vegetation is dominated by escaped pasture grasses, with sporadic clumps of willows and river birch. Rose and hawthorne are also present throughout, an indication of the heavy browse pressure in this subreach. Cottonwood stands are small and far between, comprised primarily of mature individuals with heavy cattle use underneath them. Downstream of these cottonwood stands, piles of woody debris against banks are providing some stabilization as well as improving fish habitat conditions. Fish habitat is otherwise fair throughout this subreach, with a noticeable lack of overhanging vegetation and deep pool habitat.

Two irrigation diversions were found in this subreach. The uppermost diversion was closed and determined to be old, but still leaking water and likely posing an entrainment problem. The lower diversion, also showing its age was determined to be a high risk for entrainment.

Restoration Potential

- Riparian fencing or fencing of cottonwood and willow stands to promote regeneration
- Grazing management including off-site water, decreased intensity on riparian areas
- Fish screens or removal of diversions

Heavy cattle use area in F31

View upstream near lumber operation and rip-rapped banks in F31

4.1.47 **Subreach F32ra-1**

Percentage of Linear Bank Erosion (%)	Erosion rating	NRCS Score (%)	NRCS rating	Fish Habitat Score (%)	Fish Habitat Rating	Restoration Priority Ranking
NA	NA	92	Sustainable	NA	NA	Moderate

Subreach F32ra-1 is 4,162 feet in length and located primarily within one ownership, with one small inholding at its uppermost extent. This subreach was classified as a Rosgen C4c channel with a channel bed substrate of gravel, slope of 0.3%, sinuosity of 1.5 and an estimated width/depth ratio of 13.9, as interpreted from aerial imagery and GIS.

Land owners in this subreach appear to have left the riparian area in a largely natural state, with a high density of large woody riparian shrubs dominating most of the subreach length widths range from over 100 feet to over 500 feet.

Other than the dense riparian buffer, the main distinguishing feature of this subreach is a narrower channel, likely due to the stabilizing impact of riparian vegetation. In contrast to the bankfull width, however, long riffle sections are noticeably shallow from the August 2013 imagery used for this interpretation. Stream depths are impacted by an irrigation diversion at the top of the reach, which was determined to be impassable for fish in its current configuration because of a lack of fish bypass structure.

Restoration Potential

- Conservation/Preservation of existing riparian vegetation (easement?)
- Improve fish passage at diversion

9.0 APPENDIX 3: SUBREACH EROSION SUMMARY DATA

SubReach ID	Reach Length (ft)	Linear Bank Erosion (ft)	Total Bank Erosion (ft^2)	Percentage of Linear Bank Erosion (%)	Primary Erosion Source
F01ra	1486	NA	NA	NA	NA
F01	1752	304.5	9775	8.69	HS
F02ra	3701	NA	NA	NA	NA
F02	5682	364.5	1117.5	3.21	NBS
F03ra-1	2228	NA	NA	NA	NA
F03ra-2	388	NA	NA	NA	NA
F03	774	91	173	5.88	NBS
F04ra	2872	NA	NA	NA	NA
F04	1532	147	534.5	4.80	I
F05	1569	60	250	1.91	I
F06	6073	2863	5619	23.57	LS-P/LS-B
F07ra	5197	NA	NA	NA	NA
F07	1638	653	960	19.93	RI
F08ra	4025	NA	NA	NA	NA
F08	9561	3766	9309.5	19.70	LS-P/LS-B
F09ra	17987	NA	NA	NA	NA
F09	12820	3630	5480	14.16	LS-P/LS-B
F10ra	4317.6	NA	NA	NA	NA
F10	3017	435	601.5	7.21	CR
F11	2217	137	159	3.09	CR
F12	9258	1521	2029	8.21	CR/LS-P
F13	9150	1704	2433.5	9.31	CR/LS-P
F14	5947	1476	8840	12.41	RI
F15	8690	2663	5127.5	15.32	RI
F16	15002	4736	23906	15.78	HS/RI
F17ra	10632.1	NA	NA	NA	NA
F17	3528	773	860	10.95	CR
F18ra	2715.5	NA	NA	NA	NA
F18	9480	492	8037.5	2.59	NBS, RI
F19ra	2106.3	NA	NA	NA	NA
F19	6221	0	0	0.00	none
F20	3454	1.5	15	0.02	CR
F21	2292	80	40	1.75	CR
F22ra	1670.9	NA	NA	NA	NA
F22	3212	418	731.5	6.51	LS-P/LS-B
F23	5577	1449	4754.5	12.99	LS-P/LS-B
F24	3451	515	2384	7.46	RD/HS
F25	3045	1388	2319.5	22.80	LS-P/LS-B
F26ra	1613.8	NA	NA	NA	NA
F26	3168	950	875	15.00	CR
F27	2634	70	139	1.33	LS-P
F28	1020	298	511	14.61	LS-P/LS-B
F29	1945	422	884	10.85	CR/LS-B
F30ra	3385.8	NA	NA	NA	NA
F30	1628	159	114.5	4.88	CR
F31	14771	4663	9670	15.78	CR/LS-B
F32ra-1	4161.9	NA	NA	NA	NA
F32ra-2	5696.5	NA	NA	NA	NA
F32	5134	1679	3165.5	16.35	CR/LS-B
F33ra-1	5033.7	NA	NA	NA	NA
F33ra-2	3972.9	NA	NA	NA	NA
F33ra-3	2855.0	NA	NA	NA	NA
F33	14783	4906	12647	16.59	CR/LS-B

SubReach ID	Reach Length (ft)	Linear Bank Erosion (ft)	Total Bank Erosion (ft^2)	Percentage of Linear Bank Erosion (%)	Primary Erosion Source
B01ra	26762	NA	NA	NA	NA
B01	1215	245	775	10.08	RD
B02ra	2321	NA	NA	NA	NA
B02	10152	30	67.5	0.15	I
B03	6502	30.5	81	0.23	CR
B04ra	1871	NA	NA	NA	NA
B04	2979	771	1036	12.94	NC
B05ra	1330	NA	NA	NA	NA
B05	4952	846	1624	8.54	CR
B06	8155	317	669	1.94	NBS
B07	6034	196	496	1.62	HS
B07ra	1303	NA	NA	NA	NA
B08	779	59	81	3.79	CR
B09	2600	10	5	0.19	NBS

Code	Description	Code	Description
RD	Road Erosion	I	Geomorphic incision
BR	Bridge Erosion	NC	New channel has formed in area that lack riparian vegetation
CR	Cropland Encroachment: Lack of Riparian Veg	C	Corrals
LS-B	Livestock Browse: Lack of Riparian Veg	RE	Recreation Access
LS-P	Physical Livestock Erosion	RI	Riparian buffer removed, lack of veg
TP	Trampled by livestock, no real height of erosion	NBS	
HS	Hillside erosion, channel cutting into valley walls		