



FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid



I. APPLICANT INFORMATION

A. Applicant Name: Eric Leinonen

Mailing Address: 901 Technology Blvd.

City: Bozeman State: MT Zip: 59718

Telephone: 406-396-5377 E-mail: eric.leinonen@retranches.com

B. Contact Person (if different than applicant): _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ E-mail: _____

C. Landowner and/or Lessee Name (if different than applicant): Turner Enterprises, Inc. C/O Mark Kossler

Mailing Address: 901 Technology Blvd.

City: Bozeman State: MT Zip: 59718

Telephone: 406-556-8500 E-mail: _____

II. PROJECT INFORMATION

A. Project Name: Wilson Creek Restoration Project

River, stream, or lake: Wilson Creek

Location: Township: _____ Range: _____ Section: _____

Latitude: _____ Longitude: _____ *Within project (decimal degrees)*

County: _____

B. Purpose of Project:

The first 0.75 miles of Wilson Creek has been channelized and straitened to support agricultural operations adjacent to the stream.

A restored Wilson creek will provide spawning & rearing opportunity for resident and migratory Gallatin River salmonid populations and expand the Gallatin riparian habitat complex. Furthermore, by recontouring the stream channel, flows will slow and the increased connectivity with the floodplain will allow greater opportunity for bank storage of water and increase late season water availability in Wilson Creek and in turn, the Gallatin River.

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

Wilson Creek is a tributary to Gallatin River in Gallatin County, MT. The headwaters originate off property, in the NW Gallatin Mountains within the Gallatin National Forest. The lower-most 0.9 miles of the creek flow across Flying D Ranch, before joining the Gallatin River. This tributary stream is greatly impacted by physical alterations, and dewatering during peak irrigation season. The lowermost 0.75 miles of Wilson Creek was historically channelized and straitened to enable agricultural operations on land adjacent to the stream. Additionally, greater than 80% of this reach on the Flying D has been cleared of woody riparian plant species.

This project entails restoration of an incised stream channel, in-stream habitat enhancement, and a partial stream channel relocation, which is expected to result in re-establishment of lost wetland on the floodplain. The project design primarily uses low-tech restoration techniques to increase stream complexity and improve floodplain connectivity where the channel is straightened and incised. More intensive earthwork using heavy equipment will be needed to return Wilson Creek into a bypassed historic channel, abandoning the current straightened channel below two pivot-irrigated fields. Installation of low-tech restoration techniques and a rock step-pool structure at the downstream end of the newly activated channel will stabilize the channel above its new confluence with the Gallatin River and will promote re-establishment of a riparian wetland complex on the abandoned floodplain along the restored stream course. At present Wilson Creek is separated from the historical channel due to past ditching activities and by a large berm made of the excavated ditch material. The channel relocation will entail excavating a path through said berm to the historic channel and relocating the excavated berm material into the straightened channel to act as plug and divert water into reconnected historical channel. The outer bend of the new channel dug through the berm will be stabilized using vegetated soil lifts. Water will be released back into the channel slowly, after low-tech structures have been placed in the original (braided) channel paths and the rock step-pool grade control structure has been installed at the new graded outlet to the Gallatin River.

A design concept, included with the attached aquatic resources delineation, provides a more detailed description of the proposed work and restoration techniques. Maps of the project area are included in appendix A and in appendix B attachment A of the technical memorandum. Plans of the proposed channel relocation, the channel plug for the existing straightened channel, the bioengineered outer bank, and the rock step-pool structure are also included in attachment B of appendix B. The project is scheduled to take two years to complete in total, with the lower reaches constructed in 2022 and the rest completed in 2023. The funding requests made of the Future Fisheries Fund are to be applied to work scheduled for 2022.

D. What was the cause of habitat degradation and how will the project correct the cause?

Wilson Creek was historically ditched - straightened, widened, and channelized. This was done to enhance agricultural use of the adjacent land by conveying Wilson Creek water across the land as efficiently as possible. Presently the stream looks and functions more like a ditch than a natural stream, with uniform flow velocity, near zero sinuosity, and no connectivity to floodplain providing minimal opportunity for bank storage. The proposed project will increase sinuosity, create a variety of water velocities, encourage natural channel morphology, and create greater connectivity to floodplain with increased opportunity for bank storage. Additionally, returning Wilson Creek to a historic channel will increase stream length, create opportunity for riparian wetland development, creating a dynamic stream habitat and riparian complex suitable.

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

0.75 miles (3934 ft)
Pre-restoration

Length/size of impact, if larger than project extent (e.g., stream miles opened): 1.1 miles (5924ft) post restoration

F. Project Budget Summary:

Grant Request (Dollars):	\$ 5,460.00
Matching Dollars:	\$ 15,150.00
Matching In-Kind Services*:	\$ 16,410.00
<i>*salaries of government employees are not considered matching contributions</i>	
Other Contributions (not part of this app)	\$ Future monitoring
Total Project Cost:	\$ 31,560.00

G. Attach itemized (line item) budget – see budget template

H. Attach project location map(s) that include:

- ☒ Extent of the project, including context (relation to major landmark or town)
- ☒ Indication of public and private property
- ☒ Riparian buffer locations and widths (if applicable) and grazing locations

I. Attach project plans:

- ☒ Detailed sketches or plan views with the location and proposed restoration
- ☒ Pre-project photographs (GPS location strongly recommended)
- ☐ If water leasing or water salvage is involved, attach a supplemental questionnaire (<https://myfwp.mt.gov/getRepositoryFile?objectID=36110>)

J. Attach letters or statements of support (e.g., landowner consent, community or public support, and fish biologist support). List any other project partners:

See attached letter from landowner.

Mike Duncan (MTFWP region 3 fisheries biologist) wished to be listed as a co-sponsor for this project, but I am unsure where to list this?

The Nature Conservancy is a supporting partner with this project

III. MAINTENANCE AND MONITORING (attach additional information to end of application):

- A. A 20-year maintenance commitment is required*. Please confirm that you will ensure this protection and describe your approach. Attach any relevant maintenance plans. Yes ☒ No ☐
**If it is a water leasing project, describe the length of the agreement.*

Turner Enterprises, Inc. (TEI) and the Flying D Ranch are familiar with and accustomed to the responsibilities and requirements associated with habitat restoration work. TEI will commit to maintaining the integrity and functionality of the constructed stream bypass channel and the rock grade control step-pools described for section 4. Otherwise, TEI will ensure the project has no adverse effects onto the aquatic or riparian habitats included within and below the proposed project area.

- B. Will grazing be part of or adjacent to the project? If so, describe or attach land management plans, including short term and long term grazing regimes. If the landowner is not the applicant, please describe their involvement in the project. *If you want assistance with grazing plan development, note your need.*

NO

- C. Will the project be monitored to determine if goals were met? If so, what are the short-term and long-term plans to assess benefits and lessons learned? Were pre-project data collected? Will monitoring information be shared with FWP?

TEI is familiar with assessing the success of habitat restoration work and intends to monitor specific attributes of Wilson Creek post restoration. TEI maintains an experienced biological staff to manage such responsibilities. TEI has the following goals for the Wilson creek restoration project:

1. Return Wilson Creek to a more natural morphology typified by Rosgen "c3" or "c4" channel type.
2. Establishment of appropriate riparian vegetative community along greater than 80% of the project area.
3. Document salmonid reproduction within the project area.
4. Document various age class of Salmonid using the project area.

Furthermore, TEI will establish six (6) stream channel reference sites (one per restoration reach 2a,2b,3,5, and two in reach 4). At each established site a stream cross-section will be surveyed to monitor for undesirable channel migration or incision.

Prior to project implementation, TEI has collected water temperature data and conducted fisheries population surveys above and within the project area. These data will provide context to the impacts of the project. All of these data are available, and all future data will be available for FWP review or use upon request.

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

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

Based on MTFWP surveys of the Gallatin and TEI surveys of Wilson Cree, the following species are anticipated to benefit from this project.

Rainbow Trout (*Oncorhynchus mykiss*)
Brown Trout (*Salmo trutta*)
Rocky Mountain Sculpin (*Cottus bondii*)

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

Currently Wilson Creek offers little habitat for salmonid reproduction or rearing, has severely limited riparian habitat, and has poor connectivity with its floodplain. The goal of this project is to enhance all of these, which will be an asset to the overall health and condition of the Gallatin River salmonid populations.

A restored Wilson creek will provide spawning & rearing opportunity for resident and migratory Gallatin River salmonid populations and expand the Gallatin riparian habitat complex. Furthermore, by recontouring the stream channel, flows will slow and the increased connectivity with the floodplain will allow greater opportunity for bank storage and increase late season water availability in Wilson Creek and in turn, the Gallatin River

- C. What is the expected improvement to fish populations, both short term and long term? How might the project translate to angler success?

In the short term, the goals of the Wilson Creek Restoration Project are to improve opportunity for salmonid reproduction and rearing, along with increasing potential for bank storage of water and improve the overall riparian habitat within the Gallatin River corridor. All of these things, if realized, will help bolster salmonid populations and/or their habitat. This in turn will provide opportunity for angler success while fishing the Gallatin River. Williams Rd. bridge is a popular access point for anglers on the Gallatin. This access point is approximately 1 mile upstream of the restored confluence with Wilson Creek.

In the Long term, the hydrological and morphological goals of the Wilson Creek Restoration Project will help to increase the greater Gallatin watershed riparian and hyporheic zones. This increase in groundwater storage potential and riparian shading will benefit the greater Gallatin River water quality should we experience warmer and dryer climate as is predicted by some climatologists.

- D. Will the project increase public fishing opportunity for wild fish and, if so, how? Is public fishing allowed onsite? If not, describe how the public would access the project benefits.

A restored Wilson Creek will contribute wild salmonid into the Gallatin River. These fish may migrate to areas more frequently used by the angling public. Public access will not be permitted to the Wilson Creek project area. The intent of the project is to improve habitat conducive to salmonid reproduction and rearing, as such, increased angling on Wilson creek may be counterproductive to this goal.

Although, as mentioned the Williams Rd. bridge is only a mile upstream on the Gallatin from Wilson Creek. It is well within the realm of possibility for the angling public to access Wilson Creek via the high-water mark.

- E. Aside from angling, what local or large-scale public benefits will be realized from this project?

Any increase in the Gallatin River salmonid population should be recognized as a public good. Angling generates revenue for the local economy in a variety of ways. Beyond the impact of angling, the project intends to increase the riparian habitat of the Gallatin River. This in turn will benefit wildlife, water quality, and water quantity (via increased bank storage) within the Gallatin River corridor.

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

NO

- G. Will the project result in the development of commercial recreational use on the site (including paid access)? Explain:

NO

- H. 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.

V. 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: 5/15/2022

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
--	--

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

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		includes survey		\$ 8,450.00		8,450.00		\$ 8,450.00
Engineering				\$ -				\$ -
Permitting				\$ 6,700.00		6,700.00		\$ 6,700.00
Oversight				\$ -				\$ -
				\$ -				\$ -
		Sub-Total		\$ 15,150.00	\$ -	\$ 15,150.00	\$ -	\$ 15,150.00
Travel								
Mileage				\$ -				\$ -
Per diem				\$ -				\$ -
		Sub-Total		\$ -	\$ -	\$ -	\$ -	\$ -
Construction Materials****								
Rock for step-pool const.	22	yard / 24" rock	\$45.00	\$ 990.00		990.00		\$ 990.00
pine poles for PALS	200		\$7.50	\$ 1,500.00		1,500.00		\$ 1,500.00
				\$ -				\$ -
		Sub-Total		\$ 2,490.00	\$ -	\$ 2,490.00	\$ -	\$ 2,490.00
Equipment, Labor, and Mobilization								
TEI Labor	160	hrs	\$30.00	\$ 4,800.00		4,800.00		\$ 4,800.00
TEI Labor	160	hrs	\$17.00	\$ 2,720.00		2,720.00		\$ 2,720.00
Flying D Rock Mobilization	6	hrs	\$130.00	\$ 780.00		780.00		\$ 780.00
Flying D loading rock	1	hrs	\$160.00	\$ 160.00		160.00		\$ 160.00
Flying D Excavator & operator	32	hrs	\$160.00	\$ 5,120.00	5,120.00			\$ 5,120.00
Excavator mobilization	2	hrs	\$170.00	\$ 340.00	340.00			\$ 340.00
				\$ -				\$ -
		Sub-Total		\$ 13,920.00	\$ 5,460.00	\$ 8,460.00	\$ -	\$ 13,920.00
TOTALS				\$ 31,560.00	\$ 5,460.00	\$ 26,100.00	\$ -	\$ 31,560.00

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:

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

APPLICATION MATCHING CONTRIBUTIONS				
(do not include requested funds or contributions not associated with the application)				
CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
The Nature Conservancy (TNC)	\$ -	\$ 15,150.00	\$ 15,150.00	yes
Turner Enterprises, Inc.	\$ 7,520.00	\$ -	\$ 7,520.00	yes
Flying D Ranch	\$ 3,430.00	\$ -	\$ 3,430.00	yes
Future Fisheries Fund	\$ 5,460.00	\$ -	\$ 5,460.00	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
TOTALS	\$ 16,410.00	\$ 15,150.00	\$ 31,560.00	

OTHER CONTRIBUTIONS				
(contributions not associated with the application)				
CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
TOTALS	\$ -	\$ -	\$ -	



TURNER ENTERPRISES INC.

Future Fisheries Improvement Program
FWP Fisheries Division
P.O. Box 200701
Helena, MT 59620

To the Future Fisheries Improvement Program,

The Gallatin River is a valued resource for the angling public and as large landowner of adjacent lands, Turner Enterprises, Inc. recognizes the importance to manage our properties responsibly. As Vice President of Ranch Operations for Turner Enterprises, Inc. I am writing to express support for the proposed Wilson Creek Project. The Flying D Ranch and all Turner properties are managed under the operational mission: To Manager Turner Ranches in an Economically Sustainable and Ecologically Sensitive Manner While Conserving Native Species and Habitats. The Wilson Creek Restoration Project represents this mission by aiming to improve in-stream habitats to restore greater ecological function to the stream and surrounding riparian habitat of the Gallatin River while maintaining the long-established agricultural operations on adjacent lands.

Sincerely,

A handwritten signature in blue ink that reads "Mark Kossler".

Mark Kossler
V.P. of Ranch Operations
Turner Enterprises, Inc.
901 Technology Blvd
Bozeman, MT 59718

TURNER ENTERPRISES
INCORPORATED



Image of Wilson Creek as it flows across the farm fields of The Flying D Ranch and joins the Gallatin River.

INTRODUCTION

An aquatic resource delineation was conducted by Great West Engineering, Inc in June of 2020 to support stream restoration on Wilson Creek south of Gallatin-Gateway in Gallatin County, MT. The proposed project site is mapped in **Figure 1**.

Wilson Creek, a perennial tributary to the Gallatin River, has been straightened for most of its extent within the project site. An irrigation diversion within the project area partially controls water depth and flow and has contributed to channel incision downstream of the diversion and acts as a partial fish barrier. Wetlands at the project site are palustrine forested (PFO) in the upstream portion of the project area, where pole to mature-size cottonwoods line both banks of the channel, and palustrine emergent PEM wetland downstream of the treed portion. The stream flows between two pivot-irrigated fields for most of its length within the project area. Wilson Creek is the only stream within the proposed project site, but it flows into the Gallatin River at the downstream end of the project area.

The project area lies within the Rocky Mountain Range and Forest Land Resource Region (LRR) and the Central Rocky Mountain Valleys, South West Major Land Resource Area (MLRA; MNHP 2021). Land use is primarily irrigated hay land. Wilson creek has been straightened to accommodate agricultural uses and runs between two pivot-irrigated fields. Wilson Creek runs through cottonwood-dominated forest in the upper portion of the project, but likely is incised from historic channel manipulation and currently has a farm road crossing and culvert within the forested portion of the project site. Some livestock access occurs upstream of the road crossing.

The goal of the proposed restoration is to improve aquatic habitat and induce increase scour and deposition in the existing channel of Wilson Creek and to restore Wilson Creek to a historical channel above its confluence with the Gallatin River. This project will dovetail with an irrigation diversion replacement to improve fish passage on Wilson Creek. This aquatic resource delineation report also will apply to the planned irrigation diversion upgrade, which is not yet designed.

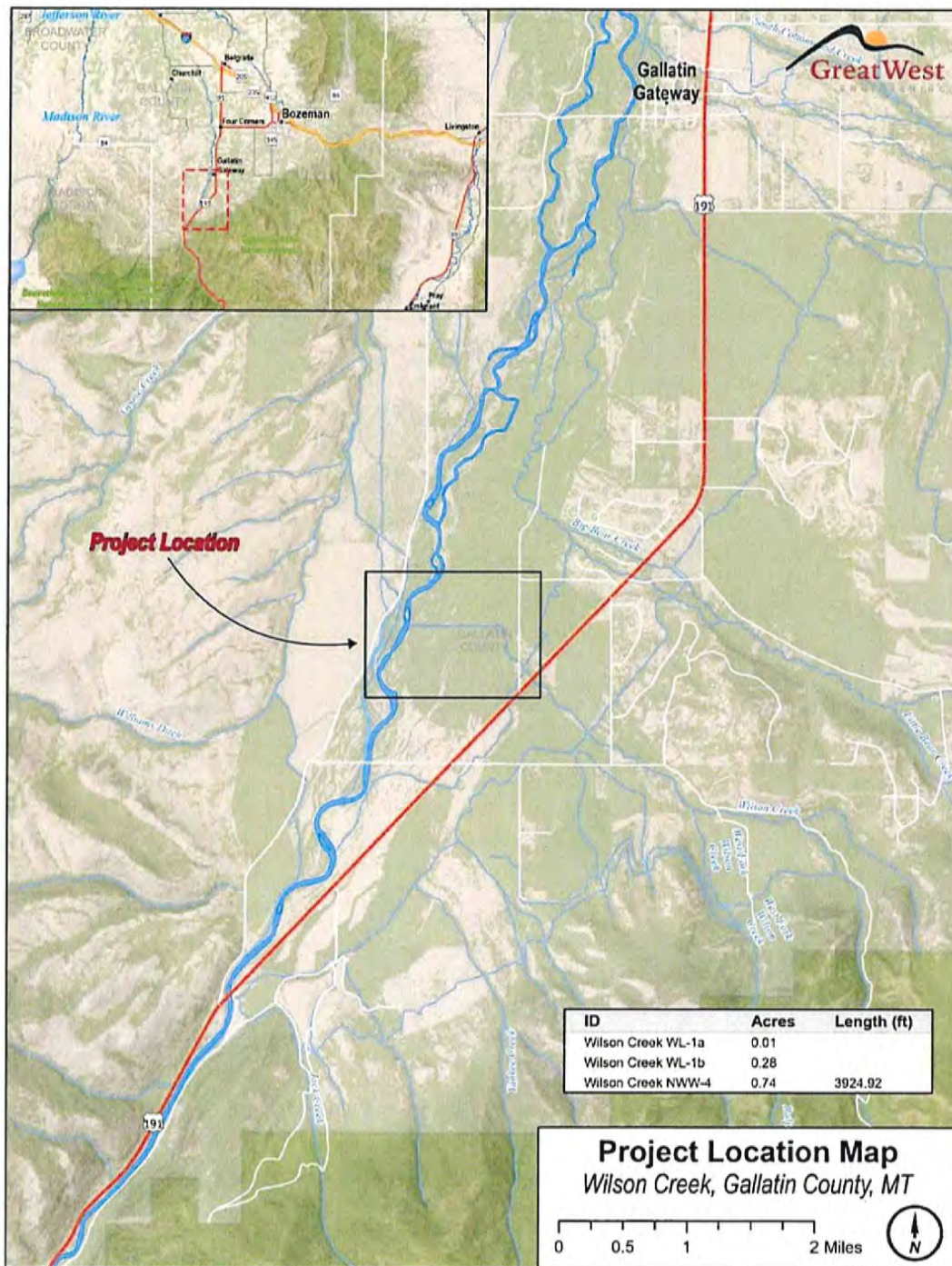


Figure 1. Project site location and reaches.

The project objectives include restoring the straightened channel back to its original channel downstream of the irrigated fields (see Maps, **Appendix A**). The area containing the abandoned natural channel is upland, but obviously had been wetland prior to channel straightening. The proposed low-tech restoration project also entails installing low-profile structures (called beaver dam analogs, or BDAs) and post-assisted log structures (PALS), which will be composed of natural materials (small native posts, brush, and/or sod) sourced at or near the project site, placed in the

streambed to re-elevate incised reaches of stream channel and to increase the natural processes of scour and deposition. These activities increase pool depths and slightly expand the extent of shallow water (generally one to two feet deep) surface area, mostly within the bankfull channel level. The pooling is not deep enough or extensive enough to convert emergent wetland to an open water system. The proposed restoration also will induce meandering and promote initial channel widening, lowering stream energy, promoting sediment trapping, improving aquatic habitat complexity and increasing stream length. In many cases, the higher water table and sediment trapping resulting from the induced pooling encourages expansion of emergent wetland and provides new seedbed areas for riparian shrubs.

The project site stream reach locations and reach-specific goals are listed below in **Table 1**. A map of restoration reaches is included in **Appendix A**. Reach 4 is not within an existing waterway or wetland.

Table 1. Reach location information for Wilson Creek

Reach ID	Upstream lat/long	Downstream lat/long	Stream Reach Length (ft)	Restoration Objective/Approach
2a	45.548143, -111.217138	45.549704, -111.219027	800	Add small log jams (PALS) to provide fish cover and increase in-stream habitat complexity
2b	45.549704, -111.219027	45.551228, -111.221332	1033	Install low, porous structures to encourage minor scour and deposition; none planned within 300 ft upstream of diversion
3	45.551239, -111.221737	45.551217, -111.227209	1401	Install PALS and BDAs to restore scour and deposition processes, increase channel sinuosity and habitat complexity
4	45.551217, -111.227209	45.554510, -111.227181*	1990	Breach berm and restore flow slowly to historic channel, letting water pick its path; Install low-tech structures before all streamflow is let into reach; structures slow flow and encourage anastomosing channel to restore wetland and fish habitat; stabilize outlet to Gallatin River with small step-pool structure
5	45.551217, -111.227209	45.551220, -111.229958	700	Convert reach 5 to high water overflow/backwater channel only; add instream habitat and promote habitat complexity

*Approximate location, based on LiDAR-derived elevation map of historic channel of Wilson Creek

A project concept report, attached in **Appendix B**, provides more detail about the restoration approach for each reach. Typical for BDAs and PALS are included with the joint permit application and pre-construction notice (PCN).

Regulatory Framework and Jurisdiction

Waters of the United States as defined in 40 CFR 230.3 include: waters which were or could be used for interstate or foreign commerce; all interstate waters, including interstate wetlands; all other waters including intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use or degradation of which could affect interstate or foreign commerce; all impoundments of waters otherwise defined as waters of the U.S.; tributaries of waters of the U.S.; territorial seas; and wetlands adjacent to waters of the U.S. (other than wetlands). Ditches are included in Waters of the

U.S. provided that they are not “excavated wholly in uplands, drain only uplands, and have less than perennial flow” or, “do not contribute flow, either directly or through another water,” to other waters of the U.S. (40 CFR 230.3).

For jurisdictional considerations wetlands are defined as: *Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3, 40 CFR 230.3).*

METHODS

Aerial photos, Montana Natural Heritage Program (MNHP) wetland vegetation maps, and NRCS soils maps (NRCS 2021) were reviewed prior to conducting the on-site delineation. The NRCS soil map and data and Montana Natural Heritage Program Wetland Inventory (MNHP-WI) maps for the project site are included in **Appendix D**. Great West Engineering delineated aquatic resources at the project site on June 25, 2020, following the Routine Method described in the USACE wetland delineation manual (Environmental Laboratory 1987), and the Western Mountains, Valleys, and Coast Region (WMVC) Regional Supplement (Version 2.0) (USACE 2010). The 2018 WMVC regional plant list of the National Wetland Plant List was used to determine vegetation indicator status (USACE 2018). The delineation was conducted during high flow conditions. Data points (DP) were established within the wetland (W) and adjacent upland (U), i.e. nonwetland area. At each data point wetland indicator data were collected and analyzed using USACE wetland determination data forms for the WMVC Regional Supplement (**Appendix C**). In general, an area qualifies as a wetland if a site exhibits positive wetland indicators for three parameters: vegetation, soils, and hydrology. Conditions at the DPs and review of aerial photos and existing soils, climate, and hydrologic data inform delineation of the extent of wetlands at the site. A list of plant species observed at sample points is provided in the wetland determination data forms, **Appendix C**. Photographs are included in **Appendix C**.

Great West Engineering surveyed wetland and non-wetland waterway (NWW) boundaries using a Global Navigation Satellite System (GNSS) receiver and ESRI Collector software on a cell phone interface to collect sub-meter GPS data. Survey data were post-processed and mapped over recent aeriels to verify accuracy of wetland boundary locations. Surveyed boundaries were used to calculate acreage of aquatic resources on-site, included in the Results section, below. The area within NWW is not included in the wetland acreage.

The exact location of wetland sod source areas along streams is determined during actual construction, with structure design and placement reflecting water response (or predicted water response in dry channels) as related to structure height and suitable building locations at the right spacing for maximizing structure stability. The PCN provides specifics about proposed construction and potential wetland impacts.

RESULTS

Table 2 lists wetlands and NWW by site name in the project area. Wetland acreage, Cowardin type, hydric soil indicators, source of hydrology, and dominant vegetation are also included in **Table 2**. Maps of delineated wetlands and NWW are included in **Appendix A**. Photos from the aquatic resources delineation are included in **Appendix C**.

Aquatic Resource Descriptions

WL-01a

Wetland WL-01a is the forested component of WL-01 along the lower banks of Wilson Creek at the upstream and of the project site. Wetland WL-01a is restricted to narrow bands of wetland on the

lower streambank and is surrounded by upland riparian forest. WL-01a covers 0.008 acres within the project site and is a palustrine forest (PFO) wetland dominated by black cottonwood (*Populus balsamifera*), with multiple grass and sedge species at lower areas near water level. Wetland cover is limited because the channel is straight and incised and has very stable banks supporting dense young cottonwood forest.

WL-01b

Wetland WL-01b is the emergent component of WL-01 along the lower banks of Wilson Creek. The wetlands are temporarily flooded, during spring high water. The channel of Wilson Creek has been straightened and the wetlands occurring along the low banks have formed partly due to the excavation. Wetland WL-01b is restricted to narrow bands of wetland on the lower streambank, with the exception of a small area directly upstream of the diversion, where water backed up at the diversion floods the seasonally maintains soil saturation on the low terrace. Portions of the wetland are limited to the boundary of the NWW and are less than 0.5 ft wide; these narrow bands do not appear on the wetland map. WL-01b covers 0.282 acres within the project site and is a palustrine emergent (PEM) wetland dominated by a nearly uniform band of introduced pasture grasses, primarily creeping foxtail (*Alopecurus arundinaceus*), with small-fruit bulrush (*Scirpus microcarpus*) at lower areas near water level. Few shrubs and trees are present. Small clusters of cottonwood (*Populus balsamifera*) are present in the downstream portion of the wetland but are not dominant and are present mainly in upland.

Non-Wetland Waterway (Wilson Creek, NWW-1)

Wilson Creek is a mountain-fed perennial stream located in the located in the Upper Missouri River Drainage Basin and flows into the Gallatin River at the base (downstream end) of the project area. Wilson Creek, which is the only NWW in the project limits, has been straightened throughout the project area to accommodate agricultural uses on the floodplain. Aquatic habitat within Wilson Creek is dominated by low-gradient riffle, with runs and shallow pools more common in the downstream reaches. Other than directly upstream of the irrigation diversion structure, the stream is incised, generally at least two to three feet. Streambanks are generally dominated by cottonwood at the upstream end of the project site and by tall pasture grasses throughout most of the area.

SUMMARY

A total of 0.29 acres of wetlands and 3934 LF of non-wetland channel were identified within the project site. **Table 2** provides a summary of wetland characteristics and acreage within the project area. Wetland determination data forms (**Appendix C**) contain additional details about aquatic resources within the project area.

Wetland (WL)	Acreage	Wetland Data Point(s)	Cowardin Type ¹	Likely JD Status ²	Hydric Soil Indicators ³	Hydrologic Source	Description and/or Dominant Vegetation Species ³
WL-01a	0.008	01a-WL	PFO	Yes	Other-Riparian problem soil	Wilson Creek	Black cottonwood, wooly sedge
WL-01b	0.282	01b-WL	PEMAx	Yes	Other-dark, organic riparian problem soil	Wilson Creek	Creeping foxtail, small-fruited bulrush

Table 2. Aquatic Resources Delineation Summary

TOTAL	0.290	-	-	-	-	-	-
NonWetland Waterway	Est. Acreage	Length within site (lin.-ft)		Likely JD Status ²		Hydrologic Source	Description
NWW-1 (Wilson Creek)	0.74	3934	-	Yes	-	Wilson Creek	Perennial stream
¹ PEMA-Palustrine Emergent, temporarily flooded; PFO- Palustrine Forested (Cowardin et al. 1979; MNHP 2021)							
² USACE makes the final jurisdictional (JD) determination.							
³ See COE data forms for scientific names and non-dominant species (Appendix C).							

IMPACTS TO AQUATIC RESOURCES

Impacts to wetlands will be limited to cutting and salvaging wetland sod and moving it to other areas within aquatic resources. Wetland sod will be a component of the base and upstream slope of BDAs and will be sourced from low wetlands within low streambanks immediately upstream of BDA construction sites, where water is expected to pool up to bankfull level. Wetland sod for BDAs will be sourced using hand tools. The proposed restoration will increase the width of surface water by creating shallow pools upstream of beaver mimicry structures. Slowing of the water and sediment capture is expected to increase the water table elevation, supporting wetland expansion and floodplain subirrigation. Minor temporary wetland impacts are expected at wetland sod source areas. Fill and dredge materials consisting of wetland sod and native post and brush materials sourced on-site will be placed in stream channels for construction of BDAs, PALS and hybrid structures containing elements of both techniques. The attached pre-construction notification narrative describes the nature and magnitude of potential wetland impacts. All impacts are expected to be more than offset by restoration and creation of riparian wetlands when the stream is reconnected to its floodplain through the proposed low-impact restoration.

Wetland is not present along the altered bank of Wilson Creek at the site of the existing berm separating the historic channel from the current straightened channel; therefore, no wetland will be excavated to breach the berm. Wetland also is not present directly below the berm breach, where the channel plug would be placed. The channel plug will be built of compacted fill material excavated from the berm removal. The plug will be built up to at least the 100-year flood stage height of Wilson Creek and will have a moderate downstream slope to allow wetland vegetation to establish at the base. The upstream end of the plug will also be a bank of Wilson Creek where the berm was breached and will be constructed using vegetated soil lifts within and slightly above ordinary high water and bankfull level to re-establish willows along the channel and provide energy-absorbing stabilization for the new streambank. The channel downstream of the plug will continue to receive water from the Gallatin River at high flow as backwater. Low-tech structures installed in the channel downstream of the plug will increase habitat complexity and are expected to increase pool and bar formation over time but will be built porous to allow fish to escape as water recedes after peak flow. Any impacts to Wilson Creek/NWW-1 from fill placed for the plug and for low-tech structures are expected to be offset by increased functional channel length through increased sinuosity and habitat complexity and by restoration of Wilson Creek to its historic channel and floodplain in reach 4.

Wetland area and function are expected to increase as a result of this project, through elevating the channel bed to increase floodplain connectivity in incised reaches of the project area (primarily reach 3), restoring floodplain wetlands through re-establishment of a complex, natural channel in reach 4, and increasing aquatic habitat complexity and restoration of scour and deposition processes in all reaches.



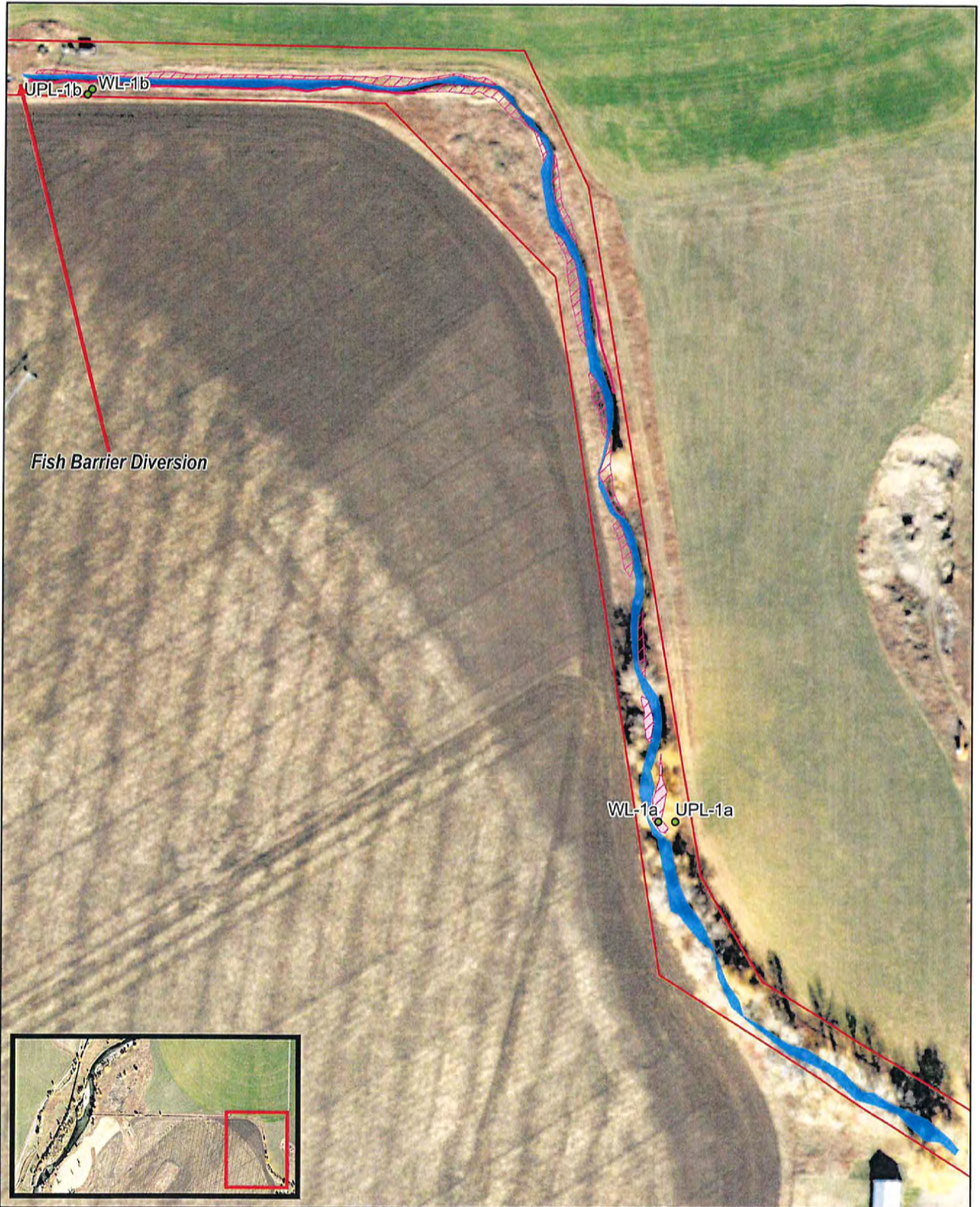
Amy Chadwick
Ecologist, Great West Engineering
achadwick[at]greatwesteng.com

REFERENCES

- Cowardin, L., V. Carter, F. Golet, and E. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. USDI Fish and Wildlife Service. Washington, D.C.
- Montana Natural Heritage Program (MNHP). 2021. Natural Heritage Map Viewer. Site accessed June 2020 and November, 2021: <https://mtnhp.org/mapviewer/?t=8>.
- Natural Resource Conservation Service (NRCS). 2021. Soil Survey, Hydric Rating by Map Unit. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>, site accessed June 2021.
- U.S. Army Corps of Engineers Environmental Laboratory (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.
- U.S. Army Corps of Engineers (USACE). 2005. Regulatory Guidance Letter, No. 05-05: Ordinary High Water Mark Identification: <http://www.nap.usace.army.mil/Portals/39/docs/regulatory/rqls/rql05-05.pdf>.
- U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountain, Valley and Coast Region (Version 2.0), ed. J.S. Wakely, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-1. Vicksburg, MS: U.S. Army Corps Engineer Research and Development Center.
- U.S. Army Corps of Engineers (USACE). 2018. Western Mountains, Valleys and Coast Regional Plant list and National Wetland Plant List, version 3.4: http://wetland-plants.usace.army.mil/nwpl_static/v34/home/home.html

APPENDIX A

AQUATIC RESOURCES DELINEATION MAPS



F:\11-18192-TNC Upper Gallatin\CADD X-XXXXX\GIS\Data\FlyingDWLD_Map.mxd

● Data Points

Wetland - WL1a

Wetland - WL1b

Non-Wetland Waterway

Project Area

Wilson Creek - Upstream of Diversion Aquatic Resources Map

0 50 100 200 Feet
1:1,500



F:\1-18192-TNC Upper Gallatin\CADD X-XXXXX\GIS\Data\FlyingDWLD_Map.mxd



- Data Points
- Wetland - WL1b
- Non-Wetland Waterway
- Project Area

Wilson Creek - Upstream of Diversion Aquatic Resources Map

0 125 250 500 Feet
1:4,000



APPENDIX B

RESTORATION CONCEPT AND PROJECT PLANS

Low-Tech Restoration Concept for Wilson Creek, Flying D Ranch, Montana

This restoration concept builds upon an earlier concept developed by Eric Leinonen of Turner Enterprises. The current design incorporates low-tech restoration design with engineered elements to maximize restoration benefits while keeping costs to a minimum. This concept describes the restoration approach recommended for multiple stream reaches, which have been broken out by land management influences and restoration goals, again based on the original design proposed by Mr. Leinonen. A map of restoration reaches is included as Attachment A.

The restoration concept follows the assumption that proposed work must not jeopardize the irrigation diversion at the downstream end of Reach 2, such as by causing the stream to carve a different channel and abandon the diversion site or causing deposits to bury the intake. The existing diversion is a likely partial barrier to aquatic organism passage; therefore, the proposed restoration approach includes replacing the existing diversion with one allowing better aquatic organism passage in the main channel but preventing entrainment into a lateral ditch, providing fish habitat if feasible (e. g. rock step-pool elevation control), and maintaining diversion stability and efficiency. The diversion replacement is not included with the restoration approach to any specific reach and is not discussed in depth in this concept but is a priority for restoring aquatic habitat on Wilson Creek.



Figure 1. Diversion and partial fish barrier on Wilson Creek

Restoration Approach

The restoration approach utilizes techniques standard to low-tech, process-based restoration and includes a variation on post-assisted log jams (PALS), which in this case are woody debris jams using small logs or large branches secured with posts or established trees, and beaver dam analogs (BDAs), which are structures made in the form of natural beaver dams, constructed out of any combination of cobble, sod, mud, and branches, secured with wooden post lines installed roughly perpendicular to the channel flow or built with a broad base and layered materials in a postless design. Examples and typicals of techniques are included in Attachment B.

A summary of the restoration reaches (zones) and the approach for each is presented below in Table 1.

Table 1. Restoration reaches and reach-specific approach

Reach Number	Approx. Length (ft)	Structure type (number)	Restoration Approach/Notes
2a	800	PALS (12)	Porous debris jams/PALS, anchored to established trees; for fish habitat and minor scour-deposition (not channel-altering)
2b	1033	BDAs (7) PALS (3)	Low BDAs and debris jams for habitat, not channel-altering; no large structures, no structures within 300 ft of diversion
3	1401	BDAs (8) PALS (12)	Larger BDAs, partial BDAs, mid-channel PALS and bank-attached PALS to induce meandering/increase channel sinuosity, restore scour and deposition to channel, and improve habitat complexity
4	1990	BDAs (12) PALS (16)	Breach berm and excavate upstream end of channel down to old channel level, then let water pick a path or, more likely, multiple paths; install BDAs and PALS to slow stream energy, create pools, and prevent excessive downcutting. Excavate the downstream end of new channel to match Gallatin River level at the confluence to facilitate upstream migration of fish into Wilson Creek. Install rock step pool structure to stabilize confluence in phase 2, after channel has established new path.
5	700	PALS (10)	Plug inlet to Reach 5 straightened channel. Install 3-4 large porous debris jams to slow energy and provide seasonal habitat in backwater during Gallatin River high flow. Excavation of an oxbow-like depression will be evaluated based on the response of the channel after flow is diverted into Reach 4.

Reach-specific restoration objectives and design details

Reach 2a: Reach 2a consists of the tree-lined upstream portion of restoration Zone 2 in the attached restoration proposal for Wilson Creek. The channel in reach 2a is lined nearly continuously with trees, which holds this incised channel at an overly-stable state in which very little scour or deposition is possible. Few pools are present, and the reach is dominated by riffle habitat. The trees are well-established and provide shade and terrestrial food sources. The proposed restoration approach in this reach is to install small log or coarse woody debris jams, using established trees as anchor points. Debris jams will slow the water, also raising the water table, and encourage some scour and deposition to add habitat complexity and will serve as habitat themselves. The trees stand lining both banks of Wilson Creek in this reach are overcrowded in many areas. In these areas, some trees can be cut partway through, making the top of the tree fold down into the channel, to add additional stretch to debris jams or to act as additional cover and encourage scour pool formation. Restoration in this reach would occur in two phases to build up structures and elevate the channel bed further after the first post-construction spring runoff and associated sediment deposition.



Figure 2. Tree-lined and incised channel of Reach 2a.

Reach 2b: This part of reach two transitions from a tree-lined channel to a straightened channel between hay fields and with water level controlled by a diversion at the downstream end. The channel is not incised above the diversion. The challenge in this reach is to improve habitat without encouraging large out-of-bank flow causing the channel to move course upstream of the point of diversion. No large structures are recommended in the straightened downstream portion of the reach. Small (less than 1.5 ft) BDAs and some small PALs installed mid-channel or on only one side of the channel are appropriate for the upstream half of the reach to increase habitat complexity and create new bars for willow or cottonwood recruitment. The lower half of the reach, but at least 300 ft upstream of the diversion, can be treated with smaller, softer treatments, such as small, leaky partial (not channel-spanning) BDAs made of willow, or smaller debris and willow bank- attached or mid-channel PALs installed to increase habitat complexity and encourage willow material sprouting or recruitment from seed deposition on newly-formed bars. Driving willow stakes into saturated banks and bank-attached brush structures is also recommended to encourage willow sprouting in this reach; however, willow staking is most successful from late fall to early spring, when willows are dormant, and may need to be completed after the initial construction timing. Thick (at least 0.75" diameter) branches of the larger willows endemic to the region (e.g. *Salix geyeriana*, *S. bebbiana*, *S. boothii*) are preferable over sandbar willow (*S. exigua*) to encourage a more diverse shrub community with a viable understory community. No treatments, other than willow staking, are recommended for the 300 feet of stream directly upstream of the diversion.

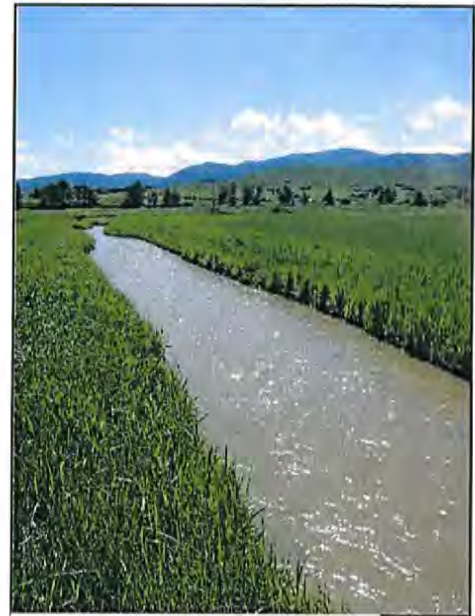


Figure 3. Reach 2b

Reach 3: This reach below the diversion is straightened, more incised, and is not likely to affect farm infrastructure, and therefore can be treated with a more aggressive approach. The restoration components in Reach 3 include larger PALs, some channel-spanning and some bank-attached or mid-channel, and larger, post-assisted BDAs, and a hybrid of the two, which is

a large post-assisted debris jam built over a less porous, approximately 1.5 ft high, BDA base. Willow or cottonwood stake or post installation is also recommended for Reach 3. Restoration in this reach would occur in two phases to build up structures and elevate the channel bed further after the first post-construction spring runoff and associated sediment deposition.



Figure 4. Reach 3.

Reach 4: This reach does not yet exist but would be created when the downstream portion of Wilson Creek is returned to one of its historical natural flow paths in the low floodplain. The natural channel is currently cut off from stream flow by a large berm, which would be breached to allow water to flow through the low floodplain. Rather than creating a designed channel, which would create a less-natural result at much greater expense, the proposed restoration approach allows the water to do the work and carve a channel in response to the energy and landform controls in place. The floodplain along the historic channel has many large willows, most of which have been killed by herbicide application in the past, but which still provide some energy absorption and are likely to help shape the channel path. Breaching should occur in low water conditions and timed to allow construction of BDAs as energy checks in the new channel path prior to the next high flow. Some low-tech structures will be constructed in the lowest paths within the floodplain below of the berm prior to breaching, to prevent excess scour from newly-released water on the floodplain. The BDA installation would trap sediment likely to be generated from scour of the new channel and would encourage the formation of pools and additional channel complexity during higher-energy flows. A second phase of structure installation is recommended to further shape habitat and stabilize the new channel after the first spring runoff.

A small step-pool structure will be installed to stabilize the new outlet of Wilson Creek to the Gallatin River prior to release of water back into the historical channel. The channel outlet will be graded to match the elevation of the Gallatin River and to establish one stable outlet. Plans for the rock step-pool structure are included as Attachment B. The series of low-tech structures will prevent high energy scour at the new channel of Wilson Creek as it develops, reducing the risk of headcutting at the new outlet.



Figure 5. Floodplain at original channel path of Wilson Creek

Elevation data derived from existing LiDAR data has informed the proposed designs for the berm breach and estimated channel path in Reach 4 (Figure 6).

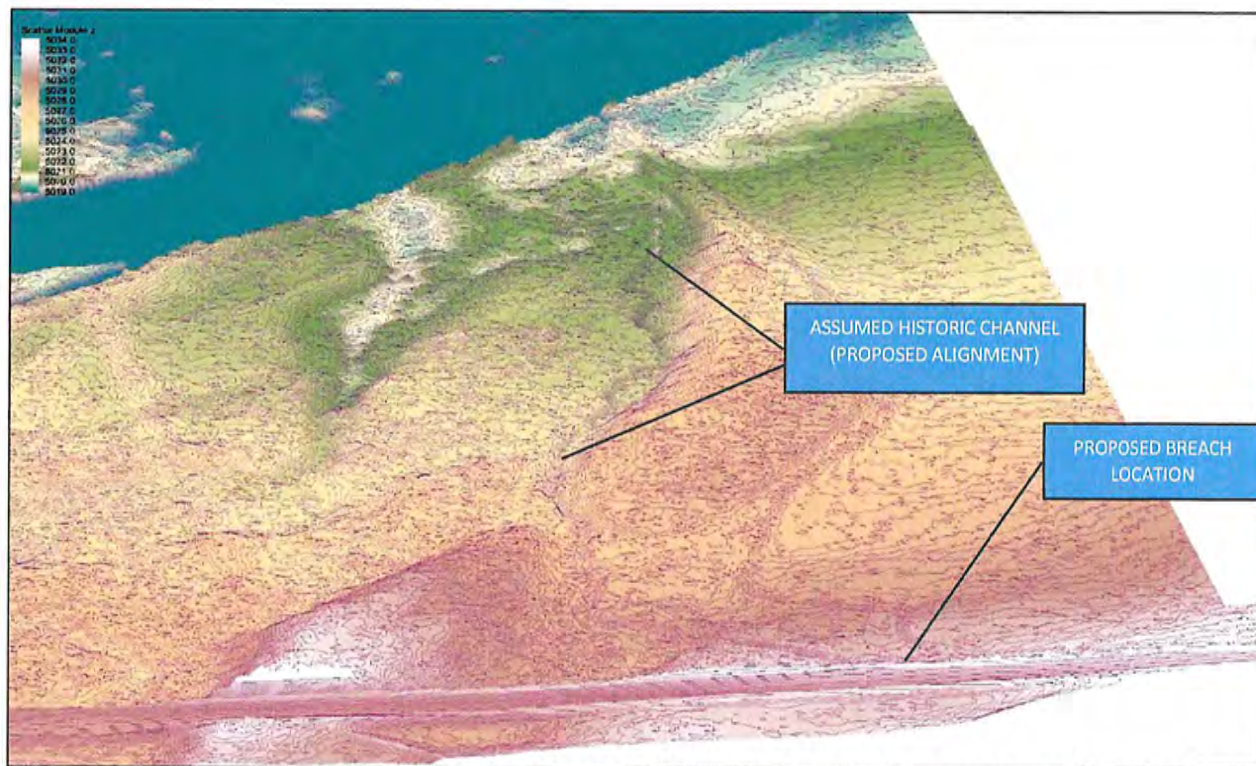


Figure 6. Elevational profile in reach 4; reaches 3 and 5 run along the bottom of the figure in the straightened channel upstream and downstream of the proposed breach location.

The attached plans (Attachment B) include the stream grading plan at the breach berm and the stream longitudinal profile within Reach 4. The rock step-pool structure will be sized appropriately to the new stream outlet.

Reach 5: This reach is the straightened existing channel above the outlet of Wilson Creek and below the proposed breach site. The reach fills with backwater from the Gallatin River during spring runoff and could provide off-channel refuge for fish in the Gallatin River during high flows. The restoration approach for this reach entails plugging the channel at the top of the reach to an elevation higher than the new channel at the top of Reach 4 and consistent with the ordinary high water mark on the Gallatin River at the current confluence, leaving Reach 5 to accommodate backwater/overflow from the Gallatin River only. The upstream end of the channel plug, which also will form the outside bend of the new channel of Wilson Creek where it is cut through the berm back to the historical channel, will be stabilized by a bioengineered bank consisting of vegetated soil lifts. The bioengineered bank will use fill excavated from the berm in the coir fabric-encapsulated soil lifts, with willow branch blankets between soil lift layers and a brush fascine at the toe of the bank. The upper bank above the soil lifts, upslope of floodprone elevation, will be sloped bank, compressed and seeded with a native upland grass mix. The design for the channel plug and the bioengineered bank are included in the plan set in Attachment C.

Large channel-spanning, porous PALs would be installed at the downstream end of the reach and decreasing in size up to the channel plug. PALs would not be solid at the base but would allow free flow of water through the structures to allow for fish to escape the channel as water recedes. Willow and/or cottonwood staking is recommended for Reach 5 as well.



Figure 7. Backwater from Gallatin River in Reach 5.

ATTACHMENT A

MAP OF RESTORATION REACHES

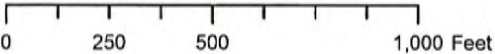
Document Path: Y:\Shared\Helena Projects\1-21232-TNC Flying D 2021\CADD X-XXXXX\GIS\Wilson Creek Map Additions\Wilson Creek Map Additions.aprx



- Reach 2a
- Reach 2b
- Reach 3
- Reach 4
- Reach 5



Wilson Creek - Restoration Reaches



ATTACHMENT B

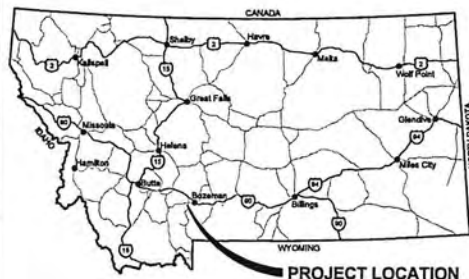
TYPICALS AND PLANS

SHEET INDEX

PROJECT: 1-18192
DATE: 12/10/2021

SHEET 1
SHEET 2
SHEET 3
SHEET 4
SHEET 5
SHEET 6

COVER
LEGEND & GENERAL NOTES
OVERALL SITE PLAN
STREAM PROFILE
STREAM REGRADING PLAN
ROCK STEP STRUCTURE



PLANS PREPARED FOR:

THE NATURE CONSERVANCY

APPROVED BY:

JONATHAN WEAVER, P.E.
GREAT WEST ENGINEERING



QA/QC BY:

AMY CHADWICK
GREAT WEST ENGINEERING

PLANS PREPARED BY:

JUSTIN EVERTZ, P.E.



SECTION 27, TOWNSHIP 4 EAST, AND RANGE 3 SOUTH
LATITUDE: 45°33'4.4" N, LONGITUDE: 111°13'38.2" W



NOT TO SCALE

NO.	REVISION DESCRIPTION	BY	DATE	SET NO.
△				SHEET NO. 1
△				
△				
△				
△				
△				

ABBREVIATIONS

[illegible]

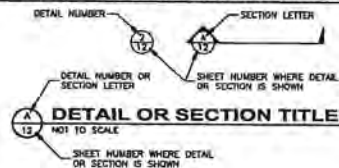
LEGEND

EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION
		MAJOR CONTOUR			SHRUB/BUSH
		MINOR CONTOUR			TREE-CONIFER
		OVERHEAD TELEPHONE			TREE-DECIDUOUS
		UNDERGROUND TELEPHONE			TREE LINE
		CABLE TELEVISION			COMMUNICATION MANHOLE
		FIBER OPTIC			COMMUNICATION VAULT
		NATURAL GAS			CABLE TV RISER
		OVERHEAD POWER			NATURAL GAS METER
		UNDERGROUND POWER			NATURAL GAS RISER
		SANITARY SEWER			NATURAL GAS VALVE
		SANITARY SEWER SERVICE			LIGHT POLE
		SANITARY SEWER FORCEMAIN			STREET LIGHT POLE
		STORM DRAIN			POWER RISER
		STORM CULVERT			PAD MOUNTED TRANSFORMER
		WATER			POWER VAULT
		WATER SERVICE			UTILITY POLE
		CHAINLINK FENCE			GUY WIRE
		BARBED WIRE FENCE			SANITARY MANHOLE
		WOOD FENCE			SANITARY CLEANOUT
		PAVED ROAD			SANITARY LAMP POLE
		GRAVEL ROAD			STORM MANHOLE
		PROPERTY/LOT LINE			STORM ROUND INLET
		PROPERTY EASEMENT			STORM SQUARE INLET
		PROPERTY SETBACK			STORM CATCH BASIN
		RIGHT-OF-WAY			11.25° ELBOW
		CITY LIMIT/DISTRICT BOUNDARY			22.50° ELBOW
		RAILROAD			45° ELBOW
		DITCH			90° ELBOW
		WATER EDGE			TEE
		WETLAND			CROSS
		BUILDING			CAP
		BENCHMARK			FIRE HYDRANT
		CONTROL POINT			GATE VALVE
		PROPERTY PIN			REDUCER
		BORING			WATER METER
		MONITORING WELL			WELL
		TEST PIT			CURB STOP
		BOLLARD			FROST FREE HYDRANT
		MAIL BOX			
		SIGN			

GENERAL NOTES:

1. THIS IS A STANDARD LEGEND AND ABBREVIATION LIST. THEREFORE, NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT.
2. UNLESS MODIFIED BY THE CONTRACT DOCUMENTS, ALL WORK WILL CONFORM TO THE MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS, SIXTH EDITION, APRIL 2010 (REFERRED TO COLLECTIVELY AS MPWS).
3. EXISTING UNDERGROUND UTILITIES SHOWN ARE FROM THE BEST INFORMATION AVAILABLE. THIS INFORMATION IS APPROXIMATE AND MAY BE INCOMPLETE. FOR ACCURATE LOCATION, THE CONTRACTOR SHALL OBTAIN CONTRACT PERMIT TO EXCAVATION, THE UTILITIES UNDERGROUND LOCATION CENTER AT: 1-800-424-5555.

GENERAL DESIGN DESIGNATIONS:



PROJECT NOTES:

1. GRADE STREAM CHANNEL PER THE SPECIFIED SECTIONS INCLUDED ON THE SUBSEQUENT SHEETS. NATIVE SOILS SHOULD BE LEFT IN PLACE TO SERVE AS CHANNEL SUBSTRATE UNLESS OTHERWISE MANDATED IN THE RESTORATION CONCEPT REPORT OR DIRECTED BY THE OWNER.
2. EXCAVATION AND EMBANKMENT QUANTITIES SHOWN IN THE PLANS ARE FOR INFORMATION ONLY AND ARE CALCULATED TO THE CHANNEL FINISH GRADE.
3. CONTRACTOR SHALL SALVAGE VEGETATED SOILS MATS, OTHER RIPARIAN VEGETATION, AND TOP SOIL PRIOR TO CLEANING AND GRUBBING AS DIRECTED BY THE OWNER. VEGETATION WILL BE PLACED IN THE COMPACTED DITCH BLOCKS AND ANY DISTURBED AREAS ABOVE BANKFULL AS DIRECTED BY THE OWNER.
4. PLACED FILL TO CONSTRUCT THE DITCH BLOCK SHOWN ON SHEET 5. SHALL BE MECHANICALLY COMPACTED UNTIL NO VISIBLE DISTURBANCES EXIST. SLOPE TOP 12" OF PLACED MATERIAL TO 3"-MINUS AS SHOWN IN SECTION A-A ON SHEET 5.
5. DURING TYPICAL YEARS, WILLOW GREEN BELOW THE DIVERSION STRUCTURE AT STA. 28+25 IS DIRT DURING THE MONTHS OF AUGUST AND SEPTEMBER. IF RESTORATION IS TO OCCUR DURING THESE MONTHS, THE CONTRACTOR SHALL SUBMIT A DIVERSIONING PLAN SHALL BE SUBMITTED AND APPROVED BY THE OWNER PRIOR TO CONSTRUCTION.
6. CONTRACTOR SHALL GIVE 2 DAYS NOTICE BEFORE DEWATERING. DEWATERING SHALL TAKE PLACE FIRST THING IN THE MORNING AND NO IN-STREAM WORK OR WORK NEARBY SHALL TAKE PLACE FOR THE REST OF THE DAY.
7. REWATERING OF THE NEW CHANNEL SHALL BE DONE SOONLY IN A MANNER TO REDUCE SEDIMENTATION.

THE NATURE CONSERVANCY

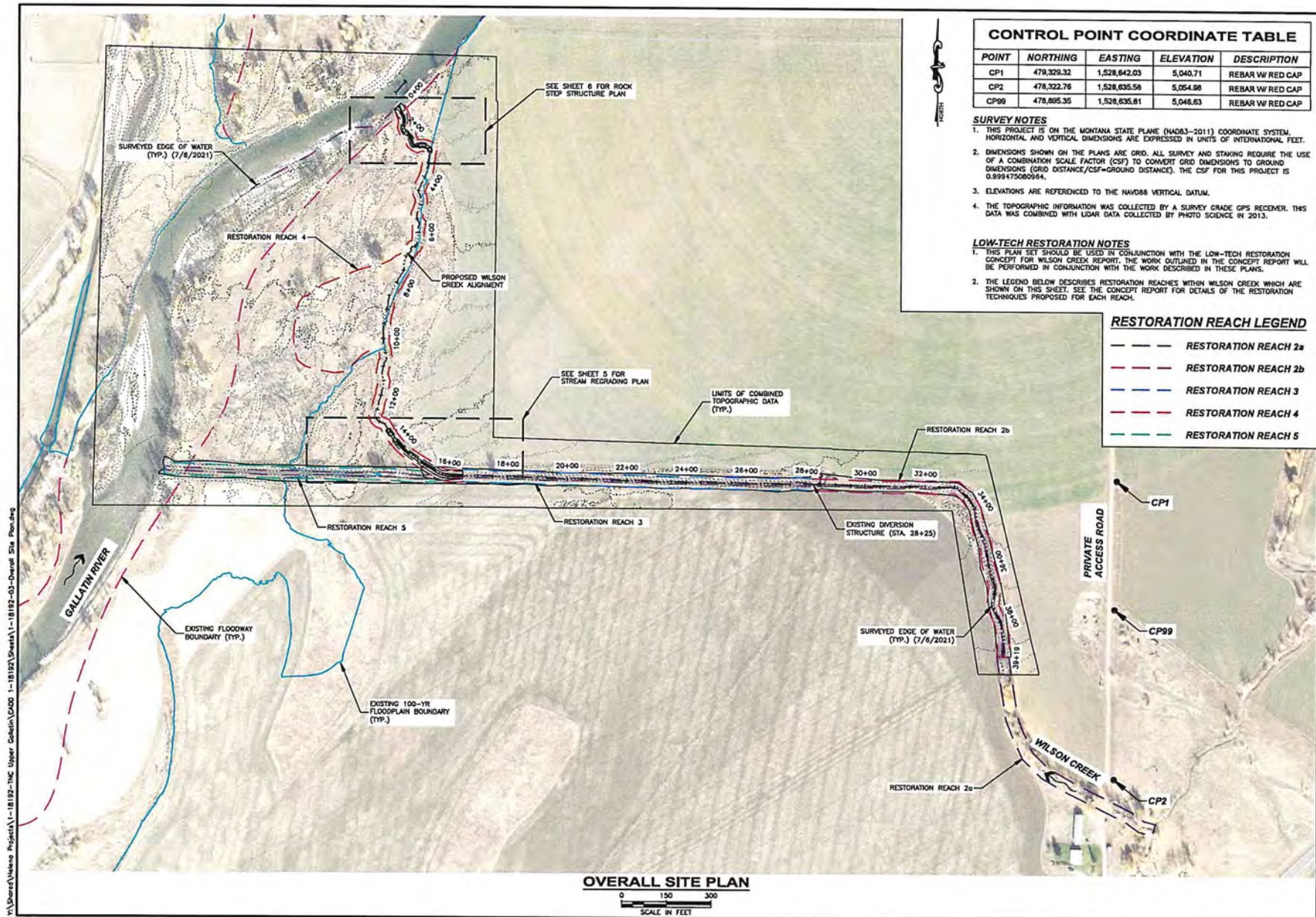
WILSON CREEK RESTORATION

LEGEND & GENERAL NOTES

2
OF 6

Wilson Creek stream and floodplain restoration

022-2022



CONTROL POINT COORDINATE TABLE

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP1	479,329.32	1,528,642.03	5,040.71	REBAR W RED CAP
CP2	478,322.76	1,528,635.56	5,054.98	REBAR W RED CAP
CP99	478,895.35	1,528,635.81	5,046.63	REBAR W RED CAP

SURVEY NOTES

1. THIS PROJECT IS ON THE MONTANA STATE PLANE (NAD83-2011) COORDINATE SYSTEM. HORIZONTAL AND VERTICAL DIMENSIONS ARE EXPRESSED IN UNITS OF INTERNATIONAL FEET.
2. DIMENSIONS SHOWN ON THE PLANS ARE GRID. ALL SURVEY AND STAKING REQUIRE THE USE OF A COMBINATION SCALE FACTOR (CSF) TO CONVERT GRID DIMENSIONS TO GROUND DIMENSIONS (GRID DISTANCE/CSF=GROUND DISTANCE). THE CSF FOR THIS PROJECT IS 0.999475080944.
3. ELEVATIONS ARE REFERENCED TO THE NAVD83 VERTICAL DATUM.
4. THE TOPOGRAPHIC INFORMATION WAS COLLECTED BY A SURVEY GRADE GPS RECEIVER. THIS DATA WAS COMBINED WITH LIDAR DATA COLLECTED BY PHOTO SCIENCE IN 2013.

LOW-TECH RESTORATION NOTES

1. THIS PLAN SET SHOULD BE USED IN CONJUNCTION WITH THE LOW-TECH RESTORATION CONCEPT FOR WILSON CREEK REPORT. THE WORK OUTLINED IN THE CONCEPT REPORT WILL BE PERFORMED IN CONJUNCTION WITH THE WORK DESCRIBED IN THESE PLANS.
2. THE LEGEND BELOW DESCRIBES RESTORATION REACHES WITHIN WILSON CREEK WHICH ARE SHOWN ON THIS SHEET. SEE THE CONCEPT REPORT FOR DETAILS OF THE RESTORATION TECHNIQUES PROPOSED FOR EACH REACH.

RESTORATION REACH LEGEND

- RESTORATION REACH 2a
- RESTORATION REACH 2b
- RESTORATION REACH 3
- RESTORATION REACH 4
- RESTORATION REACH 5

REVISION DESCRIPTION	BY	DATE

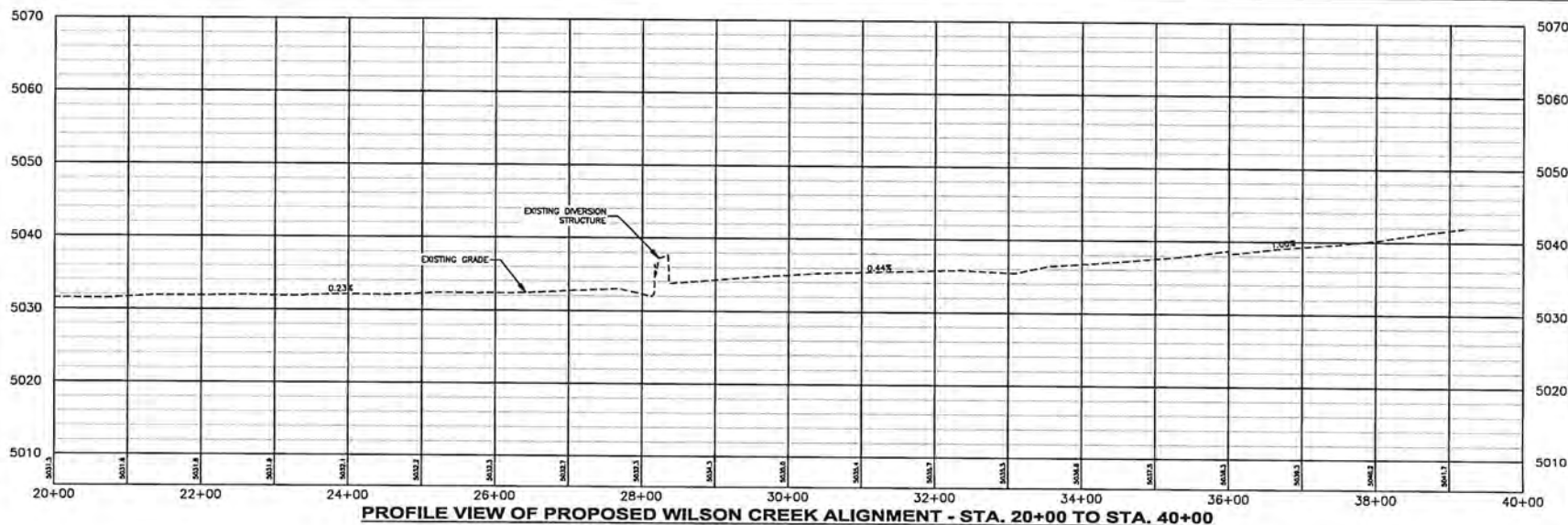
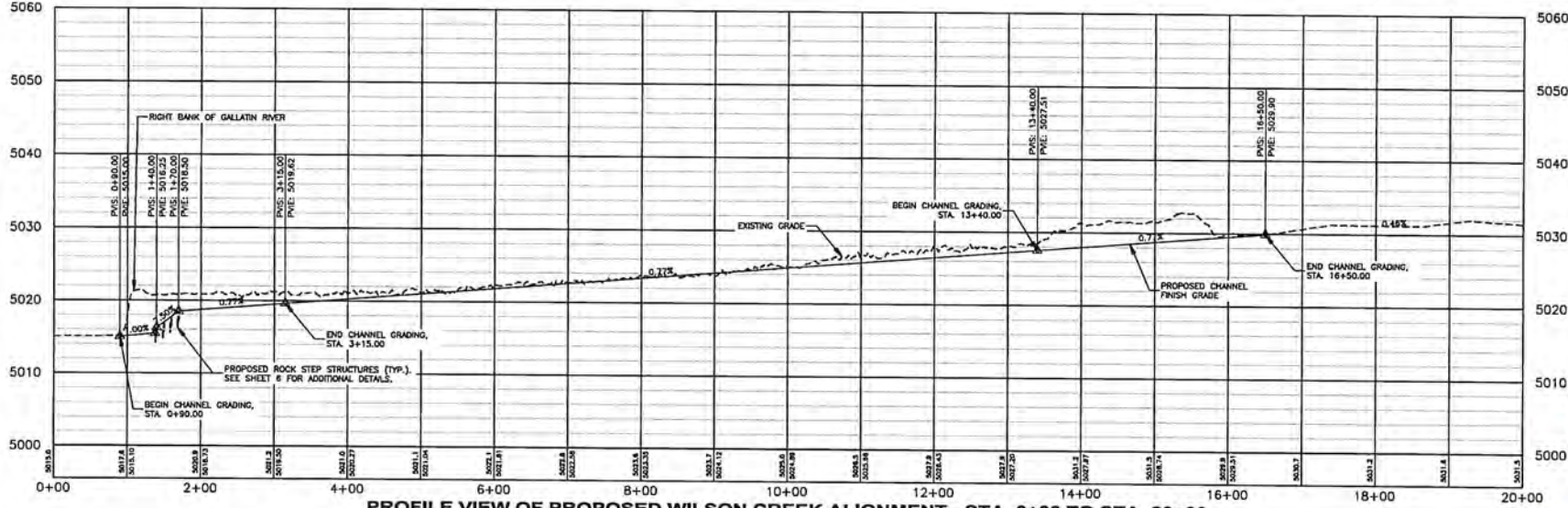
PROJECT: 1-1812	DESIGNED: JOE	DRAWN: JOE	CHECKED: AC	APPROVED: JMY	DATE: 12/10/2021
-----------------	---------------	------------	-------------	---------------	------------------



THE NATURE CONSERVANCY
WILSON CREEK RESTORATION
OVERALL SITE PLAN

SHEET NO.
3
OF 6

Y:\Shared\Wilson Project\1-18192-2021\Wilson\1-18192-2021-Stream Plan & Profile.dwg



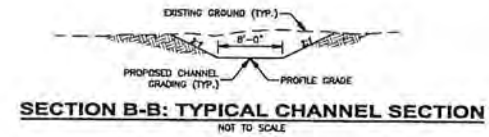
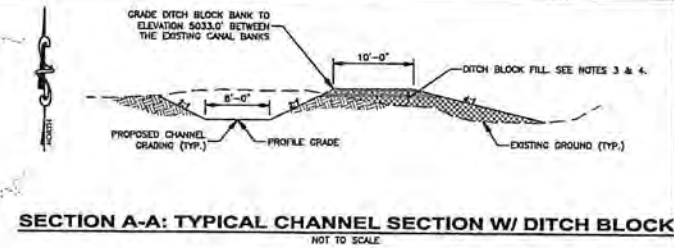
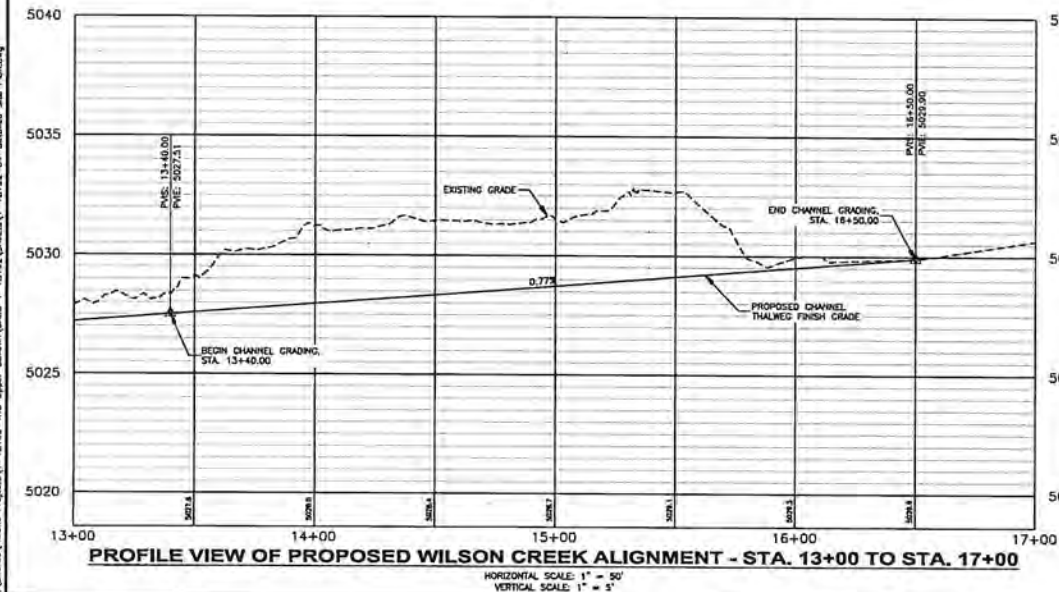
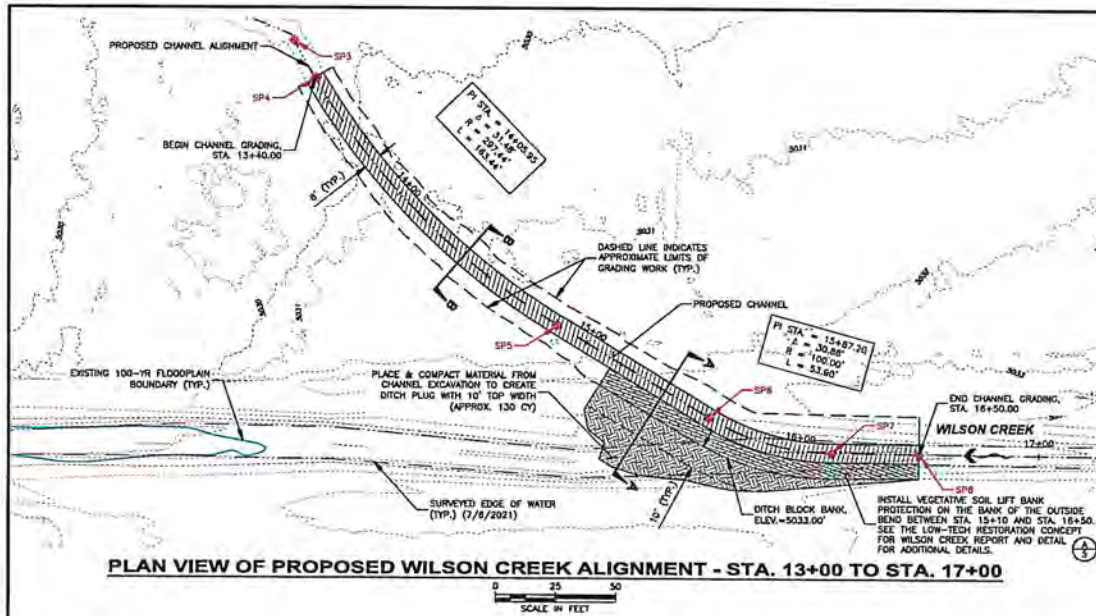
NO.	REVISION DESCRIPTION	BY	DATE
1			
2			
3			
4			

PROJECT: 1-18192
DESIGNED: JDE
DRAWN: JDE
CHECKED: AC
APPROVED: JMW
DATE: 12/09/21

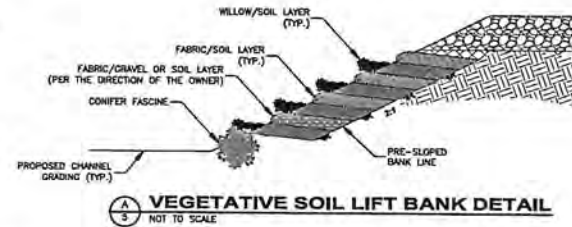
THE NATURE CONSERVANCY
WILSON CREEK RESTORATION
STREAM PROFILE

SHEET NO.
4
OF 6

Y:\Shared\Various Projects\1-18192-THC Upper Gullison\CA00 1-18192\Drawn\1-18192-04-Detailed Sta Plan.dwg

**NOTES:**

1. IF THE THALWEG ELEVATION OF THE HISTORIC CHANNEL AT THE INTERFACE WITH THE CHANNEL GRADING WORK (STA. 13+40) DOES NOT ALLOW FREE DRAINING OF FLOW, THE CONTRACTOR SHALL DIG A PILOT CHANNEL APPROXIMATELY 3' WIDE, DOWN STREAM UNTIL FREE DRAINING OCCURS.
2. ESTIMATED CHANNEL EXCAVATION QUANTITY = 340 CY.
3. ESTIMATED DITCH BLOCK FILL QUANTITY = 130 CY.
4. SORT TOP 12" OF DITCH BLOCK FILL MATERIAL TO 3"-MINUS. SEE SECTION A-A, THIS SHEET, FOR MORE DETAILS.

**CHANNEL COORDINATE STAKING TABLE**

STAKE POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
SP1	STA. 0+95.00 BEGIN CHANNEL WORK	480,580.28	1,526,231.16	MATCH EXISTING
SP2	STA. 3+15.00 END CHANNEL WORK	480,423.68	1,526,337.78	MATCH EXISTING
SP3	STA. 13+22.11 PC	479,505.98	1,526,191.28	5,028.25
SP4	STA. 13+40.00 BEGIN CHANNEL WORK	479,490.30	1,526,198.87	MATCH EXISTING
SP5	STA. 14+85.56 PT	479,387.51	1,526,300.88	5,028.63
SP6	STA. 15+59.58 PC	479,348.85	1,526,363.99	5,029.20
SP7	STA. 16+13.48 PT	479,334.13	1,526,415.16	5,029.62
SP8	STA. 16+50.00 END CHANNEL WORK	479,333.74	1,526,451.68	MATCH EXISTING
CV1	STA. 1+40.00 CROSS-VANE	480,539.70	1,526,250.52	5,016.25
CV2	STA. 1+50.00 CROSS-VANE	480,529.84	1,526,252.02	5,017.00
CV3	STA. 1+80.00 CROSS-VANE	480,519.56	1,526,251.26	5,017.75
CV4	STA. 1+70.00 CROSS-VANE	480,509.97	1,526,248.96	5,018.50

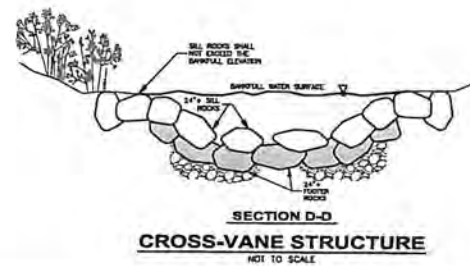
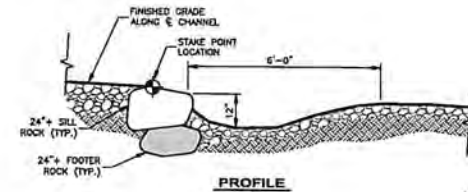
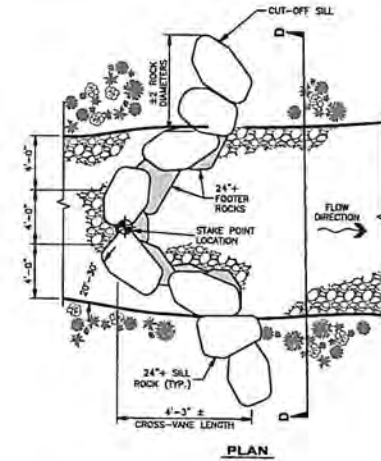
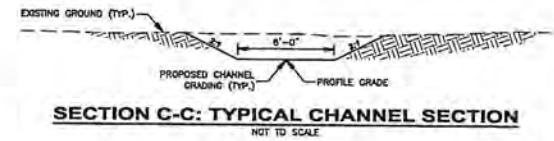
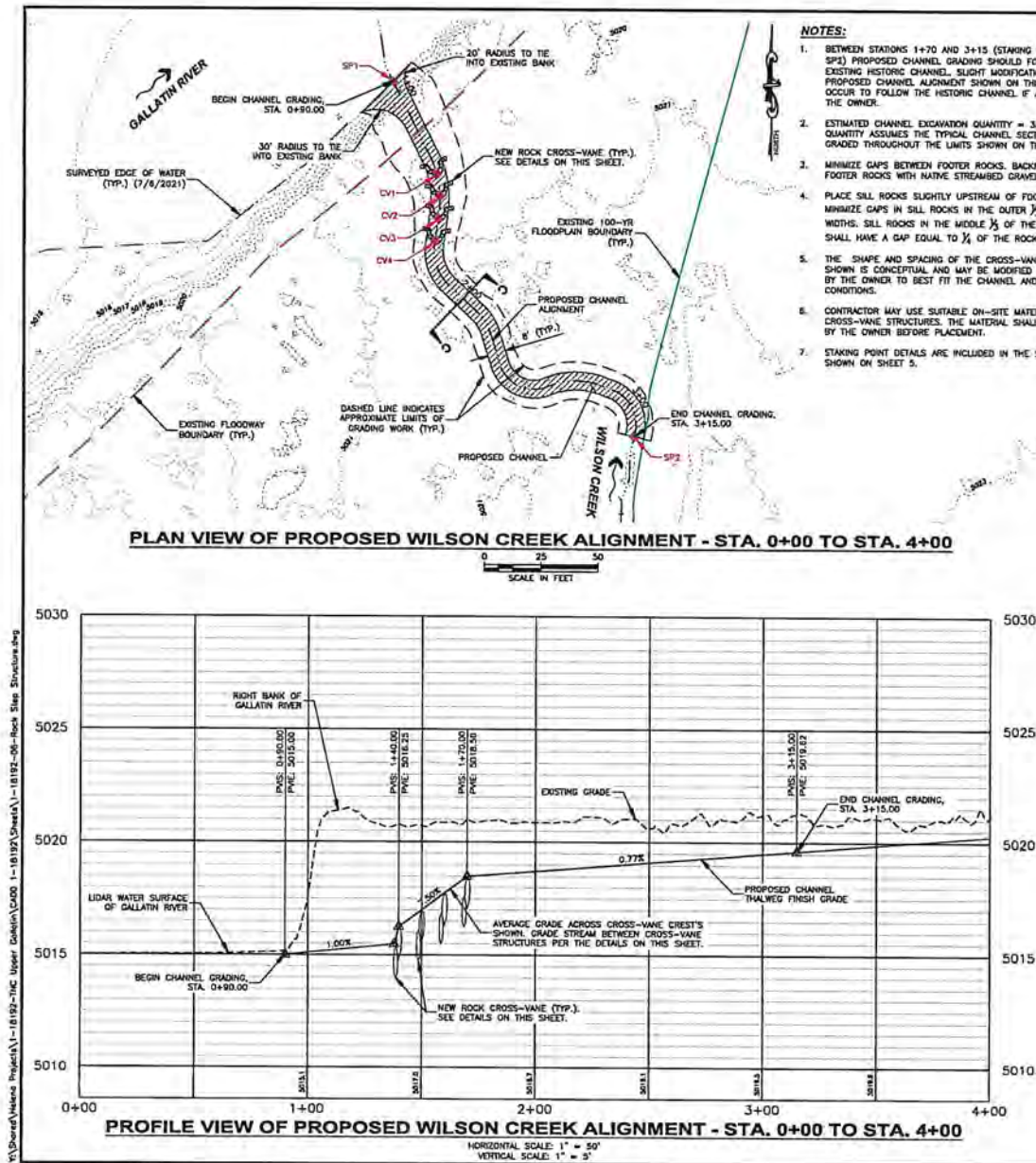
THE NATURE CONSERVANCY
WILSON CREEK RESTORATION
STREAM REGRADING PLAN

SHEET NO.
5
OF 6

REVISION DESCRIPTION	DATE



PROJECT: 1-18192
DESIGNED: JDE
DRAWN: JDE
CHECKED: AC
APPROVED: JMW
DATE: 03/09/21



THE NATURE CONSERVANCY
WILSON CREEK RESTORATION
ROCK STEP STRUCTURE

SHEET NO.
6
OF 6

REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18182	DRAWN: JOE	CHECKED: AC	APPROVED: JRM	DATE: 12/15/2021
DESIGNED: JOE	DRAWN: JOE	CHECKED: AC	APPROVED: JRM	DATE: 12/15/2021



Appendix B: Typical of LTPBR Techniques

Source for all diagrams: Wheaton et al. 2019

Channel Spanning PALS

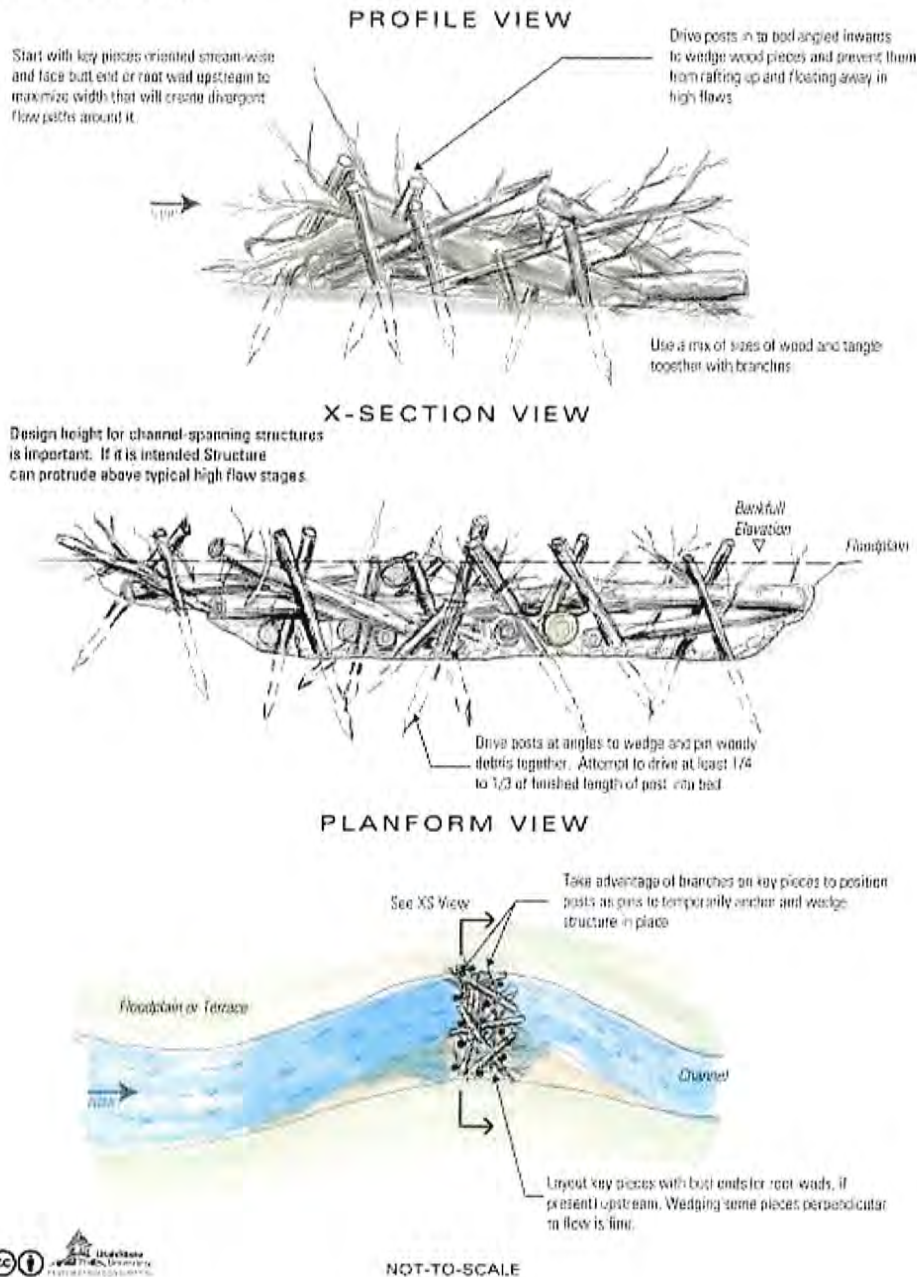


Figure 26 - Typical schematics of a channel-spanning PALS.

Bank-Attached PALS – to Force Constriction Jet

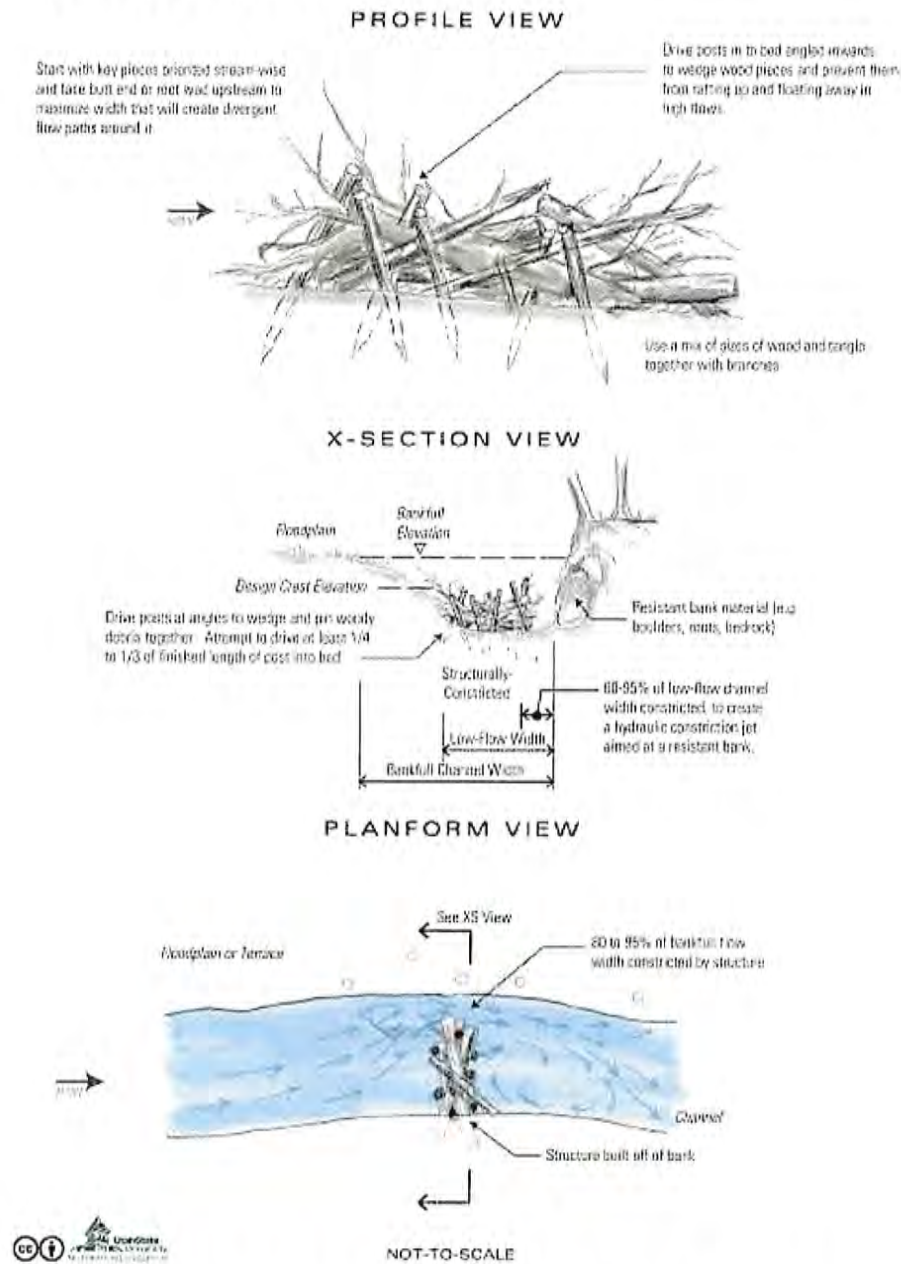


Figure 23 – Typical schematic of a bank-attached PALS directed at a resistant bank intended to force a constriction jet.

Post-Assisted BDA

Some practitioners who build BDAs have become very accustomed to using posts, because that's how the first details they saw of BDAs were built and they stuck to the [post-line wicker-weave](#) recipe (Figure 36 [Appendix C](#) and Figure 19). Posts can provide some temporary anchoring and stability to help with high flows in systems with flashier flow regimes or that produce larger magnitude floods. However, in many situations beaver can produce plenty strong dams without posts. For situations where additional support during high flows is deemed necessary, our suggested practice is to start out following the [instructions to build a postless BDA](#), and then simply add posts (Figure 34 & Figure 35).

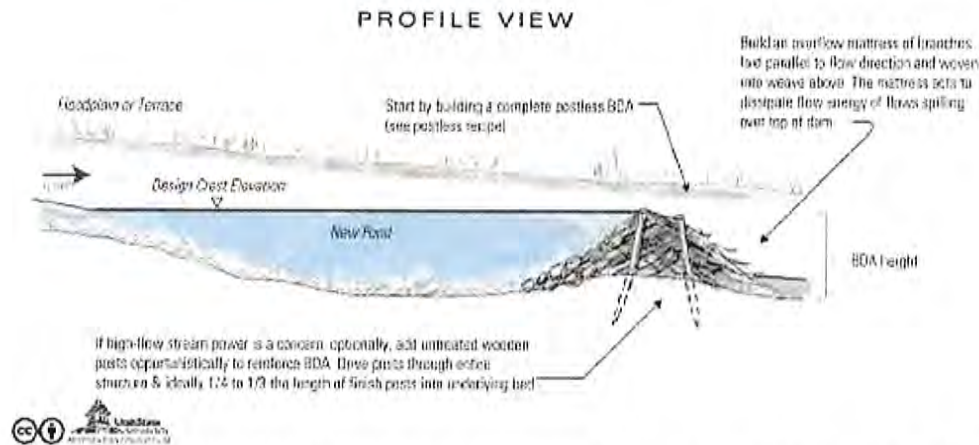


Figure 34 - Profile schematic of post-assisted BDA. If you think you need posts, our preferred approach is to build a postless BDA as per Figure 31, and then reinforce after the fact with some posts driven through the structure.

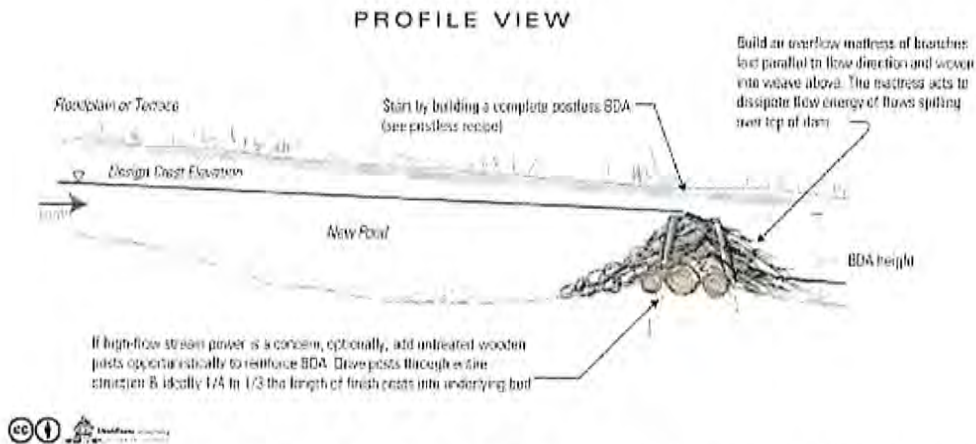
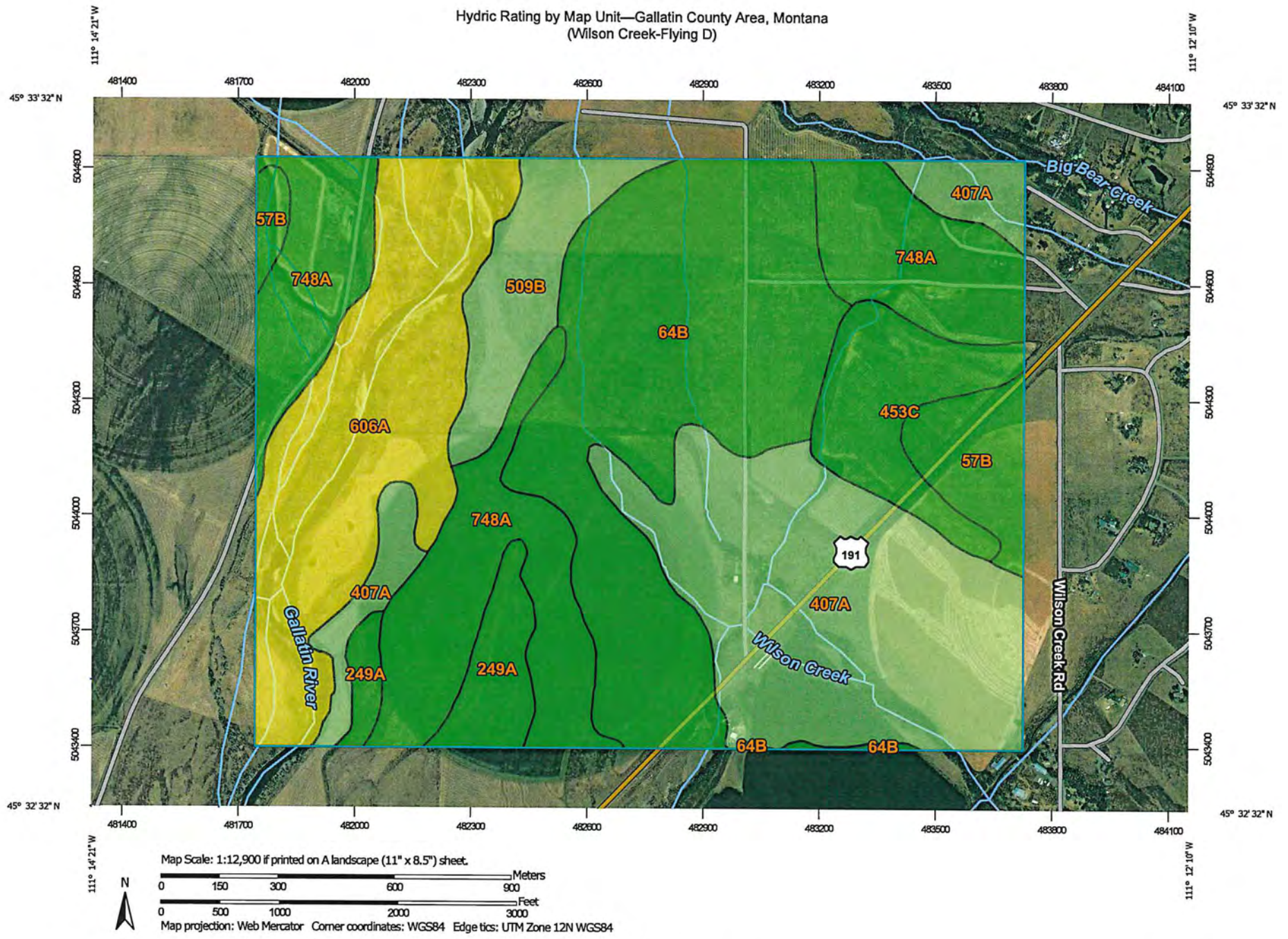


Figure 35 - Profile schematic of post-assisted BDA with key pieces. If you think you need posts, our preferred approach is to build a postless BDA as per Figure 33, and then reinforce after the fact with some posts driven through the structure.

APPENDIX D

NRCS SOIL REPORT AND MNHP WETLANDS MAP



Hydric Rating by Map Unit—Gallatin County Area, Montana
(Wilson Creek-Flying D)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 Hydric (100%)
 Hydric (66 to 99%)
 Hydric (33 to 65%)
 Hydric (1 to 32%)
 Not Hydric (0%)
 Not rated or not available

Soil Rating Lines

 Hydric (100%)
 Hydric (66 to 99%)
 Hydric (33 to 65%)
 Hydric (1 to 32%)
 Not Hydric (0%)
 Not rated or not available

Soil Rating Points

 Hydric (100%)
 Hydric (66 to 99%)
 Hydric (33 to 65%)
 Hydric (1 to 32%)
 Not Hydric (0%)
 Not rated or not available

Water Features

Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gallatin County Area, Montana
 Survey Area Data: Version 24, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
57B	Turner loam, 0 to 4 percent slopes	0	29.7	3.9%
64B	Straw loam, 0 to 4 percent slopes	0	175.9	23.4%
249A	Beaverton cobbly clay loam, 0 to 2 percent slopes	0	25.4	3.4%
407A	Sudworth-Nesda loams, 0 to 2 percent slopes	2	173.9	23.1%
453C	Amsterdam-Quagle silt loams, 4 to 8 percent slopes	0	41.2	5.5%
509B	Enbar loam, 0 to 4 percent slopes	10	38.6	5.1%
606A	Bandy-Riverwash-Bonebasin complex, 0 to 2 percent slopes	65	121.0	16.1%
748A	Hyalite-Beaverton complex, 0 to 4 percent slopes	0	145.8	19.4%
Totals for Area of Interest			751.5	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower