Center for Riverine Science and Stream Re-naturalization

Field Trip Guide

Fourth Annual National Conference

Assessing Stream Restoration Success:

Developing Sustainable Ecological and Physical Systems

Thursday

September 28, 2006

Clark Fork River, Milltown

Ashby Creek, Potomac Valley

Field Trip Leaders

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http://www.umt.edu/rivercenter/

The University of Montana 2006

Field Trip Guide

Greetings! The Fourth Annual River Center Field Trip will take us to the Milltown Reservoir /Milltown Dam removal site to discuss setting river restoration assessment goals. We will then travel up the Blackfoot River to visit and discuss restoration project goal setting and post restoration assessments of three to four fish centered tributary projects.

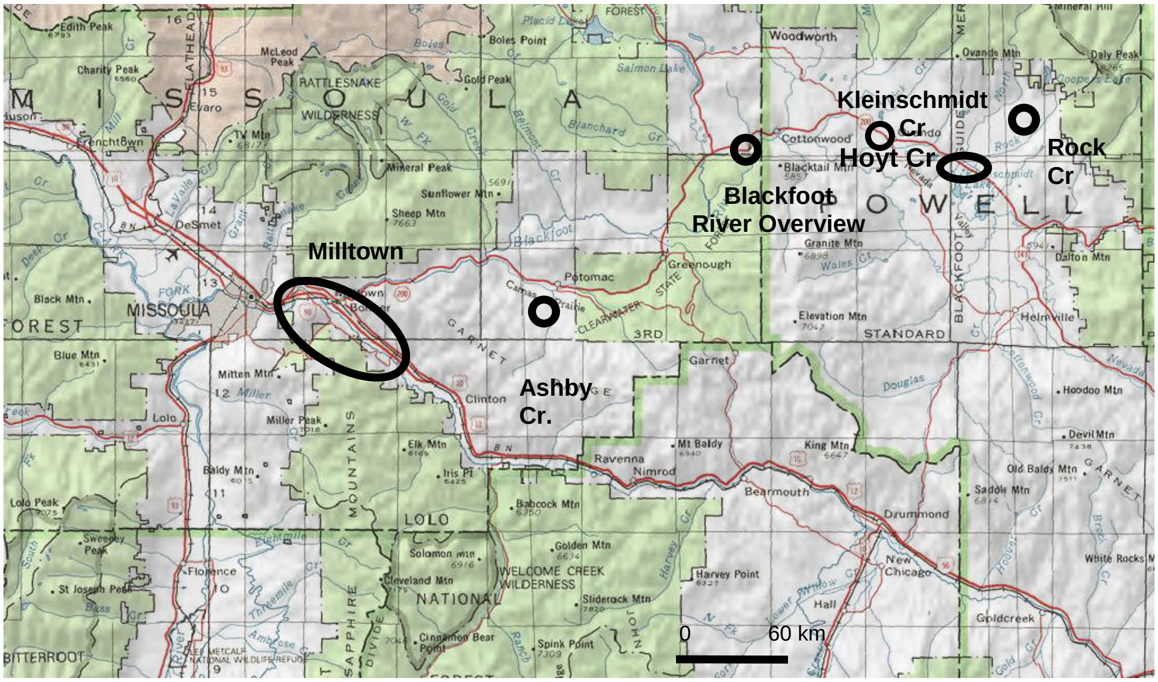


Figure 1: Trip Route and Stop Location Map.

Mile

0   7:30 Depart the University Center parking area between the UC Center and Library. Travel north along Campus Drive past the football stadium. Continue to Maurice Street, turn right and cross the Clark Fork River on Madison Street Bridge. At the intersection with East Broadway, bear right onto Broadway. This becomes the frontage road that follows the Clark Fork River to Milltown. Continue past the Albertsons shopping center.

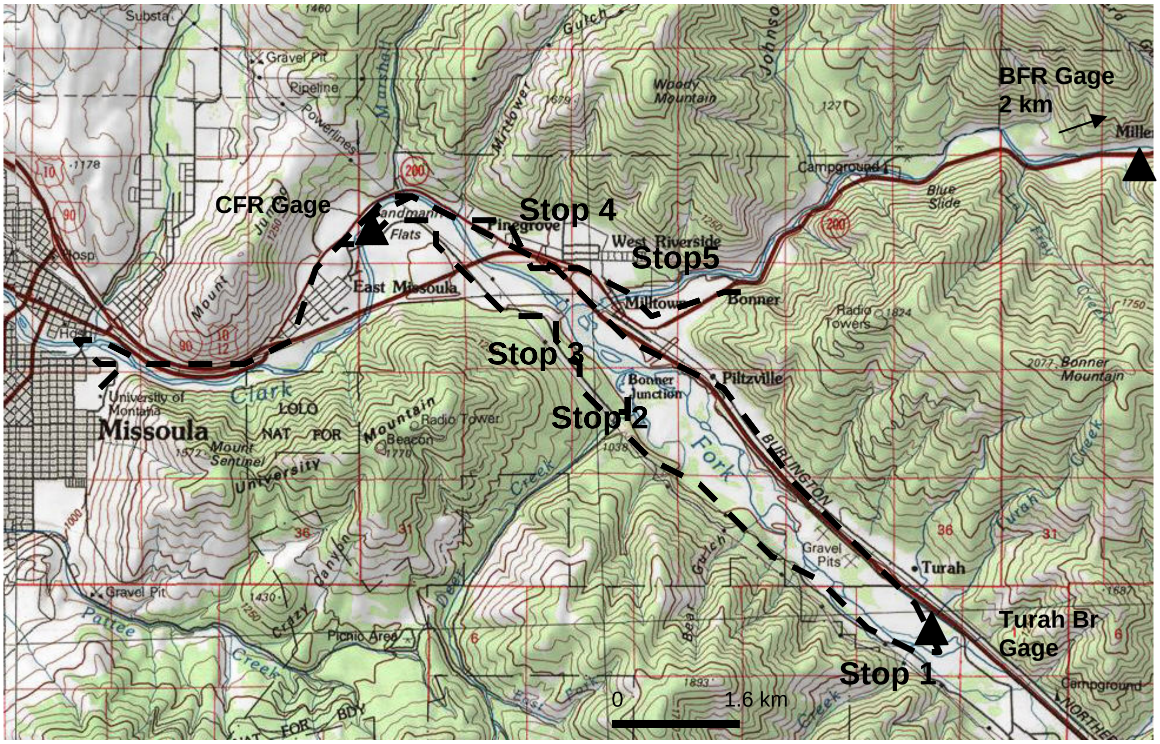


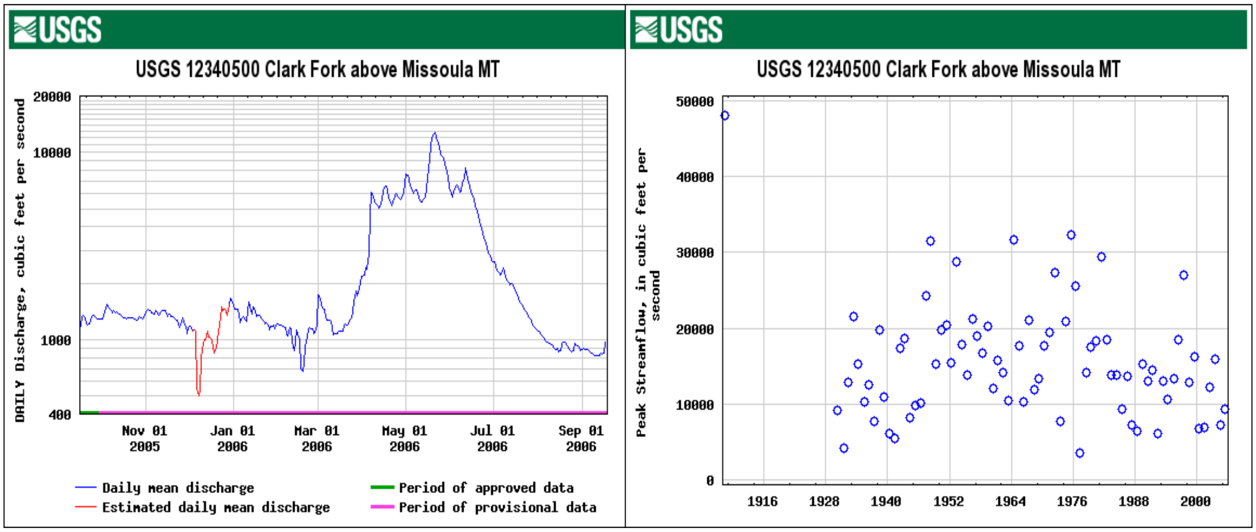
Figure 2: Morning trip route and stops, Milltown Reservoir Site.

2 Enter the Clark Fork River Canyon (Hellgate Canyon just east of Missoula). The mountains to the north and south of the road are Mount Jumbo and Mount Sentinel, respectively. Both are composed of Precambrian argillites and quartzite of the Belt Super Group. You can see shorelines from glacial Lake Missoula on the southern slope of Mount Jumbo. Look for them throughout the trip today. Continue on and pass through the community of East Missoula. The community is partly founded on tan to pink Lake Missoula sediments.

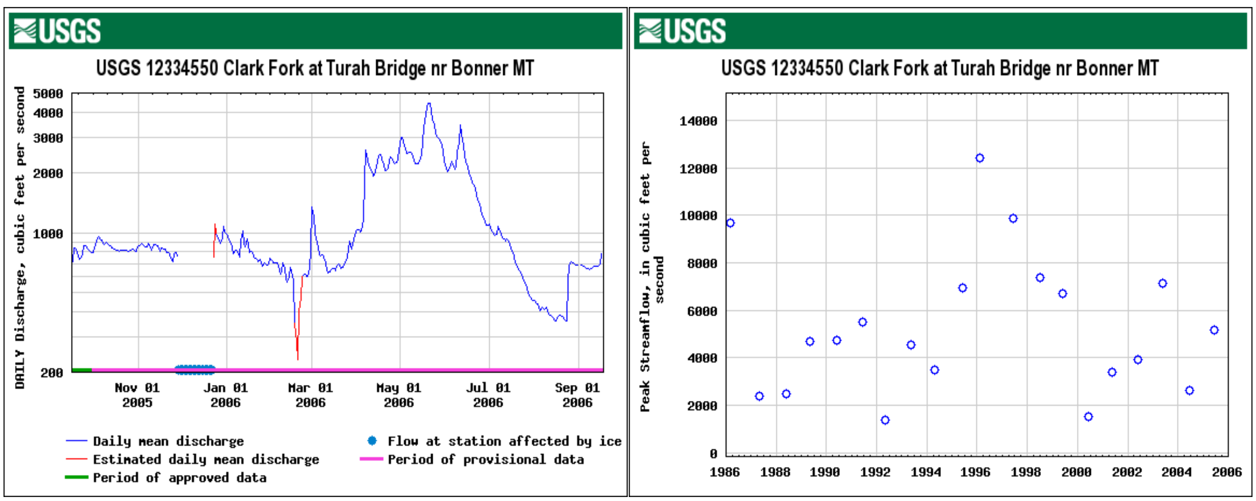
Figure 3: Entering Hellgate Canyon and the Clark Fork River east of East Missoula, below Milltown Dam.

4 Leave East Missoula and drop down to the sand gravel cobble and boulder river floodplain. The Clark Fork River flows at about 1,200 cfs (34 cms) at this time of year. This is very near the Deer Creek Bridge (just down river) USGS Above Missoula Gauging Station, the point used for down stream water quality compliance during remediation and restoration efforts at Milltown. We are below the confluence of the Blackfoot River and the Clark Fork River, and Milltown Dam.

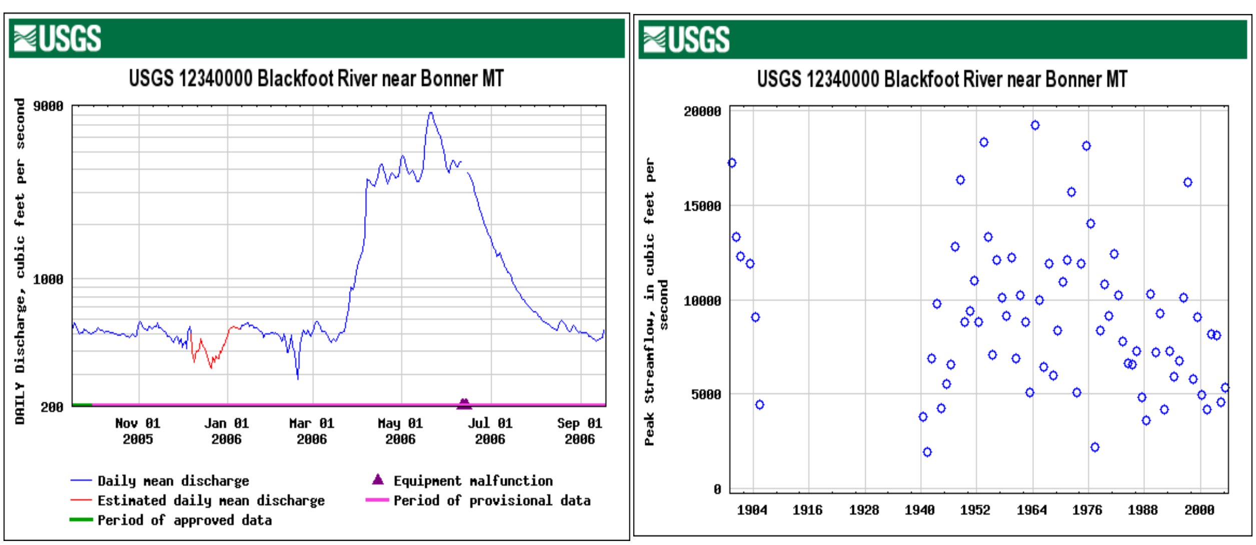
During the field trip you might want to examine stream hydrographs for the Clark Fork and Blackfoot Rivers. We have provided you the 2005 to 2006 hydrograph and peak stream flow data.



Below the Milltown Dam. USGS Station Above Missoula Clark Fork River.



Turah Bridge USGS Station on the CFR above the Milltown Reservoir



Blackfoot River about 11 km above the confluence with the CFR, USGS Gage.
Figure 4: Stream flow hydrographs.

6 The road ends at a stop sign bringing you to RT 200. Turn right (back towards Missoula) on 200 and enter I-90 heading east towards Butte. Continue to the next exit, Turah.

11 Exit at Turah, at the stop sign turn right and at the T turn east (left). Continue about 2 miles until you reach the Turah Bridge. We will stop here and discuss the Clark Fork River System.
STOP 1. Handouts provided by Doug Martin Montana Natural Resource Damage Program and Pat Saffel Montana Fish, Wildlife and Parks.
WATCH FOR TRAFFIC ON AND NEAR THE BRIDGE!!

Figure 5: Turah Bridge and CFR looking west.

Leave the bridge and follow the busses along the south side of the river. We will be driving along through private land and observing the river, floodplain and riparian zone as we proceed to the shore of the reservoir near Deer Creek.

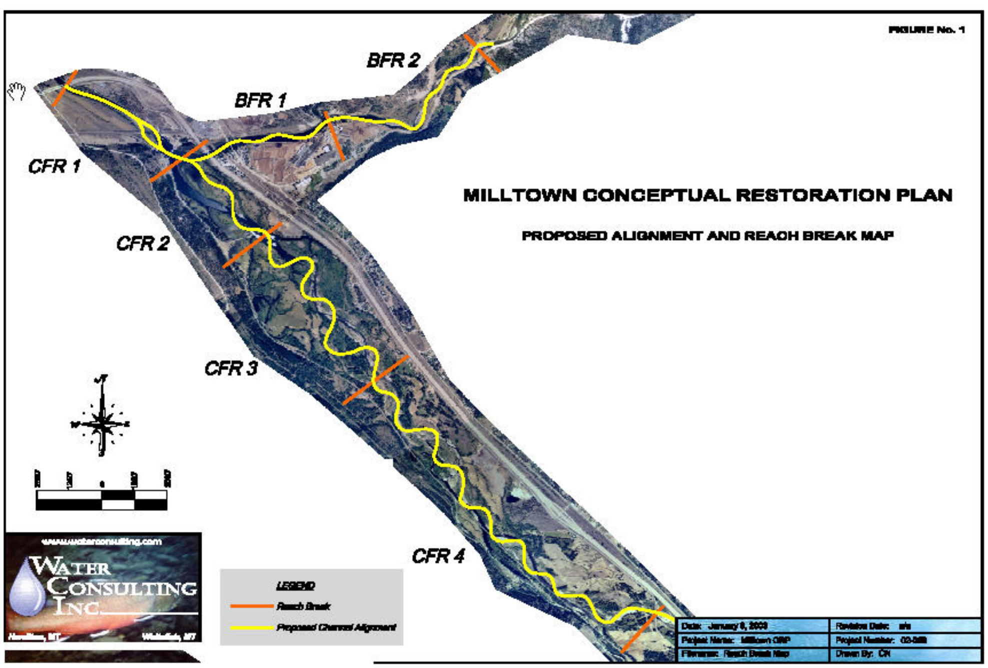


Figure 6: Conceptual Restoration Plan.

16 At Deer Creek we will exit the buses and examine the reservoir sediments and discuss issues associated with sediment transport, and channel construction and design. **STOP 2**

Figure 7: Channel plan near Duck Bridge.

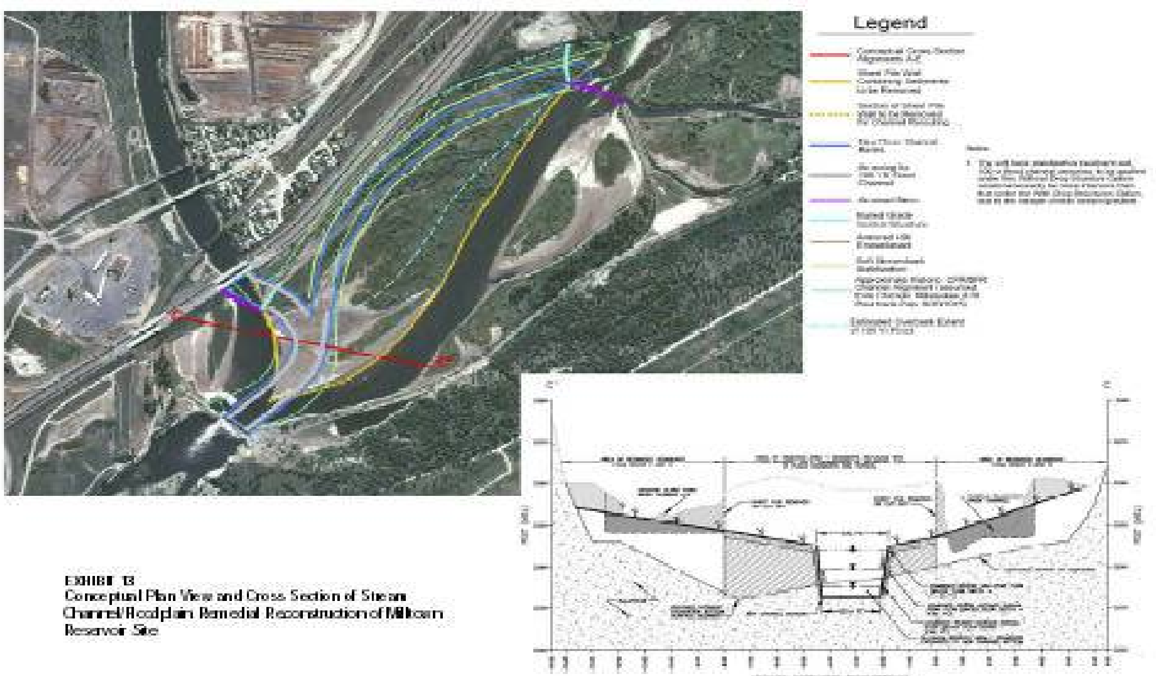


Figure 8: By-pass design.

17.5 After leaving Deer Creek we will stop along the Deer Creek road and walk down to a dam and reservoir overlook. Here we will discuss river restoration assessment goals. Be extremely careful at this site. **STOP 3**

The site has a sheer drop off on its northern edge. Do not approach this area. Please be careful and watch out for others.

Figure 9: Milltown Dam, Area 1 Sediments exposed after an 8 ft drawdown (Summer 2006), and view looking southeast up the CFR from dam overlook.

We will continue down the Deer Creek Road through the new Canyon River Golf course and development.

19 We cross the Deer Creek Bridge, the CFR water quality compliance point below the reclamation and restoration sites.

22 We will stop at the Truck Stop in Milltown for a bathroom break. **STOP 4**

23 Now we will proceed northeast on RT 200 towards Lincoln and Great Falls. Once we pass though the mill town of Bonner we will pull off the road and examine the reservoir drawdown impacted lower reaches of the BFR. **STOP 5 Final Stop on the Milltown portion of the trip.**

Figure 10: Blackfoot River head cut just up stream of the Bonner Mill.

LUNCH TIME Eat on the bus.
At the end of this stop we will pull out lunches and eat lunch as we proceed 40 minutes to a site on the BFR for a discussion of restoration goals and the importance of local buy in.

The drive will proceed along the "River Runs Through It" Big Blackfoot River.   This is also the return route of Lewis in 1806, and was the trail taken by local Native American tribes to access the plains and bison on the east front of the Rocky Mountains. Geologically we will be traversing a valley floor composed of alluvium over bedrock surrounded by mountains composed of Precambrian rocks. Once we leave the river floodplain and enter mountain basins, the valley floors will be underlain by fine grained Tertiary or glacial sediments.

44 At mile post 21 we pass through The University of Montana Lubrecht Experimental Forest run by the College of Forestry and Conservation.

49 We continue on and break out into the Blackfoot River Valley crossing the river and paralleling the Paws Up Ranch on the east side of the road. Look for elk in the fields near mile post 26 or so.

53 The next landmark is Clearwater Junction with a gas station and large cow. You can tell we are coming under the influence of mountain glacial systems as this intersection is located on a sand and gravel rich outwash plain.

56 We proceed about 3 miles further east on RT. 200 and turn right into the Russ Gates Fishing Access**. BATHROOM BREAK** and Orientation by Montana Fish Wildlife and Parks and Blackfoot Challenge Team. **STOP 6**: Blackfoot River at Russ Gates
Introductions: Ryen Aasheim, Jim Berkey, Stan Bradshaw, Matt Daniels, Brian McDonald, Greg Neudecker, Ron Pierce wtih Greg Neudecker – USFWS – the Blackfoot Challenge –a watershed effortRon Pierce – FWP – Migratory fish of the Blackfoot – why tributaries are key Ryen Aasheim – BBCTU work in the tributaries

Figure 11: Bull Trout

We leave the fishing access and continue east on RT 200. We are heading towards Orvando and Lincoln Montana. Notice the rolling hummocky hills we are passing through. They are composed of glacial drift deposited from glaciers coming from the north. The mountains you see to the north are in the Scapegoat and Bob Marshall Wildernesses.

70 We are now turning off RT 200 and heading north along the North Fork of the Blackfoot River.

72 We will cross the North Fork. Notice the size and nature of the stream. This is an important tributary of the Blackfoot River. It also links two of its tributaries, Rock Creek and Kleinschmidt Creek to the Big Blackfoot River, our next two stops.

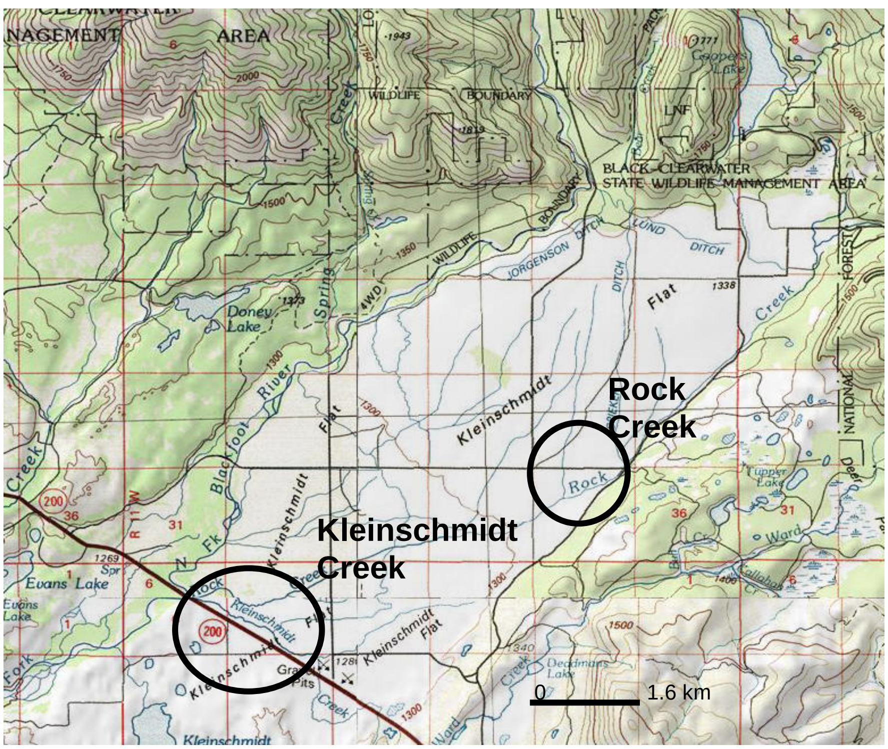


Figure 12: Location map Kleinschmidt Flat.

76 Rock Creek restoration site**. Stop 7**: Rock Creek at the Grimes/Hoxworth Property Line: Ron Pierce – Bull trout Recovery and the "Core area" concept, WSCT movement story and the Rock Creek migration corridor, Greg Neudecker – project intro and techniques – Restoration methods (excavation -vs- floodplain construction) up and downstream and why two methods were used, Stan Bradshaw – in-stream flow monitoring results – re-establishing surface flows based on modification of methods, and Group - Discussion of grazing and shrub monitoring needs.

Rock Creek

Restoration Objectives: Restore migration corridors for native fish; restore natural stream morphology to improve spawning and rearing conditions for all fish using the system.

	2001	2005
Channel seepage	40-50%	40-50%
Diversion (flow)	4-8 cfs	<3 cfs
Diversion (frequency)	nearly continuous	periodic
Connectivity	thru mid-July	thru early September
Average August flows at mouth	<0.5 cfs	2.1 cfs

Table 4. Comparison of flows in lower Poorman Creek, 2001 and 2005 (data from Mike Roberts, DNRC hydrologist).

Project Summary

Rock Creek, a basin-fed stream over most of its length, receives significant groundwater inflows between mile 1.2 and 1.6. Rock Creek is the largest tributary to the lower North Fork of the Blackfoot River, but has been degraded over most of its 8.2-mile length due to a wide range of past channel alterations and riparian management activities (Pierce 1990; Pierce et al. 1997). Rock Creek has also been the focus of continued restoration since 1990.

In 2004-05, the Blackfoot Cooperators reconstructed ~3,000' the South Fork of Rock Creek, a spring creek tributary entering Rock Creek at mile 1.7. This spring generates the majority of flow to lower Rock Creek during base flow periods. Additional projects included constructed floodplain for an adjacent ~3,000'an over-widened stream between mile three and four. These projects also employed shrub plantings and grazing changes with fencing and off-stream water developments. Active restoration is now completed over the entire 8.2-mile length of Rock Creek and its primary tributary, the South Fork of Rock Creek. Recovery of riparian areas, including plant communities, is expected to take several years.

Fish Populations

Rock Creek supports spawning migrations of brown trout and rainbow trout in lower reaches, and brook trout throughout the length of the stream. Middle reaches provide bull trout rearing and fluvial migration corridors to small headwater populations of WSCT. In 2002, we continued to survey fish populations in a section (mile 1.6) of stream reconstructed in 1999. Survey results show a continued increase in trout densities and a community dominated by brown trout (Figure 39). Prior to restoration this section of Rock Creek was brook trout dominated. Bull trout and rainbow trout also periodically utilize this portion of Rock Creek in low abundance.

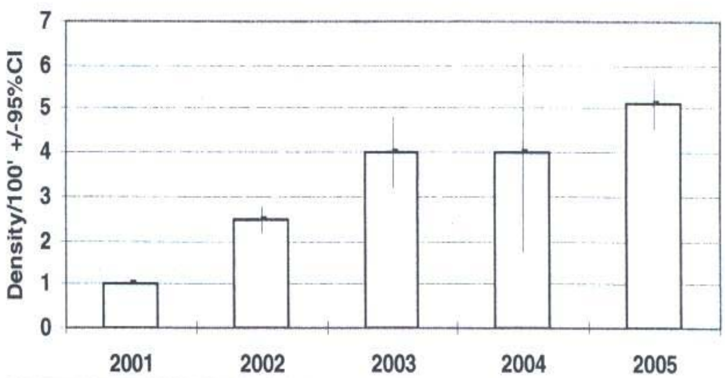


Figure 39. Densities of age 1+ brown trout in Rock Creek at mile 1.6, 2001-2005.

Figure 13: Rock Creek. Upstream “hard” restoration and downstream “soft” restoration. Cattle adjacent to restoration efforts.

We now continue across the creek and turn south back towards RT 200; travel about 3 miles to RT 200 turn west (right-back towards Missoula) and travel two miles pulling off at a ranch house and barn (for sale sign).

81 Kleinschmidt Creek. **Stop 8**: Kleinschmidt Creek Renaturalization Project:.Ron Pierce - Intro, goals and objectives; Before and after of channel; Water temperature changes; Fish population monitoring comparison of methods; Whirling disease monitoring and Spawning substrates.

Figure 14. Kleinschmidt Creek Restoration.

Kleinschmidt Creek

Restoration objectives: reduce whirling disease infection levels; restore stream channel morphology for all life stages of trout; increase recruitment of trout to the Blackfoot River: and restore thermal refugia and rearing areas for North Fork Blackfoot River bull

Project Summary

Kleinschmidt, a spring creek tributary with a base flow of ~9 cfs joins with Rock Creek at mile 0.1 before entering the North Fork of the Blackfoot River at mile 6.2. Kleinschmidt Creek has a long history of stream degradation involving livestock over-use and channel alterations related to instream rock dams, undersized culverts and highway channelization (Pierce 1991). Restoration of Kleinschmidt Creek began in 1991, and expanded substantially in 2001 when 6,250' of the stream was reconstructed to a longer (8,494'), narrower, deeper and more sinuous channel. Restoration continues to expand upstream where grazing changes and limited channel reconstruction are planned for 2006. Summaries of pre-and post-project fisheries and channel measurements are described in Pierce et al. 1997; 2002; and 2004

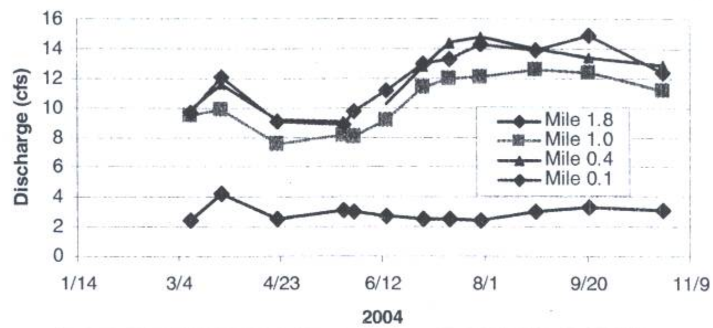


Figure 25. Summary of flow measurements at four locations in Kleinschmidt Creek (data from USFWS, 2004).

Fish Populations and other monitoring

During the 2004 and 2005, we monitored fish populations, water temperatures, whirling disease and spawning substrates in Kleinschmidt Creek. Fish populations were resurveyed at two locations (mile 0.5 and 0.8) of lower Kleinschmidt Creek established in 1998 prior to channel reconstruction. These sites were established not only to assess the fisheries responses to restoration, but also to assess restoration techniques involving the placement of large instream wood into E4-type channels. We placed no instream wood in the reconstructed channel at mile 0.5, whereas the rest of the channel, including the mile 0.8 survey site, included instream wood placements.

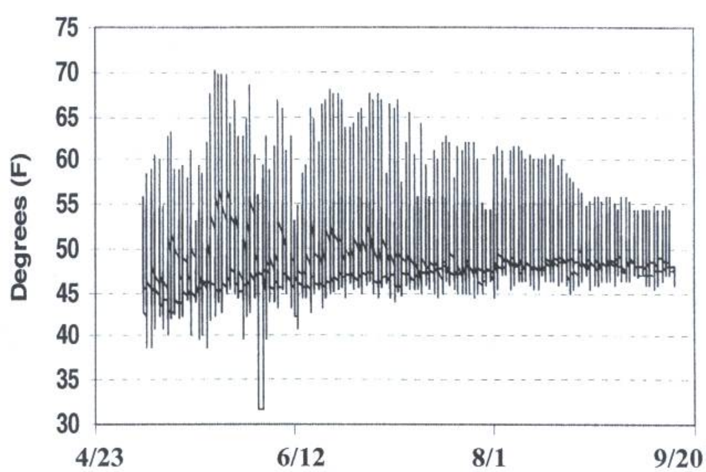


Figure 26. Pre-project (2001-green) and post-project (2004-blue) restoration water temperature comparison for Kleinschmidt Creek.

Both sites show higher densities of age 1+ brown trout

:ompared to the pre-project periods (Figure 27). During the post-project monitoring)eriod (2002-05), densities of age I+ brown trout were 168% higher in the wooded ;ection compared to the woodless section. Unfortunately, livestock access to the mile).5 site has confounded early phases of the study, making full interpretation of these ·esults difficult. The survey site at mile 0.8 was not subject to streamside livestock lamage.

In 2005, we also established a new pre-project fish population survey upstream of :he groundwater influence area (mile 2.0) in order to assess the influence of planned ·estoration. This survey revealed very low densities of fish with a total trout CPUE of 1.7 fish/100' (Appendix A). This portion of channel is degraded from livestock over-use and appears to suffer from seasonal dewatering.

The USFWS measured stream discharge at four locations between mile 0.1 and 1.8 in 2004 (Figure 25). The data shows significant groundwater inflows between mile 1.0 and 1.8 and a mid-summer peak in the hydrograph that extends into the fall.

Water temperature monitoring has shown substantial reduction in water temperatures in the newly constructed channel, with maximum water temperatures 12 °F lower in 2004 than the 2001 pre-project temperatures (Figure 26).

Whirling disease sampling in 2004 recorded a continued severe 4.9 mean grade infection.

We also completed and assessment of spawning areas in Kleinschmidt Creek (Results Part IV), which generally show that Kleinschmidt Creek substrates are comprised largely of "fine" textured material (<6.35mm - silt, sand and fine gravel) in high quantities sufficient to inhibit trout reproduction.

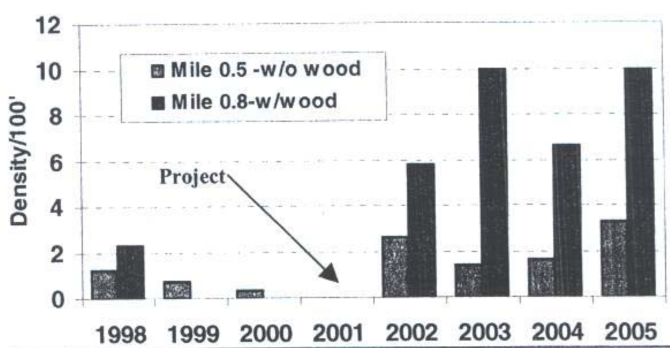


Figure 27. Estimated densities of age 1+ brown trout in two sections of Kleinschmidt Creek, 1998-2005.

Lincoln Spring Creek

Restoration objectives: To be identified.

Leave this site by turning right (west) on RT 200 and continue back towards Missoula passing Orvando.

90 We will pull off the road and overview Hoyt Creek if there is time. Stop 9.Greg or Ryen – Intro and project goals and objectives; Gary Decker – Methods; Brian McDonald – TMDL monitoring. **(next page)**

Our last stop is back closer to Missoula. We can stop back at the Fishing Access to use the rest rooms if you let us know. We will continue west back to the Potomac valley

118 Near the village of Potomac. We will turn south off RT 200 crossing Union Creek. We will proceed bearing left at the fork and continue about 2.5 miles to the Ashby Creek Site. **Stop 10**: Jim B. – Hayes Ranch Intro; Ron P. – Fish populations in the Union watershed and Ashby Creek; Project goals and objectives and monitoring so far, and Matt D. - Assessment (reference reach) work leading into the design of the new channel.

Hoyt Creek

Restoration Objectives: Reduce irrigation demand, increase downstream flows and improve water quality.

Description

Hoyt Creek, a small tributary to lower Dick Creek, originates from alluvial aquifers located immediately north of Ovando. This spring-influenced creek flows ~4 miles exclusively through private agricultural ranch land. Water from Hoyt Creek is used for irrigated hay production and livestock. The topography of the area consists of knob and kettle terrain. The stream loses water to four irrigation canals and receives water from two return-flow channels and a small, degraded spring at mile 0.5. This spring approximately doubles the base flow of Hoyt Creek and likely exerts a cooling influence. Fisheries impairments located throughout the stream include channel instability (incision), irrigation dewatering and suppressed riparian vegetation and hoof-shear damage to stream banks.

Hoyt Creek is also the site of a developing restoration project. The project proposes reconstruction of 10,300' of incised (G-type) channel to a stable E-type channel, while elevating the new stream to its historic floodplain. The project is expected to restore 334 acres of wetland, improve sub-irrigation, reduce irrigation demand and improve downstream water quality in Hoyt Creek. Grazing changes are also planned.

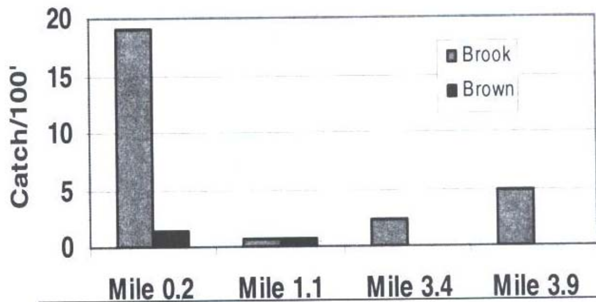


Figure 22. CPUE for fish at four sites in Hoyt Creek, 2005.

Fish Populations and other Monitoring Activities

In order to establish a pre-restoration baseline, we inventoried fish populations, measure water temperatures. discharge and aspects of channel morphology in Hoyt Creek.

Fish population surveys, completed at four locations in 2005, recorded low densities of primarily brook trout, except downstream of the spring where densities were significantly higher. Brown trout are also present in lower Hoyt Creek (Figure 22).

We measured stream discharge at three locations: 1) 0.30 cfs in the small spring creek to lower Hoyt Creek; 2) 0.38 cfs in lower Hoyt Creek immediately upstream of the spring creek confluence; and 4) 0.30 cfs upstream the project area and all diversions at mile 4.0. All irrigation was shut off during these surveys.

Water temperature sensors recorded a high of 64.9 °F upstream of the project (mile 4.3) compared to 74.6 °F downstream of the proposed project (mile 1.2) (Appendix H). We used a "cumulative bankfull width" survey to calculate channel width characteristics of lower Hoyt Creek upstream of the spring. The survey is based on a stable (i.e. reference E-type) bankfull width and involves a systematic upstream survey of 30 bankfull widths at 10' intervals beginning at the "reference" cross-section width. This survey indicates the existing lower Hoyt Creek channel has a cumulative bankfull width approximately 50% wider than the cumulative reference condition (Figure 23). Based on observations, this widening is a function of hoof-shear damage.

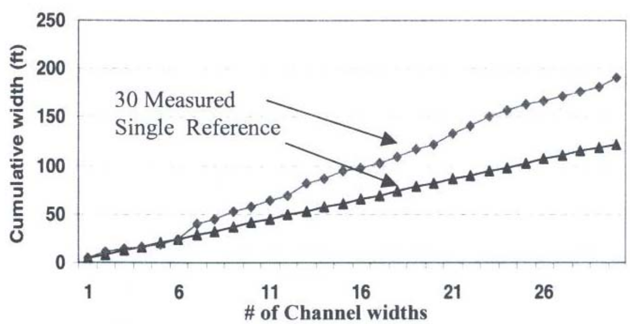


Figure 23. Cumulative bankfull width relationship for a reference and 30 measured channel widths.

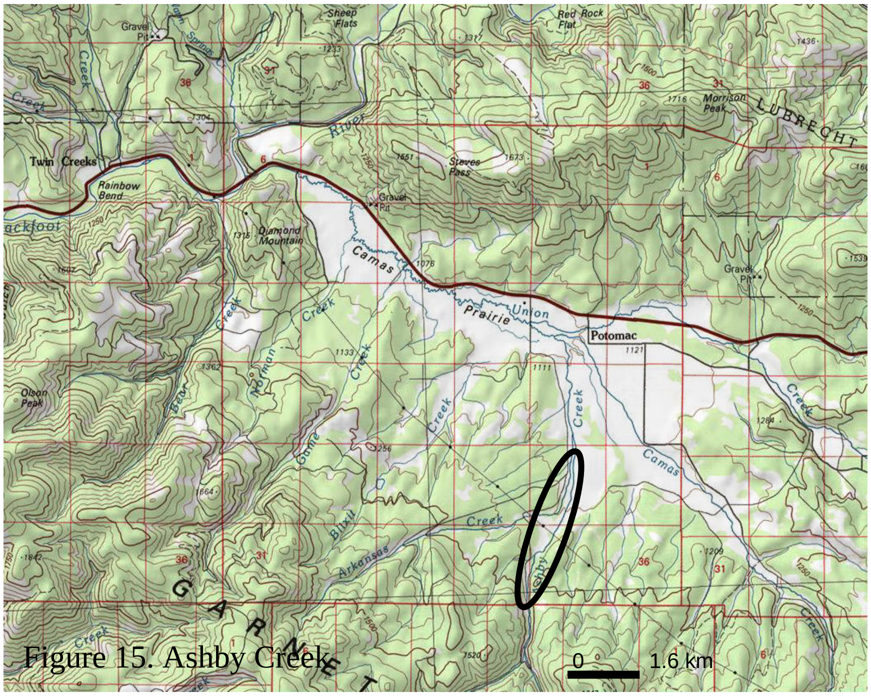


Figure 15. Ashby Creek

Ashby Creek

Restoration objectives: Protect the genetic purity of a WSCT population in the upper Ashby Creek watershed by using an existing wetland as a migration barrier, and improve WSCT habitat by creating a natural channel that provides complexity, increases riffle-pool habitat features and available spawning substrate and increases shade and small diameter wood recruitment to the channel. Improve and re-establish wetland functionality.

Project Summary

Ashby Creek, a 2nd order tributary in the Union Creek basin enters Camas Creek at stream mile 0.5. Upper reaches originate in forested areas including Plum Creek and BLM properties before entering private ranch lands near mile 3.0. Below stream mile 3.0, Ashby Creek has been severely altered by agricultural practices. Alterations involve the loss of the historical channel to farming and irrigation, livestock degradation of streambanks, loss of woody plant communities, an inter-basin transfer of water to Arkansas Creek and associated dewatering of the channel and downstream wetlands.

Over the last several years a comprehensive restoration project has been in the development phases, with implementation planned for 2006. The project will involve landscape protection measures (conservation easements), creation of ~17,000' of new stream channel and revegetation, upgrades to a diversion structure, riparian grazing changes, instream flow enhancement and wetland restoration – all within the context of a working agricultural operation.

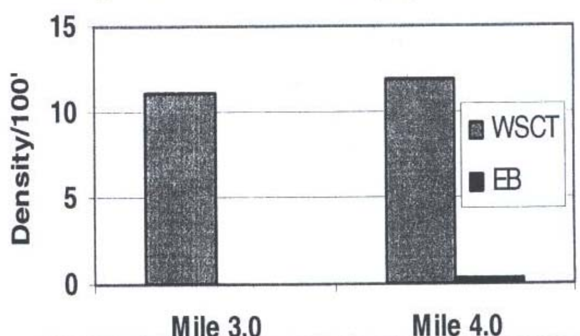


Figure 13. Densities of fish >4.0" at two sites in Ashby Creek, 2005.

Fish populations and other monitoring

In 2005, FWP established pre-project control (mile 4.0) and treatment (mile 3.0) fish population monitoring sections in order to measure the influence of the upcoming project (Figure 13). On August 8th, during the peak irrigation season we measured flows at 2.6 cfs above the diversion and 0.9 below the diversion. This 0.9 cfs downstream value in expected to approximate the minimum instream summer flows in the new channel.

Figure 16: Ashby Creek Restoration and original channel.

136 Return to Missoula 6:00 pm

Figure 17. Potomac Valley Union Creek.

References

Milltown Reservoir EPA site
http://www.epa.gov/Region8/superfund/sites/mt/milltowncfr/home.html
State NRDP
http://doj.mt.gov/lands/naturalresource.asp

Blackfoot River
Pierce, R. and C. Podner, 2006. The Big Blackfoot River fisheries restoration report for 2004 and 2005. MT FWO, Missoula, May.

Pierce, R., R. Aasheim and C. Podner, 2005 An integrated stream restoration and native fish conservation strategy for the Blackfoot River basin. A Report to the Stakeholders of the Blackfoot River Fisheries Restoration Initiative, MTFWP, April.