

*Center for Riverine Science and Stream Re-naturalization*

**Fifth Annual Conference**

**“Ecology - when it comes to river restoration design, so what?”  
Field Trip Guide to Dunham Creek, Blackfoot River Watershed**

Thursday  
September 20, 2007



**Field Trip Leaders**

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## Goal of the Fieldtrip

The goal of our fieldtrip is to examine in detail the restoration of a headwaters' stream of the Blackfoot River. We will discuss the watershed setting of this restoration at a couple of stops and spend most of the day examining the channel and floodplain of Dunham Creek. This will give us the chance to discuss the role of ecology in channel restoration at both the reach and watershed scale, as we work through the history of the restoration effort and the long-term goals for protecting the Blackfoot River. As well as hearing the presentations by the leaders, we hope this format (a long stay at one or two sites) will give you the opportunity to talk amongst yourselves and with the keynote speakers. Dunham Creek offers many opportunities to see and discuss nearly all aspects of channel design, building and monitoring. It will also be a great springboard to discuss the broader implications of channel restoration and ecosystem function. Here are some major points that we hope we can discuss during the trip:

- Existing ecological context (vegetation, fisheries, etc.)
- Watershed dynamics, past, present and future
- Past, present and future management issues
- Environmental river mechanics, design, layout, and construction approaches and techniques used to build a functioning ecosystem to the disturbed reach
- Possible river mechanics alternatives, reference reaches for hydrologic and ecosystem designs, accounting for uncertainties in design, sediment loads and ecosystem response
- Groundwater/surface water interactions, importance of connectivity at what scales, applicability of natural flow regime paradigm
- Terrestrial, semi-aquatic, and aquatic use of the riparian corridor, management and design
- Developing project needs and action plans with ecology in mind, tying fluvial geomorphology and hydrology to ecology

## The Blackfoot Watershed Project

The Blackfoot River watershed may be one of the most extensive restoration efforts in existence. Started in 1988 by a consortium of private landowners, Montana Fish Wildlife and Parks, the Big Blackfoot Chapter of Trout Unlimited, the U.S. Fish and Wildlife and many others, the goal was to preserve and enhance the "cold-water fisheries" in the basin. That initial group has now evolved into a huge partnership (see Box 1).

### **Box 1: Key partners in the Blackfoot River Project**

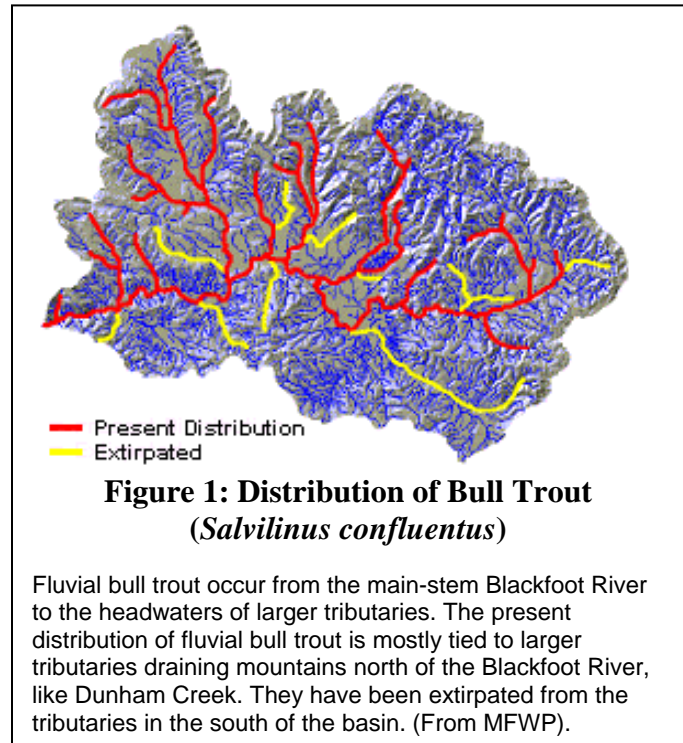
Private Landowners, Big Blackfoot Chapter of Trout Unlimited, Montana Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, Blackfoot Challenge, North Powell Conservation District, Natural Resources Conservation Service, National Fish and Wildlife Foundation, Chutney Foundation, Bureau of Land Management, U.S. Forest Service, Plum Creek Timber Company, Environmental Protection Agency, Montana Department of Environmental Quality, Montana Land Reliance, The Nature Conservancy, Montana Power Company, Sundance Foundation, Orvis Company, and many others.

Unlike many such projects the principles spent the first three years collecting a wide range of data, and assessing the biologic and physical integrity of the basin. This laid a strong foundation to work with landowners and government agencies to restore damaged habitat and preserve unharmed areas. A commitment to monitoring continues today, nearly two decades later. Much of the restoration revolves around the native game fish in the basin (Figure 1), but has much broader implications for the larger regional ecosystem because of the extent of the effort. To date, 37 tributary streams have been restored/rehabilitated, affecting over 350 miles of streams of the total 1900 miles of perennial

streams in the basin capable of supporting fish. Over 2,500 wetland/riparian acres have been restored, grazing plans implemented on over 45,000 acres, and over 70,000 acres are now protected through conservation easements.

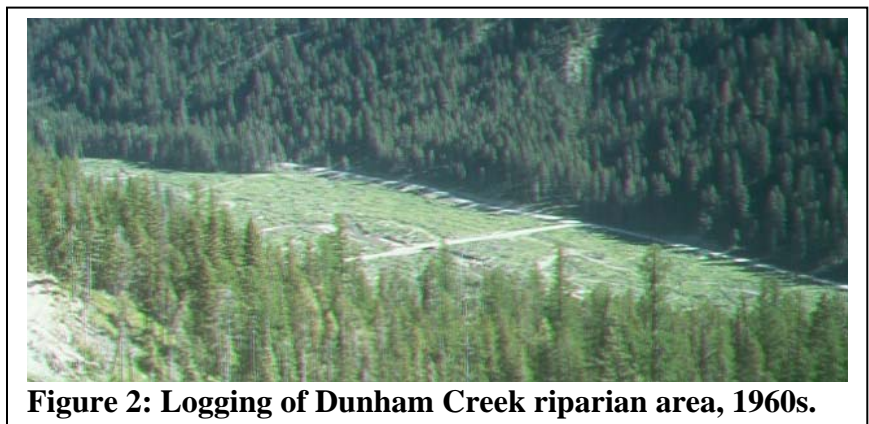
### Dunham Cr Project Background

Monture Creek is a major tributary to the Blackfoot River and a stronghold for bull and cutthroat trout. Dunham Creek is a major tributary to Monture Creek and a primary trout migration route. In the mid-1960s about a mile of the Dunham Creek valley bottom was extensively logged (Figure 2) and experienced tremendous change over the last half century (Figure 3). This logging unit spanned almost the entire valley bottom and removed all trees and the majority of shrub vegetation. A road and bridge bisected the clearcut, allowing access to both sides of Dunham Creek. During the 1970s, attempts were made to stabilize the disturbed reach. Berms were placed all along the stream and it was channelized into a trapezoidal channel (Appendix 1). Since this time berms have been breached many times, bank erosion is prevalent, and the stream remains very unstable.



In the summer of 1998, Montana Department of Fish, Wildlife and Parks (MFWP) collected extensive fish population and distribution data in the Blackfoot River Basin and determined that bull and cutthroat trout populations in several sections of Dunham Creek were very low. In addition, the subject reach had intermittent flow and was very unstable. MFWP was concerned that the disturbed reach was causing considerable increases in sediment deliveries, poor fish habitat, and an altered migration corridor. MFWP contacted the Lolo National Forest (LNF), inquiring about the feasibility of a geomorphic assessment of Dunham Creek.

MFWP wanted to know: 1) why the situation exists, 2) is it naturally occurring, and 3) are rehabilitation measures warranted. MFWP was working with the Big Blackfoot Chapter of Trout Unlimited (TU) and the U.S. Fish and Wildlife Service (FWS) to rehabilitate private lands downstream of Dunham Creek. Assessing this section of Dunham Creek was a necessary link to downstream recovery efforts.





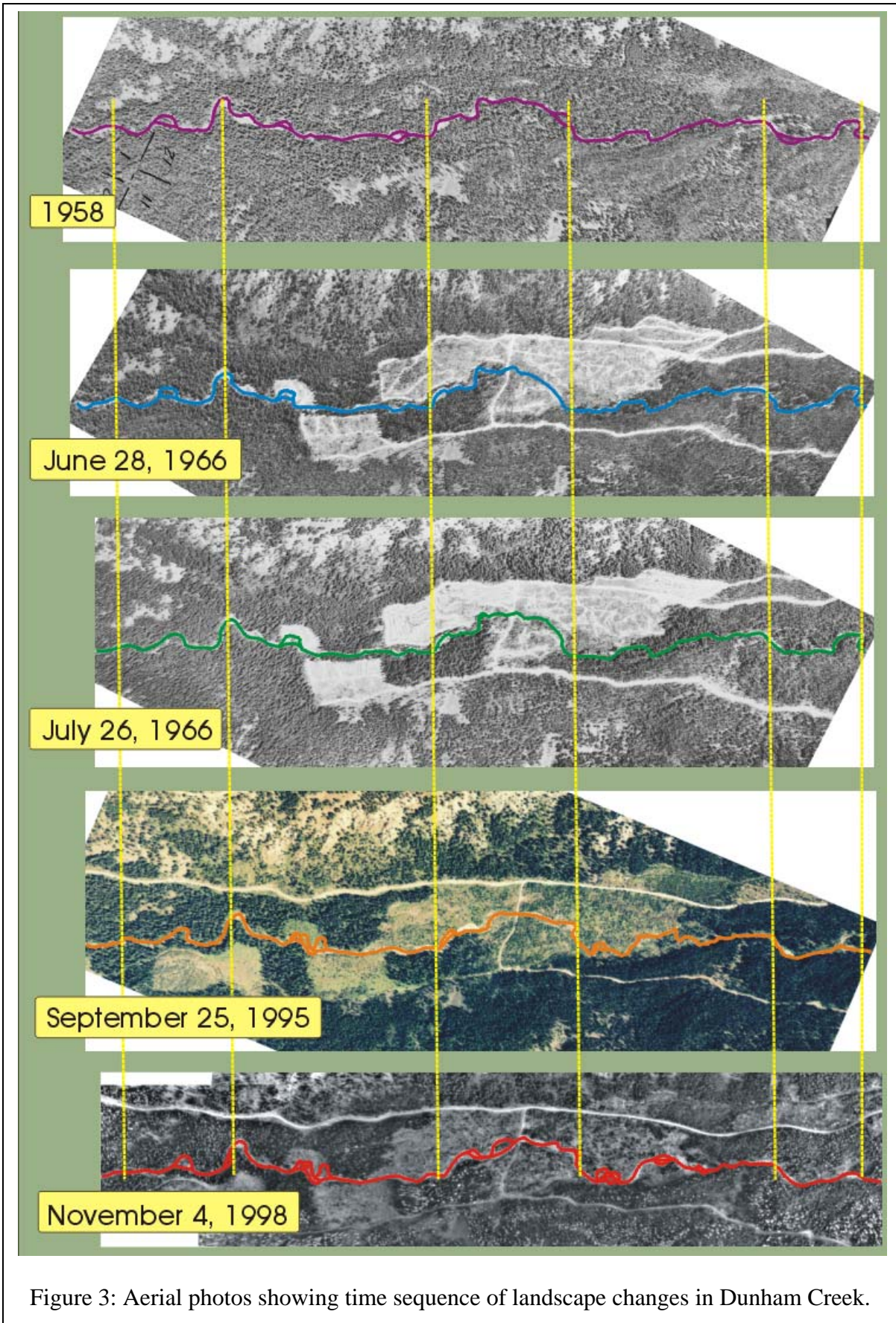


Figure 3: Aerial photos showing time sequence of landscape changes in Dunham Creek.

In the fall of 1998, LNF Water Resources Department began collecting data on Dunham Creek. Data collection and site surveys continued in 1999, including a geological and seismic assessment. Due to Forest priorities and a lack of funding, efforts to reduce, assess, and formalize the data into a formal geomorphic assessment did not materialize. However, data collection and site reconnaissance lead to the following conclusions: 1) past timber harvesting and stream channelization in the 1960s - 1970s caused about 6200 feet of stream to become highly unstable as compared to reference stream reaches; 2) the subject reach most likely is intermittent naturally, but the spatial and temporal extents have been altered due to human-caused stream instability; 3) sediment deliveries due to bank erosion are above natural delivery rates and are producing a high risk to down stream resources; and 4) the subject reach is slowly recovering as the area revegetates, but stream instability will continue at undesirable rates for at least 50-100 years.

These results were exchanged verbally with MFWP. MFWP and the U.S. Fish and Wildlife Service (FWS). The Seeley Lake District Ranger was contacted and it was requested that the USFS consider the subject reach of Dunham Creek as a priority in the Forest watershed restoration program. Trout Unlimited (TU) offered to fund design efforts if the LNF would fund the environmental assessment. LNF, together with MFWP, TU, and FWS agreed to enter a Challenge Cost Share Agreement. Funding from this Partnership would be used to implement the rehabilitation design for the disturbed reach of Dunham Creek.

The rehabilitation design for the Dunham Creek temporarily (10-15 years) stabilizes all sections of the subject reach that have become unstable due to timber harvesting and stream channelization. The subject reach was returned to near its recent historic position within the valley. Implementation involved stabilizing streambanks, reconstructing meanders, riffles, and pools, recontouring banks, shaping the channel, removing berms, and replacing large woody materials. The design sized the rehabilitated channel to convey water and sediments through the reach without impacting water surface elevations or stability relative to the up- and downstream reaches. Particular attention was placed on habitat complexity, channel complexity, and the revegetation plan. Every portion of trees used for rootwads was incorporated into either stabilization or habitat components. Streambanks were constructed to be irregular and complex. The use of rock was limited to that necessary for short-term stability. The effort was implemented in two phases in order to maximize revegetation success. Phase I, the initial reconstruction phase, occurred in 2001. Phase 2 involved revegetation and transplanting, through 2002. A monitoring program including hydrologic, geomorphic, and biologic parameters is used to determine if additional restoration response is needed and is expected to extend through (at least) the stability phase of the project. We will discuss the details of the restoration and the monitoring in the field.

### **Challenges to Dunham Creek and Ecosystem Restoration**

The restoration and management of Dunham Creek presents some unique challenges:

- ◆ High sediment input from upstream sources of high-relief Paleozoic and Proterozoic sedimentary rocks and Quaternary glacial deposits (Figure 4).
- ◆ Relatively high snow-melt runoff discharge followed by very low summer flows resulting in intermittent seasonal flows locally that act as barriers to fish passage (Figure 5).
- ◆ High sediment transport rates and large bedload of coarse-grained sediment.
- ◆ Sediment aggradation in the reach below the restored reach with potential downstream effects on irrigation withdrawal and flooding.





Figure 4: Google Earth view of Dunham Creek headwaters.



Figure 5: Late summer "low" flow within restored reach.

## **Itinerary**

### **Start—University Center parking area.**

Depart the parking lot 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, turn right onto Broadway to Interstate 90 and take the onramp to East. Proceed on I90 to the Highway 200 Exit and drive through Milltown and Bonner. The highway continues northwest along the Blackfoot River. The drive will proceed along the “River Runs Through It” 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 for the first 25 miles or so over 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. These can be seen in roadcuts in the Potomac Valley.

At mile post 21 we pass through The University of Montana Lubrecht Experimental Forest run by the College of Forestry and Conservation. We continue on and break out into the Blackfoot River Valley crossing the river at roundup rapid bridge and skirting the Paws Up Ranch on the east side of the road. Look for elk in the fields near mile post 26 or so. The next landmark is Clearwater Junction with a gas station and large plastic cow. This intersection is located on a glacial outwash plain. We will continue east on Highway 200 to the Ovando Valley. The Valley contains glacial moraines, glacial lake deposits, kettle lakes and many other glacial features left after the last glacial advance from the north. At Ovando we will turn north on the Monture Creek Road to the Dunham Creek area. As we drive north on the Monture Creek Road we will point out various geologic and restoration points of interest.

### **Stop 1 (Figure 6):**

Monture Campground. We will get out of the buses take a quick toilet break and then present background information on the day’s trip and the area in general. We will discuss the overall goals in the Blackfoot basin, the general history of the Dunham Creek project and the goals of that project in the context of the larger goals of the basin. If you drove separately from the buses you will need to leave your cars here and ride on the buses. There is limited parking and turn around areas where we will spend the rest of the day.





Figure 6: First stop is at Monture USFS Campground for rest stop & orientation.

**Stop 2 (Figure 7):**

Leaving Monture Campground, we will drive north into Dunham Creek canyon. The first stop will be at a site above the restored reach to look at a reach of Dunham Creek used for a reference (Figure 8) in designing the restored channel farther downstream. We will walk along and in the creek channel for about a half mile to look at the channel characteristics, large woody debris, flow regimes, bed material, etc. The object is to have discussions on the important aspects of these cobble-boulder, high sediment transport streams in regards to important channel morphologic features, sediment transport, fisheries and ecosystem function. We will start out in one group but expect to break up into smaller groups as we wade downstream and clamber over and under log jams. Be prepared to wade and get wet. Walk back to the buses along the east side of the creek where a good game trail runs up the hill to the road.



Figure 7: Google Earth image showing location of stop 2, reference reach area.



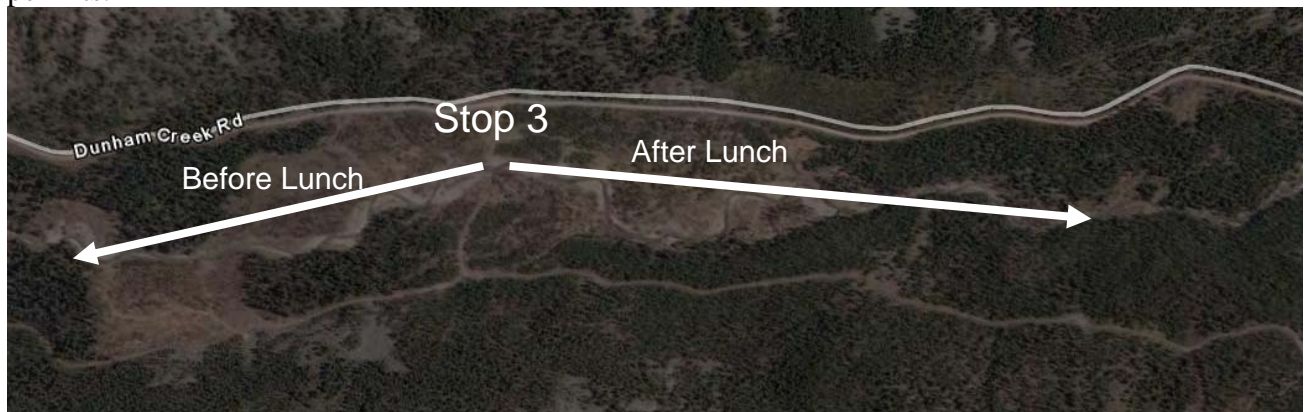
### Stop 3 (Figure 9):

Return along the main dirt road. We will stop and park at the decommissioned bridge crossing site (approximate middle of project). First, we will discuss detailed project history, setting, objectives, design philosophy and rehabilitation techniques. The objectives of this stop will be to have a detailed discussion of channel rehabilitation techniques in the



**Figure 8: Reference reach—view looking downstream**

context of sediment transport, channel migration to maintain a viable riparian ecosystem, the role of ground water, and overall approaches to maintaining connection to broader ecosystem issues as channels are designed and built on the reach scale. This is an excellent place to break into groups as we move through the reach and see various structures and talk about changes in the channel since construction. Before lunch, we will walk upstream about a quarter of a mile looking at channel and floodplain features. We will return to the buses for lunch. After lunch we will continue the discussion while we work our way downstream along the channel through the rehabilitated reach. We will discuss floodplain vegetation, channel migration, sediment transport and surface water-ground water interaction along this reach. We will continue along the channel until we get to the original stream channel, where we will discuss sediment transport and downstream issues related to sediment transport through the restored reach. We will work our way back north along the channel to the buses looking at riparian features along the way. Detailed maps and information will be provided at the stop. We will return to Missoula after this stop, possibly stopping at one more site if time permits.



**Figure 8: Stop 3 at restored reach of Dunham Creek**