Center for Riverine Science and Stream Re-naturalization

PROGRAM

Fourth Annual National Conference

Assessing Stream Restoration Success:

Developing Sustainable Ecological and Physical Systems

September 28 and 29 2006

Organized by

William W. Woessner, Acting Director

Johnnie N. Moore

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Schedule

Pre Conference Events:

Wednesday, September 27- Clark Fork River Task Force **–Managing Clark Fork Basin Groundwater** (8:00-17:00 separate registration-see River Center Web Site for details)

Wednesday, September 27- **Fluvial Geomorphic Processes in Restoration**-Northwest Environmental Training Center(08:00-1700) http://www.nwetc.org/hyd-407_09-06_missoula.htm

Conference:

Thursday, September 28

Field Trip 7:30 to 18:00
We will travel to Milltown Reservoir and the Clark Fork River where the State will present a reference reach and detailed Clark Fork River channel restoration plans. A discussion of restoration criteria will be facilitated by keynote speakers, agency personnel and conference participants. We will then continue up the Blackfoot River and examine a number of sites where fisheries/stream restoration goals have been set.

Friday, September 29

8:00-8:15 Gathering University Center Theater 3rd floor of the University Center. Introduction Johnnie Moore

8:15-8:40 Welcome and Governor's Restoration Program-short video Dean Perry Brown, College of Forestry and Conservation

8:45-9:35 **Ecological Systems and Re-naturalization Success**
Dr. Emily Bernhardt, Assistant Professor, Duke University 9:35-9:50 Discussion

9:50-10:15 Coffee Break and set up posters- South Ball Room.

10:20-11:10 **Sediment Transport and Stream Re-naturalization Success**
Dr. Peter R. Wilcock, Professor, The John Hopkins University

11:10-11:30 Discussion

11:30-13:15 Lunch and poster session. South Ball Room.

Poster presenters get lunch and then bee at your poster from 12:00 to 13:15You may take down your posters after 1:15 or wait to the end of the meeting.

POSTER ABSTRACTS are ATTACHED and available on the River Center Web Site.

13:20-14:10 **Fisheries and Stream Re-naturalization Success**
Dr. Jeffrey L. Kershner, Center Director, USGS Northern Rocky Mountain Science Center

14:10-14:30 Discussion

14:30-15:20 P**lanning and Executing a Successful Re-naturalization Project**
Tyler Allred, Lead Designer, Allred Restoration Inc.

15:20-15:40 Discussion

15:40-15:50 Closing remarks

15:50 Meeting adjournment Poster presenters take down your posters.

Poster Abstracts

Fourth annual River Center workshop/conference

Assessing Stream Restoration Success: Developing Sustainable Ecological and Physical Systems

Poster Session Abstracts

1

Monitoring and Assessment of a Reconstructed Placer-Mined Channel: Elk Creek, Montana

In late fall, 1994, Montana Fish, Wildlife and Parks and the United States Bureau of Land Management reconstructed major portions of the upper reaches of Elk Creek in the Cabinet Mountains of Western Montana. These reaches were heavily impacted by placer mining, which probably began in the 1860's and persists to this day. In some areas of the valley floor stream channels were entirely obliterated by mining activities; reconstruction restored year-round surface flow in all project reaches. Benthic invertebrates were sampled by Rhithron Associates, Inc. before and after reconstruction at 8 sites above, within, and below the reconstructed channel. Monitoring continued, with biological samples taken in 3 seasons for 3 years following reconstruction. In addition, discharge, water quality, riparian inventories, channel cross sections and channel sealing, fish habitat and pool development, and benthic particle sizes were studied. In this presentation, the biological data is revisited, and results re-examined in light of the physical measures, and newer assessment methods available.

Presenter: Wease Bollman, Chief Biologist
Rhithron Associates Inc.

2

Wild Fish Habitat Initiative

Habitat Degradation Is One Of The Principal Reasons For The Listing Of Wild Fish As “Threatened” Or “Endangered” Under The Federal Endangered Species Act. Habitat Degradation Can Exacerbate The Detrimental Effects Of Fish Predators, Exotic Competitors, And Diseases Such As Whirling Disease. In Addition, Land Values Are Diminished By Habitat Degradation And The Subsequent Loss Of Wild Fish Populations.

Fish Habitat Restoration Has Become A Multi-Billion Dollar Industry With A Diversity Of Techniques Being Developed And Practiced. However, Project Results Have Not Been Shared Widely, And Their Efficacy Is Not Well Understood Because There Is Little Or No Evaluation And Monitoring. The *Wild Fish Habitat Initiative* Is A Cooperative Effort Between The U.S. Fish And Wildlife Service (Partners For Fish And Wildlife Program) And The Montana Water Center At Montana State University. The *Initiative* Seeks To Provide Technical Information Related To Native Fish Habitat Restoration To Landowners And Professionals Using Two Methods: 1) A Technology Transfer Program Using A Resource Library And A Database Of Case Histories Which Showcases Outstanding Stream Restoration Projects Within The Intermountain Western U.S.; And 2) Targeted Research Related To Native Fish Habitat Restoration Techniques.

The Wild Fish Habitat Initiative Began In Summer 2002 With A Grant From The U.S. Fish And Wildlife Service To The Montana Water Center. It Is Being Carried Out By Montana State University Biologists In Collaboration With Several Private- And Public-Agency Biologists. For More Information On This Project Visit The Website At: Http://Wildfish.Montana.Edu.

Presenter: Kristin Keith, Researcher/Technical Writer
Montana Water Center

3

Innovative Mechanized Planting Technique For Woody Plants In Riparian And Wetland Sites

Restoration of riparian and wetland sites is critical for improving water quality and healthy fisheries. Woody riparian plants provide bank stability, shade for temperature moderation and woody debris for fish habitat. Most degraded streams have conditions that are difficult for successful establishment of riparian plants. Some have high banks that can be dry during part of the year. Many streams have very rocky soils with few fine sediments. Current restoration techniques include the planting of cuttings, salvaged riparian shrubs and nursery grown plants. Each technique has limited success under the difficult conditions common to most stream revegetation projects. A new technology for the installation of cuttings and deep container grown riparian plants was utilized on a stream re-location project near Yellow Pine, Idaho. A section of Meadow Creek was re-located and constructed to move it away from water borne tailings and to restore salmon and trout spawning habitat. Willow cuttings were collected on the site and used to grow 10,000 plants in containers 76 mm in diameter and 355 mm deep. An additional 2,000 (approx. 1.3 m in length) willow cuttings were collected just prior to installation. The plants were installed with a rotary planter mounted on an excavator arm. This planter has a magazine capable of holding 50 plants and can plant up to 50 plants in 6 minutes. This magazine has three rings that can be accessed by the operator thus allowing for the selective planting of three separate species. The cuttings were planted using an excavator mounted “stinger”. Most of the plants and cuttings were installed through fiber encapsulated soil lifts and rocky soils. The cuttings were installed in the stream banks at least 1 m deep. Installation of both plants and cuttings was complete in less than five days. This innovative technology provides cost effective installation of superior riparian plant material under difficult site conditions.

Presenter: Len Ballek
Director of Business Development for Bitterroot Restoration, Inc.

4

Guaranteeing Restoration Success through Education: The Clark Fork Watershed Education Program (CFWEP)

Remedy without education of future generations is a temporary change in condition, not a sustainable solution. With this in mind, we have created the Clark Fork Watershed Education Program (CFWEP) in the Technical Outreach Office of Montana Tech in Butte. CFWEP works with students and their teachers to foster environmental stewardship and science-based decision-making, drawing on the upper Clark Fork Superfund complex as an outdoor laboratory and using professional scientists as instructors.

CFWEP has provided hands-on science education to over 2700 children and almost 50 teachers since spring 2005. The program targets over 30 schools from Butte to Bonner including the Blackfoot River and Flint Creek tributaries. CFWEP provides watershed science education in several capacities. An intense annual teacher-training gives educators the background needed to incorporate watershed science into their curriculum. A standard program provides each middle school student with watershed science lessons and fieldtrips. We arrange mentors for science fair projects, independent research and job shadowing. CFWEP provides outlets for scientists to interact with students through classroom and/or fieldtrip projects. Could you be a role-model for a student? Could your project benefit from having student researchers? Could you donate your time to teach stream-side watershed science? By interacting with students, your science becomes your legacy. Please consider working with a student or classroom. Be the spark that ignites.

Restoration creates the conditions in which sustainability can be realized, but a crucial component is practical, science-based watershed education.

Presenters: Colleen Elliott and Jen Titus
Montana Tech

5

Relationships Among Abiotic Factors, Biotic Interactions, And Successional Shifts In Riparian Mycorrhizal Communities

Establishment of vegetation is integral to floodplain restoration. Mycorrhizae are plant/fungus mutualisms essential to ecosystem function and productivity, influencing primary production, seedling establishment, plant community structure, and soil structure. During succession in temperate and boreal systems, the dominant mycorrhizal association can progress from arbuscular mycorrhizal (AM) to ectomycorrhizal (ECM). Here we employed an unregulated riparian soil chronosequence to explore relationships between mycorrhizal groups and concurrent changes in biotic and abiotic factors over time. AM biomass and mycorrhizal inoculum potential (MIP) peaked within the first 13 years of succession then declined. Conversely, total length of ectomycorrhizal roots of cottonwood (*Populus trichocarpa*) increased throughout the chronosequence. ECM colonization increased rapidly post disturbance and was near the maximum observed by five years post disturbance. The decline in AM fungal abundance did not appear to be related to the abundance of host plants because the aboveground biomass of AM fungal plant species continually increased. AM fungal abundance was negatively correlated with abiotic soil variables matter chronosequence ($p<0.05$); however, surface litter was the only variable that changed significantly ($p<0.05$) prior to the decline in AM fungal abundance, and may warrant further study regarding potential feedbacks between above and belowground processes. The high abundance of AM fungi during early succession suggests that regular flooding and establishment of new sites is necessary for AM fungal persistence in riparian systems. Plant community succession, productivity, and soil stabilization following disturbance will be dependent in part on the presence of AMF inoculum and should be a management consideration.

Presenters: Jeff Piotrowski
Department of Biological Sciences, University of Montana

6

Spatial distribution of stream power using ALSM-derived digital elevation models

Energy in the fluvial system begins as potential energy, and is converted to kinetic energy, as water flows downhill. Energy is expended as well doing the geomorphic work of creating channel morphology and transporting sediment. The distribution of energy through the channel network creates a distribution of channel morphologic types by taking disorganized hillslope inputs of wood and sediment and creating channel structure, organization, and regularly spaced bedforms. Stream power provides a physically based measure of sediment transport capacity (Phillips, 1989) and has been used as a proxy for fluvial processes. The spatial distribution of stream power indicates sediment transport, deposition, and storage locations, and has implications for the type and location of morphologic types (Flores et al., 2006). Our ability to establish the causality between fluvial form (channel morphology) and fluvial processes (stream power) has been constrained by the coarseness of available topographic information and the resolution of the channel networks examined thus far. Spatial distribution of stream power at 0.5 and 1.0 meter resolution was calculated on reaches of Stringer Creek, U.S. Forest Service Tenderfoot Creek Experimental Forest, Little Belt Mountains, Montana. ALSM (airborne laser swath mapping) data was used to create high resolution digital elevation models (DEMs). DEMs, gage data, and field measurement of channel cross-sections, and thalweg elevation were used to calculate stream power and examine power spectra. The effect of external controls such as lithology is also examined by comparing distributions between different lithologic units.

Presenters: Karen Williams and William Locke
Montana State University

7

Southeast Montana's Prairie Watersheds – finding reference stream sites for impaired ecosystems

This poster focuses on Montana Department of Environmental Quality (DEQ)'s efforts to find reference streams in Eastern Montana through the Wadeable Stream Reference Project, which is now in its second decade. While there is considerable knowledge on reference conditions for western Montana streams, the lack of information on eastern Montana streams presents a challenge for DEQ's goal of setting appropriate water quality standards.

Three regions in Eastern Montana have been sampled through the Reference Project: the northeastern glaciated plains (Milk River Basin), the southeastern unglaciated plains (Lower Yellowstone and Little Missouri basin), and Fort Peck Reservoir tributaries.

This poster focuses on data collected at the southeastern Montana sites in 2005. Each site was field sampled three times throughout the summer, using a comprehensive suite of sampling techniques. Data collected included water chemistry (pH, flow, DO, SC, temperature, ions, hardness, TSS/TDS, turbidity, nutrients, metals), biology (periphyton, phytoplankton, macroinvertebrates), and physical characteristics (Rosgen, NRCS, Rapid Habitat Assessment, EMAP).

The results indicated a high level of variation both between and within stream sites in the parameters measured. This level of variation is consistent with another similar study done in the northeastern glaciated plains of Montana, which suggests Montana prairie streams may vary more in chemical, biological, physical, and biological characteristics than do streams in western Montana.

This poster presentation examines site selection and sampling techniques, discusses the results of the sampling events, and discusses future challenges to sampling prairie streams in Eastern Montana.

Presenters: Natalie Shapiro
Dept. of Environmental Studies, University of Montana

8

Restoration and Monitoring of Two Streams in the Gravelly Mountains

Keif Storrar, Matt Bell, Tom Schemm, and Chris Riley

With the beginning of European settlement in the western US, human impacts (beaver trapping, placer mining, livestock grazing, etc.) to low gradient, alluvial streams have included channel downcutting, overwidening, straightening, and the loss of near-stream soil moisture, water tables, and conversion of riparian vegetative communities. Restoration activities and pre-treatment inventory began in 2004 on two such streams, Tepee Creek (9400 ft) and Wigwam Creek (7000 ft), located in the Gravelly Mountains of southwest Montana. Restoration work was continued into 2005 and 2006. Treatment reaches of both streams are primarily E channel types that have been degraded to an F- or G-type (Rosgen 1996). Using the induced meandering method of Zeedyk (2006) employing wood stakes, native rock, and willow cuttings, we constructed "baffles" – creating point bars, and "riffles" - channel spanning weirs that trap sediment and raise streambed elevations. These structures, designed to accelerate sediment deposition, result in increased channel sinuosity, narrowing of the channel, and where desired increased streambed elevations and associated water tables. Monitoring data in Tepee Creek indicates that after the first year considerable amounts of fine sediment were trapped, followed by little deposition in the second year. In Wigwam Creek, the length of channel increased from 247 m to 256 m, resulting in a 9% reduction of channel gradient. Bankfull width decreased 17% and 3% respectively, in Reaches 1 and 2. All structures in both streams have survived intact with little maintenance required. Overall, these restoration activities have shown positive initial success.

Presenter: Keif Storrar, Fisheries Technician
Beaverhead-Deerlodge NF, Madison Ranger District

9

Evaluating habitat restoration using bird communities: a spatially explicit approach and application to aquatic systems

Habitat restoration is one of the only alternatives for conserving biodiversity in threatened landscapes. Biologists and managers are not only faced with restoring habitat, but it is also critically important to evaluate the potentially widespread effects of restoration. Determining the success of restoration can be complex, however, because management can have a variety of effects on plant and animal communities. Here, we describe the merits of using information on bird communities collected at landscape scales to evaluate restoration success. We illustrate this approach with an example from ongoing restoration at Odell Creek, a small stream located near the Madison River, MT. The advantages of using bird communities for evaluating restoration success include that: 1) systematic data can be collected easily and less expensively than for other vertebrates and some plants, because birds are the most visible and active vertebrates; 2) information can be rapidly gathered for dozens of species across broad spatial scales; 3) collective effects of restoration are integrated into information on bird communities, such as effects on water quality, insect abundance, vegetation, and microclimate; and 4) identifying effective indicators are highly probable because birds vary widely in their requirements and life history strategies. Furthermore, sampling designs, like that used for monitoring restoration at Odell Creek, can easily be implemented that allow assessment of the spatial extent and magnitude of restoration effects. Our approach should help act as a springboard for initiating future restoration on private lands, improving methods of restoration, and using existing data to predict restoration potential.

Presenters: Robert J. Fletcher and Richard L. Hutto
Avian Science Center, Division of Biological Sciences, University of Montana

10

Reference Streams In Montana's Northern Glaciated Plains - Criteria Development

Reference streams are relatively undisturbed examples of a similar group of waterbodies in an ecoregion. Such streams represent the natural ecological integrity of that region and waterbody type and are useful in setting benchmarks for water quality standards and goals for restoration efforts. Candidate streams were evaluated based on quantitative watershed and water quality analyses as well as qualitative assessments of stream health and condition. Assessment criteria differed for mountain & prairie streams. Screening tests for reference condition included indexes of: site specific data sufficiency, cumulative impacts of multiple causes, agricultural use of watershed, water quality standard exceedences, mining impacts, (& for cold water streams) road density & timber harvest intensity. Reference streams identified by this process are mainly first to fourth order streams and must be grouped by key variables to determine the streams for which they can serve as references. These variables include ecoregion, elevation, and watershed size. Characteristics of the reference streams of Montana's Glaciated Plains have been summarized and used to develop nutrient and algal biomass criteria to protect beneficial uses in this ecoregion. Criteria (& their rationale) for nitrogen and phosphorus concentrations and for floating and benthic algal biomass will be presented.

Presenters: Vicki Watson, University of Montana
M Suplee, RS de Suplee and D Feldman, Montana Department of Environmental Quality, Water Quality Standards Section
Lei Zheng and Jeroen Gerritse, TetraTech
T Laidlaw US Environmental Protection Agency Montana Office

11

Preferential Flow Paths and Residence Time of Hyporheic Groundwater in an Alluvial Floodplain

River ecosystems are dynamic landscapes shaped by longitudinal, lateral and vertical hydraulic interactions that create a shifting habitat mosaic (SHM) across floodplains, linking aquatic and terrestrial habitats (Stanford et al. 2005). The SHM is driven by fluvial geomorphic processes of cut and fill alluviation, channel avulsion, flood events and seasonal discharge fluctuations that create a succession of secondary and remnant channels (Lorang and Hauer 2006). These channels are hypothesized to be areas of high hydraulic conductivity that act as preferential flow zones, influencing the pattern of groundwater movement and surface water- groundwater exchange which drives biogeochemical cycling, water temperature controls, and the movement and distribution of aquatic organisms. This study investigates the relationship between residence time of hyporheic groundwater and the length of assumed flow paths in the parafluvial zone of a gravel-bed alluvial flood plain. Flow paths were determined by identifying remnant or recently abandoned secondary channels, locating sites of upwelling hyporheic groundwater within those channels and measuring the distance from the upwelling site to main channel using a Global Positioning System (GPS). Residence time was determined by collecting upwelling groundwater at the surface or from piezometers placed within a flow path, and then measuring radon concentration, a conservative tracer which can detect mean subsurface residence time up to 15 days. The linear correlation between residence time and flow path length was significant (R^2=0.91) for a several recently disconnected secondary channels. However, large variance was found for most channels over 150 m in length. The variance is most likely due to increased mixing of groundwater that occurs when longer flow paths intercept a complex latticework of subsurface paleochannels with various hydraulic conductivities.

Presenters: Wendy Marsh
Environmental Studies Department, University of Montana

12

Engineering Naturally the Lefthand Creek Channel Improvement Project

Floodway improvement projects in urban environments often meet the city goals for removing developable land from floodplains but at a loss of improved wetlands, wildlife and aquatic habitat. The Lefthand Creek Channel Improvement Project displays the exception.

Located in the city of Longmont, Colorado, 40 miles north of Denver, Lefthand Creek flowed through agricultural lands planned for future residential and commercial development. With its headwaters high in the Indian Peaks near Rocky Mountain National Park, Lefthand Creek flows through the foothill canyons and across the plains to its confluence with the Saint Vrain River, a tributary to the South Platte River. Since the 1870s and the beginning of farming, ranching and town settlement along the Colorado Front Range, land next to Lefthand Creek has been heavily grazed, cottonwood forests cut for lumber and firewood, and the creek channel straightened and confined to a steepbanked course.

Longmont's goals for the channel improvement project included narrowing the creek's floodplain to remove adjacent developable land out of the 100-year flood plain. Longmont also wanted to construct a recreation trail to expand the city's growing greenway trail system and maintain the existing irrigation ditch diversion structure downstream of channel improvements. The channel improvement project would also meet the need for wetland mitigation for unavoidable wetland impacts from a new Longmont main street bypass project.

Early design concepts began with a trapezoidal shaped channel cross-section and a concrete and riprap low flow channel. Through the teamwork of city and highway staff, the Colorado Division of Wildlife, and Carter & Burgess hydraulic engineers, landscape architects and wetland scientists, the project design evolved to a wider floodplain cross section and meandering low flow channel stabilized with cottonwood root wads, boulders and riparian and wetland vegetation. The project was recognized by the American Public Works Association, Colorado Chapter as the 'Project of the Year' for 2002.

Presenter: Laura Backus, Wetland Scientist and Diane Yates, Landscape Architect
Carter & Burgess, Inc.

13

A Characterization of Rattlesnake Creek within Greenough Park, Missoula, Montana

This study will describe the current condition of Rattlesnake Creek within Greenough Park, Missoula, Montana. The need for such as study is two-fold: the Greenough Park Advisory Committee, charged with making recommendations about the park's maintenance, needs a scientifically defensible description of the creek for informed decision making, and current data on the creek will make it possible to note specific changes in the creek over time. An important goal of this study involves establishing baseline stream data for Rattlesnake Creek in anticipation of future changes resulting from the continued population growth in the area, the addition of new septic systems in the Rattlesnake watershed, the discontinuation of older septic systems and the connection of those households to municipal sewer lines, and the re-naturalization/reclamation projects to occur in Greenough Park. Three sites will be selected for this study – one at the upper boundary of the park and another at the lower boundary, with one site in the middle in order to provide a representative sample for the expanse of the park. Each site will be characterized according to Hansen's riparian classification system and then monitored for discharge (stream flow) and chemical parameters (nutrient concentrations, specific conductivity, temperature, pH, dissolved oxygen, and turbidity) during the spring and summer water seasons from April to September. The description of physical characteristics will include gathering previously collected data and classifying the stream according to Rosgen's classification system. The biological attributes of the stream will be described using a modified rapid bio-assessment protocol for benthic macro-invertebrates.

Presenter: Andrew Erickson
University of Montana, Environmental Studies

14

Monitoring the Impact to Ground Water from Drawdown of the Milltown Reservior during the Initial Stage of Dam Removal, Western Montana

The Milltown Dam is located 4.3 miles east of Missoula, Montana at the confluence of the Clark Fork and Blackfoot Rivers. In December of 2004 the Environmental Protection Agency opted for the Milltown Reservior Sediments Operable Unit (MRSOU) to be cleaned up. The decision was to remove the Milltown Dam and 2.51 of the 6.6 mcy of contaminated sediments in the reservoir. Among the benefits of removing the Milltown Dam are increased ground water quality, fish passage, and the return of the rivers to their natural state. In preparation for the removal of Milltown Dam the reservoir will be lowered in three stages to enable adequate dewatering of sediments and bridge stabilization work to be done. A ground water monitoring network has been established to determine how the reservoir stage changes effect the local and regional water table position and operation of over 400 domestic wells. A network of 50 wells and 10 river stage gauges have been developed including instrumentation with 22 level loggers. Preliminary results are being analyzed by the following strategies: comparing historical surface and ground water elevations, using digital elevation grids of potentiometric surfaces to establish areas of high and low elevation change with time, comparing contours of ground water elevations, and using graphical comparisons of present and historical conditions.

In addition the link between river and ground water systems is being investigated using in-stream piezometers to distinguish vertical hydraulic gradients and in bed temperature monitoring to quantify leakage rates. Work is planning to continue and will be used to calibrate a planned three dimensional numerical ground water model of the site.

Presenter: Anthony Farinacci
University of Montana, Dept. of Geosciences

15

Dunham Stream Rehabilitation: an example of the marriage between analytical and geomorphic approaches to successful stream rehabilitation design

Photos help recollect the story of almost a mile of riparian harvest in Dunham Creek, a tributary in Montana's Blackfoot River basin in the mid-1960s. Then, a road and bridge bisected the area, where activities targeted large spruce trees and spanned the entire valley bottom. Shortly after removing all trees and understory, the high bedload, C4 stream unraveled. During the early 1970s, well-intentioned stabilization attempts channelized, bermed, and reshaped the channel into a trapezoidal character. In 1998, remnants of the berms existed, the bridge had washed out, bank erosion was magnitudes above natural, the channel was braided and 150 feet wide in many locations, and sediment loads threatened fisheries and downstream facilities. Although slowly recovering, projections attaining natural stability were 50-100 years into the future, which was unacceptable to multi-entity bull trout recovery efforts in the basin. With funding and/or collaboration from at least eight entities, Lolo National Forest water resource personnel designed and implemented a detailed rehabilitation plan that will stabilize the reach for at least 10-15 years until vegetation is reestablished. Today, the project highlights the importance of considering riparian values first and foremost in all management activities and how trained personnel can successfully employ a combination of geomorphic approaches, as applied by Rosgen teachings, and analytical approaches of other environmental river mechanic design approaches, in a very cost-effective manner. After several high flow events, the stream is functioning as intended, and studies have already shown increased fish populations.

Presenter: Traci L. Sylte, P.E.
Fluvial Geomorphology/Hydrology
Lolo National Forest

16

Watershed Rehabilitation Examples and Talking Points

This is captioned photo poster of various examples of watershed rehabilitation being conducted by the USDA Forest Service. The poster provides examples to generate discussion and is not intended as a comprehensive review of overall approaches or techniques used.

Presenter: Traci L. Sylte, P.E.
Fluvial Geomorphology/Hydrology
Lolo National Forest

17

Assessing Geomorphic Channel Response to Change by Analyzing Historical Impacts to the Upper Blackfoot River, MT

The Mike Horse Dam was built in the headwaters of the Blackfoot River and breached in 1975, this breach deposited mine tailings into the channel for several miles. The Helena National Forest is now looking at restoration options for the Mike Horse Dam and the damaged river channel. Our purpose is to find stream reaches that are susceptible to geomorphic change by looking at past impacts in the drainage. We stratified the channel into constrained and unconstrained reaches downstream of the Mike Horse Dam. Historical aerial photos were then compared looking for visible channel change from 1938 (before dam construction), 1961 (following dam construction), 1979 (following the dam breach) and 1995 (recovery period). Cross-sectional surveys were taken to assist in classifying the stream type, calculating channel slope and determining differences in floodplain width between the constrained and unconstrained reaches. Pebble counts from channel riffles and floodplain bars indicated that the most significant differences occurred with regard to larger sediment sizes between the constrained and unconstrained reaches. Application of this data helped compile a general overview of areas that have a higher probability of experiencing geomorphic change during restoration work.

Presenter: Steve Jay and Denine Schmitz
Department of Land Resources Environmental Sciences, Montana State University