2012 UMSRS Poster Abstract Guide

P-01: Monitoring the effectiveness of large wood for creating and maintaining deep pool habitat in the Sucker River, NE Minnesota

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Habitat improvement projects employ a variety of techniques to corral the flow, create hydrologic complexity, stabilize eroding banks, or improve specific types of stream habitat. Minnesota North Shore streams offer a unique challenge with flashy flood peaks followed by low summer base flows, and it is unknown whether techniques used elsewhere will be successful here. We are monitoring the effectiveness of a habitat improvement project conducted by Minnesota Trout Unlimited (MNTU) on the Sucker River in northeastern Minnesota with the goal of improving deep pool habitat through a combination of installed log jams and cross-vanes. The log jams were created from white pine and black ash, with many logs larger in diameter than riparian trees currently available on banks for recruitment into the stream. This project is intended to be a test case to see if deep pool habitat can be created and maintained, and if the increase in habitat translates into improvements in the local fish population. Many North Shore streams have low base flows, and deep pools are important for the survival of fish in late summer and for providing over-wintering habitat.

We established a monitoring framework that is being implemented by University of Minnesota Duluth students through class laboratory assignments, ensuring long-term monitoring of the site. To date, we have conducted pre-installation and post-installation surveys on 16 cross-sections, plus wood and pool surveys throughout the entire reach. Pre-installation fish shocking was conducted by the Minnesota DNR. Results indicate that pool habitat (defined as areas > 2 feet deep) in the 400 meter reach increased from 53 m^2 pre-installation, with 40% of that area in the largest pool, to 123 m^2 immediately post-installation, with 18% of that area in the largest pool. Additional surveys in July 2011 and October 2011 found a continued increase in deep pool area, from 208 m^2 to 347 m^2. Several large peak flow events occurred since installation, testing the integrity of the wood. Most of the wood has remained in place, with additional wood trapped by installed logs.

Amity Creek: Weber Stream Restoration Initiative & Projects

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Amity Creek is a coldwater trout stream on the northeast side of Duluth, MN. It is one of an estimated 720 perennial and 127 intermittent streams that flow into ultraoligotrophic Lake Superior, including 309 trout streams and their tributaries along the Superior North Shore and St. Louis River Estuary. Bedrock escarpments create a high density of stream corridors in forested watersheds with steep gradients, thin, erodible soils, typically low productivity, and “flashy” hydrology. Its watershed is mostly undeveloped (~4% Rural/Urban, 6-8% impervious surface), but faces increasing development pressure due to its location leading to the scenic North Shore. These trout streams are especially sensitive to potential impacts from urbanization and rural development: rising water temperature, increasing water and sediment runoff, openings in riparian cover/canopy, impervious surfaces, road crossings, and construction runoff. Impacts from watershed disturbance would likely be exacerbated by concurrent trends in warming and increased frequency of severe storms, that climate change models predict will persist and worsen. The stream was listed as Impaired (303(b)) in 2004 due to excess turbidity from suspended sediment, and fish-Hg. Since then, an effort has been made by multiple agencies, organizations, individuals, and UM-Duluth to determine the source and solution to the turbidity problem. In 2005, a private gift to NRRI-UMD spawned the Weber Stream Restoration Initiative (www.lakesuperiorstreams.org/weber) with a goal of restoring and protecting Superior Basin trout streams using the Amity Creek watershed as an ideal demonstration project for restoration, assessment, and extension education activities. Over a dozen projects were carried out by the Partnership from 2005–2011 including two stream

bank/channel stabilizations, a neighborhood stormwater reduction project, comprehensive water, habitat, and biological monitoring and outreach programs, and mapping landscape stressors to highlight areas of higher risk for environmental impacts. Great Lakes Restoration Initiative and MN's Superior Coastal Program grants, and in-kind Partner efforts began in 2011 focused on: (1) stream restoration using BMPs in critical areas; (2) social tools to improve land use through erosion control and stormwater runoff management by developing a novel, online residential mapping tool for use in two rural townships; (3) creating a regional ditch design and maintenance manual; (4) geomorphic assessment of banks and bluffs using a ground-based Lidar scanner; (5) intensive hydrologic assessment of surface and groundwater movement; (6) continued WQ, habitat, and biological monitoring; and (7) outreach activities.

P-02: Geomorphic Processes Following Dam Removal in Centerville Creek, Wisconsin

Benjamin Lee *Inter-Fluve,* John Hoopes *University of Wisconsin-Madison*

Channel adjustments in the former impoundment of Centerville Creek, a tributary to Lake Michigan in eastern Wisconsin, were analyzed over a 15 year period following dam removal. Detailed topographic surveys were completed 5 years and 15 years after the removal. Results indicate relatively little erosion of impoundment sediments over this time compared with other studies that monitored impoundment sediment erosion. The primary controls on sediment dynamics, following dam removal in Centerville Creek, were the cohesiveness of the sediments and large woody debris that was exposed as the channel incised and migrated through the impoundment sediments.

This poster will be of interest to those involved with dam removal. The implications of passive sediment management in a small impoundment with cohesive sediments are useful for future dam removal planning.

P-03: Applying Dendrogeomorphic Methods to Determine Site Specific Annual Erosion Rates – A Quick and Cost Effective Alternative to Using Erosion Pins

Bryan M. Dick**,** Ian Jewell, Steven Pires, Andrew Wilson, Ron Johnson, **Sean Collins** *AECOM;* Ilona Peszlen *North Carolina State University;* Peter Simon *Ann Arbor Technical Services*

Changes in the anatomy of exposed tree roots provide a means of dating and estimating erosion rates of soil from riverbanks, hillslopes, gullies, dunes and other landforms. Dendrogeomorphology is a well established field, yet little has been done in the continental U.S. using this tool to analyze erosional processes and prior work has primarily focused on hillslope and gulley erosion for watershed modeling purposes. A primary factor in understanding and modeling channel stability is the accurate estimation of riverbank sediment entrainment.

The dendrogeomorphic method, using exposed tree roots, establishes erosion rates accurately and in a more cost effective manner than erosion pins or by resurveying bank profiles, which only determine erosion rates from the date of the last survey. Further, erosion pins and direct survey studies can take years to determine the rate of bank retreat, often exceeding the decision critical timelines of contaminated sites. Of significant importance on contaminated sites is the ability to hindcast erosion rates for specific time periods by evaluating roots that were exposed during the specific period of concern. While aerial photo studies and topographic map comparisons do offer a means of looking at past erosion, the scale is normally too course for accurate estimation of annual erosion rates.

The use of dendrogeomorphology as tool for evaluating erosion rates and relating it to Bank Erosion Hazard Index (BEHI) on fluvial sites, the findings, and regression models from three recent projects are presented.

P-04: Lateral erosion in an experimental channel: the influence of bed roughness on wear by bedload impacts

Theodore Fuller *Saint Anthony Falls Laboratory, University of Minnesota* Leonard S. Sklar *San Francisco State University,* Karen B. Gran *University of Minnesota, Duluth*

Lateral bedrock erosion is important in setting boundary conditions for river and landscape evolution, yet little is known about the controls and mechanisms of this process. We conducted a series of flume experiments with erodible 'bedrock'

walls to investigate the influence of bed roughness on lateral erosion in bedrock channels. Bed roughness was varied along the length of the channel by changing the size of particles embedded in a non-erodible bed material. Single experiments consisted of 3 or 4 bed roughness sections, each spanning 2 m in length with a distinct embedded particle size. Embedded particle size ranged from 1.2 mm to 16.0 mm over the series of experiments and varied by a factor of 2.5 to 6.5 within a single experiment. In addition to varying the size of embedded particles, we varied the downstream trend in bed roughness (increasing, decreasing or alternating). Experiments consisted of an initial time period of clear water flow followed by multiple periods in which 4mm gravel was introduced at a constant rate. At the end of each time period, detailed elevation data of the experimental channel were collected.

Lateral erosion from clear water flow was negligible compared to erosion during periods of bedload supply. Erosion was focused near the base of the channel walls resulting in banks that were undercut by as much as 25% of initial channel width. Reach-average lateral erosion rates in 'rough' sections were 3 to 5 times greater than those in control sections (no embedded particles). Within a single experiment, erosion rates in 'rough' sections of different embedded particle size and concentration were similar. This suggests that reach-average lateral erosion rates are insensitive to increases in bed roughness beyond a threshold value (embedded particle size : transport particle size ? 1). In contrast, longitudinal variability in cross-section-scale erosion increases continuously with increases in bed roughness and likely reflects the larger gap between embedded particles of increased size, highlighting the important role of particle deflection in the process of lateral erosion by bedload impacts. Our results indicate: 1) bedload impacts are a viable mechanism for lateral bedrock erosion; 2) the presence (or absence) of roughness elements on the bed exerts a control on rates of lateral erosion and 3) the size of individual roughness elements and/or the mean free space between roughness elements influences the spatial distribution of lateral erosion by bedload impact.

P-05: Measurement and modeling of NO3 uptake in low-order streams: effects of various in-stream hydraulic structures

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The fate of nitrogen, and its most reactive oxidation state, NO3, has been a growing concern in streams and rivers. Its detrimental effect to water quality includes acidification of primary waters and eutrophication of coastal waters. In the past, modeling of NO3 transport and transformation has assumed only longitudinal variability within the stream channel. Detailed cross-sectional measurements have shown that 3-dimensional heterogeneity exists for NO3 as well as other variables (dissolved oxygen, temperature, shear stress, etc.). In-stream structures can play a role in enhancing the variability in environmental and fluid flow conditions. A Gaussian-type relation is proposed based on experimental data for NO3 uptake and hydraulic conditions in low-order streams. This relation is used to compare different in-stream rock structures and determine their overall influence on NO3 uptake. The structure's effect as compared to baseline conditions in the Outdoor Streamlab at St. Anthony Falls Laboratory is further explored. Denitrifying bacterial biomass and denitrification potential in sediment cores is also studied to understand the significance of this fluid-flow on sediment and biota at the sediment-water interface.

P-06: Gravel sediment sources and bar distribution within the main stem of upper Bull Creek, southwest Missouri

Kyle Kosovich *Missouri State University* Dr. Robert Pavlowsky

Gravel mobilization and stream channel migration in Bull Creek is evident with recent flood occurrences. Landowners blame stream destabilization on a local ATV area managed by Mark Twain National Forest. Bull Creek is an Ozark Plateau stream draining mostly steep topography with in-channel bedrock outcroppings and large gravel bars. It is located in Christian county, the fastest growing county in Missouri. This study will evaluate the historical patterns of reach-scale gravel bar area in a 9 km long segment of upper Bull Creek in order to understand the timing and sources of excess gravel loads to the main stem. The objectives are to: (i) use historical aerial photographs to monitor bar deposition and

erosion; (ii) perform field assessments to evaluate upland, tributary and main stem sources of gravel sediment; and (iii) collect field data on channel and bar morphology to better understand the geomorphic processes involved in channel changes in response to gravel storage and transport. A channel classification system according to historical planform behavior and bedrock influence is presented. Preliminary results based on historical bar analysis indicate that: (1) bar area and meander belt widths are positively correlated; (2) bar areas at some sites do not vary much over time suggesting broader sediment source and valley-scale control of bar deposition to some degree; and (3) gravel bar area is usually highest below tributaries draining ATV use areas. The relative contribution of geomorphic forcing on gravel bar storage patterns in contrast to human influence such as ATV trail erosion will be evaluated.

P-07: Urban Flood Damage: Gully Repair at the Stream's Edge

Shengyi Yue *Iowa State University,* Mimi Wagner *Iowa State University*

College Creek is a small urban stream running through the Iowa State University campus in Ames, Iowa. Typical of many U.S. streams, the channel is incised and is developing a new active floodplain. Concentrated deliveries of stormwater to the stream from storm drains have created several gullies in the past decade, including one that was 15' high. A 500-year storm event in August 2010 aggravated gully erosion at this location, resulting in a 20' wide gully at the stream edge. Federal flood recovery funds were used to repair the gully in July 2011 using a clay plug and riprap. The result was the development of a new, subsequent gully adjacent to the clay repair plug, leading to additional sediment deposits in the stream and eroding stream bank. This research documented these changes and designed a retrofit for the study area to transport stormwater from the source to the stream while protecting soils, reestablishing vegetation and enhancing the visual quality of the area.

One of the key aspects of this project was the inclusion of undergraduate students in analysis and retrofit design. Existing conditions were documented with vegetation analysis for rooting density, longitudinal profile and cross section survey, pebble counts, runoff calculation, photo points and Rosgen's bank erosion hazard index (BEHI). Retrofit design included bioretention cell, new channel design with check dams, and bioengineering. The rehabilitation repaired the gully and resized it for the correct storm water volume and efficiently controlled the grade change. Erosion was drastically decreased. Urban streams are susceptible to gully formation. Treatment practices specific to each site are needed in the short and long term to rehabilitate and stop gully expansion.

P-08: Stream Bank Stability Assessment for the City of Cavalier, North Dakota

Alexa Skjold *University of North Dakota*

The City of Cavalier, ND is located on both banks of the Tongue River approximately 7.8 river-miles downstream from Renwick Dam. This dam creates a reservoir which forms an integral part of Icelandic State Park. Very actively eroding stream banks are found at many sites along the Tongue River within the city area. These riparian sites are being analyzed individually for each property owner as of the summer of 2011 by the Red River Riparian Project team. There is no hydraulic model used in providing an overall dynamic assessment of the flow regime in the Tongue River under various flow conditions.

The main objective of this study is to model the hydraulics of the Tongue River and provide a coherent assessment framework for active stream bank erosions. This project will provide short-term assessment on the stretch of the Tongue River within town for feasibility of a city-wide solution in place of individual modifications.

A hydraulic model of the Tongue River is being established for the river reach starting from the Renwick Dam and ending half of a mile downstream from the city of Cavalier using the Hydrologic Engineering Centers River Analysis System (HEC-RAS) software. Hydrologic peak flow data was collected for the site using U.S. Geological Survey (USGS) data from their site 300 ft downstream from the Renwick Dam. Soil and Light Detection and Ranging (LiDAR) 3-meter Digital Elevation Model (DEM) data were also gathered from Natural Resources Conservation Service (NRCS) and the Red River Basin Decision Information Network, respectively. Since LiDAR data reports back the elevation of the water surface, additional

surveying was done in November in order to obtain elevations for the riverbed in some locations. The elevations for the river bed between the surveyed sections were then interpolated and estimated. A gradation of the riverbed material was also estimated from the soil survey data available.

In order to improve the model and create a more accurate representation of the Tongue River, a survey crew will be returning in March, weather permitting. During this excursion it is expected that soil samples and suspended sediment data can be collected, and more of the riverbed can be surveyed. Once the final model is analyzed, the feasibility study for a city-wide resolution to the erosion will be completed and discussed with city officials and homeowners.

P-09: Assessing the need for stream restoration efforts in Bassett Creek

Jon Schwenk *University of Minnesota,* Antoinette Abeyta *University of Minnesota,* Sarah Baumgardner *University of Minnesota,* Stephanie S. Day *University of Minnesota*

A reach of Bassett Creek was recently targeted for restoration with estimated costs reaching $856,000. As part of the University of Minnesota Stream Restoration Certificate Program, we investigated the need and extent of stream restoration along this section of Bassett Creek by evaluating its morphologic and sediment stability.

The current morphology of Bassett Creek could be entirely natural or entirely anthropogenic. Regardless of historical anthropogenic impacts within the watershed, historical aerial photography shows that the study reach of Bassett Creek has not appreciably changed in over 70 years. Additionally, sediment transport measures calculated from collected field data do not imply system instability.

Land use maps of Bassett Creek watershed indicate that less than 5% of the watershed remains undeveloped and the primary land use is residential. While the development of the watershed has certainly increased flow rates through the stream, this reach of Bassett Creek appears able to accommodate the larger flow rates. Further watershed development is unlikely to cause bank failure or increased flooding.

Based on the analyses we performed, it is recommended that no major actions be taken to maintain stability or prevent catastrophic bank failure. However, erosion at two sections along Bassett Creek is accelerated by pedestrian traffic. Access control features should be installed at these sites to prevent further erosion, and some mitigation efforts may also be necessary at these locations. Restoration efforts toward water quality and habitat improvements may be more effective than bank stabilization.

P-10: Effects of Historical Mine Tailings Inputs on Channel Morphology and Substrate, Big River, southeast Missouri

Lindsay Olson *Missouri State University* Dr. Robert T. Pavlowsky*, Missouri State University*

Tailings releases associated with large-scale historical Pb-Zn mining in southeast Missouri resulted in excessive sedimentation in the Big River. Mining “chat” composed of coarse sand to fine gravel-sized dolomite fragments was released to the channel from ore mills from 1894 to around 1932 after which slime ponds and tailings dams were created to contain mine waste. Presently, chat represents from 20 to 60 percent of the mobile bed material near mining areas. This study addresses how mining sediment inputs influence fluvial processes and forms in the Big River. The specific objectives of the study are to (i) evaluate historical planform channel changes in affected and control reaches; (ii) determine bed substrate characteristics at the channel unit-scale in affected and control reaches; and (iii) evaluate indicators of geomorphic recovery from the effects of historical land use. Channel morphology and sediment data were collected at 19 reaches across a gradient of mining influence in the Big River. Sediment samples were analyzed for particle size and mineralogy. Morphologic data were combined with features digitized from historical aerial photographs and used to evaluate planform changes within a geospatial framework. Mining affected reaches contain more sand and sediment overall per unit channel length than controls. However, preliminary results indicate the chat sediment wave has not moved far downstream and has attenuated or dispersed locally by infilling large pools or moving into semi-

permanent storage in vegetated bars or young floodplains. Thus, mining effects are limited in downstream extent, but recovery may take a relatively long time.

P-11: St. Louis River Interlake/Duluth Tar and Tallas Island Habitat Restorations – How to Restore Two Areas with One Dredge

Guy Partch *Barr Engineering,* Eric Hedblom*,* Jeff Lee*, Barr Engineering;* Timothy Rogers *Xcel Energy, Inc;* Tom Johnson*, Marine Tech, LLC*

The St. Louis River Interlake/Duluth Tar (SLRIDT) site is the largest completed sediment remediation project in the State of Minnesota. A CERCLA site located in the estuary approximately six miles upstream of Lake Superior, the remedial actions addressed over 500,000 cubic yards of contaminated sediments located in and near two commercial boat slips, a Federal navigation channel, and a shallow, sheltered bay. Approximately 60 acres of wetland and fish habitat were restored, along with the creation of shoreline buffer zones and a large upland habitat.

As a requirement of the Minnesota Department of Natural Resources (MDNR) permit to mitigate loss of water volume adjacent to one of the SLRIDT boat slips, an additional habitat restoration project was constructed at Tallas Island. Located two miles upstream of the SLRIDT site, the shallow, sheltered bay located behind Tallas Island had been essentially filled by sedimentation from the Knowlton Creek watershed during the past 50 years. The MDNR collaborated on a design to remove approximately 50,000 cubic yards from the Tallas Island area, restoring an effective hydraulic connection to the St. Louis River and creating shallow and deep water fish habitat, as well as a sediment catch basin to capture future Knowlton Creek sediment loads.

The material removed from Tallas Island in 2010 was incorporated into the sediment work at the SLRIDT site as "environmental media". This environmental media provided a surface layer and seed source in the capped and covered areas of the site for the establishment of new benthic communities. Vegetation monitoring after the first growing season has been completed, and results show that the Tallas Island material supports the re-establishment of sub-aqueous and emergent wetland communities at the SLRIDT site.

P-12: Quantifying the local hydraulic environment associated with high Glossosoma (Trichoptera) larval spatial density

Mark Morris *St. Anthony Falls Laboratory (SAFL), University of Minnesota;* Mohammad Hajit *SAFL, University of Minnesota;* Stephanie Day *SAFL, University of Minnesota;* Miki Hondzo *SAFL, University of Minnesota;* Mary Power *University of California, Berkeley;* Fotis Sotiropoulos*, SAFL, University of Minnesota*

The stream-dwelling larvae of the caddisfly Glossosoma spp. are dominant grazers in lotic food webs and are capable of suppressing stream periphyton. We investigated a method for developing a scaling relationship between macroinvertebrate density and local hydraulic variables. As an example of this method, we quantified habitat for larval stone-cased caddisflies, Glossosoma califica and Glossosoma penitum, in three coastal mountain streams in northern California over two years. We applied dimensional analysis to develop a functional relationship with physically meaningful dimensionless groups from a power law based on dimensionless local hydraulic and larval density variables that is applicable to areas where Glossosoma are present. The proposed functional relationship described 41% of the variance in the spatial distribution of glossosomatid larvae. This expression predicts how density and effects of these grazers would change under variable hydraulic conditions. High resolution (1 cm) light detection and ranging bathymetry of a 10 m riffle reach in Valley Creek, Minnesota, provides an independent data set to verify the hydraulic conditions found to correlate with Glossosoma spatial density in California. A computational fluid mechanics model of the study riffle in Valley Creek is pending which will ideally provide a three-dimensional replica of the in-stream hydraulic environment above the measured bathymetry. The hydraulic environment local to larvae is quantitatively described through double, i.e. spatially and temporally, averaged hydraulic variables. Averaging window dimensions, which are related to the local patch size, are based on characteristic length scales obtained through variogram analysis

of stream bed roughness height. Methods employed here may serve as a pattern to improve understanding of benthic organism interaction with natural hydraulic environment and lead to tools for predicting the impacts of a changing hydraulic regime on the benthic macroinvertebrate community.

P-13: The Role of Epiphytes in Stream Nutrient and Contaminant Cycling

Amy Hansen , Miki Hondzo *Department of Civil Engineering, University of Minnesota,* Jacques Finlay *Department of Ecology, Evolution and Behavior, University of Minnesota*

Submerged aquatic vegetation (SAV) has major effects on the physical and chemical in-stream environment, altering such characteristics as dissolved oxygen concentration, pH, temperature, light availability, and water motion. SAV leaves and stems typically host epiphyte assemblages which may alter SAV productivity by decreasing light and nutrient availability at the plant surface. Through laboratory and field experiments, we investigated the effect of epiphytes on in-stream cycling of contaminants and nutrients including; soluble reactive phosphorus (SRP), dissolved oxygen (DO), and the heavy metal nickel. These results show that epiphyte removal increased SAV productivity resulting in lower SRP and higher DO throughout the water column. In contrast, epiphytes were shown to be more efficient concentrators of heavy metals than SAV and therefore are important for remediation. Epiphyte coverage decreased surface shear stresses for filamentous algae. Under controlled laboratory conditions, epiphyte detachment was shown to be a function of fluid velocity, which could be manipulated in the field. Collectively these findings indicate that epiphytes, although small, can play a large role in nutrient and contaminant cycling. Active management of epiphyte coverage could be a useful tool for improving water quality

P-14: A Field Assessment of Soil Nitrogen and Reed Canary Grass

William Bartodziej *Ramsey-Washington Metro Watershed District,* Simba Blood *Ramsey-Washington Metro Watershed District*

The invasive reed canary grass (Phalaris arundinacea) is a common species along streams, lakeshores, and wetlands in the Ramsey Washington Metro Watershed District. It thrives in our urban watershed where stormwater increases nutrient concentrations, water level fluctuation, and sediment inputs. Limited public funds warrant the development of cost-effective strategies for restoration site prioritization. To investigate differences in invasion potential between organic and mineral soil wetlands, we compared reed canary grass abundance, soil organic matter (OM), and soil nitrogen (N) in wetlands throughout our watershed. Data from this study and another field investigation point to manageable levels of reed canary grass in urban wetlands with soil nitrate levels of less than 0.6 ppm. We discuss findings in relation to the development of stream restoration and management plans.

P-15: Climate Change Impact on Shoreline Plants, Bio-engineering, and Water Quality

Shahram Missaghi *St. Anthony Falls Laboratory, University of Minnesota;* Mary L Presnail *University of Minnesota*

Climate change can increase hydromodifications via changing precipitation patterns, frequency and intensity of storm events and warmer air temperatures, which may impact littoral zones. An experiment was conducted from April to October of 2010 to evaluate the potential impacts of four climatic scenarios on typical plants used in bioengineering and shoreline restorations. Experimental goals were: (1) Design a research program of experiments focused on testing response of vegetation treatments and soil to variability in water level; (2) Design and construct four shoreline test-basins to test climate-driven changes in lake levels on beach sediment and shoreline protection BMPs (3) Determine effect of duration of inundation and drawdown on vegetation health, and (4) Measure impact of climate-driven alternation in lake levels on soil moisture, organic content and potential nutrient release.

Four outdoor mesocosoms (4.5 x 4.5 x 1 m) were constructed at University of Minnesota St. Anthony Falls Laboratory in Minneapolis, MN. Two sets of four wetland plants designated as “drier” and “wetter” were planted in the basins. Each basin was subjected to a water level regime representative of one of the four climatic scenarios. The goals of this project were first to investigate the relationship of climate change, shoreline aquatic plant survivability, lake hydrodynamics, sediment nutrient flux, and lake water quality. We will describe efforts in obtaining data input; applying

climate change scenarios; watershed modeling (XPSWMM); lake modeling setup, configuration, and simulations results using a three-dimensional coupled hydrodynamic and ecological lake model (ELCOM-CAEDYM). The findings will aid in developing a set of recommendations (our second goal) in selecting shoreline restoration plants most adaptive to climate change.

P-16: Fishers & Farmers Partnership: Landowners in the Lead

Heidi Keuler *Fishers & Farmers Partnership for the Upper Mississippi River Basin*

The Fishers & Farmers Partnership for the Upper Mississippi River Basin is a self-directed group of individuals representing organizations and agencies working to achieve the partnership's mission "… to support locally?led projects that add value to farms while restoring aquatic habitat and native fish populations." Fishers & Farmers Partnership (FFP) was initiated in 2009 by biologists and visionaries from federal, state, and non-governmental organizations in both agricultural and natural resource fields. The FFP exists to support landowner-led, voluntary conservation projects that add value to farms while restoring aquatic habitat and native fish populations in the Upper Mississippi River Watershed. FFP is unique because it puts landowners in the lead; funds only collaborative, watershed-based projects; and works for more flexibility from conservation agencies than is the norm.

On-the-ground Fishers & Farmers projects' may include: stabilization of eroding stream banks or ravines, oxbow restoration or reconnection to floodplain, building water and sediment control basins, building in-stream habitat, exploration of alternative land uses, optimization of fertilizer application rates, enhanced grazing rotations, fenced creeks, or better watering systems. Rivers respond quickly and well to these straightforward techniques. Many of these practices are currently being implemented in three focus areas of the Upper Mississippi Basin including: the Meramec/Bourbeuse Watershed in Missouri, the Boone River Watershed in Iowa, and the Seven Mile Creek Watershed in Minnesota.

Fishers & Farmers Partnership is committed to listening first, supporting landowners in taking on leadership roles, collaborating flexibly, simplifying process when possible, basing actions on solid science, and completing projects that benefit farms, fish and people. Efforts are focused so results compound and can be seen. When projects are completed, we tell the stories so others are inspired and the work spreads across the Upper Mississippi River basin.

P-17: Stream Health and Restoration Workshops and Other Resources - Minnesota Department of Natural Resources

Amy Childers *Minnesota Department of Natural Resources*

The MN DNR Stream Habitat Program offers workshops and a variety of resources that focus on stream function, health, and restoration. Stream Health and Restoration workshops are a series of four week-long workshops (1 or 2 offered every summer) that teach the basic functions and processes of rivers, the Rosgen method of stream classification, assessment and monitoring, and natural channel design river restoration. Course offerings for 2012 will be announced March 1st. We are also offering a new series titled *The Science of Healthy Waters*, which presents (1) the science underlying integrative, system-based watershed management; (2) the problems, issues and barriers hampering our ability to protect and restore watershed health and (3) alternative approaches for accomplishing goals of clean water, improved fish and wildlife habitat and reduction of flood damages and erosion related to a specific issue, such as ditching or dams.

Our poster will describe other resources, which include the Watershed Assessment Tool, the Understand Our Streams and Rivers brochure series, the Reconnecting Rivers: Natural Channel Design in Dam Removal and Fish Passage book, and the Healthy Rivers Water Course program.