Science in the Driftless Area Symposium
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Development of a Rapid Visual Habitat Assessment (RVHA) Methodology to Evaluate Driftless Areas Streams

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Despite a long history of successful stream restoration projects throughout the Driftless Area information about why these projects have – or have not – been successful are generally lacking. Although most would argue that restoration efforts within the Driftless Area have been particularly successful, we still know little of the causative factors that result in successful restoration projects. Through a National Fish Habitat Action Plan grant submission we are proposing to develop a rapid visual habitat assessment (RVHA) methodology for Trout Unlimited chapters throughout the Driftless Area. RVHA protocols allow for statistically-valid rapid assessment of habitat conditions based on correlations with more detailed and labor-intensive data collection methodologies. We proposed to develop this methodology to: 1) provide Trout Unlimited chapters with an inexpensive, non-labor intensive method to evaluate habitat and biological changes due to restoration efforts; 2) begin to assemble a database of restoration projects; and 3) provide TU chapters with information to better prioritize, plan, and evaluate future restoration projects.

RASCAL: A Method for Assessing In and Near Stream Conditions in Iowa's Watershed Improvement Projects

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The RASCAL procedure (Rapid Assessment of Stream Conditions Along Length) has been modified from the NRCS Stream Visual Assessment Procedure (SVAP) to assess in-stream and near-stream environments of Iowa's streams and rivers. The RASCAL procedure and its results are intended to assist watershed groups in identifying priority areas for targeted conservation practices such as bank stabilization or buffer establishment.

The RASCAL data collection procedure has been developed to function as an easy to use application for use handheld PDAs equipped with GPS receivers. Surveyors assess stream reaches noting the condition of stream substrate, pool frequency, canopy cover, bank type, bank height, neighboring land cover, livestock access, and more. Point features such as tile outlets, storm sewer outlets, stream crossings, severe bank erosion, and trash piles also are GPS'ed and evaluated.

The ABCs of Streamside Grazing

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Grazing has an image problem. Most people, including many agency representatives, believe that grazing along streams is an environmentally bad decision and that livestock exclusion in the stream corridor is the answer to stream heath. That perception doesn't line up with reality. Ralph Lentz has 40 years of personal experience managing a beef herd on 100 acres in Wabasha County Minnesota. Sugarloaf Creek, a trout stream, runs through the Lentz farm. For the past 20 years Ralph along with members of the MN DNR have been educating farmers, agency personal and academicians about the benefits of managed grazing both for profit and healthy streams.

Buried Archaeological Sites: Where are They? Why are They Here?

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There has been an increased interest in the implementation of streambank/shoreline protection practices due to additional federal dollars being allocated to the Driftless Area Initiative. While these practices, and other ground disturbing practices, are aimed at impeding erosion, improving water quality, and improving riparian habitat, they simultaneously have the potential to effect archaeological sites. To be in compliance with federal regulations, the Natural Resources Conservation Service (NRCS) has conducted archaeological surveys on several streambank stabilization projects in the Driftless Area. In Minnesota, these surveys have resulted in the discovery of buried and for the most part intact and stratified prehistoric archaeological sites. Results from investigations at two buried prehistoric sites, in Fillmore and Houston Counties, Minnesota, are discussed in an effort to increase awareness and educate partner agencies about the location, contents, and significance of theses types of cultural resources.

Assessment of Stream Resources in the Driftless Area Ecoregion in Western Wisconsin Using a Probabilistic Sampling Design

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The Wisconsin Department of Natural Resources assessed stream resources in the Driftless Area ecoregion in western Wisconsin using an unequal probability sample design. The objectives of the study were to: 1) Assess the physical, chemical, and biological conditions of the ecoregion's entire wadeable stream population; 2) Determine whether sampling randomly selected stream reaches near road-accessible access sites characterize individual reaches or populations of streams similarly to a true random sampling design; 3) Quantify relationships between watershed land use and in-stream physical habitat and water quality; and 4) Determine whether certain biotic assemblages are more discriminating of specific environmental stressors than others. Comparisons of physical habitat, water chemistry, and biotic assemblage data collected at randomly selected streams sites and least-disturbed reference condition data indicate that high proportions of the random stream sites (and by inference the entire Driftless Area wadeable stream population) exhibit some degree of degradation. No statistically significant differences were found between the true random sites and road-accessible sampling sites for any of the 35 physical, chemical, and biological variables analyzed. No significant correlations were found between broad-scale watershed land use types and the condition of any of the physical habitat or biological assemblages measured. Of 11 water quality parameters measured, only conductivity and nitrate-nitrite concentrations were found to be correlated with watershed land use. Macroinvertebrate metrics were significantly correlated with various water chemistry measures, but fish assemblage metrics were not.

Examining Stream Restoration Efforts Using Partnerships: Example from the Nohr Chapter

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The Harry and Laura Nohr Chapter of TU recently established a unique partnership with the University of Wisconsin-Platteville to examine stream restoration within southwestern Wisconsin. Undergraduates are supported through an endowed internship and mentored by a university faculty member. The logistics, structure, implementation, and initial results of this partnership will be presented. Particular attention will be given to the Blue River in southwestern WI.

The Status of Iowa Plecoptera From the Paleozoic Plateau

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The northeast corner of Iowa lies within the Paleozoic Plateau ecoregion or the “driftless area”. Karst geologic features, bedrock outcroppings, and boreal microhabitats characterize this ecoregion. Displaying the greatest stonefly diversity in the state, this area harbors 32 of the 44 species listed from Iowa. Nine of these species have not been recorded elsewhere in the state and several species are known from single locations. Considering the region’s stonefly diversity, unique aquatic habitats and the extremely limited distributions of several of these taxa, there is concern that adequate protection of these aquatic communities may be lacking. Currently Iowa has no state protection for stoneflies, nor any aquatic invertebrate taxa. The continuing documentation of biogeographic distributions has indicated environmental and geographic restrictions exist for specific taxa. A comprehensive sampling program will further document distributions and consequently characterize what taxa may be in need of protection.

Development of a Coldwater Benthic Macroinvertebrate Index of Biotic Integrity for Iowa

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Effective Indices of Biotic Integrity (IBI) for fish (FIBI) and benthic macroinvertebrates (BMIBI) have been developed for assessing Iowa streams using a reference stream framework. Currently statewide in scope, the FIBI and BMIBI are used for assessing Iowa's coldwater streams (nearly all located in the "driftless"/Paleozoic Plateau ecoregion). Coldwater stream quality tends to be underrated by the FIBI and overrated by the BMIBI. Lyons, Mundahl, Simon and others have developed coldwater fish IBIs that should be applicable or easily modified for use in Iowa coldwater streams. We are in the process of developing a BMIBI for Iowa coldwater streams which may be applicable to regional coldwater streams in adjacent states. Preliminary analyses have yielded a suite of candidate metrics that seem to discriminate well between reference and impaired conditions within the subset of Iowa streams characterized as coldwater. Sampling conducted in the summer/fall of 2007 is expected to provide a robust dataset inclusive of the range of reference and impacted coldwater streams present in Iowa, facilitating development of a functional coldwater BMIBI.

Putting Conservation Science into Practice: Conservation Action Planning for Northeast Iowa's Karst Streams

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The karst streams of northeast Iowa have been identified as a conservation priority by The Nature Conservancy (TNC) due to their importance for Upper Mississippi River freshwater biodiversity. The recognition that freshwater ecosystems are among the most important globally threatened habitat types has spurred The Nature Conservancy (TNC) to adopt the restoration of freshwater habitat and ecosystem function as a priority under our 2015 goal. In the fall of 2007, The Nature Conservancy will be working to complete a first iteration Conservation Action Plan (CAP) for northeast Iowa's karst streams. The CAP process is an iterative landscape-level planning process, based on principles of conservation biology and ecology, that involves identification and viability assessment of key conservation targets, threat assessment, analysis of strategic actions, and effectiveness monitoring. The CAP is designed to be adaptive, e.g. if monitoring indicates that a particular strategy isn't working, the process loops back to analysis of strategic actions. Ultimately the goal of TNC's landscape-level CAPs is to guide conservation actions and resources towards more efficient and effective achievement of biodiversity protection goals

on the ground. CAPs are intended to be developed with extensive input from partners and local and regional experts in each priority landscape. We will provide a brief overview of the CAP process, with specific reference to northeast Iowa, and then facilitate a brainstorming/input session with conference attendees.

Past, Present, and Future Brook Trout Habitat in the Wisconsin Driftless Area: Results from a GIS-Based Watershed Model

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Brook trout (*Salvelinus fontinalis*) are native to the Driftless Area, but were almost eliminated by agricultural development in the late 1800's and early 1900's. In recent years, better land-use practices, habitat restoration, and stocking of appropriate strains have led to a resurgence of brook trout in the region. To explore trends in brook trout distribution, we developed a GIS (Geographic Information Systems)-based watershed model to predict suitable brook trout habitat in Wisconsin streams. This model uses existing, readily available landscape-scale data on climate, geology, topography, and land cover to estimate stream water temperature, flow, and brook trout occurrence. In tests with independent data, the model had an accuracy of about 67%. Based on land-cover data from pre-statehood land surveys, the model predicted that in 1848 habitat was suitable for brook trout in 12,760 of the 24,980 km of stream (51%) in the Wisconsin Driftless Area. From 1992 land-cover data, the model estimated that brook trout habitat had been reduced to 4,430 km (18%), a 65% drop from 1848. Projected changes in land-cover through 2030 yielded estimates of 5,400 km (22%) of brook trout habitat, a 22% increase from 1992, but this assumed a present-day climate. With increasing air temperatures, future brook trout habitat gains were reduced or even reversed, depending on the climate scenario employed in the model. The brook trout model serves as a prototype for developing similar watershed models for brown trout (*Salmo trutta*), smallmouth bass (*Micropterus dolomieu*), mottled sculpin (*Cottus bairdi*), and over 50 other stream and river fishes. Together, these models are a powerful new tool for forecasting fish habitat responses to land-use and climate change in the Driftless Area.

Pool Filling by Fine Sediments in Streams of the Whitewater River Watershed, Southeastern Minnesota

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The filling of stream pools with fine sediments was examined in 25 pools in streams in and near the Whitewater River watershed. Pools varied in the extent of volume lost to fine sediment accumulations, ranging from <5 to >93% of total pool volume lost to fines. Middle Branch Whitewater pools had the

lowest volume loss to fines (<11%), whereas Trout Valley Creek pools had the most extensive losses (>70%). There was no apparent pattern of volume loss from upstream to downstream sites within a stream. Turbidities produced by disturbing pool sediments suggested that upstream pools were dominated by finer sediments (silts, clays) and downstream pools were dominated by coarser sediments (sands, gravel). Pool loss to fine sediments, whether historical or ongoing, reduces the capacity of the stream to support abundant, sustainable trout populations.

Aquatic Organism Passage at Road-Stream Crossings: Lessons Learned

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The ability to move freely through stream networks is an important aspect of a fish species long-term viability (Fausch et al. 2002). Fish movement in streams prevents population fragmentation (Winston et al. 1991), allows for population recovery following disturbance (Detenbeck et al. 1992; Adams and Warren 2005; Roghair and Dolloff 2005), and provides access to critical habitats (Fausch and Young 1995). Effects of road-stream crossings on stream-resident fishes in the eastern U.S. historically received less attention, in part because resident fishes were regarded as sedentary (Gerking 1959). Recent re-examination of historic movement studies (Gowan et al. 1994) and new research on a wide range of stream-resident fish species (Warren and Pardew 1998; Albanese et al. 2003; Schmetterling and Adams 2004) has shown a frequency and magnitude of movement that must be considered when making stream-riparian restoration decisions.

There are estimated to be over 50,000 road-stream crossings on National Forest managed lands in the eastern U.S. (M. Hudy, Forest Service U.S. Department of Agriculture, unpublished data). Each of these crossings represents a potential impediment or barrier to fish movement among stream reaches and watersheds. The Forest Service recognizes the importance of modifying or removing those crossings identified as barriers to meet its objective of restoring and maintaining native species diversity (Forest Service, U.S. Department of Agriculture 2004). But invasive species are also a consideration when making a decision to provide for passage. In alignment with the Forest Service National Strategic Plan, the Eastern Region considers the removal of barriers to fish and other aquatic organisms as a key strategy for meeting its critical objective of improving watershed condition and restoring stream continuity. The presentation will cover some lessons learned.

Restoring the Riparian Corridor of the East Branch of the Pecatonica River

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Like many streams in southwestern Wisconsin, the Pecatonica River has high steep banks of beautiful dark soil that crumble easily into the water. Whenever the stream rises, portions of the bank slump down and wash down the river. This beautiful soil becomes water pollution downstream in the Pecatonica, the Mississippi and perhaps as far away as the Gulf of Mexico.

The purpose of this restoration project was to reconnect the stream to its natural floodplain of wetland communities on a quarter-mile stretch. This project goes beyond traditional in-stream habitat improvements in that up to four feet of sediment along the banks of the stream were removed to expose the native soil layer buried by topsoil that eroded from nearby ridges before farmers adopted soil conservation practices. The soil (>10,000 cubic yards, or 1000 truck loads) has proven to be a valuable resource that could be sold to cover the expenses of excavation, tree removal and plantings if the method is replicated.

Scientists from the WDNR and UW-Madison have gathered information on aquatic species and on the levels of nitrogen, phosphorus and sediment in the stream. These researchers hope to learn if the wetlands along a small section of stream can capture and utilize nitrates, sediment and phosphorus when the water spills over the banks, ultimately helping to improve water quality. In addition, removal of the sediment eliminates a sediment and phosphorus source that would eventually reach surface waters. Monitoring will also assess the wildlife habitat created along the stream in hopes of attracting non-game fish, frogs, toads and birds as this habitat has disappeared along most of the streams in this area of the state.

WDNR and TNC are part of a partnership of conservation organizations working together to sustain important grassland and freshwater habitat in the 50,000-acre Military Ridge Prairie Heritage Area.

Five Years and 20,000 Feet of Restoration: The Value of Monitoring on Gilbert Creek (Dunn County WI).

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Gilbert Creek is one of the northern most streams in the Driftless area, and has gone through five years and nearly 20,000 feet of restoration. The Ojibleau Chapter of Trout Unlimited in partnership with the University of Wisconsin-Stout has monitored this stream for a variety of biological (e.g., insect diversity, E. coli) and physical properties (e.g., pH, velocity, temperature, nitrogen, phosphate, conductivity, turbidity, dissolved oxygen and salinity) using Water Action Volunteer (WAV) protocol. This stream has gone through an amazing succession of events; we will report out on the numerous successes of this project as well as some of the short comings.

From leaky landscapes to lipids: Control of trout production in Driftless Area Streams

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The Driftless Area is underlain by karst geology – highly fractured limestone – resulting in a “leaky landscape” where springs and instream upwelling zones are common. While abundant cold water derived from this landscape helps support productive trout streams, we know little about what factors control trout production or production of supporting food webs in these streams. Experience suggests that hydrology, particularly flood frequency and intensity, is the controlling factor controlling the greatest amount of variation in trout cohort production (both brown and brook) in Driftless streams. Secondary factors likely include pool size, canopy cover, presence of competitors or appropriate forage fish, sediment characteristics, and nutrient concentrations. The leaky nature of the Driftless area also makes these streams and aquifers susceptible to potentially harmful nutrient and contaminant inputs from regional agricultural and urban landuse. Poor nutrient and manure management on farms and feeding operations can lead to rapid fluxes of nitrogen, phosphorus, pesticides, and coliform bacteria into these streams. To the extent that these factors promote or inhibit growth and production of trout is unknown.

Here we discuss potential questions and approaches to characterize and quantify productivity in Driftless area streams that could help in their management and restoration.

Primary questions include: 1. What factors control production of brown and brook trout populations? 2. How much variation in trout production is there among watersheds? 3. What controls this variation? 4. Are any of these drivers of production unique to the Driftless Area? 5. How does variation in trout populations vary with biotic factors (e.g., primary and secondary production)? 6. Does production vary with watershed land use or land cover characteristics?

General approaches to addressing these questions include:

1. Compilation and summary of existing reports and publications.

2. Establishment of trend streams to determine effects of seasonal, annual, and decadal discharge and thermal variation on trout population and prey dynamics.

3. Use of biochemical (e.g., lipids and fatty acids) and isotopic markers (^{15}N, ^{14}C) to determine variation in food sources (aquatic v terrestrial) and assimilation.

4. Determine the role of instream biotic features (e.g., hummocks and macrophyte beds, upwelling zones), characteristic of Driftless area streams, on trout and trout prey population dynamics.

5. Evaluate GIS models useful for determining watershed-scale nutrient and sediment sources.

It is our hope that this presentation generates discussion that may help guide a comprehensive science approach to a better understanding and restoration of Driftless area streams.

Monitoring Changes in Subsurface Hydrology and Vegetation Following Floodplain Restoration on the East Branch Pecatonica River, WI

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The Wisconsin Department of Natural Resources and The Nature Conservancy are implementing a new floodplain restoration technique in the headwaters of the East Branch Pecatonica River, WI. The technique consists of removing the cultural sediment deposited due to poor agricultural practices throughout the late 19th and early 20th centuries and restoring the pre-settlement floodplain topography.

Current research is focused on monitoring a site restored in August 2006 and another to be restored in October 2008 to quantify changes in the subsurface hydrologic fluxes and their influence on the establishment of various vegetation communities. The removal of sediment and the subsequent decrease in the depth to the water table is expected to increase evapotranspiration and encourage establishment of wet prairie species on the floodplain. Insights and preliminary results from the first summer of monitoring including site response to August flooding will be discussed.

Road-Stream Crossings—Not Something to Just Pass Over Science in the Driftless Area

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Trout Unlimited is currently making efforts to restore waterways within the 24,000 square-mile Driftless Area. The restoration work that is occurring within these streams is segment by road-stream crossings. These crossings are primarily bridges and culverts on public and private roads. Historically these structures have been sized hydraulically, to pass certain storm events. However, focusing on this method alone combined with poor installation techniques has at times proven to be detrimental to aquatic organisms. We are seeing structures that are velocity barriers, jump barriers, depth barriers, and exhaustion barriers. This results in structures that may fragment stream habitat and isolate fish populations.

During this presentation tools to evaluate and prioritize road-stream crossings in terms of aquatic organism passage will be reviewed. This information can be utilized to drive restoration projects and guidelines on how to size and install structures to best pass aquatic organisms will be discussed. Lastly, an overview of partnership ideas and opportunities will be presented.

Research for Managing Wisconsin's Driftless Area Trout Fisheries

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The Wisconsin DNR has a long tradition of using science-based resource monitoring and decision making to support the management of our state's abundant trout resources. I will present an overview of current DNR trout research in the Driftless Area of Wisconsin. Current research efforts include: (1) Stream habitat restoration approaches to restore native brook trout. Initial population size and water temperature may determine the success of restoration targeted to brook trout (no overhead cover) versus brown trout (overhead cover) in sympatric populations. The similar response by brown trout to different restoration techniques suggests potential cost savings for future restoration. We are currently investigating the use of artificial barriers to restore brook trout populations where other stream restoration efforts have not succeeded. (2) Assessing the viability of Wisconsin's innovative wild trout stocking program. Wild trout stocking has been an important tool for fisheries managers, and maintaining the viability of trout source populations is critical to the program. The removal of eggs from about 15% of female brown trout in the Timber Coulee Creek source population appears sustainable. However, removal of eggs from about 43-82% of female brook trout in Ash Creek raises concerns, particularly about size selection pressures on the population and risks to long-term viability from stochastic events. (3) Modeling stream temperatures and trout status in Wisconsin streams. These models provide a first-ever comprehensive assessment of coldwater resources in regional areas of Wisconsin. (4) Monitoring temporal trends in trout populations and base flow in Driftless Area streams. In 2007 we initiated a study in 18 Driftless Area streams to quantify the relationships between stream base flow and annual flow variability, precipitation, and trout population dynamics. (5) Developing population models for managing inland trout fisheries. We are using data from ongoing trout studies, long-term monitoring, and the fish and habitat database to parameterize inland trout population models to better understand processes that regulate and factors that limit trout populations and to provide a framework for the rigorous evaluation of trout fishing regulations and habitat management activities.

Posters

Riparian Vegetation of Southwest Wisconsin Prior to European Settlement

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Riparian vegetation of Southwestern Wisconsin prior to 1825 was examined. Government and private land surveys, early reports, and private journals were analyzed for references on riparian-specific vegetation. Beaver concentrations in Southwestern Wisconsin prior to 1820 also provided information regarding riparian vegetation based on beaver habitat. Evidence suggests that riparian corridors of Southwestern Wisconsin were mosaics of herbaceous and woody vegetation.

Changes in aquatic macroinvertebrates following the reestablishment of a spring-fed stream to its original location

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Brook Creek, a small stream-fed tributary of Waterloo Creek ca. 1 km northwest of Dorchester, IA, was reestablished into its former streambed from its diverted path in September 2004. During the summer months of 2005, 2006, and 2007, three 1 sq. ft aquatic benthic macroinvertebrate samples using surber samplers were taken from three sample sites in Brook Creek. Each sample was processed in lab and all aquatic macroinvertebrates were separated, counted, and identified to class, order and family as well as by their common name. Brook Creek showed an increase in average number of macroinvertebrates from 257/sq. ft. in 2005 to 748/sq. ft. in 2007. Overall taxonomic richness (at the family level) increased from 16 in 2005 to 29 in 2007. EPT taxa increased from 5 to 8 while EPT abundance basically doubled from 2005-2007.