Rivers and Streams Technical Committee

Dakota Chapter Report to the North Central Division – Rivers and Streams Technical Committee
December 2007
Compiled by Lucas Borgstrom

Executive summary

South Dakota

Blackhills Coldwater Streams

A stream fertilization project to improve the brown trout population dynamics after a Didymo infestation began this summer. Results are still pending, more this spring. Renovation of a lowhead dam in Spearfish Canyon was conducted to allow fish passage for the first time since 1917. Fish were using the rapids and anglers were using the areas directly downstream of the rapids. A PIT study will commence in 2008 to determine fish passage of the structure. There is an ongoing instream flow regimen investigation on a Spearfish Creek hydropower plant to recommend an instream flow regimen to the city of Spearfish.

Prairie Warmwater Streams

There is ongoing work to develop a macroinvertebrate biomonitoring tool for headwater streams. The Flandreau Santee Sioux Tribe conducted a study on mercury contamination in fish from the Big Sioux River and determined the levels were low enough to be no real concern. A study is being completed on the population characteristics of sturgeon chub and flathead chub in the Cheyenne and White Rivers. I will share more on the spring when the results are available.

Missouri River – South Dakota

The Long Term Monitoring and Assessment Program is ongoing. Asian carp monitoring is ongoing. They have not yet been collected upstream of Gavins Point Dam. The Pallid Sturgeon Population Assessment Project captured 83 pallid sturgeon compared to one and nine in previous sampling. A Sturgeon Response to Flow Manipulation Monitoring project had fish catches high in late winter during low flows and low temperatures. Researchers collected 15 pallid sturgeon, 1,100 shovelnose sturgeon, and blue sucker catches of up to 160 fish in one drift. There are three SDSU projects on the Missouri River. Bryan Spindler (M.S.) is conducting a spatial habitat analysis and found that velocity variance and food availability determines pallid habitat association Kristen Berg (M.S.) is investigating macroinvertebrate communities between river reaches and in pallid sturgeon diets. Melissa Wuellner (Ph.D.) is researching gizzard shad in the Missouri River reservoirs.

North Dakota

Red River Drainage

Current work on white sucker phenotypes and genotypes is being conducted at NDSU. A study focusing on species of concern is in year two of three with over 120 sites sampled in two years and seven species of concern collected. A biological condition project that involves monitoring and assessment of chemical, chlorophyll-a, macroinvertebrate, fish, and physical habitat

characteristics of the rivers is ongoing. A joint project to create a plan for the investigation of fish kills has been started in light of two fish kills on the Red River this past summer. A project to install three fish passageways has been initiated. Work on one should start this winter. Sheyenne River sampling in Lone Tree WMA collected no unique riverine species, mostly bullheads.) A high rainfall event led to interbasin transfer of fishes beyond a rotenone drip in Snowflake Creek. Extensive collecting resulted in one carp being collected from a lake downstream from the interconnection and several in the wetland adjacent to the interconnection. Work is continuing on a permanent berm to keep the Red River and Devils Lake watersheds separated.

Missouri River – North Dakota

Sampling in the lower reaches of the river collected 30 species of fish. Other projects conducted included electrofishing for walleye-spawning sites and standard adult population sampling. Paddlefish were tagged for study on abundance and movement. In the upper reaches of the river, work was conducted to sample and tag paddlefish

Missouri River Tributaries

Sampling was conducted on Cedar and Cannonball Rivers to assess the aquatic community diversity. Beaver Creek was seined and 17 species were collected.

Full report

South Dakota

There are many projects not specific to any particular region or river system in the state. The DENR is responsible for the continued long term water quality monitoring in South Dakota.

Black Hills Coldwater Streams

Dr. Chipps (SDSU) is beginning work dealing with *Didymosphenia geminata* (Didymo). South Dakota Game Fish and Parks (SD GF&P) have been focusing on the stream trout fisheries in the Black Hills. To “manage around” a Didymo infestation SD GF&P has started a nutrient-enrichment project this past spring that involves artificially increasing total phosphorus in Rapid Creek for 3-kilometers immediately below Pactola Dam. The project goals are to stimulate productivity, both primary and aquatic insect, and to ultimately increase brown trout growth and survival. The brown trout population in Rapid Creek has bottlenecked with mostly YOY and age-1 fish and very few adults since didymo was first reported in 2002. The nutrient enrichment project will run from April to August through 2009. Forty artificial tile substrate samplers were used to evaluate chlorophyll-a, community composition and biomass. Fifty macroinvertebrate samples were taken in May, July and September and water samples were taken at each site through the 3 sampling periods in the summer. Percent Didymo coverage and thickness on 100 rocks at each site was used as an index of Didymo biomass change. Dan James (SDSU) will be completing this project for his PhD. Dr. Steve Chipps (SDSU) is the major professor overseeing the project.

SD GF&P performed a reconstruction project in Spearfish Canyon at the site of the 1917 Hometake Mining Company Savoy intake on Spearfish Creek. They re-constructed the old low-head dam into a fish passable structure using five step-pools below the dam. It was built with limestone to look like a natural rock fall and created an upstream backwater pool and rapids. This project reconnected the brown and rainbow trout populations that have been separated since 1917. It also improved visitor safety and expanded recreational opportunities. Fish were observed moving through the created rapids and fishing activity increased in the pool and run immediately below the rapids. A PIT study is planned for 2008 to determine fish passage.

There is also an ongoing instream flow regime investigation for Spearfish Creek in the northern Black Hills for the Federal Energy Regulatory Commission (FERC) licensing of the small hydropower plant located in Spearfish owned by the City of Spearfish. Information from this will be used to recommend an instream flow regime to the city.

Prairie Warmwater Streams

In warmwater prairie streams, Dr. Troelstrup (SDSU) and students are working on invertebrate biomonitoring in eastern South Dakota. They are attempting to develop macroinvertebrate biomonitoring tools for headwater streams, which are quite harsh and variable hydrologically. Dr. Berry (SDSU) and students are doing work with fish biomonitoring in the lower James River in eastern South Dakota, but using fish as bioindicators in western South Dakota may be difficult due to the tolerant fish assemblages in the plains streams and the intolerant assemblages in the Black Hills streams. Vicki Kujawa with the Flandreau Santee Sioux Tribe conducted a mercury contamination study on fishes in the Big Sioux River this past summer and determined that the mercury level in fishes was low enough to be no real concern. This is in contrast to a recent article (Bulletin of Environmental Contamination and Toxicology, Influence of fluctuating water levels on mercury concentrations in adult walleye) where lentic fish populations are having consumption advisories applied to them due to the mercury levels. This is possibly due to the differences between lentic and lotic systems.

Another project, which is being conducted by Nicholas Ahrens (SDSU) in western South Dakota involves inspecting sturgeon chub and flathead chub population characteristics (i.e. fecundity, diet, and age & growth) in the White and Cheyenne Rivers.

Missouri River – South Dakota

The Missouri River receives a fair amount of attention because of the regulated rivers ordinance and the endangered species (i.e. pallid sturgeon, piping plover) it supports. The long-term monitoring and assessment program (LTMAP) has an emphasis on pallid sturgeon and is ongoing. As an additional part of the LTMAP there are investigations that take place at a different time of year than the pallid work to inspect the fish community. There is ongoing monitoring of Asian carp (silver and bighead). They have not been collected upstream of Gavins Point Dam.

The SD GF&P Sturgeon Crew from Yankton continued two projects on the Missouri River below Gavins Point Dam during 2007. Both projects involved collaboration with Federal agencies. One of the projects led by the US Army Corps of Engineers, the Pallid Sturgeon Population Assessment Project, was in its third year in South Dakota. This is a large-scale project aimed at gathering data on pallid sturgeon and other Missouri River native fishes by sampling from Ft. Peck, MT to St. Louis. SD GF&P biologists were sampling on the river below Gavins Point Dam during each month from March to December. During this time over 1,200 nets (trammel, gill, bottom trawl, push trawl, and mini-fyke) were deployed, as were two hook sampling techniques: setlines and angling. This effort produced a catch of 83 pallid sturgeons, which is up dramatically from one and nine in previous samples. Sampling will continue in 2008, starting with the gill net season in February or March.

The other project the SD GF&P Sturgeon Crew from Yankton worked on is the Sturgeon Response to Flow Manipulation Monitoring. The goal is to learn as much about gravid female sturgeon as possible by monitoring over suspected sturgeon spawning areas to determine how fish respond to flow management through Gavins point dam. Sampling began on 21 February 2007. The study design involved sampling three specific river bends (characterized by rocky substrate) twice a week and six randomly selected river bends once a week with 2.5 inch trammel nets. Net catches from specific sites were compared to random sites. In addition to 2.5 inch trammel nets; a 16-foot otter trawl was implemented as a standard sampling gear to determine if fish exhibited any behavioral avoidance to the trammel nets. Otter trawls were conducted once a week at all three specific sites. Fish catches were high in the late winter periods when temperatures and flows were low and included 15 pallid sturgeon and 1,100 shovelnose sturgeon (they collected samples from 104 gravid females). Blue sucker catches were high in early spring, especially near the James River confluence. Net catches of up to 160 fish in one drift were recorded. This suggests that a major blue sucker spawning run was occurring the first and second weeks in March.

There are two SDSU projects nearing completion. Bryan Spindler heads one project that deals with a spatial habitat assessment tool applied to the Fort Randall reach. He is finding that pallid sturgeon are more associated with velocity variance between the upper and lower water columns, and food availability. The other is a macroinvertebrate study comparing the Fort Randall and Gavin's Point reaches and an associated pallid sturgeon diet analysis being conducted by Kristen Berg.

Next year Greg Wanner of the US FWS will be starting a 2 year larval, juvenile, and adult fishes survey on the Niobrara River in Nebraska from Spencer Dam downstream to its confluence with the Missouri River.

North Dakota

Red River Drainage

The Red River of the North is important because it is an international waterway. Two major concerns associated with this river include water quality and interbasin transfer of fishes between the Red and Missouri Rivers by way of

the Garrison diversion. There is also concern for interbasin transfer of fishes between the Red River basin and the Devils Lake watershed, which is completely surrounded by the Red River watershed.

Dr. Clark (NDSU) and a student are working on a project inspecting white sucker phenotypes and genotypes in the Red River drainage. From South Dakota State University, Dr. Berry and students are working on a three-year project that is determining the status of seventeen fishes with immediate conservation need. Sampling started in 2006 and focused on the Red River with 46 different sites sampled and five species of concern collected. Sampling for 2007 included increased effort on the Forest River, which is where largescale stonerollers were collected in 2006. We sampled over 80 additional sites and collected seven species of concern. This project entails verifying voucher specimens to aid in determining which species of stoneroller, largescale or central, is present in North Dakota.

The rivers in the Red River drainage are the primary focus of a monitoring and assessment project headed by Mike Ell with the North Dakota Department of Health. They are collecting chemical, chlorophyll-a, macroinvertebrate, fish, and physical habitat data for this project. The sites are selected at random and in depth physical habitat characteristics are taken. The information and data collected will be used to assess the current biological condition of the perennial, wadeable streams in the Red River basin in North Dakota.

Further work in the Red River includes a joint project with North Dakota Game and Fish (NDGF), North Dakota State Water Commission (SWC), the Department of Health, Minnesota Department of Natural Resources (MN DNR), and the Minnesota Pollution Control Agency to create and have in place a fish-kill response plan due to two fish-kills on the river this past summer. Another joint project is coupling NDGF, SWC, MN DNR, MetroCog (cities of Fargo/Moorhead), and the Fish and Wildlife Service to install a fish passageway at Christine Dam and Hixson Dam. The Red River Basin Riparian Project is an organization continuing work to “influence land management choices in the basin that will improve forest condition, protect water resources, and improve water quality, restore riparian corridors on continuous reaches of rivers and streams within the basin using established and revised best management practices, and protect existing and restored riparian zones from destructive activities.” They achieve this through stabilizing stream banks with plantings and riprap as at Park River Bible Camp, planting willows along the bank of the Turtle River (Benson site), and further use of proper grading and rock toes at Grand Forks Country Club. More information about the Red River Basin Riparian Project can be obtained at their web site at http://www.health.state.nd.us/rrbrp/index.htm.

Work on the Sheyenne River, which is in the Red River Watershed, includes a fish passageway planning and installation near Sheyenne, ND (work is expected to start this winter or next spring) and sampling in Lone Tree WMA that resulted in no unique riverine species, mostly bullheads.

A major project in North Dakota deals with Snowflake Creek. This creek drains into the Pembina River and eventually the Red River of the North. The threat here is that it abuts the Devils Lake drainage and becomes interconnected

in high water periods. This has the potential for introducing common carp into the Devils Lake drainage from the Red River drainage. A liquid rotenone drip station (at or below 5 ppm) was installed to prevent upstream movement, but a brief high rainfall event allowed some young of the year carp to move beyond the drip station. Intensive and extensive sampling using minnow traps, rotenone, trapnets, and gillnets has been employed in the adjacent waters in the Devils Lake drainage. One carp was collected below Billings Lake and others in the wetland near the interconnection of the two watersheds. None were collected downstream of Billings Lake. Work is continuing on a permanent earthen berm across the interconnection area with the input of landowners to prevent problems and to address their concerns.

Missouri River – North Dakota

The Missouri River/Garrison Dam master plan has been reviewed and commented on. A number of projects occurred on the lower reaches of the Missouri River such as seining that resulted in the collection of 30 species, electrofishing for walleye-spawning sites, the standard adult population sampling, and tagging adult paddlefish as a part of an abundance and movement study. The North Dakota Game and Fish Department and the US Fish and Wildlife Service work on the upper Missouri River. They conducted work on sampling and tagging paddlefish.

Missouri River Tributaries

The Fish and Wildlife Service completed an assessment of the Cannonball and Cedar Rivers. The objective was to assess the aquatic community diversity in the Cannonball River and Cedar Creek and to compare the results to previous work done on the streams in the mid 1990s and in 1976. Nathan Kuntz and Tyler Berger (SDSU students) completed this work.

The lower reaches of Beaver Creek were seined and 17 species were collected.

North Dakota Game and Fish personnel assisted the FWS Bureau of Reclamation with the operation of an electrofishing barrier below Arrowwood Reservoir that was installed to prevent carp from entering the refuge's duck production lakes.

Iowa Chapter Report
March 11, 2008
Greg Gelwicks
Iowa DNR Fisheries Research

Missouri River Fish and Wildlife Mitigation Project

The Iowa DNR is monitoring and evaluating off-channel habitat created under the Missouri River Fish and Wildlife Mitigation Project. Two years of data have been collected in a three year study. Objectives are: 1) Collect a select group of biological indicators using standard collection methods and assess the biological performance of constructed off-channel habitat sites. 2) Describe habitat use by life stage of selected fish species or species groups and make comparisons between sites. More than 120,000 fish have been collected in the first 2 years of the study. Initial data analysis indicates that species richness is much greater in continuously connected backwater sites as opposed to pump supplied managed wetlands. Using principles of Adaptive Management, this study will provide guidance for the design of future habitat projects. Contact: Van Sterner (712) 433-4706, van.sterner@dnr.iowa.gov.

Biomonitoring

The Iowa DNR Watershed Monitoring and Assessment Section (IDNR-WMAS) and the University of Iowa Hygienic Laboratory (UHL) Limnology Section continue gathering benthic macroinvertebrate and fish assemblage data throughout the State to assess the biological condition of Iowa's rivers and streams in accordance with Federal Clean Water Act monitoring and reporting requirements. The bioassessment program has three main focus areas: 1) status and trend monitoring; 2) reference (benchmark) biological criteria development and maintenance; 3) impaired (TMDL) waterbody assessment.

REMAP

Sampling for the Regional Environmental Monitoring and Assessment Program (REMAP) statewide probabilistic (random) survey of perennial survey of rivers and streams was conducted during 2002-2006. Summarization and analysis of sampling data from this project is currently being done. A project summary report will be completed in 2008. Ongoing maintenance sampling of wadeable stream reference sites continues with approximately 20 reference sites sampled each year. With respect to reference condition development, the current emphasis is identifying and sampling candidate reference sites representing small warmwater perennial streams. The State of Iowa recently added aquatic life use designations and criteria for approximately 14,000 miles of small perennially flowing or pooled stream habitat. Reference condition development to define the expectations for aquatic communities inhabiting these streams is critically needed.

Headwater Stream Reference Site Development

In 2007, IDNR-WMAS and the UHL Limnology Section began collecting biological data from small headwater streams in the Des Moines Lobe (47b) ecoregion. Currently IDNR's warmwater fish and benthic macroinvertebrate IBIs are calibrated for streams "larger" than the small perennial headwaters up to streams with 500 mi2 watersheds. The headwater streams sampled were first and second order streams stratified by riparian vegetation, sinuosity and sampling season (spring, summer and fall).

Coldwater Benthic Macroinvertebrate and Fish IBI Development

For the past several years, WMAS and the UHL Limnology Section have been collecting benthic macroinvertebrate data for the development of a CW BMIBI. Sampling last year included collecting benthic macroinvertebrate data from designated CW streams (good, fair, poor) and temperature data from some of the poor/marginal streams. The project is currently focusing on the development of the IBI but data analysis from 2007 may lead to additional data collection in 2008.

Discussions have been held between IDNR WMAS, Fisheries and UHL Limnology about a collaborative effort to develop a CW fish IBI or other type of fish assemblage assessment tool for Iowa coldwater streams. The project is still in the data assimilation and evaluation phase but over the next year hopefully the project will begin the CW FIBI development stage.

Stressor Identification for Impaired Streams

Stream bioassessments are also being done in conjunction with intensive water quality monitoring in several 303(d) impaired stream segments as part of the Stressor Identification (SI) process, which is used to identify the primary causes of stream aquatic life use impairments. The SI process typically leads to development of a Watershed Improvement Plan or TMDL designed to improve stream conditions and bring about compliance with water quality standards through voluntary and regulatory measures. The Iowa DNR Watershed Improvement Section recently added two full-time staff to complete Stressor Identifications. Currently, the SI process is being applied in Silver Creek, a small watershed located in the Driftless Area dominated by agricultural land uses and containing a creamery wastewater discharge, and Dry Run Creek, a rapidly developing suburban/urban watershed in Cedar Falls, Iowa. Contact: Tom Wilton, (515) 281-8867, tom.wilton@dnr.state.ia.us or Ken Krier, (515) 242-5184, Ken.Krier@dnr.iowa.gov
Iowa Department of Natural Resources, Watershed Monitoring and Assessment Section.

Fish Assemblages in Iowa's Non-Wadeable Rivers: Relationships with Habitat and Sampling Methods

The focus of this research is determining appropriate sampling gear(s), and sample size necessary, to effectively sample the fish communities and habitat structure of Iowa's non-wadeable rivers. Thirty-five potential sampling sites have been identified, with sampling reach lengths of 3 or 5 km depending on stream order. Reaches are divided up into 100 m long sections, separated by a habitat transect. Half of the sections in a reach are being sampled with boat-mounted electrofishing equipment, the other half are being sampled with both a modified Missouri trawl and a bag seine. At each of the transects, habitat is being measured using a custom non-wadeable habitat assessment protocol based on the Iowa Department of Natural Resources' wadeable streams physical habitat assessment and the United States Environmental Protection Agency's non-wadeable river protocols.

During the first field season (i.e., 2007) ten sites were sampled on nine different rivers. A total of 12,021 fish from 66 species, in 13 families were collected. Thirteen species of greatest conservation need were collected as well as one state threatened species (western sand darter). There were three noteworthy collections: the first spotted gar and skipjack herring documented in an interior Iowa river, and the first western sand darter recorded from an interior Iowa river since 1958. Preliminary analysis shows that all three gear types collected relatively the same number of species and individuals at the current effort levels. Analysis also suggests that a combination of gears will be required to effectively sample fish assemblages in non-wadeable rivers.

The goals for the next sampling season are to sample 15 new sites and resample one or two of the 2007 sites. After the 2008 sampling season is completed data will be analyzed to determine the optimum sampling length and gear(s) for assessing fish assemblages in Iowa's non-wadeable rivers. In addition, the habitat assessment protocol will be examined for redundant variables and a "rapid" habitat assessment protocol will be developed.

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A Probabilistic Survey of Iowa's Stream Resources: Habitat

A research project investigating relationships among stream fish assemblages, physical habitat, and landscape variables was completed in 2007. The research analyzed data from 93 randomly selected wadeable stream sites included in the 2002-2006 REMAP probabilistic survey of perennial rivers and streams. Multi-variate statistical analysis identified thirty habitat variables that correlated with fish assemblage composition and distinguished between sites ranked as healthy or impaired using Iowa's Fish IBI. Strong linkages between land use variables and stream habitat characteristics were identified and support a hierarchical perspective in which landscape and watershed scale factors influence stream

habitat conditions, which in turn are reflected in patterns of fish assemblage structure and biotic integrity. The results of this research have management implications relating to stream assessment and restoration in Iowa and other agricultural midwestern states. Contact: Dr. Clay L. Pierce, Iowa State University, Department of Natural Resources Ecology and Management, (515) 294-3159, cpierce@iastate.edu.

Stream Surveys

Iowa Fisheries Management Teams are expanding fish and habitat monitoring efforts on a statewide scale. These Fisheries efforts are being coordinated with efforts being conducted by Iowa DNR's Water Quality Bureau, so more areas are sampled and duplication of effort is minimized. This effort began with an effort by SW Iowa Management Teams monitoring southwest Iowa streams in 2002. During 2005, SW Iowa Management Teams sampled 11 sites on 10 streams for fish population and habitat status, while NW Iowa Management Teams sampled 3 sites on 3 streams. During 2006, 19 stream sites were sampled in western Iowa. An additional 18 stream sites were sampled in western Iowa during 2007. All sites have been and will be sampled using the Habitat Evaluation Procedures for Wadeable Streams and Rivers of Iowa protocol developed by Tom Wilton, ESD Water Quality Bureau. Assessments of available stream fish habitat and fish populations were conducted in conjunction with development of a long-term database. Fish collection data from Iowa streams dating back to 1854 is available online via the Iowa Rivers Information System (IRIS), http://maps.gis.iastate.edu/iris/. Other items currently available include fish range maps; current Doppler radar; 1-day, 7-day, and monthly precipitation totals; aerial photography and topographic maps; water quality sampling sites and related data; USGS stream flow stations; dams and impoundments; and, other geographically relevant information such as roads and cities. Soon, habitat and other parameters collected in the field will also be available via this website. Plans are in place to commence data entry into the IRIS system over the internet for future monitoring efforts. Historic data collections are also being used to plan future monitoring efforts. Historic collection location data have been entered into a GIS and overlayed on a statewide HUC 12 coverage to determine watersheds that have not been recently sampled. HUC 12 watersheds are presently being used as the "filter" for determining areas in need of sampling.
Contact: Jeff Kopaska, (515) 432-2823, jeff.kopaska@dnr.state.ia.us.

Dam Removal/Modification

Fisheries management staff with Iowa DNR are working with various groups on potential dam removal/modification projects on the Upper Iowa, Turkey, Maquoketa, Boone, and Des Moines Rivers.

Aquatic Nuisance Species (ANS)

The U.S. Army Corps of Engineers, National Park Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, Illinois Department of Natural Resources, and Iowa Department of Natural Resources collected zebra mussel veliger samples from the Upper Mississippi River and major tributaries during July and August 2007. In Iowa, DNR staff collected samples below Lock and Dam 10, 12, 13, 14, 16, 17, and 18 and from the Wapsipinicon, Iowa, Cedar, and Maquoketa Rivers. The first three Iowa tributaries are not known to be infested with zebra mussels and have been stocked with fish inoculated with Higgins' eye pearlymussel (Lampsilis higginsi) glochidia. They are monitored in order to quickly identify any zebra mussels to protect the endangered Higgins' eye pearlymussel. Zebra mussels were found in Lake Delhi, an impoundment on the Maquoketa River, in 2006. The samples taken from the Maquoketa River below Lake Delhi had veliger numbers similar to the Mississippi River.

Silver and bighead carp distribution and abundance in Iowa are monitored to determine statewide trends. As of 2007, bighead carp have been reported from the Mississippi and Missouri Rivers along Iowa's borders and from rivers and streams throughout southern Iowa. Silver carp have been sampled in the Mississippi, Missouri, Des Moines, and Chariton Rivers. No young-of-the-year bighead or silver carp have been sampled in Iowa's rivers or streams.

Boat accesses on Iowa's lakes and rivers were targeted for watercraft inspections between 6 May and 17 September 2007. Water patrol officers and seasonal fisheries employees discussed inspecting watercraft for ANS with the operators and collected information on ANS presence, watercraft type and state of registration, number of people, last and next waterbody visited, and operator familiarity with Eurasian watermilfoil, zebra mussels, Asian carp, and Iowa's aquatic invasive species law.

For additional information, contact Kim Bogenschutz at 515-432-2823 ext. 103 or kim.bogenshutz@dnr.iowa.gov.

Iowa Stream Management Workshop

The Iowa DNR continues to host the Iowa Stream Management Workshop. The workshop is modeled after the Missouri Department of Conservation's Stream Management Workshop, and has been adapted to Iowa. Natural resource professionals from Iowa DNR Fisheries, Water Quality, Information & Education and Geological Survey Bureaus; Iowa State University Forestry Dept.; and the Iowa Dept. of Ag and Land Stewardship present the workshop. The workshop addresses stream dynamics from a watershed perspective and stresses the

interaction of the physical sciences (hydrology, hydraulics, geomorphology) and their relationship with the stream's biota. The target audience is field staff from all agencies in Iowa that are involved in the management or restoration of stream systems. The goal of the workshop is to provide participants with a common understanding of: stream and watershed processes; relationships of streams with their floodplains, riparian zones, and watersheds; impacts of human activities on stream equilibrium; and what may or may not be attainable for stream restoration. This year's workshop will be held July 10-12. More information can be found at http://www.iowadnr.com/education/resrcpro.html.

Interior Rivers Research

Contact: Greg Gelwicks, (563) 927-3276, gregory.gelwicks@dnr.iowa.gov

Interior River Habitat and Fish Community Assessment

We are continuing to inventory and evaluate interior river and stream habitat conditions and fish communities. Data collected for this project is being used to help build the Iowa River Information System (IRIS), a statewide GIS database that will integrate existing and future information related to rivers and streams in the state. Data collection over the past several years has focused on non-wadeable streams and this will continue in 2008 in conjunction with a study of non-wadeable stream sampling protocols that is being conducted by Iowa State University.

Evaluation of the Status, Distribution, and Habitats of Flathead Catfish in Iowa's Rivers

Greg Gelwicks and John Pitlo developed a coordinated statewide research project to evaluate flathead catfish populations in Iowa. Work on this project began in July 2003. The study is designed to build on knowledge obtained from management investigations conducted on the Mississippi River by Gene Jones, Bernie Schonhoff and Kevin Hanson, and on interior rivers of southeast Iowa by Don Kline. The project is evaluating methods used to sample flathead catfish, assessing populations, evaluating flathead catfish distributions and movements, determining relationships between populations and habitats, and evaluating the fishery. Flathead populations have been sampled from 12 sites on the Iowa, Cedar, Des Moines, and North Raccoon rivers in early summer and late summer 2004-2007. We are also evaluating the relative effectiveness of low-frequency electrofishing, hoop nets, bank poles, and trot lines for sampling flathead catfish in the Iowa River. A radio-telemetry study of flathead catfish movement was started in fall 2004 in the Iowa River. Over fifty fish have been radio-tagged between the lowermost dam at Iowa City and Wapello, Iowa. Preliminary results of the telemetry study indicate that the flathead catfish population at a given site on the Iowa River is seasonally variable, and that the reach or single river scale may not be appropriate for management of flathead catfish in the Iowa River.

Mississippi River Research

Contact: Mike Steuck, (563) 872-4976, michael.steuck@dnr.iowa.gov

A study of walleye/sauger population parameters is being conducted on the Mississippi River in the tailwaters of Lock and Dam 10 and 12 at Guttenberg and Bellevue. The study includes creel surveys and estimates of exploitation of these species. Fall tailwater fish surveys at Guttenberg and Bellevue indicated the 2003 through 2006 year classes of walleye and sauger were average. Angling in these areas should be fairly steady over the next several years. This study will also be used to evaluate two regulations in place on the Mississippi River. For walleye, a 15 inch minimum and a release slot of 20-27 inches with a six fish bag with one over 27 inches is in place from Lock & Dam 11 in Dubuque south to the Missouri border in an effort to improve recruitment in walleye. For sauger, roughly 1 mile of river below Lock and Dams 11, 12 and 13 are closed to fishing from December 1 to March 15 in an effort to reduce extremely high mortality rates on the sauger.

A telemetry study on the Mississippi River is being conducted in Pool 13 to document habitat selection and spawning movements of adult walleye. Channel training structures (wing and closing dams) that are regularly used by adult walleye have been changed by the COE. Telemetry will allow us to document changes, if any, in use of these structures and the areas near them. Walleye are found to use backwater habitat prior to spawning and telemetry allows us to document this use and attempt to determine why they use backwaters at this time of year. The greatest amount of movement occurs in the late winter and early spring when fish are moving to spawning areas. Annual movements of twenty to forty-five miles are common as adult fish move from winter habitats to spawning habitats and then return to summer areas. Three spawning areas have been documented in Pool 13; all have characteristic rock-rubble, gravel, or mussel bed substrates. Additional monitoring of radio tagged fish during the winter period will be undertaken during the next several years to document any changes in winter habitat that may result from changes in wing dam and closing dam construction in lower Pool 13.

Winter habitat selection of bluegill and black and white crappies in the Mississippi River is being determined by radio telemetry. This study is designed to identify overwinter habitats, habitat requirements, and evaluate a backwater restoration project. Early results show that no matter where in a backwater complex the fish were tagged, nearly all the fish moved to several small, protected backwater lakes to overwinter. There was no current in these backwater lakes and water temperature was around 35-37 oF (main channel water temperatures were always around 32 oF). This study was continued in different backwater complexes and Mississippi River pools and produced similar results. Ongoing telemetry in a habitat project currently under construction allowed contractors to make modifications to the project that improved fish use of the project area by decreasing flows into the area. This information will be used to help direct

rehabilitation of backwater complexes through the COE's Environmental Management Program's Habitat Rehabilitation and Enhancement Program.

We are also working with Greg Gelwicks as a part of a Statewide Flathead Catfish study. Flathead catfish were sampled in Pool 13, Upper Mississippi River to determine body condition, length frequency distribution, age structure, age and growth, and relative abundance of the fishery. Most fish were collected using low frequency/low pulse DC electrofishing and creel survey. Ageing structures and length weight data were collected from fish harvested by commercial fishers. Length weight data collected from commercially harvested fish allowed for conversion of pounds of fish harvested to number of fish harvested. Over 9,700 flathead catfish were collected by electrofishing during this study. Flathead catfish were measured, weighed, and all fish equal to or greater than 10 inches were tagged with alpha numeric Visual Implant (VI) Tags or a Passive Integrated Transponder (PIT) tags. Each fish was adipose fin clipped with a secondary clip of a rayed fin to identify tag type or location to estimate tag loss. The rate of tag loss varied with tag location and type of tag. The overall rate of tag loss was 42.7%. Proportional Stock Density (PSD) of flathead catfish during this study ranged from 29-49% from 1999-2006. Length frequencies and PSD varied seasonally. Age and growth was calculated from spines, otoliths and tagged fish that were recaptured at least one year later. Spines and otoliths were used to calculate mortality and growth. Annual growth estimated from tag returns was estimated to be 1.37 inches/year. Total annual mortality was estimated to be 22% and a large number of 20-30 year old fish suggests that commercial harvest of flathead catfish at its present rate is not negatively impacting the population. This study will help determine the status of Iowa's flathead catfish on Pool 13 of the Mississippi River and help direct future management efforts in Iowa's rivers.

Fishery Enhancement Assessment for the Pool 12 Overwintering HREP

Contact: Mel Bowler, (563) 872-5495, melvin.bowler@dnr.iowa.gov or Kirk Hansen, (563) 872-4798, kirk.hansen@dnr.iowa.gov

The Bellevue LTRMP station and Bellevue's Fisheries Management station have undertaken a multi-year study, tentatively titled: "Fishery Enhancement Assessment for the Pool 12 Overwintering HREP". The US Army Corps of Engineers has completed the design phase of the "Pool 12 Overwintering" HREP in cooperation with the US Fish and Wildlife Service, Illinois Department of Natural Resources, and Iowa Department of Natural Resources. The primary objective of the proposed HREP is to rehabilitate backwater habitat in Pool 12, with the goal of improving the fishery resource in Pool 12. We believe that the impending completion of the "Pool 12 Overwintering" HREP provides an ideal opportunity to assess the effectiveness of HREPs as a management tool for improving the Upper Mississippi River (UMR) fishery resources. The objective of this study is to organize and initiate an intensive assessment of the local (individual backwater), backwater aquatic area (all backwaters within a navigation pool) and pool-scale (all aquatic area within a navigation pool) effects

of off-channel fish habitat improvement in the UMR. In late October 2007, the Bellevue LTRMP and Fisheries Management stations completed a second year of electrofishing and fyke netting for the Pool 12 HREP fisheries evaluation.

Bowfin: The Other Black Egg

Contacts: Michael Quist, (515) 294-9682, mcquist@iastate.edu
Kirk Hansen, (563) 872-4976, Kirk.Hansen@dnr.iowa.gov

Bowfin Amia calva are a common species throughout the Mississippi River basin and although they are generally regarded as a "rough" fish by management agencies and anglers, commercial harvest of bowfin for their roe has increased in the upper Mississippi River (UMR) basin. Unfortunately, very little is known about bowfin population dynamics, particularly in the UMR. The purpose of this study was to investigate the age and growth and reproductive ecology (e.g., age at maturity, fecundity) of bowfin in Pools 11 and 13 of the UMR. We sampled 118 bowfin from Pool 11 and 138 fish from Pool 13 using modified fyke nets and electrofishing. Fish in Pool 11 varied from 422 to 783 mm in total length. Bowfin in Pool 13 were similar in length, varying from 392 to 807 mm in length. Sex ratios were near 1:1 in both pools (Pool 11 = 54 female:64 male; Pool 13 = 63:68). Female bowfin matured at age 3 and had gonadosomatic index (GSI) values around 9%; whereas, male bowfin matured at age 2 and had GSI values near 2% in both pools. Bowfin varied in age from age 2 to age 13 in Pool 11 and from age 2 to age 12 in Pool 13. Interestingly, we did not sample any male bowfin older than age 8 in Pool 11 or older than age 9 in Pool 13. Total annual mortality of age-4 and older bowfin was around 30% for both populations. Total annual mortality of male bowfin was approximately 10% than for females in both pools. Growth of bowfin was similar between pools and sexes. Results of this study will be used to evaluate the effects of harvest and possible management activities that ensure sustainable harvest of bowfin in the UMR.

Mississippi River Management (Guttenberg)

Contact: Scott Gritters, (563) 252-1156, Scott.Gritters@dnr.iowa.gov

Still working with the Lampsilis higginsii jeopardy opinion on trying to re-establish this federally endangered mussel back into its historical range. We are having some success stocking higgins eye inoculated fish into the Wapsipinicon River near Central City. So far we have documented 10 Higgins eye mussels from surveys from these efforts. We expect the area to have an abundant Higgins eye population established as most of the surveyed mussels were still small and hard to sample. Similar efforts in the Iowa and Cedar River have not yielded any sampled Higgins eye mussels to date. Plan to re-survey additional areas on the Wapsipinicon River in August... weather permitting.

On the Mississippi still working on documenting over wintering centrarchid areas for the Upper Mississippi. This is a joint study with Wisconsin and Minnesota

DNR for the previous eight years. We are winding down on this study as nearly a complete inventory of backwaters has been completed.

Recently higher mercury values in our fish tissue sampling on Pool 12 of the Mississippi was documented in 2007. We also have consumption advisories on a few other interior rivers such as the Upper Iowa River. In 2008, will plan to further document additional areas around these consumption advisory boundaries.

Dealing with an increasing number of development projects and encroachments along the upper Mississippi River. The development in the form of large docking units, river fill and condominium projects are impacting large tracts of the natural shoreline. The Iowa DNR is currently in the process of re-writing our administrative rules to give maximum protection to our river shorelines and wetlands possible.

Mississippi River Management (Fairport)

Contact: Bernie Schonhoff, (563) 263-5062, Bernard.Schonhoff@dnr.iowa.gov

Continued the RAFTMP sampling at designated locations

Collected zebra mussel veligers from three locations as part of the Invasive species sampling

Collected walleye and sauger in tailwater at L&D 15 as part of the evaluation of the closed areas below several of the river dams

Sampled in late fall to determine overwintering area in Huron Is. as part of the pre-project work for the HREP program

Assisted Genoa hatchery in distributing juvenile Higgins eye mussels in he lower Rock River and in Pool 16 as part of the effort to re-establish the federally list mussel

Assisted the UMRCC vegetation ad hoc committee in sampling pool 18

Assisted in the Higgins eye cleaning at Cordova

NORTH CENTRAL DIVISION OF THE AMERICAN FISHERIES SOCIETY
RIVERS AND STREAMS TECHNICAL COMMITTEE MEETING
11-12 MARCH 2008

Nebraska report

[Steven Schainost, Nebraska Chapter AFS Representative and Rivers and Streams Program, Nebraska Game and Parks Commission]

GENERAL SYNOPSIS OF WORK BEING DONE

The Nebraska Department of Environmental Quality continues to monitor the health of the state's streams and other waterbodies. Within the Nebraska Game and Parks Commission the Missouri River Program has a large section working exclusively on Missouri River issues. The Rivers and Streams Program collects biological monitoring data in support of our Natural Legacy Plan as well other projects like fish passage work. It, in support of the Environmental Services Program, also works on instream flow issues. Dr. Mark Pegg and Dr. Kevin Pope and their students at the University of Nebraska at Lincoln and the Cooperative Fisheries Research Unit are studying on Platte River fisheries problems. At the University of Nebraska at Omaha Dr. Alan Kolok is studying environmental contaminants and Dr. Richard Stasiak studies some of our rarer cyprinid species. Dr. Wyatt Hoback at the University of Nebraska at Kearney is looking for a solution to the western mosquitofish problem.

A NEW PUBLICATION IS OUT

Peters, E. J. and J. E. Parham. 2008."Ecology and Management of Sturgeon in the Lower Platte River" (Nebraska Technical Series No. 18). Copies can be obtained from the Nebraska Game and Parks Commission, Fisheries Division, 2200 North 33rd Street, PO Box 30370, Lincoln, NE 68503.

ENDOCRINE DISRUPTING COMPOUNDS BEING STUDIED

Dr. Allan Kolok with the University of Nebraska at Omaha has been spending several years studying endocrine disrupting compounds in Nebraska waterways. Endocrine Disrupting Compounds (EDCs) are chemicals that alter the normal functioning of the endocrine system, and thereby alter fish metabolism, development and reproduction. While these chemicals have a wide variety of sources, the most common sources in Nebraska are confined animal feeding operations and municipal sewage treatment plants. The most common effects that are being documented are male fish with female traits and vice versa.

NIOBRARA INSTREAM FLOWS

Under the prior-appropriation water rights doctrine of Nebraska and other western states, water can be put to beneficial use only if it is removed from the stream. In 1984, the Nebraska Legislature recognized fish, wildlife and recreation as a beneficial use of the water. Because of this, now water may be left in a stream for a beneficial use and has legal protection. Since 1984, instream flow water rights have been granted on two streams, Long Pine Creek in north-central Nebraska (1989) and the Platte River (1998). The process of developing an instream flow right for the Niobrara River in northern Nebraska was begun in 2006. Fieldwork on collecting hydrologic data has begun and we are still determining what biological information needs to be developed.

A FIELD GUIDE TO THE FISHES OF NEBRASKA

"A Field Guide to the Fishes of Nebraska" is being written. Intended for undergraduate students and biologists, as well as interested amateurs, it will feature each of Nebraska's 100+ species. The guide will include keys to identification as well as species accounts featuring a line drawing of the species, a range map, and comments on identification and habitat. It is expected that the guide will go to the printers in late 2008.

FISHWAYS

To date, fish passage work in Nebraska has focused on barriers located on our larger streams. Three are in the progress at this time, including work on the Milburn Dam and the Sargent Irrigation Diversion on the Middle Loup River and the Spalding Dam on the Cedar River. Both the Cedar and Middle Loup Rivers are have significant sport fisheries below the barriers, primarily consisting of channel catfish. These barriers have resulted in blocking the movement of these species and, as a result, nearly 200 miles of stream have no sport fishing opportunities. The Milburn Project was completed in 2005 but operational problems prevented full use. Additional stabilization work on the dam was completed last fall and we hope that it will in operation this spring. Downstream of this project, erosion and bed degradation at a pair of weirs near Sargent, Nebraska, have developed into a barrier. We are working with the owners to build a rock ramp fish pass at this location. Finally, a design for a denil fish pass over the Spalding Dam was completed in 2006. We are looking for funds to complete engineering blueprints so this project may proceed.

DEPARTMENT OF ENVIRONMENTAL QUALITY

A total of 202 sites were surveyed in Nebraska during a 5-year rotation R-EMAP survey. These sites included 55 reference sites and 147 randomly selected sites. The majority of stream surveyed were first to third order streams. A stream

classification was developed based on fish, macroinvertebrates, habitat, stream size, water temperatures, and ecoregion. Stream size was divided into small, medium, and large streams. Individual metrics for each biological index were selected from alist of metrics that showed the greatest responsiveness to least disturbed or highly disturbed habitat conditions. The fish IBI consisted of eight metrics; the macroinvertebrate ICI, four metrics; and the habitat HBI, 10 metrics. A total of 38 streams were determined to be impaired and were placed on the Nebraska Section 303(d) list.

Rivers and Streams State Report for Indiana
Rivers and Streams Spring Meeting
March 11th and 12th.
Rock Island, IL
Written by Len Kring

1. Bureau of Water Quality, Muncie, IN
   Jason Doll, Aquatic Biologist

   1) Killbuck Creek and Pipe Creek, tributaries of the upper West Fork of White River located in Delaware County, will be sampled to repeat a study originally conducted by the Bureau of Water Quality in 1978. The goal of this project will be to investigate fish community changes in response to stream habitat alterations. Habitat conditions from 1978 will be evaluated based on qualitative remarks from Bureau of Water Quality reports and from historical aerial photos.

   2) In response to EPA's Stormwater Phase II Rule which requires the city of Muncie to institute a Stormwater Quality Management Plan, the Bureau of Water Quality began monitoring the biological condition of fish communities from six 14-digit watersheds located within the Muncie Sanitary District in 2005. The objective is to assess the biological response of fish communities to storm water runoff.

2. District 1, IDNR,
   Bob Robertson, District 1 Fisheries Biologist
   IDNR - Division of Fish and Wildlife
   Kankakee Fish and Wildlife Area
   PO Box 77
   North Judson, IN 46366
   Tel: (574) 896-3673
   Fax: (574) 896-3038
   brobertson@dnr.state.in.us

   1) In 2007 we sampled 4 sites on Crooked Creek in Porter Co. The report is still being written. Crooked is one of our put and take trout streams and was stocked one week after opening day due to high water. No trout were recorded in the four barge stations.

   2) Ed Braun (District 4) and I will be surveying the Wabash River in August. This survey was delayed from last year due to high water. I'll repeat the sites sampled in the 1999 survey in my district (from Warren through Cass Counties), Ed will do the stations upstream to Ohio in his district.

3) I also plan to do some survey work on the Little Kankakee in Laporte County. Probably several sites sampled twice to determine trout abundance.

3. District 2, IDNR
   Neil Ledet, District 2 Fisheries Biologist
   IDNR – Division of Fish and Wildlife
   Fawn River State Fish Hatchery
   6889 N SR 327
   Orland, IN 46776
   (260) 829-6241
   nledet@dnr.state.in.us

   1) Will sample the St. Joseph River for walleye.
   2) Will sample Solomon Creek and the Little Elkhart River for Trout.
   3) Will do a general survey on the Pigeon River.

4. District 4, IDNR
   Ed Braun, District 4 Fisheries Biologist
   IDNR – Division of Fish and Wildlife
   NERO
   1353 S. Governors Drive
   Columbia City, IN 46725
   (260) 244-6805
   ebraun@dnr.state.in.us

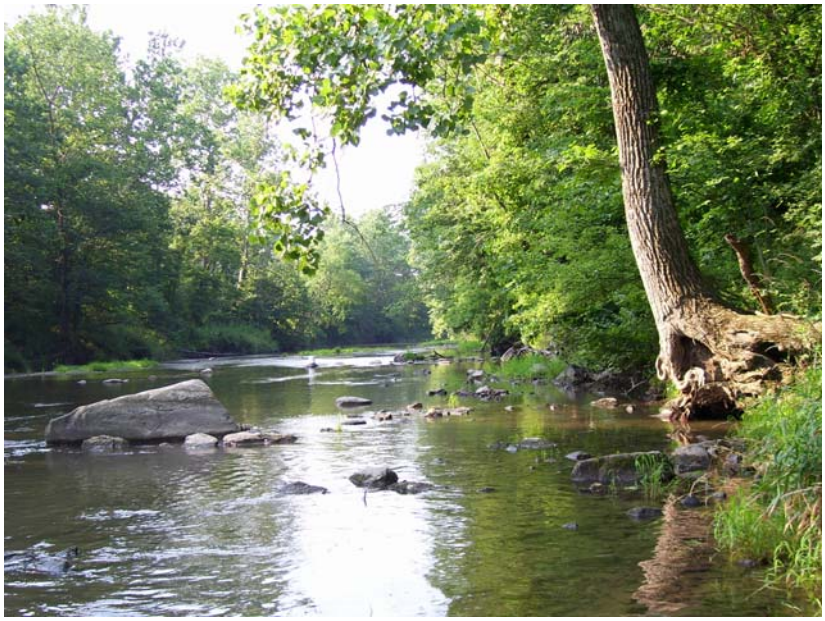
   1) Will sample Rock Creek for Smallmouth Bass.
   2) Assist District 1 with a Wabash River Survey.

5. Greg Bright
   Commonwealth Biomonitoring

   The Nature Conservancy was awarded a grant by the Joyce Foundation to assess whether a new channelization technique (a two-stage ditch) will protect water quality and aquatic life in Creel Ditch, a direct tributary of the Fish Creek. Fish Creek is in the Lake Erie drainage and the only known location where the federally endangered white cat's paw pearly mussel (*Epioblasma obliquata perobliqua*) still exists [1]. One of the tasks in the project is to assess water quality using fish and macroinvertebrate monitoring. This report presents the biological data collected during 2007, the first year of the project and before ditch modification begins.

6. Jennifer Campbell-Allison, Restoration Biologist
   Indiana Department of Natural Resources
   Div. of Fish & Wildlife/Fisheries/Contaminants
   402 W. Washington St., Room W273
   Indianapolis, IN 46204-2781
   Phone: 317.232.5821 FAX: 317.232.8150

   As the result of a Contaminants case settlement, the Indiana Department of Natural Resources developed a project to improve 7.37 acres of riparian corridor and habitat along a tributary of Mud Pine Creek in Warren County, Indiana. In the same settlement, Indiana Department of Environmental Management negotiated additional buffer and filter strips on the property to protect water quality. Protecting this tributary was a win for Smallmouth bass in the Exceptional Use segment of Mud Pine Creek."



7. Indiana Department of Environmental Management/ Office of Water Quality/Biological Studies Section
By Stacey Sobat

In the summer of 2007, the Probabilistic Fish Community Monitoring Program collected a total of 86 samples at 78 sites in the East Fork White River and

Whitewater River basins. 112 species or 55% of the fish species expected in Indiana (203 total expected) were captured, and 32,298 individuals were identified. There were nine out of 38 sites impaired in the East Fork White River and just one site impaired in the Whitewater River. A boat methodology study was also conducted in the summer of 2007 with the assistance of Dr. Thomas P. Simon, U.S. Fish and Wildlife Service, at 14 sites on the East Fork White River and one site on the Muscatatuck River. A total of 264 transects (250 meters each) were collected, capturing 108 species or 53% of the fish species expected in Indiana (203 total expected), and 58,345 individuals were identified. Preliminary results indicate that IDEM will need to modify the boat sampling standard operating procedures for fish community assessment to sample in a downstream fashion rather than upstream.

The Biological Studies Section will be sampling the Upper Wabash River basin in 2008. Site reconnaissance, site evaluation, and gaining landowner access has already begun. The goal is to sample 38 sites in the basin. Data to be collected at these random sites include water chemistry, *E.coli*, nutrient data, macroinvertebrate communities, fish communities, and a habitat analysis. In addition to the probabilistic sampling, fish tissue will be collected for contaminant analysis at targeted sites throughout the basin. Another project, tentatively scheduled for summer 2008, will take place in the Upper Fall Creek watershed (above Geist Reservoir). Several branches within the Office of Water Quality at IDEM will work together to sample biological, chemical, and physical parameters within the watershed to assess environmental stressors.

U.S. EPA will be or already conducted several National Monitoring Surveys (for a schedule of activities visit http://www.epa.gov/owow/monitoring/guide.pdf). The objective of these surveys are to provide new funds to states for developing and implementing monitoring strategies, partnership with agencies, and providing statistically valid information on the extent of impairment and key stressors. In 2006, a National Wadeable Stream Assessment was conducted (project detail at http://www.epa.gov/owow/streamsurvey/). A National Lake Monitoring project was completed in 2007 http://www.epa.gov/owow/lakes/lakessurvey/ and other national studies will be conducted soon…Rivers and Streams 2008/2009 http://www.epa.gov/owow/riverssurvey/index.html, National Coastal Monitoring Project in 2010, and Wetlands in 2011. Due to current workload and budget constraints, it is unclear if IDEM will be able to participate in these studies or if a USEPA contractor will be completing the projects.

Staff have given numerous presentations and attended many workshops since the December Newsletter. Charles Morris presented “Fish assemblage structure along a PCB-gradient” at the Spring Indiana American Fisheries Society meeting. Ali Stephan also gave a presentation at the meeting titled “The present and historic fish distribution of the South Fork Wildcat Creek Watershed.” Stacey Sobat attended the second EPA Workshop on Bioindicators and Climate Change February 19-21, 2008 in Crystal City, VA. The main theme from the workshop

was…be proactive not reactive! States or regions need to be monitoring core stations or reference sites to establish a baseline condition to monitor for climate change over time. States need to work to protect areas that may serve as a refuge for species. States need to reduce non-climate stressors. More emphasis needs to be put on restoration of riparian zones or buffer strips with canopy to reduce impacts of temperature and runoff increases as the climate changes. Did you know that we have an Indiana State Climate Office located at Purdue University http://www.agry.purdue.edu/climate/ ? Another good source of climate change information in the Midwest can be found at http://www.usgcrp.gov/usgcrp/Library/nationalassessment/7MW.pdf .

In addition to repairing and acquiring new equipment for the field season, staff are also revising Standard Operating Procedures for many of the Biological Studies Section activities. Staff has interviewed and will acquire four intern positions for the summer through the Governor's Public Service Summer Internship Program. If you are looking for a job, watch the state of Indiana's Job Bank website http://www.in.gov/jobs/ where future positions will be posted!

8. Mark Pyron
   Ball State University

We examined historic snail material from University of Michigan and Ohio State museums and returned to the same 100+ sites to search for the same species. The numbers of taxa we collected are changing constantly, because I am trying to get everything identified correctly and keep the few snail taxonomists happy. It looks to be around 30 aquatic gastropods for the state. Several appear to be rare. None we collected have any T E status.

2008 MN Summary of Activities for the Annual NCD Rivers and Streams Technical Committee

Compiled by: Karl Koller, MN NCD Rep. (Karl.Koller@dnr.state.mn.us)
(Thank you to all the people who took the time to contribute to this document.)

MN AFS Streams and Rivers Committee

Two student white papers, one on OHV impacts on streams and one on woody debris removal are being wrapped up. Students were contracted to complete the research for the papers and committee volunteers will do the final editing.

A resolution drafted to be sent to the MN DNR Division of Water, the permitting authority for culverts and bridges, to require that a stream simulation design method (MESBOAC) be adopted as the required design method for general permits for stream crossings for counties and for the state DOT. The committee completed the final draft and voted unanimously to forward the resolution to the EXCOM for discussion at the business meeting. The membership at the business meeting voted to adopt the resolution. It was also decided a similar resolution should be drafted to be sent to all parties that install culverts on the need to properly install them. Many of the culverts installed in the state do not require a permit (on streams with drainages of less then 2 square miles).

The committee will also consider drafting resolutions on dam removal and the permitting of rip rap for bank stabilization in streams.

Culvert study

The University of MN, with the cooperation of the MN DOT, the Association of MN County Engineers and the MN DNR is conducting a study to compare alternative culvert designs to the standard method of using hydraulic modeling to achieve a required design velocity. The study is primarily comparing installation costs for different methods. Originally, the study had hoped to evaluate the cost savings in the long run of installing culverts which match channel form to determine how the savings from reduced maintenance cost compared to the increases installation costs associated with installing a larger culvert. However, this question and determining ecological costs of various designs was determined to be beyond the scope of the study.

MN DNR Fisheries Management Activities

John Frank, Fisheries Specialist, Hinkley

Sturgeon Sampling in the Kettle River

Lake sturgeon sampling began in the Kettle River in 1992 and continues to the present time. The initial reason for this was because lake sturgeon levels had been historically much higher and information on their movements was desired

for potential stocking in other river systems. Also, there was very little growth and age information on this population. Additionally it was hoped that enough fish could be marked to calculate a population estimate for the river. Also, a dam that had been a barrier for 75 years was removed in 1995 and we wanted to determine if these two separate populations would now intermingle after dam removal.

Hook and line sampling is used to target most fish, although a few have been caught with gill nets and by electrofishing during regular population assessments and surveys. All fish captured are marked with a disc-dangler and passive integrated transponder (PIT) tag. All fish lengths are measured to the nearest tenth of an inch and weighed to the nearest tenth of a pound. Pectoral spine samples are also removed from all newly caught fish for aging purposes.

As of 2006 there were a total of 474 fish tagged in the river. Recapture percentage had been running about 50% up until 2004, and now recapture percentage is close to 70%. Population estimates have been calculated and indicate there are about 500 fish in the river. Two fish have been captured above the old dam site that were tagged below it. Also, since the dam was removed in 1995, there has been a lot of sediment migrating down stream and several holes near the dam filled in and some several miles downstream are beginning to fill in as well.

An assessment report evaluating the impact of sediment released from a dam removal has also been completed and copies can be requested.

Brian Nerbonne, Metro Area Trout Stream Coordinator

SE MN flood: In the immediate aftermath of the flood, provided technical assistance to DNR Waters and state and county highway departments on emergency repairs to damaged roadways that required channel modifications. Assessed and provided design for a restoration order from DNR to repair an illegal channel relocation by a county highway department. Provided technical assistance to Winona County to help restore the stream channel in a county park. Coordinated with PCA to capture airphotos of flooded streams for use in damage assessment and restoration planning.

Designated an additional 6 miles of a Vermillion River tributary as trout stream, working with local governments and landowners.

Worked with Watershed Joint Powers Organization, PCA on assessing groundwater sources, recharge areas, and thermal characteristics of Vermillion River as part of EPA targeted watershed grant.

Successfully stocked MN wild brook trout strain into a stream in the Minnesota Valley Fish and Wildlife Refuge, located approximately 1/2 mile from the Mall of America.

Eric Altena, Assistant Area Fisheries Manager, Montrose, MN

Stream work within Central Minnesota
Cold Spring Creek shoreland restoration project.

With cooperators like the City of Cold Spring, DNR, Gluek Brewing and Stearns County, several project have been underway to minimize the urban impacts to this brook trout stream that runs through the center of the City of Cold Spring MN. The stream has a hydrograph heavily influenced by runoff events, bouncing from 2 cfs under base flow conditions to almost 100 cfs in a matter of several minutes. As a way to alleviate some of this bounce and temperature stress to the brook trout in the stream, a cooperative project was undertaken to install an infiltration basin on the Gluek Brewing property adjacent to the creek. The brewery had plans to pave an existing dirt parking area and with relationships that had been established with various entities, a grant was acquired through the DNR for a Shoreland Habitat Restoration program. This project involved installation of the infiltration basin and native plant material on over 300 ft of shoreline in an urban environment. Along with the project, instream work using brush layering, artificial riffle creation, bio-log placement and willow staking were performed on this section of stream that has been over widened due to the increased runoff. The project will be monitored for several more years.

St. Francis River Dam removal and/or modifications

Sherburne County is one of the fastest growing counties in the state of Minnesota. With the development pressure comes strain on our natural resource gems like the Sherburne National Wildlife Refuge. The refuge includes 30,700 acres of wetland, river floodplain, Oak Savannah and prairie. However, part of the management includes manipulating waterfowl production areas with the use of two radial gate dams on the mainstem of the St. Francis River. In a 2004 survey of the St. Francis River conducted in cooperation with the DNR, ands USFWS, recommendations were made to either modify or remove dams that were put in place on the refuge. Until recently these requests were met with some resistance, however, the Sherburne Refuge staff have received a fish passage grant to address the issue to some extent. Although the project is still in planning phases, the potential to remove two concrete dams and allow fish passage to more than 50 miles of stream has great promise for the otherwise unimpeded St. Francis River. Potential solutions to the dams would involve either fish bypass channel, riffle replacement or complete removal. The project will likely take some time to get rolling, but the thought processes have changed positively in recent years.

Mike Carlson, Lanesboro Assistant Area Supervisor

Projects planned for this field season:

Pickwick Creek, Winona County, cooperative project with NRCS on 2000-3000 feet (depending on how far we can stretch the $$). Major bank sloping and erosion control planned.

Wisel Creek, Fillmore County, project 1/2 done and finishing up this season. Going great. 3600 ft.

Winnebago Creek, Houston County, good population of fish already. Bank stabilization and reconnection to floodplain planned.

Cooperative projects with TU at Hay Creek and Trout Run.

Stream Habitat Program, MN DNR Ecological Resources

Geomorphology training

Annual geomorphology training continues. Fluvial Geomorphology and Stream Classification will be offered in Fergus Falls in July, and Stream Monitoring will be at Whitewater State Park in August. For more information on the training, go to http://files.dnr.state.mn.us/events/streamworkshops.pdf.

THE WATERSHED ASSESSMENT TOOL IS NOW AVAILABLE ON THE MN DNR WEBSITE

http://www.dnr.state.mn.us/watershed_tool/promo.html

This interactive tool is designed to improve access to information about Minnesota's natural resources and the ecological health of our watersheds. Please share this link with others that are interested in the health of our natural systems.

LOOK FOR THESE SPECIAL FEATURES:
- Text describing the 5 components of watershed health.
- On-line interactive map that displays 40 GIS data layers and summarizes information for each major watershed.
- Information and metadata about each of these data layers
- Downloadable pdf MapBooks for each major watershed and each component

Used together, the map and the text will lead to a better understanding of the components, their connection to each other and the complexity of interactions between them.

Thank you for your interest in the ecological health of Minnesota's watersheds! Comments or questions can be directed to Beth Knudsen with Ecological Resources, Stream Habitat Program.

Beth Knudsen
Research Analyst
MN DNR Ecological Resources
1801 South Oak Street
Lake City, MN 55041

Phone - 651/345-3332 ext 228

WARSSS Methodology Testing

What is: Watershed Assessment of River Stability and Sediment Supply (WARSSS)?

It *"is a geomorphology based procedure for quantifying the effects of land uses on sediment relations and channel stability"*

Dave Rosgen

WARSSS is hierarchical approach to provide documented justification for Assessment, Prediction, and Monitoring of effects of land use activities on stream stability and sediment within a watershed. Through the WARSSS procedure, the researcher assesses the present condition of stream channel reaches, by stream type, within a watershed and produces defensible results of relative reach impacts from landuse activities. It accomplishes this by assessing hillslope, hydrological, and channel processes for each sub-watershed in a systematic fashion. WARSSS provides a comprehensive, standardized framework for documenting the inclusion (poor condition) and exclusion (healthy condition) for more advanced study of sub-watersheds within the larger watershed.

2007/2008 Summary of WARSSS on the Whitewater watershed

In an effort to implement an adaptive management strategy for the Whitewater River, the DNR, Stream Habitat Program (SHP) initiated WARSSS on this watershed in the Fall 2007. The results from completing the initial assessment failed to exclude any sub-watersheds (i.e. the entire watershed was considered impacted). This failure to exclude any sub-watershed was caused by the August 23rd, 2007 rain event, which caused massive erosion and deposition throughout the Whitewater watershed. This 1000+ year, rainfall event caused a unique problem for required field data for advanced WARSSS. The main question raised by our analysis of the technique is how does one prioritize the 2008 fieldwork, within a 330 square mile watershed, containing 23 sub-watersheds, when ALL sub-watershed stream channels are considered unstable, thus requiring detailed geomorphic field data collection?

To help direct the 2008 field efforts, the SHP proceeded into the second level assessment for the Whitewater watershed. This second level assessment, together with stream professional and local input, will provide direction and prioritization for 2008 field data requirements. Once the 2008 field data is collected and assessed, the final third level assessment can be initiated. Then a comprehensive watershed restoration and management direction can be formulated and implemented to improve the health of the Whitewater River. In addition to providing direction, WARSSS provides a quantifiable framework for monitoring these efforts to ensure success.

Summary of Stream Research Activities for 2006

Neal Mundahl
Department of Biology
Winona State University
Winona MN 55987

Flood Impacts

Following the catastrophic, 1000-year floods that hit many streams in southeastern Minnesota during August 2007, we surveyed stream habitats, fish populations, and invertebrate communities in several streams. Streams ranged from slightly impacted to drastically scoured, reworked, and relocated. Stream habitats ranged from simply being flushed of fine sediments to having old channels blocked and abandoned and new channels formed. No fish populations were eliminated, and all age classes survived, but in greatly reduced numbers. Large macroinvertebrates, such as amphipods, were severely reduced or eliminated from some streams, leaving mostly small fly larvae and caddisflies in some systems. Lack of large prey items in some streams forced slimy sculpin to feed more heavily on fly larvae, and fish condition declined entering the winter season. We are continuing to assess, through 2008, the invertebrate communities within streams in Whitewater State Park, one of the areas hardest hit by flooding.

DNR Fisheries Research

Doug Dieterman, Research Biologist, Lake City, MN

Study 674: Movement, growth, and mortality of brown trout in southeast Minnesota streams.

OBJECTIVES: **Quantify spatial and seasonal patterns of survival and movement of brown trout, evaluate the relative importance of survival and movement on the growth rate of trout populations, and test the effects of habitat quality and trout density on spatial and seasonal differences.**

SUMMARY: Although most study streams were surveyed for geomorphic and habitat conditions in 2006, flooding in March 2007 prompted a resurvey to ensure a mosaic of conditions was still present in the study area. Brown trout habitat quality and percent cover were primary variables resurveyed in summer 2007. Habitat quality and total percent cover continued to be variable among study streams and reaches following spring flooding. Most reaches were classified as either Good or Fair habitat quality for brown trout in 2006 and again in 2007. Three reaches suggested changes from better to worse habitat quality, changing from Good to Fair (2 reaches) or from Fair to Poor (1 reach). Two reaches suggested improved habitat quality, changing from either Poor to Fair or Fair to Good. Percent cover ranged from 1.6% of surface area of reach CE to 45% of surface area of reach PA. Percent cover increased in all but two reaches (PB and CF) that were surveyed in both years.

Estimates of adult and juvenile brown trout abundance varied among study reaches and seasons reflecting spatial and seasonal differences in environmental and biotic conditions. Juvenile abundance estimates in late-summer 2007, representing the 2007 year class, were lower in all reaches than abundance of the 2006 year class measured in late-summer 2006, likely indicating the effects of spring and summer flooding in 2007. Reaches CB and CF on Coolridge Creek consistently had the first or second highest adult abundance estimates whereas reach CA, immediately downstream from reach CB, often had the second or third lowest abundance estimate during all sampling occasions. A total of 511 brown trout were newly tagged with Passive Integrated Transponders (PITs) in 2007, resulting in 1,541 brown trout that have been tagged since the studies' inception. A total of 720 of these 1,541 trout (47%) have been recaptured at least once. Two brown trout with PITs were known to have died in 2007. One was found dead in an isolated overflow pool in the pastured floodplain of reach PA following spring flooding and the other was harvested by an angler. Seasonal growth varied by brown trout age and size group, stream, and season. The age-0 2006 cohort grew the most in their first summer of life in all three streams with median growth highest in Pine Creek. Similarly, median growth was highest during the summer for both ages 1-2 and age-3-and-older groups. Median growth for all age and size groups of brown trout was lowest over the fall-spawning period. There was a negative relationship between initial length of brown trout and subsequent growth over the next year for almost all streams and brown trout age and size groups, suggesting that larger individuals are growing less than smaller conspecifics. However, data were sparse for age-0 and age-3-and-older groups. Data collection will continue in 2008.

Study 2: Lake sturgeon survival, seniority, and population status in the Kettle River, MN 1992-2007: Inferences from capture-recapture models.

Doug Dieterman, John Frank, Nate Painovich, and David F. Staples

Abstract: Lake sturgeon (*Acipenser fulvascens*) is a species of special concern in Minnesota that declined due to overfishing, pollution, and because access to suitable spawning habitat was blocked by dams. Fundamental information for rare species management includes demographic rates of survival, recruitment and production. Such information can be used in population models to evaluate viability and management actions. We used capture-recapture models to examine population trends for lake sturgeon in the Kettle River from 1992-2007 and to estimate survival, seniority, and the relative importance of survival and recruitment for influencing population trends. Analyses indicated a constant population, as the average λ across years = 1.0 and the 95% C.I. was 0.90, 1.12. This suggests that the lake sturgeon population in the Kettle River has been neither increasing nor decreasing since 1992. Annual survival was nearly constant at about 80%. A seniority parameter, γ, ranged from 0.49 to 0.87 indicating that 49-87% of the lake sturgeon in the population in a given year-, consisted of survivors from the same population the previous year. Thus, maintaining the population appears dependent on maintaining high survival rates. Annual population estimates ranged from about 130 to almost 300 individuals but suffered from wide confidence intervals. Similarly, estimates of new lake sturgeon entering the population each year, either from within population recruitment or immigration, ranged from 0 to over 100 but also with wide confidence intervals. It appears that the population is essentially maintaining itself through a combination of episodic recruitment and relatively constant survival. Closure of the fishery in 1995 appears to have been an appropriate action that should help maintain high survival rates and the current population size. However, bolstering recruitment may be necessary to increase the population and full recovery will require patience for this long-lived, late-maturing, infrequently-reproducing species.

Habitat requirements of the winged mapleleaf mussel: potential habitat degradation and decline in the St. Croix River

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Abstract

Freshwater mussels are among the most important faunal groups of the St. Croix National Scenic Riverway. Over 40 mussel species live in the St. Croix River, including two federally endangered species, the Higgins eye (*Lampsilis higginsii*), and one of only two known reproducing populations of winged mapleleaf

(*Quadrula fragosa*). Conservation of rare mussel species is an important activity in the St. Croix National Scenic Riverway. The following research objectives were undertaken to improve conservation efforts: (1) describe the status of winged mapleleaf populations at three locations in the Riverway, (2) describe winged mapleleaf microhabitat requirements, and (3) monitor mussel community and habitat dynamics at several Riverway locations to assess habitat degradation.

Estimating population size of endangered or threatened species is often difficult due to low organism density. Typically a large number of samples must be collected to estimate population size. Another approach is to utilize adaptive cluster sampling, which increases sampling efficiency for organisms that are spatially clustered. We used adaptive cluster sampling to estimate the size of winged mapleleaf and Higgins eye populations at three locations between Interstate State Park and Peaslee Lake, Wisconsin. Mean winged mapleleaf density varied from 0.008-0.020 individuals/m2 (coefficient of variation of 50-66%) at Interstate State Park and Franconia (none were found at Peaslee Lake). We estimate there are 2400-4250 winged mapleleaf at our study sites and 13,000 winged mapleleaf along the entire reach between Interstate State Park and Franconia, MN. We collected Higgins eye at Interstate, Franconia and Peaslee Lake. Mean Higgins eye density varied from 0.008-0.015 individuals/m2 (coefficient of variation of 66-167%). We estimate there are 8900 Higgins eye at our three study sites and that the Higgins eye population between Interstate State Park and Peaslee Lake consists of 14,400 individuals. These are the first statistically valid estimates of winged mapleaf and Higgins eye populations for this location.

Several measured variables differed between sites with high and low mussel densities. High-density sites had a significantly greater proportion of the riverbed comprised of coarse sediment. Mussel species richness, mussel density and sediment compaction were higher at high-density sites. Winged mapleleaf and Higgins eye were only found at high mussel density areas. There was no difference in sediment organic matter, water velocity just above the riverbed or shear stress (as measured using FST spheres) between high and low-density sites. Areas with high mussel density had significantly higher Froude numbers, shear velocity and shear stress (as measured with the acoustic Doppler current profiler). Within high-density sites Higgins eye and winged mapleleaf were found associated with areas of the highest mussel density and species richness. The only habitat factor that differed among quadrats with and without Higgins eye was larger sediment size in quadrats with Higgins eye (as assessed with our field sieving technique).

When we compared various hydraulic parameters at different discharge levels between sites with Higgins eye and without Higgins eye we found shear stress and shear velocity were significantly higher at sites where Higgins eye were present. Similarly, those sites that contained winged mapleleaf had higher shear

stress, shear velocity, Roughness Reynolds and Froude numbers than those without.

Long-term monitoring of mussel communities and habitat dynamics at Wild River State Park, Interstate State Park, Franconia and Osceola continues to show problems at Interstate. We followed a stratified quantitative sampling regime to collect at least 100 - 0.25 m2 quadrats with SCUBA at each location. Significant changes are taking place at one of the four locations - Interstate. Mussel density and substrate particle size have decreased at Interstate since we began monitoring in 1992. The decline in mussel density at Interstate is noteworthy due to the diverse and important mussel community at that location. The Interstate State Park site seems to be an important location for both Higgins eye and winged mapleleaf, but is especially crucial for winged mapleleaf. The fact that both of these species are associated with dense and diverse mussel populations indicate that management activities aimed at maintaining and increasing mussel habitat will likely benefit these federally endangered species

We conducted a mussel survey between the St. Croix Falls Dam and State Highway 8 bridge. Winged mapleleaf have been found in this location previously. Although we did not collect winged mapleleaf we did observe areas with diverse, dense mussel communities. However, the density of populous mussel beds in this reach were lower than densities associated winged mapleleaf at Interstate State Park so it is unclear whether this area is home to a significant number of this species. Since this part of the river is difficult to sample due to the lack of boat access a significant effort would be needed to understand the importance of this area for winged mapleleaf.

Superior National Forest
Fisheries and Aquatics Program
Program Highlights 2008

Ken Gebhardt, Fishery Biologist
Minnesota AFS Meeting, March 5, 2008

Stream Crossing Improvement Projects: Stream crossing improvement projects are planned for Little Mississippi Creek, Mark Creek, Fry Creek, and Thompson Creek (two crossings) on the Gunflint Ranger District. One stream crossing improvement project is also planned for Marion Creek on the LaCroix Ranger District. Existing stream crossing structures will be replaced with larger culverts or bridge structures to accommodate bankfull flows, sediment and debris transport, and aquatic organism passage. All projects are expected to be accomplished by September 15, 2008.

Inga Creek Stream Crossing Project Monitoring

Dark River Project

Forest-wide Collaborative Stream Monitoring Reaches: The Forest is currently evaluating protocols and methodologies for establishing long-term stream water quality and channel monitoring sites across the Forest with other interested agencies and partners. We are currently seeking input from other agencies, universities, and research on existing protocols and priority watersheds. The SNF will be hosting a meeting with interested partners in late March or early April. The meeting will occur at NRRI or at the USFS office in Duluth.

Dark River Large Woody Debris Project Monitoring: The Forest will again be monitoring the 2005 Dark River Large Woody Debris Project in July-August. Monitoring will occur at established cross sections both within and outside the project area. Stream electrofishing will also occur within established project area and control reaches. Full stream snorkeling surveys may also occur to evaluate freshwater mussel populations.

Stream Crossing Improvement Project Monitoring: Recently completed stream crossing improvement projects will be monitored and evaluated in 2008. Monitoring protocols and sites will also be initiated for stream crossing improvement projects completed in 2008 (see above). Monitoring will include established cross sections, longitudinal profiles, and fish movement studies.

Historic Fish Structure Inventory: A survey of historic fish habitat improvement projects and structures will be initiated on the SNF in 2008. Structures will be surveyed to determine if they are still serving their intended purpose. Future projects may include removal of structures that are no longer functioning properly.

AFS NCD Rivers and Streams Technical Committee
Wisconsin Chapter Report
March 11, 2008

Prepared by Paul Kanehl, WI DNR, 2801 Progress Road, Madison, WI 53716.
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The following studies are being conducted by John Lyons, WI DNR, 2801 Progress Road, Madison, WI 53716. Phone: 608-221-6328, Email: john.lyons@wisconsin.gov

1. STATUS AND TRENDS IN THE FISH COMMUNITY OF THE LOWER WISCONSIN RIVER

STUDY OBJECTIVE:

1) Monitor long-term fish community dynamics each year over the entire Lower Wisconsin River.
2) Evaluate sportfish abundance, reproductive success, size structure, and growth rate each year for the Prairie du Sac Dam tailwater, continuing annual surveys begun in 1987.
3) Maintain a database containing information from 1) and 2)

PERFORMANCE ON SCHEDULED ACTIVITIES:

1) Assess fish communities over the entire Lower Wisconsin River: In late August/ early September 2006, the fish assemblage of the main-channel-border habitat was monitored by standardized daytime boat electrofishing at 10 one-mile-long stations along the 92.3-mile length of the Lower Wisconsin River (Table 1). These 10 stations had also been sampled in the same manner each year in August/September since 1999. An attempt was made to capture all fish observed. Captured fish were identified, counted, weighed, and checked for disease and the resulting data were used to calculate an index of biotic integrity (IBI) as a measure of river health (Table 2). In 2006, a total of 46 species and 2424 fish were collected from all 10 stations combined. Included were 14 gamefish species, one state special-concern species (3 western sand darter) and two state-threatened species (86 blue suckers, 1 black buffalo). Nine species (common carp, spotfin shiner, emerald shiner, quillback, shorthead redhorse, channel catfish, smallmouth bass, sauger, and freshwater drum) occurred at all 10 stations (Table 3). The most numerous species were emerald shiner (598), gizzard shad (287), shorthead redhorse (286), and Mississippi silvery minnow (181) (Table 4); the greatest biomass was collected for shorthead redhorse (195 kg), blue sucker (182 kg), and common carp (115 kg) (Table 5). Among the gamefish, the most numerous species with the most biomass were smallmouth bass (130 individuals; 29.6 kg), channel catfish (42; 22.9 kg), sauger (29; 10.0 kg), and walleye (26; 7.8 kg). Index of biotic integrity scores ranged from 80 to 100,

and all 10 stations had excellent ratings (Table 6). Scores and ratings in 2006 were similar to those in previous years.

2) Estimate sportfish population parameters for the Prairie du Sac Dam tailwater: On October 18 and again on October 19, 2006, standardized nighttime boat electrofishing was used to monitor populations of sauger, walleye, largemouth bass, smallmouth bass, muskellunge, and northern pike over a 1.8-mile length of shoreline in the Prairie du Sac Dam tailwater. Although this study began in 2000, this monitoring has been conducted since 1987 as part of other studies. The emphasis of the monitoring is to determine the relative abundance and growth of young-of-the-year (YOY) sauger and walleye in order to assess yearly fluctuations in recruitment. In 2006, a total of 119 sauger (7.4-18.5"), 272 walleye (7.0-27.0"), 3 saugeye (sauger X walleye hybrid)(12.8-18.9"), 45 largemouth bass (4.5-16.6"), 68 smallmouth bass (4.4-19.8"), 15 muskellunge (23.9-42.9"), and 2 northern pike (29.6"-29.8") were collected. These are about average catch rates for recent years (Table 7). The catch rate of 1.6 YOY sauger per mile was below the long-term median (3.8), as was the catch rate of 10.8 walleye per mile (29.5) (Table 8). Mean size of YOY sauger (7.9") was above the long-term average (7.2") as was the mean size of YOY walleye (8.6" vs 8.2").

STUDY PUBLICATIONS:

Lyons, J. 2005. Fish assemblage structure, composition, and biotic integrity of the Wisconsin River. Pages 345-363 *in* R. Calamusso, R. Hughes, and J. Rinne, editors. Historical changes in large river fish assemblages of North America. American Fisheries Society Symposium 45, Bethesda, Maryland.

Lyons, J. 2003. Recruitment patterns of walleye and sauger in the lower Wisconsin River. Pages 79-80 *in* T. P. Barry and J. A. Malison, editors. Proceedings of Percis III, the Third International Percid Fish Symposium, Madison, Wisconsin, July 20-24, 2003. University of Wisconsin Sea Grant Institute, Madison.

Weigel, B. M., J. Lyons, and P. W. Rasmussen. 2006. Fish assemblages and biotic integrity of a highly modified floodplain river, the Upper Mississippi, and a large relatively unimpacted tributary, the Lower Wisconsin. River Research and Applications 22:1-14.

2. STATUS AND TRENDS IN SPORTFISH POPULATIONS OF SOUTHWESTERN WISCONSIN WARMWATER STREAMS

STUDY OBJECTIVE:

1) Monitor sportfish abundance, reproductive success, size structure, and growth rate each year in seven streams in southwestern Wisconsin, continuing annual surveys begin in 1989.

PERFORMANCE ON SCHEDULED ACTIVITIES:

1) Assess sportfish populations in seven southwestern Wisconsin streams: As scheduled, sportfish populations were monitored in late August-early September 2006 following standardized wading electrofishing procedures from single 950 to 1900-m-long stations on seven warmwater streams in southwestern Wisconsin (Table 1). Although this study began in 2000, these seven stations have been sampled in the same manner as part of other studies since 1989-1991, depending on the station. The primary gamefish at each station is smallmouth bass; northern pike, channel catfish, bluegill, rock bass, and walleye are encountered at a few of the stations in generally low numbers. Smallmouth bass catch-per-100-m for age-I fish was high in 2006 at most stations, reflecting a regional strong year class in 2005 (Table 2).

3. REWRITE THE BOOK *FISHES OF WISCONSIN*

STUDY OBJECTIVE:

1) Completely rewrite and update the book *Fishes of Wisconsin*, including all relevant information compiled on Wisconsin fishes since the 1970s.

2) Make available data from the book in electronic format, either via CD (or another electronic medium) or the web.

PERFORMANCE ON SCHEDULED ACTIVITIES:

Substantial progress has been made. The book will be an online "e-book" (http://web1.er.usgs.gov/wdnr_fishes/fishes_home.jsp), and the website format is under development in cooperation with the U.S. Geological Survey. A team has been assembled and has begun to write the various chapters that will populate the e-book. This team includes over 15 people from within the Wisconsin DNR and from various universities and federal agencies. Drafts of 23 chapters are done and have received preliminary editing; three have been submitted to outside experts for formal peer review. A photographic-based fish identification system has been completed in cooperation with the University of Wisconsin Center for Limnology and the University of Wisconsin Sea Grant Program. The identification system is available as both a stand-alone website (http://wiscfish.org) that will be linked to the e-book website and a CD for use in field settings. A scientific paper describing the identification system has been published. Additionally, a stand-alone interactive mapping website (http://infotrek.er.usgs.gov/fishmap) that will also be linked to the e-book website has been developed in cooperation with the U.S. Geological Survey Great Lakes Aquatic GAP Program. This website portrays the precise distribution of each species in the state in great detail.

STUDY PUBLICATIONS:

Lyons, J., P. Hanson, and E. White. 2006. A photo-based computer system for identifying Wisconsin fishes. Fisheries 31(6):269-275.

4. Development and Evaluation of Watershed Models for Predicting Stream Fishery Potential

STUDY OBJECTIVE:
The primary goal of this project is to develop and evaluate watershed models that quantify the inherent fisheries potential of streams and predict how watershed land-use will influence the realization of this potential. Specific model-development objectives are:

1) Modify as necessary the Michigan models for predicting stream groundwater delivery, water temperature regime, and overall stream flow regime based on climate, surficial geology, topography, soils, vegetation, and land uses for various regions of Wisconsin. Test model predictions against observed temperatures and flows in stream reaches throughout the state.
2) Develop and test statistical models that relate observed stream temperatures and flows to observed fish community and fishery attributes in stream reaches throughout the state.
3) Link the models from 1) and 2) and classify and map Wisconsin stream reaches based on their actual and potential fisheries (coldwater, coolwater, warmwater-centrarchid, warmwater-esocid, etc.). Use current land-use data to estimate actual conditions and historical data to estimate potential.
4) For selected watersheds, use the models to explore how projected changes in land-use may affect stream fisheries.

PERFORMANCE ON SCHEDULED ACTIVITIES

Activity # 1 - Prepare GIS layers and implement Michigan ground water delivery model:

GIS data layers for land use/cover, surficial geology, soil, bedrock type, bedrock depth, digital elevation model, precipitation, degree growing days, conductivity, slope, and ground water delivery potential are complete for the entire state of Wisconsin. Work has also been completed on a layer containing variables that indicate proximity to lakes, dams, and large rivers.

Activity # 2: Develop and validate GIS-based watershed model that predict stream flow, water temperature, and fish community characteristics:

A model has been developed to predict site-specific stream flows from the GIS layers. A similar model for predicting stream water temperatures has also been completed and described in two scientific papers. A database on fish community, habitat, temperature, predicted flow, and GIS variables from 393 sites on 287 streams has been developed and is being used to develop models that predict fish community characteristics.

Activity # 3: Develop a statewide classification system for Wisconsin streams:

Two different GIS layers of stream segment classification based on watershed landscape characteristics, watershed land use, stream size, stream channel morphology, and biological communities. One is for Fisheries Management and emphasizes smallmouth bass occurrence and abundance. The other is for Watershed Management and emphasizes potential fish assemblages and biotic integrity.

Activity # 4: Explore how projected changes in land-use may affect stream fisheries:A model has been developed to project the spatial pattern and extent of future urban growth in Wisconsin, and this model has been coupled with models from Activity # 3 to predict impacts of land-use change on stream fisheries. Local applications of the model for fisheries and watershed managers have been completed for parts of southwestern, northwestern, and north-central Wisconsin.

STUDY PUBLICATIONS:

Stewart, J., M. Mitro, E. A. Roehl, Jr., and J. Risley. 2006. Numerically optimized modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – Part 2. *In* Proceedings of the 7th International Conference on Hydroinformatics, Nice, France. 8 pages.

Roehl, E. A., Jr., J. Risley, J. Stewart, and M. Mitro. 2006. Numerically optimized modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – Part 1.
In Proceedings for the Environmental Modeling and Software Society Conference, Burlington, VT. 6 pages.

5. EVALUATION OF THE WISCONSIN PTIORITY WATERSHED PROGRAM FOR IMPROVING STREAM HABITAT AND FISH COMMUNITIES

STUDY OBJECTIVES:
1. Document the quantitative and qualitative short-term responses of stream habitat quality, fish community structure, sport fish populations, and ecosystem integrity to installation of specific individual Best Management Practices (BMPs) at selected sites within study watersheds.

2. Document the quantitative and qualitative long-term responses of stream habitat quality, fish community structure, sport fish populations, and ecosystem integrity to site-specific and watershed-wide implementation of multiple BMPs at selected sites and entire subwatersheds.

3. Develop conceptual and, if possible, quantitative ecological models that relate changes in watershed and riparian land use to physical, chemical, and biological responses in different types of stream ecosystems that occur in Wisconsin.

4. Make recommendations based on Objectives 1-3 as to how Priority Watershed activities could be made more effective at achieving aquatic resource goals. Provide specific guidance as to which BMPs work best for particular types of streams and types of non-point-source pollution problems.

PERFORMANCE ON SCHEDULED ACTIVITIES:

Activity 4 - Stream habitat and fish community data collection.

Objective 1 has been met with the publication of Wang et al. (2002). For objective 2, field work has been completed for the Otter Creek Priority Watershed and a report has been prepared and is in peer review. Field work in the Waumandee Creek Priority Watershed has been completed, and data summarization and analysis has begun. Field work in the Lincoln Creek/Milwaukee River Priority Watershed began again in 2004 after a hiatus of five years following implementation of significant urban BMPs in 2001-2003 and was completed in June 2006. For objective 3, several papers (see publication list) have been published that have developed models relating land-use to stream condition. Additional models will be developed upon completion of analyses from the Waumandee and Lincoln Creek Priority Watersheds. Objective 4 is covered under the following Activity.

Activity 5 - Data summarization and communication.

All data have been computerized and summarized, and an annual summary has been prepared and widely distributed within and outside the Wisconsin DNR. Several oral technical presentations of study results have also been made, and study principal investigators are active participants in committees and task forces charged with providing guidance to the Watershed Management program. A list of peer-reviewed publications concerning this study is attached.

STUDY PUBLICATIONS:

Lyons, J. 1996. Patterns in the species composition of fish assemblage among Wisconsin streams. Environmental Biology of Fishes 45:329-341.

Lyons, J., and P. Kanehl. 1993. A comparison of four electroshocking procedures for assessing the abundance of smallmouth bass in Wisconsin streams. General Technical Report NC-159. St. Paul, MN. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 35 pp.

Lyons, J., S. W. Trimble, and L. K. Paine. 2000. Grass versus trees: managing riparian areas to benefit streams of central North America. Journal of the American Water Resources Association 36:36:919-930.

Lyons, J, L. Wang, and T. D. Simonson. 1996. Development of and validation of an index of biotic integrity for coldwater streams in Wisconsin. North American Journal of Fisheries Management 16:241-256.

Simonson, T. D., and J. Lyons. 1995. Comparison of catch per effort and removal procedures for sampling stream fish assemblages. North American Journal of Fisheries Management 15:419-427.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994a. Guidelines for evaluating fish habitat in Wisconsin streams. General Technical Report NC-164. St. Paul, MN. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 36 pp.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994b. Quantifying fish habitat in streams: transect spacing, sample size, and a proposed framework. North American Journal of Fisheries Management 14:607-615.

Simonson, T. D. 1993. Correspondence and relative precision of stream habitat features estimated at two spatial scales. Journal of Freshwater Ecology 8:363-373.

Stepenuck, K. F., R. L. Crunkilton, M., A. Bozek, and L. Wang. In review. Comparison of macroinvertebrate assemblages and stream quality metrics between snags and riffles in southeastern Wisconsin streams. Submitted to Journal of the North American Benthological Scoety.

Stepenuck, K. F., R. L. Crunkilton, and L. Wang. 2002 . Impacts of urban land use on macroinvertebrate communties in southeastern Wisconsin streams. Journal of the American Water Resources Association 38:1041-1051.

Stewart, J. S., D. D. Downes, L. Wang, J. A. Wierl, and R. Bannerman. 2000. Influences of riparian corridors on aquatic biota in agricultural watersheds. Pages 209-215 In Proceedings of the International Conference on Riparian Ecology and Management in Multi-Land Use Watersheds.

Stewart, J. S., L Wang, J. Lyons, J. A. Wierl, and R. Bannerman. 2001. Influences of watershed, riparian- corridors, and reach-scale characteristics on aquatic biota in agricultural watersheds. Journal of the American Water Resources Association 37:1475-1487.

Wang, L. and J. Lyons. 2002. Fish and benthic macroinvertebrate assemblages as indicators of stream degradation in urbanizing watersheds. Pages 227-250 In

T. P. Simon (editor), Biological Response Signatures: Multimetric Index Patterns for Assessment of Freshwater Aquatic Assemblages. CRC, Press, Boca Raton, FL.

Wang, L., J. Lyons, and P. Kanehl. 1998. Development and evaluation of a habitat rating system for low gradient Wisconsin streams. North American Journal of Fisheries Management 18: 775-785.

Wang, L., J. Lyons, and P. Kanehl. 2002. Effects of watershed best management practices on habitat and fishes in Wisconsin streams. Journal of the American Water Resources Association 38:663-680.

Wang, L., J. Lyons, and P. Kanehl. 2003. Impacts urban land use on trout streams in Wisconsin and Minnesota. Transactions of American Fisheries Society 132:825-839.

Wang, L., J. Lyons, P. Kanehl, and R. Bannerman. 2001. Impacts of urbanization on stream habitat and fish across multiple spatial scales. Environmental Management 28:255-266.

Wang, L., J. Lyons, P. Kanehl, R. Bannerman, and E. Emmons. 2000. Historical fish assemblage changes and watershed urban development in southeastern Wisconsin streams. Journal of the American Water Resources Association 36:1173-1189.

Wang, L., J. Lyons, P. Kanehl, and R. Gatti. 1997. Influences of watershed land use on habitat and fish in Wisconsin streams. Fisheries 22 (6): 6-12.

Wang, L., J. Lyons, P. Kanehl, D. Marshall, and M. Sorge. 2000. Responses of stream habitat, macroinvertebrate, and fish to watershed BMPs: Lessons from Wisconsin. Proceedings of Water Environment Federation, Watershed 2000, July 8-12, 2000, Vancouver, Canada.

Wang, L., T. D. Simonson, and J. Lyons. 1996. Accuracy and precision of selected stream habitat estimates. North American Journal of Fisheries Management 16: 340-347.

The following studies are being conducted by Brian Weigel, WI DNR, 2801 Progress Road, Madison, WI 53716. Phone: 608-221-6325, Email: Brian.Weigel@wisconsin.gov

1) **Baseline Monitoring Program – Rivers Subteam Leader.**
   - Timeline – indefinite; collaborators: Water Division, Regional fisheries and water staff.

- Develop a river monitoring strategy and work plan for regional staff, dole funds, measure performance, and report to the WDNR Water Division (WD) Monitoring Team.
- The Baseline Monitoring Program is a high priority within WD because it is the primary mechanism in gathering information for US EPA Clean Water Act reporting, discharge permitting, quantifying fisheries statistics, and prioritizing management efforts.

2) **Develop biocriteria for rivers and streams.**

- DRAFT 2008; WD River and Streams Assessment Methodology Team.
- Design a framework that uses fish and macroinvertebrate assessment methodologies (previously developed by BISS) to compare a waterbody's current condition with its best potential condition. Determine how two major Water Division functions, Use Designation and Baseline Monitoring, can mesh scientifically to provide a legally-defensible method for EPA Clean Water Act reporting (e.g., 303(d), 305(b) listing).
- This project is a high priority for WDNR, specifically WM.

3) **Evaluation of best management practices used for nonpoint source pollution abatement in agricultural and urban settings.**

- Report/MS in 2008; collaborators: John Lyons, Paul Kanehl, Roger Bannerman – WM, and USGS.
- We are comparing instream habitat and fisheries before and after best management practices have been installed within highly disturbed watersheds.
- This effort is part of WD's Priority Watershed Program and is intended to provide guidance for effective and efficient ways to reduce nonpoint pollution to streams for restoration efforts.

4) **Quantifying biotic relations with nutrient concentrations in rivers of Wisconsin.**

- Characterize water chemistry relations with fish and macroinvertebrates among 42 sites within 34 rivers statewide that represent a gradient of environmental conditions. Identify threshold values of nitrogen and phosphorus concentrations above which the biotic community is consistently impaired.
- This effort directly feeds into WM Bureau's need for nutrient standards in water discharge permits and EPA reporting.
- STUDY PUBLICATIONS
    1) Weigel, B.M., D. M. Robertson. 2007. Identifying biotic integrity and water chemistry relations in nonwadeable rivers of Wisconsin: Toward the development of nutrient criteria. Environmental Management 40:691-708.
    2) Robertson, D. M., B. M. Weigel, and D. J. Graczyk. In Press. Nutrient concentrations and their relations to the biotic integrity of

nonwadeable rivers in Wisconsin. US Geological Survey, Professional Paper XX-XXXX.

5) **Development and validation of macroinvertebrate collection and assessment methods for predicting watershed and local stressors on rivers in Wisconsin.**

- Run analyses early 2008; draft MS 2008, collaborators: Jeff Dimick – UW-Stevens Point
- Collected 120 macroinvertebrate samples among 36 rivers during 2003 – 2005. Develop and test a multimetric index of biotic integrity (IBI) that accurately and consistently reflects river health.
- A macroinvertebrate IBI tool for rivers would be incorporated into the WD Baseline Monitoring Program – Rivers (Tier II) for EPA reporting and for helping to prioritize management or remediation efforts.

6) **Trend analysis of sport fish and index of biotic integrity in rivers of Wisconsin: 2002-2007.**

- Publish manuscript 2009; collaborators: WD, Regional fisheries and water staff
- Use fisheries data collected via standardized Baseline Monitoring Program – Rivers to calculate summary statistics on common sport fish and IBI scores. Quantify temporal variation due to sampling error, natural environmental fluctuations, and then compare the variation among sites having different levels of human impact.
- Analyses are directly applicable for WD goals of EPA reporting and managing fisheries. The work provides feedback to the Baseline Monitoring Program – Rivers, characterizing the effectiveness of the current monitoring strategy and highlighting opportunities for program improvements.

7) **Changes in channel morphology, fishes, and macroinvertebrates subsequent to removal of 3 dams along the Baraboo River.**

- Timeline, sample every 5 yrs through 2020. Collaborators: John Lyons – BISS.
- The Baraboo River is now the longest free-flowing river in the Midwest since dams were removed in 2002. Many fishes previously constrained within the downstream Baraboo River reach or Wisconsin River immediately took advantage of spawning, rearing, and feeding habitats that opened because of dam removal. We intend to monitor changes in river morphology and biology to determine when equilibrium is reached.
- This study demonstrates how certain waterbodies impaired by dams can be restored, presenting realistic expectations of how the river and its inhabitants change through time. This research is applicable to WD's goal of removing 30-50 dams within the next several years (according to "A Fisheries, Wildlife, and Habitat Management Plan for Wisconsin, 2004-2007).

The following studies are being conducted by Matthew Mitro, WI DNR, 2801 Progress Road, Madison, WI 53716. Phone: 608-221-6366, Email: Matthew.Mitro@wisconsin.gov.

1. Monitoring Temporal Trends in Trout Populations and Base Flow in Streams

This study began in 2007 and will address two main objectives:

1. Determine the utility of temporal-trend monitoring of fixed sites in coldwater streams as part of the statewide baseline monitoring of wadeable streams.

2. Quantify the relationships between stream base flow and annual flow variability, precipitation, and trout population dynamics in coldwater wadeable streams.

This study will address two critical needs for trout stream management in Wisconsin. The first benefit will be to document the utility of temporal trend reference sites as a component of baseline monitoring of coldwater wadeable streams. Data collected from fixed sites sampled over time will allow the separation of temporal and spatial variability in baseline monitoring and will provide the information necessary to formulate insightful hypotheses about trout population dynamics in streams. We will use results from temporal trend reference sites surveyed in this study to help interpret concurrent baseline monitoring data collected in other streams in the region.

The second benefit will be to further our understanding of trout population dynamics in response to base flow level and variability. A better understanding of base flow dynamics and trout population response may assist in determining appropriate minimum flows for stream trout populations and in identifying risks to base flow and trout populations from changing land and groundwater use and from changing precipitation and climate regimes.

In 2007 we installed water level and temperature monitors in 18 Driftless Area streams. At each stream we conducted an IBI fish survey, tagged all trout, and measured basic habitat characteristics of the survey site.

2. Viral Hemorrhagic Septicemia: State of the Science Report

Coauthor: Angela Engelman

We are currently putting together a report on the state of the science of viral hemorrhagic septicemia (VHS). VHS was discovered in Wisconsin waters in 2007 and has resulted in many changed in the Wisconsin DNR fisheries

management program. For this report we are compiling existing research pertaining to VHS exposure and effects on fish individuals, populations, and communities. Background information on VHS will be used to identify the current state of the science of VHS and to identify areas of research that may be needed to manage VHS in Wisconsin waters. The report will also include an annotated bibliography on the scientific literature pertaining to VHS.

3. Use of artificial barriers to restore populations of native brook trout in Wisconsin streams

I have been investigating the restoration of a brook trout population in Trout Creek via the mechanical removal of a brown trout population. Specific objectives include evaluating the removal and restoration processes and determining the effects of brook trout restoration upstream of a barrier on brown trout downstream of the barrier. The barrier—a spillway through a dry dam—proved to be inadequate for preventing upstream migration of brown trout. Before this project is continued, modifications will need to be made to the spillway and the plunge pool beneath the spillway to prevent further upstream migration.

A second brook trout restoration using an artificial barrier began in 2007. Stream restoration began in Tenny Spring Creek, a tributary to Elk Creek in Vernon County, Wisconsin, in 2007 and will continue in 2008. A natural-type waterfall barrier that will create a barrier to upstream migration of brown trout was installed at the lower end of Tenny Spring Creek. A splash pad consisting of flat rock was installed below the barrier to prevent the formation of a pool such that trout will not be able to make any jumping attempts to scale the barrier. Brown trout were mechanically removed from Tenny Spring Creek above the barrier in 2007. Further stream restoration work will be completed in 2008, after which additional brown trout removals will be conducted and brook trout will be stocked.

4. Long-term viability of source populations of wild brook trout and brown trout
for Wisconsin's wild trout stocking program

I am investigating the long-term viability of wild brook trout and brown trout populations as source populations for Wisconsin's wild trout stocking program. The wild trout stocking program has aimed to improve the quality of hatchery-reared brook and brown trout by raising offspring from eggs collected from wild adult trout as opposed to hatchery broodstock. I am sampling brook trout in Ash Creek and the South Fork of the Hay River and brown trout in Timber Coulee Creek to determine how much annual reproductive output is removed from these populations for the wild trout stocking program. I am also tagging these trout to determine survival rates (for trout spawning in the stream versus those brought to a hatchery to spawn), recruitment of new trout to each population, and how these populations are changing over time. The goal is to ensure a sustainable wild trout stocking program.

This study will result in a quantitative understanding of the effects of egg collection on the source populations for the wild trout stocking program. Fisheries managers will have the tools and information necessary to make science-based management decisions for Ash Creek, South Fork of the Hay River, and Timber Coulee Creek to help ensure the long-term viability of these source populations for producing surplus eggs. The tools and information will include parameterized population models and strategies for updating models in the future. These models will facilitate the inclusion of reproduction and mortality rates into the egg collection decision-making process, which is currently based solely on meeting hatchery quotas.

This study will also benefit the general understanding of trout population dynamics in Wisconsin and stock-recruitment theory as it pertains to stream-resident salmonids in general. First-winter survival, for example, can be quite variable in Wisconsin streams and we still do not fully understand its importance to long-term trends in trout population dynamics. This study will address annual variation in wild trout survival, and recruitment rates, in relation to stock size and egg production. We will also improve our knowledge concerning the role of harvest restrictions on trout population dynamics and population structure, given that the streams in this study are protected by special regulations.

Preliminary results

Preliminary results show apparently robust populations of brook trout in Ash Creek and South Fork of the Hay River and brown trout in Timber Coulee, each with populations generally sufficient to meet egg quotas. A relatively low proportion of adult trout were removed for egg collection from the South Fork of the Hay River (about 15%) and Timber Coulee Creek (about 20%) each year. In Ash Creek, however, the proportion of brook trout removed for egg collection varied from a low of about 43% in 2004 to a high of about 84% in 2005. Spawning brook trout in 2006 were dominated by new recruits and the average fecundity was 435 eggs per female, down from 661 in 2005 and 552 in 2004. Consequently, the total number of eggs collected from Ash Creek in 2006 was less than expected. This trend continued in 2007 and may have been exacerbated by the large-scale flood events in August, which was a stressful event for the trout in Driftless Area streams. Further analyses of tag-recapture data and population modeling will help quantify the risks of the current egg collection strategy to the viability of the Ash Creek population.

5. Brook and brown trout population response to instream habitat restoration in Elk Creek and Big Spring Branch, Wisconsin

There is current interest in stream habitat restoration for brook trout, the only trout native to Wisconsin streams. Questions remain, however, on how to best tailor restoration efforts to benefit brook trout over brown trout where they

coexist. Research in Wisconsin has shown that brown trout have had a greater positive response than did brook trout to habitat improvement that added overhead cover to streams with sympatric populations. I am testing if habitat improvement without overhead cover can improve brook trout populations in Big Spring Creek and Elk Creek, two streams where brook trout coexist with brown trout. One reach in each stream was restored with cover-creating habitat improvements intended to favor brown trout and another reach was restored with non-cover-creating habitat improvements intended to favor brook trout. This study will also determine the importance of initial conditions (relative abundance of brook and brown trout) to the success of targeted habitat restoration.

Results of this study will help guide future trout stream habitat restoration projects. Costs associated with intensive instream habitat restoration are high. This study will help establish guidelines for future allocations of habitat restoration money to ensure funding of projects that are likely to succeed and to maximize trout population response per dollar cost of restoration.

Preliminary results

Initial populations of trout differed between streams. Brown trout were the dominant salmonid species in the Elk Creek restoration zone targeting brook trout, but brook trout have had a stronger presence in the analogous restoration zone in Big Spring Branch. Preliminary results suggest initial population condition may be an important determiner of success and instream habitat restoration alone may not be sufficient to improve brook trout versus brown trout numbers in sympatric populations. Brook trout constituted about 67-85% of the trout population in the Big Spring Branch reach restored without overhead cover, but brook trout have not responded positively to similar restoration in Elk Creek, constituting less than 5% of the trout population. An additional section of Big Spring Creek was restored in 2007 without overhead cover, with brook trout increasing in total number and as a percentage compared to brown trout. Brown trout numbers have increased in reaches restored with and without overhead cover in Elk Creek. However, brown trout response to restoration with overhead cover has varied. This result suggests that the purported benefit of high trout numbers associated with installing overhead cover may not always be realized in stream habitat restoration projects.

6. Relationships between reach-scale habitat variables and biotic integrity, brook trout density, and brown trout density in Wisconsin streams

Coauthor: Andrew H. Fayram

Trout density and biotic integrity scores are central metrics used to guide trout stream management actions. The relative priority of restoring particular reach scale habitat characteristics may differ depending on whether trout density or biotic condition of a stream is given priority. To determine the relative strength of

relationships between reach scale habitat characteristics and important biological metrics, we used artificial neural network models to examine the relationships between 11 reach scale habitat variables and 1) brook trout catch per effort (CPE), 2) brown trout CPE, and 3) coldwater fish index of biotic integrity (IBI) scores.

Results

The trout CPE models generally included habitat features related to physical characteristics and the IBI model generally included physical characteristics as well as those related to water quality. The brook trout CPE model included sinuosity and pools. The brown trout CPE model included gradient and cover. The coldwater IBI model included gradient, percent fine sediments, buffer, and width:depth ratio. Habitat restoration efforts that seek to maximize brook trout CPE, brown trout CPE, or IBI may benefit by altering significant habitat variables in each model. We also performed quantile regression to evaluate whether the there was evidence that any one of the response metrics of interest (brook trout CPE, brown trout CPE, or IBI) may be limiting to any of the other variables. It appears that conditions that control IBI scores may also limit brook trout and brown trout densities since there was a significant 90^{th} percentile regression between both brook trout CPE and IBI score and brown trout CPE and IBI score. Although our findings suggest that IBI scores and trout densities may often be increased simultaneously, the fact that different habitat variables were included in each model suggests that the most appropriate habitat restoration efforts may also differ depending on the management goal.

This research has been submitted for publication and is currently under peer review.

The following study is being conducted by Randal Piette, WDNR, 625 County Road Y, Suite 700, Oshkosh, WI 54901. Phone: 920-424-3839, E-mail: randal.piette@wisconsin.gov

1. Movement of Juvenile Flathead Catfish (*Pylodictis olivaris*) in the Wolf River Determined by Radio-Telemetry.

STUDY OBJECTIVE:

Determine movements of juvenile flathead catfish and identify critical habitat in the Wolf River in Wisconsin.

PERFORMANCE ON SCHEDULED ACTIVITIES:

A total of 22 juvenile flathead catfish (were implanted with radio transmitters and are being followed for a period of one year. Scuba gear was used to capture 18 fish at their overwintering locations, and 5 fish were implanted later during the summer. Fish were tracked beginning in March 2007, and will continued to be tracked until transmitters expire (May 2008?). Fish were tracked weekly by boat,

on foot in winter, or by aircraft as needed. Most tracking was conducted during daylight hours in order to facilitate other research objectives of the project. Five fish were tracked for a 24 hr period during mid-late summer to determine daily movement patterns. Fish movement ranged from 1.10 mi – 67.8 mi and averaged 15.5 mi. Eight fish were declared dead or shed tags during the summer tracking. The remaining fish showed strong winter site fidelity with 69% returning to the site at which they were tagged. Fish moved out of wintering areas in late April and May when water temperatures exceeded 15˚C. Movement stabilized in mid-late summer. Downriver movement to winter locations began in late September and all fish were at winter locations by mid October where they have remained throughout the winter. We anticipate transmitters will last long enough to track fish back to summer 2008 locations.

The following studies are being conducted by Tim Larson, WI DNR, N3344 Stebbins Rd, Poynette, WI 53955 Phone: 608-635-8122 Email: Tim.Larson@wisconsin.gov

1. Use of angler diary and fishing tournament data to manage a Wisconsin River bass fishery.

Data from angler diaries have been used to characterize the smallmouth and largemouth bass fisheries of Lake Wisconsin (9,000ac) and the 35 miles of river upstream to the next dam. Monitoring of fish at fishing tournament weigh-ins have allowed population estimates and movement information on released bass to be attained. Much of the river is only accessible by float boats or jet prop craft, making it difficult to sample by electro-shocking. The cost of voluntary angler data is mimimal compared to DNR sampling and it better samples larger size fish. This data is used to assess current angling regulations and the impact of tournaments.

Results indicate that electro-shocking samples a higher percentage of smaller size bass than angler catch. Diary anglers reported river catches of SMB over 10” to be 44% larger than 16” and 17% larger than 18”, compared to shocking of 14% over 16” and 8% over 18”. This Wisconsin River data with a 14” minimum size limit compares favorably to waters with catch and release regulations. Data is similar to the Sylvania Tract lakes in Michigan and much better than the Maquoketa River in Iowa and the Zumbro River in Minnesota. Both smallmouth and largemouth bass weighed in at bass tournaments comprised about 25% of the population estimate of 14” and larger fish and smallmouth bass were noted to travel a much greater distance from tournament release sites than largemouth. Ninty nine percent of largemouth traveled less than 7 miles, whereas 60% of smallmouth traveled greater than 7 miles. Smallmouth heading back up river outnumbered those that moved into the lake by a 3 : 1 ratio.

2. Status of the Wisconsin River Lake Sturgeon Fishery

Harvest records exist on the lake sturgeon fishery of Lake Wisconsin(9,000 acres), Wisconsin River to Dells (35 miles) and the lower Wisconsin River (93 miles) since 1983. Regulations have changed over time to reflect increasing evidence that the fishery is being over harvested. The minimum size limit increased from 45" to 50" in 1991 and alternate year size limits of 50" and 70" began in 2000.

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In 2005, a 50"size limit season, an exploitation rate of 30% was obtained on adult lake sturgeon below the Sauk dam. At that level, this population will not be sustained. An emergency rule of a statewide, 60" minimum size limit was implemented for the 2007 fall hook and line season. This will reduce the 70-80 fish harvested below the Sauk dam to about 10, which is an acceptable exploitation rate of 5%.

In the fall of 2007 16 adult lake sturgeon were implanted with radio tags and monitored to track their movement in the lower Wisconsin River. This will allow determination of the origin of the Sauk dam fish which are being harvested. Previous tagging data indicates some migrate from the Mississippi River, some come over the dam from Lake Wisconsin and some may well be resident fish. The study will also help determine where the lower Wisconsin River fish might spawn, as recent information indicates they move from the dam area during the spawning period.

Current harvest on Lake Wisconsin and the river up to the Dells has been stable and is felt to be at an acceptable level. A population estimate is in the process of being determined but will required a few more years of marking and recapture data.

3. Analysis of the No-Harvest Slot Regulation

The No-Harvest 20-28" slot regulation on walleye and sauger in Lake Wisconsin was enacted in 2002. In 2005 the Department extended the sunset date on its evaluation until 2014. The primary evaluation method on Lake Wisconsin is angler diary information. Through 2007 the angler catch data indicates the presence of 20"+ walleye and sauger since enactment versus virtually absence of these fish through the 1990s. This has occurred despite four years of low walleye recruitment during 1998-2001. DNR netting data comparing 1995 to 2005 on Lake Wausau shows a marked presence of 20"+ walleye, following just 3 years of the rule change. In 2012 the regulation evaluation will be reviewed by DNR and if approved, presented as a question on the Conservation Congress Spring Hearing to allow it to continue.

The following studies are being conducted by Robert Hansis, WI DNR, 3911 Fish Hatchery Road

Fitchburg WI 53711. Phone: 608-275-3304, Email: Robert.Hansis@wisconsin.gov.

1. RECONNECTING A STREAM TO ITS FLOODPLAIN ON THE EAST BRANCH OF THE PECATONICA RIVER (Update)

-The streambanks withstood severe flooding; the project site survived runoff from a 9.5" rainfall over the entire watershed during August.

Vegetation response was tremendous. Over 50 native species were inventoried after one year. Prairie cordgrass, the "keystone" species of the area, is off to a good start.

-The coconut logs that were installed along the stream edges performed their function.

-Stream velocity almost doubled by removal of obstructions.

-Minor water temperature changes occurred after the construction.

-Very little sediment was released to the creek.

-No noticeable changes to stream nutrient levels were detected during first year.

-Seven frog and toad species were present in the year following construction.

-It appears that the project will not be overwhelmed by new inflowing sediment.

-Fish, bugs and habitat surveys are scheduled for '08.

UW-Madison has submitted grant proposals for *Quantifying and manipulating stream-aquifer interactions at a stream restoration site*

Finally, we have 3 similar projects in the planning phase for construction in the next two or three years.

The following studies are being conducted by Mike Hughes, Wisconsin Cooperative Fishery Research Unit, 800 Reserve Street, Stevens Point, Wisconsin 54481, Mike.Hughes@uwsp.edu, Phone: 715-346-2178; Brian Sloss, Wisconsin Cooperative Fishery Research Unit, Wisconsin, Brian.Sloss@uwsp.edu, Phone: 715-346-4023; Matthew Mitro, Wisconsin Department of Natural Resources, Wisconsin, matthew.mitro@wisconsin.gov, Phone: 608-221-6366

1. Genetic Diversity of Wisconsin Brook Trout in the Driftless Region: The Suitability of Ash Creek's Brook Trout Population as a Genetically Appropriate and Genetically Representative Source of Wild Broodstock

In 1995, the Wisconsin Department of Natural Resources began a wild trout stocking program. The program aims to capture broodstock from a wild source population, spawn these fish in a hatchery, return the broodstock to their source population, and stock the offspring in other streams. Selecting a genetically appropriate and representative source of broodstock is a critical decision toward

maintaining the genetic diversity within and among managed populations. Since 1999, Ash Creek (Richland Co., WI) has served as the sole source of broodstock for brook trout (*Salvelinus fontinalis*) in southwestern Wisconsin. It was selected because it contains a healthy, naturally reproducing population. The genetic characteristics of Ash Creek's population and its relationship to other brook trout population in southwestern Wisconsin are unknown. To determine the appropriateness of Ash Creek as a brood source, the genetic diversity of Ash Creek brook trout and 13 other southwestern Wisconsin brook trout populations were characterized using 12 microsatellite loci. High levels of population divergence were found among populations; however, the majority of divergence appeared to be unrelated to the populations' geographical proximities to one another. The failure to observe geographical patterns within the genetic structure of brook trout is most likely attributed to two factors: (1) populations are small and reproductively isolated with very limited gene flow between them and, therefore, highly influenced by the stochastic nature of genetic drift, and, (2) populations have been impacted by historical stocking events and the introduction of exogenous genes into the native gene pool. As a consequence, the determination of Ash Creek's population as a genetically appropriate and regionally representative broodstock is difficult. Given the complexity of the mechanisms driving population genetic structure in the southwest region, it's vital that restoration efforts attempt to minimize adverse genetic changes to recipient wild populations. The most genetically conservative stocking approach would be to manage supplementation efforts in accordance with drainage boundaries. While such a strategy still carries some genetic risks, it reduces the overall risks across Wisconsin's southwestern region as a whole and ensures the likelihood that a sufficient number of populations will remain viable to enable brook trout to persist in the short-term and diversify in the future.

2. The Genetic Impacts of Broodstock Sampling Strategies on a wild brook trout population.

In 1995, the Wisconsin Department of Natural Resources began a wild brook trout stocking program to improve the quality of hatchery-reared trout and subsequently improve rehabilitation efforts of brook trout populations in the southwestern region of Wisconsin. In this program, wild adults are captured from Ash Creek (Richland Co.) in the fall, transferred to a hatchery, spawned, and returned to their home stream in the late fall/early winter. The number of fish collected from this population is a critical decision for the wild trout stocking program that influences the levels of genetic diversity and the demographic characteristics of the propagated fish and Ash Creek's remaining in-stream population. Currently, ≥50% of Ash Creek's adult population is removed annually to meet hatchery production goals. The removal of this many fish could have genetic (increased rates of genetic drift and/or inbreeding), and demographic (reduction in the population's fecundity and adult size structure) consequences that would threaten the viability and sustainability of Ash Creek's population. The goal of this study was to evaluate these potential consequences. The first

objective was to determine if there were measurable differences in genetic diversity levels and/or size distributions between hatchery-spawned brook trout and Ash Creek's remaining instream adult population. The second objective was to determine if there were any measurable differences between the instream adult brook trout and their subsequent progeny. Genetic and morphological (length and weight) measures were taken from (1) hatchery broodstock, (2) Ash Creek's remaining adult population, (3) hatchery-reared young-of-year (YOY), and (4) Ash Creek's in-stream YOY. The genetic characteristics within each component were characterized and compared using 12 microsatellite DNA loci. Levels of genetic diversity adult components (broodstock and in-stream fish) did not differ over the two years indicating that despite the large proportion of adult fish removed, the remaining in-stream adult components retained genetic diversity. A size bias was observed with larger fish being used as broodfish. The reduction of Ash Creek's adult population size resulted in no observable reductions in levels of genetic diversity within or among the yearly in-stream YOY components. Levels of genetic diversity among the hatchery and in-stream YOY components were similar, although, the effective number of breeders that produced the hatchery components was approximately seven times larger than that of the in-stream components. This skew likely reflects a combination of the reduction in the size of the number of in-stream breeders and a lower variance in family size within the hatchery. These data suggest that current broodstock selection strategies have had no detectable short-term impacts on genetic diversity levels within Ash Creek. Several results of this study raise concerns that the long-term impact of such strategies will be detrimental. The removal of larger brook trout and subsequent reductions in the mean body size of Ash Creek's in-stream breeding population will have negative consequences to the reproductive potential (lower mean fecundity) and genetic integrity (lower mean number of breeders).

The following studies were submitted by Barb Scudder, USGS, Phone: 608-821-3832, Email: bscudder@usgs.gov or visit http://wi.water.usgs.gov/nawqa/index.html

The Western Lake Michigan Drainages study unit of the USGS National Water Quality Assessment (NAWQA) program is in the report writing phase. Sampling for water quality, habitat, and stream biology continues on a limited basis at several sites. During 2002-5, additional national NAWQA studies examined (1) ecological effects of urbanization on streams, and (2) bioaccumulation of mercury in stream ecosystems. The urbanization effects study sampled 30 streams in the Milwaukee and Green Bay areas for assessment of changes in water flow and chemistry, habitat, and communities of algae, benthic invertebrates, and fish. The mercury study focused on better understanding the effects of source strength, mercury cycling, and food-web interactions on bioaccumulation of mercury; three Wisconsin streams were included. Reports are planned for release in 2008. For more information, contact Barb Scudder (em: bscudder@usgs.gov, ph: 608-821-3832)

In 2008, the USGS Wisconsin Water Science Center is continuing a cooperative study with the Milwaukee Metropolitan Sewerage District (MMSD), the Wisconsin DNR, SE WI Regional Planning Commission, and local universities. In 2004, 15 sites on 9 Milwaukee area streams were sampled for water chemistry to provide a baseline to facilitate future impact evaluations. In addition, stream habitat and community composition of algae, benthic invertebrates, and fish were assessed in late summer/early fall 2004 and 2007, and will be assessed again during the same time period in 2010 as part of a long term monitoring effort that also includes water chemistry measurements. Semi-permeable membrane devices and toxicity studies were included in sampling at a subset of six sites in 2007. A report on the 2004 sampling is available at http://pubs.usgs.gov/sir/2007/5084/; a factsheet on 2007 biological sampling is planned for late 2009. For information contact Dave Graczyk (em: dgraczyk@usgs.gov, ph: 608-821-3840).

The Great Lakes Aquatic GAP (GLGAP) project began in 2001 as part of the USGS National Gap Analysis Program with current projects in WI, MI, and NY; a completed project in OH; a parallel and cooperative effort in IL, and future projects in MN, IN, and PA. The objectives of GLGAP are to 1) map and model fish species occurrence and abundance in streams using landscape scale habitat, 2) classify aquatic habitats in rivers and coastal margins, 3) identify gaps in conservation of species and habitats, and 4) develop data sets for use by natural resource organizations for aquatic resource assessments, planning, monitoring, and management. The GL GAP project has been working closely with state natural resource agency partners at WI DNR, MI IFR, IL DNR, and NY DEC to accomplish these objectives. Stream habitat has been characterized for individual stream reaches (confluence-to-confluence) using 1:100,000 National Hydrography data (NHD) to characterize local channel, and both local and network watersheds and riparian buffers. Fish sample collections have been compiled from State Natural resource agency databases and linked to the stream habitat characteristics using a geographic information system (GIS). Models have been developed to predict summer stream temperature (ie. July mean, maximum daily mean, etc.), and exceedence flows (April, August, and annual) for individual stream reaches. Additional models have been developed to characterize fish species – habitat relations and predict fish species occurrence and abundance at sampled and un-sampled stream reaches in the study area using classification and regression tree and artificial neural networks. Models have been developed for more than 60 fish species in WI, 90 species in MI, and more than 100 in NY. A hierarchical classification of riverine ecosystems is currently underway and should be completed by fall 2008. Results of habitat characterization, fish modeling, and classification should be available for distribution by December 2008. In addition to the above listed objectives, the results have been used to rank all stream reaches with a disturbance score and identify least impacted stream reaches for possible future sampling in both WI and MI. The data are also being used to help identify habitat for endangered dragonflies, as well as prioritize restoration efforts by identifying strategic road crossings, whose reconstruction would most benefit stream fishes by restoring stream network connectivity. The Great Lakes project is being

coordinated by the USGS Wisconsin Water Science Center. For more information contact Jana Stewart (email: jsstewar@usgs.gov, ph: 608-821-3855).

The following abstracts were copied from the Wisconsin State AFS Chapter meeting which was held February 5-7, 2008 in Wausau, WI.

Bruch, Ronald and Shannon Davis-Foust, Wisconsin Department of Natural Resources, Oshkosh; Mike Hansen,
University of Wisconsin-Stevens Point; Steve Campana, Bedford Oceanographic Institute, Dartmouth, Nova Scotia, Canada

Validation of true age of Lake Sturgeon and implications for population and harvest management

Age data are likely the most important data collected on managed fish populations, used to estimate growth and mortality rates, annual recruitment in statistical catch at age models, and average age of maturity. Ages of sturgeon have been estimated by counting growth marks on a variety of boney structures including scutes, operculum, caudal fulcra, otoliths and pectoral fin ray sections. Although the structure of choice for the last 100 years has been pectoral fin ray sections, these structures have never been fully validated to verify the ages estimated from them are the true age of the fish sampled. As k-selected species, sturgeon exhibit slow growth, late maturation, long life-spans, and are very sensitive to recruitment overfishng. The validity of ages estimated from growth marks on pectoral fin ray sections of lake sturgeon from the Winnebago System in east central Wisconsin was examined through mark and recapture of known age fish, and by comparing bomb radiocarbon levels in otolith cores to a reference time series of bomb radiocarbon developed for Lake Winnebago. Ages estimated from pectoral fin ray sections were found to be relatively accurate for fish up to 13-15 years of age (98-103 cm, 39-41 in), but generally underestimates of true age for fish older than 15 years of age. Age estimation error for fish older than 15 years was multiplicative and increased as the true fish age increased. True age was related to estimated age for unsexed samples by the power function True Age = 1.35703*(Est Age^0.9606). Validated true age data for lake sturgeon from Winnebago system were used to develop maturity and mortality models. The average age of maturity of female lake sturgeon was 27, with age of full recruitment to the spawning stock at 39, and the average age of maturity for males was 19 with full recruitment at age 30. Average total instantaneous annual mortality (Z) and total annual mortality (A) for lake sturgeon in the Winnebago System for the period since the implementation of a harvest cap system to control exploitation, 1997-2006, were estimated to 0.1219 and 11.5%. Instantaneous natural mortality (M) was estimated to be 0.0715 using Pauley's equation, and the average instantaneous fishing mortality rate (F) was estimated to be 0.0505. Length-true age data did not fit a von Bertalanffy growth model well, so Faben's method using long-term mark recapture was used to

estimate the VB growth coefficient, k, for females 6 years and older at 0.0257, and for males 6 years and older at 0.0140. A likelihood ratio test found a significant difference between growth of female and male lake sturgeon ≥ 6 years of age. Lake sturgeon life history parameters used in management decision making need to be based on accurate age estimation data as the use of inaccurate age estimates has been shown to significantly increase the risk of over-harvest in fisheries.

Cross, Benjamin K. and Michael A. Bozek
Wisconsin Cooperative Fishery Research Unit, Stevens Point
Matthew Mitro
Wisconsin Department of Natural Resources, Madison

Increasing suitable trout stream length in central Wisconsin through riparian vegetation management

Stream temperature is known to be a major factor limiting trout distribution in Wisconsin's streams. Elevated summer stream temperatures can become unsuitable for trout and accordingly limit the length of stream they can occupy. Riparian vegetation management offers possibilities for mitigating these elevated temperatures through the reduction of solar radiation provided by shade. The objective of this study is to determine the amount of riparian vegetation cover that would maximize the length of stream thermally suitable for trout. We assessed six central Wisconsin trout streams totaling 57.3 km in length that transition from thermally suitable to unsuitable for trout. Study streams were broken into segments based on riparian vegetation type and density. Each segment was surveyed to summarize channel and riparian vegetation characteristics affecting the streams' heat budget. Using stream temperature data recorded at a maximum of 1 km intervals, we constructed thermal profiles for each stream based on weekly mean maximum stream temperatures. Study streams were then modeled using present stream characteristics to calibrate the model. Different amounts of canopy cover that resulted in a range of shading (0, 50, and 100 percent shade) were used in the model to predict the length of stream suitable to trout. Preliminary results showed that stream shading from riparian vegetation resulted in large increases in the lengths of streams that would be thermally suitable for trout. This study provides insight into the length of stream suitable to trout that could be increased by adding riparian vegetation cover in streams currently limited by thermal habitat requirements.

Donofrio, Michael
Wisconsin Department of Natural Resources, Peshtigo, WI

Retention of T-bar anchor tags and passive integrated transponder tags by Lake Sturgeon in the Menominee River, WI

Michigan and Wisconsin DNR have cooperatively assessed the lake sturgeon population in the lower Menominee river for several years. The agencies have utilized a variety of marks to identify lake sturgeon for population estimates. This paper focuses on two widely used marking techniques, T-bar anchor tags and Passive Integrated Transponder (PIT) tags. Gill net and electrofishing surveys produced 554 lake sturgeon in 2005-06. We recaptured 43 lake sturgeon in 2005-06 that were tagged in 2005 with T-bar and PIT tags. Retention of T-bar anchor tags was lower than PIT tags over a period from 2-18 months. The difference in the retention rates impacted the population estimate of this lake sturgeon population. Sufficient numbers of lake sturgeon were recaptured to develop population estimates. Population estimates calculated using a Chapman adjusted Petersen method for sturgeon larger than 107 cm, with PIT tags as recapture mark, was 1,679 and a 95% confidence interval of 1,250 to 2,252. However, if the T-bar tag loss was not factored into that same estimate, then it would be 2,256 with a 95% confidence interval of 1,604 to 3,162. The T-bar tag population estimate was 34% higher than the PIT tag estimate. Based on these findings, future surveys will not use T-bar anchor tags as a marker to determine population estimates for this fishery.

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Stream fish distribution and abundance: Estimating changes from 1850 to the present

Very little is known about fish distribution in Wisconsin streams prior to European settlement. However, it seems almost certain that major changes have occurred since then because of the transformation of the Wisconsin landscape by agriculture, forestry, and urbanization. We used a newly developed, GIS-based, watershed-scale, stream model to quantify current relations between land cover and fish occurrence in Wisconsin streams. We then applied this model to land-cover data gathered by the first surveyors of Wisconsin during the mid 1800's, before major land conversion to agriculture, forest clear-cutting, or urban development, to estimate pre-European-settlement fish distribution patterns. The stream model estimated that stream baseflows were generally higher and summer water temperatures were lower in the 1800's than at present. Coldwater species such as trout and sculpins were more widespread and were found in regions where they are now absent, such as near the city of Green Bay. In 1850, brook trout were predicted to occur in about 29,900 km of stream (34.5% of 86,900 km in Wisconsin) versus 17,900 km (20.5%) today, a 40% decline. Conversely, warmwater species were less widespread in the past. Environmentally sensitive warmwater species have shown smaller increases from the 1800's to the present than tolerant species because the decreases in

baseflow and increases in water temperature that occurred over the last 150 years were often associated with declines in water or habitat quality. For example, the distribution of the sensitive carmine shiner increased 4,400 km, from 4,700 km (5.5%) in the pre-settlement period to 9,100 km (10.5%) now, whereas the tolerant green sunfish increased 10,900 km, from 2,300 km (2.5%) to 13,200 km (15%). The stream model is an exciting new tool that allows us to reconstruct the fish faunas of Wisconsin streams before they were modified by human activities.

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Survey of lower Wisconsin River oxbows: Lakes the river made.

An extensive network of oxbow lakes straddles the 92-mile Lower Wisconsin River in southwestern Wisconsin. The oxbows reflect a floodplain free of dams and impoundments. These unique lakes often support an unusual blend of both lake and riverine fishes, forming diverse lentic ecosystems. While scores of glacial lakes and impoundments throughout Wisconsin have been the focus of intensive monitoring and management, oxbows like those associated with the Lower Wisconsin River have been largely ignored. Recent WDNR and River Planning Grant funded surveys of the river's oxbows have revealed surprising populations of State Endangered starhead topminnows and other rare species. These new species accounts likely reflect a dearth of surveys, but long-term trends of increasing groundwater levels and stream flows may have also expanded habitat for these species. The preliminary surveys suggest that oxbows lacking either tributary inflow or groundwater inputs are devoid of fish. Factors that may alter water quality and supplies beyond the river floodplain may determine the future of these oxbow fisheries.

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The changing global energy landscape: A threat to wild trout

Trout fisheries in Wisconsin have improved in recent decades following improvements in agricultural land use and the implementation of energy-intensive stream restoration projects. A changing global energy landscape, however, will challenge the gains that have been made in protecting and restoring wild trout populations and our ability to manage for wild trout in the future. World oil supply

and demand curves are converging. When supply of non-renewable fossil fuels is no longer sufficient to meet demand, fish populations and our ability to manage them may be impacted from two directions: the exploitation of alternative sources of energy may reverse environmental gains, and increasing costs and declining revenue sources may restrict the work that can be done by natural resource agencies. We are currently seeing a push for expanded sources of energy to meet growing demand and to sustain economic growth. In the Midwest, there has been a rapid push towards increasing the production of biofuels such as corn-based ethanol, which may result in land moving out of Conservation Reserve Program protection and into production. I will draw upon recent research to show how such changes in land use can be detrimental to trout conservation. Rising energy costs associated with limits to supply will impact angler and agency budgets. As the cost of travel increases, angling may become more local, thereby changing economic impacts and effort and harvest dynamics. Agency budget constraints will limit energy-intensive management activities, such as hatchery production of trout and instream habitat restoration. I will use recent research on instream habitat restoration and fish distribution models to show how agency resources can be better allocated to maximize trout conservation success as the world energy landscape changes.

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Field-based estimates of thermal tolerance limits for trout: Incorporating exposure time and temperature fluctuation

We used temperature and fish data from streams across Michigan and Wisconsin to estimate thermal tolerance limits for brook trout *Salvelinus fontinalis* and brown trout *Salmo trutta*. Tolerance limits were estimated for the maximum daily mean (MEANT), maximum daily maximum (MAXT), and maximum daily range (RNGT) at exposure lengths of 1, 3, 7, 14, 21, 28, 35, 42, 49, 56, and 63 d. We found no difference in the upper thermal tolerance limit for brook trout and brown trout. For time periods of 1 to 14 d, the upper temperatures tolerated by trout decreased rapidly from 25.3ºC to 22.5ºC for MEANT and from 27.6ºC to 24.6ºC for MAXT. For time periods from 21 to 63 d, the upper temperatures tolerated by trout declined more gradually from 22.1ºC to 21.0ºC for MEANT and from 24.2ºC to 22.9 for MAXT. The 7-d upper tolerance limit was 23.3ºC for MEANT and 25.4 for MAXT. The maximum RNGT tolerated by trout varied as a function of mean temperature and length of exposure. Our findings suggest that chronic temperature effects as well as temperature fluctuation play an important role in limiting trout distributions and, therefore, should be considered when developing management objectives and water quality standards.

Pratt, Frank
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Tame, wilder, wildest

The author gives a historical overview of wild trout in streams of Sawyer and Rusk County. He begins with the 1880s logging era and the early decline of native brook trout and the introduction and establishment of brown trout. Then he discusses wild trout management during his 34 year tenure. He draws on field work from his initial 1981 inventory of the Namekagon River, the 1982-84 evaluation of domestic trout stocked in seven Class 2 streams, the 1994-97 wild trout evaluations on the Phipps reach of the Namekagon, and most recently his 2000-2007 evaluations of stocked Timber Coulee strain, brown trout. The recent trend appears to be a reascension of brook trout and a decline in wild brown trout. He speculates on the future prospects of both species in the face of global warming. He advocates for continued beaver control on cold-water tributaries, watershed protection, and genotyping of wild stocks of both species. He advocates studying and culturing unique stocks of wild, naturalized brown trout as a hedge against climate change. By 2100, he predicts a low grade re-emergence of brown trout in big water habitats, and another decline of brook trout - with their range being compressed into only the smallest, coldest, most groundwater -dominated tributary habitats.

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Lake Sturgeon management on the lower Wisconsin River.

A popular fall hook and line angling season for lake sturgeon, *Acipenser fulvescens,* occurs on Lake Wisconsin and the lower portion of the Wisconsin River. Sturgeon are vulnerable to overfishing due to their extremely slow reproductive cycle; most fish do not mature until 50”+ and 20 years of age, with females spawning only once every four years. Mandatory harvest registration has occurred since 1983 with regulations becoming more restrictive with increased harvest. An increase in sturgeon registered below the Prairie du Sac (PDS) dam began to occur in the mid 1990s, rising from an average harvest of 17 during 1983-1993 to 34 from 1994-1999 and 68 during alternate 50” years (2000-2006). In 2005, crews began gill netting adult lake sturgeon below the PDS dam to estimate population levels and angler harvest rates. Population estimates have fallen from 278 in 2005, 201 in 2006, and to 169 in 2007. Fin rays were taken to determine age/growth and total annual mortality, which was estimated at 18%. Gut samples on harvested fish were collected by registration stations to determine sex and stage of maturity. Females dominate the harvest; 74% harvested below the PDS dam were female. Additional information

concerning spawning location, residence time at the PDS dam, and overall use of the Wisconsin and Mississippi Rivers will be addressed through a movement study started in the fall of 2007.

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Stream channel succession and trout habitat formation in central Wisconsin agricultural drainage ditches

In the early 1900's, the Buena Vista Marsh, Portage County, Wisconsin, was ditched to create suitable agricultural lands from the extensive wetland complex. In addition to draining the surrounding fields, these ditches now provide a small stream trout fishery. Ditches are currently maintained (re-dredged) by the Buena Vista Drainage District on an "as-needed" basis, recurring approximately every 25-50 years. The purpose of the study was to evaluate ditch morphology, terrestrial and stream habitat, and channel formation using ditches of varying ages to provide insight into stream recovery processes. Habitat was evaluated using transects located at 5 different channel ages spaced approximately 10 years apart. Along channel cross-sections, habitat was measured using terrestrial and in-stream quadrats for substrate, velocity, and riparian and aquatic vegetation. Study reaches were also electrofished to obtain estimates of fish populations. In-channel terrestrial vegetation was significantly correlated with channel age, and riparian vegetative cover significantly affected the rate of habitat formation among channel ages. Aquatic vegetation played an important role in channel formation by trapping sediment, creating a meandering center thalweg. Fish communities were mixtures of warm-, cool-, and coldwater fishes, and more influenced by water temperatures than structural habitat. These results clearly demonstrate the natural processes that help channels form and should be used to promote an inter-agency plan for managing these ditches for all of the agricultural, groundwater, and fishery resources.

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Active vs. passive channel restoration following dam removal; a comparison of approaches

Channel design techniques have increasingly been applied to relic impoundments following dam removal. Removal of the physical barrier may only meet half of the expectations for many projects, with the balance made up by restoration of a lotic channel within the former impoundment. "Active" and "passive" channel restoration characterizes the two approaches most widely

used in dam removal. Passive restoration allows the channel to evolve from an early successional, head-cut driven form to an anticipated stable late successional form utilizing little, if any, mechanical means. Active restoration attempts to accelerate natural succession to provide a basis to attain a late successional channel condition. Though the late successional condition is the end objective regardless of the method used, the means to attain this goal are quite different. This paper compares these two methods and the effects on physical, biological, economic, and social metrics along the path to a late successional channel condition. Finally it provides recommendations for the use of the two methods within the context of contemporary, budget-driven, dam removal projects.

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Impacts of road/stream crossings in Wisconsin and why DNR review does not always prevent habitat fragmentation on recently constructed projects

Although the scientific literature and knowledge of river / stream dynamics and aquatic organism passage requirements continues to grow, not much is known about the ecological impact of the approximately 62,000 road stream crossings in Wisconsin. The frequency that culverts and bridges are placed above the elevation of the streambed and the amount of stream constriction at crossings is estimated using data collected by DNR staff and volunteer monitoring efforts around the State. In addition to estimating the extent of the problem on the landscape, in 2007 a field evaluation was conducted in Florence and Forest Counties to determine if DNR regulatory review addresses the negative impacts that road crossings can have on a stream system. The results of the evaluation show that approximately 20% of the new structures were barriers to a 7 inch brook trout. The law and policy that guides the DNR review of bridges and culverts on public highways uses vague language regarding the extent that crossings can influence the passage of water, wood, sediment, and aquatic organisms. The importance of continued evaluation efforts to develop specific language and support for new policy guiding the installation of road/stream crossings will be emphasized.

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Effects of tributary spatial position, urbanization, and multiple low-head dams on warmwater stream fish community structure in a Midwestern stream

A survey of stream fish communities was conducted in the upper Des Plaines River watershed in Illinois and Wisconsin to determine the current status of species distribution, and to evaluate the effects of tributary spatial position, urbanization, and multiple low-head dams on fish species diversity and species composition. Forty-eight sites upstream of Salt Creek in Illinois to the headwaters in Wisconsin were surveyed between 2002 and 2004. We found that fish species diversity decreases along an urban gradient as agricultural land is replaced by urban land. In addition, significant differences in the fish species diversity were attributable to tributary position within the drainage network. Specifically, we found significantly lower fish species diversity in mainstem tributary streams located lower in the drainage network than in similarly sized streams located in the headwaters of the drainage area. Fish species composition, determined by multivariate principal component analysis, also showed significant differences among stream position within the drainage network. Fish species composition among undammed tributary sites also was found to be significantly affected by urbanization. In contrast, the presence of low-head dams fragmenting tributary streams was a significant determinant in fish species composition as opposed to urbanization. In addition, the presence of multiple low-head dams on the mainstem had a cumulative detrimental affect on fish species diversity, which decreased along an upstream to downstream gradient. Therefore, it is important to consider tributary spatial position within the drainage network, the amount of urbanization, and the number and locations of dams when characterizing the structure of warmwater fish communities, especially in relation to the development of restoration plans in highly urbanized or urbanizing watersheds.