Rivers and Streams Technical Committee

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

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. Dr. Hoagstrom recently completed a project updating South Dakota fish assemblages for the first time in over fifty years and found 111 species with 89 being native and therefore 22 were nonnative species. Some of the findings of this work were that 36 species were lost from one or more drainages, six species were restricted to just one drainage, and eight species had gone extinct in the state since previous inventories. Dr. Berry and his students completed a validation and accuracy project of the fish distribution models created from the aquatic gap analysis program. They found that most models performed well and suggested that this information would allow a measure of confidence on where to focus conservation efforts.

Black Hills Coldwater Streams

Dr. Chipps is proposing work on the streams dealing with *Didymosphenia geminata*. There is continued attention to the stream trout fisheries being focused on by South Dakota Game Fish and Parks.

SD GFP is also working on a reconstruction project in Spearfish Canyon at the site of the 1917 Hometake Mining Company Savoy intake on Spearfish Creek. They will be renovating the old low-head dam to make a fish passable structure by means of five step-pools below the new structure. It will be built to look like it was built with limestone in the manner of a rock fall and creating an upstream backwater pool and rapids.

In an attempt to “manage around” an infestation of *Didymosphenia geminate* South Dakota GFP is starting a nutrient-enrichment project this spring that involves artificially increasing total phosphorus in a 3-kilometer section of Rapid Creek immediately below Pactola Dam. The goals of this project are to stimulate productivity, both primary and aquatic insect, and to ultimately increase brown trout growth and survival. The brown trout in Rapid Creek has bottlenecked with mostly YOY and age-1 fish and very few adults since didymo was first reported in 2002. This stream was one of the top two brown trout fisheries in the state in 1990s. Didymo has not hampered reproduction but it has had an affect by greatly restricting recruitment beyond age-1. This impact appears to be due to didymo altering the aquatic insect community and thus impacting the food source for the trout. The nutrient enrichment project will run from April through August for the next three years. This project will also entail collecting water quality, periphyton, macroinvertebrate, and fish population data.

In the Black Hills in general, fish populations are low. This is due to the persistence of a drought for the last 7 (starting year 8). So, most fish populations in the Black Hills are at the low end of their 15-20 year cycle due to the lack of stream flow and elevated water temperatures.

Prairie Warmwater Streams

In the warmwater streams of the prairie areas in South Dakota, Dr. Troelstrup and students are working on invertebrate biomonitoring in eastern South Dakota. Dr. Berry and students are doing work with fish biomonitoring in the lower James River in the eastern part of the state, but using fish as bioindicators in the western part of the state may be difficult due to the tolerant fish assemblages in the plains streams and the intolerant assemblages in the Black Hills streams. The Flandreau Santee Sioux Tribe is working on a project dealing with mercury in the Big Sioux River.

Missouri River

The Missouri River receives a fair amount of attention in regards to research in the state. The long-term monitoring and assessment program (LTMAP) has an emphasis on pallid sturgeon and is on going. As an additional part of the LTMAP there are investigations into the fish community that takes place at a different time of year than the pallid work. Studies are being conducted under the tutelage of SDSU professors investigating the invertebrate communities and the relationship to sturgeon gut contents. Also, there is ongoing monitoring of Asian carp (silver and bighead). They have not been collected upstream of Gavins Point Dam.

North Dakota

Warmwater Streams

Working on white sucker phenotypes and genotypes in the Red River drainage is a project that Dr. Clark and a student are working on from North Dakota State University. 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 were collected. This project entails looking into 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. In the course of this project, they are collecting chemical, chlorophyll-a, macroinvertebrate, fish, and physical habitat data. 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.

ILLINOIS RSTC STATE REPORT – SPRING 2007

ILLINOIS AFS

Illinois' AFS chapter has been busy this year. In addition to updating our membership database, which was a major undertaking, we've started a few new initiatives. The first is to award student research grants annually. The second is to create a professional travel grant program. Third, we added another student sub-unit at Eastern Illinois University, which brings the total to three in Illinois. Additionally the Chapter voted to increase our Executive Committee to include two annually elected Member-at-large positions. Finally, we've added a committee to provide updates on the implementation of Illinois' Wildlife Action Plan. IL AFS is one of 26 "core partners" in the state charged with tracking implementation of the Plan.

The Illinois Chapter held its annual meeting at Lake Shelbyville's Eagle Creek Resort February 27 through March 1. In addition to a full slate of excellent papers, a successful raffle was held to raise student funds, student travel awards were given to four students.

IL AFS provided a letter supporting the IEPA / IDNR joint proposal fro dissolved oxygen standards (see below).

ILLINOIS NATUAL HISTORY SURVEY

Survey staff Kevin Cummings, Chris Mayer, and Jeremy Tiemann along with and IDNR Office of Resource Conservation staff, John Schwegman, Bob Schanzle, and Bob Szafoni are conducting freshwater mussel surveys across the state. We have an upcoming publication:

> *Tiemann, J.S., K.S. Cummings, and C.A. Mayer. 2007. Updates to the distributional checklist and status of Illinois freshwater mussels (Mollusca: Unionacea). Transactions of the Illinois State Academy of Science 100(1):107-123.*

Trent Thomas, John Epifanio, and Jeremy Tieman are conducting surveys for the state-threatened redspotted sunfish, with hopes of reintroducing it into the Sangamon River basin.

A recovery project of the fed-listed clubshell mussel starting with logperch (fish host) survey of the Wabash River basin.

Mike Retzer of the Illinois Natural History Survey has initiated a project funded by the State Wildlife Grant program to reintroduce and establish several native fish species to restored floodplain lakes along the Illinois River. Mike has partnered with the Illinois Department of Natural Resources, The Wetlands Initiative, and The Nature Conservancy of Illinois to establish historic fish communities to the Hennepin-Hopper Lake system (Putnam County), Emiquon (Fulton County), and Spunky Bottoms (Brown County). The purpose of the project is to introduce 4-6 native fish species to each of these areas along the Illinois River as part of the restoration of the aquatic communities. In addition to the establishment of native species, the project will provide valuable research and educational opportunities.

ILLINOIS DNR

Back in 2004, Illinois Association of Waste Water Agencies (IAWA) proposed a revision to the D.O. standard for Illinois. Current standard is 5.0 ppm minimum year-round, which most agree needed some type of revision based on USEPA 1986 guidelines. Their original proposal included a reduction of the minimum standard to 3.5 ppm, with a higher standard of 5.0 ppm during the period from March through June, to provide added protection for early life stages. They also included a recommended 7-day mean of means of 6.0 ppm during the early life stage present period and a 4.0 ppm, 7-day mean of minima for July-February when they claimed early life

stages were either absent or only composed of very tolerant, later spawning species. IDNR and IEPA produced a counter proposal using information from the statewide fisheries data-base and input from field biologist. This joint proposal included a dual level approach with enhanced protection for the streams with cooler water, D.O. intolerant species as determined by existing literature and field data. Both levels included an early life stage present period, but extended it to the end of July, one month longer than the IAWA proposal. The one month extension was supported by published life history information and extensive experience from statewide field biologist. The Level 1, enhanced protection standard for cool water communities included a daily day minimum of 5.0 ppm from March through July with a 6.25 ppm 7-day mean of means. Level 1 protection for early life stages absent was 4.0 ppm. The level 2 standard for warmer water communites was similar the statewide proposal by IAWA, 5.0 ppm aily minimum for early life stages present and 3.5 ppm daily minimum for the early life stages absent. There have been a number of hearings before the Illinois Pollution Control Board, and a mound of paper submitted as evidence, concluding at the end of 2006. Currently the Board is still deliberating and no ruling has come forth.

(Ann Hogan, Watershed Section - Springfield) After several years in development, Illinois has a large GIS databases of landscape level attributes to stream arcs (i.e., confluence to confluence stream reaches). Local channel, riparian, and catchment attributes were derived, as well as total drainage riparian and catchment scale variables. Additionally, flow, temperature, and fish models have been developed. We're currently in the process of using a subset of these attributes to group stream segments into similar types of streams. Our work is very similar to what is being done in MI and WI under a region EPA STAR grant led by Paul Seelbach.

In July 2006, we began a three year project to document location and conditions of coolwater streams in Illinois. Prior to this project, no comprehensive assessment has been conducted statewide with the exception of an initial effort that used the presence of indicator coolwater fish species and ground water potential to identify potential coolwater stream reaches. More field-based information is needed to document the extent (e.g., specific segments or large reaches of stream), thermal profile, and other contributing factors (e.g., riparian cover, instream vegetation) influencing these conditions. The main outcome of this project will be a map of validated coolwater stream segments along with mapped areas of potential coolwater stream segments that stakeholders can use for planning, protections, and restoration efforts.

In August 2006, we began a three year project to develop a new multi-metric habitat index for wadeable streams. This new index is needed because existing methods for sampling stream habitat in Illinois are too time consuming for staff to routinely collect, or are not sensitive enough to detect meaningful differences in stream quality. Through this project, we will develop a qualitative habitat index that will allow IDNR resource managers to rapidly assess a stream's habitat quality, thereby allowing managers to track changes in habitat quality over time. Last year we sampled approx 75 sites. We're hoping for at least 125 more this year. Three graduate students from Eastern Illinois University are also funded on this project. Their research will link the biological responses to changes in habitat, assess impacts of bridges on the representativness of a sampling reach, and assess how representative habitat measured over a reach is to greater stream distances.

Also in August 2006, we began updating an evaluation of streams in Illinois based on aquatic biodiversity and biotic integrity. Previous stream rating processes such as Biological Stream Characterization (BSC) and Biologically Significant Streams (BSS) have not been updated regularly, thus outdated stream ratings exist for many streams in Illinois. This project will generate a map of updated ratings and will establish a process that will allow IDNR resource managers to calculate new stream ratings as additional data become available. This project will be complete by September 2007.

(Gary Lutterbie – Region 3 Streams, East Central Illinois) In 2000 an effort was made to restore the walleye population in the Kankakee River using walleyes from the river. In 2000 only 27 walleyes could be collected for spawning. In 2006, 270 walleye were collected during the spawning season. The CPE in 2000 was 1.6 walleye/hr, in 2006 it was 77/hr. Fishermen report catching good numbers of walleye now, where in the past if they caught one it was headline news. The number of stocked walleyes collected has ranged from 52 to 75% of fish collected during fall surveys.

From 2003-2006 surveys were conducted in the three Parkland Sand Areas of the state to assess the status of the weed shiner (*Notropis texanus*), ironcolor shiner (*N. chalybaeus*) and the starhead topminnow (*Fundulus dispar*).

- In the Beaver Creek area the weed shiner was found at 5 of the 15 sites sampled; ironcolor shiner, 10; and starhead topminnow, 4. All three species in this area preferred clear, small ditches, with moderate current and sand substrate. The ironcolor shiner was also found in ditches where the substrate was 55% silt. Aquatic vegetation appears to be more important for the ironcolor shiner and starhead topminnow, than the weed shiner.
- In the Crane/Quiver Creek area only the ironcolor shiner and starhead topminnow are found. Ironcolor shiners were found at five of the eight sites sampled where they were abundant at three of the sites. The starhead topminnow was collected at only two of the eight sites and at one of the sites only one individual was found. The habitat for these two species in this area is clear, small ditches with a slight current and a silt/detritus bottom. The silt was 1.3-1.75 ft deep at these sites and aquatic vegetation covered 70-90% of sampling sites.
- In the Green River area only the weed shiner had been reported, but we thought the starhead topminnow may be present. In 2005 the weed shiner was found at only one of the nine sites surveyed, though starhead topminnows were found at one sites, which is a new record for them. In 2006 the weed shiner was found at five of the seven sites sampled. Several of the sites where they were not found in 2005, they were present in good numbers in 2006. During the 2006 surveys we also collected the blacknose shiner (*Notropis heterolepis*) which had not been seen in the watershed since 1963. These species were found in clear, small ditches with a moderate current and substrates of predominately silt/detritus. Aquatic vegetation covered 75-86% of the sites sampled.

Smallmouth bass stockings in the Vermilion River which were started in 1999. The average CPE prior to stocking was 17.5/hr. The average CPE for the six years following stocking was 53/hr.

(Trent Thomas Region 3 Streams Program)
Status survey and management implications of the harlequin darter and Eastern sand darter in southeastern Illinois Donovan Henry and Lennie Pitcher of Three Rivers Environmental Assessments, LLC have received State Wildlife Grant funding to initiate population surveys for two state-listed fish species in southeastern Illinois. The project will determine current distribution and relative abundance of the harlequin darter and Eastern sand darter in the Little Wabash River, Embarras River, and Illinois portion of the Wabash River. The project will also evaluate habitat, identify potential threats, and determine feasibility of translocation and/or habitat enhancement to benefit these species.

Redspotted sunfish reintroduction project The initial phase of a reintroduction project for redspotted sunfish *(Lepomis miniatus)* in Illinois was approved by IDNR in 2004. The goals of the initial phase are to locate and assess all the known populations of redspotted sunfish in Illinois, collect tissue samples for DNA analyses, and determine feasibility for captive propagation and reintroduction measures. To date, surveys are showing that the redspotted sunfish numbers in Illinois are extremely low. Remnant populations appear to be barely hanging on in only a few backwater lakes along the Wabash River and Ohio River in southeast Illinois. Several of these lakes contained populations of this sunfish as recent as 1987 (from a survey by Brooks Burr),

where they now appear to be extirpated or nearly so. The most stable Illinois population was found to be in a small tributary of the Saline River in Gallatin County.

Stable populations were found to be thriving in nearby Missouri and Indiana. Tissue samples are currently being analyzed by John Epifanio at the Illinois Natural History Survey. Results from these analyses will guide efforts for broodstock collection and captive production for reintroduction efforts into rehabilitated waters throughout the species' historic Illinois range. Funding for this project is being provided through the State Wildlife Grant Program of the US Fish & Wildlife Service. If anyone has information regarding redspotted sunfish or questions about the project, please contact Trent Thomas at Trent.Thomas@illinois.gov.

***Kickapoo Creek stream restoration project*.** A stream restoration project of Kickapoo Creek of the Sangamon River Basin in McLean County, Illinois is in the early stages of development. The project is being funded largely by a group of developers in Bloomington, Illinois. Funding is also being sought from the Illinois Environmental Protection Agency's Section 319 Grants and the USFWS State Wildlife Grants. When completed, the project will re-meander two miles of stream channel with engineered in-stream habitat features. The restored stream will be encompassed by an 80-acre eco-park containing riparian wetlands, prairie, and forest components which will be managed by the City of Bloomington Parks & Recreation Department.

The infamous Don Roseboom of the USGS has been recruited as the project engineer. The Corps of Engineers has issued a Nationwide Permit 27, the USEPA has provided a grant for long-term surface water monitoring, and the USGS has included this reach of Kickapoo Creek in the National Ambient Water Quality Monitoring Network. The project is being closely monitored to serve as a demonstration project for mitigating stream impacts in the face of growing developmental pressures.

USEPA Wadable / Non-wadable Streams Sampling Asssessment
Illinois participated in the USEPA boat and wadable stream collection methods comparison (Ed Hammer, Chris Yoder) which continues this year,

Various Restoration projects

Lyman Woods Headwaters Restoration, Seavey Ditch Streambank Stabilization, and Raccoon Creek Re-Meandering Project Phase 2. (Ted Grey Livingwaters Inc.)

Two small dams removed on Brewster Creek, and continuation of the YWCA Dam removal study continued, which has show minimal downstream effects due to sediment release.

Two dams were removed on the Fox River mainstem at South Batavia, and North Avenue in Aurora.

EXOTIC SPECIES

Evidence presented at the Illinois AFS meeting suggests a relatively high hybridization rate between big head and silver carp. Hybrid and especially F1s are sometimes difficult to detect. Twisted gill rakers are common on hybrids which composed 22% of over 150 individual sampled. Hybrid swarm is possible. Backcrosses are less fit, and have reduced jumping ability.

Studies also found the first evidence that Asian carp are affecting condition factor of native species, particularly some buffalo fishes.

INDIANA RSTC STATE REPORT – SPRING 2007

Smallmouth bass population estimation in Rock Creek
Rousch Lake Wildlife Management Area
Supplemental Evaluation
Dates of Survey: September 5 and 6, 2006
Biologist: Ed Braun and Angela Grier, IDNR District 4
Work Plan Objectives: 1) Increase the catch rate of 15 inch and larger smallmouth bass by 50% over pre-experimental regulation levels. 2) Determine other fishing opportunities in the streams.
Survey Objectives: Conduct the first year of sampling for a game fish population estimate in Rock Creek in Huntington County under Work Plan 204759.
Summary:
A total of 497 fish from 6 game species was collected from all stations (Table 1). Eighty-two fish from 4 game species were collected at station 1; 211 fish from 5 game species at station 2; 143 fish from 5 game species at station 3; and 65 fish from 6 game species at station 4. The most abundant species collected was smallmouth bass. Other game species collected included bluegill, rock bass, largemouth bass, yellow bullhead, and channel catfish. Few rock bass were collected during the survey. Of those that were collected, all but one were age 1. Of the rest of the game species that were collected, population estimates could not be calculated because depletion was not always attained after three passes and the catches of other game species was low.
The smallmouth bass PSD was 31 and the RSD-12 was 19. This indicates that the population is balanced because there are not too many small fish or large fish. Smallmouth bass were ages 1 to 4, with most of the captured fish being age 1. According to the back-calculations, smallmouth bass in this stream stretch reached 12 inches at age 4 (Table 2). The population estimates (confidence intervals; standard error) for smallmouth bass were calculated for each station: station 1 was 68 fish (61 – 75 fish; SE = 3.412), station 2 was 166 fish (162 – 170 fish; SE = 1.844), station 3 was 112 fish (108 – 116 fish; SE = 1.901), and station 4 was 39 fish (36 – 42 fish; SE = 1.572). The population estimates were expanded to the number of fish per mile for each station: station 1 (440 ft) was 819 fish/mile (735 – 904 fish; SE = 41.1), station 2 (823 ft) was 1,064 fish/mile (1,038 – 1,090 fish; SE = 11.8), station 3 (697 ft) was 848 fish/mile (818 – 879 fish; SE = 14.4), and station 4 (685 ft) was 300 fish/mile (277 – 323 fish; SE = 12.1).
Overall, the quality of the smallmouth bass fishery of Rock Creek located on state property is good.

District 4 is also planning on a fisheries survey of the Wabash River in District 4 this year. Schedules are still up in the air as some work plans are still being developed. If District 1 can do their portion of the river as well, it would include the upper half of the Wabash. The last time DNR looked at the Wabash was 1999.

Morris, C.C., Stephan A.K. 2007. Physical, Chemical and Biological Assessment of the Salt Creek Watershed, Porter County Indiana. Indiana Department of Environmental Management, Indianapolis Indiana.

Biological monitoring has become a significant tool used by States to monitor and assess their jurisdictional waters. Using biological data in this fashion has proven accurate in identifying site specific impairments and these monitoring results are routinely used in the decision making process for aquatic life support. While biological monitoring in most states has become routine this approach has had limited application in determining specific sources or causes of observed impairments. The purpose of this study was to use a formal causal evaluation process utilizing multivariate techniques to provide statistically defensible correlative conclusions for the biological impairments in the Salt Creek watershed. Fish assemblages, water chemistry, land use and in-stream habitat data from 43 bridge locations, sampled both in August 2006, were used to evaluate the condition of the Salt Creek watershed. Anthropogenic stressors were identified using a biological integrity response gradient developed from a numerical classification analysis of fish assemblage data. Individual physical and chemical stressors were evaluated relative to the biological integrity gradient using ANOVA ($\alpha = 0.05$) to generate a list of significant candidate stressors. Candidate stressors underwent a validation procedure where the observed stressor dose response was compared to the expected biological response. If the observed response could not be reconciled against documented dose responses, the candidate stressor was rejected. Three local scale land uses (percent riparian buffer, forest and grass/pasture) five contaminants (sodium, chloride, ammonia, total dissolved solids and total solids) and three in-stream habitat quality measures (Qualitative Habitat Evaluation Index score and two of its metrics in-stream cover and channel score) were identified as being significantly predictive of the biological response gradient. To assist in management decisions we evaluated the validated stressors using a factor analysis to elucidate each stressors relative contribution to the explained variance. The first factor was composed of the three local scale land-use variables and explained 35 percent of the variance. The second factor was composed of the three habitat quality measures and explained an additional 21 percent of the variance. The final factor was composed of the four contaminants and explained an additional 21 percent of the total variation. In all, the three factors explained 77 percent of the total variation. This stressor identification procedure provides a sound scientific foundation for undertaking management activities in the Salt Creek watershed. Management goals can target the identified stressors with a firm expectation that these activities should elicit a positive response in fish assemblage condition.

Stacey Sobat, IDEM
Indiana's Department of Environmental Management has a Water Quality Monitoring Strategy which samples approximately 20% of the state's streams each year for attainment of designated aquatic life and recreational uses. The Probabilistic Monitoring Program is one component of the Strategy that provides an evaluation of stream water quality and biological integrity in major basins of Indiana using a probability design. This design facilitates statistically valid estimations of the percent of stream miles impaired in the basin of interest. In 2006, the West Fork White River and Patoka River basins were the focus of IDEM sampling efforts. For 2007, the East Fork White River Basin as well as the Whitewater or Great Miami River Basin will be the basins sampled. Water chemistry, bacteria, algal biomass, fish and macroinvertebrate communities are

sampled for the Probability Monitoring Program. Fish tissue sampling is also conducted in Indiana surface waters to monitor bioaccumulating contaminants as well as provide data serving as the basis for fish consumption advisories. Sites for fish tissue collection are targeted in the watershed based on need for information, follow-up monitoring, emerging problem areas, and water bodies never before monitored. For more information on IDEM's biological monitoring programs, check out the website at www.in.gov/idem

2006 Indiana Wildlife Diversity Report, supplied by Brant Fisher, Non-Game Biologist, IDNR

A fish species never previously recorded in Indiana was discovered in October 2006. The story of this exciting discovery starts with a search for a completely different species. Biologists from Illinois are evaluating the possible augmentation of some redspotted sunfish populations in their state. As part of that process, they are conducting a genetics study of other populations to determine the feasibility of using them as source populations. The Illinois biologists were taken to Knox County in southwest Indiana to collect some redspots for this purpose. While the search for redspots was just beginning, an unexpected, but readily welcomed species was soon discovered. The diminutive banded pygmy sunfish was netted shortly after the first redspotted sunfish was collected. This species was always assumed to be a historical inhabitant of Indiana, although there are no actual records of the species form Indiana waters. The sunfish was collected from an organic muck-bottomed ditch, choked with vegetation.

Lake sturgeon are endangered in Indiana. Since 2002, transmitters have been placed in different lake sturgeon in the East Fork White River. Lake sturgeon have shown similar annual movement patterns. These fish tend to be found in deep areas through out much of the year, however using different locations in winter then they use in summer. In 2005, lake sturgeon spawning was documented in the river for the first time. Several deposited eggs were collected and taken to Cikana State Fish Hatchery to determine their viability. More than a dozen larvae were produced form these eggs. Larvae were also collected from the river with larval drift nets.

A study through Purdue University was completed in 2006 to determine if the genetic structure of the East Fork White River lake sturgeon population is unique. Results showed these fish to be sufficiently different enough from other Great Lake populations to warrant conservation of the population. Any type of augmentation to the East Fork White River populations or reintroductions in other parts of the Ohio River drainage should only be attempted using East Fork lake sturgeon.

A pilot propagation effort with the East Fork White River lake sturgeon will be attempted in the near future. A couple of male and female lake sturgeon will be collected during spring spawning. Milt and eggs will be harvested, mixed and taken to a hatchery to be grown for stocking.

Freshwater mussels are the most endangered group of wildlife in Indiana. Of our 77 species, 15 are state-endangered, 10 of those are federally endangered, and one is a candidate for the federal list. Surveys for freshwater mussels have been completed for most of Indiana's major drainages, and now we are working on filling information gaps to be sure all species and potential locations have been surveyed. We will then prepare maps for each of Indiana's 77 species of freshwater mussels delineating their current distribution. Often we find only shells of a

mussel but these are important indicators of which species once existed there and may still be living in a stream. Our biologists maintain records of live mussels, "fresh dead" and "weathered" shells. This year we concentrated on sampling in the drainages highlighted in the map on page 7. Weathered shells of several of our endangered and special concern species (clubshell, rabbitsfoot, wavyrayed lampmussel, round hickorynut, kidneyshell, purple lilliput and rayed bean) were found in the lower Big Monon Ditch drainage. Weathered shells of northern riffleshell were located in the upper Eel River in Wabash County. Live kidneyshell were found in Indian Creek in Lawrence County. Live wavyrayed lampmussel, weathered kidneyshell and purple lilliput were discovered in Rock Creek in Carroll County. Weathered shells of ellipse were uncovered in the Little Calumet drainage. Attempts will be made to conduct additional intensive sampling for some of our rarer species during the next two field seasons.

Hydrologic alteration in the Wabash River watershed
Mark Pyron and Klaus Neumann, Ball State University

Flow alteration of streams from anthropogenic impacts is ubiquitous worldwide. In this paper we examine flow alteration in the Wabash River watershed. The Indicators of Hydrological Alteration software was used to evaluate hydrological variables generated from daily discharge during the past several decades at 80 USGS gauging stations. We used regressions of hydrological variables with time to identify hydrologic change. An average of 6.9 hydrologic variables (of 33 variables) were significantly altered at each station, and stations with larger watersheds had an increased number of altered variables. Streams with upstream dams had increased minimum flows for all but the 90-day minimum variable, decreased maximum flows for all increments, increased fall rate, decreased summer monthly flows, and decreased high pulse count. The presence of agriculture in upstream watersheds resulted in increased number of zero flow days, increased low pulse counts, and decreased high flows during October and April. No significant differences were detected in hydrologic alteration based on urban coverage in upstream watersheds. Although this study did not quantify ecological degradation, hydrologic alterations in the Wabash River watershed have undoubtedly resulted in ecological degradation.

Changes in functional guilds of fish assemblages in the middle Wabash River from 1974 to 1998
Jayson Beugly, Mark Pyron, Thomas E. Lauer, and James R. Gammon, Ball State University, Aquatic Biology and Fisheries Center, Department of Biology, Muncie, IN (JB, MP, TEL) and DePauw University, Department of Biology, Greencastle, IN.

We evaluated historic fish collections from 1974 – 1998 for the middle Wabash river to test for changes with time in percent abundance for eight functional guilds. Functional guilds were trophic types, silt tolerance, and habitat preferences described by Poff and Allan (1995) as related to hydrologic alteration of lotic ecosystems. The historic Wabash River collection sites were from Delphi (RM 329) to Montezuma (RM 238). Fish collections were made using a boat electrofisher. Functional relationships with time were

examined as correlation coefficients at each of 28 sites in plots by river km. Significant temporal trends were apparent for the majority of the five functional measures (23 subcategories), indicating shifts in functional guilds of the middle Wabash River fish assemblages during this period. Potential causes include improvements in water quality, changes in agricultural practices, and hydrologic alterations.

Macroinvertebrate and fishes in Indiana headwater streams with agricultural watersheds
Jayson Beugly and Mark Pyron, Ball State University, Aquatic Biology and Fisheries Center, Department of Biology, Muncie, IN

We expect to sample macroinvertebrate and fish assemblages in headwater streams of the West Fork of the White River beginning spring 2007. The goal is to examine the effects of agricultural practices on headwater streams that have continual groundwater flow to headwater streams that rely on run-off from fields. Our expectation is that agricultural influences will be more pronounced on intermittent streams.

Blue River (Crawford, Harrison, and Washington Counties) 2006 report summary. Sampling conducted by Indiana Division of Fish & Wildlife, District 7 Fish Management. Dan Carnahan

EXECUTIVE SUMMARY

- The Blue River originates in Washington County and flows 74 mi through Crawford and Harrison Counties. Its confluence with the Ohio River is about 3 mi east of the Town of Leavenworth.
- Fish sampling was conducted from September 11 to October 5, 2006. The sites sampled were RM 9.0, 14.7, 34.6, and 62.4. The site at RM 54.5 was not sampled due to high water conditions.
- A pulsed DC tote barge electrofisher was used to sample three stations and a pulsed DC electrofishing boat was used at RM 34.6.
- A total of 106 rock bass was sampled that weighed 11 lbs. They ranged in length from 1.2 to 7.7 in. Rock bass growth was good for all ages.
- A total of 71 smallmouth bass was sampled that weighed 11 lbs. They ranged in length from 1.8 to 12.0 in. Smallmouth bass growth was slow and similar to 2004.
- The quality of Blue River's smallmouth bass population has deteriorated since the 12-in minimum size limit that was imposed in 1998.
- A black bass 12 to 15-in protective slot limit and 5 bass bag limit, of which, only two can be greater than 15.0 in, will become effective in February 2007.

Gillespie, Robert B. **Ecological Assessment of Habitat and Aquatic Life in Cedar Creek, Indiana in Support of the Conservation Effects Assessment Program.**
Department of Biology, Indiana University-Purdue University, Fort Wayne, Indiana.

The USDA currently supports six major conservation programs that promote land-use practices to protect water quality and the ecological integrity of the nation's streams and rivers. However, until recently there has not been a programmatic analysis of the success of these conservation programs. The Conservation Effects Assessment Program (CEAP)

began in 2004 with the objective of studying the environmental benefits of conservation practices implemented through 2002 Farm Bill programs. The project described here, initiated in spring, 2006, will assess the ecological health of receiving streams in the Cedar Creek Watershed, Indiana that currently serves as a benchmark study area for the CEAP. Cedar Creek is the largest contributor to the St. Joseph River of the Maumee River Basin. Eight stream segments are being monitored by the National Soil Erosion Research Laboratory (NSERL) for agricultural contaminants. Study sites are paired subwatersheds of similar area, with one serving as a treatment (application of soil conservation practices) and the other as a reference (no conservation practices). Annual ecological assessments are being made immediately downstream of the eight automated water samplers maintained by NSERL. Riparian zone habitat characteristics, fish and macroinvertebrate diversity, water quality, and in-stream habitat are being assessed each year over a five-year period. Ecological assessment data collected over the duration of the study will be analyzed by comparing the relative ecological health of paired subwatersheds. Ecological health assessments will be used to support data from water quality sampling to assess the effectiveness of conservation practices in the Cedar Creek Watershed.

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The Indiana Division of Fish and Wildlife sampled fish in the East Fork and West Fork White Rivers in 2003 and 2004. The IN DFW also conducted creel surveys on the East Fork White River in 2003 and on the Wabash River in 2004 and 2005. For fisheries surveys, data on IBI, QHEI, and fish lengths and weights were collected. For creel surveys, pressure and harvest were estimated. Reports can be found at http://www.in.gov/dnr/fishwild/fish/ as they are posted.

Len Kring
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The city of Elkhart finished its ninth year of aquatic community monitoring in 2006. A total of 24 sites were sampled in Elkhart County and 10 sites were sampled in St. Joseph County. The city completed a three year pilot study on macroinvertebrate sampling with the assistance of the Midwest Biodiversity Institute. The city is preparing for the addition of new sites within the city of Mishawaka that will complete a biological picture of the entire Indiana portion of the St. Joseph River. The city is hoping to have its first international student working for the program in 2007 from Australia. The City is hoping

add the City of Goshen as partner in coming years. Also the city is hoping to do some preliminary sampling with representatives from Michigan to compare sampling protocols.

We completed 54 site visits during the summer of 2006. Our second three year contract with the City of South Bend ended successfully in 2006. Sites in South Bend will now be on a 3-year rotation to start comparisons with the originally established baseline. Also in 2006, the third year of our macroinvertebrate pilot study ended. This work is done in conjunction with the MBI based in Columbus, OH. We are in the midst of starting a relationship with the City of Mishawaka, IN similar to what we have established with South Bend. We are awaiting word on a grant application with the NFWF to help offset some of the costs of our monitoring program as we try to expand our coverage. We held numerous demonstrations and educational workshops for such groups as the Boy Scouts and summer educational day camps sponsored by local universities and the Elkhart Environmental Center.

Len Kring
Aquatic Biologist
Elkhart, IN

We have completed a 5-year recovery project (restocking, fish population recovery tracking, recreational surveys, and several million dollars in riparian lands leases and improvements) following a major fish kill in late 1999 on the White River in central Indiana. Currently, we are modeling the smallmouth and largemouth bass populations in the impacted length of river to see if a change in the current 14-inch minimum size limit is warranted. The bass populations are doing well after the fish kill, and we are still looking to see if sauger have been established in the impacted portion of river. I have completed reports on 2 recreational surveys, a fish loss assessment, and annual fisheries surveys available that can be emailed to interested individuals. The final 2005 river recovery report should be approved for release soon. Have anyone interested contact me for the reports.

I am also involved in a recreational survey of the Wabash River (lower 300+ mi.of the river). This project is in its 2nd yr, scheduled to be completed next yr.

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EXECUTIVE SUMMARY. – An assessment of the fish assemblages of major tributaries of the West Fork White River was conducted at 77 stream reaches from Indianapolis to Muncie, Indiana. The survey was conducted in the fish kill zone to document the species present including basic biological data. In addition, habitat and water quality was assessed during two time periods between July and October 2002. Characteristics of the fish assemblage of each tributary were compared to habitat, ammonia, and nitrate concentrations measured during the fall sampling period. The biological integrity was calculated using an index calibrated for the Eastern Corn Belt

Plain Ecoregion. Habitat quality of the stream reaches showed QHEI scores for the study reaches ranged from 30 to 90. The highest quality streams included Williams Creek (sites 5 & 7), Cicero Creek (sites 22 & 24), Carmel Creek (site 11), and Crooked Creek (site 4). Mean QHEI score for all sites was 57.2 (N = 77), which suggests that habitat is not a limiting factor for many tributary streams in the West Fork White River drainage. Water temperature in July and August showed that many streams never exceeded the threshold separating cool- from warmwater streams. Stream segments influenced by pollutant loadings had increased values in salinity, specific conductance, and total dissolved solids. Nine percent of the sites had specific conductance values greater than 1000 µS/mL and total dissolved solids greater than 600. Salinity for most streams was 0.1‰, however, pollutant affected streams had values greater than 0.3-0.9‰. Nitrate values ranged from 0.61 to 37.46 mg/L during October 2002, while ammonia ranged between 0.1 to 3.1 mg/L. Baseline ammonia values in the West Fork White River tributaries showed that 80.3% of the stream reaches (N = 61) exceeded the acute criterion for ammonia. Nitrate baseline values exceeded the acute criterion at 9.2% (N = 7) of the stream reaches sampled. A total of 51 fish species comprised of 15,404 individuals were collected in the West Fork White River tributaries. Species numerically dominating the catch included central stoneroller (3,201 individuals), creek chub (2,271 individuals), bluntnose minnow (1,915 individuals), and bluegill (1,014 individuals). Species that dominated by weight included carp (161.14 lbs, 73,158.3 g), creek chub (68.04 lbs, 30,889.7 g), central stoneroller (66.2 lbs., 30068.7 g), and white sucker (59.2 lbs., 26,877.9). Three game species were represented by relatively few, small individuals.

Project Period: July 2002 –December 2005

Background and Results

During the last three decades, the Environmental Protection Agency (EPA) and State designated agents have regulated through Section 316(a) of the Clean Water Act, heated effluents that are discharged into waters of the United States. The protection of fish species and aquatic communities is a primary focus of water intake and discharge permits for coal, oil, gas, and nuclear power plants as well as industrial facilities. Section 316(a) regulates heated and chlorinated cooling water discharge. The largest industrial user of cooling water is the steam electric power industry, which reports that 44% of United States steam-electric generating capacity draws water from the ambient environment and is used to cool the heat-producing components of the energy production, which is then discharged into the environment after a single use (EEI 1996). About 50% of generating capacity utilizes closed-cycle-cooling systems. In closed cycle systems, water is withdrawn from a cooling tower, basin, or cooling pond, or cooling lake, pumped to the condenser and returned to the tower, basin, pond, or lake. Once-through cooling systems affect the environment through the discharge of heated water. Heated water causes two primary effects, either causing avoidance or the heated water or acute mortality from rapid changes in tissue exposure. The U.S. Fish and Wildlife Service in collaboration with the State of Indiana Department of Environmental Management completed a project that evaluated and assessed electric generating facilities in the Wabash and White river drainages.

The purpose of the current study was to complete four tasks that were established by the State of Indiana Department of Environmental Management during fiscal year 2002. Task A was a data review of existing industry submitted reports from four facilities. The Wabash River and Cayuga Generating Stations (CINERGY Corporation) and the Eagle Valley and Harding Street Stations (IPALCO) were selected. This task required the entire project period to complete. Five products were produced from this task that included individual reviews of the four selected facilities and a report that analyzed the analysis of the four facilities submitted information. The purpose of this study was to evaluate information submitted by regulated industry to satisfy section 316(a) monitoring requirements of the Clean Water Act. This is identified as Task A by the State of Indiana Department of Environmental Management. After scrutiny of the information and rigorous quality assurance, we eliminated data that could not be substantiated for the analysis. The final data used for this analysis was based on consistently collected data, consistent site definition, or consistent measurement of temperature. We could not verify the method temperature was collected nor was any standard operating procedure seen. This limited the available data to principally information collected from 1990-2001. Less than one of four data points submitted by industry met IDEM QA/QC standards. The analysis of fish assemblage information was done to evaluate monthly and annual trends, patterns upstream and downstream of the discharge, and to evaluate representative aquatic species (RAS) that would be present near the four electric generating facilities. We evaluated the Wabash and White river systems separately.

Seasonal patterns showed significant difference between individual metrics and IBI metric scores based on month of sampling for all Wabash River facilities and for four White River metrics and five IBI metric scores. Several metrics could not be evaluated since insufficient information had been collected to conduct an analysis. The percent individuals with deformities, eroded fins, lesions, and tumor (DELT) anomalies and the relative number of individuals could not be analyzed because the data was not collected.

Comparison of upstream versus downstream effects of the heated effluent showed no significant difference at the Wabash River facilities for four metrics expected to show differences. Conversely, the White River facilities showed no difference between upstream and downstream metric scores for number of individuals, but showed higher mean metric scores downstream of the heated discharge than upstream. Metrics included the number of sensitive species, number of round-bodied sucker species, and number of species. This was expected since these facilities have an impoundment immediately upstream of the discharge and put the control samples in lake habitats, rather than representative riverine habitats.

Patterns in IBI scores could only be done for the Cayuga Generating Station and a partial analysis for the Eagle Valley Generating Station. The lack of a consistent data record precluded the evaluation of trends at the Wabash River Generating Station and the Harding Street Station. For those facilities that were evaluated, trends at both facilities showed unexplainably high variability in IBI scores, widely ranging standard deviation and standard error, and never a significant difference between the downstream heated

effluent zones and the upstream control. Comparisons of these results to biological criteria always showed significant deviations between the upstream and downstream sites from reference sites, but not for the "reference condition" sites and the Wabash River Generating Station and the number of individuals, number of sensitive species, or the upstream number of species. A significant difference was seen with Cayuga and the reference condition for number of individuals and number of species. Based on industry data, monthly patterns in IBI showed little difference between ambient conditions and the heated discharge. Temperature information was always within a few degrees F of ambient conditions, despite the expected differences closer to the discharge. This raises the question whether these data were actually collected in the discharge plume or outside in areas unaffected by the discharge?

Patterns in fish assemblage metrics showed that most metrics showed significant differences in response from a normal bell-curve response based on the reference condition data. All metrics tested were highly significant and showed a disproportionate difference from the reference condition expectation. This is similar to other studies conducted by Dufour et al (2003) and Emery et al. (2003).

Finally, the discussion surrounding representative aquatic species (RAS) was evaluated based on criteria used by the Ohio River Water Sanitation Commission based on the protection of species that would utilize the mainstem Ohio River. One of the criteria is that the species should be representative or be numerically abundant or prominent in the system. This was tested by evaluating a cumulative frequency distribution of percent occurrence of the power industries database against the rank abundance of government collected data from throughout the mainstem rivers. Points of deflection between the two datasets were observed at 35% for the Wabash River and 38% occurrence for White River fish species. Many of the species collected as rare, sporadic, occasional, or commonly in the river by the government agency personnel were not collected at all by the power industry. These lost species included minnows, darters, and other coolwater species, such as the recreationally important walleye and sauger. The absence of these species in the vicinity of the heated effluents may require a review of temperature standards for the Wabash and White rivers.

Project Period: January 2000 –June 2004

Background

Severe degradation and destruction of coastal wetlands along the Great Lakes has reduced what were once expansive wetlands to only a remnant. The loss of coastal wetlands has formed an immense void for aquatic life found in the transition between terrestrial and aquatic habitats. These habitats are important spawning, nursery, and feeding areas for a majority of Great Lakes' fish species during a portion of their life cycle. The U.S. Fish and Wildlife Service in collaboration with the U.S. Environmental Protection Agency and other Great Lake state, federal, and local agencies are completing a project that developed environmental indicators for assessment of remaining Great Lake coastal wetlands.

The fiscal year priorities for the International Joint Commission and the focus of the State of the Lakes Ecosystem Conference (SOLEC) included the establishment of environmental indicators for nearshore habitats and coastal wetlands of the Great Lakes. Development of reference conditions for the Great Lakes was an imposing task when confronted by the need to account for differences among Great Lakes, wetland types, and size dimensions. The Great Lake coastal wetlands are affected by filling and disturbance, urbanization, and are heavily impaired by a variety of land uses. Coastal wetlands possess substantial spatial heterogeneity and are vulnerable to contaminants from industrial sources, atmospheric deposition, non-point sources, erosion, and invasion by alien species.

Efforts to characterize Great Lakes biocriteria and establish regional reference conditions have generally concentrated on tributary waters within several states (Simon 1991; Lyons 1992; Thoma 1999) or have included limited numbers of sites (Wilcox et al. 1999; Burton et al. 1999). Greater portions of the Great Lakes nearshore and coastal wetlands have not been sampled, thus restricting a more global spatial depiction. Our effort was to develop sampling procedures, conduct pilot studies to determine spatial relevance of indicator development, and produce reference conditions for fish, plants, and macroinvertebrates. This effort is a preliminary study that has answered many questions regarding the quality of coastal wetlands throughout the Great Lakes. Our efforts will impact future data needs for the establishment of reference conditions, numerical biocriteria development, and State/Provincial-Regional monitoring and trend assessment.

Objectives

The main goal of this project was to establish reference conditions for Great Lakes coastal wetlands and develop and test multimetric indices of biological integrity for wetland plants, invertebrates, and fish assemblages. Specifically, objectives included the following: 1) establish consistent reference condition expectations and calibrate multimetric indices for fish assemblages in various wetland types of the four Great Lakes; 2) evaluate the differences in biological community expectations due to spatial heterogeneity of the coastal wetlands (among ecoregions, eco-reaches and latitudinal differences); 3) determine whether methods for biological integrity assessments in the Great Lakes can be applied similarly across political boundaries; 4) assess the current condition of biological integrity of the nearshore coastal resources of the Great Lakes; and 5) refine and test indices of biological integrity for fish, aquatic plants, and aquatic invertebrates in specific Great Lakes coastal wetland type, e.g. drowned river mouth wetlands in Lake Michigan.

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The one interesting note is that the number of asian carp we are seeing seems to be increasing. We collected quite a few (mainly silver carp), but as we travel up and down the Wabash and West Fork of the White, they are jumping everywhere in fairly large numbers.

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Duke Energy
Corporate EHS- Biological Services
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Iowa Chapter Report

March 14, 2007
Greg Gelwicks
Iowa DNR Fisheries Research

Missouri River Fish and Wildlife Mitigation Project

The Iowa DNR contracted with the USACOE to monitor off channel habitat created under the Missouri River Fish and Wildlife Mitigation Project. Monitoring is intended to evaluate fisheries response to constructed habitat, determine specific habitat use and guide design of future projects. Contact: Van Sterner (712) 433 4706, van.sterner@dnr.state.ia.us

Biomonitoring

The Iowa DNR Water Monitoring and Assessment Section released the report entitled "Biological Assessment of Iowa's Wadeable Streams" http://www.iowadnr.com/water/tmdlwqa/wqa/streambio/index.html].
The report describes the main components of the bioassessment framework including ecoregions, reference sites, standard sampling procedures, and biological indices (fish and benthic macroinvertebrates).

Staff of the Iowa DNR Water Monitoring and Assessment Section and the University Hygienic Laboratory Limnology Section continue gathering benthic macroinvertebrate and fish assemblage data that are used to assess the biological condition of Iowa's rivers and streams. The bioassessment program has three main focus areas: 1) status and trend monitoring; 2) reference (benchmark) biological criteria development and maintenance; 3) impaired (TMDL)/Stressor Identification (SI) waterbody assessment. The initial statewide random perennial river and stream survey was completed in 2006 with an additional 43 sites sampled. IDNR plans to continue random sampling in some capacity in the future. A second round of statewide reference site sampling was completed over the last several years and will begin again in the future. Stream bioassessments of several 303(d) impaired stream segments, done in conjunction with water quality monitoring for TMDL development, occurred in 2006 and will continue in the future. This sampling includes fish, benthic macroinvertebrates, habitat, diurnal temperature and DO, event sampling (where needed), and monthly/bi-weekly WQ monitoring tailored to rural or urban streams. The SI process is designed to evaluate the degree to which various water quality and habitat related stressors contribute to impairment of aquatic communities. An SI was completed for the North Fork Maquoketa River in 2006 and additional stressor identification work is planned for 2007. Contact: Ken Krier, (515) 242-5184, ken.krier@dnr.state.ia.us.

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. 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, Maquoketa, Boone, and Des Moines Rivers.

Aquatic Nuisance Species (ANS)

The U.S. Army Corps of Engineers, 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 2006. In Iowa, DNR staff collected samples below Lock and Dam 10, 12, 13, 14, 16, 17, and 18 and from the Wapsipinicon, Iowa, and Cedar Rivers. The 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 discovered in Lake Delhi during July 2006. Lake Delhi is a 448-acre impoundment on the Maquoketa River in northeast Iowa. This was the first documentation of zebra mussels in a Mississippi River tributary in Iowa. Local residents on Lake Delhi removed a concrete block from the lake that had about 20 small zebra mussels attached to it. Subsequent visual inspections of rocks at the dam and the marina revealed low densities of zebra mussels of varying sizes on most rocks. Zebra mussels were also located on rocks in the Maquoketa River below the Lake Delhi dam.

Reports of silver and bighead carp in Iowa are entered into a database to determine statewide trends in distribution and abundance. As of 2006, 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 only been sampled in the Mississippi, Missouri, and Des Moines Rivers in Iowa but are expected to follow the expansion of the bighead carp.

Boat accesses on Iowa's lakes and rivers were targeted for watercraft inspections between 26 May and 20 August 2006. Seasonal 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.state.ia.us.

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.

Water Quality

Iowa DNR fisheries personnel continue to be heavily involved in multidisciplinary watershed projects partnering with local communities and landowners, USEPA, NRCS, Iowa Department of Agriculture and Land Stewardship, and other groups.

The Geological Survey Bureau and Environmental Protection Division of the DNR have been very active in expanding and improving its Ambient Water Quality Monitoring Program over the last several years. Information about the program can be found at http://wqm.igsb.uiowa.edu/.

The IOWATER program continues to expand. Volunteers are collecting baseline water quality data across the state. This information can be found at http://www.iowater.net.

Interior Rivers Research

Contact: Greg Gelwicks, (563) 927-3276, gregory.gelwicks@dnr.state.ia.us

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 2007 in conjunction with a new 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 2004-2006. 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, mike.steuck@dnr.state.ia.us

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 ^{o}F (main channel water temperatures were always around 32 ^{o}F). 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. 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.

Iowa State University

The following are river and stream related projects being conducted at Iowa State University.

Iowa Rivers Information System (IRIS)

The Iowa Rivers Information System (IRIS) is a tool for both professionals and the public to obtain information about rivers and streams in Iowa and the diversity of natural resources they support. IRIS provides easy entry to the world of information about Iowa's rivers and streams. Maps, data and research products are available through IRIS, as well as links to several other sites containing a wealth of information. Most of the available information is geo-referenced for mapping and analysis in IRIS, or for download and import to GIS software.

IRIS has many potential uses and users. From the fisheries biologist seeking information to evaluate a stream's potential as a smallmouth bass fishery, to the water quality analyst searching for clues to explain differences in stream nutrients and biological integrity, to the science teacher helping students learn about flowing water ecosystems, IRIS is an important and versatile tool. Best of all, the web interface brings the power of IRIS to anyone with a computer and Internet access. From the sidebar users can view and customize maps, query or download databases within IRIS or from external sites, view or download reports and publications, or link to other related web sites.
The URL for IRIS is: http://maps.gis.iastate.edu/iris/

Questions about using the IRIS web site should be directed to Patrick Brown, patrickb@iastate.edu, (515) 294-7312

Evaluations of physical habitat, stressor, and biological response indicators for wadeable streams in Iowa's Regional Environmental Monitoring and Assessment Program

The primary goal of this project is to objectively assess the health status of Iowa's perennial streams. Habitat assessment is one component of the Iowa REMAP (Regional Environmental Monitoring and Assessment Program) project. In 2002, the DNR received a grant and technical assistance from EPA to begin the project. The state ambient monitoring program also contributes funding to support the project. The

sampling design and some of the sampling methods are patterned after other REMAP projects in the Central Plains and across the U.S.

Thirty-three stream reaches, were sampled between July 1 and October 15 at low flow conditions for the summer of 2006. This brings the total number of stream reaches sampled to 143. All sites were selected using a stratified random systematic design from all 2-5 order wadeable streams in Iowa. At each location physical habitat was surveyed following the EPA EMAP wadeable streams physical habitat assessment protocol.

These methods quantify by measurement or estimation; stream size, channel morphology, gradient, sinuosity, substrate size and stability, habitat complexity, cover, woody debris size and abundance, riparian vegetation cover and structure, and anthropogenic disturbance. Measurements of stream-flow, temperature, dissolved oxygen, pH and water chemistry samples were taken for each reach.

At the same locations the University of Iowa Hygiene Lab sampled the fish assemblage by single pass electrofishing, and the benthic macroinvertebrates using artificial substrates, Hess samplers and qualitative collections.

Human disturbance metrics have been quantified for each site at multiple scales. These metrics quantify landcover, landuse and/or human activities that may have a negative impact on stream ecosystem integrity. Eaxmples include, percent of watershed covered by estimated impervious surface, road density with 30m of the steam network, estimated area drained by tile, or number of upstream road stream crossings. Metrics have been quantified by ATtILA, an ArcView extension developed by the USEPA-ORD.

Basin morphometry metrics are being quantified using the computer program Basinsoft.

A comparison of the precision between the EPA EMAP and the IDNR wadeable streams physical habitat assessment protocols was completed and presented at the 136th Annual meeting of the American Fisheries Society

Metrics of stream reach physical habitat will be analyzed to determine relationships with stream fish communities and for their ability to predict component metrics of the Iowa Fish Index of Biotic Integrity. Human Disturbance and basin morphometry will be analyzed at multiple spatial scales to determine relationships with biological and physical habitat components of stream ecosystem integrity. The results of these analyses will be presented as part of the statewide and regional stream and river monitoring symposium at the 67th Annual Midwest Fish and Wildlife Conference.

Contact: Clay L. Pierce (515) 294-3159, cpierce@iastate.edu.

Monitoring of Fish Movement Patterns Following Modification of Streambed Grade Control Structures in Turkey Creek, Cass County, Iowa.

Nearly 400 rock rip-rap grade control structures (hereafter GCS), were recently placed in streams of western Iowa, USA to reduce streambank erosion and protect bridge infrastructure and farmland. In this region, streambeds are dominated by silt and sand substrates and normally support low macroinvertebrate abundance and diversity. Therefore GCS composed of rip-rap may provide critical habitat for benthic macroinvertebrates. Macroinvertebrate abundance and diversity were greatest at sites with coarse substrates (cobble/boulder), including GCS sites and one natural riffle site. Densities of several families in the orders Ephemeroptera (Baetidae, Heptageniidae, Isonychiidae, Tricorythidae), Trichoptera (Hydropsychidae, Hydroptilidae), Diptera (Chironomidae, Empididae, Simuliidae), Coleoptera (Elmidae), and Acariformes responded positively to increased substrate particle size (adj. $r2 > 0.19$, $P < 0.031$) and were abundant on GCS riprap. With possible exception of flow velocity and depth that were highly correlated with particle size, no other measured environmental variable was significantly related to macroinvertebrate assemblage characteristics ($P > 0.05$). Local increases in macroinvertebrate density, biomass, and diversity at GCS may increase efficiency of ecological processes (e.g., rates of physical and chemical destruction of organic matter) in streams, and provide enhanced food resources for aquatic vertebrates. Grade control structures (GCS) may restrict fish passage and affect fish assemblage structure. We used mark-recapture methods to evaluate fish passage over a total of five GCS ranging in slope (run:rise) from 13:1 to 18:1. Three structures, over which limited fish movement was documented from 2002–2004, were modified in the winter of 2004–2005 to facilitate fish passage. Channel catfish Ictalurus punctatus, yellow bullhead Ameiurus natalis, black bullhead Ameiurus melas, and creek chub Semotilus atromaculatus, were documented passing over at least one structure, with the majority of movements over GCS (92%) in the upstream direction. In addition, we evaluated differences in fish assemblages and habitat variables in reaches immediately downstream from GCS and reaches at least 1 km from any GCS, and investigated longitudinal changes in fish assemblages in this GCS fragmented stream. Reaches downstream from GCS were characterized by greater proportion of pool habitat, higher maximum depth, greater total fish biomass, and greater abundance of Centrarchidae, specifically largemouth bass Micropterus salmoides. Index of biotic integrity scores were fair (<43 on a 0–100 scale) and were not significantly different between GCS and non-GCS sites ($P > 0.117$). While 13 fish species were present from downstream of the furthest downstream GCS to the most upstream sampling location (a distance of 18 km fragmented by five GCS), 15 additional species exhibited truncated distributions not extending to the most upstream sampling location. The presence of GCS in streams of western Iowa is pervasive, with nearly every low order stream containing at least one in-stream structure. To sustain fish populations, management efforts should focus on constructing or modifying GCS to allow fish passage.

Completed all fieldwork and laboratory work. Completed all data analysis. Wrote and successfully defended M.S. thesis. Submitted final report to funding agencies. Presented

results at national meeting. Submitted two manuscripts for publication in peer-reviewed journals.

Contact: Clay L. Pierce (515) 294-3159, cpierce@iastate.edu.

An Integrated Immunological-GIS Approach for Bio-monitoring of Ecological Impacts of Swine Manure Pollutants in Streams

This research is predicated on the hypothesis that low levels of swine liquid manure slurry and anaerobic lagoon liquid released to open water cause changes in immunological response in fish and increase fish susceptibility to infection. The initial objectives, therefore, are 1) to evaluate this hypothesis through a series of laboratory immunological assays applied to the test organism, the fathead minnow (Pimephales promelas) and 2) to identify one or more assays for use as a bio-monitoring technique to detect ecological impact of manure pollution in nature. A subsequent task involves use of digital environmental databases that are maintained and managed by the USGS BRD Iowa Cooperative Fish and Wildlife Research Unit at Iowa State University. The objective is 3) to characterize a number of Iowa watersheds and stream systems according to their potential susceptibility to hog manure pollution and to use this information to design a water quality and fish sampling regime. Finally, water and fish collected at selected stream sites will be analyzed through a battery of chemical and immunological procedures with the objectives 4) to quantitatively measure ecological impact of manure pollution on the streams, and 5) to evaluate the utility of this approach as a biomonitoring tool for environmental protection agencies.

Progress report:

2003 - Fathead minnow colony was succesfuly established. We have developed and constructed the computer controlled flow through system, but water heating problems caused unexpected delays in project timeline. We have developed the isolation technique for extracting leukocytes from fathead minnow kidney. We finished morphological and cytochemical characterization of prepared leukocytes. We have developed and optimized assay for measuring production of reactive oxygen species in isolated neutrophils by cytochrom C reduction method.
2004 - We have developed and optimized assay for degranulation of primary granules. The assay is capable of detecting handling and crowding stress as well as differences in various stress causing treatments (anesthesia procedures). We established baseline values for FHM neutrophil oxidative burst, myeloperoxidase content and degranulation. We have tested developed assays on several fish species (Catfish, Bluegill, Largemouth bass). We have started production of GIS maps in order to determine possible manure/chemical loads within designated watersheds. We have tested electrofishing equipment and assayed fish samples with our developed techniques.
2005 - We expanded the battery of assays with NETs (neutrophil extracellular traps) release assay, and tested existing battery of assays with different immunomodulators. We calibrated the assays to be used in fathead minnows and optimized assays for use on

bluegills, largemouth bass, common carp and catfish. We have compiled GIS map of surfaces likely exposed to manure loading and currently are preparing maps for use in flow path analysis. We continued sampling in order to optimize sample collection and laboratory procedures for rapid and efficient analysis of neutrophil function from field samples. USGS approved extension of the project to 09/2006.
2006 - Flow path analysis for the State of Iowa has been partially completed and the analysis is ongoing. Data on fish kills and Iowa Department of Natural Resources fish community sampling was requested form IA DNR and is included in the GIS analysis of the flow path. Laboratory testing of manure effects on neutrophil function is ongoing.

We plan to complete laboratory trials of manure impact on neutrophil function in Spring 2007. We plan to complete GIS flow path analysis and determine hot and cold spots in impacted streams in Spring 2007. We plan to analyze long term fish kill and fish community sampling data and determine if there is correlation between sampling points and manure loading predicted by GIS model. We plan to prepare and submit final report for the project in 2007.

Contact: Clay L. Pierce (515) 294-3159, cpierce@iastate.edu.

NCD Rivers & Streams Technical Committee
Winter Meeting – December 3, 2006
Kansas Report

Kansas Department of Wildlife & Parks

- Aquatic Nuisance Species – Sampling the Kansas River for zebra mussels and silver carp, and Deep Creek for Asian tapeworm.
- Study of Topeka shiner movement and potential migration barriers in Clear Creek, Pottawatomie County.
- Monitoring the effects of bendway weirs on the fish community of the S.F. Ninnescah and Little Blue Rivers.
- Ongoing population monitoring of Neosho madtom at gravel excavation sites in the Neosho River.
- Finished the 3rd year of a rare fish and mussel survey across the state.
- Initiated basin surveys in the Marais des Cygnes and Missouri River basins.
- Recent publication in the Southwestern Naturalist of mussel population response to establishment of a refuge on the Verdigris River.

Kansas Department of Health & Environment

- Initiated a probablisitic sampling program for physical, chemical, and biological features of headwater streams across Kansas.

Kansas State University – Cooperative Fish & Wildlife Research Unit

- Finalizing a study on trophy potential for flathead catfish in the Kansas River.
- Project assessing the impacts of sand dredging on fish community and habitat in the lower Kansas River.
- Initiating a project on the effects of road crossings on the Topeka shiner.
- Finishing a project on the effects of disturbance on Great Plains fish assemblages.

Pittsburg State University

- In 2nd year of 5-year monitoring the effects of bendway weirs on Neosho madtom populations and gravel bar habitat.
- Conducting population studies on freshwater mussels in the Verdigris, Neosho, and Spring Rivers.

USFWS – Manhattan Ecological Field Office

- Visual assessment of road crossings as barriers to fish movement, Mill Creek.

National Park Service – Tallgrass Prairie Preserve

- Ongoing monitoring of Topeka shiner populations.
- Studying the effects of grazing and fire management program on channel morphology.

City of Wichita

- Initiating study of effects of water withdrawal/aquifer recharge project on fish and macroinvertebrate assemblages in the Little Arkansas River.

City of Lenexa

- Initiating a biological monitoring program for streams within City jurisdiction.

2006 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.)

Statewide Department of Natural Resources, Section of Fisheries –

Stream Survey Manual Release

The new manual is scheduled for a state-wide released this April for statewide application the summer of 2007. This manual requires a comprehensive look at the five components of a stream system; hydrology, biology, geomorphology, water quality and connectivity. Each of the five components will typically be used when completing one of the survey types. Initial Surveys are reconnaissance type surveys where initial descriptive data is collected, mainly with the intent of determining similar reaches and establishing sampling stations. Full surveys take a comprehensive look at all the components within each reach. An output format is still being completed for use in the interim until a database is developed. RIVERMorph software is being purchased for every Area Fisheries office in the state to be used as the database for geomorphic data. Work on the database program for the recording other data and to link to RIVERMorph will begin once the lake survey program work is completed.

Other Activities

One of the activities that received the most attention statewide on streams was beaver trapping on trout streams. Many of the streams where trapping occurs have marginal temperatures in parts of the streams and beaver trapping appears to aid trout production.

A guide to trout streams in NE Minnesota, which includes tributaries to the North Shore of Lake Superior, has gone through its final edits. Bids are currently out for printing. It is scheduled to be released in April. It will also appear on the web site at the same tiem.

In the NE Region, Fisheries has been working with the Division of Waters to update the General Permit for Stream crossings for counties in the Region. A General permit spells out the requirements for minimum qualifications that must be met in the design of a stream crossing. Under a general permit, the county highway engineer is not required to get an individual permit for stream crossings from Water's unless those qualifications aren't met. Fisheries requested that a stream simulation design methodology be required to promote fish passage and geomorphic stability. These requirements are: (1) the culvert width must be equal to or greater than the bankfull width of the stream; (2) the culvert slope must match the stream bed slope; (3) culverts must be buried a minimum of 1 foot, with depth buried equaling $1/6^{th}$ the bankfull width of the stream, with a maximum depth of 2 feet; (4) Multiple culverts should be offset, with one culvert buried in the thalweg to $1/6^{th}$ the bankfull width and the other culvert(s) set 1 foot higher; (5) The culvert must be set in alignment with the stream channel. While the new permits do not have this methodology as the primary design technique, it is an optional method for stream crossing design. Minnesota also has a general permit for its' DOT. When that permit expires in 2008, an attempt will be made to incorporate these changes there as well. A best management practices document was created for the Statewide General Permit that does spell discuss this methodology. It can be viewed at;

http://files.dnr.state.mn.us/waters/watermgmt_section/pwpermits/DNR_GP_Guidance_Manual.pdf .

MN AFS Streams and Rivers Committee

At the 2007 annual Chapter meeting, all stream related talks will be grouped into one session that will be followed by the annual meeting. In the past, lack of coordination of talks often resulted in people being scheduled to give their talk at the same time as the committee meeting. The session begins with a 40 minute talk by nationally recognized geomorphology expert, Dr. Luther Aadland entitled; System-based Stream Restoration: Undoing the Damage of River Management. This is followed by a talk by the relatively unknown Karl Koller (Supreme Commander of the MN AFS Streams and Rivers Committee) on a proposed stream restoration. Talks on a paired watershed study (Jesse Anderson), distributional patch habitat patterns among minnows (Robert Mueller Jr), and a general talk on challenges in restoration (Brian Nerbonne).

A resolution to limit Off Highway Vehicle trails near waterways, written by committee members, is being considered by the MN Chapter at the annual meeting.

Arrowhead Regional Stream Team

This multi-agency group of Federal, State and local officials whose goal is to promote the use of geomorphic principles when dealing with streams was not very active in 2006, but a meeting in March 2007 aims to reinvigorate the group. One of the main goals is to expand the number of personnel in the state who have gone through Rosgen training. Coordination among agencies of stream TMDL processes is also an area the Stream Team feels they can contribute. The stream team also supports a few of the restoration projects proposed for the NE Region.

Ecological Resources (formerly Ecological Services) Stream Habitat Program (from Ian Chisholm)

The DNR received $2 million in bonding money for stream restoration projects. Ten to twenty projects will be complete over the next 3 - 5 years funded with this bonding money. Streams are prioritized following a coordinated process that includes all Divisions of the DNR involved in streams. Criteria have been established that are used to rank the projects.

Special publication report #162 – Habitat Suitability Criteria for Stream Fishes and Mussels of MN has been published. It summarizes data collected since 1987. It covers 147 species-life stages and likely represents the largest HSI library in the nation.

Data collection has been completed, and manuscripts are being drafted which analyzes fish community changes over 15 years in disparate streams, the Ottertail and Yellow Medicine Rivers. The intent is to publish manuscripts in Ecology. It is co-authored by Yosef Cohen of the University of Minnesota.

Annual geomorphology training continues. Fluvial Geomorphology and Stream Classification will be offered in Duluth in July, and Stream Restoration will be in Fergus Falls in August. Prerequisites for the Restoration class include Fluvial Geomorphology and Stream Classification and the Stream Monitoring course. For more information on the training, go to http://www.dnr.state.mn.us/ecological_services/streamhab/index.html.

Monitoring continues on the Whitewater, and North Branch of the Root Rivers to track responses to restorations. In addition, the Straight River is also being monitored to track its response to restoration this past summer. Trees were placed by helicopter to narrow over-wide sections of stream.

A template was developed for use in Mining Environmental Impact Statements to respond to potential impacts due to changes in streamflows from dewatering of pits or appropriation for processing. Geomorphology monitoring would be required to assess possible habitat changes due to changes in stream stability. Geomorphic effects have not been considered in the past during environmental review or permitting. The outcome of this proposal is still pending, but it is hoped the monitoring will be included as part of the permit requirements for the life of the projects.

Watershed Assessment Tool - An emerging GIS-based watershed assessment tool (WAT) is being developed that is designed to: 1) provide managers with a robust, comprehensive view of the ecological status of the watershed; 2) assess watershed resource 'health' based on ratings of the data layers under each of 5 resource components of a watershed: hydrology, geomorphology, connectivity, water quality, and biology; and, 3) monitor watershed 'health' based on long-term tracking of these same data layers. An important aspect of the ultimate success of the WAT will be an educational component, targeting natural resource managers, and enabling them to fully understand and effectively use important watershed information in their decision-making process.

From Dean Paron, Assistant Area Fisheries Supervisor, Hinckley, MN

Rush Creek Stream Stabilization and Dam Removal Project
Rush City, Chisago County

Project Description: The restoration objective is to remove a failed low-head dam and to restore and stabilize Rush Creek with a natural channel design that will allow for unhindered upstream and downstream passage of fish. Dam removal will also provide an equally important benefit by supporting critical ecosystem functions and process by providing improved connectivity between the upstream and downstream areas and greater stability and improved habitat conditions through the project footprint area. Also, as part of this project, ponds will be created in the project area to provide benefits for wildlife and recreation.

Lawrence Creek Stream bank Stabilization
Franconia, Chisago County

Ernie Lehman a Franconia landowner along Lawrence Creek had expressed interest to stabilize the rapidly eroding streambank along his property. At the time, lack of streambank protection was resulting in mass wasting, sloughing of bank materials, and inputting excess sediment into Lawrence Creek, and ultimately, the St. Croix River. This request was directed to a multi-agency partnership that had been created between the US Fish and Wildlife Service (USFWS), the Minnesota Dept. of Natural Resources (MNDNR), Chisago County Soil and Water Conservation District (SWCD), and Trout

Unlimited (TU) to address watershed problems in Lawrence Creek. Members of this multi-agency team proposed a project that would use a natural channel design and employ bioengineering practices to reduce soil loss, improve water quality, and enhance fish and wildlife habitat. The initial construction was completed in the fall of 2005. Now the project team and landowner are looking to re-vegetate the project area with native plants.

Brian Nerbonne, Metro Area Trout Stream Coordinator

Two of my projects focused on improving brook trout habitat in streams in Washington County. Restoration of a 1,700 foot coldwater tributary to Old Mill Stream was completed in William O'Brien State Park in partnership with the Minnesota Department of Transportation, who received wetland banking credits for restoration at the site. Additionally, 400 foot meandering channel was created to replace a channelized portion of Valley Creek. A third project on a warmwater tributary to the Vermillion River restored 4,200 feet of stream channel in partnership with the local school district, on whose grounds the project was located.

The Vermillion River Watershed received an EPA targetted watershed grant to study the possibility of market based trading to mitigate thermal impacts to the stream from development. I have been a partner is assessing critical stream reaches for trout, defining groundwater recharge and discharge areas, and working with the St. Anthony Falls Laboratory at the University of Minnesota to develop models that will assess the relative contribution of different land uses and parcels to maintaining coldwater habitat in the Vermillion River.

Louise Maudlin, U.S. Fish and Wildlife Service

"National Fish Habitat Action Plan "

The National Fish Habitat Action Plan is a new science-based, non-regulatory strategy to better protect, restore, and enhance fish habitat in the United States. The Action Plan is supported by an unprecedented coalition of anglers, conservation groups, scientists, state and federal agencies, industry leaders, and a growing number of local watershed groups and landowners. The Action Plan fosters public-private partnerships to work across jurisdictional and land ownership boundaries; focuses our limited resources on strategic priorities for conserving aquatic habitats and communities; and provides a framework for measuring results at regional and national scales. The National Fish Habitat Board is working to establish at least 12 Fish Habitat Partnerships to provide leadership and help to develop fish habitat projects at regional and local levels. The Board encourages jurisdictions and partnership-based entities to organize Fish Habitat Partnerships around key geographic areas, keystone species, or system types. For more information, visit www.fishhabitat.org, or email partner@fishhabitat.org.

U.S. Forest Service -Chippewa National Forest Stream Activities, 2006-2007

2006:

- Willow River and North Turtle River Stream Channel Surveys, Blackduck & Walker Ranger Districts: Stream flow and geomorphic analyses continued for Willow River and North Turtle River.

    - ✓ The Willow River watershed is one of three basins that drain into Big Rice Lake, located in eastern Cass County about two miles south of Remer, MN. Most of the flow from the Willow River now bypasses the lake and leaves the watershed through Judicial Ditch 1. Before construction of the ditch, the Willow River flowed through the lake, entering the lake near the northeast corner and exiting a short distance southeast of the inlet. The ditch system that remains now bypasses 3 miles of the natural channel that flowed in to Big Rice Lake but remains connected to the lake's outlet, and as a result, the flow through the lake outlet can alternate directions depending on the amount of discharge (Ford, 1981). Alternating flow directions between the river and lake, combined with unsuitable habitat conditions in the ditched portion of the Willow River, influences movement of aquatic organisms to and from Big Rice Lake, and throughout the river. In addition, the ditching has removed natural stream meanders that provide habitat (e.g., pools and undercut banks) for fish and invertebrates, and has cut off oxbows and floodplain wetlands that provide important habitat for waterfowl and other wetland wildlife. Removing or plugging the ditch system to restore the Willow River drainage is a project currently being developed by the Walker Ranger District.

      Restoration would allow the water to return to natural drainage patterns, re-establish the hydrology of the area, provide habitat for sensitive species, and restore natural floodplain wetlands which are important to many fish and wildlife species. Throughout 2004 and 2005, Dave Morley led the effort to survey the channel geometry —both ditch and historic channel. In 2006, Morley completed survey of the Willow River downstream of Big Rice Lake and Birch Brook (a channelized tributary). Stream flow and geomorphic analyses of the survey data were contracted out to Ellen River Partners in order to begin design of a restoration project. Plans for 2007 include completion of restoration designs and meetings with potential partners and neighboring landowners

    - ✓ The North Turtle River drains Pimushe Lake and eventually merges with the Turtle River upstream of Cass Lake in western Beltrami County, north of the City of Cass Lake and about 15 miles southeast of Bemidji, MN. Historic log drives out of Pimushe Lake left the channel immediately downstream of the lake overwide and shallow, with width/depth ratios ranging from 21 to 69 on this C-type channel. About 3200 feet of river were surveyed in 2004-2005

and stream geomorphic analyses were contracted through Ellen River Partners. Plans for 2007 - 2008 include completion of restoration designs and meetings with potential partners.

- Fletcher Creek Impoundment Removal / Stream Restoration, Deer River/Marcell Ranger District: 231 acres of wetland habitat and 1 mile of stream habitat were restored through the removal of a failed water control structure on Fletcher Creek. Dike fill material was removed from the wetland and the stream channel through the dam area was re-shaped and seeded.

- Lacroix 2 Impoundment Removal/Stream Restoration, Deer River/Marcell Ranger District: Wetland and stream habitats were restored through the removal of a failed water control structure. Dike fill material was removed from the wetland and the stream channel through the dam area was re-shaped and seeded.

2007:

- Reconstruction of culverts on Forest Road 2162 (West Banks road). This stretch of the West Banks road runs along the west side of the Mississippi River in Cass County, north of U.S. Highway 2. Four tributaries to the Mississippi are crossed with culverts. All are undersized, contribute sediment to the Mississippi River, and most currently restrict fish passage. In 2007, these culverts will be replaced by larger structures which approximate the bankfull width and allow fish passage.

- Removal of Woodtick Impoundment and restoration of the wetland/stream channel (Walker Ranger District) - Wetland and stream habitats will be restored through the removal of a failed water control structure. Dike fill material will be removed from the wetland and the stream channel will be re-shaped and seeded.

Willow River restoration project (Walker Ranger District) - completion of restoration designs and meetings with potential partners and neighboring landowners.

Dark River Large Woody Debris Project Monitoring

OBJECTIVE: Monitor the success of the 2005 Dark River Large Woody Debris Project.

SUMMARY: There was little change in the large woody debris structures placed in the Dark River between July 2005 and July 2006. One large woody debris structure log had moved at Site #2. As expected, increased stream bed scouring and gravel deposition were documented at several large woody debris structure sites. Fish population surveys

indicated that brook trout abundance within the project area had increased from 2005 but was still lower than in the control reach.

2006 Joint Fire Sciences Mercury Fire Project

OBJECTIVE: Fish collections for Mercury in the Boundary Waters Canoe Area Wilderness.

SUMMARY: In 2006, Superior National Forest Fisheries and Aquatics Program staff and the North Central Research Station cooperated in collecting 407 yellow perch, bluegill, and pumpkinseed sunfish from 10 study lakes within the Boundary Waters Canoe Area Wilderness. Fish collections were subsampled, aged, and transported to the University of Minnesota for tissue analysis.

Riparian Surveys

OBJECTIVE: Identify riparian habitat improvement opportunities.

SUMMARY: The Superior National Forest Fisheries and Aquatics Program completed lake and stream riparian surveys at 24 sites within the Glacier Project Mid-Level Area in 2006. These survey results will assist with prioritizing recommendations for proposing future riparian habitat improvement opportunities on the Kawishiwi Ranger District.

Coarse Level Stream Crossing Surveys

OBJECTIVE: Inventory road crossings in the Superior National Forest.

SUMMARY: Many road stream crossings are designed without recognition or calculations necessary to provide for both flow and sediment transport. Coarse level surveys enable us to survey the majority of stream crossings in a mid-level area, prioritize sites based on existing conditions, and to identify out-year restoration and remediation projects. This data also contributes to National Environmental Policy Act project identification, serving as existing condition information used in watershed analysis as well as guide planning and management efforts. In 2006, the Superior National Forest completed coarse level road/stream crossing surveys at 139 locations. Total stream miles inventoried as a result of these completed surveys was 35 miles (1/4 mile @ each site).

Rusty Crayfish Surveys

OBJECTIVE: Monitor distribution and relative abundance of rusty crayfish on the Superior National Forest.

SUMMARY: Rusty crayfish surveys occurred on 18 lakes on the Superior National Forest in 2006. Rusty crayfish were present in seven lakes including Bass, Crane, Cedar, Garden, Fall, Snowbank, and Tofte Lakes. Annual monitoring will continue in both occupied and unoccupied lakes within the Superior National Forest. Monitoring information will be useful for public education and control efforts.

Spiny Water Flea Monitoring Project

OBJECTIVE: Monitor presence/absence, distribution, and abundance of spiny water flea on the Superior National Forest

SUMMARY: Spiny water flea surveys occurred in 5 lakes on the Superior National Forest; spiny water flea were observed in samples from one lake that were previously unknown to be infested (Crane Lake). Similar surveys will occur at establish monitoring locations in future years to monitor presence/absence and relative abundance of this species on the Superior National Forest. It is anticipated that monitoring information will be useful for providing public education/information in an effort to control future invasions on the Superior National Forest and in northeastern Minnesota.

Nester Creek Stream Crossing and Riparian Habitat Improvement Project

OBJECTIVE: Improve aquatic organism passage and riparian habitat conditions in a Lake Superior tributary.

SUMMARY: The Nester Creek Stream Crossing and Riparian Habitat Improvement Project improved aquatic organism passage and riparian conditions within a 1-mile stream reach. The project also improved stream flow, sediment transport, and floodplain function within and outside of the immediate project area.

Kadunce River Stream Crossing Restoration Project

OBJECTIVE: Improve aquatic organism passage at three road/stream crossings on an important Lake Superior Tributary.

SUMMARY: Completed road/stream crossing restoration projects on three sites in the Kadunce River; Improved fish access to over 5 miles of cold water stream habitat. Project partners included Trout Unlimited and the Minnesota Department of Natural Resources.

Harris Creek Stream Crossing Restoration Project

OBJECTIVE: Improve aquatic organism passage and stream water quality.

Summary: This 2006 project on the Kawishiwi Ranger District successfully improved aquatic organism passage, removed a potential sediment source associated with a road/stream crossing, and contributed to restoring stream habitat downstream from the project site. Water quality and fish habitat were improved by removing the culvert, reducing sediment and wash-out road material sources, as well as improving stream channel and hydrologic functions. The purchased temporary bridge structure will be placed at the site in Fiscal Year 2007 to accommodate the Kawishiwi Ranger District access and road travel needs.

Reference Reach and Stream Monitoring Project

OBJECTIVE: Establish long-term stream habitat, fish population, and channel condition reference reaches and monitoring sites on the Superior National Forest to address Forest Plan monitoring requirements.

SUMMARY: Stream channel reference reaches and monitoring stations were established at 18 sites on 20 streams and rivers on the Superior National Forest in 2006 including Bill Creek, Camp 97 Creek, Denley Creek, Harris Creek, Hill Creek, Little Isabella River, Lost Jack Creek, Mitawan Creek, Nira Creek, Norway Creek, Snake Creek, Spawn Creek, Sphagnun Creek, Spring Creek, Stony River, Trappers Creek, and tributaries to Pickett, Mudro, and Grassy Lakes. Stream channel conditions, stream and riparian habitat, and fish populations were monitored at these sites within each mid-level project area. Long term monitoring at established reference reaches and monitoring stations is

planned to occur every 3-5 years depending upon proposed National Forest management, Regional Forester Sensitive Species information needs, and/or environmental conditions that require monitoring.

Summary of Stream Research Activities for 2006

Neal Mundahl
Department of Biology
Winona State University
Winona MN 55987

Slimy Sculpin

Working in cooperation with personnel from MN DNR-Lake City and the U of MN, we examined slimy sculpin habitat use and preferences in streams throughout SE MN. Streams included the three streams being used as donor streams for MN DNR's sculpin reintroduction program, several sculpin recipient streams, plus additional streams where sculpin also maintain healthy populations.

We also examined sculpin diets (prey numbers and preferences) and the abundance of invertebrate prey in six streams.

In the lab, we assessed sculpin feeding rates at various water temperatures, as well as temperature tolerances and the influence of water temperature on oxygen consumption and assimilation efficiency.

South Branch Root River Watershed Project

We assessed fish, benthic macroinvertebrates, and stream habitats at nine sites on the upper South Branch Root River and its tributaries for Fillmore County and MPCA. Comparisons are being made to data collected in 1998 and 1999.

Whitewater Watershed Project

We gathered data on fish, invertebrates, and stream habitats from numerous sites within the Whitewater River drainage, as a continuation of collections begun in 1992. We also assessed the filling of stream pools with fine sediments within that drainage, as well as nearby drainages.

DNR Fisheries Research

Studies 674 and 675: Movement, growth, and mortality of brown and brook trout in southeast Minnesota streams (i.e., an examination of potential metapopulation structure in a series of adjacent stream reaches across three interconnected streams).

Principal Investigators: Doug Dieterman and John Hoxmeier, MNDNR Fisheries Research

OBJECTIVES: Quantify spatial and seasonal patterns of survival and movement of brook and 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: We selected a stream system composed of a portion of Pine Creek (1.2 km), and the entire lengths of two tributaries: Coolridge (1.6 km) and Hemmingway (2.9 km) creeks. To be an adequate study site, this system needed to provide a spatial mosaic of abiotic conditions that could potentially influence trout recruitment, mortality, emigration, and immigration. We initially identified two reaches on Pine Creek, 10 reaches on Coolridge Creek, and six reaches on Hemmingway Creek. Geomorphic and physical habitat features were measured on reaches on Pine and Coolridge creeks in late summer 2006. Both Pine Creek reaches were a C4 geomorphic channel type, but had differing riparian zones. One was entirely pasture and the other entirely wooded. Coolridge Creek had more diverse geomorphic channels that included C4b, F4, B4c, and C5 channel types. Most of the riparian zone along Coolridge was wooded but the extreme lower area was pasture. Pine and Coolridge were dominated by gravel substrates. Trout habitat quality was classified as "good" in Pine Creek but most Coolridge Creek reaches were classified as "fair" habitat quality. Total cover, expressed as a percent of the total surface area of each stream reach, was highest in Pine Creek (10.02%). Total cover was < 3% of surface area in eight of ten reaches on Coolridge Creek and 9.35% of surface area in one Coolridge Creek reach. Late-summer, early-fall stream discharge was highest in Pine Creek reaches and lowest in the most upstream reaches on Coolridge and Hemmingway creeks. There were no obvious physical barriers to fish movement, such as beaver dams or improper road crossings, in any proposed study reaches. Poor habitat conditions, such as low flows, or excessively warm water temperatures, will continue to be evaluated as potential barriers.

Adult and juvenile brown trout abundance varied among proposed study reaches on Pine, Coolridge, and Hemmingway creeks suggesting the presence of a spatial mosaic of environmental conditions that these populations are responding to. Most juvenile abundance estimates were higher in Coolridge and Hemmingway creeks than in the larger Pine Creek. All juvenile abundance estimates, except one, were highest in the F4 channel type in the entrenched reaches in middle Coolridge Creek. A total of 1,028 brown trout ≥ 120 mm TL, and 287 brook trout ≥ 100 mm TL, were implanted with Passive Integrated Transponder (PIT) tags in late summer 2006. The first subsequent recapture occasion, conducted in late fall 2006, found 339 (33%) of brown trout recaptured in the same reach they were initially tagged in and 17 others (2%) recaptured in a different reach. Five hundred and four brown trout, 49% of the original 1,028, were not recaptured due to some combination of mortality, poor recapture efficiency and emigration out of the study area. A total of 86 brook trout, 30% of the original 287, were recaptured in the same reach they were initially tagged in. Four brook trout (1%) were recaptured in a different reach and 197 were not recaptured during the second sampling occasion.

STUDY 620: Movement of Flathead Catfish in the Minnesota River During the Late Summer Post-Spawning Period

PROBLEM: Information on movement of flathead catfish in the Minnesota River during the late summer post-spawning period is needed to understand how catches by various fishing gears in relatively short study reaches relate to true population abundance and size structure at this time of year.

OBJECTIVES: 1) To describe and quantify movement of juvenile and adult flathead catfish in the lower Minnesota River during the late summer post-spawning period in order to provide basic information necessary for potential future estimates of absolute population abundance and size structure; 2) To evaluate and compare manual and automated ultrasonic tracking methods in a medium-sized river such as the Minnesota.

PRELIMINARY RESULTS: Performance of our ultrasonic telemetry equipment during the 2006 field season was surprisingly poor, and therefore the fish movement data were inconclusive. We will try again in 2007 with improved transmitters and receivers.

STUDY 671: Assessment of Natural Channel Design for Stream Trout Habitat Improvement

OBJECTIVE: To evaluate the effectiveness of natural channel design and restoration techniques for expanding the range and abundance of trout in the Dark River between Dark Lake (69-0790) and the Sturgeon River. Specifically, to evaluate the short-term (4 years) changes in channel stability, water temperature, trout abundance, morphological trout habitat variables, and fish and invertebrate community indices, before and after habitat work is completed.

SUMMARY: Six sampling reaches have been identified and sampled since 2004. Three of these reaches are in areas where habitat work is planned, two are similar reaches where no work is planned, and one is a reference reach that has excellent habitat and high brook trout numbers. In 2006 all of the reaches were sampled for fish and macroinvertebrates. Habitat surveys, which measured woody debris and other structure, were conducted in all six reaches and temperature loggers were deployed in each reach from late May through late August. In addition, permanent cross-sections were established in the proposed work areas and surveys were begun, with further survey work to be completed in spring of 2007.

Brook trout were sampled by electrofishing. Table 1 shows numbers of adult brook trout caught in each reach for all three years. Trout have been caught throughout the Dark River, including at the Highway 65-Upstream station, which is the closest sampling station to Dark Lake and farthest from the Reference Reach. Macroinvertebrate sampling is done using the EPA multihabitat rapid bioassessment protocol, which requires dividing each reach into habitat types. This habitat survey is repeated each year and the summary data is shown in Table 2. The fish habitat survey that was conducted in 2006 will add detail to this coarse survey data. Invertebrates are currently being identified and counted.

In 2007, fish and invertebrate sampling will be repeated, temperature loggers will be deployed, and physical survey work will be completed. The habitat work is slated for 2007, pending environmental review and permitting. Sampling will continue for four years after the work is completed to assess the change in the physical habitat, macroinvertebrate community, and brook trout numbers.

Table 1. Numbers of brook trout sampled in the first pass of electro-fishing at each station for 2004-2006. Mean temperature is from the Potlatch area for the three days prior to and including the day of sampling.
* indicates stations not sampled.

	2004	***2005***	***2006***
Reference Reach	22	288	245
Leander	*	*	5
Potlatch-1	9	*	37
Potlatch-2	4	1	0
Highway 65	0	0	0
Highway 65-Upstream	2	0	0
Mean temp ºC	15.5	20.1	19.2

Table 2. Habitat summaries used to allocate macroinvertebrate sampling effort.

2004

Habitat type	***EF-3***	***Leander***	***POT 1***	***POT 2***	***EF-7***	***US-EF-7***
Macrophyte	0.5	-	21	53.5	57	74.5
Snag	15.5	-	3.5	4.5	3.5	5
Overhanging veg or bank	0.5	-	1.5	0	5.2	3.5
Rock / cobble / gravel	44.5	-	60	2.5	1.2	0
Sand / muck	39	-	14	39.5	33.1	17

2005

Habitat type	***EF-3***	***Leander***	***POT 1***	***POT 2***	***EF-7***	***US-EF-7***
Macrophyte	0	7	-	38.5	30.5	42.5
Snag	12.5	9.5	-	1.5	2.5	5
Overhanging veg or bank	0	0	-	2	5	0
Rock / cobble / gravel	46.5	24.5	-	8.5	0	0
Sand / muck	41	59	-	49.5	62	52.5

2006

Habitat type	***EF-3***	***Leander***	***POT 1***	***POT 2***	***EF-7***	***US-EF-7***
Macrophyte	0	4	33.5	28	56.5	55
Snag	13	16	13.5	7	12	9
Overhanging veg or bank	0	0	0	1	0	0
Rock / cobble / gravel	43.5	37.5	33.5	15	0	0
Sand / muck	43.5	42.5	19.5	49	31.5	36

North Central Division of the American Fisheries Society
Rivers and Streams Technical Committee meeting
14-15 March 2007
Moline IL

Nebraska report
[by Steven Schainost, Rivers and Streams Program, Nebraska Game and Parks Commission]

New Topeka shiner population found

A new collection of the Topeka shiner, *Notropis topeka*, has been made from Big Creek, a tributary to the North Loup River. This stream is near another known population in Brush Creek and both are located in southern Cherry County.

Missouri River Aquatic GAP Project

Nebraska has been cooperating with the Missouri Resource Assessment Partnership by providing aquatics data. The Nebraska Aquatic GAP portion of the project was completed in July of 2006 with the completion of a report entitled: "Developing Predicted Fish Distribution Models for Fish Species in Nebraska". The information developed with these models will be used in conjunction with Nebraska's Natural Legacy Project to guide future distributional surveys.

Niobrara Instream Flows

In 1984, the Nebraska Legislature recognized fish, wildlife and recreation as a beneficial use of the water in the state's streams. Since then, instream flow water rights have been granted on two streams, Long Pine Creek in North Central Nebraska in 1989 and the Platte River in 1998. The process of developing an instream flow right for the Niobrara River in northern Nebraska was begun in 2006. At this point a meeting has been held between all interested parties to initiate discussions on data availability and needs. The full process will, if it proceeds to a formal application for flows, take from two to three years.

FishBook

A group of five biologists with knowledge of Nebraska's fishery resources have been working on "The Fishes of Nebraska". This will be a field guide intended for undergraduate biology students, biologists, and interested amateurs and will feature each of Nebraska's 100+ species. It will include an identification key as well as species accounts that will feature a line drawing, a range map, and comments on identification

and habitat typical of other state fish books. It is expected that the guide will go to the printers in late 2007.

AFS NCD Rivers and Streams Technical Committee
Wisconsin Chapter Report
March 14, 2007

Prepared by Paul Kanehl, WI DNR, 2801 Progress Road, Madison, WI 53716. Phone: 608-221-6332, Email: paul.kanehl@wisconsin.gov

Wisconsin Department of Natural Resources

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.

PERFORMANCE ON SCHEDULED ACTIVITIES:

1) Assess fish communities over the entire Lower Wisconsin River: In late August/ early September 2005, 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. In 2005, a total of 41 species and 2043 fish were collected from all 10 stations combined. Included were 11 gamefish species, two state special-concern species (2 silver chub, 1 western sand darter) and two state-threatened species (56 blue suckers, 1 black buffalo). Two species (common carp, shorthead redhorse) occurred at all 10 stations and seven species (gizzard shad, emerald shiner, quillback, smallmouth buffalo, smallmouth bass, walleye, freshwater drum) occurred at 9 of 10. The most numerous species were Mississippi silvery minnow (770), shorthead redhorse (270), emerald shiner (131), and gizzard shad (127); the greatest biomass was collected for shorthead redhorse (161 kg), blue sucker (137 kg), and smallmouth bass (122 kg). Among the gamefish, the most numerous species with the most biomass were smallmouth bass (82 individuals; 14.4 kg), walleye (31; 13.7 kg), sauger (26; 9.3 kg), and channel catfish (21; 13.4 kg). Index of biotic integrity scores ranged from 75 to 100, with 9 of 10 stations rated as excellent and the 10th as good. Scores and ratings in 2005 were similar to those in previous years (Table 2).

2) Estimate sportfish population parameters for the Prairie du Sac Dam tailwater: On October 26 and again on October 27, 2005, 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 2005, a total of 86 sauger (6.5-17.8”), 327 walleye (6.6-26.1”), 2 saugeye (sauger X walleye hybrid)(16.5, 20.5”), 22 largemouth bass (3.8-15.9“), 39 smallmouth bass (3.3-15.2“), 16 muskellunge (28.5-41.3“), and 1 northern pike (35.6”) were collected. The catch rate of 4.3 YOY sauger per mile was identical to the long-term median (4.3), and the catch rate of 34.9 walleye per mile was slightly above the long-term median (31.9). Mean size of YOY sauger (7.4”) was just above the long-term average (7.2”) and the mean size of YOY walleye (8.0) was just below the long-term average (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 2005 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 was high in 2005 at most stations, reflecting a regional pattern of a strong year class (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. An outline and format for the book has been developed, and a team has been assembled and has begun to write the various chapters. This team includes over 15 people from within the Wisconsin DNR and from various universities and federal agencies. Drafts of 17 chapters are done and have been distributed to the team. Most of the workload in 2005-2006 focused on completing a photographic-based fish identification system for the book and the internet. This was done 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 website and a cd for inclusion in the book. The web site is (http://wiscfish.org). A manuscript describing the identification system has been published. Additionally, an interactive mapping website (http://infotrek.er.usgs.gov/fishmap) has been developed in cooperation with the U.S. Geological Survey Wisconsin GAP Program that portrays the distribution of each species in the state. This website will allow rapid development of distribution maps for the book. Work continues to improve this website.

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 a paper in press. A database on fish community, habitat, temperature, predicted flow, and GIS variables from 284 sites on 253 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:**

We are in the process of developing a GIS layer of stream segment classification based on watershed landscape characteristics, watershed land use, stream size, stream channel morphology, and biological communities.

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 will be coupled with models from Activity # 3 to predict impacts of land-use change on stream fisheries.

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. This sampling will continue through 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 field work and 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 Priority Watershed 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.

Stepennuck, 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.

Stepennuck, 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 May 2007; 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, Ed Emmons – BISS, 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.**

- MS accepted, Environmental Management; collaborators: Dale Robertson – USGS, Jim Baumann - WT
- 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.

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

- Run analyses early 2007; draft MS 2007, 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. Development of artificial neural network models to predict water temperature in Wisconsin streams

Coauthors: Jana S. Stewart (USGS) and Edward Roehl (Advanced Data Mining, LLC)

We developed artificial neural network models to predict summer (June-August) daily mean stream temperature in all Wisconsin streams (1:100,000 National Hydrography Data). Artificial neural network models are a multivariate, nonlinear curve-fitting technique that can optimally model dynamic behaviors. Summer stream temperature data were collected from 254 streams across Wisconsin in single or multiple years from 1990 to 2002. Predictor variables included dynamic climate variables and static GIS-derived landscape variables. Two modeling approaches were used: (1) a single model was developed for the entire dataset, and (2) the data were divided into three classes of stream temperature, which each exhibited different dynamic variability and were modeled separately. Streams were assigned to classes by an innovative approach that linked landscape variables with temporally discontinuous stream temperature data.
Independent stream temperature data were used to test model performance.

The stream temperature model will be applicable to all streams throughout the state, whether they have ever been sampled or not, by making use of existing landscape and climate data. Stream temperature predictions will serve as a key input for the Lyons et al. stream models, which will predict fish species presence or absence, abundance, and biomass in streams. Stream temperature models may be used in management and conservation assessments, providing decision support for land use planning, and allocating stream monitoring effort. As a component of models predicting trout presence and absence, the stream temperature model will be useful for allocating trout stream monitoring efforts, identifying trout streams for restoration work based on the potential for success, and evaluating how different land use or global climate change scenarios may impact water temperatures and trout populations in Wisconsin streams.

Results

The artificial neural network modeling approach succeeded in predicting the climatically-forced dynamic behaviors of stream temperature across Wisconsin. However, model accuracy may be inherently limited by the resolution and categorization of GIS-derived variables that describe landscape characteristics over large regional settings. Air temperature was the best predictor climate variable and was included in all models. The best categorical variables, which were also included in all models, were drainage area, darcy values (measures of groundwater input), water and wetland land cover in the watershed, and downstream link (a measure of stream segment location in a stream network). The single model had an R^2 of 0.60 for model training and 0.67 for model testing. The aggregated individual class models had an R^2 of 0.63 for model training and 0.66 for model testing. Predictions tracked the dynamic variability of measurements but generally ran either high or low for each site. Primary sources of error were the static GIS-derived variables, which tended to predict the mean behavioral component for each site. Further model testing with independent data showed the best model results were achieved with the single model, and for predictions of July mean stream temperature, 53% were within 0-2 °C and 83% were within 0-4 °C of measured

values. Predictions of stream temperature were generated for all 38,533 stream segments in Wisconsin and have been applied in models predicting trout presence and absence in Wisconsin streams.

Project papers (available by contacting M. Mitro):

Stewart, J., M. Mitro, E. A. Roehl, Jr., and J. Risley. 2006. Numerically optimized empirical modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – part 2. *In* Proceedings of the 7th International Conference on Hydroinformatics, Nice, France. pp. 1-8.

Roehl, E., J. Risley, J. Stewart, and M. Mitro. 2006. Numerically optimized empirical modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – part 1. *In* Proceedings for the Environmental Modeling and Software Society Conference. Burlington, Vermont. pp. 1-6.

2. 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.

<u>Preliminary results</u>

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 about 44% in 2004 to about 84% in 2005 and about 44% in 2006. 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. 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.

3. 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. Brown trout numbers have increased in reaches restored with overhead cover in both streams, but total trout abundance was similar among restoration zones within streams, regardless of whether overhead cover was established or not. 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. Less expensive restoration designs without overhead cover may yield similar increases in trout abundance, and cost savings can be allocated towards restoring larger sections of streams.

4. 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 will occur in 2007. Tenny Spring Creek, a tributary to Elk Creek in Vernon County, Wisconsin, is scheduled for stream restoration in 2007. A site has been chosen at the downstream end of the stream to install a natural-type waterfall barrier that will create a barrier to upstream migration of brown trout. A splash pad consisting of flat rock will be 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. A preliminary fish survey was completed in 2006. A follow-up survey, stream restoration, brown trout removal, and brook trout transfer will occur in 2007.

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

Coauthor: Andrew H. Fayram

There may be tradeoffs between managing a stream to maximize the production and abundance of a particular species versus managing a stream to maximize biological diversity. For example, managing a stream to maximize

brown trout abundance may involve stream restoration that increases the availability of cover. Managing a stream to maximize biodiversity may involve stream restoration that focuses on a greater diversity of habitat types, which may be at the expense of brown trout carrying capacity.

We are analyzing available fish and habitat data to determine if there are any relations between particular habitat attributes in streams and measures of abundance for trout species or measures of a stream's biotic integrity. We will specifically be using a nonlinear approach in the form of artificial neural network models to examine the relation between stream habitat variables and (1) brook trout catch per effort (CPE), (2) brown trout CPE, and (3) coldwater index of biotic integrity (IBI). We used data collected by the Wisconsin DNR since 1990 and available in the statewide database. Habitat variables included measures of buffer width, bank erosion, percent pool area, width:depth ratio, mean distance between riffles or bends divided by mean stream width, percent of fine sediments, percent cover for fish, percent channelization, percent gradient, and sinuosity.

Preliminary results

The suite of habitat variables considered in our models explained very little of the variation in trout CPE or coldwater IBI scores (r^2 values were < 0.15). However, some habitat variables were significantly related to response variables, and these habitat variables differed depending on which response variable was modeled. Sinuosity and pools explained some of the variation in brook trout CPE; gradient, bend:bend ratio, and cover explained some of the variation in brown trout CPE; and gradient, fines, buffer, erosion, and width:depth ratio explained some of the variation in IBI scores. These results concur with those of other studies that have found little relation between fish-habitat ratings systems and IBI scores.

In general, our preliminary results suggest that the appropriate habitat index will depend on the desired response variable. A substantial amount of work has been conducted to refine habitat measures that reflect IBI scores in Wisconsin streams. However, habitat indices designed to predict coldwater IBI scores may be of limited utility in predicting other variables of interest to fisheries managers, such as trout CPE. In addition, reach scale measurements that we included were not strongly related to any of the response variables we examined. As such, further research may be necessary to identify habitat metrics indicative of trout density. Alternatively, different modeling approaches, such as considering habitat variables as limiting factors rather than as directing factors may be considered.

The following studies are 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 Flathead Catfish (*Pylodictis olivaris*) in the Upper Fox River and Wolf River Systems Determined by Radio-Telemetry.

STUDY OBJECTIVE:

Determine annual movements of adult male flathead catfish and identify spawning areas and critical habitat in the upper Fox River and Wolf River systems in East-Central Wisconsin.

PERFORMANCE ON SCHEDULED ACTIVITIES:

A total of 44 male flathead catfish were implanted with radio transmitters and followed over several years. Fox River fish (24) were tracked from May 2002 – December 2004 while Wolf River fish (20) were tracked from May 2004 – December 2006. The tracking schedule was variable throughout the year dependant upon weather, fish movement, seasonal movement, and aircraft availability. Fish were followed weekly during the open water period and bi-monthly during winter periods. Fish were followed more frequently than weekly during the pre-spawn period to establish spawning sites. Tracking was conducted during daylight hours in order to facilitate other research objectives of the project. Water levels and temperatures from continuous recorders were compared to peak movements during open water periods. Fish showed strong river and site fidelity, returning to the river in which they were tagged and generally returning to the same river reach and often the same woody structure in successive years during spawning the spawning period. Most fish returned to the same wintering area in the upper river lakes during the winter periods, however, 25% of Fox River fish and 20% of Wolf River fish wintered in the river in deep pool habitat. Fish that wintered in the rivers returned to the same winter locations in successive years. Fish began upriver spawning migrations in late April and May when water temperatures reached 15˚C. Movement stabilized in

mid-June when water temperatures reached 20˚C and in late again in late summer. Downriver movement began in August and peaked through September when water temperatures declined from 25 to 20˚C. Specific spawning sites were located by boat in early summer, during boat tracking, exact locations were recorded and, with few exceptions, all flathead catfish in the Fox and Wolf Rivers were associated with large woody debris (downed trees, log jams) adjacent to deep run habitat during spawning and summer periods. During spawning, fish preferred large woody structure (>14" DBH) with rootwad attached and anchored near the bank in 7-9'depth and orientated 25˚ to 45˚ to the bank. Fox River fish traveled up to 48.1 mi and Wolf River fish up to 98.0 mi between winter and summer locations.

2. 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 East-Central Wisconsin.

PERFORMANCE ON SCHEDULED ACTIVITIES:
A total of 21 juvenile flathead catfish 13-15" will be captured at winter locations and implanted with radio transmitters and followed over a one year period. Activity planned to begin late March 2007.

The following studies are being conducted by Andy Fayram, WI DNR, PO Box 7921, Madison WI 53707-7921. Phone: 608-266-5250, Email: Andrew.Fayram@wisconsin.gov.

1. Temporal and spatial variability in PSD in Wisconsin streams.

One of the parameters of interest to fisheries managers is the size structure of a given population. One commonly utilized metric describing population size structure is proportional stock density (PSD). In order to calculate a PSD, one must first define the population of interest. Although defining a population is somewhat difficult in streams due to their interconnected nature, fisheries managers are often concerned with the PSD of brown and brook trout within a given stream. Confidence intervals of individual PSD scores are based on the number of individuals collected and confidence intervals of a streamwide PSD is based on numerous PSD scores from sites with the stream.

Fisheries managers often hope to detect changes in PSD due to some management action (regulation, stocking etc) but PSD will also vary over time independently from any management actions.

Therefore, it is important to quantify expected temporal changes in PSD in order to establish appropriate expectations and reasonable goals for management actions. My goals are to 1) quantify the temporal variation in PSD scores, 2) determine the mean stream length that should be sampled in order to calculate a PSD with specified confidence limits, and 3) determine the mean number of stream sites necessary to sample in order to calculate a streamwide PSD with specified confidence limits.

Publication: Spatial and temporal variation in brook trout and brown trout proportional stock densities in Wisconsin streams. Fisheries Ecology and Management (In press).

2. Examining the relationship between IBI scores and trout size structure

The Index of Biotic Integrity (IBI) is used to rate the health of a stream. The percent of salmonids that are brook trout is a metric of the coldwater IBI score. The more brook trout in the stream, the higher the score. However, IBI scores may or may not be related to other parameters of interest to fisheries managers.

How are IBI scores related to the size structure of gamefish in the streams? We analyzed how IBI scores and the components of the score are related to the size structure of brook trout and brown trout in coldwater streams. We

used proportional stock density (PSD), a commonly used metric describing the number of fish over a certain size, and components of the PSD in the analysis.

Publication: Relationships between a fish index of biotic integrity and mean length and density of brook trout and brown trout in Wisconsin streams. Transactions of the American Fisheries Society (Accepted)

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

Like many streams in southwestern Wisconsin, the Pecatonica River has high steep banks of beautiful dark soil that crumble easily into the water, particularly when the stream rises. This soil pollutes downstream portions of the Pecatonica, the Mississippi River and the Gulf of Mexico. The purpose of this restoration project was to reconnect the stream to its natural floodplain of wetland communities on a quarter-mile stretch. This project goes beyond traditional in-stream habitat improvements in that up to four feet of sediment along the banks of the stream were removed to expose the native soil layer buried by topsoil that eroded from nearby ridges before farmers adopted soil conservation practices. The soil (> 500 truck loads) has proven to be a valuable resource that could be sold to cover the expenses of excavation, tree removal and plantings if the method is replicated. Scientists from WDNR and UW-Madison have gathered information on aquatic species and phosphorus and sediment levels in the stream to learn if the wetlands along this section of stream can help improve water quality. Monitoring will also assess the wildlife habitat created along the stream in hopes of attracting non-game fish, frogs, toads and birds as this habitat has disappeared along most of the streams in this area of the state. WDNR and TNC are part of a partnership of organizations working together to sustain important grassland and freshwater habitat in the 50,000-acre Military Ridge Prairie Heritage Area.

2. RECONNECTING A STREAM TO ITS FLOODPLAIN ON THE EAST BRANCH OF THE PECATONICA RIVER: IN-STREAM RESPONSES

Coauthers: Noah Lottig, University of Wisconsin-Madison Emily Stanley, University of Wisconsin-Madison

Restoration of agriculturally degraded streams frequently involves establishment of riparian areas of “natural” or “undisturbed” vegetation, which often means woody vegetation. However, riparian zones along small headwater streams in prairie regions of the USA were predominantly grassy prior to agricultural development. We compared restored and unrestored streams in southern Wisconsin to examine how reestablishment of prairie (non-woody) riparian zones influenced nutrient cycling, ecosystem metabolism, and stream characteristics that potentially drive these processes. A restored reach was established along a stream section in which all woody riparian vegetation was removed in winter 2004, followed by reseeding with native prairie flora. An unrestored reference reach was established on an adjacent stream and a third reach was established downstream of the reference reach that was restored during July 2006. All reaches had comparable stream discharge (31-51 L/s) and nutrient characteristics. Phosphorus retention varied between reaches. Additionally, gross primary production was greater in the restored reach than the reference reach, most likely due to increased channel insolation (4x greater). Results suggest that restoration of a prairie riparian zone shifts the stream to a more autotrophic status, potentially increasing nutrient retention, which can be considered an additional benefit of restoration in these nutrient-rich agricultural landscapes.

The following studies were submitted by Terry Dukerschein, WI DNR, 2630 Fanta Reed, La Crosse WI 54603. Phone: 608-781-6360, Email: Terry.Dukerschein@Wisconsin.gov.

1. The main activity of the Wisconsin Department of Natural Resources' Onalaska field station is performing standardized monitoring of the upper Mississippi River. Funding comes from the federal Environmental Management Program's Long Term Resource Monitoring Program and the Environmental Monitoring and Assesment Program for Great Rivers (EMAP-GRE). Key river-related resources being monitored are fish, water quality, vegetation, land cover/land use, and invertebrates. In addition, Long Term Resource Monitoring Program (LTRMP) employees have monitored sediments and other parameters as contracts dictated.

By monitoring all these components of the river resource, we improve the chance of detecting changes that might signal problems and/or the necessity for management actions. The Long Term Resource Monitoring Program includes 5 additional field stations located in the states of Iowa, Illinois, Minnesota, and Missouri and is one of the most comprehensive large river monitoring programs in the world.

Detailed information about the Long Term Resource Monitoring Program (LTRMP) and the Onalaska Field Station can be found at the following website: http://www.umesc.usgs.gov/ltrmp.html

Detailed information about the Environmental Monitoring and Assessment Program for Great River Ecology (EMAP-GRE) can be found at the following website: http://www.epa.gov/emap/greatriver/index.html

2. EMAP-GRE (Wisconsin DNR, Minnesota DNR, EPA/ORD studies on the Mississippi River)

- For the past 2 years, staff on the WDNR's Mississippi River Team have been developing a new grant partnering with U.S. EPA, MNDNR, and MNPCA. Their efforts have recently been successful.

- On September 12, 2006, USEPA's Office of Research and Development, Mid-Continental Division awarded $ 1,084,798 of federal funding to the Wisconsin Department of Natural Resources for work spanning years 2006-2010 . WIDNR will be passing about half of the funding to partner agency MNDNR in a cooperative agreement.

- Major objectives of the new EMAP-GRE grant include:
    - Help USEPA and other partner agencies define best available reference condition for various indicators on the Mississippi River. To date this has not been done on the Mississippi River and is needed to create a "yardstick" by which to measure changes in condition over space and time.
    - Promising development more precise bioindicators or indices for aquatic macrophytes on the Mississippi River that will align more closely with management actions for improving habitat quality and ecology of great rivers and that have potential for providing earlier warning than physical and fisheries indicators presently used.
    - Improving existing fish community sampling procedures being used by WI, MN, and the Federal government to better assess fish help, make assessments easier to interpret and more applicable to great river fisheries, and more consistent among various state and federal agencies.
    - Helping EPA and Partner agencies develop more suitable indicators of ecological integrity or indexes of biological integrity (IBI) (Index of Biological Integrity) specific to great rivers (Ohio, Mississippi, Missouri Rivers).

- To date, $ 495,574 has been received by Wisconsin DNR for the 2006-2007 increment of work, which included sampling intended to develop reference condition, vegetation indicators, and methods comparison for fish IBI's along the WI/MN border waters and the WI/IA border waters of the upper Mississippi River I 2007 and 2008. The remainder of the funding was slated to be received in 2008 and will depend on funding EPA receives from U.S. Congress.

- The WI DNR's monitoring field station, located at USGS's Upper Midwest Environmental Sciences Center in La Crosse, will be doing the portion of the work planned for Wisconsin DNR. The MNDNR's monitoring field station in Lake City, MN, will be doing most of the work planned for Minnesota, but working closely with Minnesota Pollution Agency staff, who have Clean Water Act Authority in Minnesota.

    - Both field stations are part of an efficient network that monitors the Mississippi River for the Mississippi River Environmental Management Program funded by the U.S. Army Corps of Engineers and scientifically directed by the U.S. Geological Survey. That monitoring program, the Long Term Resource Monitoring Program, has been sampling each year since 1988 and has been helpful for clean water act assessment and reporting but there are gaps in spatial coverage up and down river.

        - Working as partners with MNDNR and MNPCA enables Wisconsin DNR to cover our shared portion of the Mississippi River much more efficiently and cost effectively-we've been doing

this in other programs since 1988 but this is the first time Wisconsin and Minnesota are engaged in a full effort to develop water quality indicators together.
    - Wisconsin and Minnesota are logical states to be working together on the studies. Their border waters contain some of the worst and some of the best reaches of the upper Mississippi River.
    - Working together from the start will facilitate development of consistent sampling methods, reference criteria and Clean Water Act Standards for these commercially, culturally, and ecologically important interstate waters --collaboration is leading to many good ideas and significant cost savings.

- Great Rivers are unique because they operate at larger scales than their large river tributaries and also have additional human-derived stressors such as commercial navigation, commercial fisheries, invasive species, and flood control that disturb or influence their ecology.
- EPA and the river experts from states of Wisconsin and Minnesota feel there is demonstrated need for quantitative Clean Water Act indicators and standards developed that are specific to Great Rivers.
    - Work to determine the status of great river began with an increment of EMAP-GRE sampling under a separate EPA/USGS grant in 2004 and 2005 which a network of field stations from 13 states covered for the 3 great rivers.
    - This new grant and others in PA and MO build on the work already started in 2004 and 2005. Sampling is scheduled for 3 more summers but will only be conducted for one more summer if grant awards decrease by half as threatened.

The following studies were submitted by Barb Scudder, USGS, Phone: 608-821-3832, Email: bscudder@usgs.gov.

U.S. GEOLOGICAL SURVEY – WISCONSIN WATER SCIENCE CENTER - 2007

The Western Lake Michigan Drainages study unit of the USGS National Water Quality Assessment (NAWQA) program is now in the report writing phase. Sampling for water quality, habitat, and stream biology continues on a limited basis at several sites also sampled during the last cycle of intensive sampling in 1993-95. 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. Data interpretation and report writing are in progress, and reports are planned for release in 2007-2008. For more information, contact Barb Scudder (em: bscudder@usgs.gov, ph: 608-821-3832) or visit http://wi.water.usgs.gov/nawqa/index.html

In 2007, 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 will be assessed again during the same time period in 2007 and 2010 as part of a long term monitoring effort that also includes water chemistry measurements. Semi-permeable membrane devices and toxicity studies will be included in sampling at a subset of sites in 2007. A report is in review for publication in 2007. For more information contact Dave Graczyk (em: dgraczyk@usgs.gov, ph: 608-821-3840).

An Aquatic Gap Analysis project for the Great Lakes States began in 2001 as part of the USGS National Gap Analysis Program. Gap analysis is a program for identifying the degree to which native species and natural communities are represented in current conservation lands. Those areas where unique biological communities and conservation lands do not overlap constitute gaps in conservation efforts. A gap analysis is an approach for biodiversity planning using computer-based geographic information systems to map land cover, conservation areas,

aquatic habitat, and species distributions. To accomplish this, the GAP program builds institutional cooperation at the state and regional level with projects conducted at the state level. Information from gap analysis may be used to identify and prioritize opportunities to conserve riverine biodiversity; identify information or data gaps; help design and plan sampling strategies for research and monitoring; assist in county, state, and regional planning; and assist with education and outreach. Great Lakes Aquatic Gap projects are currently underway in MI, NY, and WI with plans to begin aquatic gap projects in the other GL States in the future. Electronic fish databases were acquired from stakeholders and compiled, and a GIS-based habitat classification for streams is completed. A centralized Great Lakes GAP database was developed, and fish species and habitat information have been linked to allow predictive modeling and identification of conservation gaps. Stream temperature and flow models have been developed and fish modeling is currently underway. Work is being coordinated with a US EPA Science To Achieve Results (STAR) grant for river classification in MI, WI and IL, along with the MI Institute of Fisheries Research, NY Department of Environmental Conservation, IL Department of Natural Resources (DNR), and WI DNR. The Great Lakes project is being coordinated by the USGS Wisconsin Water Science Center. For more information contact Jana Stewart (em: jsstewar@usgs.gov, ph: 608-821-3855) or visit the web site at http://wi.water.usgs.gov/public/gap/index.htm.

The following abstracts were copied from the Wisconsin State AFS Chapter meeting which was held January 9-11, 2007 in Milwaukee, WI.

Bergman, Paul
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An Examination of the Relationship Between Electrofishing Catch Rate and Trout Density in Wisconsin Streams

The relative quickness and cost effectiveness of single pass electrofishing samples (catch per effort, CPE) argues for their use over multiple-pass estimates for enumerating stream fish populations. However, CPE generally acts as an imprecise index of fish abundance and therefore may not be as useful as more precise estimators of abundance (i.e. mark-recapture, depletion) for assessing trout populations. We evaluated the use of single pass electrofishing samples (catch/mi) as predictors of adult brook trout and brown trout density (number/mi) in Wisconsin streams by quantifying the relationship between electrofishing catch rate and adult trout density. We tested for linearity in the relationship between CPE and adult trout density, while accounting for measurement error. Next, we explained residual variability in the relationship using physical and biological attributes of the surveyed streams. A proportional (linear) relationship was found between CPE and trout density for brook trout and brown trout. Catchability was not significantly different between trout species and electrofishing gear types (backpack and DC-tow barge). However, catchability was significantly different among Wisconsin ecoregions and seasons. Trout density alone explained 82% - 97% of the variation in trout catch rates. Pool density explained significant additional residual variation but failed to measurably improve the model. The results show that CPE is a precise and accurate measure of abundance in Wisconsin streams. Use of electrofishing CPE will permit Wisconsin fisheries managers to index trout abundance reliably, with less effort.

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Lake Sturgeon Rehabilitation in Lake Michigan: The Milwaukee River Experience

Lake sturgeon, *Acipenser fulvescens*, historically were abundant in Lake Michigan, with spawning populations using many of the major tributaries and several shoal areas of the lake (Auer 1999, Holey et al. 2000). Their rapid decline in Lake Michigan coincided with habitat destruction, degraded water quality, and intensive commercial fishing associated with European settlement in the region (Harkness and Dymond 1961). Lake sturgeon rehabilitation is

currently a focus of many Great Lakes agencies. Wisconsin began its rehabilitation of lake sturgeon in the Milwaukee River in 2003 when larval sturgeon were stocked. Since then, both fingerlings and yearlings have also been stocked. Starting in 2006, Wisconsin DNR, with additional funding from the U.S. Fish and Wildlife Service and the Great Lakes Fishery Trust, deployed a stream-side rearing facility (SRF) for the Milwaukee River to raise lake sturgeon. This facility was needed so that lake sturgeon can be raised on local river water enabling them to imprint to the water as they grow. The stream-side rearing facility is a state of the art, mobile trailer that house 4 raceways, egg incubating trays, sediment filters, treatment baths and a wet lab. Results from the first 3 years of rehabilitation will be presented.

Frey, Nicole
McKinnon, Jeffrey
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The Impact of Stocked Non-native Species, the Brown Trout, *Salmo trutta*, on the Evolution of the Native Brook Stickleback, *Culaea inconstans.*

Although an introduced species can cause a native species to go extinct, some species of fish have been here so long that they have become naturalized and are now deliberately stocked. The brown trout is currently being stocked in Wisconsin waterways where brook stickleback are known to reside. Such an introduced species can itself evolve rapidly, as well as cause rapid evolution in the indigenous species it is invading. My study is testing whether the brown trout has had a detectable effect on brook stickleback evolution. Measurements are being taken of the stickleback's spines and shape, in sites with and without trout that are matched as closely as possible for other pertinent characteristics. The hypothesis that stocked trout alter selection pressures on the sticklebacks predicts that the stickleback found in water bodies containing brown trout will have longer spines than those found in water bodies lacking trout. Support for this prediction would suggest that other introduced species can have similar effects on the evolution of Wisconsin's native species. It would also imply that greater effort should be put into researching species before they are stocked into Wisconsin waterways.

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Burzynski, Tom
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Assessment of Seasonal Movement Patterns of Walleye (*Sander vitreus*) in the Lower Milwaukee River and Estuary, Wisconsin.

Adult walleye (*Sander vitreus*) were captured in the Milwaukee River estuary using electrofishing to surgically implant radiotransmitters. The main objectives of the study were, a) to examine if walleye in the Lower Milwaukee River and estuary exhibit a seasonal movement pattern, b) to examine if these walleye exhibit a characteristic spawning migration upstream, and c) to document potential spawning areas. We implanted 36 radiotransmitters built by Advanced Telemetry Systems, Inc. in 2000 and 2001. Twenty-five walleye were implanted and released in the spring and sixteen were implanted and released in the fall. About half the numbers of walleye were released in the harbor and the other half were released 5 km upstream from the mouth of the river. Data were gathered by tracking every other week, using a hand held loop antenna and a scanning receiver, for a period of a little over three years. Although the initial expected battery life ranged from 200 to 700 days, several transmitters lasted beyond two years, allowing us to document long-term data. Our data indicated a clear seasonal movement pattern in adult walleye. They seem to move to the deeper, cooler harbor area in the summer months, while they take refuge in the Menomonee River canals during the fall and winter months. The water temperature in the canal is warmer due to cooling water discharge from a nearby power plant. There is also a tremendous density of gizzard shad in the canals during the fall, which might attract walleye to the area. Several radio-tagged walleye traveled upstream during spring (March), and a few repeated this movement pattern around the same time in the following spring. It is possible that spring movement upstream coincides with the walleye spawning season, which indicates potential spawning grounds on the Milwaukee River.

Hughes, Mike
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The Genetic Suitability and Long-Term Viability of Ash Creek's Brook Trout Population as a Regional Brood Source for Wisconsin's Wild Trout Stocking Program.

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. Two critical decisions in designing supplemental propagation programs that rely upon wild broodstock are (1) identifying the source for wild broodstock and (2) determining the proportion of fish collected from the source population. Since 1999 Ash Creek has served as the sole source of broodstock for brook trout (*Salvelinus fontinalis*) in southwestern Wisconsin and was selected because it contains a healthy, naturally reproducing population. Questions exist regarding the genetic suitability of Ash Creek as a broodstock source and the impact of annual removals approaching 50% or more of the adult brook trout in the population. The objectives of this study are (1) to determine the genetic suitability of Ash Creek's brook trout population as a broodstock source and (2) to evaluate impacts of the current broodstock collection strategy on the viability and genetic integrity of Ash Creek's population. Genetic variation was assessed from 12 microsatellite loci for 14 southwestern Wisconsin populations and for subcomponents of Ash Creek's population including fish spawning at the hatchery versus in the stream. To date, sampled populations clustered into two primary groups, suggesting a restricted suitability of Ash Creek as a representative broodstock. Moreover, genetic relationships among populations failed to conform to geographic expectations and suggests a wide-spread impact of stocking in the study region. No significant genetic differences were observed between Ash Creek's YOY instream and hatchery spawning subcomponents. However, significant size differences between instream and hatchery spawning subcomponents indicated an inadvertent bias towards collecting larger trout to spawn at the hatchery. The long-term value of the wild trout program is predicated on the production of trout that are healthy and vigorous and representative of Wisconsin wild brook trout. In order to meet programmatic goals into the future, we suggest alternative broodstock sources and selection strategies that may be employed.

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A Comparison of the Pre- and Post- Impoundment Fish Community of the Upper Mississippi River (Pools 4-13) With an Emphasis on Centrarchids

An investigation of historical fisheries information for pools 4-13 of the Upper Mississippi River (UMR) was conducted to: 1) determine the pre-1938 relative abundance and distribution of bluegill (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*) 2) determine the composition and relative abundance of the pre-impoundment fish community; 3) determine if a shift in community structure or dominance has occurred due to impoundment.

Many of the pre-impoundment information sources did not include a detailed description of the fish community, but did yield qualitative statements regarding the pre-impoundment abundance of bluegill, largemouth bass, and other species. This qualitative assessment indicated bluegill and largemouth bass were widely distributed and abundant prior to impoundment in pools 4-13 of the UMR.

Pre-impoundment (1900-1938) quantitative seining data were obtained from the Wisconsin Department of Natural Resources (WDNR) fisheries database and annual reports of federal fish rescue operations. Post-impoundment (1993-1999) quantitative seining data were obtained from the Environmental Management Program's Long Term Resources Monitoring Program (LTRMP) database, maintained by the United States Geological Survey (USGS).

Pre- and post-impoundment data were compared for similarity in the rank of 13 groupings of fish based on summaries of catch reported by the federal fish rescue. There was a significant correlation between the pre-impoundment datasets but no correlation between the pre-impoundment datasets and the USGS post-impoundment dataset. This indicates that the community structure has changed for the groups included in this analysis.

A comparison of fish species (n=75) common to the WDNR and LTRMP database showed significant correlation for ranks of percent frequency of occurrence and relative abundance. In general, what was common and abundant prior to lock and dam construction is common and abundant today. However, the ranks of percent frequency of occurrence and relative abundance for some species have changed for some species.

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Restoration of the Genesee Creek Following Dam Removal

Genesee Creek is a spring fed Class I trout stream located in southeastern Wisconsin and is only one of two streams in Waukesha County that has naturally reproducing populations of brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*). During February of 2005, the Wisconsin Department of Natural Resources (DNR) removed a roller mill dam built in 1847. A new channel was constructed where an impoundment of approximately two acres in size previously existed. Carroll College Environmental Science Program is collaborating with the DNR, the Southeastern Wisconsin Chapter of Trout Unlimited (SEWTU), National Wildlife Federation (NWF) and the National Resources Conservation Service (NRCS) to restore the Genesee Creek. Habitat sampling at multiple spatial scales was implemented to assess change in stream morphology and habitat suitability for coldwater fishes. Pre-removal data includes benthic macroinvertebrate and fish species composition but physical habitat and water quality data are lacking. Future plans include restoration of the riparian and stream ecosystem - especially within the former dam site - and restoration of spring-fed tributaries. Future goals include assessing the viability of re-establishing brook trout to the stream. Monitoring and evaluation of post-dam removal changes are limited by the lack of pre-removal abiotic data.

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Characteristics of Habitat and Salmonid Populations in Complex and Simple Reaches of a Northern Wisconsin Stream

This paper report on the findings of a multiyear study that explored habitat and fish population characteristics in two reaches of a northern Wisconsin stream. Of the two reaches, one was characterized by an unusually high abundance of large woody debris (> 70 pieces of wood/100 m of channel); the second reach(< 20 pieces/100 m) possessed characteristics more typical of streams in this region. In important respects, habitat conditions in the reaches were very different. The complex reach contained a greater variety of microhabitats, more refugia for fish and more stable habitat conditions than the simple reach. The simple reach was more deeply incised and contained a significantly lower proportion of microhabitats suited for salmonids. Characteristics of salmonid populations differed substantially in the two reaches as well. At the reach scale, diversity was higher and population estimates more stable in the complex reach. At the microhabitat scale, segregation among YOY salmonid species was very strong in the simple reach. Fish here occurred in large conspecific groups and were generally restricted to open water near stream banks. By contrast, YOY salmonids in the complex showed greater similarity in microhabitat use and occurred in small groups across the stream channel. Our findings are consistent with the work of others concerning the role of wood as a determinant of diversity and fish distribution in streams. Of greater local interest is what our

findings suggest about the impact of habitat degradation on the persistence of native brook trout in streams now dominated by non-native salmonids.

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The Channel Catfish Population of the Middle Wisconsin River.

Channel catfish were initially stocked into waters flowing to the Wisconsin River in 1979. The first stockings went into Lincoln County waters, with subsequent stocking in the main channel of the Wisconsin River above Wausau. From these relative few stockings the channel catfish has populated the Wisconsin River from Merrill to Wisconsin Rapids. In the past several years anglers have been reporting good catches of catfish, but little or no survey information existed for distribution to anglers on the status of this fishery. To meet this need we initiated surveys in the Stevens Point Flowage in 2004 using baited hoop nets, but catch was minimal. The survey was expanded in 2005 to include two other river segments, techniques were slightly adjusted, and CPUE improved. Catch rates decreased slightly in 2006 but overall were similar to 2005 in all three river reaches. Age and growth investigations were started in 2005 with spine sections, in 2006 spines and an otolith sample were collected.

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Predicting Summer Water Temperatures for all Wisconsin Streams using Artificial Neural Network Models.

Artificial neural network models were developed to predict summer (June-August) daily mean stream temperature in all Wisconsin streams (1:100,000 National Hydrography Data). Artificial neural network models are a multivariate, nonlinear curve-fitting technique that can optimally model dynamic behaviors. Summer stream temperature data were collected from 254 streams across Wisconsin in single or multiple years from 1990 to 2002. Predictor variables included dynamic climate variables and static GIS-derived landscape variables. Two modeling approaches were used: (1) a single model was developed for the entire dataset, and (2) the data were divided into three classes of stream temperature, which each exhibited different dynamic variability and were modeled separately. Streams were assigned to classes by an innovative approach that linked landscape variables with temporally discontinuous stream temperature data. The single model had an R2 of 0.60 for model training and 0.67 for model testing. The aggregated individual class models had an R2 of 0.63 for model training and 0.66 for model testing. Predictions tracked the dynamic variability of measurements but generally ran either high or low for each site. Primary sources of error were the static GIS-derived variables. Further model testing with independent data showed the best model results were achieved with the single model, and for predictions of July mean stream temperature, 53% were within 0-2 degrees C and 83% were within 0-4 degrees C of measured values. Predictions of stream temperature were generated for all 38,533 stream segments in Wisconsin and have been applied in models predicting trout presence and absence in Wisconsin streams.

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Wolf River Trout Management.

The Upper Wolf River has a long and well known reputation as a trout fishing destination in the Midwest. The Wolf River tumbles for 37.4 miles through eastern Langlade County offering anglers a large, whitewater river, which is conducive to wading and fly fishing. For decades, the Wisconsin Department of Natural Resources has been annually stocking thousands of trout, mostly browns, into the Wolf River. Little assessment of the trout population

has been done due in part to difficulty in sampling the river (large and fast flowing; hard to effectively stream electrofish the rapids and whitewater stretches which hold the most trout) and inaccessibility. In 2004, a raft electrofishing unit was used to sample the entire reach of trout water in Langlade County. A total of 345 brown trout (6.2-19.9”), 7 brook trout (7.6-9.9”), and 1 rainbow trout (12.9”) were captured in two trips down the 37.4 miles of trout water in Langlade County. The brown trout catch rate (5.6/mile) and mark/recapture population estimate of 158 fish/mile (95% CI: 70-379/mile) revealed a low density population. Average size of brown trout captured was 9.7” and a minimum of 67% of the catch were trout stocked earlier that spring (6.7-10.2” inches; average = 8.9”). Brown trout RSD12, 15, and 18 values for both weeks of the survey were 10, 3, and 0.6, respectively. Carry-over from year to year of stocked brown trout in the Wolf River was limited and estimated at less than 2% based on clipped fish recaptures from trout stocked in 2003. There was no evidence of significant brown trout reproduction occurring in the Wolf River.

The information learned from this study is helping guide future trout management on the Upper Wolf River. The low carry-over of brown trout and lack of significant natural reproduction, suggests that stocking is necessary to maintain a trout fishery, which the strong following of Wolf River anglers desire. The data also point towards managing the river more as a put-and-take trout fishery rather than the put-grow-and-take (12” brown trout size limit) and catch-and-release fisheries being managed for now. Regulations to liberalize the size limit, allowing anglers to keep stocked trout that don’t need to carry-over and grow to become legal size, while still maintaining a trophy aspect that anglers want, are being considered. The following regulation proposals may be able to accomplish both objectives: 1) daily bag of 5 fish; all trout kept must be less than 12”; no gear restrictions; 2) daily bag of 5 fish; all trout from 12-18” must be released; only 1 fish greater than 18”; artificial lures only. These proposals, or combinations of them (gear restrictions or not), are being circulated to area anglers and Trout Unlimited chapters to gather initial reactions and suggestions. Broad public acceptance of a scientifically and biologically based regulation proposal is preferred before initializing the formal regulation change process.