ILLINOIS CHAPTER AMERICAN FISHERIES SOCIETY

2014 ILLINOIS REPORT

TO THE

NORTH CENTRAL DIVISION AFS

RIVERS AND STREAMS TECHNICAL COMMITTEE

Respectfully submitted

April 2, 2014

Scaleshell Mussel Found in the Illinois River

During mid-April flooding in 2013, seven barges broke free from their tow and piled against the Marseilles Dam on the upper Illinois River. Weeks later, the Army Corps of Engineers did a drawdown of the river pool to inspect and repair damage from the incident. On May 13-14, 2013, a 10-mile stretch of the Illinois River from Marseilles to Morris was lowered 6-8 feet below normal pool.

Five boats and approximately 25 people from the Illinois Natural History Survey, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service, Army Corps of Engineers, and Western Illinois University worked in teams to salvage, identify, and count as many exposed mussels as possible. In two days of work, the group saved 14,850 mussels of 23 species. Among these was a single federally endangered scaleshell (*Leptodea leptodon*) collected by Kevin Cummings (INHS).

The scaleshell has not been seen in the state for over 100 years and had not been collected from the Illinois River since 1865. Adding to the significance of these results is the fact that the upper Illinois River was completely devoid of live mussels as recent as 50 years ago. The mussel population appears to be responding favorably to decades of water quality improvements.

(paraphrased from a News-Gazette article by Rob Kanter and personal communication from Kevin Cummings)

Reintroduction of Federally Endangered Northern Riffleshell and Clubshell

The Illinois Natural History Survey, Illinois Department of Natural Resources, and U.S. Fish & Wildlife Service continued their reintroduction of the federally endangered northern riffleshell and clubshell. To date, 1,349 Northern Riffleshell and 958 Clubshell have been translocated to eight sites in the Vermilion River basin (five in the Middle Fork and three in the Salt Fork). *(submitted by Jeremy Tiemann)*

Dam Removal Projects Approved in Vermilion River Watershed

On January 7, 2014 the Danville City Council overwhelmingly approved the complete removal of two lowhead dams, the Danville Dam on the Vermilion River and the Ellsworth Park Dam on the North Fork Vermilion River. The vote culminated months of contentious local debate regarding these projects, both part of Gov. Quinn's nearly $10 million Illinois Dam Removal Initiative which seeks to remove or modify 16 such structures statewide for the purposes of public safety, water control and ecological restoration (see 2013 ILAFS Environmental Concerns report).

The Chapter weighed in on this matter with a November 2013 letter to the City's mayor and board of aldermen urging complete dam removal. Our letter cited a litany of ecological impacts these structures imposed upon these high quality streams including water quality degradation, habitat fragmentation, possible T/E species extirpation (Black Sandshell mussel above Danville Dam), and the creation of favorable habitat conditions (stagnant, pooled water) for Asian carp and other aquatic nuisance species. Studies by IDNR and Eastern Illinois University (EIU) have shown over a third (20 species) of the two stream's collective fish fauna had their distribution impeded by the dams. Ironically, some of the project opponents claimed dam removal as "bad for fishing" because of reduced pool depth and related access issues.

The larger of the two dams, the 11-foot high Danville Dam, constructed in 1914, serves as the downstream-most impoundment between the Wabash River and the Vermilion River basin. The dam is an effective barrier between the lower 22 miles of Vermilion River mainstem and the 1,290 mi^2 drainage area upstream, hindering distribution of several aquatic organisms, including 96 species of fish and 46 species of mussels. The dam is also a safety hazard with 3 drownings in the past 10 years. This project will remove a barrier to 1,115 stream miles upstream of this dam in the Vermilion River basin, benefitting an extraordinarily high number of Species in Greatest Need of Conservation (83) of the Illinois Wildlife Action Plan (33 mollusks, 2 crustaceans, 28 fish, 15 amphibians, 5 reptiles).

In the end, concerns about public safety (several drownings had occurred below these structures) and ongoing financial liability (City would be solely responsible for maintenance and repair had the dams remained) may have won the day. Regardless, the vote was a significant victory for Illinois' aquatic resources. Portions of each stream have been classified as "Biologically Significant Streams" by IDNR based on fisheries and aquatic life data. Dam removal is slated for 2014 and 2015, and EIU fisheries students have already amassed 36 "pre-project" fish samples to document changes in the stream fish community following this restoration effort.
(IL AFS 2014 Environmental Concerns Report)

State Listing of the American Eel, American Brook Lamprey, Brassy Minnow, and Crystal Darter

The Illinois Endangered Species Protection Board has approved listing of the American eel (*Anguilla rostrata*), American brook lamprey (*Lampetra lamottei*), and brassy minnow (*Hybognathus hankinsoni*) as state-threatened due to declines in collection numbers and distribution in state waters.

The crystal darter (*Ammocrypta asprella*) is no longer considered extirpated in Illinois (now listed as state-threatened). The fish had not been collected alive in over 100 years, but have been found 6 times in the last 15 years.
(submitted by Jeremy Tiemann)

GLMRIS Report Addresses Ecological Separation of Great Lakes from Mississippi Basin

On January 6, 2014 the US Army Corps of Engineers (USACE) released its long awaited "Great Lakes and Mississippi River Interbasin Study (GLMRIS)" to Congress. The study's stated goal is "to present a range of options and technologies to prevent the transfer of Aquatic Nuisance Species (ANS) between the Great Lakes and Mississippi River basins through aquatic pathways". Although prompted by the well publicized threat of Asian carp entering Lake Michigan, the report considers 13 invasive species (five fish, three invertebrates, four plants and a virus) with a "medium or high likelihood" of transfer between the two watersheds (in either direction).

The study compares eight alternatives with a wide range of "non-structural" and "structural" measures aimed at ecological, if not physical, separation of the basins. Non-structural measures include removal of fish by netting, use of registered biocidal chemicals, controlling boat access along with boat cleaning stations, and public education and outreach programs. Structural measures tend to be more expensive with a higher probability of ANS control. They include construction of GLMRIS locks, electrical barriers (similar to those already in use), ANS treatment plants utilizing water filtration and UV treatment, screened sluice gates, and physical barriers separating the watersheds.

The GLMRIS document addresses impacts of each option to "uses and users" of the Chicago Area Waterway System (CAWS) and Lake Michigan including flood risk management, water quality, navigation (commercial and recreational), hydropower and ecological values. Most of the alternatives feature mitigation measures (e.g. reservoirs, stormwater conveyance tunnels) which run long term costs into the billions. In fact, the four most highly engineered options range between \$15 billion to \$18 billion (excluding annual costs) and would each take 25 years to completion.

Of the three "cheaper" alternatives (\$6.8-8.3 billion), Alternative Plan #8 is the only one involving a physical barrier (along the CSSC at Alsip). It would utilize a suite of control technologies (locks with flushing chambers, ANS treatment plants, electric barriers, screened sluice gates) elsewhere in the study area. Major impacts would be to Lake Michigan water quality; much of Chicagoland's wastewater and stormwater runoff would be redirected to the lake as it originally flowed. Therefore, water quality mitigation measures including reservoirs and tunnels constitute about half of this option's cost.

A public comment period is now underway including a series of meetings with stakeholders across the affected area. To view the GLMRIS document in its entirety (or a very readable 28 page summary), go to http://glmris.anl.gov/.
(IL AFS 2014 Environmental Concerns Report)

Ruffe and Ready? Recent eDNA Findings Highlight Potential Invader

Recent (2013) sampling conducted by the University of Notre Dame, Central Michigan University and The Nature Conservancy has detected "environmental DNA" (eDNA) of the Eurasian ruffe (*Gymnocephalus cernua)* in the Calumet Harbor portion of southern Lake Michigan. Environmental DNA does not necessarily indicate the presence of live fish as this material can be present in fish slime, scales, feces and urine, making it potentially transportable by boats, fishing nets and piscivorous birds. According to IDNR Aquatic Nuisance Species Program Manager Kevin Irons, "…we don't believe Eurasian ruffe are established anywhere in southern Lake Michigan".

Irons' conclusions are corroborated by intensive interagency (IDNR, USFWS) fish sampling efforts which have never collected any ruffe in the Illinois portion of the lake despite the use of bottom trawling and micro-mesh gillnets, two methods well suited to capture this bottom dwelling percid. According to Kelly Baerwaldt, joint USACE/USFWS eDNA Program Manager, "Because Lake Calumet is such a busy port, lake freighters from infested regions could simply discharge water and enable detections". The fish is well established in southwestern Lake Superior where it constitutes about 80% of fish abundance according to trawl samples.

Concerns over the spread of this fish arise because it is a benthic invertivore which could directly compete for food resources with native fishes such as yellow perch and walleye. It has negatively impacted yellow perch populations in Scotland and whitefish in Russia, the latter through egg predation. According to GARP (Genetic Algorithm for Rule-set Production) modeling it will eventually find suitable habitat throughout shallower areas of all five Great Lakes. Because of its potential for inter-basin transfer, the ruffe is one of the 13 target species considered in the abovementioned GLMRIS. *(Sources IDNR 12/3/2013 press release and US Geological Survey Non-IndigenousAquatic Species website)*

Hydraulic Fracturing Rulemaking Draws Fire From Environmentalists

Hydraulic fracturing, or "fracking", is an oil and natural gas extraction practice which involves the high pressure injection of water, sand and various chemicals into shale deposits to free up fossil fuels which would otherwise not be economically recoverable. It is an old technology that has recently been adapted to work horizontally, thus making it far more efficient at accessing deposits than a traditional vertical bore. Several states have experienced a boom in this practice with sometimes mixed results (high profits and job creation coupled with groundwater pollution and other environmental maladies).

Last year, legislation was passed allowing this practice in Illinois. The law resulted from an unlikely consortium of industry, business and environmental groups, all of whom touted it as the nation's most stringent fracking legislation to date. This perception changed for many in December 2013 when IDNR published its proposed rulemaking. While the rules did contain verbiage for water quality protection including setbacks from ponds, lakes and perennial streams, the suite of enforcement actions for non-compliance appears lenient relative to the huge profits oil and gas companies stand to reap. This has prompted many to believe operators will be lax in their environmental compliance (as has occurred in other states) and simply pay nominal fines as part of the "cost of doing business".

One major concern from an aquatic perspective is the huge volume of water consumed by this practice. Each fracking site requires 2-4 million gallons of water to create sufficient pressure to fracture oil and gas bearing rock. Between 10-50% of this water returns to the surface as "flow-back" but this water is laced with chemical additives and must be disposed of as a pollutant (either injected into a deep well or hauled to an approved treatment facility). The rulemaking has safeguards against "pollution and diminution" but appears to address human users, i.e. domestic and industrial consumers of surface and groundwater, with little or no attention afforded to instream flow protection.

This has disturbing implications for lakes, rivers and streams of southeastern Illinois where the New Albany shale holds most of the state's economically recoverable natural gas deposits. Already saddled with a legacy of surface mine runoff, brine pollution and other impacts of fossil fuel extraction, this region of the state could face serious reductions in its surface and groundwater resources. A public comment for IDNR's rulemaking ended January 3, 2014. Over 30,000 comments were received, with the overwhelming majority critical of the proposals and many calling for a moratorium on fracking in Illinois. *(Multiple news sources)*

Illinois' River Otters Contain High Levels of Banned Pesticides

According to a recent article in the journal *Ecotoxicology and Environmental Safety*, river otters collected in central Illinois had alarmingly high levels of several long banned chemical compounds in their livers. The study analyzed liver tissue samples from 23 otters found dead (drowned in traps, road kills) and turned over to IDNR from 2009 to 2011. Lead author Samantha Carpenter, a wildlife technical assistant at UIUC, reported the highest concentrations of dieldrin of any such samples taken across the United States.

Dieldrin is one of several organochlorine insecticides banned in 1978 because of their propensity to bioaccumulate and cause health problems for humans and wildlife. It has been associated with neurological, behavioral and immune suppression problems in wildlife. Impacts to human health are less clear but studies suggest links to asthma, Parkinson's disease, Alzheimer's disease, and breast cancer, according to Carpenter. Between 1953 and 1978, dieldrin was heavily used on Illinois row crops with peak application in 1967 at over half of the state's 10 million acres of corn plantings.

One particularly troubling finding was that mean liver dieldrin concentrations were higher from otters in this study relative to those tested between 1984 and 1989. Aside from dieldrin, the study found measurable amounts of ten other organohalogenated compounds (OHC) out of 20 tested for. PCB's (polychlorinated biphenyls) and 4,4'-DDE (breakdown product of DDT) were present in the next highest amounts. The study's findings appeared consistent with U.S. Geological Surveys's recent NAWQA (National Water Quality Assessment) report finding high concentrations of dieldrin in fish tissue from the Sangamon River basin.

River otters were selected for this study due to their status as an "apex predator" (mostly piscivorous) and, therefore, a sentinel species for bioaccumulating chemicals. Most of the otters collected in this study were from counties between the Illinois and Mississippi Rivers; animals utilized in the 1984-1989 project were presumably from northwestern IL. The fact that a suite of organochlorine compounds banned 25-40 years ago are still showing up in organs of a fish eating predator, let alone increasing in the case of dieldrin, is disturbing and points to the need for continued (and expanded) testing.
(Sources Ecotoxicology and Environmental Safety 100(2014) 99-104 and related press articles)

Illinois Pollution Control Board Board Adopts Second-Notice "Aquatic Life Use" Designations for CAWS and Lower Des Plaines River

On November 21, 2013, the Illinois Pollution Control Board (IPCB) adopted aquatic life use (ALU) designations for second notice in the rulemaking docketed as Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303, and 304, R08-9(C). Specifically, the Board adopted an Upper Dresden Island Pool (UDIP) ALU designation rather than designating UDIP as General Use. The Board continues to believe that UDIP is not impacted by the Use Attainability Analysis (UAA) Factors and that the Clean Water Act goal of "fishable" is attainable in the UDIP.

As proposed, UDIP ALU waters are capable of maintaining, and shall have quality sufficient to protect, aquatic-life populations consisting of individuals of tolerant, intermediately tolerant, and intolerant types that are adaptive to the unique flow conditions necessary to maintain navigational use and upstream flood control functions of the waterway system. Such aquatic life may include, but is not limited to, largemouth bass, bluntnose minnow, channel catfish, orange-spotted sunfish, smallmouth bass, shorthead redhorse, and spottail shiner.

Additionally, the Board proposed amendments to the definitions of ALU "A" and ALU "B" in response to concerns raised. As proposed, Chicago Area Waterway System (CAWS) ALU "A" waters are capable of maintaining, and shall have quality sufficient to protect, aquatic life populations predominated by individuals of tolerant and intermediately tolerant types that are adaptive to the unique physical conditions, flow patterns, and operation controls necessary to maintain navigational use, flood control, and drainage functions of the waterway system. Such aquatic life may include, but is not limited to, fish species such as channel catfish, largemouth bass, bluegill, black crappie, spotfin shiner, orangespotted sunfish, common carp, and goldfish. Proposed ALU "A" waters are Upper North Shore Channel, Lower North Shore Channel, North Branch of the Chicago River, South Branch of the Chicago River, Cal-Sag Channel, Calumet River, Little Calumet River, Grand Calumet River, Lake Calumet, and Lake Calumet Connecting Channel.

As proposed, CAWS and Brandon Pool ALU "B" waters are capable of maintaining, and shall have quality sufficient to protect, aquatic life populations predominated by individuals of tolerant types that are adaptive to unique physical conditions and modifications of long duration, including artificially constructed channels consisting of vertical sheet-pile, concrete and rip-rap walls designed to support commercial navigation, flood control, and drainage functions in deep-draft, steep-walled shipping channels. Such aquatic life may include, but is not limited to, fish species such as common carp, golden shiner, bluntnose minnow, yellow bullhead, and green sunfish. Proposed ALU "B" waters are the Chicago Sanitary and Ship Canal and Brandon Pool.

For more information, contact Marie Tipsord at 312-814-4925 or marie.tipsord@illinois.gov.
(Source Environmental Register, November 2013-Number 713, IL Pollution Control Board)

Proposed Bill Would Remove Cast Net Restrictions

Legislation recently proposed in the Illinois General Assembly would remove all size restrictions for cast nets and greatly expand species legal for capture by this means. To date, this gear has been approved only for the capture of shad as bait fish and sets gear limits at eight feet in diameter with a mesh size of no greater than 3/8" (bar). The new regulation, sponsored by Rep. Raymond Poe (R-Springfield) would amend Illinois Conservation Law at 515 ILCS 5/10-45 as follows:

"Amends the Fish and Aquatic Life Code. Provides that all casting nets shall be legal, without size limits, for the capture of shad, minnow, common carp *(Cyprinus carpio)*, goldfish *(Carassius auratus)*, Asian carp [bighead carp *(Hypophthalmichthys nobilis)*, black carp *(Mylopharyngodon piceus)*, grass carp *(Ctenopharyngodon idella)*, and silver carp *(Hypophthalmichthys molotrix)*], goldeye, mooneye, carp, carpsuckers, suckers, redhorse, buffalo fish, freshwater drum, and skipjack for use as live, dead, or cut bait. Provides that all individuals using casting nets for the capture of specified fish shall possess a valid sport fishing license."

While well intentioned (easing bait capture restrictions for anglers and allowing the harvest of Asian carp as baitfish), this change could have disastrous implications for Illinois fisheries resources. The complete abandonment of gear size restrictions could facilitate its irresponsible or illegal use as could the broadening of target species, e.g. "redhorse" harvest could impact two state-listed species, greater redhorse and river redhorse. The most potential damage, however, could occur with the legal collection of young Asian carp which could then be transported and inadvertently released in other waters.

There is already potential for this practice (due to the similarity of young Asian carp to shad) which has prompted the prohibition of cast netting in the Rend Lake and Carlyle Lake tailwaters. Broadening the scope of cast netting statewide would certainly complicate the enforcement of ANS prevention measures. For these reasons, IDNR stands opposed to the bill. HB3778 received its First Reading and was immediately refereed to the House Rules Committee on January 13, 2014.
(IL AFS 2014 Environmental Concerns Report)

Research Shows Arsenic, Mercury and Selenium in Asian Carp Not a Health Risk to Most

Researchers at the Prairie Research Institute's Illinois Natural History Survey have found that overall, concentrations of arsenic, selenium, and mercury in bighead and silver carp from the lower Illinois River do not appear to be a health concern for a majority of human consumers. The full results of the study have been published in the journal Chemosphere.

Average mercury concentration in fillets was below the US Food and Drug Administration Action Level and EPA Screening Value for Recreational Fishers, though some individual fish had mercury concentrations high enough to recommend limiting consumption by sensitive groups (children < 15 years and women of childbearing age) to 1 meal/week. Mercury concentrations were greater in bighead carp and were elevated in both species taken from the confluence of the Illinois and Mississippi rivers. "These fish are low in mercury in comparison to many other commercially available fish. However, as always consumers need to make informed decisions about their food choices," said Dr. Jeff Levengood, lead investigator of the study.

Arsenic and selenium concentrations in bighead and silver carp fillets examined did not pose a risk to human consumers. Inorganic arsenic concentrations were undetectable and concentrations of selenium in carp fillets were well below the 1.5 mg/kg threshold for restricting the number of meals according to the US Environmental Protection Agency. "Carp species, size and collection location should be considered in judging risks associated with uses of these fish taken from the Illinois River ", Levengood said.
(IL AFS 2014 Environmental Concerns Report)

Iowa Chapter Report

April 1, 2014
Greg Gelwicks
Iowa DNR Fisheries Research

Decorah Management Station

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Rockford Dam Removal

The 200ft long 8ft high lowhead dam on the Shell Rock River at the town of Rockford, Iowa had been in a state of near failure for three years. During periods of base flow all of the river flow was piping underneath the dam. This dam was removed by a private contractor this winter during the absolute coldest two weeks we encountered. There was no in-stream habitat improvement work completed on this project, the river channel will be allowed to naturally reform. Cost of this removal was $160,000.

Haus Park Dam Removal

This 75ft long lowhead dam on the Little Wapsipinicon River on the edge of the town of North Washington, Iowa has been nonfunctional for several years. At base flow all flow goes completely underneath this structure and the impounded area above the dam has entirely reverted to a meandered river section. This dam will be removed this late winter and replaced with a vortex weir to provide fish habitat. Total project cost will be approximately $20,000.

Waterloo Cr Bank Stabilization

Five stream banks on Waterloo Creek, a coldwater trout stream, were stabilized. The stream banks were 10-11ft in height and totaled approximately 1000ft in length. Each stream bank was sloped to a 6:1, excess dirt was spoiled behind the stream bank site and native grasses and forbes were planted. An erosion control fabric mat was installed at the base of the stream banks. Three additional stream banks at this site that were adjacent to state hwy 76 were stabilized with traditional techniques of rock rip-rap on the toe and seeding above the rock.

Natural reproduction of Trout

The number of streams in the northeast corner of Iowa that sustain natural reproduction of trout continues to increase. In the 1980's only 6 streams had populations of trout that were fully supported by natural reproduction. By the winter of 2012 that number had increased to 36 streams and by this winter (2014) the number increased again to 41 streams. Thirty four of these streams have only brown trout reproduction, 3 have only brook trout reproduction and 4 have both brook and brown trout reproduction. A combination of improved land use practices in the watersheds, habitat improvement in the streams and the use of wild strain fingerling stockings have been responsible for this increase over the past 30 years. The increase in the past two years has occurred even though many highly erodible areas in the watersheds have been converted to row crop agriculture.

Iowa State University Research

Distribution and Population Dynamics of Asian Carp in Iowa Rivers

Principal Investigators: Michael J. Weber, Clay L. Pierce
Student Investigator: Carlos Comacho (M.S.)

Goals and Objectives:

- Evaluate adult population characteristics (abundance, distribution, size structure) and dynamics (recruitment, growth, mortality) of Asian carp among select Iowa rivers, including the Mississippi, Des Moines, Skunk, Iowa, and Cedar rivers
- Evaluate Asian carp reproduction (fecundity, larval and juvenile densities) and recruitment in select Iowa rivers, including the Mississippi, Des Moines, Skunk, Iowa, and Cedar rivers.

Introduction:

Bighead (Hypophthalmichthys nobilis) and silver (H. molitrix) carps (collectively, Asian carp) are non-native fishes that have invaded the Mississippi and Missouri river basins. Asian carp can reduce zooplankton assemblages which may result in negative interactions with native fishes. Extensive research has been devoted towards understanding Asian carp populations in the Illinois and lower portions of the Mississippi and Missouri rivers. However, little is known about Asian carp populations in tributaries of these systems, including those throughout southeastern Iowa. Asian carp are known to inhabit lower portions of the Des Moines, Iowa, Cedar, Skunk, and Chariton rivers in Iowa. However, it is not known whether these are resident or migrant populations, the best time of year to sample these populations, if Asian carp are successfully reproducing and recruiting in Iowa rivers, or factors regulating dynamic rate functions of these populations.

Resource managers and stakeholders are concerned that Asian carp will further contribute to the impaired ecological conditions of Iowa's aquatic resources. Success of Asian carp populations in Iowa depends on the ability of adults to find suitable conditions for reproduction (sustained, high flow velocity during spring). A more detailed evaluation of factors affecting reproduction and recruitment in Iowa tributaries of the Mississippi River is needed to better understand Asian carp population dynamics in these systems and potentially develop management strategies for these invasive fishes. A basic understanding of fish population dynamics is essential for management of any population. Additionally, fecundity, age at sexual maturity, and spawning periodicity provide insight into reproductive potential. Finally, information on the spatial and temporal distribution of Asian carp larvae will help to identify adult spawning areas, determine reproductive cues, and characterize relationships between environmental variables and survival of larvae and juveniles.

Progress:

In summer 2013, Asian carp were collected during preliminary sampling in the Mississippi, Des Moines, and Cedar rivers. In the Des Moines River, 120 Silver carp were captured with boat electrofishing ranging from 480-810 mm with 95% of the individuals being 520-660 mm. Additionally, 21 Bighead carp were captured ranging from 560-1080 with the majority (52%) being 700-820 mm. In the Mississippi River, 109 Silver carp were captured ranging from 560-920 mm with 73% of the individuals being 620-740 mm. An additional 11 Bighead carp were caught ranging from 680-1120 mm. In the Cedar River, 1 Silver carp (881 mm) and 1 Bighead carp (1080 mm) were caught. Field observations suggest Bighead carp may not be as numerous as Silver carp in these locations. Asian carp numbers appear to be less abundant above compared to below Lock and Dam 19 but fish above the dam may be larger and in better condition.

Future Plans:

Additional sampling for all life stages of Asian carp will occur in spring-summer 2014 and 2015.

Aquatic Invasive Species (AIS) in Iowa Rivers and Streams
Contact: Kim Bogenschutz, 515-432-2823 ext. 103, kim.bogenshutz@dnr.iowa.gov

U.S. Army Corps of Engineers, Wisconsin DNR, Iowa DNR and National Park Service staff collected zebra mussel veliger samples from the Upper Mississippi River and selected tributaries during July and August 2013 to monitor trends in veliger abundance and peak production. In Iowa, DNR staff collected samples below Lock and Dam 14 and from the Maquoketa, Wapsipinicon, Iowa, and Cedar Rivers. The samples were sent to the U.S. Army Corps of Engineers Research and Development Center in Vicksburg, Mississippi, for analysis. No zebra mussel veligers have been found in the Maquoketa River samples since the Lake Delhi dam broke in 2010. Similar to the Maquoketa River, the Cedar River has the influence of Clear Lake on its zebra mussel population. During high water, the outlet of Clear Lake flows into Willow Creek and then to the Winnebago, Shell Rock, and Cedar Rivers. Low densities of veligers have been collected from each of those rivers during past sampling. It is unknown if the veligers came from Clear Lake, or if there are adult populations within these rivers.

Bighead carp and silver carp have been reported throughout the Mississippi and Missouri Rivers and in tributaries of both rivers in southern and central Iowa for over 10 years. New upstream locations were reported in 2013 for bighead carp (Cedar River, Black Hawk County) and silver carp (Cedar River, Linn County). DNR-AIS staff sampled for bighead and silver carp in the Des Moines, Chariton, and Cedar Rivers in 2013. The highest densities were observed below the Red Rock Dam on the Des Moines River and below the Rathbun Dam on the Chariton River. Bighead carp sampled ranged from 8.7-42.5 inches long, and silver carp ranged from 9.1-34.7 inches long. DNR-AIS staff also assisted with Asian carp collection for an Iowa State University research project funded by DNR-AIS to evaluate the distribution and population dynamics of Asian carp in southeast Iowa rivers. This research project will continue through 2016 in order to better understand Asian carp populations in Iowa.

Stream Biological Assessment – 2013/2014
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http://www.iowadnr.gov/Environment/WaterQuality/WaterMonitoring/MonitoringPrograms/Biological.aspx

The Iowa DNR Watershed Monitoring and Assessment Section (IDNR-WMAS) and the State Hygienic Laboratory (SHL) Limnology Section continue gathering benthic macroinvertebrate, fish assemblage and stream habitat data throughout the State to assess the biological condition of Iowa's rivers and streams in accordance with Federal Clean Water Act monitoring and reporting requirements. The bioassessment program currently has four primary focus areas: 1) status and trend monitoring; 2) reference (benchmark) biological criteria development; 3) impaired stream assessment; and 4) nutrient criteria development.

Status and Trend Monitoring
Status and trend monitoring continues according to a five-year rotational schedule established for approximately 100 warm water ***wadeable stream reference sites***. Historically, approximately 20 wadeable reference sites were sampled annually across the state and were stratified by ecoregion, size and other site characteristics. In 2012-2014, the number of wadeable reference sites sampled was increased to approximately 30/year to try to catch up and get back on a five-year sampling

rotation. Beginning in 2015, approximately 25 warm water wadeable stream reference sites will continue to be sampled annually. In the next few years, the current population of wadeable reference sites, along with other sites that have been sampled historically, will be reviewed to see if changes (additions and/or subtractions) need to be made to the wadeable reference site population.

Reference condition development
The ***reference condition development*** work in 2012/2013 continued to focus on sampling candidate reference sites representing ***small (headwater) warm water perennial streams***. More intensive sampling was conducted in 2012 and 2013 on headwater streams than has occurred in the past and this sampling increase will occur again in 2014.

A report on the ***coldwater stream benthic macroinvertebrate IBI (CBI)*** has been finalized and will be available from the IDNR bioassessment web site in 2014. In the interim, a pdf version of the report is available upon request. Additional sampling data collected at coldwater stream sites in 2012 and 2013 (and again in 2014) will be used to evaluate the performance of the CBI. The Iowa coldwater reference site network is sampled on a five year rotation with four sites sampled annually.

The IDNR Bioassessment program is continuing to work on the development of a **non-wadeable river benthic macroinvertebrate IBI**. Benthic macroinvertebrate samples were collected in non-wadeable rivers across the state at both existing and new sites in 2012 and 2013. The non-wadeable BMIBI development will continue in 2014.

Impaired stream assessment
Historically intensive water quality monitoring and bioassessments were completed as part of the ***Stressor Identification (SI)*** process. Currently there are data available to complete SI's for Middle Fork Grand River, Ringgold Co. and Peck Creek, Clayton Co. However, due to budgetary constraints, future SI monitoring and development is on hold.

In 2013, fish assemblage sampling was conducted in nine stream segments needing ***status updates*** following ***fishkill events*** that occurred several years ago resulting in Section 303(d) impairment listings for aquatic life uses. In 2014, IDNR WIS and WMAS sections plan on sampling 15 streams needing status updates due to fish kills.

In 2013, ~30 potentially biologically impaired streams were sampled to determine their status. In 2014, ~12 potentially biologically impaired streams will have verification sampling conducted to determine their status.

Nutrient criteria development
Sampling and analysis of benthic macroinvertebrate, fish and water quality data continues to be done for the development of ***nutrient criteria*** designed to protect ***stream aquatic communities***. A draft technical report containing draft recommendations for wadeable coldwater and warm water streams is available at
http://www.iowadnr.gov/InsideDNR/RegulatoryWater/WaterQualityStandards/Nutrients.aspx.

Bionet, the new ***internet database*** **(http://iowadnr.gov/bionet/)**, is online and it stores and provides public access to data from the IDNR's stream bioassessment program. Bionet summarizes sampling data for benthic macroinvertebrates, fish, and stream habitat from 1994 to the present and continues to be updated, improved and polished on a daily basis.

Interior Rivers Research

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Interior river habitat and fish community assessment

The completion report for the interior river habitat and fish community study is being finalized. The report includes result of radio-telemetry studies of seasonal movements and habitat use by game fish on the Wapsipinicon and Turkey rivers, including descriptions of important overwintering and backwater habitats. Also reported are the results a study examining the relationships between physical habitat and fish assemblages at 44 sites on 15 non-wadeable Iowa rivers.

Response of fish and habitat to stream rehabilitation practices in Iowa's interior rivers

A new study began in 2010 to evaluate river and stream rehabilitation practices in Iowa. This study will help to develop management guidelines for use of stream rehabilitation practices to improve river and stream habitat and fishing opportunities for Iowa anglers. The first project that we are evaluating is the modification of the Vernon Springs Dam on the Turkey River at Cresco, IA. The dam was converted into a series of rock arch rapids in late July 2010 to address safety and fish passage concerns. Pre-construction fish community and habitat sampling was conducted at three sites above the dam and two sites below the dam. Over 4,400 game and non-game fish were marked below the dam to monitor fish movement over the new structure. Fish community and habitat sampling was also completed at three sites on the Volga River that will serve as control sites for the three upstream sites on the Turkey River. Post-construction sampling of the impoundment above the dam detected 12 black redhorse, 11 golden redhorse, 3 walleye, and 1 northern hog sucker that moved upstream over the structure. Smallmouth bass and black redhorse were sampled post-construction above the dam at sites on the Turkey River and N. Branch Turkey River where they were not detected pre-construction.

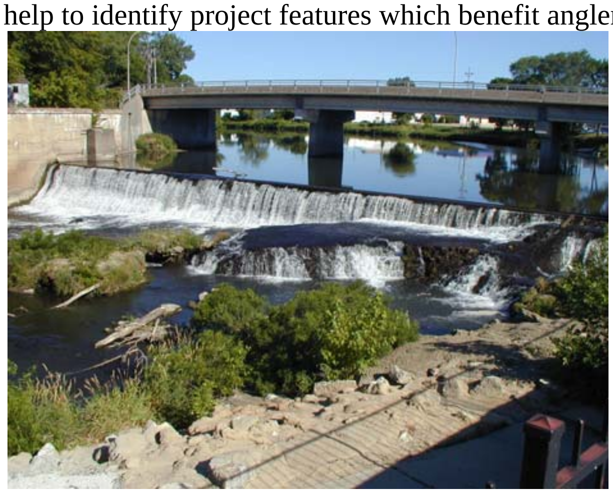
Pre-project fish and habitat data collection began in 2012 for a dam removal on the Shell Rock River in Rockford, IA, and a proposed whitewater park and habitat improvement project at the site of the Marion Street Dam on the Maquoketa River in Manchester, IA. Continued monitoring of these projects, and investigations of additional stream rehabilitation projects will help to guide decision making and lead to improved methods, designs, and allocation of resources for improving Iowa's river and stream fisheries.

Angler response to stream rehabilitation practices in Iowa

Over the past several years, there has been increased interest in modifying and removing aging, low head dams on Iowa's interior rivers. This interest is driven by safety/liability concerns, deterioration of existing dams, and a desire to increase river recreation opportunities. Areas below dams are often popular fishing locations. One common concern about dam removal or modification projects in Iowa is that they will negatively impact angling, particularly below the dam. The impact of dam removal or modification on angling has not been studied in Iowa, and there is little information on this topic available from other states. Solid information on the impact of dam removal and modification on angler use, catch, and harvest is needed to inform decision makers for future projects.

A whitewater park and habitat improvement project has been proposed at the site of the Marion Street Dam on the Maquoketa River in Manchester, IA. Plans call for the partial removal (~6 ft.) and modification of the dam, and building of five additional structures that will create whitewater features while also allowing fish to pass upstream. The project is also expected to improve angler access and fish habitat at the site. A roving creel survey was initiated in April 2012 to collect pre-project data on angler use, catch, and harvest on the Maquoketa River upstream and downstream of the dam. Anglers will be surveyed during the months of April-October for three years prior to construction, and three years after construction. During 2012, total angler effort was 4,785 hours and smallmouth bass, common carp, and walleye were the species caught most often. Bluegill, smallmouth bass, and common carp were caught most frequently in 2013, and anglers expended 6,652 total hours of effort.

Measuring the impacts of a dam modification or removal project in Iowa will provide information that will help managers address angler concerns with future projects. This information may also help to identify project features which benefit anglers that can be incorporated in future projects.



Dam Mitigation and Rivers Program

Contact: Nate Hoogeveen, (515) 281-3134, nate.hoogeveen@dnr.iowa.gov
Links: http://www.iowadnr.gov/Recreation/CanoeingKayaking/LowHeadDams.aspx

Dam removal and modification

Big Sioux River- Removal of the Klondike Dam and replacement with a rock arch rapids is complete. Minor channel work, landscaping, and plantings remain to be completed.

Des Moines River- Rock arch rapids was installed below the Boone Waterworks Dam.

Shell Rock River- Complete removal of the Rockford Dam was completed.

Wapsipinicon River- A rock arch rapid was installed below the dam at Quasqueton. Littleton dam modification is in the project management/permitting phase.

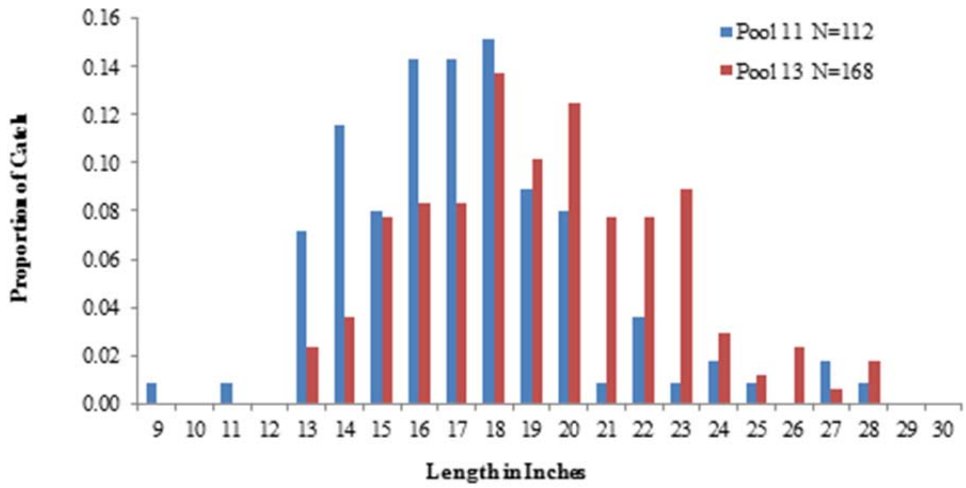
Maquoketa River- A whitewater park and habitat improvement project at the site of the Marion Street Dam in Manchester is in the permitting phase with expected construction in fall 2014 or winter 2015.

Turkey River- The lower dam at Elkader was removed and replaced with a loose stone whitewater feature.

Iowa DNR, Mississippi River Fisheries Research
Contact: Royce Bowman 563-872-4976, royce.bowman@dnr.iowa.gov

Evaluation of Walleye and Sauger populations and associated fisheries in Pools 11 and 13 of the UMR.
Evaluation of a 15 inch minimum with a 20-27 inch release slot for Walleye has shown an increase of Walleye in the 20-27 inch range in pools where the regulation is in effect (Pool 13) versus pools without the regulation (Pool 11). Seventy percent of the eggs produced by Walleye come from fish in the 20-27 inch range. Protecting this size class to increase the number of eggs in the system may improve recruitment in the future.

River conditions were excellent for electrofishing wingdams during summer of 2013. We collected 112 Walleyes in Pool 11, and 168 in Pool 13. CPUE was slightly higher in Pool 11, 21.6 (fish/hour) compared to 16.7 (fish/hour) in Pool 13. However, Walleye RSD-P (% > 20”) was only 19 in Pool 11 compared to 46 in Pool 13. Catches of young Walleye collected during fall tailwater sampling have not measurably changed post regulation. However, sampling from the Long Term Resource Monitoring Program have shown a threefold increase in wingdam Walleye catch rates in Pool 13 since the regulation was enacted (compared to no change in non-regulation pools). Recommendations include continuing with the slot limit and evaluation of the Walleye population as this size class increases.

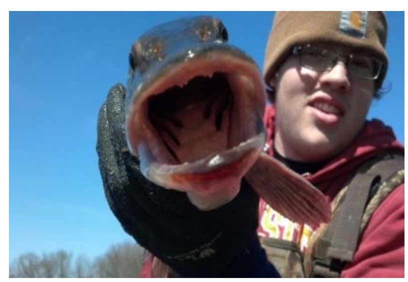


Proportional size distribution of Walleyes caught electrofishing wing dams in Pool 11 and Pool 13 in 2013, Upper Mississippi River.

During the fall 2013 night electrofishing population survey in Pool 11 (Guttenberg), 614 Walleyes (CPUE 32.4 fish/hour) and 1301 Sauger (CPUE 68.7 fish/hour) were collected. In Pool 13 (Bellevue), 1617 Walleyes were caught (CPUE 88.0 fish/hour) and 3187 Sauger (CPUE 173.4 fish/hour).

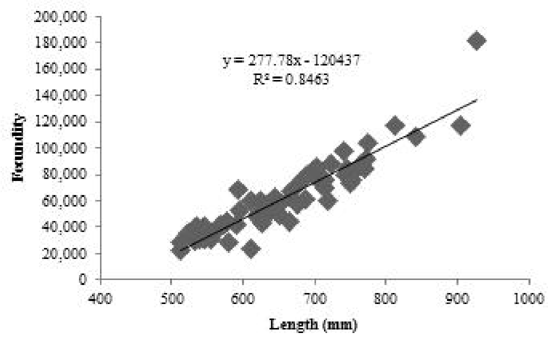
Evaluation of the status, distribution and habitats of Northern Pike in the Upper Mississippi River (UMR).

Northern Pike provide an important recreational fishery for Upper Mississippi River (UMR) anglers. Angler expectations from UMR fisheries vary greatly because anglers target this species for a variety of reasons. Some anglers target Northern Pike due to their trophy potential, while others are more consumption oriented. For many anglers, Northern Pike are a non-target species that they appreciate for the uniqueness that they offer to their angling experience. In order to effectively manage this fishery for this diverse angling group, this study was initiated in 2010 to provide information on Northern Pike population dynamics, angler opinions, and habitat availability in the UMR.



A total of 660 Northern Pike were sampled with fyke nets from Pools 10 and 13 in the spring of 2013. In Pool 10, 209 Northern Pike were collected in 30 net nights (CPUE = 7.0 fish/24 hr set) and in Pool 13, 451 Northern Pike were collected in 32 net nights (CPUE = 14.1 fish/24 hr set). Anal fin rays from six fish per inch group were removed for age and growth determination. During an extended period of hot weather during the summer of 2012, surface water temperatures exceeded 32°C (90°F) resulting in widespread Northern Pike mortality in the UMR. Despite the observed heat related mortality, CPUE in Pools 10 and 13 were comparable or higher than catches in spring 2012, 7.2 (fish/24 hr set) in Pool 10 and 5.4 (fish/24 hr set) in Pool 13.

Fecundity was measured from 56 gravid female Northern Pike collected during spring netting in Pool 13 in March 2013. Whole ovaries were removed, individually weighed, and egg counts from three subsamples (front, middle, and back) were enumerated. The total number of eggs per ovary was calculated by multiplying the total ovary weight by the average subsample (# egg/g) with total fecundity being the sum of both ovaries. Gravid female Northern Pike ranged in size from 512-927 mm and 913-7,976 g and fecundity ranged from 21,829-182,062 eggs/fish (Mean = 63,402). The length fecundity regression was $Fecundity = 277.78(TL) - 120{,}437$. Mean gonadosomatic index (0.18) and eggs per kg of body weight (26,792 egg/kg) were unrelated to total length.



Length fecundity relationship for Northern Pike collected in Pool 13, UMR, March 2013.

In an effort to determine seasonal movements and habitat selection of Northern Pike in the UMR, 60 Northern Pike have been surgically implanted with radio transmitters. In Pool 10, 20 Northern Pike were radio tagged at Sny Magill Bottoms and 10 at Bussey Lake. In Pool 13, 20 Northern Pike are radio tagged in Crooked Slough, and 10 in South Sabula Lake. We will continue to track radio tagged fish for the next two years although angler harvest, heat mortality and transmitter battery expirations have reduced our numbers of contact fish.

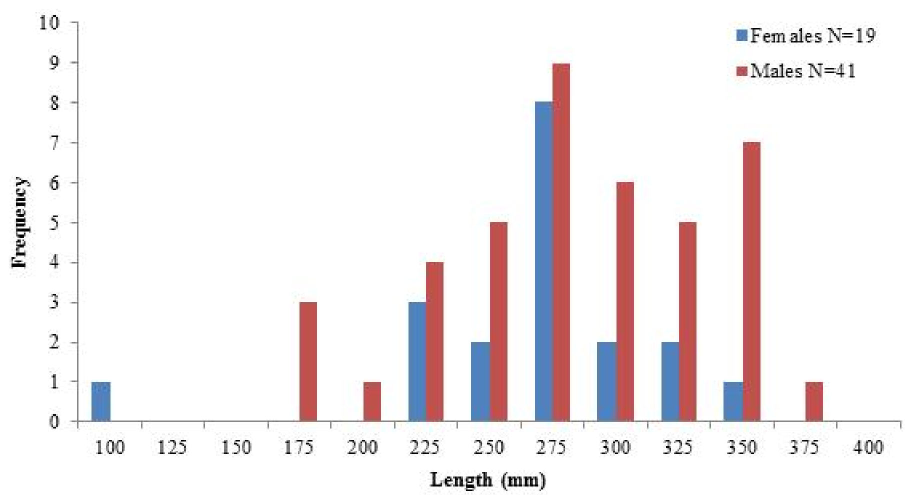
2013 Turtle Sampling

In 2009, the Iowa Department of Natural Resources formed The Joint Committee on Turtle Harvest. The Committee's primary goal is to ensure self-sustaining native wild turtle populations in Iowa. Biologists are concerned about recent trends in commercial turtle harvest and increases in demand. This was our first year collecting turtle data using newly established Standard Operating Procedures (SOP).

Nets used were standard turtle nets with three 762 mm (2.5 ft.) round hoops, 25.4 mm (1 in) bar mesh, and a single flat throat. Turtle nets had a mesh bait bag suspended and fixed in the cod end filled with cut common carp. In addition to cut carp, a can of sardines (lightly smoked, packed in oil) was placed inside the bait bag with lid slightly cracked open. Nets were fished for approximately 24 hours. Captured turtles were enumerated, sexed, weighed, measured and individually marked as described in Iowa turtle sampling SOP. Data analysis was performed on common snapping turtles as the target species during the sampling period.



A wide variety of turtle habitats were sampled including rivers, streams, oxbows, farm ponds and wetlands encompassing both public and privately owned waters in Eastern Iowa. Mean daily air temperature was 30.8° C (87.5° F, range 80-95) and mean water temperature across sites was 25.6° C (78° F, range 73-88). A total of 49 common snapping turtles were caught in 45 net nights (CPUE 1.08/net night) using the standard turtle nets. An additional 14 common snapping turtles were collected using non-standard turtle nets, fyke nets and hand capture for a total of 63. Mean straight-line carapace length was 288 mm (11.3 in, range 4.6-15). Mean weight was 6,615 g (14.6 lbs, range 1.3-28.7). Male to female sex ratio was 1:0.45. Spiny softshells (n = 16), western painted turtles (n = 81), and Blanding's turtles (n = 6) were also collected.



Common snapping turtle length frequency histogram by sex (N=60) collected during the 2013 sampling period.

The histogram may indicate mortality on sexually mature females perhaps from highway mortality and harvest during nesting season. Female turtles are thought to be more vulnerable to road mortality than males because they travel overland to lay eggs. Plus, demand for hatchlings has likely increased commercial fishing pressure on females for their eggs. These preliminary findings suggest more research and data collection for common snapping turtle abundance, and size structure by sex is needed to ensure Iowa's snapping turtle populations remain healthy and self-sustaining.

Mississippi River Management (Fairport) Pools 16 to 20

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

Habitat Improvement

Several meetings, conference calls and data collection trips occurred this year for the Huron Island Habitat and Rehabilitation project (HREP) as work continued with the PDT (Project Delivery Team) from the Rock Island District of the Corps. This project is being designed to raise the topographic diversity on Huron Island to provide improved habitat for mast producing trees. The project will also dredge some of the backwater habitat in order to provide enhanced overwintering opportunity for lentic fish species. Part of the project is also designed to provide shore line protection to some of the area within the project including some of the small islands within Huron Chute.

Permit Reviews

A total of 11 construction or sovereign land permits were reviewed and comments provided. The BNSF coal spill mitigation plan was completed and approved and the coal was removed from the river. Mussel monitoring will continue for 5-10 years to record the progress natural reintroduction of mussels to the area. Other permits were for expansion and stream re-alignment at Lafarge facility, Linwood mining dredging and Muscatine Harbor dredging.

Fish Kill Investigations

On December 4 the unit responded to a report of a freshwater drum die-off in the tailwater of L&D 15. Upon investigation a fairly large number of drum were found from the tailwater to approximately one mile downstream. We recovered 19 fish to hold in case they needed to be tested for cause of death. Our initial determination was a winter die-off due to cold stress. We examined the area again on Dec 5 and saw only about 30 fish still floating near the Marquette St. boat ramp. Scott Gritters from the Bellevue office also examined several tail waters upstream of Pool 16 and did not find any additional die-offs. Therefore, we determined the cause to be winter stress at this one location on the known to be fragile freshwater drum.

Resource Monitoring

Summer random pool sampling was completed on Pools 17 and 18. There were 26 sites completed in Pool 17 and 30 sites completed in Pool 18. Sites are divided into main channel border, side channel border, and backwater contiguous habitats. Each site is sampled for 15 minutes by electrofishing and all species of fish are collected. Some basic water quality and habitat data are collected from each site as well. Random pool sampling was started to provide some fishery trend data on our lower Mississippi Pools. Sampling is similar to what the Bellevue Long Term Resources Monitoring station does on Pool 13.

Random sampling was also completed within Huron Island this summer. Huron Island is a backwater complex located in pool 18 that is scheduled for an HREP habitat improvement projects in the future. The summer random sampling was done to provide pre-project fisheries data. Sampling will continue after the project is completed. There were 22 random sites sampled within the backwater complex. Sites are divided into side channel border and backwater contiguous habitats. Each site is sampled for 15 minutes by electrofishing and all species are collected. Basic water quality and habitat data are collected from each site as well.

Fall overwintering sampling was also completed in Huron Island for crappie, bluegill, and largemouth bass. This is a nonrandom electrofishing survey to help monitor fish populations and document panfish overwintering sites within the backwater complex. Sampling typically starts once water temperature is below 50 degrees.

Aquatic Nuisance (Invasive) Species Program

Fairport Fish Management staff completed zebra mussel veliger sampling on July 11th and August 8th, 2013. Samples were taken on the lower end of the Wapsipinicon River and below Lock and Dam 14 on each date.

Bernie participated and provided expert opinion on a planning meeting for an Asian Carp Project being initiated by the USGS in the pools 19 and 20 area

Fish Population Assessment
Bernie and Adam assisted the Bellevue Fish Management Station with their annual shovelnose sturgeon tagging project on the Cedar River at Palisades Kepler State Park on May 6-9.

White Bass were collected in June to complement sampling done in the fall. Spines and otoliths were collected from certain size ranges to fill in missing sizes from the fall effort. Otoliths collected this summer were aged at the LTRM station. White Bass otoliths collected from the previous fall were aged at the Spirit Lake office with assistance from Jon Meerbeek.

Shovelnose sturgeons were sampled using trammel nets in Pool 18. Shovelnose sturgeon sampling is being done to monitor status of the shovelnose sturgeon populations due to commercial harvest and provide additional recapture information for the tagging project on the Cedar River.

Night electrofishing was completed in October for walleyes and saugers in pool 16 below Lock and Dam 15 and in Sylvan Slough. Eight nights of electrofishing were completed this fall. Sampling is done the second and fourth weeks in October. Again this year white bass were also collected during our night electrofishing in Pool 16. White bass were measured and weighed. The project was started due to concerns from the public about not catching as many white bass as they have in the past and information from the states of Minnesota and Wisconsin that indicates that white bass populations are low river-wide. The information collected during the project will be used to gain a better understanding of white bass populations in the Mississippi River.

Mussels
Adam Thiese, and Nick Kramer assisted with the higgins eye mussel broodstock collection and zebra mussel cleaning at the Cordova mussel bed on pool 14 near Cordova, Illinois. Bernie Schonhoff and Adam Thiese participated in the mussel distribution for the Pool 15 Mussel Augmentation Project at Pigeon Creek and Campbells Island on Pool 15. These mussel were produced by the Genoa National Fish Hatchery. Prior to stocking all of the mussels were tagged with a number vinyl tag for later identification. Tagging was done at the Fairport Hatchery jointly by the FWS and the unit staff. A total of 304 higginseye mussels, 360 plain pocketbook mussels, 364 hickory nut mussels and 7 black sand shell mussels were tagged and divided between the two stocking areas. Adam assisted the Fish and Wildlife Service with mussel cages at the Dubuque Ice Harbor.

Bellevue LTRMP station
Contact: Mel Bowler, (563) 872-5495, melvin.bowler@dnr.iowa.gov

Pool 13 - Fish Stuff:
Aside from working in high water levels from June and July, all 300 samples were completed on time. Excluding hybrids, the total number of fish collected was 13,048. Number of species observed in 2013 – 58. No new species of record to report for the year, but we did collect one specimen of American eel *Slimaximous overwhelmenus* (taken off the bullnose at Lock & Dam 13, and the first eel we've collected since 1990) along with two blue suckers, a brown bullhead,

and a slenderhead darter.

The number of species collected to date from LTRMP in Pool 13 is still on hold at 88. The five most numerically abundant species collected in 2013 were: bluegill, mimic shiner, emerald shiner, channel catfish, and largemouth bass. Species collected that have special status in Iowa included ninety-four weed shiners. No bighead, grass, or silver carp were observed or collected within the pool.

Channel catfish

Catch rates of channel catfish in our small hoop nets were better than the last few years and above the twenty-two year median this year. Channel catfish catches in 2009-2012 were below average following excellent collections from 2007 and 2008. The abundance of larger sized catfish (PSD) has remained fairly good over the last few years, and anglers as well as commercial fisherman will continue to have another year of good catfishing in 2014 in Pool 13. However, channel catfish had a poor spawning season in 2013 relative to the recent larger year classes of 2008 and 2010-2012. Tailwater trawling in Pool 13 for age-0 channel catfish (< 4 inches) yielded a mere 1.0 fish/haul compared to the twenty-three year median of 3.00 fish/haul.

Crappie *spp.*

Catches of black and white crappie in Pool 13 backwater fykes nets had been sub-par between 2007 and 2011. In 2012, we observed escalating catches in both species. In 2013, black crappie abundances about average, while white crappie catches were a couple of fish above the long-term median in 2013.

Largemouth bass

The abundance and condition of largemouth bass populations in Pool 13 were once again very solid in 2013, with no apparent detrimental effects of LMBV. The backwater day electrofishing catch rate of largemouth in 2013 (10.8 fish/15 min.) was equivalent to the 22-year median after two top-year catches in 2011 and 2012. There was a slight decrease in mean *Wr* for all three size categories of largemouth bass compared to last year, but *Wr* values continue to be well within accepted ranges for healthy bass populations.

Shovelnose sturgeon

Tailwater trawling catch rates for shovelnose in 2013 were again outstanding, but not quite as good as last year. Trawl yields for shovelnose sturgeon averaged 7.6 fish/haul, and this was well above the twenty-three year median of 2.9 fish/haul. This year we made collections of age-0 fish which attributed to 5% of the total sturgeon catch in our trawls. Looks like we had excellent recruitment of the 2011 year class last year and this year, as the majority (87%) of the sturgeon we collected were ages 1 and 2 (11-19 inches); however the spawn was relatively light in 2012 and 2013.

Pool 13 – Water Quality Stuff:
Standardized water quality monitoring was conducted at randomly selected sampling sites in Pool 13 and at fixed-site sampling in the mainstem and tributaries of Pools 12, 13, and 14 in 2013. Over 12,300 water quality observations were recorded using 20 parameters during this span. Annual long-term trend data from stratified random sampling collections in backwaters, impoundment, main channel, and side channels on Pool 13 from 1994-2012 (all periods; i.e., spring, summer, fall, and winter) indicates variable but flat trends of suspended solids, total nitrogen (one exception - winter), total phosphorus, and turbidity. The long-term trend of mean total nitrogen in all strata, (and especially the backwater stratum in winter) had been increasing over time from 2008-2011. Backwater mean total nitrogen in 2012 dramatically dropped to an eighteen year low, although the variance specific to this mean was particularly high. A possible explanation for lower nitrogen levels in the winter may be related to reduced ice depths and shorter duration of ice cover relative to the last five years.

Pool 13 - Vegetation Stuff:
Standardized aquatic vegetation monitoring was conducted at 450 sites randomly distributed within Pool 13. Despite higher than normal water levels during the sampling season, all 450 sites were sampled. Fourteen species of submersed vegetation and two species of rooted floating vegetation were sampled in 2013. No new species of aquatic vegetation were observed in 2013. Of the submersed plant species observed in Pool 13, six of the more prevalent species (coontail, curly-leaf pondweed, elodea, myriophyllum, sago pondweed, and vallsineria) were chosen to examine long-term abundance trends (frequency of occurrence) by stratum from 1998-2013. Coontail exhibited a long-term increase over time in all strata, but has been decreasing since 2011. Curly-leaf pondweed has been highly variable from year to year in backwaters, but has shown an increase in frequency since 2004. Elodea and myriophyllum have been highly variable in backwaters and in the impounded portion of Pool 13. Trends for sago pondweed showed low variability in frequency of occurrence from 1998-2006 in all strata, but have been somewhat more variable since. Vallisneria has increased steadily in frequency since 1998 in all strata, and has especially increased in the impounded portion of Pool 13.

Also a summation of all submerged aquatic vegetation (pooled by year; frequency of occurrence) was examined, to get a general sense for the vegetation trends in Pool 13 over the last sixteen years. Trends in submersed aquatic vegetation (SAV) have shown an increase in frequency in backwater and the impounded strata since 2003. The main increases in frequency of submersed aquatic vegetation occurred from 2004-2008. Although frequency of SAV in backwaters and the impounded portion of Pool 13 have remained fairly stable over the last five years, frequency of SAV in the main channel borders and side channels decreased substantially in 2013.

Pool 12 HREP stuff:
In late October and early November 2013, the Bellevue LTRMP and Fisheries Management stations completed an eighth year of electrofishing and fyke netting for the Pool 12 HREP fisheries evaluation. Once again due to low water levels we had to use the Go-Devil to shuttle nets in and out in a couple of lakes. Muskrats were virtually non-existent in the six Pool 12 lakes this year.

All data from 2013 has been entered and verified. Excluding hybrids, we collected 4,159 fish of 24 species from the fyke netting segment of the study and 2,881 fish of 43 species from the electrofishing segment. Six hundred and six bluegills were retained from the six backwater fyke netting locations for aging and sexing in 2013. We completed otolith extraction and sexing of bluegills in December of 2013. Data from aged bluegill were processed through a SAS script that randomly assigns ages to the unaged bluegill, so that we can obtain accurate age frequencies and mortality estimates for the six backwater lakes in 2013. We will be focusing on changes in the abundance, size structure, and condition in fishes among three HREP backwaters in Pool 12 versus three non-HREP Pool 12 backwaters (pre- versus post-HREP) with Pool 13 data serving as an overall point of control (a control for natural variation).

MOAFS RIVERS AND STREAMS TECHNICAL COMMITTEE MEETING

Summer Meeting – 8/1/13 at Runge Nature Center, Jefferson City, MO

Meeting was called to order by Chairperson Kyle Winders

40 Attendees

The business meeting was preceded by presentations by students at the universities of Missouri and Central Missouri. The presentations were as follows:

STUDENT PRESENTATIONS

Impacts of invasive crayfish on macroinvertebrates in Ozark streams

Brandye Freeland, University of Central Missouri – btj32860@ucmo.edu

A predictive temperature model for a thermally heterogeneous stream system

Jacob Westhoff, University of Missouri - WesthoffJ@missouri.edu

Movement of riverine smallmouth bass in a thermally heterogeneous stream system

Jacob Westhoff

Vulnerability, Distribution, and Conservation Status of Missouri's Stream Fish

Nick Sievert, University of Missouri – nas4tf@mail.missouri.edu

Seasonal Fish Community in the lower Osage and Gasconade rivers, 2012-2013

Emily Pherigo, University of Missouri - ekpvx8@mail.missouri.edu

Efficacy of orangespotted sunfish (*Lepomis humilis*) as spawning associates of the Topeka shiner (*Notropis topeka*)

Alex Prentice, thesis from University of Central Missouri, Alex.Prentice@mdc.mo.gov

New Business

- Reminder about the The Midwest Fish and Wildlife conference to be held in January of 2014 in Kansas City, MO.
- Missour Natrual Resource Confrence in February of 2014.
- Kyle Winders opened a discussion about MNRC workshop topics under the conference theme of "Battles in Conservation: Politics, Science, and Stewardship". He suggested the possibilities of: Defense of our aquatic resources and Battles over our aquatic resources. These topics could include habitat, biological invasions, or regulations. Kyle then opened the floor for any additional ideas.
- Lots of discussion of topics and speakers was generated.
- The idea that was selected for the 2014 MNRC workshop was Ecological Flows.
- Jason Persinger asked to provide an additional agenda item to be discussed at this time. He stated that at the 2014 MNRC there would be a MOAFS 50th year celebration banquet off site that would occur during our regularly scheduled business meeting time. More details would be provided by MOAFS in the future.

Warmwater Streams Committee Meeting, Charleston, SC
January 23, 2014
State Activity Updates - Missouri

The Missouri Department of Conservation (MDC) is working on developing an ecological flow policy for internal use. Although, the MDC has no regulatory authority regarding water use, the agency is occasionally asked to provide flow recommendations to protect resources affected by water withdrawals or dams. A policy is needed to guide staff efforts in collecting appropriate information and making recommendations for flow management to conserve riverine resources.

The MDC also is funding three ecological flow research projects with University of Missouri. Dr. Craig Paukert and Emily Tracy-Smith of the Missouri Cooperative Fish and Wildlife Unit have submitted the draft final report for Ecological Flow Linkages in Missouri: Identifying Recent Advances and Refining the Missouri Hydrological Assessment Tool has been submitted. The ecological flow linkages study involved a literature review to document hydrologic and biologic metrics used to demonstrate flow alteration and indicate ecological response.

In 2013, Dr. Paukert and Emily Tracy-Smith began a follow-up project to the ecological flow linkages study. The second study is an Assessment of Available Ecological Flow Data to develop a comprehensive geodatabase of biologic, hydrologic, stream temperature, land-use, and stream alteration information. The geodatabase will be used to identify data gaps, identify sites that are altered and unaltered so we can prioritize monitoring sites, and identify sites with long-term data sets as candidates for maintaining or enhancing monitoring. The project will also include pilot work by Jason Persinger, MDC Stream Habitat Ecologist, to evaluate MDC's ability to develop accurate stage-discharge relationships for small streams.

A third project, Development of Stream Temperature Models for Selected Missouri Streams, is being conducted by Dr. Jodi Whittier and Dr. Paukert. The goals of the study are to characterize water temperature patterns for Missouri streams and examine the relationship between water temperature and stream discharge. The study concludes in 2015 following 2-3 years of temperature monitoring at about 70 stream sites with USGS gaging stations.

AFS NCD Rivers and Streams Technical Committee
2013 Wisconsin Chapter Report

Prepared by Timothy Parks, WI DNR, 810 W Maple Street, Spooner, WI 54801.
Phone: 715-635-4163, Email: Timothy.Parks@wisconsin.gov

EVALUATION OF THE WISCONSIN PRIORITY WATERSHED PROGRAM FOR IMPROVING STREAM HABITAT AND FISH COMMUNITIES

By: Paul Kanehl paul.kanehl@wisconsin.gov, John Lyons john.lyons@wisconsin.gov, Brian Weigel Brian.Weigel@wisconsin.gov

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 by Wang et al. (2002). Objective 2 has been met, in part, with a publication by Wang et al. (2006) on the Otter Creek Priority Watershed. Field work in the Waumandee and Lincoln Creek Priority Watersheds has been completed, and data summarization and analysis, and write-up finalized (see attachment). For Objective 3, several papers (see publication list) have been published that have developed models relating land-use to stream condition. Additional models may be developed upon completion of analyses from the Waumandee and Lincoln Creek Priority Watersheds. Objective 4 is covered under Activity 5 - Data summarization and communication. All data have been computerized and summarized, and an annual summary has been prepared and widely distributed within and outside

the Wisconsin DNR. Several oral technical presentations of study results have also been made, and study principal investigators are active participants in committees and task forces charged with providing guidance to the Watershed Management program. A list of peer-reviewed publications concerning this study is attached.

SIGNIFICANT DEVIATIONS FROM SCHEDULED ACTIVITIES:
Because an insufficient number of BMPs had been implemented and we had already collected sufficient pre-BMP-implementation data, we have discontinued sampling of the Lower Grant Priority Watershed study area since the 1999 field season.

STUDY PUBLICATIONS:
Kanehl, P. and B. Weigel. 2013. Evaluation of the Wisconsin Priority Watershed program for improving stream habitat and fish communities. Wisconsin DNR Report. Pp. 1-115.

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

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

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

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

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

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

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

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

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

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

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

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

Wang, L. and J. Lyons. 2002. Fish and benthic macroinvertebrate assemblages as indicators of stream degradation in urbanizing watersheds. Pages 227-250 In T. P. Simon (editor), Biological Response Signatures: Multimetric Index Patterns for Assessment of Freshwater Aquatic Assemblages. CRC, Press, Boca Raton, FL.

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

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

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

Wang, L., J. Lyons, and P. Kanehl. 2006. Habitat and fish responses to multiple agricultural best management practices in a warm water stream. Journal of the American Water Resources Association 42:1047-1062.

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.

FISHERIES MONITORING AND ASSESSMENT FRAMEWORK DEVELOPMENT FOR STREAMS AND RIVERS

By: Brian Weigel Brian.Weigel@wisconsin.gov

STUDY OBJECTIVES:

1) Derive stream and river classification schemes based upon fishery potential

2) Determine an adequate distribution of monitoring effort

3) Recommend appropriate sampling techniques

4) Propose quantitative guidelines to determine if the fisheries potentials are being met

5) Provide technical and policy consultation to make informed fisheries decisions.

PERFORMANCE ON SCHEDULED ACTIVITIES:

This program facilitated the standardization of stream and river monitoring programs, with quantitative criteria, for managers and policy makers to formulate defensible fisheries decisions. Ultimately the appropriate classification and assessment of waterways will serve to protect exceptional fisheries, and prioritize waterways for improvement or management. In each year, efforts in this program have assisted the evolution of statewide stream and river monitoring programs, responded to inquiries from managers and policy makers for fisheries related issues, and assisted managers with statistical advice for analyzing data appropriately.

During 2010, significant time was spent in developing a new approach for monitoring wadeable streams. Streams were stratified by their natural fish assemblage potential based upon stream flow and temperature. A general randomized tessellation stratification (GRTS) technique, developed by USEPA ORD, was employed to systematically and objectively select 250 wadeable stream sites. The selection process uses a spatial framework to avoid site clustering yet optimizes coverage in the area of interest. The framework allows for stratification by natural stream types, which we used to select sites by stream type in proportion to their occurrence on the landscape. Instream data focused on sport fish collections (i.e., CPUE, length, weight, condition) and supporting data included complete fish assemblage, macroinvertebrate, habitat, and water chemistry. The fish and macroinvertebrate assemblage data can be used to calculate index of biotic integrity (IBI) values and ultimately help fulfill US Clean Water Act reporting requirements for 303(d) and 305(b) purposes. Most of the time supported through this project was used to develop the monitoring framework, select the sites using a GRTS model, run desk-top reconnaissance using remotely-sensed information to validate stream type and accessibility, and provide technical consultation to management in sampling techniques and fisheries decisions.

During 2011, much effort was invested in comparative analyses to maximize efficiency in the stream monitoring strategy so that it meets as many data needs as possible with finite staff and fiscal resources (Weigel 2011). Tradeoffs were characterized between three common monitoring strategies, Geometric, Stratified Random, and Targeted Model designs, in their ability to meet fisheries and US Clean Water Act reporting requirements for the 303(d) impaired waters list, and 305(b) statewide condition assessment. Each of the three strategies was determined to yield one deliverable better than the others. Therefore, the recommended approach is a hybrid of the strategies in which we achieve data for consistent comparisons over time (Targeted Model), a statewide snapshot of resource condition (Stratified Random), and accurate identification of impacts (Geometric) in an objective and cost-efficient manner. Also defined are timelines, staff roles, and support necessary for the monitoring. Comparisons of the three strategies led to further research in which we will determine if a reduced-intensity geometric design can be deployed with minimal loss of information from each watershed. In turn, reducing the intensity within each watershed would increase our capacity to assess more watersheds and increase assessments over a broader spatial scale. This work is supported in part through Region V EPA during 2013. Other activities include selecting sites for subsequent field season according to the monitoring strategy.

During 2012, we focused upon maintaining the buy-in for the recently developed monitoring design. Once again during field season 2013 we are sampling according to the 2010 protocol. This necessitated strong program management in ensuring sampling locations were identified, prioritized, and prescribed to be completed by District biologists according to standardized methods. The strong sportfish component was maintained in evaluating if our naturally reproducing trout streams in fact had multiple year classes of trout. A similar emphasis was placed upon warmwater streams and rivers in building the expectation that they achieve *acceptable* smallmouth bass numbers and metrics (Lyons 2006). The monitoring and evaluation methods based upon this SFR study have been adopted by WDNR's Water Quality Bureau.

Lyons, J. 2006. A sampling framework for smallmouth bass in Wisconsin's streams and rivers. WDNR unpublished report, Smallmouth Bass Rivers Assessment Team, 21pp.

STUDY PUBLICATIONS:

Weigel, BM. 2011. Proposed stream monitoring design for spring 2012 and beyond. WDNR Research Report, Madison, Wisconsin.

Weigel, BM. 2013. Water Quality Bureau Baseline Stream and River Monitoring Design. WDNR Research Report, Madison, Wisconsin.

STUDY PRESENTATIONS:

Weigel, B.M. 2010. A new approach to stream monitoring in Wisconsin. WDNR Watershed Biologist Annual Meeting, February 2010.

Weigel, B.M. 2011. Stream macroinvertebrate and fish responses to stressors. WDNR Watershed Biologist Annual Meeting, March 2011.

Weigel, BM. 2011. Proposed stream monitoring design for spring 2012 and beyond. WDNR Watershed Biologist Annual Meeting, March 2012.

Weigel, BM. 2013. Baseline stream and river monitoring design and evaluation. US EPA and WDNR Monitoring Discussion, February 2013.

Weigel, BM. 2013. Baseline stream and river monitoring design and evaluation. WDNR Stream and Rivers Monitoring Technical Team, March 2013.

IMPACTS OF DAMS & DAM REMOVAL ON FISH COMMUNITY STRUCTURE & MIGRATIONS IN THE BARABOO RIVER

By: Brian Weigel Brian.Weigel@wisconsin.gov

STUDY OBJECTIVES:

1. To ascertain the effects of dam removal on lotic fish migration rates and patterns

2. To quantify changes in biotic integrity and guild composition of the fish community at previously impounded sites following dam removal

3. To evaluate basin-scale recolonization dynamics of fishes into upstream habitats from which they were previously excluded by dams

PERFORMANCE ON SCHEDULED ACTIVITIES:

Objective 1) Effects of dam removal on fish migrations

The effects of dam removal on fish migration patterns were evaluated using target species that were known to undergo seasonal migrations and were relevant to sport fish recovery. Twelve native, lotic species including lake sturgeon Acipenser fulvescens, northern pike Esox lucius, quillback Carpiodes cyprinus, channel catfish Ictalurus punctatus, smallmouth bass Micropterus dolomieui, and walleye Stizostedion vitreum, among others, were selected for study. Electrofishing gear and hoopnets were used to collect fish weekly from July 1, 2003 to October 31, 2003 at six study reaches along the mainstem Baraboo River. Annual field sampling for this study objective was completed in fall of 2003. Target species were tagged with individually numbered anchor tags and the date and location of release and recapture were recorded. Analyses used recapture data to test for differences in migration distance and direction between pre- and post-dam removal periods, among study reaches, and among seasons using Kruskal-Wallis and Mann-Whitney U-tests (α=0.01). Preliminary results indicate that several fish species, including shorthead redhorse Moxostoma macrolepidotum and channel catfish Ictalurus punctatus, migrated farther upstream following dam removal and were more likely to move upstream of the former dam sites.

In addition to fish migration analyses, the timing and species sequence of spawning of six catostomid species were evaluated relative to environmental variables such as photoperiod, water temperature, and discharge. Sampling for this sub-objective was completed in 2002. The study manuscript was published during spring 2007 (see study publications section).

Objective 2) Changes in biotic integrity and guild composition following dam removal

Reach-scale fish community recovery patterns were evaluated by comparing pre- and post-dam removal fish community data from sites adjacent to, and hydrologically affected by dams (i.e., impoundments and tailwater areas). Fish were collected from July 1, 2003 to October 31, 2003 by electrofishing at four impoundment and three tailwater sites using standard methods for sampling fish communities in Wisconsin's rivers and streams. Annual field sampling was terminated in 2003. Future sampling for this study objective will reconvene in spring 2009 and will continue every fifth year for 25 years thereafter to evaluate long-term recovery processes. Fish assemblage structure was quantified using community indices such as the index of biotic integrity, species richness and diversity, guild composition (e.g., percent top carnivores, percent riverine species, percent tolerant species), and individual species abundances (e.g., smallmouth bass, carp). Fish community health and quality improved substantially at previously impounded sites within one year of dam removal as biotic integrity, species richness, and sensitive species such as smallmouth bass increased, while tolerant species such as carp decreased. In tailwater areas, biotic integrity declined initially then generally recovered within two years following dam removal.

Objective 3) Recolonization dynamics following dam removal

Recolonization dynamics were evaluated by assessing the rate and degree to which species with truncated pre-removal distributions extended their upstream ranges following dam removal. Fish were collected at 35 study sites along the Baraboo River and tributaries from July 1, 2003 to October 31, 2003 using standardized methods. Annual field sampling was terminated in October of 2003. Future sampling for this study objective will reconvene in spring 2009 and will continue every fifth year for 25 years thereafter to evaluate long-term recovery processes. Using presence/absence data, the range and upstream distribution of each fish species was established for pre- and post-dam removal time periods. Pre-dam removal data were used to identify species with truncated upstream distributions at dam sites (i.e., found downstream but not upstream of dams). Eight of 20 species with truncated pre-removal distributions recolonized upstream habitats within one year following dam removal. During June 2009, 11 stations were sampled consistent with the revised schedule. Data were entered and summarized in the attached draft report.

SIGNIFICANT DEVIATIONS FROM SCHEDULED ACTIVITIES:
The consistent flooding events during spring 2009 suggest that we sample again during 2010 for added assurance that the data were representative of baseline conditions. Unfortunately the fishery was not sampleable during 2010 summer field season due to the irregular hydrography that never approached stable base flow conditions.

We sampled fish during the 2011 field season, entered the data into the fisheries database, and present the results and conclusions in the attached report (Weigel 2013).

RECOMMENDED CHANGES TO STUDY ACTIVITIES OR TIMELINE:
We recommend finalizing the study at this time instead of the suggested 25-year timeframe discussed in objective 3.

STUDY PUBLICATIONS:
Catalano, M.J., M.A. Bozek, and T.D. Pellett. 2001. Fish habitat relations and initial response of the Baraboo River fish community to dam removal. Bulletin of the North American Benthological Society 18:177.

Catalano, M.J. 2002. Evaluating fish-habitat relations, fish distribution, and effects of dam removal in the Baraboo River, Wisconsin. Master's thesis. University of Wisconsin, Stevens Point.

Catalano, M. J. 2004. Loosening a knotty hold on rivers. Wisconsin Natural Resources Magazine 28(4):15-19.

Catalano, M.J., M.A. Bozek, and T.D. Pellett. 2007. Effects of dam removal on fish assemblage structure and spatial distributions in the Baraboo River, Wisconsin. North American Journal of Fisheries Management 27:519-530.

Weigel, B.M. 2009. Baraboo River; Long-term trends in fish assemblage, biotic integrity, and the smallmouth bass fishery after dam removal. Wisconsin Department of Natural Resources, Science Services.

Weigel, B.M. 2013. Baraboo River; Long-term trends in fish assemblage, biotic integrity, and the smallmouth bass fishery after dam removal. Wisconsin Department of Natural Resources, Science Services.

SPAWNING AND EARLY LIFE HISTORY OF FLATHEAD CATFISH IN THE UPPER FOX AND WOLF RIVERS, WISCONSIN

By: Randal Piette randal.piette@wisconsin.gov

STUDY OBJECTIVE:
Identify critical spawning and nursery habitat by following movements of flathead catfish Pylodictis olivaris in the Wolf and Upper Fox Rivers in east-central Wisconsin.

PERFORMANCE ON SCHEDULED ACTIVITIES:
Activity # 1: Radio-tag and track mature male flathead catfish - completed.

Activity # 2: Locate spawning locations and describe the biotic and abiotic characteristics of these sites - completed.

Activities # 3 and 4, dealing with early life history suspended.

Activity # 5: Movement and habitat use of juvenile flathead catfish – field work completed.

Activity # 6: Manuscript published on adult flathead catfish movements in Transactions of the American Fisheries Society Catfish 2010 Symposium 77. Finalize juvenile flathead movement report delayed until fall. Continue informational exchange with state biologists.

SIGNIFICANT DEVIATIONS FROM SCHEDULED ACTIVITIES:
Juvenile movement report to be submitted when completed.

RECOMMENDED CHANGES IN STUDY ACTIVITIES OR TIMELINES:
Administrative close-out complete.

STUDY PUBLICATIONS:
Piette, R. R. and A. Niebur. 2011. Movement of Flathead catfish in the upper Fox River and Wolf River Systems Determined by Radiotelemetry. American Fisheries Society Symposium 77.

FISH COMMUNITY RESPONSE TO STREAM FLOW CHANGES IN THE MENOMINEE RIVER SYSTEM

By: Randal Piette randal.piette@wisconsin.gov

STUDY OBJECTIVE:

Complete phase II post flow change survey on the Menominee River System. Evaluate the effects of increased minimum flows and re-regulation of flows on game and non-game fish communities in the affected portions of the Menominee River by comparing abundance indices before and after flow changes.

PERFORMANCE ON SCHEDULED ACTIVITIES:
Activity 1- Mini-boom electrofishing surveys (Summer 2010-11)
Field sampling completed.

Activity 2- Electrofishing Grid Surveys (Summer 2010-11)
Field sampling completed.

Activity 3- Produce Annual Report of Results
Annual report covering 2008-10 activities in completed. Final report covering pre (1996-98) and post (2008-10) flow regulation changes completed.

STUDY PUBLICATIONS:
Piette, R. 2011. 2010 Progress Report Study SSDM: Effects of Flow Regulation and Restriction of Passage Due to Hydroelectric Project Operation on the Structure of Fish and Invertebrate Communities in Wisconsin's Large River Systems. Phase II: Menominee River. Fish and Habitat Conditions Post Flow Regulation Changes.

Piette, R. 2013. Final Report Study SSDM: Effects of Flow Regulation and Restriction of Passage Due to Hydroelectric Project Operation on the Structure of Fish and Invertebrate Communities in Wisconsin's Large River Systems. Phase II: Menominee River. Fish and Habitat Conditions Post Flow Regulation Changes. Wisconsin DNR report. Pp. 1-79. – Attached.

LAKE STURGEON DISTRIBUTION, MOVEMENT AND STOCKING SUCCESS IN THE UPPER ST. CROIX RIVER AND NAMEKAGON RIVER

By: Jeff Kampa jeffrey.kampa@wisconsin.gov

STUDY OBJECTIVES:
1. Estimate lake sturgeon population size from the confluence of the St. Croix River and Namekagon River upstream to the first barrier in both river systems.

2. In cooperation with WDNR and MDNR Fish Management staff, document lake sturgeon movement throughout the upper St. Croix River system in Wisconsin and Minnesota.

3. Assess the performance of lake sturgeon stocked above movement barriers in the St. Croix River and Namekagon River.

PERFORMANCE ON SCHEDULED ACTIVITIES:

Activity #1: We electrofished 3.6 km of the St. Croix River with a boat-mounted DC electrofishing unit on May 30, 2013. High spring flow precluded electrofishing on the Namekagon during June, 2013.

We continued targeted hook and line sampling of lake sturgeon in the Namekagon River and St. Croix River because a comparison of targeted and randomized sampling resulted in similar distribution maps (Figure 1). We deployed angling effort based on river flows, the general downstream seasonal movement of lake sturgeon, and equipment and staff availability. Total effort was 11 days of angling during July – September, 2012.

We collected 49 lake sturgeon downstream from the Trego Dam on the Namekagon River and downstream from the Gordon Dam on the St. Croix River. Lake sturgeon were inspected for dangler tags and scanned for PIT tags from marking in previous years by WDNR and MDNR; unmarked fish were double-marked with dangler tags and PIT tags. Total length and weight was recorded for each lake sturgeon and a section of the right pectoral spine was removed from unmarked fish for aging. GPS coordinates were recorded for each capture location. Lake sturgeon ranged from 37cm to 138cm in total length. Twenty nine of the fish collected were unmarked, 2 recaptures were marked by Minnesota DNR in the St. Croix River, 2 recaptures were marked by WDNR Fish Management crews in the St. Croix River and 1 recapture was a lake sturgeon stocked above the Trego Dam during September, 2011. This was the first documentation of lake sturgeon movement downstream past the Trego Dam.

Lake sturgeon distribution tended to be clumped in river segments that had lower gradient, finer substrates and more pools than unused reaches (Figure 2).

Pectoral spines were cross sectioned with a Buehler Isomet slow speed saw and examined under a Nikon binocular microscope at a magnification of 40x. Ages ranged from 2 to 30 years old. Growth rates were similar between the lake sturgeon collected downstream on the St. Croix by Fish Management staff and the upper river sections we sampled.

Activity #2: Capture locations of all marked and recaptured lake sturgeon were documented with a GPS unit and used to develop a map of capture locations during July 2008 – June, 2013 (Figure 2). Direct river corridor distances between marking and recapture locations for individual fish were used to describe movement. We recorded 35 recapture events from 2008 - 2012; 27 fish were recaptured once, 7 fish were recaptured twice, and 1 fish was recaptured 3 times.

Lake sturgeon demonstrated localized and long distance movements ranging from 0 km to 115 km during 2008 - 2013. Seventy five percent of the recaptured fish moved less than 12 km and 45% moved less than 2 km. We considered this localized movement because the remaining 25% of recaptured lake sturgeon moved 19 km or more. Lake sturgeon moving more than 19 km were seasonally found upstream during the spring to early summer and downstream during the late summer to early fall. We documented additional movement between the Namekagon River and St. Croix River during 2012 – 2013 which is important because the St. Croix River is jointly managed as a border water with Minnesota and continued restoration of lake sturgeon in the Namekagon River below the Trego Dam may require recruitment of lake sturgeon from the St. Croix River.

Activity #3: We deployed graded mesh horizontal gill nets for two short-term (2-hour) sets for lake sturgeon in the Trego Flowage on August 1 and August 27, 2012. Gill net mesh sizes were 2”, 2 ½”, 3”, and 3 ½”. Gill nets were fished on the bottom after verifying adequate dissolved oxygen levels for lake sturgeon. Gill net mesh sizes were selected to capture immature lake sturgeon because most stocking occurred after 2001. Gill nets were deployed in an area Fish Management staff had collected lake sturgeon by angling on August 1and we set in the deep basin near the dam on August 27. We also angled for lake sturgeon during the gill net sets. One lake sturgeon was captured in gill nets and none were collected by angling.

STUDY PUBLICATIONS:

Kampa, J. M., G. R. Hatzenbeler, and M. J. Jennings. In Prep. Status and Management of Lake Sturgeon in the upper St. Croix River and Namekagon River, Wisconsin, USA. Proceedings of the International Sturgeon Symposium.

STUDY PRESENTATIONS:

Kampa, J. and G. Hatzenbeler. 2009. Lake sturgeon reintroduction and population assessment in the Namekagon River and St. Croix River, Wisconsin. Bureau of Science Services Poster Session, April 28, 2009, Madison, WI.

Kampa, J. and G. Hatzenbeler. 2009. Lake sturgeon reintroduction and population assessment in the Namekagon River and St. Croix River, Wisconsin. Poster Presentation at Twenty-first Annual St. Croix River Research Rendezvous, St. Croix Watershed Research Station, Science Museum of Minnesota, Warner Nature Center, October 23, 2009, Marine on St. Croix, MN.

Kampa, J. M., G. R. Hatzenbeler, and M. J. Jennings. 2011. Lake sturgeon movement and abundance in the Namekagon River and St. Croix River during the 1960s and 2000s. Wisconsin Chapter of the American Fisheries Society 40th Annual Meeting, January 31-February 2, Stevens Point, Wisconsin.

Kampa, J. M., G. R. Hatzenbeler, and M. J. Jennings. 2011. Lake sturgeon movement and abundance in the Namekagon River and St. Croix River during the 1960s and 2000s. Bureau of Science Services Poster Series, February 17, Madison, Wisconsin.

Kampa, J., G. Hatzenbeler, J. Wendel, and M. Jennings. 2012. Status of lake sturgeon restoration in the Namekagon River, Wisconsin. Poster presentation at 24th Annual St.

Croix River Research Rendezvous, Science Museum of Minnesota, Warner Nature, October 16, Marine on St. Croix, MN.

Kampa, J. M., G. R. Hatzenbeler, and M. J. Jennings. 2013. Lake Sturgeon in the upper St. Croix and Namekagon Rivers: Status and Restoration. St. Croix River Association Speakers Series, National Park Service Visitor Center, January 19, St. Croix Falls, WI.

Kampa J. M., G. R. Hatzenbeler, J. Wendel and M. J. Jennings. 2013. Status of Lake Sturgeon restoration in the Namekagon River, Wisconsin. , Wisconsin Chapter of the American Fisheries Society 42nd Annual Meeting, February 5 – 7, Rothschild, WI.

Kampa, J., G. Hatzenbeler, J. Wendel, and M. Jennings. 2013. Status of lake sturgeon restoration in the Namekagon River, Wisconsin. Bureau of Science Services Poster Series, March 1, Madison, WI.

PREDICTED EFFECTS OF CLIMATE CHANGE ON WISCONSIN STREAM FISHES

By: John Lyons john.lyons@wisconsin.gov, Jeff Kampa jeffrey.kampa@wisconsin.gov, Matthew Mitro Matthew.Mitro@wisconsin.gov, Andrew Rypel Andrew.Rypel@Wisconsin.gov, and Greg Sass Gregory.Sass@Wisconsin.gov

STUDY OBJECTIVES:

1. Improve the sensitivity of an existing GIS-based, watershed-scale model that predicts stream suitability for stream fish species to variation in climate and groundwater flows by developing a hydrologic model to link changes in air temperature and precipitation to changes in water temperature and stream flow

2. Use the improved model to predict how various climate change scenarios predicted specifically for Wisconsin will alter the distribution and abundance of Wisconsin stream fishes

3. Examine long-term datasets on fish reproduction to determine if migrations and spawning have changed in response to climate warming over the last 50 years.

PERFORMANCE ON SCHEDULED ACTIVITIES:

1. During the past year, the study team, consisting of participants from the Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, International Joint Commission, U.S. Geological Survey, and Michigan State University, developed improved versions of the stream temperature and stream flow models. Outputs from these models were linked with updated climate, geology, land-cover, and stream channel characteristics in a Geographic Information Systems (GIS) framework.

New species distribution models were then developed from this framework for 15 stream fish species using Random Forests statistical software. These models were tested with independent data and found to have accuracies of 75-90% in predicting species occurrence under current climate conditions.

2. Collaborators from the University of Wisconsin-Madison developed downscaled climate projections for Wisconsin and the entire Great Lakes Basin for 13 Global Climate Models under one Emissions Scenario (A1B). The study team then ran these projections through the new stream temperature, stream flow, and fish species distribution models for all streams in Wisconsin and the Upper Great Lakes Basin (1:100,000 mapping scale) to estimate the range of fish habitat suitability at mid century under predicted climate change. Outputs were portrayed in maps and tables that were made available in a website “FishVis” (Beta Test version: http://wim.usgs.gov/FishVisDev/FishVis.html#). Not surprisingly, the models predicted warmer stream temperatures, modest flow changes, sharp declines in the distribution of coldwater and coolwater fish species, and moderate gains in the distribution of warmwater fish species. The team then sponsored a two-day workshop of representatives from government agencies, academic institutions, and conservation organizations with interests and expertise in stream fisheries management to critique the website. The website is in the process of being modified and improved in response to feedback from the workshop. A manuscript is in preparation describing how future changes in thermal habitat suitability are like to affect lake sturgeon distribution in Wisconsin’s rivers.

3. In collaboration with Wisconsin DNR fish managers, data were gathered from long-term (> 20 years) surveys of fish reproduction (migration and spawning). Data from spawning surveys in the Great Lakes indicated that yellow perch spawned earlier in the spring and lake trout later in the fall where water temperatures were increasing. A manuscript is in preparation describing these results. Early spring spawning was also observed for lake sturgeon and walleye in the Wolf River. Efforts are underway to capture and summarize data on anadromous salmonid migrations in the Bois Brule River, and white sucker, muskellunge, and walleye spawning in northern Wisconsin lakes.

STUDY PUBLICATIONS:

Mitro, M. G., J. Lyons, and S. Sharma. 2011. Appendix: Coldwater fish and fisheries working group report. Wisconsin’s changing climate: impacts and adaptation. Wisconsin Initiative on Climate Change Impacts, Madison. http://www.wicci.wisc.edu/report/Coldwater-Fish-and-Fisheries.pdf

Sharma, S., M. J. Vander Zanden, J. J. Magnuson, and J. Lyons. 2011. Comparing climate change and species invasions as drivers of coldwater fish population extirpations. Public Library of Science (PLoS) ONE 6(8):e22906. 9 pages.

Lyons, J., J. S. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, U.S.A. Journal of Fish Biology 77:1867-1898.

Mitro, M. G., J. Lyons, and J. S. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Proceedings of Wild Trout X, West Yellowstone, MT, September 28-30, 2010.

Westenbroek, S., J. S. Stewart, C. A. Buchwald, M. Mitro, J. Lyons, and S. Greb. 2010. A model for evaluating stream temperature response to climate change scenarios in Wisconsin. Proceedings of the 2010 Watershed Management Conference, American Society of Civil Engineers, Madison, WI, August 23-27, 2010.

STUDY PRESENTATIONS:

Krueger, D. M., J. M. Stewart, L. Wang, D. Infante, J. Lyons, J. McKenna, K. Wehrly, A. Covert, D. Wieferich, S. Westenbroek, S. Niemela, M. Mitro, J. Bruce, and N. Estes. 2013. Assessing Midwest stream fish habitat in the face of a changing climate: an adaptive management approach using the FishVis mapping tool. 1st Annual National Adaptation Forum, April 1-5, 2013, Denver, Colorado.

Lyons, J., and J. M. Stewart. 2013. FishVis: A web-based system for visualizing predicted effects of climate change on stream fishes in the Great Lakes region. Presentation given to the Wisconsin Department of Natural Resources Fisheries Management Biennial Training Session, Wisconsin Dells, WI, February 26-28, 2013.

Lyons, J., and J. M. Stewart. 2013. FishVis: A web-based tool for predicting responses of stream fishes and their habitats to climate change in the Great Lakes region. Wisconsin Chapter of the American Fisheries Society, Wausau, WI, February 5-7, 2013.

Sharma, S., M. J. Vander Zanden, J. J. Magnuson, and J. Lyons. 2012. Comparing climate change and species invasions as drivers of coldwater fish population extirpations. Annual Meeting of the American Fisheries Society, August 19-23, St. Paul, Minnesota.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, and L. Kammel. 2012. Effects of future climate projections on stream temperatures and fish thermal habitat for Upper Midwest and Great Lakes streams. Annual Meeting of the American Fisheries Society, August 19-23, St. Paul, Minnesota.

Lyons, J. 2012. Climate change influences on streams and fish. Presentation to U.S. Fish and Wildlife Service Land Conservation Cooperative workshop on climate change, Ann Arbor, MI, June 21, 2012.

Lyons, J. 2012. Assessing vulnerability of fish to climate change. Presentation to U.S. Fish and Wildlife Service Land Conservation Cooperative workshop on climate change, (June 21) Ann Arbor, MI, June 21, 2012.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, and C. Buchwald. 2011. An approach to model and evaluate stream temperature response to climate change in Wisconsin. Annual Meeting of the American Fisheries Society, September 4-8, 2011, Seattle, Washington.

Mitro, M., J. Lyons, and J. Stewart. 2011. Use of models to predict climate change impacts and inform adaptation strategies for trout in all Wisconsin streams. Upper Midwest Stream Restoration Symposium, February 27-March 2, 2011, Oconomowoc, WI.

Mitro, M., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. 71st Midwest Fish and Wildlife Conference, Minneapolis, MN, December 12-15, 2010.

Mitro, M., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Wild Trout X, September 28-30, 2010, West Yellowstone, MT.

Lyons, J., J. Stewart, and M. Mitro. 2010. Use of a watershed-scale GIS model to predict responses of 50 Wisconsin stream fishes to climate warming. Annual Meeting of the American Fisheries Society, September 12-16, 2010, Pittsburgh, PA.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, S. Greb, and C. Buchwald. 2010. Integrating a soil water balance model with an artificial neural network model to predict stream temperature for Wisconsin streams under current conditions and future climate-change scenarios. 2010 Watershed Management Conference, American Society of Civil Engineers, Madison, WI, August 23-27, 2010.

Lyons, J. J. Stewart, and M. Mitro. 2010. Predicted shifts in broad-scale distribution of stream fishes in Wisconsin, USA, in response to climate change. Fish and Climate Change, Fisheries Society of the British Isles Annual Symposium, July 26-30, 2010, Belfast, Northern Ireland.

Sharma, S., J. Vander Zanden, J. Magnuson, and J. Lyons. 2010. Predicting the effects of climate change and invasion of rainbow smelt on cisco extinctions. American Society of Limnology and Oceanography, June 6-11, 2010, Santa Fe, NM.

Lyons, J. 2009. Effects of climate change on Wisconsin's fishes. Seminar presented to the UW-Madison Center for Climate Change, April 24, 2009, Madison, WI.

Lyons, J. 2009. Effects of climate change on Wisconsin's coolwater and warmwater fishes. Presentation in UW-Madison's "Bracing for Impact: Climate change in Wisconsin" series, February 26, 2009, Madison, WI.

Mitro, M. G., J. Lyons, and J. Stewart. March 2009. Response of Wisconsin's coldwater fishes to climate change. Bracing for Impact-Climate Change Adaptation in WI, sponsored by the Wisconsin Initiative on Climate Change Impacts, University of Wisconsin, Madison, Wisconsin. Invited talk.

Lyons, J. 2009. A statewide model to predict the effects of land use and climate change on stream fishes in Wisconsin. Seminar present to WDNR Bureau of Fisheries Management, March 5, 2009, Madison, WI.

Mitro, M. G. January 2009. Trout stream habitat restoration and climate change in Wisconsin. WDNR Fisheries Management Statewide Meeting, Wisconsin Dells, Wisconsin.

Lyons, J. 2008. Climate change impacts on Wisconsin's fish and fisheries. Sustaining Wisconsin's Environment and Economy: Responding to Climate Change. Second Annual Nelson Institute Earth Day Conference, April 16, 2008, Madison, WI.

RESTORATION OF A BROOK TROUT FISHERY IN TENNY SPRING CREEK USING AN ARTIFICIAL BARRIER

By: Matthew Mitro Matthew.Mitro@wisconsin.gov and Paul Kanehl paul.kanehl@wisconsin.gov (Mike Aquino michael.aquino@wisconsin.gov, Gene Van Dyck gene.vandyck@wisconsin.gov, and Jordan Weeks jordan.weeks@wisconsin.gov; DNR cooperators)

STUDY OBJECTIVE:

In this study we are investigating the restoration of a brook trout population in Tenny Spring Creek via installation of a barrier and mechanical removal of a brown trout population. Specific objectives include evaluating changes in the trout population and stream fish community following restoration, evaluating movement across the stream barrier (upstream and downstream), and determining if brook trout restoration upstream of the barrier in Tenny Spring Creek improves the brook trout population downstream of the barrier in Elk Creek.

PERFORMANCE ON SCHEDULED ACTIVITIES:

The restoration of brook trout is a priority management goal for the Wisconsin DNR, but to date the installation of a barrier to fish movement has not been used in Wisconsin for brook trout restoration. Habitat restoration work on Tenny Spring Creek provided the opportunity to install a barrier to fish movement for the sole purpose of excluding brown trout and restoring brook trout. The barrier has proved to serve as only a partial barrier to upstream movement of brown trout, but the suppression of brown trout by mechanical removal during our surveys has allowed stocked brook trout to survive and grow such that a brook trout fishery now exists in Tenny Spring Creek. The following sections describe our work on Tenny Spring Creek prior to 30 June 2011, from 1 July 2011 to 30 June 2012, and from 1 July 2012 to 30 June 2013.

Summary of work through 30 June 2011

Habitat restoration work began on Tenny Spring Creek in summer 2007 with the installation of a waterfall-type rock barrier at the lower end of the stream (Figure 1). The fisheries crew from La Crosse conducted a mechanical removal of brown trout in September 2007 using three passes with electrofishing equipment. All captured brown trout were removed and placed downstream of the barrier. Instream habitat restoration was delayed in 2008 and continued upstream of the barrier in 2009. In 2009 the barrier was reconfigured (Figure 2) because the previously installed barrier was not successful at blocking brown trout movement upstream.

We surveyed Tenny Spring Creek beginning at the barrier and working upstream on 30 September 2009. We collected 355 brown trout and 5 brook trout in the first 500 m surveyed. The brook trout were released upstream of the barrier and the brown trout, including 172 age 1+ trout tagged with visible implant elastomer tags, were released immediately downstream of the barrier.

We surveyed Tenny Spring Creek about two weeks later, on 15 October 2009, to see if any tagged trout had moved upstream through the barrier. Brown trout typically attempt to move upstream to spawn during autumn. We captured 271 brown trout and none were previously tagged. We tagged 39 of the age 1+ brown trout and released all of them downstream of the barrier.

We surveyed Tenny Spring Creek the following spring on 7 April 2010 to further investigate whether any trout had moved upstream through the barrier. We captured 349 brown trout, 4 of which had been tagged in autumn 2009 (total lengths 146, 207, 223, and 329 mm). Most of the brown trout were yearlings (324 brown trout < 170 mm total length).

The data suggest that the barrier is not functioning as an absolute block to upstream migration but is providing some level of impediment to upstream movement.

We had anticipated stocking Tenny Spring Creek with brook trout in autumn 2010 to determine if a barrier that prevents some level of upstream movement by brown trout would allow for the establishment of a brook trout population. The stocking of Tenny Spring Creek was delayed until September 2011.

We continued monitoring the trout population in Elk Creek with surveys in October 2010 and April 2011. Brown trout continue to be the most abundant trout species at over 95% of the population. On 26 April 2011, one day after our last spring survey on Elk Creek, a manure spill occurred on a tributary to the stream, about four miles upstream of the confluence of Tenny Spring Creek. The impact of the spill on the trout population was limited to the unnamed tributary, but brook trout were disproportionately affected. A survey of the impacted tributary showed the following numbers of dead trout: 51 young-of-year brook trout, 7 yearling brook trout, 10 adult brook trout, 9 yearling brown trout, and 9 adult brown trout. The largest concentrations of brook trout in Elk Creek tend to occur in the colder tributaries, such as the one impacted by the manure spill. Most of the tributaries are small, but Tenny Spring Creek is the largest tributary and offers the opportunity to significantly increase brook trout numbers in the Elk Creek system.

Summary of work from 1 July 2011 to 30 June 2012

We stocked Tenny Spring Creek in September 2011 with 1,010 brook trout derived from the Ash Creek stock, which included 505 F1- and 505 F2-generation brook trout. We used this stocking opportunity to evaluate the survival of F1 versus F2 brook trout. The F1 brook trout were obtained by spawning wild Ash Creek brook trout and the F2 brook trout were obtained by spawning F1 brook trout (See Study SSLT). Each stocked brook trout had a fin clip to identify whether it was a F1 (left ventral fin) or F2 (right ventral fin) brook trout.

Prior to stocking brook trout, we collected and removed 1,279 brown trout on 20 September 2011 from about a 1 km section of Tenny Spring Creek upstream from the barrier. (We did not remove trout from the upper 0.5 km of Tenny Spring Creek.) We transferred the brown trout to the Kickapoo River, which is downstream from Tenny Spring Creek and Elk Creek.

We surveyed Tenny Spring Creek the following spring in 19 March, 11 April, and 4 June 2012. We continued to capture many brown trout, most of which were yearling trout that likely moved downstream from the upper section of Tenny Spring Creek. All brown trout were transferred downstream of the barrier and a subsample of the brown trout were tagged with a visible implant tag to further monitor upstream movement across the barrier.

Return rates for F1 brook trout were consistently greater than return rates for F2 brook trout (Table 1 and Figure 3). There were no significant differences in length between groups of F1 and F2 brook trout on each sample date (Table 2). We also captured some wild brook trout which ranged in length from 115 mm to 297 mm, indicating multiple age classes of brook trout were present (Table 1).

We installed a water level monitor immediately downstream of the barrier to document any changes in water level that might compromise the ability of the barrier to prevent upstream migration of brown trout. We suspect that flood conditions in Tenny Spring Creek and Elk Creek during heavy precipitation events may compromise the effectiveness of the barrier.

Summary of work from 1 July 2012 to 30 June 2013

We stocked Tenny Spring Creek again in September 2012 with the next cohort of 1,012 brook trout derived from the Ash Creek stock, which included 508 F1- and 504 F2-generation brook trout. Each stocked brook trout had an adipose clip and a ventral fin clip (F1 = left ventral fin and F2 = right ventral fin). We also continued to monitor the trout population by surveying the stream on 17 September (prior to the September stocking) and 5 November 2012 and on 4 April and 4 June 2013. All brown trout collected during these surveys were transferred downstream of the barrier to Elk Creek. Return rates continued to be greater for F1 brook trout as compared to F2 brook trout for both the 2011 and 2012 cohorts (Table 1 and Figure 3). There were no significant differences in length between groups of F1 and F2 brook trout (Table 2). However, for the 2011 cohort there appeared to be an increasing trend in the difference between the average size of F1 versus F2 brook trout, with the F1 brook trout showing a progressively greater average size (Figure 4). Also of note was that the average size of both F1 and F2 brook trout from the 2011 cohort was about 9 inches by September 2012, indicating that many of these age 1 brook trout were legal for anglers to harvest (9 inch minimum size limit).

Gill lice

We have also observed brook trout in Tenny Spring Creek infected with gill lice. We first observed gill lice in Tenny Spring Creek brook trout in May 2012, but we were not able to complete a survey of the stream at that time. We documented the gill lice infection rate in the June, September, and November 2012 and April and June 2013 trout surveys (Table 3). The gill lice infection rate for the 2011 cohort of stocked brook trout increased from 14% in June 2012 to 91% in June 2013. The gill lice infection intensity ranged from 1 to 15 gill lice per individual trout.

RECOMMENDED CHANGES IN STUDY ACTIVITIES OR TIMELINES:

We recommend stocking brook trout in Tenny Spring Creek upstream of the barrier in 2013 both to continue the evaluation of F1 versus F2 brook trout (see study SSLT) and to further monitor the feasibility of establishing a brook trout population and the utility of the barrier to reducing upstream migration of brown trout. We also recommend the continued monitoring of gill lice infection prevalence and intensity in Tenny Spring Creek brook trout and any impact it may have on brook trout survival and growth.

We also recommend similarly studying the use of a barrier to restore a brook trout population in Trout Creek (Iowa County, Wisconsin). Trout Creek has a dry dam that is scheduled to have a collar installed on the outlet pipe to prevent upstream movement of brown trout. Previous studies have observed tagged brown trout moving upstream through the pipe. The collar installation addresses this issue and should allow for the prevention of brown trout movement upstream to a 3-kilometer section of Trout Creek.

STUDY PRESENTATIONS:

Mitro, M. G., S. Marcquenski, K. Soltau, P. Kanehl, D. Walchak, J. Haglund, E. Struck, and A. Nolan. March 2013. Gill lice infection of brook trout in Driftless Area streams in Wisconsin. 6th Annual Driftless Area Symposium (invited), La Crosse, Wisconsin.

Mitro, M. G., S. Marcquenski, K. Soltau, P. Kanehl, D. Walchak, J. Haglund, E. Struck, and A. Nolan. March 2013. Gill lice infection of brook trout in Wisconsin streams. Poster presented at WDNR Science Services Open House, Madison, Wisconsin.

Mitro, M. G., S. Marcquenski, K. Soltau, P. Kanehl, D. Walchak, J. Haglund, E. Struck, and A. Nolan. February 2013. Gill lice infection of brook trout in Wisconsin streams. Poster presented at WDNR Fisheries Management Statewide Meeting, Wisconsin Dells, Wisconsin.

Mitro, M. G., S. Marcquenski, K. Soltau, P. Kanehl, D. Walchak, J. Haglund, E. Struck, and A. Nolan. February 2013. Gill lice infection of brook trout in Wisconsin streams. Wisconsin Chapter of the American Fisheries Society 2013 Annual Meeting, Wausau, Wisconsin.

Mitro, M. G. December 2012. Trout research update presented to the Wisconsin DNR Fisheries Management Board, Madison, Wisconsin.

Mitro, M. G., P. Kanehl, D. Walchak, and E. Struck. August 2012. Viability of a brook trout source population used for egg collection in Wisconsin's wild trout stocking program. American Fisheries Society 142nd Annual Meeting, Minneapolis-St. Paul, Minnesota.

Mitro, M. G., P. Kanehl, D. Walchak, and E. Struck. July 2012. Survival and recruitment in a brook trout source population used for egg collection in Wisconsin's wild trout stocking program. 10th International Congress on the Biology of Fish, Madison, Wisconsin.

Mitro, M. G., P. Kanehl, D. Walchak, and E. Struck. March 2012. Monitoring trout response to stream habitat development in Wisconsin: lessons from Elk Creek. 5th Annual Driftless Area Symposium (invited), LaCrosse, Wisconsin.

Mitro, M. G. March 2011. Climate change and the future of inland trout distribution in Wisconsin. Coulee Region Chapter of Trout Unlimited meeting (invited), LaCrosse, Wisconsin.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. April 2010. Climate change, trout ecology, and the future of inland trout distribution and management in Wisconsin. UW-Richland Natural Resources Club, Richland Center, Wisconsin. (Invited)

Mitro, M. G. November 2008. Trout research in Wisconsin streams. Blackhawk Chapter of Trout Unlimited meeting, Janesville, Wisconsin.

FISH PASSAGE AND STREAM CONNECTIVITY RESEARCH

By: Matthew Diebel Matthew.Diebel@Wisconsin.gov

STUDY OBJECTIVES:

1. Develop infrastructure for collection, storage, and analysis of barrier data across the Great Lakes Basin.

2. Develop a volunteer monitoring program for evaluating fish passage at road crossings.

3. Prioritize barrier removal in western Green Bay tributaries to facilitate northern pike spawning migrations and prevent further inland spread of round goby.

PERFORMANCE ON SCHEDULED ACTIVITIES:

•Completed final report for objective 3 (attached).

•Working with DNR Water Division staff to incorporate road crossing inventory information into the SWIMS database.

•Leading development of guidelines for prioritizing fish passage at road culverts statewide.

•Trained DNR staff in road crossing assessment protocol and provided ongoing support and data analysis for several groups who are conducting road crossing inventories.

•Co-PI on LCC-funded Great Lakes connectivity project.

STUDY PUBLICATIONS:

O'Hanley, J., J. Wright, M. Diebel, M. Fedora, and C. Soucy. 2013. Restoring stream habitat connectivity: A proposed method for prioritizing the removal of resident fish passage barriers. Journal of Environmental Management 125:19-27.

Januchowski-Hartley, S., P. McIntyre, M. Diebel, P. Doran, D. Infante, C. Joseph, and J. D. Allan. 2013. Restoring aquatic ecosystem connectivity requires expanding barrier inventories. Frontiers in Ecology and the Environment 11:211–217.

STUDY PRESENTATIONS:

Prioritizing barrier removal to restore native fish migrations in Great Lakes tributaries, 6/26/13 at International Conference on Engineering and Ecohydrology for Fish Passage.

Prioritizing barrier removal for northern pike spawning migration in Green Bay tributaries, 3/7/13 at WDNR Biologists Meeting.

How to reconnect your watershed, 10/10/12 at Wisconsin Association for Floodplain, Stormwater, and Coastal Management Conference.

Roles of aquatic habitat connectivity in the life cycles of Great Lakes fishes, 8/22/12 at American Fisheries Society annual meeting.

DEVELOPMENT AND EVALUATION OF WATERSHED MODELS FOR PREDICTING STREAM FISHERY POTENTIAL

By: John Lyons john.lyons@wisconsin.gov and Matthew Mitro Matthew.Mitro@wisconsin.gov

STUDY OBJECTIVES:
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 existing 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. Use current land-use data to estimate actual conditions and historical and "least-impacted" 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, air temperature, degree growing days, conductivity, slope, and ground water delivery potential are now complete for the entire state of Wisconsin at both the 1:100,000 and 1:24,000 scales. 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:
New and improved versions of models have been developed to predict site-specific stream flows and water temperatures from the GIS layers. A database on fish

community, habitat, temperature, predicted flow, and GIS variables from 393 sites on 287 streams has been assembled and will be used to develop new models that predict the occurrence and abundance of 60 over stream fish species, including all of the major game and non-game fishes found in Wisconsin streams. Based on past fish modeling, these new fish models will have accuracies of 55-95% in predicting species occurrence.

Activity # 3: Develop a statewide classification system for Wisconsin streams:
Two different GIS layers of stream segment classification based on watershed landscape characteristics, watershed land use, stream size, stream channel morphology, and biological communities have been developed. One is for Fisheries Management and emphasizes smallmouth bass occurrence and abundance. The other is for Watershed Management and emphasizes potential fish assemblages and biotic integrity. Both rely on a detailed thermal and stream-size classification framework that has been developed and is described in part in Lyons et al. (2009). Using this framework, all streams in the state have been classified at the 1:24,000 scale.

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 land-cover in Wisconsin, and this model has been coupled with models from Activity # 3 to predict impacts of both past and future land-use change on stream fisheries. Local applications of the model for fisheries and watershed managers have been completed for parts of southwestern, northwestern, and north-central Wisconsin..

STUDY PUBLICATIONS:

Wang, L., T. Brenden, J. Lyons, and D. Infante. 2013.Predictability of in-stream physical habitat for Wisconsin and northern Michigan wadeable streams using GIS-derived landscape data. Riparian Ecology and Conservation. 2013:11-24. Doi: 10.2478/remc-2013-0003.

Lyons, J. 2012. Development and validation of two fish-based indices of biotic integrity for assessing perennial coolwater streams in Wisconsin, USA. Ecological Indicators. 23:402-412.

Wang, L., D. Infante, J. Lyons, J. Stewart, and A. Cooper. 2011. Effects of dams in river networks on fish assemblages in non-impoundment sections of rivers in Michigan and Wisconsin, USA. River Research and Application 27:473-487.

Lyons, J. 2010. Indices of environmental integrity: a state agency's perspective. Pages 357-358 in W. Hubert and M Quist, editors. Inland fisheries of North America, Third Edition. American Fisheries Society, Bethesda, Maryland.

Lyons, J., T. Zorn, J. Stewart, P. Seelbach, K. Wehrly, and L. Wang. 2009. Defining and characterizing coolwater streams and their fish assemblages in Michigan and Wisconsin, USA. North American Journal of Fisheries Management. 29:1130-1151.

McKenna, J. E., P. J. Steen, J. Lyons, and J. Stewart. 2009. Applications of a broad-spectrum tool for conservation and fisheries analysis: aquatic gap analysis. U.S. Geological Survey GAP Bulletin 16:44-51.

Lyons, J. 2008. Seeing the "big picture" for Wisconsin stream fisheries. Science in the Spotlight. Page 4, 2008 Wisconsin Fishing Report, Wisconsin Department of Natural Resources, Madison. PUB-FH-506 2008.

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

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

STUDY PRESENTATIONS:

Lyons, J. 2013. Stream natural communities: applications for bioassessment. Presentation during U.S. Environmental Protection Agency review of the Wisconsin DNR biomonitoring program, Madison, WI, May 1, 2013.

Lyons, J. 2013. Validating/modifying stream Natural Community classifications with field data. Presentation given to the Wisconsin Department of Natural Resources Annual water Quality Biologists Training Session, Tomahawk, WI, March 6-7, 2013.

Lyons, J. 2012. The role of the IBI in fisheries management. Lecture and field training session for new staff of WDNR Fisheries Management, Dodgeville, WI, July 2012.

Lyons, J. 2012. Development of multimetric biotic indices (IBI's) to assess aquatic ecosystem integrity in Wisconsin. Lecture given to the Stream Ecology Class, Wisconsin Lutheran College, Wauwatosa, WI, October 2012.

Lyons, J. 2012. The role of the IBI in fisheries management. Lecture and field training session for new staff of WDNR Fisheries Management, July 12, 2012, Dodgeville, WI.

Stewart, J., J. Lyons, M. Mitro, L. Wang, and B. Weigel. 2010. A landscape approach to select stream sites for long-term biomonitoring in Wisconsin. Annual Meeting of the American Fisheries Society, September 12-16, 2010, Pittsburgh, PA.

Wang, L., D. M. Infante, J. Lyons, J. Stewart, and A. Cooper. 2010. Effects of dams in river networks on fish assemblages in non-impoundment sections of rivers in Michigan and Wisconsin. Annual Meeting of the American Fisheries Society, September 12-16, 2010, Pittsburgh, PA.

Stewart, J., J. Lyons, and L. Wang. 2010. A framework for selecting least impacted reference streams based on landscape models for use in assessing biotic integrity of wadeable streams in Wisconsin. U.S. EPA National Water Quality Monitoring Council, Monitoring Conference, April 25-29, 2010, Denver, CO.

Lyons, J. 2010. The Wisconsin stream model: function and application. Presentation to the Wisconsin DNR Office of the Great Lakes, February 24, 2010, Madison, WI.

Stewart, J., and J. Lyons. 2008. Fish distribution in Wisconsin streams: estimating changes from the mid 1800's to the present with a GIS-based, watershed-scale, predictive model. Annual Meeting of the American Fisheries Society, August 17-21, 2008, Ottawa, Ontario.

Lyons, J., and J. Stewart. 2008. Stream fish distribution and abundance: estimating changes from 1850 to the present. Annual Meeting of the Wisconsin Chapter of the American Fisheries Society, February 6-7, 2008, Wausau, Wisconsin.

STATUS AND TRENDS IN SPORTFISH POPULATIONS OF SOUTHWESTERN WISCONSIN WARMWATER STREAMS

By: John Lyons john.lyons@wisconsin.gov and Paul Kanehl paul.kanehl@wisconsin.gov

STUDY OBJECTIVES:

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

2. Maintain a database containing information from 1).

3. Produce annual report.

PERFORMANCE ON SCHEDULED ACTIVITIES:

1) Assess sportfish populations in seven southwestern Wisconsin streams: Although this study began in 2000, these seven stations have been sampled annually in the same manner as part of other studies since 1989-1991, depending on the station. On each of these warmwater streams, we survey single 950 to 1900-m-long stations (Table 1) in late August or early to mid September following standardized wading electrofishing procedures (single stream DC shocker with 3 anodes, fish upstream in a single pass without block nets). 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. The seven streams represent a range of habitat and population conditions. The Galena and Little Platte sites have some of the best stream smallmouth bass habitat in southwestern Wisconsin and are capable of supporting

excellent fisheries. The Ames, Rattlesnake, and Sinsinawa sites have more typical habitat for the region and are capable of supporting fair to good fisheries. The Mineral Point Branch site is a “nursery” stream, too small to support large numbers of adults throughout the summer but providing good habitat for juveniles. The Otter Creek site has been plagued by fish kills caused by episodes of poor water quality, and its population is depressed. Recently, stocking has been undertaken there to try and increase smallmouth bass numbers.

Overall smallmouth bass catches in 2012 were well above normal (Table 2). Large numbers of age-0 smallmouth bass were produced in all streams, and catches were the highest or second highest since sampling began in 1989-1991. The above-normal catches of age-0 fish were not surprising because the weather during and after the spring spawning period in 2012 was much warmer and drier than normal, conditions that often lead to large year-classes. Even in Otter Creek, where adults are extremely scarce, good numbers of age-0 fish were collected, indicating that either a handful of adults can produce substantial young or that age-0 fish had migrated into the stream from elsewhere (or both).

2) Maintain a database: All data from 2012 have been entered into a PC-SAS database maintained at the WDNR Science Operation Center in Madison.

3) Produce annual report: This performance report constitutes the annual report for this study.

STUDY PUBLICATIONS:

Lyons, J., and P. Kanehl. 2002. Seasonal movements of smallmouth bass in streams. Pages 149-160 in D. P. Philipp and M. S. Ridgway, editors. Black bass: ecology, conservation, and management. American Fisheries Society, Bethesda, Maryland.

Rabeni, C., J. Lyons, J. Peterson, and N. Mercado-Silva. 2009. Sampling fish in wadeable warmwater streams. Pages 43-58 in S. Bonar, D. Willis, and W. Hubert, editors. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.

RECENT STUDY PRESENTATIONS:

Lyons, J. 2012. Smallmouth bass fisheries in wadeable streams. Lecture and field training session for new staff of WDNR Fisheries Management, Dodgeville, WI, July 2012.

Lyons, J, and P. Kanehl. 2010. Understanding (or not…) recruitment of smallmouth bass in southwestern Wisconsin streams. Annual Meeting of the Wisconsin Chapter of the American Fisheries Society, February 1-3, 2010, Green Bay, WI.

Rabeni, C., J. Lyons, J. Peterson, and N. Mercado-Silva. 2009. Sampling fish in wadeable warmwater streams. Poster presented at the Annual Meeting of American Fisheries Society, August 30-September 3, 2009, Nashville, Tennessee.

Rabeni, C., J. Lyons, J. Peterson, and N. Mercado-Silva. 2009. Sampling fish in wadeable warmwater streams. Poster presented at the Annual Meeting of the Western Division of the American Fisheries Society, May 3-7, 2009, Albuquerque, New Mexico.

Lyons, J. 2008. Characterizing warmwater streams for fisheries management. Office and field training session for new staff of WDNR Fisheries Management, July 11, 2008, Dodgeville, WI.

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

By: John Lyons john.lyons@wisconsin.gov

STUDY OBJECTIVES:

1. Monitor long-term fish community dynamics each year over the entire Lower Wisconsin River.

2. Evaluate sportfish abundance, reproductive success, size structure, and growth rate each year for the Prairie du Sac Dam tailwater, continuing annual surveys begun in 1987.

3. Maintain a database containing information from 1) and 2)

PERFORMANCE ON SCHEDULED ACTIVITIES:

1) Assess fish communities over the entire Lower Wisconsin River: In late August and early September 2012, 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 have 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 deformities and the resulting data were used to calculate an index of biotic integrity (IBI) as a measure of river health (Table 2). In 2012, a total of 43 species (plus 1 hybrid) and 1447 fish were collected from all 10 stations combined. Included in the 43 species were 13 gamefishes and one state-endangered species (1 crystal darter), two state-threatened species (68 blue suckers, 1 black buffalo), and one state-special-concern species (5 western sand darters). Four species (mooneye, emerald shiner, quillback, and shorthead redhorse) occurred at all 10 stations (Table 3). The most numerous species were emerald shiner (301 individuals), gizzard shad (228), shorthead redhorse (181), and quillback (105) (Table 4); the greatest biomass was collected for blue sucker (156 kg), shorthead redhorse (115 kg), smallmouth buffalo (89 kg), and quillback (85 kg) (Table 5). Among the gamefishes, the most numerous species with the most biomass were smallmouth bass (82 individuals; 15.8 kg), walleye (19; 9.2 kg), sauger (21, 6.6 kg), and channel catfish

(14, 7.0 kg). Index of biotic integrity scores ranged from 80 to 100, and all 10 stations were rated as excellent, similar to previous years (Table 6).

2) Estimate sportfish population parameters for the Prairie du Sac Dam tailwater: On October 24 and again on October 25, 2012, standardized nighttime boat electrofishing was used to monitor populations of sauger, walleye, largemouth bass, smallmouth bass, muskellunge, and northern pike over a 1.86-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 2012, a total of 121 sauger (6.8-17.3”), 274 walleye (6.9-27.3”), 3 saugeye (sauger X walleye hybrid) (12.9-19.0”), 27 largemouth bass (5.6-17.0“), 90 smallmouth bass (3.4-19.9”), 5 northern pike (25.4-37.8”), and 23 muskellunge (33.3-48.8“) were collected. Except for smallmouth bass and muskellunge catches, which were relatively high, these overall catch rates are near average (Table 7). The catch rate of 2.2 YOY sauger per mile was below the 26-year median (5.6), as was the catch rate of 26.6 walleye per mile (30.6) (Table 8). Mean sizes of YOY sauger (7.5”) and walleye (8.9”) were above the long-terms medians (7.2” and 8.2”, respectively).

3) Maintain a database: All data from 2012 have been entered into a PC-SAS database maintained at the WDNR Science Operations Center in Madison.

4) Produce annual report: This performance report constitutes the annual report for this study.

STUDY PUBLICATIONS:

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 22:923-936.

Weigel, B. M., J. Lyons, P. W. Rasmussen, and L. Wang. 2006. Relative influence of environmental variables at multiple spatial scales on fishes in Wisconsin’s warmwater rivers. Pages 493-511 in R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Influences of landscapes on stream habitats and biological assemblages. American Fisheries Society Symposium Number 48, Bethesda, Maryland.

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.

Lyons, J., and K. Welke. 1996. Abundance and growth of young-of-year walleye (Stizostedion vitreum) and sauger (S. canadense) in Pool 10, upper Mississippi River, and at Prairie du Sac Dam, lower Wisconsin River, 1987-1994. Journal of Freshwater Ecology 11:39-50.

STUDY PRESENTATIONS:

Lyons, J., D. Rowe, and J. Unmuth. 2011. Fishes and fisheries of the Lower Wisconsin River. Presentation to the Wisconsin Department of Natural Resources Board, August 9, 2011, Spring Green, WI.

Lyons, J. 2011. Paddlefish and lampreys in the Lower Wisconsin River. Filming and interview for National Geographic Television, June 8, 2011, Prairie du Sac, WI.

Lyons, J. 2009. Application of a fish IBI to assess the Upper Mississippi River and Wisconsin's large rivers. U.S. EPA Workshop on the Ecological Assessment of the Upper Mississippi River, May 5-7, 2009, Dubuque, IA.

Lyons, J. 2009. Using fish assemblages to assess the ecological health of the Upper Mississippi River. Invited Plenary Presentation, Annual Meeting of the Mississippi River Research Consortium, April 30-May 1, 2009, LaCrosse, WI.

Lyons, J. 2009. Assessing smallmouth bass in non-wadeable rivers. Presentation to the statewide Annual WDNR Fisheries Management Training Session, January 20-22, 2009, Wisconsin Dells, WI.

Marshall, D., J. Lyons, and J. M. Unmuth. 2008. Survey of lower Wisconsin River oxbows: lakes the river made. Annual Meeting of the Wisconsin Chapter of the American Fisheries Society, February 6-7, 2008, Wausau, Wisconsin.

Lyons, J. 2007. What lurks beneath? Fishes of the Lower Wisconsin River. Field presentation at the Annual Meeting of the Wisconsin River Alliance, October 8, 2007, Prairie du Sac, WI.

EVALUATION OF FISH PASSAGE AT THE PRAIRIE DU SAC DAM, WISCONSIN RIVER

By: John Lyons john.lyons@wisconsin.gov

STUDY OBJECTIVES:

1. Determine the attributes (i.e., number, species, size, age, maturity) of fish using the newly constructed (completion date uncertain) upstream fish passage facility at the

Prairie du Sac Dam, and compare with fish populations found above and below the dam.

2. Identify the conditions (i.e., time of day, season, water temperature, river flows) during which upstream movement through the dam is most likely to occur.

3. Estimate the contribution of fish using the passage facility to fish populations above the dam.

4. Document whether shovelnose sturgeon, paddlefish, and blue sucker have used the fish passage facilities to become re-established above the dam.

PERFORMANCE ON SCHEDULED ACTIVITIES:
The fish passage facility is still in the planning and design phase, and much of the past year was spent in assisting with this process as part of an interagency-power company team. Significant time was also spent in gathering data on fish populations downstream of the dam in order to document biological attributes prior to construction of the passage facility. All species were sampled, with emphasis on lake sturgeon, shovelnose sturgeon, blue sucker, smallmouth bass, western sand darter, and walleye. For these six species data were collected on length and aging structures. Both species of sturgeon and blue sucker were also tagged (Passive Integrated Transponder tags) to look in more detail at growth and movement patterns.

SIGNIFICANT DEVIATIONS FROM SCHEDULED ACTIVITIES:
The design and construction of the fish passage project has been delayed by the U.S. Fish and Wildlife Service so that they can complete an Environmental Assessment (EA) of fish passage options with emphasis on alternatives that would minimize the chance of aquatic invasive species using the passage facility to colonize areas above the dam. The completion date of the EA is unknown at this time, but it is likely to push back construction of the passage facility by 1-2 years.

RECOMMENDED CHANGES IN STUDY ACTIVITIES OR TIMELINES:
Continue data collection and monitoring of downstream fish populations, but scale back effort somewhat until a new target date is set for completion of the passage facility. The sampling schedule and ending date of the study can then be adjusted accordingly.

STUDY PUBLICATIONS:
Pracheil, B. M., P. B. McIntyre, and J. Lyons. 2013. Enhancing conservation of large-river biodiversity by accounting for tributaries. Frontiers in Ecology and the Environment 11:124-128. (http://dx.doi.10.1890/12179).

STUDY PRESENTATIONS:
Lyons, J., N. Utrup, and J. A. Morton. 2012. Fish passage at the Prairie du Sac Dam on the Wisconsin River. Presentation to Alliant Energy Staff, October 31, 2012, Madison, WI.

Lyons, J., N. Utrup, and J. A. Morton. 2012. Sturgeon and paddlefish restoration through implementation of fish passage at the Prairie du Sac Dam on the Wisconsin River. Annual Meeting of the American Fisheries Society, August 19-23, St. Paul, Minnesota.

Pracheil, B. M., P. McIntyre, and J. Lyons. 2012. Movements of shovelnose sturgeon throughout life history inferred from otolith microchemistry. Annual Meeting of the American Fisheries Society, August 19-23, St. Paul, Minnesota.

Lyons, J., and D. Rowe. 2012. Prairie du Sac Dam fish passage project. Lecture and field training session for new staff of WDNR Fisheries Management, July 11, 2012, Sauk City and Prairie du Sac, WI.

Lyons, J. 2012. Prairie du Sac Fish Passage. Presentation to the WDNR Water Leaders and Fisheries Board, May 30, 2012, Prairie du Sac, WI.

Lyons, J. 2012. Biological basis for fish passage at the Prairie du Sac Dam on the Lower Wisconsin River. Presentation to employees of Alliant Energy, Feb 23, 2012, Madison, WI.

Lyons, J. 2012. Spawning ecology of shovelnose sturgeon and blue sucker in the Lower Wisconsin River. Annual Meeting of the Wisconsin and Michigan Chapters of the American Fisheries Society, February 7-9, 2012, Marinette, WI.

Pracheil, B. M., P. B. McIntyre, J. Lyons, and M. A. Pegg. 2011. Defining the riverscape: tributaries as a key to Great River fish conservation. Annual Meeting of the American Fisheries Society, September 4-8, 2011, Seattle, Washington.

Lyons, J. 2011. Balancing the benefits of reconnecting fish populations with the risks of spreading invasive species in the design and operation of fish passage projects. Invited Plenary Talk at 1st Annual National Conference on Engineering and Ecohydrology for Fish Passage, June 27-29, 2011, Amherst, MA.

Lyons, J. 2011. Upstream fish passage at the Prairie du Sac Dam on the Wisconsin River. Presentation to the Lower Wisconsin Riverway Board, April 14, 2011, Sauk City, WI.

Lyons, J. 2010. The challenge of reconnecting streams in the age of AIS: Prairie du Sac Dam experience. Presentation at the WDNR Annual Statewide Watershed Management Training Conference, March 5-6, 2010, Amherst, WI.

Lyons, J. 2010. Upstream fish passage at the Prairie du Sac Dam on the Wisconsin River: the challenges of reconnecting at fragmented river system while preventing the spread of aquatic invasive species. Presentation to Wisconsin DNR Central Office Staff, February 25, 2010, Madison, WI.

Lyons, J. 2009. Restoration of fish populations via upstream fish passage at the Prairie du Sac Dam, Wisconsin River. Poster presented to Wisconsin DNR Central Office Staff, March 8, 2009, Madison, WI.

EFFECTS OF FLOW ALTERATIONS ON STREAM FISHES

By: Matthew Diebel Matthew.Diebel@Wisconsin.gov

STUDY OBJECTIVES:
1. Develop hydrologic models that relate climate and landscape characteristics to temporal and spatial variation in stream flows across Wisconsin.

2. Use hydrologic model predictions to calculate hydrologic indicators that describe components of flow regime that may be related to stream ecological structure and function.

3. Develop statistical models that relate modeled hydrologic indicators to the measured occurrence and abundance of fish species in Wisconsin streams.

PERFORMANCE ON SCHEDULED ACTIVITIES:
•Developed new 1:24,000 scale stream watershed layer for Wisconsin (see attachment for details).

•Stream flow models were developed for 23 flow metrics, including 5, 10, 25, 50, 75, 90, and 95% exceedance flows at annual, seasonal (spring, summer, fall) and monthly (April, August) periods. The models are mixed effects regressions with log(discharge) as the response, several covariates (e.g., watershed area, precipitation, geology, land cover) as fixed effects, and USGS gage ID as a random effect on the intercept. Flow predictions were made for USGS water years 1984-2010, and are included in the attribute database as the mean of these annual predictions. A complete description of the flow models is being developed as a separate report.

•Assembled fish and stream attribute dataset for objective 3.

STUDY PRESENTATIONS:
•You are what you drain: A high-resolution hydrologic database connecting freshwater with the surrounding landscape, 3/1/13 at WDNR Science Services Open House.

•Ecological limits of hydrologic alteration in Dane County streams, 11/14/12 at Capitol Area Planning Conference.

THERMAL REGIME OF COOLWATER WALLEYE IN THE WARM LOWER WISCONSIN RIVER

By: Brian Weigel Brian.Weigel@wisconsin.gov

STUDY OBJECTIVES:
1) Document the thermal regime of the lower Wisconsin River, particularly the summer maximum water temperature.

2) Determine the water temperatures inhabited by walleye through out the summer, with special emphasis during peak summer temperatures.

3) Identify any thermal refugia used by walleye and determine the necessity for adapting fisheries management to climate warming.

PERFORMANCE ON SCHEDULED ACTIVITIES:
Objective 1: This study is beginning to understand temporal variability in the thermal regime of the Lower Wisconsin River. Thirteen temperature data loggers were deployed in the Lower Wisconsin and 3 of its coolwater tributaries where it is hypothesized that walleye could seek thermal refuge under stressfully warm water conditions. Summer maximum and mean water temperatures will be calculated at all locations in multiple years. In addition, the USGS flow and temperature gages on the Wisconsin River at Muscoda, WI (river mile 45) and Wisconsin Dells, WI (RM 137) yield an annual picture of hydrography and temperature.

Objective 2: 42 Walleye were implanted with radio tags; 32 tags transmit a temperature signal and the other 10 tags archive temperature data. Tracking was conducted at least bi-weekly during summer, and weekly under the hottest conditions. Location, water temperature, habitat, and dissolved oxygen were collected at each fish location and the data will be entered for analyses.

Objective 3: Preliminary data suggest that the bulk of walleye tend to remain within the first 5km of the dam at Prairie du Sac (RM 92), the upper extent of the Lower Wisconsin River, despite nightly DO sags <3 mg/l. Perhaps this area is in greatest need for resource management, particularly improved water quality. It appears that 5 locations downstream may provide thermal refugia, but several of these locations have the risk of becoming isolated as the river stage drops and stranding fish in very poor physicochemical conditions.

EFFECTS OF KNOWN EXPLOITATION RATES ON TROUT POPULATION DYNAMICS

By: Matthew Mitro Matthew.Mitro@wisconsin.gov and Paul Kanehl paul.kanehl@wisconsin.gov (Gene Van Dyck gene.vandyck@wisconsin.gov, DNR cooperator)

STUDY OBJECTIVE:
In this study we are investigating the effects of a known exploitation rate on a brown trout in a Driftless Area stream in Wisconsin. Specific objectives include quantifying the effects of a known exploitation level of trout under a maximum size limit on trout population abundance, size structure, recruitment, growth, and mortality.

PERFORMANCE ON SCHEDULED ACTIVITIES:
In this study we proposed to experimentally simulate trout angling exploitation by removing a known proportion of trout from a stream population. The rationale behind this project is to improve our understanding of how angling regulations may impact trout populations. Recognizing the difficulty in implementing experimental angling regulations and quantifying angler catch, effort, and harvest, an alternative approach is to experimentally control the removal of trout.

We are interested in evaluating a maximum size limit that restricts harvest to trout under a certain size. That is, we will remove trout under a certain size yet large enough that a typical angler would consider keeping it to eat. This design will allow us to protect larger and older trout and to significantly lower the density of typically abundant size and age classes to evaluate how the change in density impacts the trout population. The ideal candidate population would have high productivity of age 0 trout, a high abundance of age 1 and 2 trout of a harvestable size, and the potential to grow older and larger trout.

In 2012 we completed pilot surveys to help identify an appropriate stream for the study and to obtain trout population data prior to an experimental removal future years. Trout Creek (Iowa County) was considered because of the presence of a dry dam and current catch-and-release trout fishing regulations; trout could be moved from the catch-and-release section and released downstream of the dry dam structure. Preliminary surveys, however, showed limited productivity in terms of low numbers of age 0 trout and an abundance of older and larger trout. The current catch-and-release regulation appears appropriate and any experimental harvest is unlikely to improve the already high-quality size structure.

Spring Coulee Creek (Vernon County) was also considered. Extensive surveys of Spring Coulee by both Fisheries Management and Fisheries Research show a high density brown trout population with an abundance of age 0 and age 1 trout and the potential to grow large trout. A single-pass survey of a 290-m section showed a density of 3.6 trout per meter. Although current regulations allow harvest, a recent creel survey from nearby Timber Coulee shows that a majority of anglers in the area practice catch-and-release.

In 2012-2013 we continued to survey Spring Coulee as part of study SSTP to monitor trends in trout populations in relation to baseflow and in preparation of experimental exploitation.

On 18 June 2013 we conducted the experimental exploitation of the brown trout population in Spring Coulee by focusing on a 400 m section of Spring Coulee at Willow Creek Farm, which is known to have a high density of small trout but with the potential to grow large trout. In a single electrofishing pass we captured 878 brown trout. We removed 806 brown trout < 12” total length, transferring them to a downstream location in Coon Creek. We returned 72 brown trout to the stream, including all trout ≥ 12” total length. All returned trout were tagged with a PIT tag, measured, and weighed. Figure 1 shows the length-frequency distribution for the 717 brown trout for which we have recorded lengths, including all 72 trout tagged and returned to the stream. Figure 2 shows the condition of a typical brown trout found in Spring Coulee.

We also surveyed adjacent sections of the stream, including a 200-m section upstream and a 100-meter section downstream. (Additional sections of Spring Coulee further away from the experimental section have been surveyed and trout tagged as part of study SSTP, with the next survey scheduled for July 2013.) A subsample of 50 trout were tagged with PIT (passive integrated transponder) tags and released in each adjacent section, and an additional 150 trout were tagged with VIE (visible implant elastomer) tags and released in each adjacent section. All tagged trout will be used to document movement (or the lack thereof) and survival and PIT-tagged trout will also be used to quantify growth. We will survey Spring Coulee in September at the end of the regular trout angling season to determine to what extent the density in the experimental section of the stream remained suppressed and to document any impact on growth in the experimental stream section in comparison to control sections.

RECOMMENDED CHANGES IN STUDY ACTIVITIES OR TIMELINES:
We recommend looking for an additional stream (or streams) in which to replicate this study.

STUDY PRESENTATIONS:
Mitro, M. G. December 2012. Trout research update presented to the Wisconsin DNR Fisheries Management Board, Madison, Wisconsin.

MONITORING TEMPORAL TRENDS IN TROUT POPULATIONS AND BASE FLOW IN STREAMS

By: Matthew Mitro Matthew.Mitro@wisconsin.gov and Paul Kanehl paul.kanehl@wisconsin.gov (Jordan Weeks jordan.weeks@wisconsin.gov, DNR cooperator)

STUDY OBJECTIVES:

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

Data collected from fixed sites sampled over time will allow the separation of temporal and spatial variability in baseline monitoring and will provide the information necessary to formulate insightful hypotheses about how and why trout populations vary over time.

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

A better understanding of stream flow dynamics and trout population response may assist in determining appropriate minimum flows, and in identifying risks to base flow and trout populations from changing land and groundwater use and from changing climate regimes.

PERFORMANCE ON SCHEDULED ACTIVITIES:

Trout and habitat monitoring

In this study we are monitoring stream fishes, water temperature, and stream flow in Driftless Area streams in Wisconsin. Objectives include determining the utility of temporal-trend monitoring of fixed sites in coldwater streams as part of the statewide baseline monitoring of wadeable streams and quantifying the relationships between stream base flow and annual flow variability, precipitation, and trout population dynamics in coldwater wadeable streams.

We continued monitoring trout populations and daily water level and temperature in a set of 23 streams (Table 1). We added four streams that we are currently studying as parts of other studies: Tenny Spring Creek (SSDX), Trout Creek (study SSTE) and Chase Creek and Lynch Branch (study SSLT). We have also been monitoring trout populations in 4 of the 23 streams as part of another research project (Study: SSLT). Each of the remaining streams are monitored according to baseline wadeable streams monitoring protocols, including fish and index of biotic integrity (IBI) surveys conducted during the June-August summer time period.

We now have 11 streams with multiple monitors (i.e., from two to five monitors per stream) recording hourly water temperature data (Table 1). Four of these 11 streams also have 2 to 3 monitors that record hourly water level data. These additional monitors will allow for temperature and flow profiles along the length of each stream.

At each water level monitoring site we installed a HOBO Water Level 13-Foot Data Logger to continuously record water pressure and water temperature at one hour intervals. Water pressure data are corrected with air pressure data to yield an estimate of water level above the data logger. We measure hourly air pressure at three regional sites (Table 1). We also measured flow at each stream when the water level monitors were installed and again when data are downloaded from the monitors. We will use flow measurements to construct rating curves that can be used to convert water levels to estimates of stream flow (except for extreme flow events).

In addition to the standard fish survey, we tagged all trout age 1 and older in a subset of seven streams using elastomer visible implant tags or passive integrated transponder (PIT) tags to establish annual capture histories. This subset of streams included four streams surveyed since 2004 (Ash Creek, Big Spring Branch, Elk Creek, and Timber Coulee Creek), one stream surveyed since 2010 (Spring Coulee Creek), and two streams surveyed since 2011 (Tenny Spring Creek and Trout Creek). We also established groups of tagged, known-aged brook trout and brown trout in six streams (Ash Creek, Big Spring Branch, Elk Creek, Tenny Spring Creek, Timber Coulee Creek, and Trout Creek). We used coded wire tags or PIT tags to tag yearling trout captured in our spring surveys during the month of April. At this time of year, age 1 trout can still be identified by length. Capture history data will allow for the estimation of abundance, apparent survival, recruitment, and population growth by year. Variables such as stream water level and temperature will be included in models of population vital rates to determine how trout populations respond to changes in these habitat variables.

Gill lice Salmincola edwardsii, an external parasite that infects brook trout, has recently been observed in two of the streams in which we tag brook trout (Ash Creek and Tenny Spring Creek). The prevalence and intensity of gill lice infection in a brook trout population may be related to the host brook trout density, water temperature, and streamflow. Higher host density and lower streamflow may facilitate the transmission of the parasite. The gill lice life cycle is also dependent on water temperature. The trout and habitat data collected in this study will be instrumental in developing an understanding of the dynamics of gill lice in brook trout populations and in understanding conditions that may lead to an epizootic of gill lice.

Climate change

The Wisconsin Initiative on Climate Change Impacts (WICCI) released its first adaptive assessment for the state of Wisconsin in 2011. We contributed to the WICCI Coldwater Fish and Fisheries Working Group report, in which we discussed potential climate change impacts on Wisconsin trout streams, trout distribution in Wisconsin under the current climate and predicted climate scenarios, and adaptation strategies that can be used to protect coldwater resources from changes in climate. The monitoring work in this study strongly supports climate change-related monitoring goals for streams and coldwater fishes such as trout in Wisconsin. A new climate-related project that began in 2012 (Matt Diebel, WDNR principal investigator) involves the collection of year-round water temperature data in streams across Wisconsin. We have been collecting similar data in this project for the Driftless Area of Wisconsin since 2007. Our data will be contributed to the new project, allowing their effort to be redirected to parts of the state for which data coverage is poor.

Climate projections for Wisconsin have been based on modeling efforts by researchers at the University of Wisconsin Center for Climatic Research. This research group ‘downscaled’ continental climate predictions from global circulation models (GCM) from 150-km-square grids to 10-km-square grids, resulting in more specific predictions for Wisconsin. They generated 45 climate change scenarios using 15 GCM with 3 emission scenarios projected over 50 years. The models predict significant warming in all months (with higher low temperatures), more extreme heat and less extreme cold, greater total precipitation (primarily in winter and spring), and more heavy precipitation events and fewer light precipitation events.

In Wisconsin we experienced two heavy precipitation events consistent with predicted changes in climate in 2007 and 2008. These events occurred in the Driftless Area in August 2007 and June 2008, coincident with the start of this study. Many of the water level loggers initially installed in July 2007 were lost in the floods, but those that were retrieved recorded the magnitude and duration of the rise in water level that occurred in surveyed streams. Some examples of retrieved data are described below.

Both flood events, as well as flooding in 2010, occurred and were documented by data loggers in Mormon Coulee Creek and Timber Coulee Creek (Figures 1-2). The greatest changes in water level were observed in Mormon Coulee Creek, a highly entrenched stream (Figure 1). Mormon Coulee Creek has an improving brown trout fishery but is threatened by urban development. The baseline water level in Timber Coulee Creek increased by about 13% following the August 2007 flood and by another 13% following the June 2008 flood (Figure 2). Continued monitoring will help in understanding flood-base flow dynamics and trout population response.

Levis Creek (Figure 3) and other Jackson County streams in our survey were not affected by the extreme precipitation events of August 2007 and June 2008, and exhibited different flow dynamics in response to different precipitation regimes.

Climate models for Wisconsin also predict significant warming in all months including higher low temperatures. Water temperature data collected in this study will be used to identify such trends and their impact on trout. In 2010 we acquired a long-term stream temperature dataset for Kinnickinnic River and its tributaries dating back to 1992 (Figure 4). We updated this dataset with water temperature data collected through the summer of 2012 (Figures 5-10). An analysis of this dataset showed changes in stream temperatures from 1992 to 2012 were consistent with climate predictions of warming air temperatures and higher low nighttime temperatures.

An analysis of long-term (1992-2012) stream temperature data from three sites on the Kinnickinnic River and one site on a tributary show increasing trends in maximum daily minimum, mean, and maximum temperatures as exposure period increases from 1 to 63 days (Figures 5-10). The daily mean temperature was calculated for each date from 15 May to 15 September by year, the maximum daily mean temperature was calculated for each year, and a moving average of the maximum daily mean temperature was calculated for exposure periods of 3, 7, 14, 21, 28, 35, 42, 49, 56, and 63 days. Statistics for maximum daily minimum and maximum were calculated similarly. In our previous analysis of data through 2009, there was generally no change or a decrease in the maximum daily mean temperature measured by 1 day (Figure 4). With the additional observations through 2012, this changed, particularly for Rocky Branch Creek (Figure

5). In general, the addition of more recent observations shows continued warming in summer stream temperature data.

As exposure period increased from 7 to 63 days, the maximum daily mean and maximum temperature (and to a lesser extent the maximum daily minimum temperature) tended to increase with year (Figures 5-10). The maximum daily mean temperatures for all exposure periods were less than thermal tolerances for brook and brown trout, which were estimated using stream temperature and fish data for Wisconsin and Michigan streams collected in 1991-2000 (Wehrly et al. 2007, Transactions of the American Fisheries Society 136:365-374). The 1992-2012 temperature data for the four Wisconsin stream sites suggests a warming trend in water temperature has been occurring, consistent with the observed warming trend in Wisconsin air temperature for the same time period. This warming has not occurred in short term peaks in stream temperature but rather as increases in temperatures as measured over broader exposure periods.

Weather conditions in 2012 were unusual compared to those in 2007-2011. We experienced unusually warm air temperatures in March 2012, which resulted in significant warming of stream water temperatures. In Ash Creek, for example, daily minimum water temperatures in March 2012 clearly exceeded daily maximum water temperatures in March 2011 (Figure 11). The March 2012 water temperatures were similar to water temperatures typically encountered during the June-August summer period. Water temperatures decreased to a more seasonable range by the end of March 2012. The warmer stream temperatures in Ash Creek in March 2012 were ideal for the growth and reproduction of gill lice and may have contributed to the epizootic observed in Ash Creek in 2012.

We have also experienced heat waves (multiple days with air temperatures > 90 °F) and drought conditions during the summer beginning in June 2012. Climate models predict we will see more days with air temperatures exceeding 90 °F and higher nighttime low temperatures, and this was what we experienced in 2012 as compared to previous years during this study (2007-2011). However, despite the higher air temperatures in 2012, our data indicated that warmer stream temperatures were observed in 2010 versus 2012 (Figures 5-14).

Stream temperature data from 2010-2012 for Big Spring Branch illustrates the dynamics of stream conditions in relation to weather patterns. Daily mean air temperature at Big Spring was generally greater during summer (June-August) 2012 compared to the previous two years (Figure 12), but water temperature in Big Spring, measured about 200 m downstream from a major groundwater source, remained relatively constant and unresponsive to day-to-day changes in air temperature (Figures 12 and 13) in 2012. The water temperature repeatedly increased during summer 2010, however, in response to precipitation events (Figure 2010). It appears that streams driven by cold groundwater input are resilient to high air temperature in the absence of precipitation events (Figure 13) and that observed increases in stream temperature are influenced by warm surface water during precipitation events when they occur (Figure 14). In the absence of precipitation events, stream water temperature does begin to respond to changes in air temperature as the distance from the groundwater source increases (Figure 15). In Big Spring, daily mean water temperature measured about 2,000 m downstream of the major groundwater source showed changes consistent with changes in the daily mean air temperature.

The long-term air temperature, water temperature, and water level data collected in this study have begun to highlight the importance of considering both temperature and precipitation in understanding climate impacts on stream conditions. Although summer air temperature was unusually high in 2012, stream temperatures were unusually cool because of the lack of precipitation.

STUDY PUBLICATIONS:

Stewart, J. S., S. M. Westenbroek, and M. G. Mitro. In review. A model for evaluating stream temperature response to climate change in Wisconsin. U.S.G.S. Report.

Mitro, M., J. Lyons, and S. Sharma. 2011. Executive summary: coldwater fish and fisheries. Pages 170-173 in E. Katt-Reinders, editor. Wisconsin’s changing climate: impacts and adaptations. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin.

Mitro, M. G., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Pages 69-76 in R. F. Carline and C. LoSapio, editors. Conserving wild trout: Proceedings of Wild Trout X. Bozeman, Montana.

Mitro, M., J. Lyons, and S. Sharma. 2011. Wisconsin Initiative on Climate Change Impacts: Coldwater Fish and Fisheries Working Group Report. 31 pp.

Lyons, J., J. S. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, U.S.A. Journal of Fish Biology 77:1867-1898.

Mitro, M. G. 2010. Groundwater key for trout as our climate warms. Wisconsin Trout 22(1):6.

STUDY PRESENTATIONS:

Mitro, M. G., J. Lyons, J. Stewart, and S. Westenbroek. March 2013. Climate change impacts on Driftless Area trout streams: observations, projections, and adaptation strategies. 6th Annual Driftless Area Symposium (invited), La Crosse, Wisconsin.

Mitro, M. G. March 2013. Adaptation in action: putting climate change adaptation strategies to work for fisheries and wildlife. Climate Academy Webinar, U.S. Fish & Wildlife Service (invited).
http://nctc.fws.gov/courses/climatechange/climateacademy/home.html

Mitro, M. G. December 2012. Trout research update presented to the Wisconsin DNR Fisheries Management Board, Madison, Wisconsin.

Mitro, M. G., P. Kanehl, D. Walchak, and E. Struck. March 2012. Monitoring trout response to stream habitat development in Wisconsin: lessons from Elk Creek. 5th Annual Driftless Area Symposium (invited), La Crosse, Wisconsin.

Mitro, M. G. March 2011. Climate change and the future of inland trout distribution in Wisconsin. Coulee Region Chapter of Trout Unlimited meeting (invited), La Crosse, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. March 2011. Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. 4th Annual Driftless Stream Restoration Symposium (invited), La Crosse, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. March 2011. Climate change and the distribution of trout in Wisconsin streams: impacts and adaptation strategies. Climate Change Graduate Seminar (invited), University of Wisconsin, Madison, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. March 2011. Climate change and the distribution of trout in Wisconsin streams: impacts and adaptation strategies. Joint Meeting of the Wisconsin Society of American Foresters and The Wisconsin Chapter of the Wildlife Society (invited), Wisconsin Dells, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. December 2010. Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. Midwest Fish and Wildlife Conference, Minneapolis, Minnesota.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. September 2010. Climate change and the future of inland trout distribution and management in Wisconsin. DNR Science Seminar Series, Madison, Wisconsin.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. September 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Wild Trout X Symposium, West Yellowstone, Montana.

Mitro, M. G. May 2010. Coldwater Fish and Fisheries Working Group Adaptive Assessment Report. WICCI Advisory Council Meeting, Madison, Wisconsin.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. April 2010. Climate change, trout ecology, and the future of inland trout distribution and management in Wisconsin. UW-Richland Natural Resources Club, Richland Center, Wisconsin. (Invited)

Mitro, M. G. February 2010. Coldwater Fish and Fisheries Working Group – Adaptive Assessment Report Update. WICCI Science Council Meeting, Madison, Wisconsin.

Mitro, M. G., J. Lyons, and J. Stewart. March 2009. Response of Wisconsin's coldwater fishes to climate change. Bracing for Impact-Climate Change Adaptation in WI, sponsored by the Wisconsin Initiative on Climate Change Impacts, University of Wisconsin, Madison, Wisconsin.

Mitro, M. G. January 2009. Trout stream habitat restoration and climate change in Wisconsin. WDNR Fisheries Management Statewide Meeting, Wisconsin Dells, Wisconsin.

Mitro, M. G. November 2008. Trout research in Wisconsin streams. Blackhawk Chapter of Trout Unlimited meeting, Janesville, Wisconsin.

Mitro, M. G., D. Vetrano, and J. Weeks. October 2008. Monitoring temporal trends in trout populations and stream flow in Driftless Area streams. 3rd Annual Driftless Area Symposium, Lanesboro, Minnesota.

Smallmouth Bass and Muskellunge Fisheries in Three Northwestern Wisconsin Rivers: "Guide to the Future" Project Report, 2013

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Introduction and Project Objectives

Medium and large rivers often hold exceptional and popular recreational sportfish populations. In northern Wisconsin rivers, smallmouth bass and muskellunge are the dominant sportfish, though northern pike are present and walleye can be important seasonally. Due to a variety of factors including current, water clarity, structural complexity, and access, these river fish populations are not easily (or representatively) sampled by traditional fisheries methods such as netting or electrofishing. On an experimental and voluntary basis the Wisconsin Department of Natural Resources (WDNR) enlisted a group of river fishing guides who completed hundreds of fishing trips on these rivers annually with their clients in 2012 and 2013 while targeting smallmouth bass and muskellunge using flyfishing gear. Records of the effort and catch from these fishing trips can provide important information on relative abundance and size structure of river populations of smallmouth bass and muskellunge in a manner that is efficient to the monitoring agency (WDNR) and informative to the guides, their clients, and the general public. In the second year of this project, we enlisted six guides from the Hayward Fly Fishing Company to collect data on the Flambeau, Chippewa, and Namekagon rivers (Price, Sawyer, Rusk, Washburn, and Burnett counties). The data can be used to inform management decisions regarding fishing regulations, access, and fish passage.

Summary of Major Findings

-Predictable differences in catch rate among anglers with different skill levels were observed for both smallmouth bass and muskellunge. Understanding these differences is necessary to control against biased interpretation. Correction factors may be developed after several years of data provide the requisite sample size, but such corrections have not been applied in this report.

-Angler catch rates of smallmouth bass on the Flambeau River were significantly higher than on the Namekagon or Chippewa rivers for a second straight year. This difference was largely driven by high catch rates of smallmouth bass less than 14 inches long. Catch rates of legal-size smallmouth bass (≥ 14 inches) in the Flambeau River were higher in 2013 than in 2012 and similar to catch rates of larger fish in the other rivers, suggesting that the relatively lower size structure indices in the Flambeau River in 2012 may have been related more to a strong upcoming year class than to slow growth rates as initially hypothesized.

-Anglers fishing these rivers with guides experienced catch rates for both muskellunge and smallmouth bass that were 2-3 times higher than the northern Wisconsin average for unguided anglers on lakes.

-Anglers targeting muskellunge encountered 2-3 muskellunge for every one caught.

-Northern pike were a common incidental catch but their distribution in these three rivers is patchy and appears to be concentrated in areas with more slack water and aquatic vegetation.

-Walleye and largemouth bass were rarely caught on these guided trips.

-Catch rates for smallmouth were highest in August in 2013. The peak for smallmouth catch rates in 2012 was July. The difference between the two years might be related to the warm weather observed early in 2012 and the late spring in 2013. There was no monthly trend in muskellunge catch rates but most effort was exerted in the fall (September-November).

-River discharge had a negative effect on smallmouth bass fishing on the Namekagon River but had no influence on catch rates of muskellunge on the Namekagon. Fishing for smallmouth bass and muskellunge did not appear to be impacted by discharge on the Flambeau or Chippewa rivers.

-Change in water level (rising, falling, or stable over a 3 day period) did not affect muskellunge catch rates on all three rivers combined or smallmouth bass catch rates on the Namekagon or Flambeau. Catch rates for smallmouth bass on the Chippewa River were higher when water was falling compared to when it was stable. In general, water level had less of an impact on fishing success than expected, although it should be noted that days with extreme discharge or change in water level were usually not fished.

Pewaukee River Watershed Protection Plan

By: Thomas Slawski TSlawski@SEWRPC.org Southeastern Wisconsin Regional Planning Commission

December 2013 draft plan available at the following website:
http://www.sewrpc.org/SEWRPCFiles/Environment/PewaukeeRiver/capr-313-pewaukee-river-wshed-protection-plan-draft.pdf
***A final draft will be available by June 2014**

Background & Purpose of Project
The Pewaukee River Partnership received Wisconsin Department of Natural Resources (WDNR) grant funding through the Chapter NR 195 River Planning and Management Grant Program with additional financial support from Waukesha County to complete a Protection Plan for the Pewaukee River Watershed. This was in cooperation with the WDNR, Waukesha County, Pewaukee Lake Sanitary District, City and Village of Pewaukee, the City of Waukesha, Town of Brookfield, Town of Delafield, Town of Lisbon, Town of Waukesha, the Village of Sussex, and Southeastern Wisconsin Regional Planning Commission (SEWRPC).

SEWRPC has prepared this plan on behalf of the Pewaukee River Partnership in cooperation with representatives from the ad hoc Pewaukee River Watershed Protection Plan Advisory Group. The Advisory Group was comprised of self-nominated individuals representing a range of stake holders with interests in the Pewaukee River watershed who volunteered their time to meet and review portions of the plan. The Advisory Group represents the diversity of interests and perspectives that affect the watershed, including businesses, stream and lake residents, and County and local government staff. From 2011 through 2013, participants in the Advisory Group either attended one or more of the several meetings or provided electronic mail correspondence to define issues, develop goals, and establish recommendations that would help manage local community growth while protecting the natural resources in the Pewaukee River watershed. It is important to note that the plan goals were based upon the feedback provided by the Advisory Group, which form the foundation for generating and evaluating the alternative and recommended plans, and for establishing a sound framework within which to implement the recommendations.

The Watershed Team and Advisory Group developed the following general goals for the plan:
•Protect and improve wildlife, land, surface water , and groundwater resources

•Minimize impacts of land development by controlling both nonpoint agriculture and urban runoff pollution and flooding

•Build partnerships and inform the public to promote protection and safe recreational use of natural resources

This plan elaborates on each of these planning goals by outlining more specific objectives and action items recommended to accomplish the goals. These objectives and management measures also benefited from discussions with Advisory Group members throughout the planning process. There were four major/key findings, five emerging threats/issues of concern, and five key opportunities that were identified through this planning process and listed below (no order of importance implied by position in the list).

Major Findings

•Water quality in the River is dependent upon water quality in the Lake.

•Water quantity in the River and Lake is dependent upon both surface runoff and groundwater discharge.

•Recreational uses of the Lake and River are linked and interrelated.

•Volunteer water quality monitoring programs in the Lake and Stream were invaluable for our understanding of this system.

Emerging Threats

•The River and Lake are highly vulnerable to drought as experienced in the summer 2012 drought conditions and illustrate the need to protect groundwater recharge areas throughout the watershed for existing and planned land uses

•Riparian buffer lands adjacent to the waterways are necessary to protect water quality and wildlife, but these protections are most vulnerable within and among small headwater tributaries throughout the watershed as well as Pewaukee Lake

•Existing and planned urban growth can limit groundwater recharge, in the absence of mitigation measures, and could negatively impact both water quality and water quantity; agricultural land use practices could be improved to reduce nutrient and sediment loads to the River

•The amount of trash and debris within this river system degrades water quality, aesthetics, and the recreational value

•Stream channelization and road crossings have limited instream fisheries habitat quality and quantity

Opportunities

•To better integrate land based and water based recreation to improve access to and quality of recreational experiences

•To protect existing and expand riparian buffer width and longitudinal connectivity to improve water quality, minimize streambank erosion, and protect and enhance fish and wildlife habitat

•To enhance groundwater recharge by protecting critical sites with high and very high groundwater recharge through appropriate zoning, purchase, and land management measures

•To implement mitigation measures to protect water quality and groundwater recharge through application of green infrastructure, stormwater treatment practices, and community coordination mechanisms

•To improve the fishery by enhancement of fish passage, protection of potential spawning areas in River/tributaries and Lake, and protection of the land-water interface through preservation of surface and groundwater linkages.

This plan forms a logical complement to the management actions that have been implemented on the land and water resources throughout the Pewaukee River watershed, and represents an ongoing commitment by the Pewaukee River Partnership, municipalities, and citizens to sound environmental planning. This plan is also consistent with the implementation of the Waukesha County Land and Water Resource Management Plans goals of protecting and improving the natural resources within this county by applying a watershed based protection planning approach. It is important to note that the watershed management approach has recently been adopted by the State of Minnesota's Department of Natural Resources as the major statewide strategic guidance for the protection of fishes and their habitats.