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On the Cover: A cold December evening at Klondike Park boat ramp on the Missouri River. Photo credit: Zack Brock, USFWS.

Above: A frosty winter morning in southeastern Missouri. Photo credit: Zack Brock, USFWS.

2012 Year in Review: Columbia FWCO Fish Passage Projects

Columbia FWCO made progress in 2012 opening waterways throughout Missouri and Iowa to allow fish passage with several completed and ongoing projects. The following synopsis provides a review of the status of our current projects and those completed in 2012.

COMPLETED PROJECTS

Locust Creek Log Jams Removed

Beginning in 2008, Missouri Department of Natural Resources (MODNR), and Missouri Department of Conservation (MDC) began working to remove five logjams in Locust Creek and Higgins Ditch on Pershing State Park in Linn County MO. This partnership was made possible because of a Fish Passage Grant through the Columbia Fish and Wildlife Conservation Office (Columbia FWCO). The purpose of the Fish Passage grant was to facilitate seasonal migration and intra-population movements of trout perch (*Percopsis omiscomaycus*), a rare species in Missouri, and restore wet prairie habitats to benefit the federally endangered Eastern massasauga rattlesnake.

Severe flooding in 2009 and 2010 thwarted efforts to remove the logjams and deposited more debris delaying completion of the project. Fortunately the mild winter and drought conditions in 2011-2012 allowed the project to be completed. In total, over 9,700 feet of logjams were removed from the two creeks and both are now free flowing. MODNR submitted their final report in 2012 and will monitor the area over the next five years.



One of the logjams removed in Pershing State Park, Linn County, Missouri. Top: Pre-removal (2009). Middle: removal (2010). Bottom: open channel of Locust Creek (2011). Photos courtesy of: Missouri Department of Natural Resources.

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West Fork 102 River Weir Modified

The steel sheet pile weir on the West Fork of the 102 River in southwest Iowa has been a barrier to fish passage for decades. The sheer vertical face of the weir made it impossible for fish and other aquatic organisms to migrate freely and was a safety hazard to paddlers. Flooding in 2010 began to wash out the weir which threatened the integrity of the upstream bridge. In 2011, the Taylor County Commission, Hungry Canyons Alliance, Iowa Department of Natural

Resources, and NRCS partnered with Columbia FWCO for a Fish Passage Grant to replace the failing weir with a fish and paddler friendly structure and to save the bridge. The flathead chub (*Platygobio gracilis*), listed as one of the species of greatest conservation need under Iowa DNR's Comprehensive Wildlife Action Plan, along with multiple other fish species, can now pass easily through the 1':15' (rise/run) grouted rip-rap slope. The structure was completed in December 2012. Iowa DNR will be conducting post-construction monitoring of fish passage at the project.



Left: Failing weir on the West fork of the 102 river in Taylor County IA in 2011. Right: After construction the 1:15 sloped grouted rip-rap fish and boat passage structure in 2012. Photos courtesy of: John Thomas, Hungry Canyons Alliance.

Prosperity Road Slab Crossing Replaced with Free Span Bridge

The Missouri Department of Conservation (MDC) 2004 Niangua Darter Recovery Plan identifies slab crossings as a reason for preventing fish from migrating between reaches and a cause for the decline of the federally listed Niangua darter (*Etheostoma nianguae*) in central Missouri. The MDC conducted a crossing survey in the native range of Niangua darter and identified 32 crossings that posed a barrier to migration. Prosperity road marks the 19th crossing to be replaced with a free span

bridge in the Niangua darter range. Prosperity road is in Dallas County on the Little Niangua River and the next to last barrier on this river to be removed. Griffith road is the last slab crossing posing as a barrier on the little Niangua River and is the next upstream barrier from Prosperity Road. We hope to have Griffith road slab replaced in 2013. While MDC was the recipient of the Grant, their partnership with Dallas County Commission and Great Rivers and Associates saw the project to completion. This project began in 2011 and, despite some minor setbacks with needing heavier equipment to remove the old structure, the project was

(Continued from page 4)

completed with a new free span bridge in the spring of 2012. MDC conducts annual monitoring of Niangua darters throughout the range and specifically at bridge replacement projects and found them occupying the area within weeks of project completion. Only 13 more barriers are left and the entire native range of the Niangua darter will be free flowing again.



Left: Prosperity Road slab crossing on the Little Niangua River in Dallas County MO before Construction. Below: Free span bridge on Prosperity Road in 2012. Photo Credit: Columbia FWCO, USFWS.



ONGOING PROGRESS

Klondike Dam Modification Begins

This project was originally funded with a Fish Passage grant in 2009. There have been several delays, primarily with determining historic significance of the dam, flooding and relocation of mussel beds in the construction footprint. Klondike Dam is a unique project to Columbia FWCO.

First, it is the first dam modification project we have worked on. Secondly, it has the collective efforts of Iowa DNR and South Dakota

Game Fish and Parks in addition to local municipalities. Removal of this dam is not a feasible alternative as several alluvial wells would be affected if upstream water levels were

lowered. Instead a series of rock arch rapids will be constructed. The final reason this project is unique is that it was one of 11 river projects highlighted by Secretary of the



Klondike Dam on the Big Sioux River between NW Iowa and SE South Dakota. Rock Arch Rapids will be placed below the dam to allow for fish passage and paddler channels. Photo Credit: Heather Calkins, USFWS.

Interior, Ken Salazar under the America's Great Outdoors Rivers Initiative (<http://www.doi.gov/>)

(Continued from page 5)

news/pressreleases/Salazar-Highlights-11-Projects-in-Midwestern-and-Southern-States-as-Americas-Great-Outdoors-Rivers.cfm).

A stakeholder meeting in December 2012 announced the contractor will begin work January 2013 with an expected completion date of March 2013. We anxiously await the completion of this

Dry Fork Slab Removed

Dry Fork creek, a tributary to the Meramec River, in Phelps County, Missouri, has the largest predicted and observed species diversity in the entire Meramec River basin. The slab crossing on County Road 3330, known as Deans Ford, is the only barrier on this creek. The ownership of this crossing was transferred to private ownership and is no longer maintained by Phelps County Road Commission. This was an excellent opportunity to remove this unvented slab which prevents all passage of aquatic organisms at normal stream levels. A cooperative agreement with MDC and the landowner was reached and a Fish Passage grant was provided to remove the slab crossing and replace it with a lite equipment and livestock crossing with a natural bottom. To date the slab has been removed and we are postponing installation of the material for the lite crossing until a few more high water events needed to stabilize the stream bed and transport impounded sediments. We hope to have this project completed in 2013 - if the creek will rise.

project as it will serve as an example of a successful alternative to dam removal for aquatic organism passage, allow safer paddler channels, preserve historic landmarks and protect municipal water supplies.

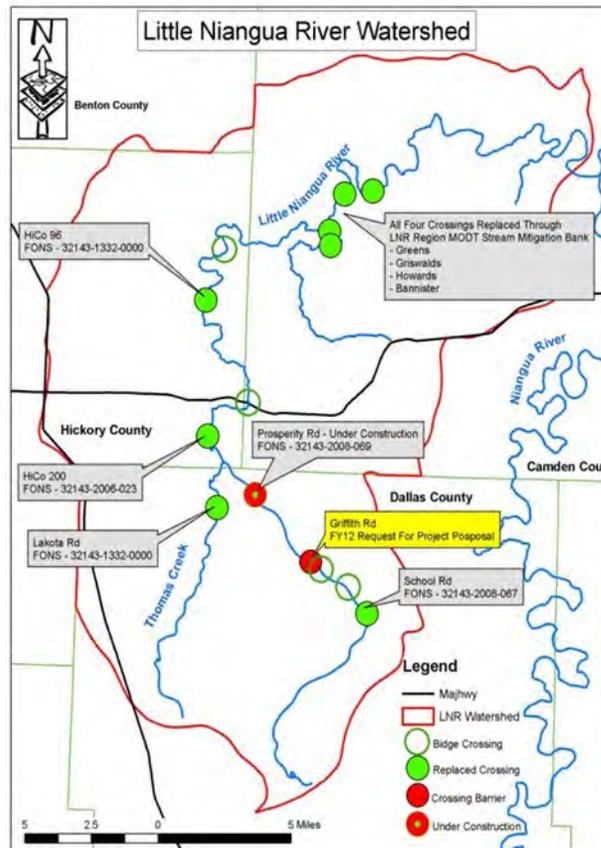


Top: Deans Ford, a slab crossing on the Dry Fork of the Meramec on County Road 3330 in Phelps County, MO before demolition. Center: Demolition of Deans Ford. Bottom: After slab removal of Deans Ford. Photos courtesy of: Missouri Department of Conservation.

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Griffith Road Slab Replacement

Just a few miles above the new bridge on Prosperity Road is the next barrier, Griffith Road Slab, the last fish passage barrier on the Little Niangua River. The map to the right was produced by our partner, the Missouri Department of Conservation, as part of their proposal to replace Griffith Road Slab. At the time Prosperity was under construction. What is notable is that of the ten crossings in the Little Niangua River posing as fish barriers, the Fish Passage Program only funded six; the other four were replaced by the Missouri Department of Transportation recognizing the need for fish passage. Once finished, Griffith Road Bridge will open 9.1 miles of stream habitat to the Niangua darter and the entire 55+ miles of the Little Niangua River will be barrier free. This will reduce the number of previously genetically isolated meta-populations from nine to one population, theoretically able to move and reproduce freely throughout their new range.



Map of barriers within the Little Niangua Watershed of Missouri 2012. Map courtesy of: Missouri Department of Conservation.

Farm Creek Weir Modification

The bridge over Farm Creek in Mills County, Iowa was like many of the other 600+ bridges with steel sheet pile weirs; it prevented fish from migrating. It was selected by Hungry Canyons Alliance and Iowa DNR as the highest priority weir modification project in western Iowa. That is until a Fish Passage grant was given to fix the problem in 2007. Unfortunately before a stilling basin could be added to the outlet of the upper weir, a major flood event occurred in 2008 causing a large scour hole to form downstream of the weir. Additional funds were provided in 2011 to create a second 1:15 slope weir with a "V" notch downstream of the



Top Left: Farm Creek Weir in Mills County Iowa before construction. Top Right: Before the project could be finished, severe flooding created a scour hole, eroding private land downstream of the modified weir. Bottom Left: 1:15 sloped modified weir at normal flow. Bottom Right: Partial completion of armoring the stilling basin to control the scour. Photos courtesy of: Hungry Canyons Alliance.

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stilling basin and armor the banks of the stilling basin to prevent the scour hole from expanding into private property. This project is expected to be completed in 2013.

BARRIER INVENTORIES

Bourbeuse River Crossing Survey Complete

The final report titled *Stream Crossings Posing Barriers to Aquatic Organism Movement: Bourbeuse River Watershed* was finished in April 2012 by Heather Calkins (see abstract). This report provides a summary of, and ranked by severity, the level of impassibility for aquatic organisms at all publicly owned road crossings over the Bourbeuse River and its larger tributaries in Crawford, Franklin, Gasconade, Maries, Osage and Phelps counties in Missouri. The purpose of this survey and subsequent report was to provide direction and draw attention to the need to replace and reconstruct crossings with free span or natural bottom bridges. The report has been shared with our partners, including but not limited to, the Missouri Department of Conservation and Missouri Department of Transportation. A copy of this report can be obtained by e-mailing heather_calkins@fws.gov or jeff_finley@fws.gov.



Heather Calkins updates her datasheet while surveying the Meramec Watershed. Photo credit: Anna Clark, USFWS

Abstract

Continuity is essential for proper stream ecosystem function. Habitat fragmentation in streams can disconnect populations leading to decline of species abundance, collapse of specific populations, genetic isolation, reduction in biodiversity and can disrupt nutrient cycling of the energy base in lotic systems. Road-stream crossings can act as barriers to the movement of organisms and other stream components, causing discontinuity of the system. A road-stream crossing inventory and assessment was performed on the Bourbeuse River watershed (Missouri) from 2009-2012 to determine which were hindering movement of benthic organisms. Of the 683 stream crossings visited, 103 were identified as being barriers to passage at low to normal flows. Most were concrete slabs with various sizes and numbers of openings with 90% being perched or having at least one jump associated with the structure. These types of crossings prove to be greatest barriers, whether physical or behavioral, to bottom-dwelling species. This assessment will assist managers and partners in prioritizing stream crossing replacement projects. Future watershed assessments should take a more holistic approach, considering not only fish but also other biological and physical attributes of the lotic ecosystem.

Meramec River Crossing Survey Underway

Similar to the aforementioned Bourbeuse Report, the Meramec River crossings are being surveyed, and a report will be produced. To date all field data has been collected and this is currently being entered into a database. This database, developed primarily by the Missouri Department of Conservation's Streams Unit and Resource Science branch, will generate a prioritized list of crossings posing the greatest barrier and, if removed, will provide the greatest level of connectivity. The Meramec River is a Priority Watershed for MDC, hosting some of the greatest diversity of fish and mussels in the state. Additionally, the Fishers and Farmers Fish

Habitat Partnership is supporting habitat work in this watershed thus further inquiring as to how these habitats can be enhanced. Our aim is to provide information on barriers in order to help guide habitat restoration efforts and road maintenance entities for justification in replacing

barriers with free span or natural bottom bridges instead of slab crossings and perched culverts. The final report is expected in the spring of 2013.

*Jeff Finley
Fisheries*

NFHP and the Columbia FWCO: Highlights of 2012

The National Fish Habitat Action Partnership or NFHP was created in 2001 to protect, restore and enhance the nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve the quality of life for the American people. Today, more than 10 years after its formation, NFHP boasts 18 partnerships and is still growing. Not only are new partnerships being formed, but existing ones are continuing to expand collaborative efforts and celebrate fish habitat success. In 2012, Columbia FWCO was active in two fish habitat partnerships (FHP) and involved with a project supported by each, both led by the Missouri Department of Conservation (MDC).

Fishers & Farmers Partnership (FFP) for the Upper Mississippi River Basin

The Fishers and Farmers FHP aims to support locally-led projects that add value to farms while restoring aquatic habitat and native fish populations. To accomplish this, landowners work with conservationists and scientists to address the needs of their own farms, local streams and the fishes of the basin. A great example of this is the *Lower Bourbeuse/Middle Meramec Aquatic Conservation Opportunity Area (LB/MM ACOA) Landowner Partnerships Project*.

Lower Bourbeuse/Middle Meramec Aquatic COA Landowner Partnerships Project-Funded 2012

The LB/MM ACOA partnership is one of the first and most successful in the region and is modeled by others across the nation. Through this



Well drilling for alternative water source for cattle. Photo courtesy of: Missouri Department of Conservation.

partnership the MDC collaborates with private landowners, The Nature Conservancy, area Soil and Water Conservation Districts and many others in implementing best management practices (BMPs) on private lands in these watersheds. The first projects employed in the Lower Bourbeuse COA actually occurred in 2001 long before Fishers & Farmers was ever formed.

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FFP provided their first funding to this group in 2010 and awarded additional funding in 2012. In the last 10 years, more than 30 miles of fence has been installed with over 350 acres of riparian corridor gaining protection. With help from the FFP, more than 20 BMPs have been installed on 9 different farms. Increasingly more and more landowners are realizing the benefits of these practices and taking advantage of the incentives offered. The great success of this partnership is due to the extraordinary outreach efforts and diligent advocacy by the MDC, private landowners and other collaborators.

Great Plains Fish Habitat Partnership

The Great Plains Fish Habitat Partnership's mission is to creatively work together to conserve aquatic resources of rivers and streams throughout the prairies of the central US. This FHP focuses on the conservation of the remaining high quality prairie rivers and streams, the restoration of highly degraded habitat (where feasible) and the enhancement of habitats that have been moderately impaired. The *Stony Point and Shelton Prairies Stream Protection Project* demonstrates this type of prairie stream protection.

Stony Point and Shelton Prairies Stream Protection Project- Completed 2012

This project excludes cattle access from two prairie streams located on different MDC owned prairies, Stony Point and Shelton, by constructing permanent fencing. These streams are unnamed tributaries in the Horse Creek watershed that

currently support several fish species, but historically held a number of other species that are now of conservation concern. Exclusion of livestock from these streams will reduce sedimentation and channel degradation improving water quality and restoring this limited resource. Prairie streams represent one of the most limited natural communities due to native prairie loss over the last 200 years. Less than one percent of the once vast tall grass prairie has survived in Missouri. Most of it is in privately owned remnant prairies that are grazed with no restricted stream access. This project will thus serve as a prairie stream stewardship model for



Shelton Prairie fence protecting stream from cattle. Installed using funds from the Great Plains FHP. Photo courtesy of: Missouri Department of Conservation.

surrounding ranchers. It is our hope that this project will demonstrate the benefits of such BMPs and encourage future participation.

*Heather Calkins
Fisheries*

A Day Surveying Crossings on the Meramec Watershed

I feel the cold in my lungs as I make my way across a bridge to measure its length. The leaves have already abandoned their posts on the trees, making way for the roving marauder of winter, a battle they would have surely lost. The rays of sunshine have lost most of their heat, and now only serve to light my way on this cold winter day. A startling shadow makes its way across the ground in front of me, and as I look up I see a bald eagle gliding to rest on a branch above. Perhaps he was hoping that I might startle some small creature into revealing its location. Perhaps he was just lonely and wanted the company of some other living thing on this cold day. Whatever the reason, I enjoyed his company.

On this particular bridge that I'm measuring, the water is pouring out of a pipe culvert and making a waterfall which pours into a deep pool below with fish swimming lazily around. This ambient environment momentarily dulled my senses to the actual problems associated with even hearing the sound of a waterfall at a bridge. The fish below know all too well what the waterfall means to them and their historic migrations. The waterfall impedes their upstream movement as it is too high for them to jump.

They succumb to life below the bridge. The eagle overhead seems to understand the fish's plight and gazes intently with grim satisfaction at an easy meal.

Originally these bridges had the bottom of their culverts well below water level. The fish were able to travel with minor difficulty upstream.

However, due to problems associated with this stream, erosion has left many bridges with a waterfall and frustrated fish downstream. This is one of the reasons crews from Columbia FWCO were measuring this and other stream crossings.

This is not the first waterfall that I have seen while conducting these surveys; in fact, this is just one of many seen so far. With three crews and two weeks, we surveyed 986 crossings and traveled approximately 5,000 miles around nine sub-watersheds of the Meramec River basin. Most of these watersheds are located in the rolling hills of southern Missouri. The Ozark hills are dotted with livestock and often cows gaze at you curiously from the icy waters above and below a crossing. As I was staring into one's



Photo of a perched culvert. Photo credit: W. Brock, USFWS.

placid face, I realized how some of these waterfalls may have formed. The worn paths to-and-from their icy baths increase erosion and sediment transport. Grazing of vegetation along the streams also increases runoff and allows for the streams to become flashy during rain events. All of these factors come

together to disrupt the equilibrium of the stream resulting in perched culverts and, thus, waterfalls.

Despite these problems, many crossings proved to be fine - needing no replacement. For example, in the Indian Creek watershed, only 7 of 64 crossings were potential candidates for replacement. Crossings included a variety of infrastructure types from nothing more than gravel fords and simple box culverts, to a concrete slab with 12 corrugated culverts and

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even four-lane free span bridges. However, some crossings surveyed were in serious need of repair and/or replacement. Several bridges that we came upon had issues with erosion such that safety for those crossing was a concern. Many crossings become a safety hazard for anyone trying to cross during a flood event due to their inability to allow sufficient water through the culverts. Therefore each bridge replaced benefits not only the species in the stream but humans as well. See video for an example of flood safety hazard: http://www.youtube.com/watch?v=p_uqPR4lr5o

Our survey focused on the Meramec Basin, seen by State resource managers as vitally important due to the diversity of species found within its banks. These streams are home to many state and federally listed species. Proposed crossing

replacements would be free span bridges, allowing for unimpeded movement of all aquatic organisms and providing more natural sediment transport. Our interactions with the curious locals were positive, mostly supporting the replacement of these sometimes dangerous crossings. We will soon be able to prioritize which crossings should be replaced as funding becomes available.

As we drive our vehicle down the country road to our next crossing, I couldn't help but think of how happy each family would be to drive safely home with no fear of floods or eroded bridges, and, how happy some of those dark shadows would be if they could once again migrate upstream.

Zack Brock
Fisheries

Volunteer Spotlight: Chris Egbert

I feel small standing next to Chris, and not just because his 6'4" frame towers over me. No, I feel small because the height of the man's character casts such a tall shadow. Chris Egbert has been our volunteer extraordinaire over the past few years, logging hundreds of hours assisting with our pallid sturgeon monitoring and broodstock collection efforts. Whenever we need an extra hand, Chris is always there. His motto has always been "Whenever you need me", and he really means it.



Volunteer, Chris Egbert (right), towers over Wyatt Doyle (left), Colby Wrasse (center) and a pallid sturgeon captured at the mouth of the Osage River.

Public service seems to be in his DNA, as he has spent a lifetime serving his country, state and city. As a young man, Chris served in the US Navy, completing two tours in the Vietnam War

Zone. He chose law enforcement as his career, retiring at the rank of Captain from the Columbia Police Department in 1993 and then retiring from Missouri State Government in 2008, after a career with the Department of Public Safety and the Department of Corrections. Now retired, Chris isn't spending his golden years watching daytime

television. In addition to volunteering for our office, he also volunteers with Big Muddy National Wildlife Refuge and the Raptor Rehabilitation Project at the University of Missouri's School of Veterinary Medicine. Chris is a certified Missouri Master Naturalist with the Boone's Lick Chapter. When he's not volunteering, you are likely to find Chris roaming the streams and woods of Missouri, catching trout or hunting squirrels. Or he might be in his workshop turning slabs of wood and common gourds into works of art. Or maybe you will find him doting on his granddaughter Ella or treating his wife Kay to dinner and a show. But you will not find him sitting idly by twiddling his thumbs watching the time pass. Though retired, he keeps

plenty busy.

Now a seasoned volunteer, Chris is like a member of our field crew. His youthful looks and boundless energy belie his calendar age, as he's able to perform fieldwork that tests a 20 year-old's strength and stamina. Chris is always ready with a lively story and a good joke to keep the day interesting, and even though we often ask him to volunteer on cold, windy, rainy days, he is always ready to come back for more. I would say that I wished we had more volunteers like Chris, but he's truly one of a kind.

Colby Wrasse with Chris Egbert

Fisheries

Mystery on the Osage River

Missouri residents utilize their water resources for recreation – whether it is boating, jet skiing or fishing - all year long. With that in mind, it isn't uncommon to find remains of fish that were cleaned at the boat ramp and left to compost. It is unusual, however, to find dead fish littering the banks, sandbars and boat ramp parking lots... and so prompted a phone call from a Mizzou graduate student researcher.

This seasoned field researcher reported seeing dead and dying Asian carp in and along the banks of the Osage River. She also noticed that the silver and bighead carp were lethargic, even complacent, when electrofished (extremely unusual behavior for Asian carp). While it was acknowledged that the water temperatures were cold – around 4 degrees Celsius, she was adamant that the Asian carp were displaying notably different behaviors even for those temperatures. After a quick call to LaCrosse Fish Health Center (FHC) to describe the situation, it was decided that an exploratory trip to the Osage River was warranted. A Columbia FWCO crew

spent a frigid day electrofishing and taking pictures of dead Asian carp near the Mari-Osa



A sick Asian carp drifts listlessly under thin ice. Photo credit: Patty Herman, USFWS.

Access, approximately 10 miles upstream from the confluence with the Missouri River.

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Upon arrival, our crew discovered piles of bighead and silver carp in the parking lot and along the ramps. These fish had obvious puncture wounds, injuries likely sustained at the hands of anglers gigging for suckers on the Osage River. It seemed curious that flighty fish like silver carp were able to be gigged, especially in the numbers that we were seeing at the access. We didn't see many live fish at all in the cold, clear water and after electrofishing for nearly an hour, we stopped at a gravel bar where the Maries River enters the Osage River. With the low water levels, a large gravel bar was exposed and littered with bighead and silver carp in various states of decay. Given the stages of decomposition, it appeared as though these fish had been experiencing a die-off for several months. Most notably, only Asian carp were observed on the shores or drifting in the current. No other species were found dead. In all, 10 live silver carp were seized while drifting or captured by electrofishing from the Osage River. The fish were packed in ice and shipped overnight to LaCrosse FHC.

Terry Ott from LaCrosse FHC was quick to process the fish and report his preliminary findings to us. Upon visual inspection, the silver carp appeared to have gas bubbles at the base of the fins and, microscopically, aneurisms were observed in the filaments – conditions often

associated with gas saturation. During the necropsy, however, the internal organs indicated a different problem. He noticed that the bile in the gall bladders was black, an indication that these fish had not eaten in over a week. The stomachs and intestines were also empty and nearly all fish appeared emaciated. Bacteria was present in several kidney cultures and cell lines are currently being cultured to determine if viral pathogens were present. Results from all tests

are expected to take several weeks.

From all outward appearances, Asian carp on the Osage River are starving to death. It is unknown if these fish are starving due to complications from a disease, are experiencing side effects from dissolved gas in the water or if they have simply eaten all available food in the Osage River. Notably, we did not observe other species of fish being impacted in the same way as the Asian carps, though species

diversity was low during our electrofishing runs. Additional reports of dead silver carp on the mainstem Missouri River have since been shared with our office. This is truly a mystery – one that we are eagerly hoping to solve.

*Patty Herman
Fisheries*



Two of hundreds of dead Asian carp on the exposed gravel bar near the Maries River confluence with the Osage River. Photo credit: Patty Herman, USFWS.

Midwest Fish & Wildlife Conference – Bridging the Gap

Hilary Meyer and Patty Herman of Columbia FWCO attended the 73rd Midwest Fish & Wildlife Conference held in Wichita, KS. Mid-December in the Midwest often sports spectacular winter storms; however, the weather was beautiful for this year's meeting (windy – but we were in Kansas, after all). The conference was well attended with representatives from many state and federal agencies, universities and wildlife

groups. Patty presented research results from her summer-long detail with U.S. Geological Survey, Columbia Environmental Research Center. She presented data on passive and active drift patterns of larval pallid sturgeon and co-authored research that defined the point-of-no-return in first feeding pallid sturgeon larvae using environmental temperature profiles as part of the Fisheries Poster Session. We would also like to recognize U.S. Fish & Wildlife Service, Region 3 for becoming a “Trophy” level sponsor for the 2012 Midwest Fish & Wildlife Conference. Without this support, opportunities to keep up with changing paradigms, learn new techniques, or incorporate innovative technologies in our work would be limited. These conferences are also a great way to reconnect with current and former colleagues, make new acquaintances and to mentor students - the lifeblood of our field.

The Lower Missouri River



- Highly engineered
 - Channelized
 - Altered habitat
- Regulated flows
 - Gavins Point Dam Releases
- Managed for commercial navigation

Above: Hilary Meyer gave a presentation discussing how different parts of the flow regime may affect the condition of native river species.

Below: Patty Herman presented a poster with preliminary findings from a larval pallid sturgeon behavior experiment.

organizations. This year's theme was “Partnerships: Bridging the Gap.” Many of the plenary speakers spoke about the important role of partnerships in conservation. Hilary participated in the Rivers and Streams Symposium, Fisheries Technical Session, and presented a talk about the influence of flow regimes on the condition of large river fishes from the lower Missouri River. There were a number of oral presentations that examined the effects of flow regime on fish. Ecological flows, natural flow regimes and other flow management paradigms have received a considerable amount of attention from a number of management and conservation




Passive and Active Drift Patterns of Pallid Sturgeon from Hatch to Bottom Settling

Patricia Herman¹, Lynne Johnson¹, James Candr¹, Aaron DeLoney¹ and Diana Papoulias²

Abstract

Conservation of riverine species necessitates understanding which drift patterns are most important to the survival of the Missouri River pallid sturgeon. This study was designed to determine the drift patterns of larval pallid sturgeon from hatch to bottom settling. The study was conducted in a laboratory setting using a flume system. The study was designed to determine the drift patterns of larval pallid sturgeon from hatch to bottom settling. The study was conducted in a laboratory setting using a flume system.

Objectives

- Describe the drift of larval pallid sturgeon from hatch to bottom settling
- Determine the relationship between drift patterns and environmental conditions
- Determine the relationship between drift patterns and environmental conditions
- Determine the relationship between drift patterns and environmental conditions

Results and Discussion

Results of the study indicate that larval pallid sturgeon exhibit different drift patterns depending on environmental conditions. The study found that drift patterns were influenced by factors such as temperature, flow velocity, and light intensity. The study found that drift patterns were influenced by factors such as temperature, flow velocity, and light intensity.

Introduction

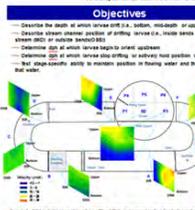
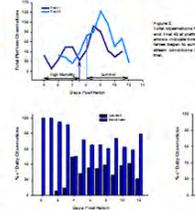
The Missouri River is a major waterway in the United States. It is home to a variety of fish species, including the pallid sturgeon. The pallid sturgeon is a species of fish that is found in the Missouri River. The pallid sturgeon is a species of fish that is found in the Missouri River.

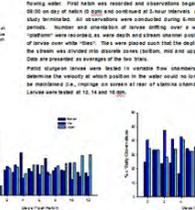
Methods

The study was conducted in a laboratory setting using a flume system. The study was designed to determine the drift patterns of larval pallid sturgeon from hatch to bottom settling. The study was conducted in a laboratory setting using a flume system.

Acknowledgments

The authors would like to thank the following individuals for their assistance in this study: [Names]



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