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On the Cover: A luna moth (Actias luna) dries its wings after emerging from its chrysalis. Photo credit: Rick Hansen, USFWS.

Above: An Upland Sandpiper (Bartramia longicauda) stands guard atop of a fence post in Northwest Missouri. Photo credit: Rick Hansen, USFWS.

Pallid Sturgeon Stocks – An Investment in the Future

Recovery of the Federally Endangered Pallid Sturgeon is a multifaceted endeavor involving the collaboration of numerous federal and state agencies. Artificial propagation and stocking has been an important component of recovery efforts, with more than 135,000 Pallid Sturgeon stocked in the lower Missouri River since 1992. This accomplishment has required the combined efforts of two fish hatcheries (Neosho National Fish Hatchery and Blind Pony State Fish Hatchery), three fisheries offices (Columbia Fish & Wildlife Conservation Office (FWCO), Missouri Department of Conservation, and Nebraska Game and Parks), United States Geological Survey (USGS) – Columbia Environmental Research Center, geneticist Dr. Heist of Southern Illinois University and many others.

We at Columbia FWCO contribute to the cause largely through our broodstock collection efforts. Since 2007, we have fished the lower Missouri River with trotlines and gill nets, capturing large, “wild” Pallid Sturgeon to utilize in the propagation effort - but catching these fish can be challenging. A potential broodstock Pallid Sturgeon needs to be 1) an adult (usually greater than 30-inches in length), 2) a “wild” fish –not a previously stocked fish, and 3) reproductively ready (Pallid Sturgeon may spawn only once every 3-5 years). The

combination of these three factors rule out many of the Pallid Sturgeon we capture. For example, during the 2013 season Columbia FWCO collected 65 Pallid Sturgeon; however, only 3 met the criteria necessary for potential use as broodstock fish.

Catching a Pallid Sturgeon is only the first step in the process. After a potential broodstock fish is captured, we then coordinate with the hatcheries for transportation of the sturgeon – this could involve up to a 5 hour truck ride for the fish. A genetic sample of the fish must be sent to Dr. Heist, who determines if the fish is 1) a pure Pallid Sturgeon (not a Pallid X Shovelnose Sturgeon hybrid), 2) a truly “wild” Pallid Sturgeon – not of hatchery origin, and 3) which management unit the fish genetically assigns to (a complicated story for another day). Biologists from USGS will also examine the Pallid Sturgeon with ultrasound and endoscope to determine the sex of the fish and its reproductive readiness. If a Pallid Sturgeon is genetically determined to be a good candidate for propagation and it is reproductively ready, then the hatchery biologists will work their magic and attempt to spawn the fish. The baby Pallid Sturgeon produced from artificial propagation typically spend about a year in the comfort of the hatchery before being



An adult Pallid Sturgeon is returned to the river after determining that it did not meet the necessary criteria for potential use as a broodstock fish. Photo credit: Colby Wrasse, USFWS.

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Adam McDaniel with a potential broodstock Pallid Sturgeon just moments before the fish was taken to Blind Pony State Fish Hatchery. Photo Credit: Colby Wrasse, USFWS.

tagged and stocked into various locations in the lower Missouri River.

Two of the Pallid Sturgeon we captured this year were reproductive males. With the ability to cryopreserve milt (sperm), the broodstock fish collected this year could also be used in future years to increase the number and genetic diversity of Pallid Sturgeon in the lower Missouri River. Much has been learned about this species in the two decades since artificial propagation first began. Advancements in broodstock collection techniques, genetic analysis, spawning techniques and hatchery rearing have allowed us to continually improve on the propagation and stocking process, which remains an important component of recovery. We still have a long way to go to recover Pallid Sturgeon, but many dedicated professionals continue working together towards that common goal.

**Colby Wrasse
Fisheries**



Jeffrey Muchard holds a hefty lower Missouri River Pallid Sturgeon. This fish was a stocked fish - a direct product of previous broodstock collection efforts. Photo credit: Colby Wrasse, USFWS.

Easy Money - Let it Go and Let it Grow

Do you want to do something easy to conserve our natural resources that will save you time and money? Consider allowing idle spots on your property to grow native. Whether you own a farm or live in an urban subdivision, you may have manicured areas on your land that you do not use. Letting idle areas grow is an idea that Aldo Leopold discusses in his book entitled "A Sand County Almanac" (1949). The concept is gaining popularity across the nation.

I have lived in suburban areas my whole life. Maintaining a well-manicured lawn is a practice that is engrained in me. However, I moved to a more country setting last year, and I was overwhelmed by the size of the lawn. It took me almost three hours and over two tanks of gas to mow it. I began to make plans to buy a riding lawn mower and enough seed, fertilizer and various lawn chemicals to maintain it all. However, I realized that my family had plenty of open space to play and did not use the majority

of the lawn. My perspective began to change, and I decided that it made more sense to let go of my desire to maintain it all. A new plan emerged to allow trees to grow and let a portion of my yard reconnect to the surrounding woods. Suddenly, there was no need to spend thousands of dollars on that riding lawn mower, and my annual yard maintenance budget was drastically reduced. I can now mow my yard with my push mower in less than 45 minutes.

Idle spots can be simply left alone to let Mother Nature do the work, or the enhancement process can be accelerated by introducing native plants. Plants that are native to your area are survivors and do not need constant care or maintenance. There are a wide variety of native plants to choose from whether you are allowing forest to grow, a prairie to develop in an open area, or wildflowers to feed butterflies in a small corner of your yard.



In my case, I already have mature trees in my yard to work with. Therefore, I can plant understory trees and shrubs in my idle area such as blooming dogwood, redbud, wild plum, and buckbrush. It will be fun to plant scattered groups of flowering perennial wildflowers and create winding paths through the area for my kids to explore. Eventually, the turf grass will give way to the leaf litter typical of a forest floor, and the area will match the rest of the woods that surround my house. There are dozens of benefits that far outweigh maintaining short grass, which has limited value to wildlife. For example, the added shade will allow my mature trees to enjoy moist soil in the summer, my family

can enjoy song birds and other wildlife that will begin using the area, and no harmful lawn chemicals will be applied. I love the side effects most of all. We will have more family time each week, and we can afford to go on an awesome vacation this year.

For more information on where to purchase and how to landscape with native plants visit <http://grownative.org/>

*Andy Roberts
Ecological Services*

Update: Mystery on the Osage

Background:

In late January 2013, Columbia FWCO received report of a fish kill on the Osage River. After a brief discussion with USFWS LaCrosse Fish Health Center (FHC), a Columbia FWCO crew headed to the river to investigate. Hundreds of dead Asian carp were observed on the shores of the Osage River near the Mari-Osa Access. Live carp were captured and sent to LaCrosse FHC in Onalaska, WI. Terry Ott, Assistant Project Leader, immediately began processing the 10 Silver Carp and reported back with preliminary post-mortem observations.

Externally, the fish had endothalmia (sunken eyes), hemorrhaging at the base of the fins, small aneurysms at the tips of the gill lamellae and appeared emaciated. Internally, petechial (capillary) hemorrhaging was noticed around the pyloric caecae and the bile was very dark in 80% of the fish. Dark bile is indicative of a fish not feeding, a diagnosis supported by the empty stomach and intestine. Fat stores also appeared to have been adsorbed in nearly all of the fish.

Terry took kidney and spleen tissue samples to culture for known fish viruses and agar plates were inoculated with kidney samples to determine if bacteria were present.



An emaciated dead carp lies on a gravel bar in the Osage River. Photo credit: Patty Herman, USFWS.

Diagnostic Report 1:

About 10 days later, Terry sent a progress report on the diagnostic case. The kidney and spleen samples that were cultured for viruses showed some atypical growth patterns when cultured at 20°C. The cells began to round up and the cell walls darkened, however; the cells never showed the characteristic cytopathic effect (CPE) nor did

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the cells completely fall apart as is normally observed when a virus invades. Terry decided to proceed with a “14 day blind pass” (re-inoculation of the samples) to determine if a virus was causing the cells to round up. If a virus was present, a blind pass would provide an opportunity for the virus to strengthen, allowing it to invade the fresh cells and develop into CPE. Terry also reported on the bacterial cultures taken from the kidneys. Of nine cultures, only three showed bacterial growth. The bacteria that were isolated and identified on those three plates were common bacterial species found in many waters in the United States. However; from two of the fish he identified one species, *Aeromonas hydrophila*, which is known to be a secondary invader of fish undergoing stress and can cause significant mortalities. Because this bacterium was only found in two of the fish, it is unlikely that this was the cause of the carp deaths in the Osage River. Septicemic infection from *Aeromonas hydrophila* would likely manifest as small surface lesions, local hemorrhages in the gills and vent, ulcers, abscesses, exophthalmia (bulging eyes) and abdominal distension. Typically, with fish experiencing septicemia, more bacteria from a greater percentage of fish would be isolated.



One of the Silver Carp captured on the Osage River and sent to LaCrosse Fish Health Center for disease testing. Note the sunken appearance of the eye. Photo credit: Patty Herman, USFWS.

Another Piece to the Puzzle?

Informational updates were frequently shared with our partners; US Geological Survey, University of Missouri – Columbia, Missouri Department of Natural Resources and Missouri Department of Conservation (MDC). During one of those updates, Dr. Chris Darnall, Aquatic Animal Health Specialist with MDC, replied with a reference to a talk given at the World Aquaculture Society meeting earlier this year. She indicated that Dr. Lester Khoo and researchers from Mississippi State University investigated a 2011 fish kill on the Mississippi River involving Asian carp. After analyzing brain tissue for bacterial growth, a slow growing, Gram-positive, coccus bacteria was isolated. Initial identification using biochemical testing was that of *Lactococcus garveiae*. However, ribosomal sequence analysis of the bacterium identified the bacteria as *L. lactis*, a bacterium used extensively in the production of cheese and buttermilk. Dr. Khoo tested the bacteria using Koch’s postulates and found it to be lethal to Asian carp. Interestingly, *L. garveiae* is more often associated with reports of pathology and disease in aquatic organism than *L. lactis*. *Lactococcus lactis* is even being explored as a cost-effective vaccine delivery system in humans. Brain tissues of Asian carp from the Osage River were not cultured. It is unknown if *L. lactis* was present in those samples.

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Diagnostic Report 2:

Approximately 24 days after the Silver Carp were sent to LaCrosse FHC, test results indicated that no fish viruses were detectable from the kidneys or spleens of the Silver Carp tested, even after the 14 day blind pass. Though *Aeromonas hydrophila* was isolated from two fish, Terry found no evidence that the mortalities were actually caused by the bacterium. No parasites were observed from the ten fish sent in for analyses, either. Diagnosis of Asian carp mortalities on the Osage River: **Unknown.**

Currently:

Incidental reports of dead Asian carp continue to surface. If more symptomatic Asian carp can be captured, we are hopeful that additional testing can be performed including brain tissue culture for pathogens. We thank Terry Ott and LaCrosse FHC for performing pathologies and analyses, as well as our partners and the public for providing pertinent information and assistance in the pursuit of answers to this mystery.

*Patty Herman
Fisheries*

Fishing for Fun

U.S. Fish and Wildlife Service employees assisted Shepard Elementary 5th graders with fishing at their end of year picnic. Using fishing

poles provided by Missouri Department of Conservation, Columbia FWCO staff taught casting skills, baiting and fish removal. The fish were biting and kids reeled in several large Bluegill and Largemouth Bass from

Stephens Lake in Columbia. One highlight from the day was watching the kids' reactions to a snake trying to eat a fish that seemed too large for it to swallow. Heather Calkins, Anna Clark, Jeremiah Smith, Brett Witte and volunteer Kevin Renfro all shared the duties of baiting hooks and

maintaining safety among the group. Brett was the main rod and reel mender after several incidents involving knotted lines and mysterious

snags. This event was very successful when measured by the interest and smiles generated by the participants. Thank you to Shepard Elementary School for including us in your picnic

celebrating these smart and hard-working 5th graders. They were an awesome group and we cannot wait to participate again next year.

*Anna Clark and Heather Calkins
Fisheries*



Fifth grade students from Shepard Elementary relax and enjoy their end-of-year picnic. Photo credit: Anna Clark, USFWS.

Some New (Yet Familiar) Faces at Columbia FWCO

Hello! I am **Jordan Fox**, at the wee, impressionable age of 24.

I am originally from Southeast Missouri; a small town called Wappapello Lake. I received my undergraduate degree in Conservation and Wildlife Management from College of the Ozarks in Branson, Missouri. While working my way through college, I was fortunate enough to have



Jordan Fox holds a Pallid Sturgeon captured while bow trawling during high water on the Missouri River. Photo credit: Adam McDaniel, USFWS.

many great opportunities for jobs and experiences along the way. I worked for the U.S. Army Corps of Engineers as a Recreation Aide in my hometown during the summer of my freshman year, worked in Alaska as a Biological Tech for USFWS the summer of my sophomore year, patrolled the parks of Table Rock Lake as a Park Ranger my junior year, and finally, after

graduating, I took a job in New Mexico working for the Bureau of Reclamation looking for the endangered Southwest Willow Flycatcher along the Rio Grande River. With all of these fantastic experiences under my belt, I knew that I had a passion for natural resource conservation and wildlife management. Since then, I have worked for Columbia Fish and Wildlife Conservation Office for a year and, following that appointment, took a temporary job in Alaska for a summer doing salmon enumeration on the Gisasa River. After returning to the Midwest, I applied and was accepted to University of Central Missouri, where I am currently working on a master's of Environmental Studies while concurrently pursuing a graduate certificate in GIS. I have since returned to Columbia FWCO as a Biological Science Technician where I find myself, again, with great friends and great experiences on the Missouri River.

My name is **Gregory Fretueg**.

I joined the Columbia FWCO in May of 2013. I am originally from Illinois where in May of 2010 I received my bachelor's degree from the University of Illinois Urbana-Champaign in Natural Resources and Environmental Sciences. From there, I did my graduate work at the University of Illinois at Springfield where I completed my master's degree in Environmental Sciences in May of 2012. My thesis work examined the habitat use and diet composition of river otters (*Lontra canadensis*) at The Emiquon Preserve and Emiquon National Wildlife Refuge near Havana, IL. Throughout my college career I worked several jobs in conservation including working for the USFWS at the Illinois River National Wildlife and Fish Refuges Complex, the Illinois Department of Natural Resources, the

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*Greg Fretueg holds a male Canvasback (*Aythya valisineria*) that was captured during a waterfowl management project in Illinois. Photo credit: Andy Gilbert, Illinois Natural History Survey.*

Illinois Natural History Survey, and the Illinois Environmental Protection Agency. Following the completion of my master's degree I moved to Minnesota as a seasonal worker for USFWS at the Morris Wetland Management District. Before moving to Columbia I was working on fisheries and waterfowl projects for the Illinois Natural History Survey. My interests are in conserving biodiversity and restoring fish and wildlife habitat. I am excited for the opportunity here in Columbia to work with a variety of programs and to gain the needed experience to further my career in fish and wildlife conservation.

Jeremiah Smith

I re-joined the Columbia Fish & Wildlife Conservation Office in March as a Biological Science Technician. I spent 8 years in the

Missouri Army National Guard as an MP with the 2175th Military Police Company. I was deployed to Iraq in 2003-2004 and made it to the rank of Sergeant before finishing my full obligation to the Army. In 2009, I received my bachelor of science degree from Columbia College with a major in Biology and minors in Environmental Science and Chemistry. I was a STEP (Student Temporary Employment Program) student with the Columbia Fisheries Resource Office (now Columbia FWCO) between 2008 and 2009. From November 2009 to August 2012, I worked with the Kentucky Department of Fish and Wildlife Resources as an Urban Fisheries Technician under the Fisheries Research Section. While working in Kentucky, I entered and managed data for exploitation tagging studies, conducted angler attitude and creel surveys, maintained outreach materials through the Urban Fisheries website and kiosks, assisted in fish habitat construction, maintained sampling gear and equipment and assisted Fisheries Biologists in a variety of fish sampling. I enjoy spending time with my wife and two young boys. Some of my favorite hobbies are hunting, fishing and being outdoors.



Jeremiah Smith holds a Flathead Catfish captured while sampling an urban lake in Kentucky. Photo credit: Kentucky Department of Fish & Wildlife Resources.

*Jordan Fox, Greg Fretueg and Jeremiah Smith
Fisheries*

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