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# 2014 Southeastern Fishes Council State Reports

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# 2014 Southeastern Fishes Council State Reports

## **Abstract**

State reports of research, activities, and events of interest to the membership.

## **Keywords**

2014 State Reports

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### 2014 Southeastern Fishes Council State Reports

(including: Alabama, Arkansas, Georgia, Kentucky, Missouri, Mississippi, North Carolina, Tennessee, Virginia, and West Virginia)

#### Alabama:

- **Auburn University Museum Projects (Jonathan W. Armbruster):**
  - Jonathan Armbruster, Matthew Niemiller, and Pamela Hart are currently undertaking a revision of the Southern Cavefish (*Typhlichthys subterraneus*), and are beginning a second survey of populations in Alabama and Tennessee with plans to explore the use of eDNA and marking and recapturing fishes.
  - David Werneke and Brian Helms are surveying fishes of the Bankhead National Forest.
  - David Werneke, Malorie Hayes, Erika Krahl, and Jonathan Armbruster have completed a study on the population genetics of the Broadstripe Shiner, *Pteronotropis euryzonus*.
  - Keith Ray and Jonathan Armbruster continue a study on the population genetics of the Blacknose Dace (*Rhinichthys atratulus*) in Alabama.
  - Keith Ray is continuing work on the biogeographic patterns of *Luxilus zonistius* with Steven Powers and Kerstin Edberg.
  - Keith Ray has been examining timing of daily movements *Macrhybopsis aestivalis* in streams.
  - Carla Stout, Morgan Raley, and Jonathan Armbruster are conducting a phylogenetic and geometric morphometric study of Longnose Minnow (*Notropis longirostris*).
  - Paul Wiczorek and Jonathan Armbruster are using Geometric Morphometrics to understand community dynamics of Alabama minnows and to examine the potential for success of introduced species based on differences in shape with natural communities.
  - Edward Burress and Jonathan Armbruster have begun a project on comparative stable isotope analysis of minnows with representative populations in Alabama, North Carolina, and Tennessee.
- **Auburn University Fish Biodiversity Lab (Carol E. Johnston):** The focus of the Fish Biodiversity Lab continues to include bioacoustics, sensory biology and hormone work, as well as conservation. Current projects of interest to SFC members include: Water availability as a catalyst for fish assemblage change. Risk assessment for Slackwater Darter (*Etheostoma boschungii*) and the Chipola watershed. Stress response of fishes to traffic noise.
- **University of Alabama (Brook L. Fluker):**
  - Brook Fluker continued phylogeographic studies of Gulf Coastal Plain fishes (*Etheostoma parvipinne*, *E. gracile*, and *E. zonifer*) and conservation genetics of the undescribed Blueface Darter (*E. sp. cf. zonistium*).

- In August 2014, Brook Fluker transitioned into a new position as Assistant Professor of Aquatic Ecology at Arkansas State University in Jonesboro, Arkansas.
- **U.S. Fish and Wildlife Service (Jeff Powell on behalf of the Alabama Rivers and Streams Network and the Alabama Ecological Services Field Office):**
  - Strategic Habitat Unit Project (SHU) Team Accomplishments:
    - To date: Completed ~139 fish IBI's in the Bear Creek, Big Canoe, Choctawhatchee/Pea/Yellow system, Murder Creek and Sipsey River SHU.
    - Assessed ~1,300 road crossing assessments in the Bear Creek, Big Canoe Creek, North River, and Murder Creek SHUs.
    - Completed two dam removals (Big Canoe Creek and Turkey Creek);
    - Since the installation of sediment traps along unpaved roads in the North River watershed back in 2011, more than 445 tons of sediment have been prevented from entering tributaries of the North River.
    - Reintroductions of 15 imperiled aquatic mollusks (10 Federally listed, 5 imperiled) in 12 different rivers have been completed by the ADCNR-AABC (Alabama Aquatic Biodiversity Center) since 2012.
  - Alabama Field Office Notes:
    - Pre-listing surveys prevented the listing and ultimate withdrawal of five crayfish species from CBD Southeastern Species Petition filed in 2010.
    - The process to determine whether or not to proceed with a potentially proposed listing package for the Black Warrior Waterdog (*Necturus alabamensis*) and Black Mudalia Snail (*Leptoxis melanoides*) is underway.

### Arkansas:

- A recent genetics survey indicates that the Leopard Darter (*Percina pantherina*) has critically low genetic effective population sizes and may go extinct range-wide without translocations due to inbreeding depression. The species appears to be near extirpation in Arkansas. They have not been collected from the Robison Fork drainage in 8 years, and are rarely detected in the Cossatot River.
- The Arkansas Wildlife Action Plan is being revised. The Fish Taxa Team has been working on revision of the NatureServe scores. We have been reviewing what is a waif species, especially for Mississippi River fishes.
- Justin Stroman recently finished his master's work at the University of Arkansas at Little Rock. He discovered that the Stargazing Darter (*Percina uranidea*) is not yet extirpated from the Saline River, but the species is very rare in the drainage.

- Adam Geik (Arkansas Tech University) has implanted Paddlefish (*Polyodon spathula*) with transmitters on Lake Dardanelle and is tracking them for his master's thesis work.
- Casey Cox recently finished his master's work on American Eel (*Anguilla rostrata*). The number of records for the state was doubled.
- Arkansas Game and Fish biologists are in the second year of a Paddlefish stock assessment project for the White River.
- Robison and Buchanan have continued work on revising the Fishes of Arkansas.

### **Georgia:**

- **Columbus State University (Bill Birkhead):** Following my retirement, I realized after two years that here was an opportunity to begin publishing data I had amassed during my 33 years at a teaching university. I have begun by tackling the long-term data sets first as they have the most value and are more apt to be publishable. With this in mind, I have begun working on the "Fishes of Fort Benning", an effort I have been touting for quite some time. Over a 30 year period (1979-2009) my colleagues and I have made 204 collections, that contain 62 species of fishes. A few of these collections resulted from field labs we conducted with students. The last time I compiled these data was in preparation for a presentation I made at the ASIH meetings in Austin, TX, in 1993 at a symposium honoring my major professor, Dr. Clark Hubbs.
- **Georgia College and State University (Chris Skelton Lab):** Chris Babb is working on the life history of the Altamaha Shiner (*Cyprinella callistia*) and will complete 1 year of sampling in February. Ethan Roberson is working on the life history and distribution of the Oconee Burrowing crayfish (*Cambarus truncatus*). Chris Skelton is working on a status assessment of the Georgia crayfishes that are currently proposed for ESA listing.
- **Georgia DNR, Fisheries Management, Region 3 (Rob Weller):** In cooperation with the FL FWCC, FWS, COE and TNC, we completed the fifth and final year of a proactive species conservation grant from NOAA being used to restore Alabama Shad (*Alosa alabamae*) populations in the ACF. The primary management technique to expand shad populations is by providing fish passage at Jim Woodruff Lock and Dam on the Apalachicola River. Passing shad at this location provides several hundred miles of additional riverine habitat to both spawning adults and their offspring in the Flint and Chattahoochee Rivers. Yearly population estimates of spawning adults, though highly variable, indicate an increase in the number spawning fish and in particular more, larger (older) individuals returning. However, the number of returning adults has been much fewer the last two years. It is unknown at this time what may be the cause of the recent reduced spawning run of

Alabama Shad in the ACF. We will continue to monitor the shad population in the ACF and fish locks will continue to be used to provide passage at Jim Woodruff Lock and Dam despite the completion of the NOAA grant.

• **Georgia DNR, Fisheries Management, Region 4 (Bert Deener):**

- Georgia DNR Region 4 Fisheries completed the 2014 sampling season (May-October), and removed 16,681 Flathead Catfish (*Pylodictis olivaris*), totaling 21,744 pounds. Since the implementation of the full time Satilla River Redbreast Restoration Project in 2007, more than 91,906 pounds of Flathead Catfish (47,497 fish) have been removed from the river. The size structure of the Flathead Catfish population has declined with the average size fish removed dropping from 5.8 pounds in 2007, to 1.3 pounds in 2014. Biomass per effort has varied from year to year (57.1 kg/hr in 2007, 23.6 kg/hr in 2008, 19.9 kg/hr in 2009, 31.1 kg/hr in 2010, 25.3 kg/hr in 2011, 10.9 kg/hr in 2012, 14.4 kg/hr in 2013, to 44.5 kg/hr in 2014). Biomass increased in 2014 after 18 months of flooded rivers provided ideal conditions for high survival and growth.
- Tim Bonvechio, Brandon Baker, and Bryant Bowen recently presented an accepted manuscript entitled “Population Dynamics of White Crappie Occurring in a Small Georgia Impoundment Stocked with Female-Only Largemouth bass” at the 68<sup>th</sup> Annual Southeastern Association of Fish and Wildlife Agencies held in Destin, Florida. Aging revealed that both stunting and rapid growth were apparent in the same year-class. Crappie populations stocked in a female-only bass fishery can exhibit high dispersion of lengths within age-classes and are a challenge to characterize with traditional population dynamic assessment tools.
- Region 4 staff completed a comprehensive age and growth study on the Largemouth Bass (*Micropterus salmoides*) population in the Ocmulgee River. In an effort to increase yield or catch, this study evaluated the current 14-inch minimum size limit by modeling growth and a range of exploitation rates. The Ocmulgee River Largemouth Bass population was characterized as having moderate natural mortality and growth, with an estimated low exploitation. Minimal changes in yield will likely occur by reducing the MLL to 12-inches, but the benefits from increased harvest exceed the subtle changes in yield. The minimum length limit for largemouth bass in the Ocmulgee River was reduced from 14 to 12 inches during 2014.
- Region 4 fisheries personnel collected a Shoal Bass (*Micropterus cataractae*) on October 27, 2014 from the Altamaha River in Appling Co. This is the first time the non-native species has been documented in the river, but they have been present in the Ocmulgee River, a tributary to the Altamaha, for more than two decades.

- **Georgia DNR-Fisheries Management, Stream Survey Team (Paula Marcinek):** The Stream Survey Team (SST) participated in two federal projects this year, comprising the majority of their fieldwork. Biologist Paula Marcinek assisted the U.S. Geological Survey with their National Water Quality Assessment (NAWQA) Program's Southeast Stream Quality Assessment (SESQA). Marcinek provided fish collection and taxonomic expertise to the USGS during the 11 day, 16 site sampling event in Georgia. The SST also partnered with the Georgia Environmental Protection Division to complete the boatable portion of the U.S. Environmental Protection Agency's National Rivers and Streams Assessment (NRSA) project, which included 16 sites and 18 sampling events. The SST also has been collecting fish for educational displays at the Go Fish Education Center in Perry, GA. When not in the field, team members have been revising and updating the statewide Fish Index of Biotic Integrity.
- **Georgia DNR, Nongame Conservation (Brett Albanese):**
  - With the help of 50 regional experts, including many SFC members, we assessed the status of 251 rare aquatic species as part of an update to Georgia's State Wildlife Action Plan. Eighty-six Georgia species are globally imperiled (G1-G2), half of which are mollusks. Within the state, 152 species are considered imperiled (S1-S2) and four dozen more are historic (SH—not seen in 20-40 years, but could still be extant) or considered extirpated (SX). The SWAP revision team identified and prioritized 52 conservation actions and 165 watersheds to benefit rare aquatic species and habitats. The U.S. Fish and Wildlife Service carried out a corresponding GIS assessment that will help identify specific conservation actions in high priority watersheds.
  - In collaboration with the Tennessee Aquarium Conservation Institute and the U.S. Fish and Wildlife Service, we carried out aquatic species surveys in South Chickamauga Creek and tributaries. Our purpose was to identify the current distribution of rare species and to determine how the aquatic community changes upstream and downstream of Graysville Dam. Highlights of the survey include updated and new occurrences of several species, including Snail Darter (*Percina tanasi*), Mountain Madtom (*Noturus eleutherus*), Tennessee Pigtoe (*Fusconaia barnesiana*), Tennessee Heelsplitter (*Lasmigona holstonia*), and Chickamauga Crayfish (*Cambarus extraneus*).
  - Due to new opportunities, we lost many valuable members from our aquatic team last year. Dr. Andrew Gascho Landis accepted a faculty position in Fisheries and Wildlife at SUNY Cobleskill. Long-term hourly workers Ani Popp and Catherine Reuter began graduate study at NCSU and LSU, respectively. That leaves Jason Wisniewski, Deb Weiler, and Brett Albanese

holding down the fort. Speaking of Deb, she created a new database to help us manage scientific collecting permit report data. Please make sure you provide complete and accurate data in your report, so we can fully utilize your important records.

- **Georgia Southern University (Steve Vives):**
  - In May of 2011, the Ogeechee River was the site of the largest fish kill in Georgia's history. Georgia Southern University initiated a three-year monitoring project in June 2014 to better understand the ecology of the Ogeechee River. As part of this multi-investigator project, we are monitoring fish populations quarterly at six sites, three above a textile processing plant discharging treated waste into the river and three below the textile plant.
  - Thomas Kuhn has begun a project using a health assessment index approach to compare fish health at impaired and non-impaired stream sites.
  - We are happy to report that SFC member Jamie Roberts was hired as an Assistant Professor in the Department of Biology.
- **Georgia Southwestern State University (Tom Lorenz):** Students worked on the behavioral interactions between invasive Creole Painted Crayfish (*Orconectes palmeri creolanus*) and native Muckalee Crayfish (*Procambarus gibbus*). This data will be presented at SDAFS in January 2015.
- **University of Georgia (Robert Bringolf Lab):**
  - Jace Nelson (MS, Warnell) is working on Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) & mussel interactions in the ACF and researching the mechanisms controlling host suitability for mussels.
  - Matt Urich (PhD toxicology) is working on a method to identify intersex fish non-lethally and better understand the prevalence and causative factors for intersex in the Upper Conasauga River. Collaborators include Cecil Jennings and Pete Lasier of USGS.
  - Adrian Parr (PhD toxicology) is also working on the Upper Conasauga project, focusing primarily on the effects of nitrate and estrogens on fish and mussel reproduction.
  - Elizabeth Hincker (MNR, Warnell) is working on developing educational programming materials for aquaponics systems for/with middle and high school teachers.
- **University of Georgia (Mary and Bud Freeman Lab):**
  - Shoal Basses (*Micropterus* spp.), Redhorses (*Moxostoma* spp.), rare fishes of the upper Coosa River system, and effects of flow alterations on stream fishes continued to occupy the Freemans and colleagues: Megan Hagler, Carrie Straight (now with US FWS), and Rachel Katz (now at U. Mass.).
  - Underway: research on trends in Little Tennessee River stream fishes (Ross Pringle, MS student, in collaboration with Dr. Bill McLarney), patterns of

fish assemblage change (Stephen Maurano, MS student, in collaboration with GDNR SST), and factors associated with loss of riverweed (*Podostemum ceratophyllum*; James Wood, PhD student).

- **University of Georgia (Gary Grossman Lab):** Congratulations to Gary Grossman for winning the AFS Sullivan award this year. (<http://news.uga.edu/releases/article/grossman-wins-national-fisheries-conservation-award-0814/>) Gary has a three year North Pacific Research Board grant to develop generalized foraging models for drift feeding fishes which will be tested in Chinook Salmon (*Oncorhynchus tshawytscha*), interior Dolly Varden (*Salvelinus malma*), and Artic Grayling (*Salvelinus alpinus*). Post-doc Jason Neuswanger, graduate student Erik Donofrio, and technician Travis Richards will be working on the project (<http://news.uga.edu/releases/article/Grossman-to-study-declining-chinook-salmon-in-alaska-1114/>). Gary is also evaluating the efficacy of original music videos on learning in his Natural History of Georgia class.
- **University of Georgia (Cecil Jennings Lab):**
  - Evaluating the distribution of fishes, shrimp, and crabs in three salinity-defined zones in the Savannah River Estuary as part of the Savannah Harbor Expansion Project.
  - Analyzing a 20-year data set of monthly gill-netting data collected during the Richard B. Russell pumped-storage project (1986 to 2009) to determine if a reduced level of sampling effort (25, 33, and 50%) can accurately characterize the fish assemblage.
  - Evaluating local-scale morphometric and water quality factors that influence the individual growth of Bluegill (*Lepomis macrochirus*) at six GADNR impoundments and determining the best model for predicting Bluegill growth based on identified characters.
  - Conducted a roving creel survey and vehicle intercept surveys at the Marben Public Fishing Are (PFA) in Mansfield, Georgia during 2013 to obtain fishery-dependent data from anglers, evaluate anglers' perceptions of fishing quality, and assess the possibility of implementing a passive effort-monitoring system in the multi-lake fishery.
- **Valdosta State University (Dave Bechler):** Dave Bechler and Josh Salter submitted a final report to GADNR on the status of the Blackbanded Sunfish (*Enneacanthus chaetodon*) in south Georgia. A total of 72 sites were examined with 61 of the sites sampled three to four times each. *Enneacanthus chaetodon* was found at one historic site and one new site.
- **Young Harris College (Johnathan G. Davis):**
  - Completion of report to GA DNR on monitoring Sicklefin Redhorse *Moxostoma sp.* in Georgia. Work will continue in 2015 as several undergraduates will work on senior theses related to this work.

- Two undergraduate students completed a habitat survey for *Cambarus parrishi* in the upper Hiwassee River watershed this fall and will present senior theses in spring 2015.
- Partnered with TVA to sort, catalog, and identify voucher specimens from TVA IBI monitoring in the Tennessee River watershed. Work is ongoing and is a great learning experience for undergraduates.

### **Kentucky:**

- **U.S. Fish and Wildlife Services, KY Ecological Services Field Office (KFO), (Michael Floyd):**
  - Palezone Shiner (*Notropis albizonatus*) 5-yr review was completed.
  - Conservation Strategy for the Kentucky Arrow Darter (*Etheostoma spilotum*) was completed; pdf copy available at [http://www.fws.gov/frankfort/pdf/KAD%20Conservation%20Strategy\\_Final%2005132014.pdf](http://www.fws.gov/frankfort/pdf/KAD%20Conservation%20Strategy_Final%2005132014.pdf).
  - Kentucky Arrow Darter Movement Study/Habitat Characterization in Elisha Creek and Gilberts Big Creek, Daniel Boone National Forest, Clay/Leslie Counties. Graduate research project of Jonathan Baxter at Eastern Kentucky University (EKU) under direction of Sherry Harrel. Funding provided by KDFWR (Section 6) and KFO. Research is ongoing.
  - Tuxedo Darter (*Etheostoma lemniscatum*) monitoring project in Big South Fork Cumberland River began in fall 2014. This work will continue in 2015.
  - Blackside Dace (*Chrosomus cumberlandensis*) 5-yr review will be completed in 2015.
  - Kentucky Arrow Darter proposed listing rule (Species and Critical Habitat) will be completed in 2015.
  - Blackside Dace surveys are ongoing in the coalfields region of TN (Campbell, Claiborne, and Scott Counties). This is a cooperative effort between the KFO and Cookeville, TN USFWS Ecological Services Field Office, Morehead State University (David Eisenhour), TN Wildlife Resources Agency, Office of Surface Mining and Reclamation, and TN Dept. of Environment and Conservation.
  - Monitoring of Blackside Dace is ongoing in Mill Branch, Knox County, following a stream restoration project completed in 2008. This is a cooperative effort between KSNPC, EKU, and KFO. Quantitative surveys were completed in March, July, and September at seven reaches. Monitoring will continue in 2015.

- A status assessment of Blackfin Sucker (*Thoburnia atripinnis*) will be completed in 2015 to determine if federal listing is warranted. This species was included in the 2010 listing petition from the Center for Biological Diversity.
- **Kentucky Dept. of Fish and Wildlife Resources (KDFWR), (Matt Thomas and Stephanie Brandt):**
  - Captive propagation and reintroduction of the Kentucky Arrow Darter (*Etheostoma spilotum*) were accomplished with CFI for the third year in Long Fork, a headwater stream in the upper Kentucky River drainage. Monthly mark-recapture surveys so far have confirmed the survival of released tagged individuals for periods exceeding two years, with an increasing trend in numbers of untagged (presumably wild-spawned) fish in 2013-2014. Reintroduction and monitoring efforts will continue in 2015.
  - Captive propagation and reintroduction of the Cumberland Darter (*Etheostoma susanae*) were accomplished with CFI for the sixth year in Cogur Fork, a small stream in the upper Cumberland River drainage. Mark-recapture surveys have confirmed the survival of released tagged individuals for periods exceeding one year and limited evidence of natural reproduction (19 untagged individuals since 2009, with 11 in 2014). Reintroduction and monitoring efforts will continue in 2015.
  - Alligator Gar (*Atractosteus spatula*) were stocked for the sixth year in portions of the species' native range in western KY. In August 2014, a total of 8,204 micro-wire tagged fish (average length 13 inches) were stocked in Clarks River, lower Ohio River floodplain lakes in Ballard and Barlow Bottoms Wildlife Management Areas, Obion Creek, lower Bayou du Chien, Mayfield Creek, and Mississippi River floodplain lakes in Doug Travis Wildlife Management Area. This project will continue in 2015.
  - Lake Sturgeon (*Acipenser fulvescens*) were stocked for the seventh year in the upper Cumberland River drainage below Cumberland Falls. In September and October 2014, a total of 5,730 fish were marked by removing the left dorso-lateral scutes 7-8 and released at the mouth of Laurel River and in the Big South Fork at Alum Ford. In December 2014 and January 2015, trotline sampling was conducted for the first time since the project began in 2007. Six lines were set for a three day period each month (checked twice per event) in the Cumberland River above and below the mouth of Laurel River, as well as the lower Laurel River. Each line was 250 ft. long with 50 hooks baited with nightcrawlers. A total of 54 sturgeon were captured (27 per sampling event). These fish ranged in size from 18-35 inches (1.5-11 lbs) and represented 4 year classes (2007, 2009, 2010, and 2011). All fish were captured in the impounded Cumberland River within 2 river miles downstream of the mouth of Laurel River.

- A fish survey of the Laurel River (upper Cumberland River) drainage was completed. Most of this watershed has been severely degraded by urbanization (cities of London and Corbin) and other land use activities, as well as impoundment (Laurel River Lake). Fish species diversity was low (37 total species) relative to other northern tributaries of the middle Cumberland River basin (e.g., Rockcastle River and Buck Creek). Previously existing populations of rare species including Blackside Dace (*Chrosomus cumberlandensis*), Flame Chub (*Hemitremia flammea*), and Olive Darter (*Percina squamata*) are now considered extirpated from the drainage. The Stripetail Darter (*Etheostoma kennicotti*) population in the Laurel River drainage appears to be a unique lineage in the upper Cumberland River (*Etheostoma kennicotti cumberlandicum*) group based on variation in genetic and morphological characters (Tom Near, pers. comm.). We found this species to be common throughout the Laurel River drainage.
- A second year of surveys was completed in the Green River for the Diamond Darter (*Crystallaria cincotta*) using combination of benthic trawling and nocturnal searches using spotlights and seines. Sampling in 2014 focused on sections of the river in Green County and in Mammoth Cave National Park in Edmonson County. No Diamond Darters were encountered, but new occurrences and updated distributional data were collected for other rare fishes, including Popeye Shiner (*Notropis ariommus*), Stargazing Minnow (*Phenacobius uranops*), Western Sand Darter (*Ammocrypta clara*), Spotted Darter (*Nothonotus maculatus*), Tippecanoe Darter (*N. tippecanoe*), and Longhead Darter (*Percina macrocephala*). Surveys will continue in 2015.
- A status survey of the Goldstripe Darter (*Etheostoma parvipinne*) was initiated in 2014. The species is known from only four locations in the lower Tennessee and Obion River drainages in western KY. Sampling at 18 locations in the Blood River drainage in spring 2014 found individuals at two previously documented locations (Sugar Creek and Billie Branch) and two new locations (Wildcat Creek and Beachy Creek). Surveys will continue in 2015 in Terrapin and Powell Creeks.
- **Kentucky State Nature Preserves Commission (KSNPC), (Michael Compton):**
  - Fish community monitoring following an extensive stream restoration project in Slabcamp Creek, Rowan County, is ongoing. Seasonal fish sampling was conducted in Slabcamp Creek (restored reaches) and White Pine Branch (non-restored reaches). Historically, Slabcamp Creek and White Pine Branch had stream channels that were disconnected from the floodplain and ground water table, because the streams were perched on bedrock at the foot of a hillside. Stream restoration efforts in Slabcamp

Creek redesigned the stream channel to approximate historical conditions and reconnected the stream to the floodplain and ground water table. Comparison of the fish assemblages indicated that Slabcamp Creek had a more diverse and stable assemblage than the fishes from White Pine Branch. The stability observed in the Slabcamp fish assemblage structure was attributed to the consistent and stable hydrology throughout the seasons, which was achieved following stream restoration efforts. This is a collaborative effort with KDFWR, U.S. Forest Service, KSNPC, University of Louisville, and EKU. Monitoring will continue in 2015.

- Fish surveys were completed in Laurel Fork within the recently designated Archer Benge Nature Preserve in Whitley County. Surveys resulted in the first occurrence of the federally endangered Cumberland Darter (*Etheostoma susanae*) in Laurel Fork in over 20 years. This was a collaborative effort with KSNPC and USFWS KFO. More surveys are scheduled in 2015.
- A survey of fishes and mussels was completed within the Western Kentucky Green River Bioreserve, Hart County. This survey focused in a section of river near the recently purchased Durham Knob tract. Over 30 species of mussels (live) and 55 species of fish were encountered. Numerous federal and state listed mussel species were encountered, such as the Spectaclecase (*Cumberlandia monodonta*) (16 specimens, multiple age classes), Fanshell (*Cyprogenia stegaria*), and Rabbitsfoot (*Quadrula c. cylindrica*). In addition, a fresh dead specimen of the federally endangered Ring Pink (*Obovaria retusa*) was found, suggesting that the species still persists within that section of river. Notable fishes were the Western Sand Darter (*Ammocrypta clara*), Stargazing Minnow (*Phenacobius uranops*), and Longhead Darter (*Percina macrocephala*). Lastly, the Bottlebrush Crayfish (*Barbicambarus cornutus*), a Green River endemic, was found to be abundant in several deep pools. This section of the Green River continues to maintain its rich biodiversity. This was a collaborative effort with KSNPC, KY Division of Water, USFWS (Asheville, NC and Frankfort, KY field offices), Morehead State University, and Western Kentucky University.
- **Morehead State University (David Eisenhour):**
  - A study of Frecklebelly Darter (*Percina stictogaster*) movements in the Red River Gorge has been completed.
  - A distribution and conservation status assessment of Trout-Perch (*Percopsis omiscomaycus*) has begun. In 2014 we surveyed streams in Lewis County. Fairly healthy populations appear to persist in Quicks Run and Salt Lick Creek, but we did not detect them in Cabin Creek nor Kinniconick Creek. We will expand our survey area into Tygart's Creek and Little Sandy River in 2015.

- **Murray State University (Timothy Spier and Michael Flinn labs):**
  - Tim Spier, previously at Western Illinois University, was hired as an assistant professor and fish ecologist at Murray State in 2014. He is currently teaching fisheries management and ichthyology, and plans to have an active graduate research program.
  - Tim is working with Mike Flinn, graduate student Ben Tumulo, and KDFWR to design studies for Asian carp management on Kentucky and Barkley Lakes, as well as an evaluation of structures for aging Asian carps.

### Missouri:

- **Missouri Department of Conservation (Bob Hrabik):**
  - Niangua Darter (*Etheostoma nianguae*) monitoring, PI – Doug Novinger: Ongoing monitoring of federally-listed threatened, Missouri-endemic Niangua Darter in five Osage River basin streams indicated that populations retained broad distributions within known range during 2011 to 2014. Occupancy probability was 0.71 in Little Niangua River, the watershed with the most robust population, and varied from 0.24 to 0.44 in the other watersheds. Each watershed has now been sampled during two time periods, once every other year using replicated snorkeling surveys in 50 to 75 sites. Exceptionally high frequencies of juvenile Niangua Darters were discovered during 2013 and 2014 in four of the five watersheds. Across the Niangua Darter's range, 18 low-water road crossings have been replaced to improve passage for aquatic organisms and materials including 12 of 32 crossings considered highest conservation priority. Ten crossings have been replaced in Little Niangua River watershed with the result that there are no longer any mainstem crossings that obstruct fish movement. Two crossings on tributaries remain to be addressed; one is scheduled for replacement within the next two years. In addition, four crossings in other watersheds inhabited by Niangua Darters are funded for replacement by 2017. Ongoing monitoring has shown that Niangua Darter populations and stream habitat have responded positively to the improved crossings. Proportions of occupied habitats and abundances of Niangua Darters have increased upstream of most crossings as the historical effects of impoundment and accumulated sediment diminish. Niangua Darter populations declined downstream of some crossings following replacement likely associated with the transfer of fine materials; however, evidence from monitoring suggests this is a short-term response.
  - *Fishes of Missouri* revision (3<sup>rd</sup> Edition), PI – Bob Hrabik: The book is progressing smoothly. Lance Merry is the photographer and all but 3 species have been photographed. Dave Neely is the illustrator and his work is in progress. All datasets have been acquired and nearly all have been

georeferenced including museum collections; new distributional maps have been generated and are under review. First draft of the manuscript is due in summer 2015.

- **University of Missouri (Corey Dunn and Craig Paukert):**
  - Mid-Sized River Bioassessment Protocol: Data collection has begun for the development of a standardized fish-community bioassessment protocol for mid-sized rivers of Missouri. Already in place for wadeable streams and the great rivers of Missouri, the aim of the project is to identify the appropriate sampling extent and most efficient combination of passive traps and three actively fished methods: boat electrofishing, trawling, and seining. In the first year of the four-year project, eight surveys were completed in six different mid-sized rivers throughout Missouri. Surveys collected over 25,000 individuals spanning 104 species and 14 families. Many of these individuals represent new distributional records in these sparsely sampled systems. Among these records, the most significant observations are listed below. Preliminary results indicate considerable overlap among the focal gears with seining and electrofishing detecting the greatest proportion of total species richness. However, other gears tended to add to the total species count by targeting species in difficult-to-sample habitats. In the future, we intend to sample a greater breadth of rivers across the state while examining the effects of physiographic province and season on results, and gaining a better understanding the function of mid-sized rivers to the greater fish community of Missouri.
    - Most significant preliminary observations:
      - Expansion of known range of Crystal Darter (*Crystallaria asprella*) in Meramec River – a species Endangered in Missouri.
      - Expansion of known range of Alabama shad (*Alosa alabamae*) in Meramec River. Additionally, the species was collected in Gasconade River in summer and late fall 2014. All individuals collected were likely age-0, and our records from October 24<sup>th</sup> represent the latest this species has been detected in Missouri before migrating to the Gulf of Mexico.
      - Additionally, surveys detected at least 11 Missouri Species of Conservation Concern and several large-river fauna that seasonally use mid-sized rivers for habitat including Skipjack Herring (*Alosa chrysochloris*), Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*), and Blue Sucker (*Cycleptus elongatus*).

**Mississippi:**

- **University of Southern Mississippi – Hattiesburg:**
  - **Jake Schaefer**
    - The University of Southern Mississippi Ichthyological Collection completed a move (the second move in 5 years!) into a new facility at the Lake Thoreau Environmental Center. The collection has grown to over 47,000 lots and is now housed on compact shelving with room for growth.
    - Jake Schaefer and David Duvernell are using next generation sequencing data to study population genomics and evolutionary ecology of the *Fundulus notatus* species complex.
    - Jared Harris completed his MS thesis on patterns of convergence in life history traits among *Fundulus* populations.
    - Scott Clark lead a team completing a two year survey of *Percina aurora* populations in the upper Pascagoula drainage. Scott is also finishing data collection on movement dynamics of species in the *Fundulus notatus* species complex.
    - Jon Barr, Nkrumah Frazier and Lauren Liddon continue surveys of coastal fish assemblages to assess potential impacts of the Deepwater Horizon spill.
    - Laura Stewart is working on a series of experiments (field and laboratory) aimed at understanding the role of thermal gradients in reproductive isolation of headwater (*Fundulus olivaceus*) and downstream (*F. notatus*) populations.
  - **Brian Kreiser**
    - Collaborating with David Buckmeier (Texas Parks and Wildlife Department) to develop molecular techniques for identifying young of the year gar.
    - In collaboration with Eric Brinkman (Arkansas Game and Fish Commission) the group is beginning a population genetic survey of alligator gar from Arkansas.
    - Stephen Flanagan has begun part of his doctoral research on *Fundulus olivaceus* and *F. euryzonus* in the Amite and Tangipahoa Rivers.
- **University of Southern Mississippi, Department of Coastal Sciences – Ocean Springs (Mark Peterson):**
  - Continuing collaborative efforts with Todd Slack (ERDC) on acoustic tracking of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) on Ship Island, Dog Keys Pass, and western Horn Island funded by USACE/MsCIP Mobile District.
  - Continuing monitoring activities for Gulf Sturgeon with Todd Slack (ERDC) related to the Gulfport Harbor Expansion project funded by HUD/Atkins Global, Inc.

- Continuing collaboration with University of New Orleans and Dauphin Island Sea Laboratory on five year BOEM project examining long-term data on white and brown shrimp and blue crabs pre- and post-Deepwater Horizon Oil Spill event.
- Publications
  - Alford, J.B., M.S. Peterson, and C. Green (eds.). 2014. Impacts of Oil Spill Disasters on Marine Habitats and Fisheries in North America. CRC Press, Boca Raton, Florida. 320p. ISBN-978-1-4665-5720-8.
  - Fogg, A.Q., N.J. Brown-Peterson, and M.S. Peterson. 2015. Northern Gulf of Mexico Lionfish: Insights into their reproductive life history. Proceedings of the Gulf and Caribbean Fisheries Institute (in press).
  - Bohórquez-Herrera, J., V.H. Cruz-Escalona, D.C. Adams, and M.S. Peterson. 2015. Feeding ecomorphology of seven demersal marine fish species in the Mexican Pacific Ocean. Environmental Biology of Fishes. (In press).
  - Ennis, B. and M.S. Peterson. 2015. Nekton and macro-crustacean habitat use of Mississippi micro-tidal saltmarsh landscapes. Estuaries and Coasts (doi:10.1007/s12237-014-9912-4).
  - Needles, L.A., S.E. Lester, R. Ambrose, A. Andren, M. Beyeler, M. Connor, J. Eckman, B. Costa-Pierce, S.D. Gaines, K. Lafferty, H. Lenihan, J. Parrish, M.S. Peterson, A. Scaroni, J. Weis, and D.E. Wendt. 2015. Managing bay and estuarine ecosystems for multiple services. Estuaries and Coasts (Invited dedicated Issue: *Human Dimensions of Our Coasts*). (doi:10.1007/s12237-013-9602-7).
  - Lowe, M.R. and M.S. Peterson. 2015. Relative condition and foraging patterns of nekton from salt marsh habitats arrayed along a gradient of urbanization. Estuaries and Coasts. (doi:10.1007/s12237-014-9865-7).
  - Grammer, P.O., P.F. Mickle, M.S. Peterson, J-M. Havrylkoff, W.T. Slack, and R.T. Leaf. 2014. Activity patterns of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in the staging area of the Pascagoula River during fall outmigration. Ecology of Freshwater Fish. (doi:10.1111/eff.12168).
  - Mickle, P.F., M.S. Peterson, J-M. Havrylkoff, and P.O. Grammer. 2014. Morphometric comparisons of the Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in western and eastern population extremes. Journal of Applied Ichthyology 30(6):1168-1173. (doi:10.1111/jai.12559).
  - Biber, P., W. Wu, M.S. Peterson, Z. Liu, and L. Pham. 2014. Chapter 7: Oil contamination in Mississippi saltmarsh habitats and the impacts to *Spartina alterniflora* photosynthesis, pp. 133-171. In: Alford, J.B., M.S. Peterson, C.C. Green (eds), Impacts of Oil Spill Disasters on Marine Habitats and Fisheries in North America. CRC Press, Boca Raton, Florida.

- Lowe, M.R. and M.S. Peterson. 2014. Effects of coastal urbanization on salt marsh faunal assemblages in the northern Gulf of Mexico. *Marine and Coastal Fisheries Dynamics, Management, and Ecosystem Science* [online serial] 6(1):89-107. (doi:10.1080/19425120.2014.893467).
- Ennis, B., M.S. Peterson, and T.P. Strange. 2014. Modeling of inundation characteristics of a microtidal salt marsh, Grand Bay National Research Reserve, Mississippi. *Journal of Coastal Research* 30(3):635-646. (doi: 10.2112/JCOASTRES-D-13-00041.1).
- Clardy, S.D, N.J. Brown-Peterson, M.S. Peterson, and R.T. Leaf. 2014. Age, growth, and reproduction of Southern Kingfish, *Menticirrhus americanus*: A multivariate comparison of life history in other sciaenids. *Fishery Bulletin* 112(2-3):178-197. (doi:10.7755/FB.112.2-3.6).
- Fulford, R.S., M.S. Peterson, W. Wu, and P.O. Grammer. 2014. An ecological model of the habitat mosaic in estuarine nursery areas: Part II - Projecting effects of sea-level rise on fish production. *Ecological Modeling* 273:96-108.
- **US Forest Service, Southern Research Station – Oxford (Susie Adams):**
  - Adams and Mel Warren continue to operate a network of about 60 stream temperature recorders across the range of the Yazoo Darter (*Etheostoma raneyi*). The temperature data will be used to better understand the relationship of water temperature, groundwater, and Yazoo Darter summer densities.
  - In collaboration with Weyerhaeuser, Inc., Adams continues to analyze the relationship between densities of the crayfish, *Hobbseus yalobushensis*, other crayfishes and fishes. *Hobbseus yalobushensis* is endemic to central Mississippi and occurs at highest densities in tiny, intermittent streams. The presence of predatory fishes appears to nearly preclude presence of crayfish.
  - Warren continues biannual field sampling for fishes in and around the Delta National Forest with emphasis on permanent and temporarily inundated habitats.
  - Warren with Ken Sterling, Andrew Brown, and Brice Noonan (University of Mississippi) continues work on genetics, microhabitat, and status of the Yazoo Darter in the Yocona and Little Tallahatchie rivers, MS.
  - Warren, with Brooks Burr, is editing volumes II and III of **Freshwater Fishes of North America**.

- **Mississippi Museum of Natural Science – Jackson (Matt Roberts):**
  - Roberts stepped up from MMNS Curator of Fishes to become MMNS Research and Collections Coordinator (i.e., became Curator of the Curators).
  - Field activities in 2014 were limited because of the transition between positions, but sampling efforts were focused on surveying for fishes at data-poor localities in Western Mississippi, especially streams located on Anderson-Tully (timber company) lands.
  - Drafting for publication an analysis of Noxubee River fish assemblages before and after construction of the Tennessee-Tombigbee Waterway.
  - Spent the last months of 2014 recruiting new MMNS Curator of Fishes with hopes to hire in January or February 2015.
  - Goals as MMNS Research and Collections Coordinator include making MMNS technical reports available online, increasing access to database records and regional expansion of all MMNS biological collections
- **Mississippi Department of Wildlife, Fisheries and Parks, Fisheries Bureau – Jackson (Larry Bull):**
  - Induced reproductive maturation and fall spawning in crappie (*Pomoxis* spp.), PIs: Charlie M. Culpepper III and Peter J. Allen, Mississippi State University. Conducted cryopreservation experiments on White Crappie (*P. annularis*) to determine optimal techniques for preserving sperm. Results indicate that Hank's buffering solution, with 5%-methanol, 5%-dimethyl-sulfoxide or 10%-methanol as the cryoprotection agent, frozen at 40°C/minute is the best method for cryopreserving White Crappie sperm. In order to develop crappie reproduction methods in tank aquaculture systems, we evaluated the viability of three commonly utilized spawning induction hormones (LHRHa, HCG and GnRH<sub>a</sub>), to induce gonadal maturation and spawning in White Crappie. Results indicate that crappie can be held and spawned in tank systems, and that GnRH<sub>a</sub> is the preferred spawning hormone to induce spawning.
  - Lower Mississippi River Sturgeon Assessment Study, PIs: Nathan Aycock and Jerry Brown, MDWFP. Crews continued sturgeon sampling in the Lower Mississippi River from December 2013 through April 2014 in collaboration with the USFWS and Mississippi State University. A total of 128 trotlines were fished at Catfish Point and 859 fish were collected. Eight fish species were collected, including; 600 Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*) [most abundant, 70% of total catch] and 28 Pallid Sturgeon (*Scaphirhynchus albus*) [third most abundant, 3% of total catch]. A total of 17 sturgeon were implanted with sonic tags in 2013-2014 including 16 Pallid Sturgeon and one Shovelnose Sturgeon.

- Flathead Catfish (*Pylodictis olivaris*) population characteristics in Aberdeen, Columbus, and Aliceville lakes of the Tennessee-Tombigbee Waterway, MS, PI: Tyler Stubbs, MDWFP. Populations were sampled in three northeastern Mississippi reservoirs along the Tennessee-Tombigbee Waterway to evaluate stock characteristics as part of a statewide effort to document current population status in reservoirs and to develop management goals. Sampling was conducted July-August during 2011-2013 using low-frequency electrofishing. Relative abundance (fish km<sup>-1</sup>) was higher in Aliceville Lake (12.56 fish km<sup>-1</sup>) than in Aberdeen Lake (7.54 fish km<sup>-1</sup>) or Columbus Lake (7.37 fish km<sup>-1</sup>), but length-frequency distributions, growth and annual mortality rates, and recruitment variation of Flathead Catfish were similar among reservoirs. This is in contrast to downstream gradients of fish population metrics typically observed in river ecosystems, which could be due to habitat homogenization resulting from navigation-related anthropogenic activities.
- Crappie Sampling on Ross Barnett Reservoir, MS, PI: Ryan Jones, MDWFP. Efforts were conducted to determine if a mid-water trawl can be used to adequately predict year class strength of White Crappie in Ross Barnett Reservoir. In conjunction with the trawl sampling, angler harvested White Crappie are being aged by collecting otoliths from carcasses collected from area campgrounds. Final efforts are to determine if significant correlations exist between trawl catch rates or the percentage of sites with YOY crappie present and angler catch rates (harvested fish only) of the same year class at ages 2, 3 and 4.
- Exploitation of crappie in Lake Washington, MS, PI: Darrin Hardesty, MDWFP. Angler exploitation of crappie is being determined in Lake Washington. Four hundred crappie were tagged with Floy t-bar tags and 65 (22%) tagged fish were recaptured by anglers during the first six months.
- Sunflower River Flathead Catfish Assessment, PI: Nathan Aycock, MDWFP. Low-frequency electrofishing was used to assess Flathead Catfish populations in the Sunflower River (e.g., abundance, size structure, and growth rates). Total length ranged from 60 mm to 913 mm and the CPUE for fish greater than or equal to stock-size was 6 fish/mile. Length at age varied widely for fish greater than stock size. Mean age at stock length (350 mm) was 2.5 years, and mean age at quality length (510 mm) was 4.6 years. Age at stock and quality lengths were almost identical to those found on the Yazoo River in 2013 (MDWFP 2013). Annual mortality was estimated to be 29% (95% CI = 26% - 32%) using the Robson and Chapman's method and 32% from a catch curve analysis.

- **US Army Engineer Research and Development Center (ERDC), Fish Ecology Team-Vicksburg (Jack Killgore, Jan Hoover and Todd Slack):**
  - Laboratory studies were conducted on passage of Sea Lamprey (*Petromyzon marinus*) through conduits of different metals and on swimming performance of juvenile Atlantic Sturgeon (*Acipenser oxyrinchus*) after exposure to sediments.
  - Telemetry studies are being conducted on Pallid Sturgeon and Shovelnose Sturgeon in the Mississippi River and Buffalo (*Ictiobus* spp.) in Mississippi Delta streams to determine their passage over water control structures – i.e., the Old River Control Structure at the Atchafalaya River and in-stream weirs, respectively.
  - Collaborative efforts with Mark Peterson (USM) continue with several Gulf Sturgeon telemetry based projects focused on the Pearl River, Pascagoula River, Mississippi Sound nearshore habitats and the Gulf Island National Seashore barrier islands.
  - Functional morphology studies were conducted on the rostrum of the Paddlefish (*Polyodon spathula*): gross tissue composition, strength and hydrodynamic properties, and size correlation with swimming performance in juveniles. In addition, ERDC collaborated with Bryan Cage and Glenn Parsons, University of Mississippi, on field assessments of swimming performance and metabolic rates of adult Paddlefish at Moon Lake, MS.
  - Two decades of Grass Carp (*Ctenopharyngodon idella*) age-and-growth studies were concluded in southeastern reservoirs.
  - Ongoing field and laboratory studies of Asian carp include: 1) a rangewide assessment of age-and-growth patterns of Silver Carp (*Hypophthalmichthys molitrix*) in the free-flowing Mississippi River; 2) field monitoring of populations in the lower Mississippi River; 3) field tests of swimming performance, in collaboration with the University of Minnesota. The Fish Ecology Team continues its collaboration with Mike Holliman, Fish Research and Development LLC, conducting on-sight experiments to refine operation of the Chicago Area Waterways System electrical barrier that prevents carp passage from the Mississippi River into the Great Lakes.
  - Population studies continue of Shovelnose and Pallid sturgeon in the free-flowing Mississippi River sturgeon – now in their 15<sup>th</sup> year. In addition, Audrey Harrison-Lewis completed a study of diets of juvenile river sturgeon. A conservation plan for Pallid Sturgeon, Least Tern, and Fat

Pocketbook mussel populations within the Lower Mississippi River, developed in collaboration with the United States Fish and Wildlife Agency, was completed and available on-line:

<http://acwc.sdp.sirsi.net/client/search/asset/1040663>

- Field studies of potamology in the lower Mississippi River started this year with surveys of fishes and mussels in habiting floodplain habitats of varying connectivity and submerged sandbars used as borrow areas by sand miners. Traditional fish sampling techniques (seining, trawling, light traps) are being supplemented by hydrographic/hydrologic modeling and by aerial surveys using drones.
- On-going sampling of delta streams in the Lower Mississippi River valley is providing long-term assessment of impacts of flood control and agricultural development on the biotic integrity of river and streams, and the information is being used a template for restoration of environmental flows, re-creation of riparian buffers, and justification for sediment management.

### **North Carolina:**

- **Cape Fear Shiner Augmentation Project (Brena Jones, NCWRC and Sarah McRae, US F&WS):** Augmentation of the federally endangered Cape Fear Shiner (*Notropis mekistocholas*) population in the Rocky River above the Woody's Mills Hydropower Dam continued in this area which is currently designated Critical Habitat by the US Fish & Wildlife Service. In 2013, 194 (two groups of 97, one in spring and one in fall) Cape Fear Shiners were collected in Chatham County and translocated to a release site just below the Pittsboro-Goldston Road crossing of the Rocky River. In 2014, this effort was repeated, translocating another 192 individuals to the release site in both spring and fall. A proportion of these fish were fin-clipped for later genetic analysis and then all individuals were released to spawn. Prior to each release, surveys were conducted to determine if the shiners were surviving in the translocation area. Several individuals were caught with each survey. Monitoring of these translocation efforts was also conducted approximately one month after each release and several individuals were recaptured and fin-clipped. Initial efforts appear to have been successful, but ultimate success will not be known until there is a self-sustaining population with demonstrated reproduction and increases in numbers over time.
- **Magnificent and Greenfield Ramshorn Captive Propagation Project (Brena Jones, NCWRC):** NC Wildlife Resources Commission (NCWRC) continues to collaborate both internally and with North Carolina State University and a Pender County landowner to sustain multiple captive

- populations of the state endangered Magnificent Ramshorn (*Planorbella magnifica*) and the state endangered Greenfield Ramshorn (*Helisoma eucosmium*). These freshwater snail species are endemic to the southeastern corner of North Carolina's coastal plain, but are now suspected to be extirpated from the wild. Snails were originally propagated by the private landowner from wild-caught animals. Currently, the Magnificent Ramshorn population at the NCWRC Watha Fish Hatchery has expanded into two large pond tanks and plans are underway to expand this portion of the facility to include capacity for Greensfield Ramshorn and additional predator exclusion.
- **Carolina Pygmy Sunfish Surveys (Brena Jones, NCWRC):** A North Carolina status survey for the Carolina Pygmy Sunfish (*Elassoma boehlkei*), began in the fall of 2014. This species is under review by the US Fish & Wildlife Service, along with 403 other species, as a result of a legal settlement with the Center for Biological Diversity. There are few collection localities where the Carolina Pygmy Sunfish has been captured within the last ten years; the most recent records are from three localities surveyed by the NCWRC in 2004 and repeated collections at the SR 1928 and SR 1340 Juniper Creek crossing areas in the late 1990's, 2009, and 2013. Prior to that, specimens held by the North Carolina Museum of Natural Sciences date from 1961 to 1986. Of 19 sampling efforts to date, the species has been found at four localities. This project will continue in 2015, incorporating extensive sampling effort.
  - **Ironcolor Shiner Surveys (Brena Jones, NCWRC):** Three years of sampling for the Ironcolor Shiner (*Notropis chalybaeus*), suggests that this species has suffered a dramatic decline in NC. From 2010 to 2013, 110 sites in the lower Cape Fear, Lumber, and White Oak basins were sampled and only three stream reaches yielded Ironcolor Shiners. In 2010, this consisted of one site in Lumber River State Park near Wagram, NC, and one upper end of the White Oak River. No individuals were captured in 2011 or 2012, but a small number of individuals were collected from an additional site in the upper section of the New River, in the White Oak basin. However, a new population of Ironcolor Shiner was discovered in the Roanoke River basin in 2014 during crayfish surveys by Tyler Black (NCWRC).
  - **Crayfish Surveys (Tyler Black, NCWRC):** Surveys for the Chowanoke Crayfish (*Orconectes virginienensis*), a state Species of Concern, were completed this year; a report will be forthcoming Fall 2014 or Winter 2015.
  - **Bridle Shiner (Tyler Black, NCWRC):** Tyler Black and Rob Nichols have begun a distribution project for the state endangered Bridle Shiner (*Notropis bifrenatus*). Bridle Shiner have been collected from 2 of 3 historically inhabited waterways in the lower Neuse River Basin and have expanded their known distribution in North Carolina. Prior to the current surveys, the most recent observation of Bridle Shiner in the Neuse River basin was from 2001

(at one locality on Bachelor Creek) and the other two records were from the 1960s. Surveys were primarily focused on historic localities, but we hope to expand our surveys in 2015. In addition, we hope to continue efforts to identify additional populations in the Chowan River basin.

- **Flathead Catfish in Lake Waccamaw (Ryan Heise, NCWRC):** Wildlife Commission staff, with the assistance of N.C. State Park personnel, collected a large Flathead Catfish (*Pylodictis olivaris*) in Lake Waccamaw, a unique Carolina Bay Lake located in Columbus County that supports 14 species of rare fish and mollusks. This is the first official record of this invasive, non-native species in the lake. This finding adds to the list of invasive species that are already in Lake Waccamaw, including *Hydrilla* and *Lyngbya*, a black mat algae. Efforts are underway to treat the *Hydrilla* and options for the treatment of *Lyngbya* are being discussed. Outreach programs are underway at Lake Waccamaw State Park to inform the public about the dangers of invasive species and informational signs have been posted at the boat ramps.
- ***Hydrilla* Control Efforts at Lake Waccamaw (Sarah McRae, US F&WS and Ryan Heise, NCWRC):** Two treatments with granular herbicide (Fluoridone) were done in 2013, and three treatments have been completed in 2014. With considerable interest in the *Hydrilla* situation, efforts have been made to provide outreach materials and to find new funding opportunities to pay for the herbicides and its applications.
- **Robust Redhorse (Ryan Heise, NCWRC):** NCWRC staff collected 19 Robust Redhorse (*Moxostoma robustum*), a state endangered species, from the Pee Dee River this spring. This number was three individuals shy of the record of 22 set in 2008. This is a collaborative sampling effort with the Robust Redhorse Conservation Committee. Staff continued to collect a few younger individuals this spring and four of the six smaller fish were previously untagged. The improvement in recruitment, although small, suggests that the increases in minimum flows from Blewett Falls Dam are having positive effects on the population of Robust Redhorse. In addition, the NCWRC has begun a long-term augmentation program for this very small population of Robust Redhorse downstream of Blewett Falls Dam. Staff spawned three females this year, which far exceeded expectations. The fertilized eggs were brought to NCWRC and SC Department of Natural Resources hatcheries for rearing. Both hatcheries had excellent hatching rates and the fish currently are being grown in outdoor ponds. Staff plans to stock these fish downstream of Blewett Falls Dam at the Hitchcock Creek and Jones Creek shoals in October 2014.

- **Spotfin Chub (Steve Fraley and Thomas Russ, NCWRC):**
  - Efforts to restore Spotfin Chub (*Erimonax monachus*) to the Cheoah River in far western North Carolina are showing signs of success. Adults of multiple year classes were observed in appropriate habitat throughout four river miles at densities comparable to the source population in the Little Tennessee River. Since 2009, Spotfin Chubs, both captively propagated and translocated wild adults, have been released in the Cheoah River as part of overall restoration efforts there following habitat improvements resulting from FERC relicense agreements. Timed visual assessment surveys in 2014 found densities of adults up to 30 fish observed per person hour of search. Subadults were observed, but at lower densities than observed in the source population. Releases are planned to continue at least through 2016 when progress will be reassessed for overall success.
  - This year (2014) marked the eighth year in our effort to assess the Spotfin Chub population in the upper Little Tennessee River over a 10 year period. The monitoring protocol was designed to meet criteria defined in the species Recovery Plan (US F&WS 1983). Goals are: 1) assess spatial and temporal distribution and abundance over a 10 year period; 2) provide information to guide management decisions, recovery efforts, and further research; and 3) provide any additional life history and habitat use information as observed. Ten sites were selected within the 37 km occupied reach. Visual surveys (mask and snorkel) along fixed transects and timed, random searches were conducted at each site. In 2007, the lowest population level was observed with 2.7 total chubs (adults and sub-adults combined) per 50 m transect (transect) and 5.8 chubs per hour of random search (hour). Since 2007 the population has increased but fluctuated with high levels of sub-adults in 2010 (9.8 per transect and 38.0 per hour). The same cohort translated into the highest adult observations in 2011 (10.0 per transect and 36.2 per hour). In 2012 and 2013, the population trended downward, continuing in 2014, when number of adult observations was the lowest in eight years (1.1 per transect and 2.6 per hour). However, sub-adults were consistent with several years' past observations (2.4 per transect and 8.6 per hour). Major flow events and trends appear to correlate with variations in recruitment.
- **Sicklefin Redhorse (Mike LaVoie, Eastern Band of the Cherokee Indians):**
  - Staff with the Eastern Band of the Cherokee (EBCI) continued the joint Sicklefin Redhorse (*Moxostoma* sp. cf. *carinatum*) Restoration Project with staff from the North Carolina Wildlife Resources Commission, Conservation Fishes, Inc., and U.S. Fish & Wildlife Service. The Sicklefin Redhorse is a state threatened species in North Carolina. Wild brood stock were collected, striped of eggs and milt, and propagated the fertile eggs.

Hatchery-raised juveniles were re-introduced into back into their historical range in the Little Tennessee River basin.

- The EBCI also undertook a telemetry project in collaboration with staff from UNC-Asheville, US F&WS, and NCWRC. Juvenile and adult Sicklefin Redhorse were surgically implanted with transmitters and translocated to the upper Oconaluftee River on tribal lands. Juvenile fish suffered high mortality, but the adult fish are now being tracked throughout the next year to better understand movement, habitat use, and reproductive ecology.
- **Mollusk Reintroduction Projects (Sarah McRae, US F&WS):** Chris Eads at North Carolina State University has been working on growing the state threatened Eastern Lampmussel (*Lampsilis radiata*) and the state endangered Yellow Lampmussel (*Lampsilis cariosa*) in a captive setting. Propagated mussels have been augmented back into the Eno River where broodstock were taken. The effort was initiated in 2006-2007, and additional effort has been made this year (2014). Several individuals that were stocked in 2007 were relocated in 2014 and showed impressive growth.
- **Aquatic Nuisance Species Management Plan (Sarah McRae, US F&WS):** With the ever-expanding list of nonindigenous species discovered in North Carolina, staff with the North Carolina Department of Environment & Natural Resources has begun an effort to develop a management plan for the state. The target date for completing the plan is Fall 2015.
- **Roanoke Logperch in North Carolina (Sarah McRae, US F&WS):** In April 2014, the US F&WS convened a group of agency, university, and private biologists who have detailed knowledge of Roanoke Logperch (*Percina rex*) biology and ecology to examine restoration opportunities in the Dan River for this federally endangered species. The group generated several restoration opportunities with the aim of promoting the species recovery. Subsequent meetings with NCWRC and US F&WS staff selected expansion/restoration efforts as the top priority, including restoration projects in the Mayo River upstream of the towns of Mayodan and Madison, the Dan River near the town of Danbury, and augmentation projects in Cascade and Wolf Island creeks. Other options for restoration include habitat improvement projects that will protect and restore in-stream habitats for Roanoke Logperch and other aquatic species in the Dan River watershed.
- **Species Augmentations (Sarah McRae, US F&WS):** In August 2014, the NCWRC's Habitat, Nongame & Endangered Species Committee authorized NCWRC staff to implement augmentations for the state endangered Robust Redhorse and the federally endangered Tar River Spinymussel (*Elliptio steinstansana*), Appalachian Elktoe (*Alasmidonta raveneliana*), and Carolina Heelsplitter (*Lasmigona decorata*).

- **American Eel Passage (Fritz Rohde, NOAA):** American Eels (*Anguilla rostrata*) were historically largely eliminated from the upper Roanoke River Basin due to flood control and hydropower dam construction, consequently reducing upstream native fish diversity as well as eel production. As part of the Federal Energy Regulatory Commission relicensing process with Dominion/North Carolina Power, the National Marine Fisheries Service issued a Section 18 fishway prescription requiring safe, timely and effective passage be provided for eels reaching the Dominion dams. We sampled eels in the river's bypassed reach and in the tailrace below Roanoke Rapids Dam from 2005 – 2008 to assess the abundance and distribution of eels below the dam. Large collections in conventional elver traps within the bypassed reach documented seasonal and horizontal distribution patterns and led to construction of high-capacity eelways at the north and south ends of the bypassed reach in 2009-2010. Over a million eels have been passed upstream during 2010-2012 (range of 321,991 to 369,632 per year). In 2013 an estimated 750,698 passed.
- **Redbreast Sunfish (*Lepomis auritus*) Removal from Richland Creek, Haywood County (Thomas Martin, Western Carolina University):** Two of Tom's graduate students (Miranda Aiken and Rachael Woods) successfully defended their master's theses in Fall 2014. Miranda's thesis centered on the question of whether selective electrofishing and removal could produce local depression of Redbreast Sunfish numbers, and Rachael's thesis centered on a description of the fish removed from Richland Creek during Miranda's removal experiment. Miranda found that monthly electrofishing could produce statistically significantly fewer Redbreast Sunfish in local (100 m) reaches of Richland Creek, but that any differences disappeared shortly after cessation of removals. Rachael found that the fish removed were overwhelmingly small, mostly juvenile (0+ and 1+) fish (only one 3+), and as expected their diets were broad and would overlap broadly with small Rock Bass (*Ambloplites rupestris*). Only three Rock Bass were seen during the study, and those were seen at the upstream most site (Waynesville Recreation Park). Our conclusion is that selective removal to control Redbreast Sunfish numbers is possible, but given the characteristics of the population, Lake Junaluska is likely serving as a constant source for new colonists and control of the Redbreast Sunfish population in the reservoir would be needed to have any lasting effect on the lower Richland Creek fish community.
- **Effects of Land Use on New River Basin Biota and Habitats (Michael M. Gangloff, Appalachian State University):** The goal of this project is to investigate the effects of changes in land use on New River fishes and their habitat in North Carolina. The sites range in size from headwater streams in Watauga County to the main stem of the New River in Ashe County. We

targeted sites with historical fish collection records. In 2014 we sampled fishes at 27 sites in the drainage. We sampled 8,017 fishes and identified 33 species including six endemic taxa and 13 introduced species. Not surprisingly, introduced trout dominated headwater streams whereas native and introduced cyprinids and centrarchids dominated main stem sites and lower-elevation tributaries in Ashe County. Endemic taxa, with the exception of *Nocomis platyrhynchus* and *Etheostoma kanawhae*, were uncommon. Analysis of the influence of habitat parameters is ongoing. Additionally, we vouchered tissue samples from numerous endemic and putatively introduced taxa and are happy to provide material for genetic studies.

- **New DWR Distributional Records for 2013 (Bryn H. Tracy, NCDWR):** (i.e., those not shown in Menhinick (1991) and collected for the first time by DWR staff from a particular county in the New River systems): White Catfish (*Ameiurus catus*), Obids Creek, tributary to South Fork New River, Ashe County, one specimen, 169 mm TL, first collection ever from the system, non-indigenous; and Margined Madtom (*Noturus insignis*), Crab Creek, tributary to the Little River, Alleghany County, three specimens, 84-110 mm TL, first collection ever from the system, non-indigenous. These four specimens were vouchered at the North Carolina State Museum of Natural Sciences, along with other nonindigenous species once again collected from the New River basin in 2013, including; Mountain Redbelly Dace (*Chrosomus oreas*), Whitetail Shiner (*Cyprinella galactura*), Highback Chub (*Hybopsis hypsinotus*), Warpaint Shiner (*Luxilus coccogenis*), Redlip Shiner (*Notropis chiliticus*), Saffron Shiner (*Notropis rubricroceus*), Tennessee Shiner (*Notropis leuciodus*), Brown Bullhead (*Ameiurus nebulosus*), Pumpkinseed Sunfish (*Lepomis gibbosus*), and Tessellated Darter (*Etheostoma olmstedti*). All of DWR's fish community data documenting the distribution of non-indigenous species since 1990 was uploaded on to the USGS's Nonindigenous Aquatic Species database in early 2014 (<http://nas.er.usgs.gov/taxgroup/fish/default.aspx>).
- **The Richland Creek Re-Introduction Project (Bryn H. Tracy, NC DWR):** The Richland Creek Re-Introduction Project in Haywood County completed its fifth year of fieldwork. Since April 2010, almost 25,000 fish of 11 species have been collected from nearby source populations and reintroduced at multiple sites in Richland Creek across the City of Waynesville. The creek is on the state's impaired streams list (the 303(d) list) due to historic and long-term poor water quality, hydrologic modifications, and habitat degradation. This innovative project (i.e., removing a stream from the §303 (d) list and restoring the biological integrity of the stream by re-introducing indigenous species, long absent from the watershed) is a cooperative effort among the NC DWR, North Carolina Wildlife Resources Commission, Haywood Waterways

Association, the University of Tennessee-Knoxville, and Evergreen Packaging. The project is patterned after the successful and on-going bi-state Pigeon River Re-introduction Project led by UT-Knoxville and NCWRC. The low-cost project essentially has involved the collection, transport and release of fish of several species upstream from Lake Junaluska during Spring and Fall in the hopes of establishing self-sustaining populations. In Summer 2012, biological monitoring determined that the fish community had already improved from Fair to Good-Fair which should trigger the stream's removal from the 2015 list. Follow-up monitoring is planned in 2017. As of Fall 2014, at least six introduced species are believed to be sustaining themselves in lower Richland Creek, upstream from Lake Junaluska: Warpaint Shiner, River Chub (*Nocomis micropogon*), Mottled Sculpin (*Uranidea bairdi*), Fantail Darter (*Etheostoma flabellare*), Greenside Darter (*Etheostoma blennioides*), and Tuckasegee Darter (*Etheostoma gutselli*). Without human intervention re-introducing and re-locating critical species such as these six species, plus Saffron Shiner, Mirror Shiner (*Notropis spectrunculus*), Tennessee Shiner, Telescope Shiner (*Notropis telescopus*), and Rock Bass (*Ambloplites rupestris*), the stream would remain on the §303 (d) list despite continuing water quality improvements in the watershed. Ultimately, the key to the project's long-term success will be for the partners to keep preaching clean water and storm water runoff management so that water quality and biological integrity continue to improve throughout the Richland Creek watershed.

• **Publications:**

- Raabe, J.K. and J.E. Hightower. 2014. Assessing distribution of migratory fishes and connectivity following complete and partial dam removals in a North Carolina River. *North American Journal of Fisheries Management*. 34:955–969.
- Midway, S.R., T. Wagner, and B.H. Tracy. 2014. A hierarchical community occurrence model for North Carolina stream fish. *Transactions of the American Fisheries Society* 143:1348–1357.

**Tennessee:**

• **Conservation Fisheries, Inc. (Patrick Rakes):**

- Conservation Fisheries, Inc. (CFI) continues to propagate, stock, and monitor Smoky Madtoms (*Noturus baileyi*), Yellowfin Madtoms (*Noturus flavipinnis*), Citico Darters (*Etheostoma sitikuense*), and Spotfin Chubs (*Erimonax monachus*) in Tellico River with evidence of reproduction and good numbers of Smokies & Citico Darters, though no Yellowfins were observed. Spotfin Chubs were observed at several sites, and for a second year observed at Oosterneck Creek, approximately two river miles above the nearest release site. Sampling effort this year (and consequently number of

fish observed per unit effort) was decreased from prior years due to implementing a new long-term monitoring protocol in Citico Creek similar to the Abrams Creek protocol with plans for expansion in Tellico River in order to eventually compare all populations more quantitatively.

Quantitative monitoring of restored Citico Darter and Smoky and Yellowfin madtom populations in Abrams Creek was continued a third year by Great Smoky Mountains National Park. Results will be compiled and compared to the first and second years as well as data from similar application of the protocol at six sites in Citico Creek this year. The data collected will provide baseline information and quantify long-term population trends and reproductive success, providing a model for similar future monitoring in Tellico River, and possibly elsewhere.

- Efforts to propagate and restore Emory River Spotfin Chubs and Elk River Boulder Darters (*Nothonotus wapiti*) to Shoal Creek continue. A record number of young Boulder Darters were produced at CFI this year (~2000 young) with many already tagged and stocked at new upstream sites above Factory Branch. Monitoring in Shoal Creek detected only one Spotfin Chub, but 13 Boulder Darters were observed at three sites, including 9 wild-spawned individuals, one at a site never stocked. In the Elk River during collection of 12 broodstock an incredible 39 Boulder Darters were captured at Harms Mill on March 24, surely a record number for the species in a single effort/locality!
- Following up on last year's Conasauga River float and snorkel surveys for *Percina jenkinsi* above the US 411 Bridge was a float this year below the bridge. Although 10 of the logperch were observed at the first site downstream, only Mobile Logperch were detected at any other sites downstream (contrary to surveys in spring 2012).
- A new project was initiated as a part of the Corps of Engineers agreed-upon Capture and Hold conservation measures described in the Final Biological Opinion on the Wolf Creek Dam/Lake Cumberland Return to Historical Pool Level Operations, Russell County, Kentucky. It involves holding, propagation, and long term maintenance of an ark/refugium population of Tuxedo Darters (*Etheostoma lemniscatum*) collected at the sites determined to be impacted by the return to historical operations of Lake Cumberland. CFI collected broodstock during concurrent (and separately funded) efforts to monitor local populations and capture fish for acquisition of tissue samples (fin clips) for a study of genetic diversity in the species throughout its range in the Big South Fork Cumberland River. Only 30 specimens taken from the lowest portions of the river impacted by Lake Cumberland lake level operations were retained as broodstock for the captive population at CFI. This effort is intended to ensure that some genetic diversity of the

impacted Tuxedo Darter populations will be conserved and will provide the necessary genetic stock to repopulate the Big South Fork in the event of loss of those populations. In addition, it also has the potential to increase the distribution of the species within the Big South Fork and/or other suitable streams by providing individuals that could be used in reintroduction and population augmentation efforts to further the species' recovery.

- In another new project CFI has developed captive propagation methods for the Bluemask Darter (*Etheostoma akatulo*) and produced a small number of young. The USFWS recently determined that a proposed Bluemask Darter reintroduction is appropriate and a necessary step in achieving recovery of the species, and would fulfill two Bluemask Darter Recovery Plan objectives. Efforts to reintroduce Bluemask Darter could increase the total amount of habitat occupied by the species, thereby reducing the risk of extinction and loss of genetic diversity. Funding was provided by USFWS, TWRA, and TVA. In conjunction with propagation efforts, snorkel field observations successfully recorded Bluemask Darters spawning in the Collins River on April 24: spawning video <http://vimeo.com/92931171>.
- Hatchery spawning and rearing included the following additional species/populations in 2014: Tangerine Darter (*Percina aurantiaca*), Marbled Darter (*Etheostoma marmorpinnum*, Barrens Topminnow (*Fundulus julisia*), Ashy Darter (*Etheostoma cinereum*), Slackwater Darters (*Etheostoma boschungii*), Spring Pygmy Sunfish (*Elassoma alabamiae*), Kentucky Arrow Darter (*Etheostoma spilotum*), Cumberland Darter (*Etheostoma susanae*), and Diamond Darters (*Crystallaria cincotta*)[again unsuccessful]. CFI will attempt to further refine already-developed captive propagation techniques for the production and collection of Diamond Darter eggs and larvae, but utilize the closely related Crystal Darter (*Crystallaria asprella*) as a surrogate to avoid collection of any additional Diamond Darters until success with the surrogate species is obtained. CFI hopes to determine larval microhabitat conditions and prey item(s) necessary for survivorship and development; in particular, by utilizing larvae of sand darters (*Ammocrypta* spp.).
- Additional field observations of note included another five Ashy Darters in the Little River (3 captured for broodstock), as well as numerous Sickle Darters (*Percina williamsi*) and wild-spawned Marbled Darters at a newly established upstream locality.
- Website info: [www.conservationfisheries.org](http://www.conservationfisheries.org) & <http://www.facebook.com/pages/Conservation-Fisheries/377299094501>

- **Pigeon River Recovery Project (Joyce Coombs):**
  - Summary of Fish work
    - Re-introduced 21 species of fish into the Pigeon River system; 12 species in TN and 10 species in NC.
    - Established populations of 7 species: TN = Gilt Darter (*Percina evides*), Stripetail Darter (*Etheostoma kennicotti*), and Mountain Brook Lamprey (*Ichthyomyzon greeleyi*); NC = Silver Shiner (*Notropis photogenis*), Telescope Shiner, Tennessee Shiner, Gilt Darter, and Banded Darter (*Etheostoma zonale*).
    - Re-introduced species are found in 43 miles of the Pigeon River and in four tributaries (Fines, Jonathan, Crabtree, & Richland Creeks)
    - Reproduction occurring in three additional species: TN = Mountain Madtom (*Noturus eleutherus*); NC = Mirror Shiner and Bigeye Chub (*Hybopsis amblops*)
    - Established two genera of snails (*Pleurocera* spp. and *Io* sp.) over 230,000 in 11 miles of the Pigeon River in TN
    - Introduced seven species of freshwater mussels, survival and growth have been documented: TN = 6 spp.; NC = 1 sp.
    - Index of Biotic Integrity (IBI) scores for 2014: Denton – 56 good/excellent; Tannery – 54 good/excellent (tied its highest score in 2010)
    - First occurrence of the Northern Studfish (*Fundulus catenatus*) at Tannery Island, TN in 2014
    - Conservation Fisheries began propagation of the Tangerine Darter in 2014 with the release into the Pigeon River in TN, planned for summer of 2015
  - Current mussel research:
    - Dr. Mike McKinney (UTK) is comparing the survival and growth of mussels, Wavyrayed Lampmussel (*Lampsilis fasciola*) and Cumberland Moccasinshell (*Medionidus conradicus*) in the Pigeon River to those in the Nolichucky River using silos/cages. Preliminary data shows more growth in the mussels in the Nolichucky. Initial results include:
      - Site condition at Pigeon River at Cosby Creek is cobbles and boulders – insufficient substrate for mussel burrowing
      - Inconclusive correlation of mussel life with silo volume
      - Insufficient population of mussels in moderately-severely silted housing to fully evaluate correlation
      - Multiple canonical analysis reveals mussel survival correlates best with the Wavyrayed Lampmussel, in clear water, in a silo, in the Nolichucky

- Other Research Updates: UT Fisheries has two graduate students continuing their research. Melinda Bousfield is completing her dissertation on the analysis of Pigeon River macroinvertebrate data over time, and Phillip Harnage is completing his assessment of macroinvertebrate sampling protocols used to assess the health of the Pigeon River for his thesis. Dr. Mike McKinney's student, Laura Pullum, is comparing the survival and growth of mussels in the Pigeon River to those in the Nolichucky River using silos/cages and, is looking at the effect of abrasion on the mortality of mussels in the Pigeon River.
- **University of Tennessee-Knoxville, Fisheries (Dr. Brian Alford's lab):**
  - Brian Alford, Joyce Coombs, and Justin Wolbert are studying the influences of agricultural land use (particular tomato fields) on the fish and invertebrate assemblages in tributaries and the main stem reaches of the Nolichucky River. Preliminary data analyses suggest that the Sharphead Darter (*Nothonotus acuticeps*), Bluebreast Darter (*Nothonotus camurus*), Greenside Darter (*Etheostoma blennioides*), and Snubnose Darter (*Etheostoma simoterum*) are strong indicators of least impacted condition in main stem riffle-run reaches, while Mottled Sculpin (*Uranidea bairdi*) and Saffron Shiner (*Notropis rubricroceus*) are indicators of least impacted condition in tributary streams. Banded Sculpin (*Uranidea carolinae*) and Redline Darters (*Nothonotus rufilineatus*) were strong indicators of the most impacted agricultural condition, regardless of stream size.
  - Dan Walker (PhD student) is describing contaminant exposure risk to Lake Sturgeon (*Acipenser fulvescens*) foraging habitat in Watts Bar and Ft. Loudon Reservoirs, and he is using side-scan sonar to map physical habitat of potential spawning reaches below three TVA dams, as well as describe the reproductive potential of Lake Sturgeon during the 2015 "spawning" season.
  - Todd Amacker (MS student) is assessing seasonal invertebrate prey availability from benthic dredge and rock basket samples in Ft. Loudon Reservoir for Lake Sturgeon. He is also using gastric lavage and colonic flushing techniques to compare sturgeon diets to the prey base.
  - Hayley Gotwald (MS student) is using remotely-sensed GIS data to map agricultural fields in the Nolichucky River watershed in Tennessee. Metrics describing benthic macroinvertebrate and fish assemblages

sampled from downstream and upstream of agricultural fields will be modeled as a function of agriculture land use size, position, and type (e.g., tomato, tobacco, corn) in the watershed.

- Chauntelle Williams (MS student) is testing the hypothesis that environmental stressors (e.g., agricultural land use) inhibit the complete formation of the supratemporal canal in the Snubnose Darter in southern Appalachian streams. Samples have been taken from sites located upstream and downstream of agricultural fields and in reference sites in forested areas during summer 2014.
- Katy Porter (Undergraduate student) completed an independent study during fall 2014 titled “*Microhabitat Characteristics of the Sharphead Darter (*Nothonotus acuticeps*) and Olive Darter (*Percina squamata*) from the Nolichucky River*”, where she found that snorkeling densities of both species were strongly and positively related to riffle habitat units that were shallower and of narrower width dimensions (e.g., secondary channels of islands), and that the species exhibited microhabitat segregation of substrates. Sharphead Darters mostly utilized cobble and gravel substrates only, while Olive Darters also were found on cobble-gravel, but also utilized more sand and bedrock surfaces compared to that of Sharphead Darters.
- Parker Hurst (Undergraduate student) is conducting an independent study project on the intersex condition and blood vitellogenin concentrations in male Smallmouth Bass (*Micropterus dolomieu*) from the Nolichucky River. He is collaborating with UT Wildlife Health expert Dr. Deb Miller.
- Sarah Sommerfield (Undergraduate student) is working on an internship research project that will develop prepared fish feed from kitchen wastes (e.g., cafeteria salad bars) and crop wastes (e.g., soybean husks left on field after harvest) found locally around Knoxville. Tilapia (*Oreochromis* spp.) are being grown in indoor, flow-through tanks, and fish growth and tissue proximate analysis of nutrients will be compared to control fish being fed the traditional, commercially available feed.
- **University of Tennessee-Knoxville, Division of Biology (Ben Keck):**
  - Ben changed positions from postdoc to lecturer in the Division of Biology and Department of Ecology and Evolutionary Biology teaching General Biology introductory courses and ichthyology, and is co-acting curator of the David A. Etnier Ichthyological Collection.

- A study funded by the University of Tennessee Institute for a Secure and Sustainable Environment and using TVA fish sampling data was published: Keck, B.P., Z.H. Marion, D.J. Martin, J.C. Kaufman, C.P. Harden, J.S. Schwartz, and R.J. Strange. 2014. Fish functional traits correlated with environmental variables in a temperate biodiversity hotspot. PLOS One. 9(3): e93237.

### **Virginia:**

- **Virginia Department of Game and Inland Fisheries**

- **Blackbanded Sunfish Distributional Survey:** Prior to this field season, only two sites in Virginia's Chowan drainage had confirmed populations of the Blackbanded Sunfish (*Enneacanthus chaetodon*), a state endangered species. For the 2014 field season, we set forth to confirm sunfish presence at previously known sites and discover new locations. Satellite imagery allowed us to categorize sites as excellent to poor based on the presence of vegetative cover, pond size and proximity to known sunfish populations. Using the invaluable assistance of local VDGIF biologists, we were able to access 15 good/excellent sites. Among these we documented two new populations in the Blackwater and rediscovered a population in the Nottoway, bringing the number of confirmed sites to five. Future efforts will focus on sampling more high quality sites and to determine potential locations for reintroduction.
- **Greenfin Darter Survey and Habitat Assessment -** Over the 2014 field season, the Virginia Department of Game and Inland Fisheries (VDGIF) Aquatic staff assessed the distribution and habitat use of Greenfin Darter (*Nothonotus chlorobranchius*). Greenfin Darters are found in clear high gradient streams in the Blue Ridge Mountains from Georgia to Virginia. In Virginia, they are state threatened and restricted to Laurel Creek and its tributaries, Washington, and Smyth counties. Laurel Creek mostly drains National Forest property and is managed by the VDGIF as a trophy trout fishery. Using snorkeling techniques, staff sampled 49 habitat units and found Greenfin Darters in all habitats sampled (pools, riffles, and runs), though they were twice as likely to occur in runs as in pools or riffles. Beaverdam Creek, which originates in Tennessee and empties into Laurel Creek at the Town of Damascus, Virginia, appears to be the species' core population center and the most impacted by urbanization. Besides Greenfin Darters, an additional 28 species have been documented including healthy, reproducing populations of Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*). Effort in 2015 will focus on sampling the remaining sites (Damascus downstream to the confluence with

the South Fork Holston River), summarizing results, and providing management recommendations.

- **Clinch River IBI Fish Assessment** - Beginning in Virginia, the Clinch River meanders over 150 miles before crossing into Tennessee. The lower Clinch River is well known for its large diversity of freshwater mussels and fish; however, the upper reaches have received less attention focused on these resources. Unfortunately, threats including coal mining, agriculture, and residential pollution are primarily concentrated in the headwaters. During the 2014 field season we partnered with the Tennessee Valley Authority to assess water quality of the upper Clinch using their Index of Biotic Integrity (IBI) methodology for fish. We targeted 10 sites over a 50-mile section from the towns of Blackford to Tazewell. Although IBI scores are still pending, we collected 53 of the possible 106 species known from the drainage. We also collected 13 species listed on Virginia's Wildlife Action Plan. Survey information will serve as a baseline to target for future restoration and protection efforts.
- **Tennessee Dace Distributional Survey** - The Tennessee Dace (*Chrosomus tennesseensis*) is a State Endangered species of the North, South, and Middle forks of the Holston River in southwestern Virginia. The species is presently known from nine streams in the state. During the 2014 field season, biologists used GIS to identify 56 additional streams within the Holston drainage that seemed to be potential sites based on fish community, proximity to extant populations, land use, and stream characteristics. During the 2014 field season, 23 of these were sampled for fish and habitat measurements were taken. An additional 14 sites were visited, visually assessed, and deemed either unsuitable for the species or were inaccessible. While in the field, an additional 10 sites were identified for later sampling. While no additional populations were discovered, a number of extant populations were confirmed to still be present, and several other streams were sampled for the first time ever. In addition, sampling in the upper South Fork Holston system discovered the introduction of the Torrent Sucker (*Thoburnia rhothoeca*), which represents a significant range expansion from its historical occurrence on the Atlantic Slope and eastern tributaries of the New River drainage. Additional sampling is expected to resume during the 2015 field season.
- **Post Chemical Spill Monitoring of Candy Darter** - In February 2014, a vehicle accident occurred on I-77 near Rocky Gap in Bland County, Virginia. While extinguishing the fire, local emergency crews inadvertently used flame-retardant foam which later drained into and caused a fish kill in Laurel Creek, Bland County, one of 4 streams in Virginia where Candy Darters (*Etheostoma osburni*) occur in Virginia. After doing an initial

response the day after the kill and finding many dead fish, including Candy Darters, a survey was planned to monitor the status of the population. Following sampling protocols set forth in previous monitoring efforts, biologists sampled six sites representing sites both above and below the spill. Candy Darters were found both above and below the site of the spill in both May and September (11 and 13 individuals, respectively). Nineteen species were collected in all, representing 380 individuals in May and 463 in September.

- **Copper Creek Conservation Committee Meeting** - Copper Creek is a tributary of the Clinch River, Scott, and Russell counties that contains over 71 native freshwater fish species and 26 species of freshwater mussels. Copper Creek also contains one of the few populations of Yellowfin Madtom (*Noturus flavipinnis*) and the only known population of Duskytail Darter (*Etheostoma percnurum*). Over the last 25 years, government and nonprofit organizations have conducted species recovery, stream restoration and community outreach thorough the watershed. Despite these efforts, very little is known regarding the current condition of the system or the success of these programs. To rectify the situation, Virginia Department of Game and Inland Fisheries organized a meeting of stakeholders including US Fish and Wildlife Service, The Nature Conservancy, Virginia Department of Conservation and Recreation - Soil and Water Conservation District, Virginia Department of Forestry, Tennessee Valley Authority, Virginia Department of Transportation, and Conservation Fisheries Inc. The meeting provided overviews of the current condition of land use, aquatic resources, threats, and restoration activities in the watershed. The attendees will be developing proposals to monitor freshwater fish and mussels as well as best management practices in Copper Creek. The group will be meeting again in January to discuss progress and plans for the upcoming field season.
- Other projects funded by the Virginia Department of Game and Inland Fisheries during 2014 include:
  - Status of Bridle Shiner (*Notropis bifrenatus*) populations in VA and results of preliminary genetic investigations of extant populations [Completed]
  - Assessment of Genetic Diversity of Yellowfin Madtom (*Noturus flavipinnis*) population to determine their distinctiveness for reintroduction efforts [Completed]
  - Assessment of the distribution and degree of genetic introgression of Roanoke Bass (*Ambloplites cavifrons*) in Virginia [On-going]
  - Survey for Spotfin Chub (*Erimonax monochus*) and their habitat in the North and Middle Fork Holston River, Virginia [On-going]

- Development of environmental DNA protocols for detecting occurrence of imperiled daces (genus *Chrosomus*) in Virginia [On-going]
- Survey for Ashy Darters (*Etheostoma cinereum*) in the Powell River of Virginia [On-going]
- Augmentation and assessment of the Yellowfin Madtom (*Noturus flavipinnis*) in Copper Creek, Virginia [On-going]
- Assessment of apparent survival and abundance of Roanoke Logperch (*Percina rex*) in response to short-term changes in river flow [On-going]
- Cost-effectiveness of riparian restoration as a recovery tactic for Roanoke Logperch (*Percina rex*) [On-going]
- Development and application of a multi-scale model of habitat suitability for Roanoke Logperch (*Percina rex*) [On-going]
- Distribution of *Chrosomus* dace with respect to status of Clinch Dace (*Chrosomus* sp. cf. *saylori*) in the Upper Clinch River System, Virginia [On-going]
- Development of non-invasive survey techniques for Roanoke Logperch (*Percina rex*) based on environmental DNA [On-going]
- Development of a conservation plan for Variegate Darter (*Etheostoma variatum*) [On-going]

### **West Virginia:**

- **West Virginia University (Stuart Welsh, swelsh@wvu.edu):**
  - Andrew, R.G. and K.J. Hartman. 2014. Uneven inputs of woody debris to Appalachian streams from superstorm Sandy. *Canadian Journal of Fisheries and Aquatic Sciences* 72: 1–6.
  - Aunins, A., J. T. Petty, T. King, and P. Mazik. 2014. River mainstem thermal regimes influence population structuring in Appalachian Brook Trout populations. *Conservation Genetics* DOI 10.1007/s10592-014-0636-6.
  - Cincotta, D.A., D.P. Wegmen, T.E. Oldham, S.A. Welsh, and L.B. Hedrick. In press. Fishes of the Blackwater River drainage, Tucker County, West Virginia. *Northeastern Naturalist*.
  - Eyler, S.M. 2014. Timing and Survival of American Eels Migrating Past Hydroelectric Dams on the Shenandoah River. Ph.D. Dissertation, West Virginia University, Morgantown, WV.
  - Huntsman, B., and J. T. Petty. 2014. Density-dependent regulation of Brook Trout populations along a core-periphery distribution continuum. *PLoS One* 9:1–15.
  - Merriam, E. R., J. T. Petty, M. P. Strager, A. E. Maxwell, and P. F. Ziemkiewicz. In press. Landscape-based cumulative effects models for

- predicting stream response to mountaintop mining in multi-stressor Appalachian watersheds. *Freshwater Science*.
- Petty, J. T., D. Thorne, B. Huntsman, and P. Mazik. 2014. The temperature-productivity squeeze: Constraints on Brook Trout growth along an Appalachian river continuum. *Hydrobiologia* 727:151–166.
  - Ruble, C.L., P.L. Rakes, J.R. Shute, and S.A. Welsh. 2014. Captive propagation, reproductive biology, and early life history of the Diamond Darter (*Crystallaria cincotta*). *American Midland Naturalist* 172:107–118.
  - Selego, S. M., G. T. Merovich, Jr., and J. T. Anderson. 2014. Conflicting natural and anthropogenic threats reduce nest success in centrarchid fishes. *Hydrobiologia* 732:161–171.
  - Smith, J., S.A. Welsh, J.T. Anderson, and R. Fortney. In press. Water quality trends in the Blackwater River watershed, West Virginia. *Northeastern Naturalist*
  - Welsh, S.A. and J.L. Aldinger. 2014. A semi-automated method for monitoring dam passage of upstream migrant yellow-phase American Eels. *North American Journal of Fisheries Management* 34:702–709.
  - Welsh, S.A., D.A. Cincotta, and R.L. Raesly. In press. First Record of the Bigeye Shiner (*Notropis boops*) from West Virginia. *American Midland Naturalist*.
  - Welsh, S.A. and Z.J. Loughman. 2014. Physical habitat and water quality correlates of crayfish distributions in a mined watershed. *Hydrobiologia* DOI 10.1007/s10750-014-2095-y