Warm Springs
Fish Technology Center

Annual Report
FY-2011

U.S. Fish and Wildlife Service
Warm Springs Regional Fisheries Center
Warm Springs, GA

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Project Leader Date

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Center Director Date

Fish Technology Center Overview

The Fish Technology Center (FTC) is a component of the Warm Springs Regional Fisheries Center (RFC) and was developed to improve and enhance fisheries management. We provide consolidated technical operational support to regional fisheries operations and technical assistance to the public. The Fish Technology Center is comprised of a cryopreservation laboratory, conservation genetics laboratory, and the National Fish Strain Registry at Warm Springs, Georgia, and a field station in Wadmalaw Island, South Carolina.

Goals:

- Provide management support of interjurisdictional coastal and riverine fishes such as robust redhorse, shortnose sturgeon, Gulf sturgeon, and Gulf striped bass.
- Provide conservation genetics support for regional fishery programs.
- Maintain the National Fish Strain Registry for dissemination of information and support of private, state and federal broodstocks.
- Develop cryopreservation techniques for imperiled fish, amphibians, and mussels.
- Develop hatchery product evaluation techniques.

Conservation Genetics

The Conservation Genetics lab primarily works with biologists and managers of the region to design and implement genetic research on imperiled aquatic organisms.

Current Projects include estimating genetic diversity from: alligator gar, Gulf Coast striped bass, robust redhorse, freshwater mussels, and threatened and endangered species such as spotfin chub.

Cryopreservation

Cryopreservation is a process in which a living cell is frozen, stored, and thawed and remains viable. Cryopreserved sperm assists reproductive efforts by allowing spawning to take place whenever females are ready, reduces the need to hold males, and can increase flexibility and genetic diversity in spawning protocols.

Currently, the Warm Springs FTC is working on numerous species of fish, including threatened or endangered species. In the near future, the FTC will expand cryopreservation research to include other aquatic species (e.g., freshwater mussels, amphibians) for conservation efforts.

National Fish Strain Registry

The National Fish Strain Registry (NFSR) is an internet-based program that assembles information on life history, genetics, reproduction, and behavior of wild populations and domestic fish strains throughout the United States. The NFSR database is available for use by public and private producers as well as resource managers of federal, state, and tribal governments through a registration process. Once registered, users are able to search, create new records, edit records, and request information. The NFSR's vision is to provide a broad collaborative program that provides access to data and information on our Nation’s aquatic resources.

Cryopreservation Laboratory

Rainbow Trout Sperm Cryopreservation

On October 26, 2010, William Wayman and Mike Hassett traveled to Erwin National Fish Hatchery (NFH), TN to conduct cryopreservation experiments with rainbow trout sperm. Erwin NFH is a broodstock station, which keeps select strains of trout, and distributes fertilized eggs throughout the country for grow-out and stocking. Cryopreservation was envisioned as a tool that might help to reduce the costs associated with raising the trout broodstock for a third year. Sperm from 2-year old males would be cryopreserved, and stored until needed the next year to produce future broodstock. If possible, this would eliminate the need to keep male trout on station for an additional year and reduce feed and labor costs. On November 16, 2010, William and Mike returned to Erwin NFH to conduct fertilization trials with sperm that were cryopreserved in October. Eggs fertilized with cryopreserved sperm did have a lower (25-49%) hatch rate than eggs fertilized with fresh sperm (36-63%), but the results suggested that cryopreservation may be a suitable option for reducing costs associated with raising trout.

Rainbow trout eggs were fertilized with cryopreserved sperm during fertilization trials. USFWS Photos.

William Wayman, Jaci Zelko, and Mike Hassett traveled to Erwin National Fish Hatchery (NFH), TN to cryopreserve sperm from 2-year old Fish Lake strain rainbow trout broodstock. The project is an effort to try to reduce the man-power and feed costs associated with raising male broodstock for an additional 3rd year. Erwin NFH uses 3-year old males in crosses to create their future broodstock. Sperm were collected from 240 males and cryopreserved over a 2-day period during February 15 – 18, 2011. The frozen sperm will be stored until next year when it will be used in fertilization trials to help determine the feasibility of the project.

Rainbow trout sperm was cryopreserved for future fertilization trials. USFWS Photos.

American Shad Sperm Cryopreservation

On March 28, 2011, Mike Hassett and William Wayman traveled to Bears Bluff National Fish Hatchery outside of Charleston, SC to attempt to store and cryopreserve sperm from American shad. Experiments were conducted to determine a solution to allow refrigerated storage of the sperm. Results of the experiments allowed increased storage time compared to last year, but findings are still far from being sufficient for refrigerated storage. Results of the cryopreservation experiments were very encouraging. Post-thaw motility was fairly high compared to the motility at freezing. The development of a refrigerated storage technique should fully enable cryopreservation of sperm from American shad.

Collecting American shad sperm. USFWS Photo

Striped Bass Sperm Cryopreservation

Striped bass held at FTC. USFWS Photo

Sperm were collected from domestic and wild striped bass at the FTC and cryopreserved in April 2011. The work is an effort to see if current cryopreservation techniques are capable of being used at a production scale. If possible, cryopreserved sperm could be used at production hatcheries during years when males are difficult to collect. The cryopreserved sperm will be used next year in fertilization trials to determine its effectiveness.

Alligator Gar Sperm Cryopreservation

In April 2011, Jaci Zelko traveled to Private John Allen National Fish Hatchery in Tupelo, MS to collect milt from several alligator gar broodstock for use in cryopreservation and short-term storage studies. The broodstock were wild fish captured from St. Catherine Creek in Sibley, MS and held at Private John Allen NFH during the spawning season. The development of cryopreservation techniques for alligator gar sperm continues in order to offset the small number of males that have been captured in the past several years. Jaci cryopreserved sperm from two males that will be added to the repository for long-term storage. Future efforts will include fertilization trials and refinement of cryopreservation techniques.

Checking alligator gar sperm motility. USFWS Photo

Pallid Sturgeon Sperm Cryopreservation

In an effort to preserve the genetic diversity of the endangered pallid sturgeon, sperm were shipped from Blind Pony State Fish Hatchery in Missouri to the FTC for cryopreservation on April 27 and 28, 2011. Sperm from 15 males were cryopreserved and placed in the pallid sturgeon sperm repository. This is the second year that sperm have been cryopreserved from middle basin fish, and this brings the number of middle basin males that have been cryopreserved up to 24.

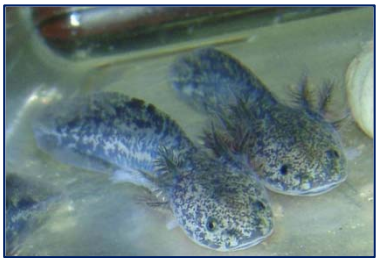
Due to record flooding on the Yellowstone and Missouri Rivers during June 2011, only one male and one female pallid sturgeon were collected for recovery spawning efforts. Sperm from the male was shipped to Warm Springs FTC for cryopreservation and included in the repository. In order to meet spawning protocol guidelines, which call for spawning a female with at least three males, cryopreserved sperm were used from four males to produce additional family lots. Sperm for these crosses were cryopreserved in 2002, 2004, and 2010. Each male cross was successful, with fertilization rates ranging from 5% – 66%.

This work was partially funded by the U.S. Army Corps of Engineers.

Pallid sturgeon was shipped to FTC for freezing. USFWS Photos

Salamander Spermatophore Cryopreservation

Chester Figiel, Jr. traveled to Lexington, KY on December 5 and 6, 2010 to work with biologists at the *Ambystoma* Genetic Stock Center located at the Department of Biology, University of Kentucky. Chester gained information regarding the culture of Axolotls and discussed the reproductive biology of these animals with faculty and staff. This meeting will help to further develop protocols for cryopreservation of spermatozoa, especially for amphibian species of concern.



Ambystoma mexicanum salamanders. USFWS Photo

Chester Figiel, Jr. completed final revisions for the book chapter entitled "Amphibian Conservation and Cryopreservation of Sperm, Cells, and Tissues" for the book *Cryopreservation in Aquatic Species* and for the manuscript entitled "Reptile and Amphibian Conservation through Gene Banking and other Reproduction Technologies" for publication in the *Russian Journal of Herpetology*.

Chester Figiel, Jr. gave a brown-bag presentation to personnel at the Warm Springs RFC on December 9, 2010. His talk was entitled "Experiments on the Cryopreservation of Sperm from the Axolotl *Ambystoma mexicanum*" and discussed two studies involving differing freezing rates and sperm viability of *A. mexicanum* spermatophores.

Channel Catfish Sperm Cryopreservation Book Chapter

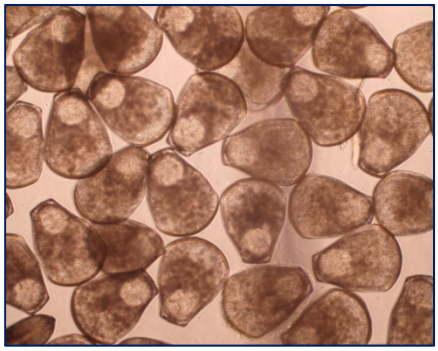
William Wayman and Chester Figiel, Jr. completed a chapter "Simple Extenders for Refrigerated Storage and Cryopreservation of Channel Catfish Sperm" for the book C*ryopreservation in Aquatic Species, 2nd Edition* edited by Terrence Tiersch and Christopher Green.

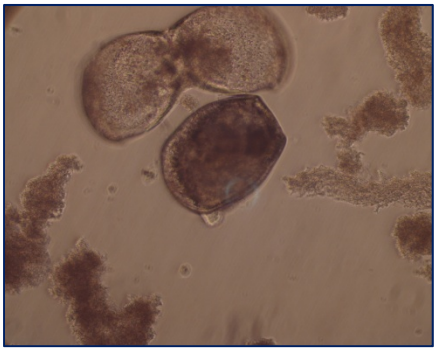
Freshwater Mussel Glochidia Cryopreservation

Jaci Zelko and Andy Hartzog (National Fish Hatchery STEP student) collected 14 mussels from the Flint River in June 2011. The mussels were transported back to the hatchery and placed in the Freshwater Mussel Quarantine Building. The mussels will be used in studies for both the FTC and NFH. Jaci will be collecting sperm and viable glochidia from the mussels to use in cryopreservation studies. The species collected were *Villlosa lienosa*, *Villosa vibex*, *Elliptio fumata*, and *Elliptio pullata*.

Studies are currently underway on the cryopreservation of freshwater mussel glochidia, a potential method for the preservation and recovery of imperiled unionid species. We are also investigating the effectiveness of transforming glochidia in a culture media, without the use of a host fish. Two common mussel species, the *Lampsilis floridensis* (Florida sand shell) and *Ellipsaria lineolata* (Butterfly) are being used as surrogates for the studies. Glochidia were collected from several mussels and placed in 6-well plates and incubated in a CO_2 incubator at 22° C. In our first study, only a few *L. floridensis* glochidia apparently survived the cryopreservation procedure. About 200 juveniles were collected. A second study is currently being evaluated using glochidia from *E. lineolata*.

Glochidia is gently flushed out of the gills. USFWS Photos.





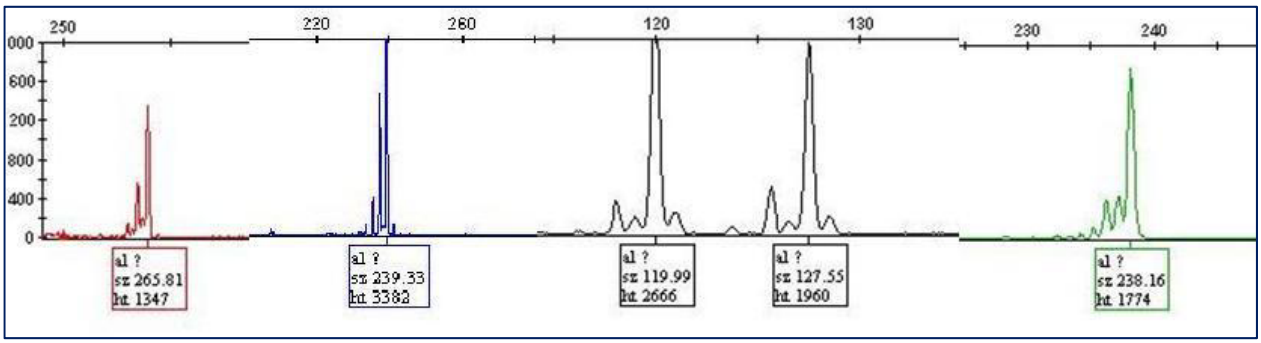
(*Left*) *Ellipsaria lineolata* glochidia and (*Right)* a juvenile *Lampsilis floridensis*. USFWS Photos.

Cryopreservation of Atlantic Sturgeon Sperm

Jaci Zelko and William Wayman cryopreserved sperm from two Atlantic sturgeon. The sperm were collected at the Bears Bluff National Fish Hatchery on September 19th and shipped to the FTC. The cryopreserved sperm will be used to help alleviate issues when females are in spawning condition but sperm from males cannot be collected.

Conservation Genetics Laboratory

The Conservation Genetics Lab (CGL) assisted the Tennessee Wildlife Resource Agency (TWRA) in the management and conservation of largemouth bass subspecies in the Chickamauga Reservoir in Tennessee. Florida bass (endemic to peninsular Florida) and the northern largemouth bass (native to mid-west and northeast US) co-exist in a natural zone of introgression (repeated backcrossing of hybrid with its parental population) that extends through the southeastern and mid-Atlantic coastal states. Stocking activities and subsequent introgression have led to an extended range for each subspecies, and an expansion of the hybrid zone, which has created difficulties for TWRA in quantifying the success of stocking events or resolving the identity of individuals. CGL established a rapid screening technique to identify largemouth bass with the use of genetic markers. The genetic markers would aid TWRA in genetically distinguishing samples into one of three respective categories: Florida bass, northern largemouth bass, or a hybrid between the two. Results indicated that TWRA has successfully integrated 15% of Florida bass genes into the current population's genome.



Largemouth bass genetic markers. USFWS Photo

Identification of Largemouth bass for use as brood stock in MS

The Conservation Genetics Lab (CGL) assisted the Mississippi Department of Wildlife, Fisheries, and Parks in identification of northern and subspecies of largemouth bass for use as brood stock. The goal of this research was to assess the genetic purity of Florida bass (*Micropterus salmoides floridanus)* individuals that will be used by the Mississippi Department of Wildlife, Fisheries, and Parks for future hatchery brood stock in the state of Mississippi. Florida bass and the northern largemouth bass co-exist in a natural zone of introgression that extends through the southeastern and mid-Atlantic coastal states. While genetic distinctiveness between northern and southern subspecies has been identified with several allozyme markers, subsequent introgression (i.e., repeated backcrossing of hybrid descendants with the parental population resulting in the infiltration of the genome of one species in to that of the other) makes the detection of backcrossed individuals difficult with these markers. This uncertainty poses problems for state hatcheries that assume purity of strain based on morphological comparisons for hatchery augmentation or reintroduction efforts. In total, 46% (32 of 70 individuals) of individuals were categorized as backcrosses sharing a portion of their genome with *M. s. salmoides*. Only eight of 20 Alabama were identified as pure *M. s. floridanus*, with 12 individuals being potential backcrosses to *M. s salmoides.* All Louisiana samples were identified as backcrosses. In contrast, all Florida and Mississippi individuals were classified as *M. s. floridanus.* Based upon its findings, CGL recommended that any individual labeled as a backcross in this document, regardless if it is questionable, be withdrawn from any future *M. s. floridanus* brood stock plans because the risk of introducing known *M. s. salmoides* alleles into areas where only *M. s. floridanus* occurs is too great to warrant inclusion.

Conservation Genetics in Anchorage Detail

Ashantyé Williams traveled to Anchorage, Alaska to attend the Applied Conservation Genetics Course during November 15 - 19, 2010. This course was designed to provide resource professionals with the tools to evaluate issues where genetic data has major implications for the evaluation, management, or restoration of populations. During this course, Ashantyé had the honor and pleasure of meeting some pioneers of conservation genetics including notable Fred Allendorf, who literally wrote the book from which the course was taught. She met with Meredith Bartron to discuss possible shadowing opportunities at the Northeast Fishery Center and with Tim King to discuss current collaborative projects and innovative technology conducted by the U.S. Geological Survey. During this course, the Warm Spring Conservation Genetics Laboratory received notoriety for various collaborative efforts on several projects mentioned. Ashantyé walked away with a better understanding of the importance of conservation genetics work to the Service. While in Alaska, Ashantyé also completed a short detail at the Anchorage Conservation Genetics Lab. She shadowed Cara Lewis, lab manager, and learned the standard day-to-day operations of their lab. The purpose for this detail was to give Ashantyé the opportunity to experience how other genetics labs function. She was also exposed to their database system that catalogues everything from tissue samples to data analysis. With this experience, she hopes to use some of their protocols and procedures to elevate the Warm Springs Conservation Genetics Lab to the next level.

Molecular tag development in lake sturgeon (*Acipencer fluvescens*)

Ashantyé Williams attended the Annual Tennessee River Lake Sturgeon Reintroduction Working Group Meeting held in Chattanooga, TN on January 13, 2011. The annual meeting is comprised of various state, federal, and university scientists that are united under one goal – successful restoration of lake sturgeon to the Tennessee River. The importance of genetics is emphasized in the restoration plan of the upper Tennessee River lake sturgeon. One of the main goals is to create and maintain genetic diversity in stocked populations. The working group discussed the possibilities of using molecular tags and how they may be useful as an alternative, or in conjunction with, standard external or internal tags and offer the advantage of permanency (do not fall off or diminish over time). Cost is the major drawback to using molecular tags because of the large number of markers necessary to allocate progeny to parents. Ashantyé reminded the group about the importance of sampling procedures when collecting tissue samples for determining the genetic characteristics of the adult broodfish. Molecular tags can also be used to accurately perform mark/recapture studies for estimation of survival and census size of lake sturgeon in the Tennessee River.

Lake sturgeon fingerling. USFWS Photo

Assess population structure above and below Chilhowee dam for three endangered species

Ashantyé Williams and Dr. Greg Moyer received news from the scientific journal *Conservation Genetics*, that their manuscript on "Isolation and characterization of 21 microsatellite loci for the federally threatened yellowfin madtom (*Noturus flavipinnis*) with cross species amplification in N. baileyi" was accepted for publication in their next issue. They isolated 21 microsatellite loci from *N. flavipinnis*, a federally threatened freshwater fish. Nine loci were polymorphic with an average of 1.48 alleles and an average observed and expected heterozygosity of 0.092 and 0.096, respectively. All loci conformed to Hardy-Weinberg expectations, and all pairs of loci showed no signs of genotypic disequilibrium. Three

of these loci were found to cross amplify in *N. baileyi*. These markers should prove useful in the conservation efforts and genetic monitoring of these rare fish species.

Yellowfin madtom. Conservation Fisheries, Inc. Photo

Determining the percentage of Alabama spotted bass in Spotted bass populations

Sheena Holley, a student from Columbus State University, first began working and volunteering for the hatchery for almost a year. CGL is always available to mentor young and upcoming scientists as they explore the world of conservation genetics. This summer Sheena and Dr. Kevin Burgess (her advisor) approached CGL with interest in adding a genetic component to Sheena's research on black bass species and their possible hybridization. As a result, she spent most of her time learning molecular techniques from Dr. Greg Moyer and Ashantyé Williams. Sheena learned everything from DNA extraction to data analysis of the genotypes. Her research interest is to evaluate the ability of genetic markers developed from Florida bass to generate successful amplification in shoal bass, spotted bass and their hybrids. She plans to take the tools she learned in the lab and apply them to her graduate studies. The data she collected also aided in providing a baseline for a possible spotted bass study that CGL will coordinate.

Sheena and Ashantyé discuss bass genetic markers. USFWS Photo

Best practices for captive propagation using the Conasauga logperch as a case study

The Conasauga logperch (*Percina jenkinsi*), one of the rarest darters in North America, is restricted to 55 river km of the mainstem Conasauga River in Georgia and Tennessee. Given recent apparent population declines, captive propagation for augmentation may be vital to prevent the species' extinction. As prior studies have noted unusually high genetic diversity within the Conasauga logperch, any propagation programs most proceed carefully to prevent disrupting this unique genetic signature in the wild. A joint study to examine genetic diversity and create a successful captive breeding program for the Conasauga logperch was initiated in 2009. Preliminary genetic analysis of the broodstock and the offspring indicated that two of the broodstock were females, and all males contributed offspring, though in different proportions. The effective population size of the offspring was 5, nearly identical to that expected based on the number of males and females in the broodstock. The partners are now discussing possible sites and numbers for augmentation.

National Fish Strain Registry

The National Fish Strain Registry (NFSR) application in the USFWS's IT Investment Portfolio was reviewed and validated in the DOI Enterprise Architecture Repository. This meets our reporting requirement for the FY 2010 DOI Internal E-Gov Scorecard. The NFSR was also updated in the Investment Performance Profile; this profile includes a brief description, manager contact information, level of compliance with the FWS enterprise architecture, security and privacy certifications, customer base information, performance metrics, and other types of project compliance.

Chester Figiel, Jr. and Nicole Rankin completed an operational analysis for the National Fish Strain Registry (NFSR) on January 13, 2011 to assess how well this investment is meeting the U.S. Fish and Wildlife Service's mission and program objectives, customer needs, and business and performance goals. The Office of Management and Budget requires that all steady state investments be reviewed to ensure their continued effectiveness in supporting mission requirements to minimize the cost of ownership.

Nicole Rankin, Lizz Pena, and Chester Figiel, Jr. worked together to add a new group functionality to the NFSR. This functionality allows users to be more flexible when creating records for their hatchery or facility. Now, more than one user at a hatchery can create and edit records for that hatchery. The NFSR group functionality was launched on February 15, 2011.

Nicole Rankin participated via phone in the National Broodstock Meeting held at Neosho National Fish Neosho, MO on February 23 and 24, 2011. This annual meeting is conducted to discuss broodstock egg requests, fish health and nutrition matters, and database concerns for each region. Nicole provided an update of the NFSR including information about number of records, number of state and federal users, new group functionality, and the pending move to the Environmental Conservation Online System.

In March and April 2011, Nicole Rankin and Chester Figiel, Jr. updated the NFSR User Guide. The NFSR User Guide expanded to include more information about Creating and Searching for Strain Records. They also continued to work with Conservation Fisheries Inc. on incorporating captive propagation and translocation data of imperiled fishes, specifically the smoky madtom, slackwater darter, and diamond darter, into the NFSR.

Chester Figiel, Jr. completed FY11 Memorandum of Agreement (MOA) between the Systems Development Team and the Warm Springs FTC for Operations and Maintenance of the National Fish Strain Registry in May 2011. Thanks to Lawrence Ford for helping get the MOA finalized!

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Chester R. Figiel, Jr. is working with programmers from ASRC Management Services for the transfer of the National Fish Strain Registry to the Environmental Conservation Online System (ECOS). This includes modifying and transferring application code, migrating existing users and data into ECOS databases, and

creating public-access pages. ECOS is a gateway web site that provides access to applications that manage data regarding threatened and endangered species, fisheries, and habitat conservation.

Other Projects:
Leadership in Science & Technology

Rapid Assessment of Ploidy of Grass Carp

William Wayman, Mike Hassett, and Brian Hickson (Warm Springs Fish Health Center) conducted experiments on February 22, 2011 to determine if an inexpensive, portable microscope and image analysis system could be used to accurately determine ploidy in grass carp. Wildlife law enforcement officers need a method of determining the ploidy of grass carp shipments entering their state. There is no way to determine ploidy of grass carp from visual observation, so blood samples must be drawn. The blood samples are usually shipped to university or hospital labs to determine the ploidy using extremely expensive equipment, which can take two days to get results. The officers need a quick and accurate method that will give them a sound reason to hold a shipment of fish for further analysis. The microscope and image analysis software was able to accurately determine the ploidy of 39 fish in a blind study, and the entire process from collecting blood to results takes only 30 minutes per sample. Although further experimentation on the process needs to be conducted, it appears to offer a practical solution to the wildlife officer's need for a rapid field assessment of grass carp ploidy.

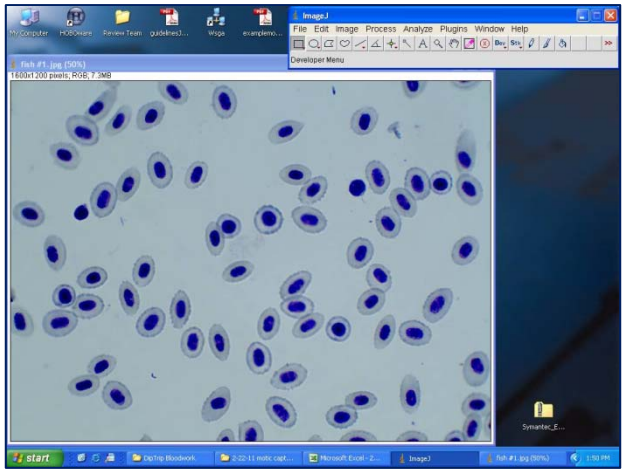


Image analysis software is used to analyze blood cells. USFWS Photo

Freshwater Mussel Fertilization Strategy Study

Nicole Rankin assisted Dr. Jim Stoeckel's group at Auburn University with sampling for a mussel tagging/movement study on Chewacla Creek, AL on November 10 and 12, 2010. Jim and his students have been tracking the location and movement of over 100 mussels every two weeks from April to November 2010. They have integrated a unique mapping technique using laser distance measuring devices with PIT tagging and robust design mark-recapture techniques to investigate the mating system of *Villosa lienosa* in this small stream. On this sampling occasion, Nicole assisted with collecting DNA samples from all individuals recaptured and glochidia from gravid females recaptured. The group collected length, weight, sex, images, and tissue swabs from all individuals. Jim and Nicole flushed the gills of gravid females with deionized water to release and collect glochidia. The use of genetic techniques will help determine whether females are primarily fertilized by upstream males, and by incorporating the mapping technique, they will be able to document fertilization distances between mussels.

(Left) Gills are flushed to collect glochidia and (Right) DNA samples are taken using swabs. USFWS Photos

Climate Change Effects on Hatchery Systems

Chester Figiel, Jr. revised the report entitled: "Risk and Vulnerability Analysis Matrix and Risk Management Guidance for Climate Change Effects on Hatchery Systems" for the U.S. Fish and Wildlife Service's Fisheries and Habitat Conservation Program. He and Hayley Dikeman (Ecological Services – Oklahoma) developed a quantitative climate change risk-assessment matrix that provides resource managers the ability to prioritize actions needed to address climate change impacts.

Aquatic Species Conservation & Management

Lake Sturgeon Marking

Chester Figiel and Nicole Rankin assisted the Warm Springs National Fish Hatchery on October 21 and 22, 2010 with marking juvenile (15- 20 cm) lake sturgeon, *Acipenser fulvescens*. Since 2000, the hatchery has been rearing lake sturgeon in an effort to reintroduce the species in the Lower French Broad River in TN and the Coosa River in GA. Fish were marked by removing one or two scutes using a curved scalpel. The scutes are removed in a certain pattern each year, and this pattern is used to determine the year-class of fish when recaptured. These fish were stocked as part of restoration efforts in the Tennessee River watershed in collaboration with the Tennessee Wildlife Resources Agency.

Striped Bass Tank Spawning

Thanks to Brent Hess (GA Department of Natural Resources), Paul Jones (GA Department of Natural Resources), Devin Chappell (Fish Health Center), and Brian Hickson (Fish Health Center) for their assistance with collecting male striped bass broodstock on April 13 and 14, 2011. Chester Figiel, Jr. and Nicole Rankin also helped with electrofishing efforts and transported the broodstock back to station. The FTC conducted a tank spawning of striped bass study and needed additional male broodstock.

Paul Jones, GADNR, collecting striped bass. USFWS Photo

Domesticated striped bass were tank spawned during the first three full weeks of April 2011. A total of 21 females were implanted and setup with males each for spawning. Eighteen of the females spawned, and their eggs were incubated to determine their viability. Egg production and hatch rates are currently being calculated. During the third week of spawning, two wild males were introduced into each tank in an effort to increase the number of males in the spawning population and to increase the genetic diversity. Genetic analyses are being conducted to determine if these wild males contributed to the spawning effort. These males will be incorporated into the population and used in future spawning studies.

(*Left*) Mike and Bill injecting hormones and (*Right*) Corey checks a tag. USFWS Photos

Corey Anderson, a graduate student from University of Southern Mississippi's Gulf Coast Research Laboratory, conducted experiments on larval striped bass in April 2011. Larval Gulf striped bass produced at the FTC were used to characterize yolk resorption timing and survival at near- lethal temperatures. Corey's research also includes estimating genetic heritability of thermal tolerance in Gulf

striped bass larvae and assessing survival of phase I and phase II striped bass stocked into Mississippi coastal rivers using molecular tags to identify recaptured fish.

Fat Threeridge Age Validation Study

Nicole Rankin and Karen Herrington, Panama City Ecological Services Office, surveyed for *Amblema neislerii* (fat threeridge) on the Apalachicola River on October 27 and 28, 2010. A total of 96 *A. neislerii* were collected from the Apalachicola River, notched using a triangular file, and tagged with numbered and passive integrated transponder tags. Mussels were replaced at the site and will be recovered one-year later to determine and validate age. Mussel shells were notched to create a known reference mark for validation. If a single annuli is examined beyond the notch mark, annual ring deposition will be considered validated for *A. neislerii.* In January 2010, Nicole and Greg Moyer completed sectioning and aging of 168 endangered *A. neislerii* samples. The oldest individual was aged to 24 years, and 83% of the individuals sampled were under age 10.

Amblema neislerii (fat threeridge) mussels. USFWS Photo

Southern Rainbow Age Validation Work

Nicole Rankin and Jason Wisniewski (GA Department of Natural Resources) assisted Justin Dycus, graduate student in the Warnell School of Forestry and Natural Resources at the University of Georgia, with aging *Villosa vibex* (southern rainbow) samples from the Apalachicola, Chattahoochee, Flint River basin. The group worked to develop a method to mark and measure annual growth of *V. vibex* thin-sections using Image Pro Analysis software. They aged and marked twenty samples on November 15 and 16, 2010. For his thesis work, Justin is evaluating the potential influence of changes to the flow regime on mussel growth by modeling annual growth and stream flow. He hopes to refine this marking/measurement method to assess the effects of water use on growth of mussel populations in the Flint River.

Freshwater Mussel Surveys

Nicole Rankin and Chester Figiel, Jr. partnered with GA Department of Natural Resources (Jason Wisniewski, Deb Weiler, Brad Strickland, and Houston Chandler) to conduct freshwater mussel surveys on the mainstem Flint River. They surveyed 24 study sites in the lower Flint River from Bainbridge to Newton, GA by SCUBA diving and snorkeling during May 23 - 27 and June 6 - 9, 2011. Study sites were selected to incorporate different river habitats e.g., riffles, runs, glides, pools, and edgewater. Occupancy models will be performed to estimate detection, abundance, and distribution of freshwater mussels, specifically the federally threatened and endangered species. The group is planning another sampling week for September 2011.

Sampling deep transects during freshwater mussel surveys on the mainstem Flint River. USFWS Photo

Deepwater Horizon Oil Spill Response

Again, staff from the Fish Technology Center joined the USFWS effort to help minimize the impact to fish, wildlife, and habitat from the Deepwater Horizon/Mississippi Canyon 252 oil spill. Nicole deployed to serve on a Natural Resource Damage Assessment Beach Bird Survey team during September 21 to October 6, 2010, and she conducted live bird assessments and wildlife surveys along the Louisiana coastline.

William Wayman and Chad Shirey (Warm Springs National Fish Hatchery) traveled to Covington, LA and assisted with Gulf sturgeon sampling on the Pearl River from September 25th to October 1st 2011. Ashantyé Williams also deployed for three weeks to assist with sampling. The objective was to place gill nets along the portions of the Pearl River where sturgeon have been known to congregate. Morphometric data and blood samples were collected from any captured sturgeon to check for impacts from the oil spill.

Ashantyé is checking the net for sturgeon (*left*) and with an alligator gar (*right*). USFWS Photos

FWS employees displaying one of the Gulf sturgeon collected during the ssmpling effort. USFWS Photo

Meetings

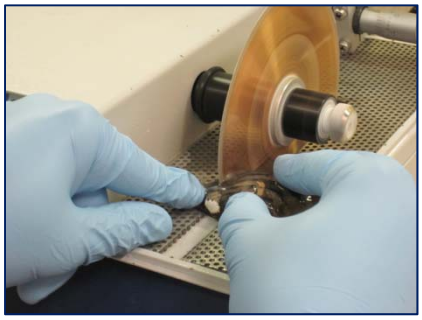
Southern Division of AFS Freshwater Mussel Symposium

Greg Moyer, William Wayman, and Nicole Rankin attended the 19th Annual Meeting of the Southern Division of the American Fisheries Society in Tampa, Florida on January 14 –16, 2011. Nicole organized and moderated the symposium, *Tools and Techniques Used to Conserve and Manage Freshwater Mussels*. Sixteen presenters from eleven federal, state, and academic agencies presented information about genetic techniques, life history research, mark-recapture studies, population modeling, stress, contaminants, and toxicity testing, and species and habitat restoration. Greg gave an oral presentation entitled "Tools for assessing genetic diversity within and among populations of threatened freshwater mussels." He reported on the development of microsatellite loci for *Pleurobema pyriforme*, *Amblema neislerii*, and *Elliptoideus sloatianus* and the utility of these markers to assess genetic diversity. William gave an oral presentation entitled "In-vitro transformation of purple bankclimber (*Elliptoideus sloatianus*) glochidia." He discussed the preliminary in-vitro methodology and transformation rates for this experiment.

Elliptoideus sloatianus mussels. USFWS Photo

Eastern Gulf Slope Mollusk and Crayfish Meeting

Nicole Rankin and Bill Bouthillier (Warm Springs National Fish Hatchery) attended the Eastern Gulf Slope Mollusk and Crayfish Meeting in Eufaula, Alabama on January 20, 2011. This informal meeting was a gathering of over 50 researchers, students, volunteers, and agency personnel from North Carolina, Alabama, Florida, Tennessee, Kentucky, and Georgia. The meeting served as a review of mollusk, snail, and crayfish conservation and research activities for the Gulf of Mexico drainages. Nicole gave a brief overview of the freshwater mussel age and growth work being conducted at the FTC. Bill gave a presentation highlighting the fish passage work and partnerships of the Paint Rock River Watershed in northern Alabama.



Sectioning a mussel for an age validation study. USFWS Photo

Morone Meeting

Greg Moyer and Ashantyé Williams attended the Annual *Morone* Meeting held February 8 – 9, 2011 in Crawfordville, FL. The meeting was comprised of various state, federal, and university scientists that met to discuss striped bass research, stocking, and issues in the Apalachicola, Flint, Chattahoochee (ACF) River Basin. Greg Moyer presented three short talks regarding conservation genetics of striped bass inhabiting the ACF River Basin. He also presented the evaluation of striped bass stocking success in West Point Lake, GA. Using molecular tags, this study evaluated the efficiency of molecular markers and oxytetracycline (OTC) tagging. Greg and his coauthors estimated levels of genetic diversity, estimated age using otoliths (fish ear bones), and checked for presence of an OTC mark. Ashantyé Williams described results of Gulf coast striped bass broodstock screening and assessment of the genetic status of broodstock lakes. Results indicated that while there is ample genetic diversity in the broodstock lakes,

the genetic diversity differs significantly among lakes. Ashantyé also suggested that microsatellite markers are necessary for accurate allocation of closely related progeny (brothers and sisters) to their respective parents. These data highlight the importance of genetic data in conservation and the utility of molecular tags to accurately perform mark/recapture studies for estimation of survival and census size of striped bass in the ACF River Basin.

Youth Ambassador Cody Meshes holding a striped bass. USFWS Photo

Freshwater Fish and Mussel Identification Workshop

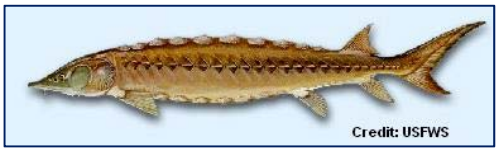
Nicole Rankin and Chester R. Figiel, Jr. attended the Apalachicola-Chattahoochee-Flint (ACF) Rivers' Freshwater Fish and Mussel Identification Workshop at the Joseph Jones Ecological Research Center in Newton, Georgia on August 2 – 4, 2011. The workshop provided background information on life history, taxonomy, habitat requirements, and fish host species of freshwater mussels in the ACF River Basin. Over 25 people from two states were in attendance and participated in the workshop which consisted of hands-on identification exercises in the classroom and two days in the Flint River surveying for fish and mussels. This workshop provided valuable information for identifying and surveying for freshwater mussels in the ACF River Basin.

Striped Bass Management Plan Meeting

Greg Moyer traveled to Wakulla Springs on August 22-25, 2011 to discuss the need to update the 5 Year Plan for striped bass management. During the meeting, several workshops were held to discuss the future goals of managing striped bass. It was decided to actively collect data and think of innovative ways to answer the questions on the proper management of striped bass. CGL has been the sole genetics resource for aiding managers in the continual stocking of striped bass into the surrounding southern states. Greg played a critical role in emphasizing the importance of having a genetic component in any management plan implemented.

Shortnose Sturgeon Protected Species Permit Meeting

William Wayman and Vincent Mudrak (RFC) traveled to Orangeburg National Fish Hatchery to discuss National Marine Fisheries Service's Protected Species Permits with Willie Booker (Orangeburg NFH), Allan Brown (Warm Water Hatchery Program Supervisor), and Cindy Williams (Fisheries Management Assistance Program Supervisor). The discussions centered on Orangeburg's application for a Protected Species permit for shortnose sturgeon. The new permit would transfer oversight of shortnose sturgeon at Orangeburg from Warm Springs to the new Orangeburg permit. This would simplify end-of-year reporting procedures.



Shortnose sturgeon. USFWS Photo

Chester Figiel, Jr., attended the 2011 Joint Meeting of Ichthyologists and Herpetologists in Minneapolis, Minnesota on July 6 – 10, 2011. Chester gave an oral presentation titled "Experiments on the Cryopreservation of Sperm from the Axolotl, *Ambystoma mexicanum*" during the symposium Assisted Reproductive Technologies and Genetic Resource Banking: Tools for Conserving Declining Amphibians.

JMIH Logo. Kevin Wang/JMIH Photo

Southeastern Fishes Council Meeting

Greg Moyer and Ashantyé Williams attended the annual Southeastern Fishes Council meeting held in Athens, GA on November 11 and 12, 2010. Greg presented a paper on the past and present processes that influence a natural population of Atlantic sturgeon. He described the use of microsatellite markers to estimate the effective population size and the effective number of breeders and used mark-recapture data to estimate the number of spawners for Atlantic sturgeon in the Altamaha River. With this data, he was able to estimate that the population experienced a significant reduction in its effective population size due to severe over-exploitation and/or habitat degradation. During the meeting, Ashantyé networked with Mark Cantrell, Asheville Ecological Services Office, to discuss on-going collaborative projects. She also met with Beth Cushman and other staff from South Carolina Department of Natural Resources to discuss American shad projects. Beth presented a poster on using genetics to characterize the population dynamics of an American Shad population in the Edisto River.

Annual Georgia Chapter of the American Fisheries Society Meeting

Nicole Rankin attended the Annual Georgia Chapter of the American Fisheries Society Meeting in Perry, GA on February 2 and 3, 2011. Over 100 people attended the conference at the Georgia National Fairgrounds and Agricenter. The first meeting day was packed with student and professional technical presentations. As a change this year, non-technical presentations were scheduled to help increase the diversity of presenters. During the business meeting, Nicole was chosen as a member of the Executive Committee and is the lead for designing and updating the GA Chapter website.

Outreach

Staff from the Warm Springs Fish Technology Center and the Fort Benning Ecological Services Office manned a booth at the Chattahoochee Watershed Festival in Columbus, Georgia on October 16, 2010. Bill Bouthillier and Mike Hassett staffed the most popular attraction: a turtle and crayfish touch tank. Several thousand children filtered through the booth, touched or handled crayfish and turtles, and received temporary tattoos. The watershed festival is the finale to the city's annual Help the Hooch day. Over 10,000 volunteers came together to help clean up trash along the banks of the Chattahoochee River and some of its tributaries. Last year volunteers removed over 150,000 pounds of litter.

Mike Hassett (SCA intern), Cody Meshes (Youth Ambassador), Nicole Rankin, Rosla Plant, and Allison Hernandez (RFC) participated in the 2010 Chattahoochee Council Boy Scout Fall Encampment held at Camp Lumpkin on November 6, 2010. This biennial event gives scouts a chance to experience new and different things, see displays and demonstrations, and spend a weekend camping with family and friends. The staff and volunteers set up a booth showcasing the U.S. Fish and Wildlife Service, aquatic animal and habitat conservation, fishing, recycling, and backyard composting. A touch tank with crayfish and turtles and an aquarium with lake sturgeon fingerlings were the major attraction for kids. Also on display was a Scouting Opportunities poster, created by Mike Hassett, and showcased the many ranks and badges scouts can earn while utilizing the Warm Springs RFC. Over 300 scouts, parents, and leaders participated in this event that celebrated 100 years of scouting. After filing through the Warm Springs booth, each scout received a reusable grocery bag, a reusable water bottle, energy and wetlands activity book, and additional handouts.

Mike, Allison, Rosla, Cody, and Nicole at the event. USFWS Photo

Warm Springs RFC staff and Friends of the Warm Springs National Fish Hatchery (Friends') participated in the Warm Springs Candlelight Festival Township on November 20, 2010. This annual festival begins the holiday celebration in Warm Springs, GA and includes candlelit streets and shops, a township parade, a candlelight tour run, and other holiday events. Rosla Plant (RFC), Devin Chappell (Fish Health Center), Jaci Zelko (RFC), Nicole Rankin, Mike Hassett (SCA intern), Cody Meshes (Youth Ambassador), Kara Brown (SCA intern), Mike Plant (Friends'), and Frida Powers (Friends') participated and either walked, rode on a decorated electrofishing boat, or drove the government truck in the Candlelight Festival Township Parade. Over five hundred children and adults watched the parade, were given candy, and encouraged to visit the facility. Parade viewers were also excited to see the Warm Springs mascots, which were two fish costumes donned by volunteers.

The staff and Friends members pose for a group photo before the parade starts. USFWS Photo

Chester Figiel, Jr., Nicole Rankin, and Mike Hassett attended the Manchester High School Career Day, Manchester, GA on Feb 11, 2011. They set up a career display with information highlighting the majors needed, SCEP and STEP programs, and job requirements for different positions in the U.S. Fish and Wildlife Service. They brought a tank with several lake sturgeons as a mechanism to gain student interest and then would talk to them about their future plans. Students grades 9 – 12 were brought through the gymnasium to learn about potential careers and college opportunities. Several students expressed an interest in science and more specifically, wildlife and fisheries science.

It was great weather for viewing a variety of birds during the 2011 Great Backyard Bird Count held at Warm Springs on February 19 and 20, 2011. Jaci Zelko, Cody Meshes (Youth Ambassador), and Frida Powers-Coates (Friends' Group) set up a booth to help participants with identification and data collection during the event. Some of the birds observed on station were purple martins, turkey vultures, red-bellied woodpeckers, Northern mockingbirds, American crows, tree sparrows, European starlings, and several others. This was a great event to get the public involved with bird counts. The bird counts are compiled by the Cornell Lab of Ornithology and will help scientists document the complex distributions and movements of many bird species.

Nicole Rankin participated in "Agricultural Week" at the West Point Georgia Visitors Center by providing a static booth that was displayed March 15 – March 20, 2011. Throughout the week, visitors could obtain information about the U.S. Fish and Wildlife Service, the Warm Springs Regional Fisheries Center (RFC), fish and fishing, and ways to improve your backyard habitat.

Ashantyé Williams and Cindy Williams, R4 Fisheries Program Supervisor, traveled to Tennessee Tech University, Cookeville, TN during March 16 – 17, 2011. The University's Student Fisheries Association graciously invited them to speak with the group on pursuing federal jobs. Cindy discussed job information in a presentation entitled "I Got A Degree, Now Give Me A Job!" During this hour long presentation, Ashantyé shared her personal experience with obtaining a degree and the route she took in order to obtain her current position. Cindy was trying to promote to the students, especially minorities, that there are jobs for everyone. During the presentation, Cindy mentioned the importance of a good resume and the trials and tribulations of tackling the USAJOBS website. This visit was just one of several that Cindy and Ashantyé plan in order to promote federal jobs for highly educated students. There is also hope to turn these presentations into a half day workshop at the Am erican Fisheries Society annual meeting. The U.S. Fish and Wildlife Service is trying to reach out to college students to increase interest and expand the skill set for employees the USFWS wishes to hire in the future.

While other students vacationed during Spring Break, Cody Meshes worked three, full days at the Warm Springs RFC on April 4 – 6, 2011. At the start of the week, Cody assisted the FTC with tank spawning striped bass by carrying fish and recording tag numbers. In the afternoon, he along with Chester Figiel, Jr. and Nicole Rankin searched for new Piedmont blue burrower sites in Warm Springs, GA. On Tuesday, Cody gave a tour to some fellow students from Manchester High School. His classmates learned about the fish raised at the Warm Springs NFH and wild and hatchery fish health inspections conducted by the FHC. The group also learned about the FTC programs including cryopreservation, conservation genetics, and amphibian and freshwater mussel conservation. Later that day, Cody assisted the FHC with dissecting wild fish health survey samples from Kentucky. On Wednesday, Cody and Chester again went searching for new crayfish sites in Meriwether County, GA. Once again, Cody proved a valuable asset to the Warm Springs RFC. We appreciate his dedication and hard work during his break from school!

Greg Moyer conducted an Earth Day program at the LaGrange Montessori School, GA for 45 preschoolers and teachers on April 18, 2011. He talked to the students about the importance of aquatic species and habitat conservation. He brought turtles, crayfish, salamanders, and an American alligator for the students to observe and touch. Overall, the preschoolers and teachers really enjoyed the visit!

The Warm Springs RFC and Fort Benning Ecological Services Office (FBESO) participated in the 2011 Earth Day Festival at Faith Middle School on Fort Benning, GA on April 21, 2011. More than 500 children and teachers from the seven Fort Benning schools learned about the U.S. Fish and Wildlife Service Fisheries Program, aquatic species biology and conservation, and environmental stewardship. Nicole Rankin, Allison Hernandez (FHC), and Sandy Spivey (FBESO) handed out educational materials, explained fisheries restoration in regards to lake sturgeon, and manned the touch tank filled with crayfish, salamanders, and turtles.

Nicole Rankin and Mike Hassett participated in the 2011 Scout Expo held at the Columbus Convention and Trade Center in Columbus, GA on May 14, 2011. Over 200 scouts and parents attended the event and learned about scouting activities across the southeast region. Nicole and Mike set up a booth highlighting scouting opportunities at the Warm Springs Regional Fisheries Center. Since the event, three scout groups have contacted the RFC and scheduled scout activities including group tours and Biologist-in-Training programs.

Mike answers questions. USFWS Photo

The Warm Springs RFC and Friends Group hosted the 2011 Kids Fish for Fun Day to teach children the enjoyment of fishing. Six FTC employees and one SCA intern helped staff this event held on June 4, 2011. This year, over 150 children participated and had the opportunity to catch and take home five catfish. William Wayman, Nicole Rankin, Greg Moyer, and Chester Figiel, Jr. greeted and registered participants at the Pre-Registration and On-Site Registration tables. Jaci Zelko, Ashantyé Williams, and Mike Hassett manned the touch tanks housed with crayfish, small turtles, salamanders, and frogs. While children and parents waited to fish, they learned more about the aquatic wildlife found in local streams and ponds in Georgia. Thanks to the Friends Group for providing food, beverages, t-shirts, and prizes for this event.

The annual Kids Fish For Fun Day is always a big hit! USFWS Photos

Nicole Rankin, Ashley Aultman (Roosevelt's Little White House Historic Site), and Stephanie Hunczak (FDR State Park) offered three-day Junior Ranger Camps on June 14 – 16 and June 21 – 23, 2011. Twelve children (five children in the first session, seven in the second session) participated in the camp sessions held in Warm Springs and Pine Mountain, GA. The children learned about Franklin D. Roosevelt and his hobbies at the Roosevelt's Little White House, aquatic biology at the Warm Springs RFC, and outdoor recreation at the FDR State Park. Junior Rangers learned about fish anatomy, aquatic food webs, and stream and pond habitats while at the Warm Springs RFC. This year, junior rangers also learned how to tie fishing knots, cast spinning rod/reel combos, and fish for blue gill! Other camp activities included a geology walk scavenger hunt, stream aquatic life sampling, nature hikes, nature crafts, and sailboat racing. Junior rangers received patches and certificates during a ceremony held at the FDR State Park on the last day.

Jr. Ranger Camp participants sail boats and look for critters. USFWS Photos

Mike Hassett, Nicole Rankin, and Sarah Edgar (FTC volunteer) participated in the 2011 Georgia On My Mind Day at the West Point Visitor Center, West Point, GA on June 17, 2011. This one-day event increases awareness of the importance of travel and tourism in the state of Georgia. Over twenty vendors set up displays focusing on travel destinations, ecotourism, and upcoming events. Nicole, Sarah, and Mike provided information on upcoming events at the Warm Springs RFC and handed out brochures highlighting career and volunteer opportunities with the U.S. Fish and Wildlife Service. They also set up a touch tank with crayfish and turtles to emphasize the importance of aquatic species conservation.

The Warm Springs Regional Fisheries Center hosted a visit for 48 children and adults from the Faith Deliverance Super Summer Camp on June 27, 2011. Judy Toppins and Stacie Nesby from the Regional Office Fisheries Program along with Rosla Plant (RFC) and Nicole Rankin organized environmental education activities for the group. In the morning, children were separated into three groups and cycled through three activities: aquarium tour, fish and turtle biology, and "Design a Fish" craft bag activity. Following lunch, the children got in the stream and collected aquatic insects and salamanders and painted fish-print t-shirts. Even though the weather was a little dreary, the group enjoyed the visit and loved the chance to "Get Outside."

The Tech Center participated in the annual Warm Springs Open House on September 24, 2011. This event focused on promoting the USFWS mission, fisheries conservation efforts, improving communication with the local community, and encouraging people to become environmental stewards

in their community. FTC staff set up displays and computers to highlight cryopreservation, conservation genetics, and freshwater mussel research efforts. A 50-gallon touch tank with crayfish, salamanders, and turtles was the most popular attraction. William Wayman, Greg Moyer, Chester Figiel, Ashantyé Williams, and Jaci Zelko talked to over 250 people about the importance of conservation genetics and cryopreservation. The FTC was just one station that attendees could visit. Stations were also set-up for the Regional Fisheries Center, Fish Health Center, National Fish Hatchery, and Friends of the Warm Springs National Fish Hatchery. Once visitors got a stamp in their fish passport book from each station, they were eligible for door prize drawings.

FTC staff have a great time meeting the public at the Annual Open House. USFWS Photos

Workforce Management

Jaci Zelko transferred to the Fish Technology Center in February 2011. She previously worked at the FTC from 2003 to 2007 before transferring to the Warm Springs National Fish Hatchery. She is excited to be performing research, specifically cryopreservation, again. Jaci brings her extensive background and knowledge of intensive fish culture for many species including sturgeon, alligator gar, striped bass, and freshwater mussels. Jaci's new role is the lab manager for the Cryopreservation Laboratory, and her main duties will be fish culture, freshwater mussel cryopreservation, and lab coordination.

We were pleased to welcome a new volunteer to the Fish Technology Center - Sarah Edgar!!! She is a senior at Manchester High School. She is actively involved with the Dance Team, Academic Team, and Golf Team. *"Working as a volunteer at the Warm Springs National Fish Hatchery has been a brilliant experience. Over the last few months I have learned and done an assortment of things that have made me grow to love the hatchery. I have helped work with mussels, turtles, salamanders, crawfish, and a variety of fish. The real life experience I have gained here has magnified my understanding of sciences and, allowed me to grow as a person. I am so pleased to be a volunteer at The Warm Springs Fish Technology Center." –Sarah Edgar*

Nicole Rankin attended the training course "Natural Channel Design Review Methodology" at the National Conservation Training Center during October 12 – 15, 2010.

Bill Bouthillier, Chester Figiel, William Wayman, and Greg Moyer attended a financial planning for government employees session on October 13, 2010. This session covered all aspects of retirement planning for all employees within the Federal Employee Retirement System.

Chester Figiel, William Wayman, and Ashantyé Williams attended the American Heart Association's Heartsaver First Aid Course on October 20, 2010.

William Wayman, Greg Moyer, and Chester Figiel completed the mandatory training "Hiring Reform for Supervisors, Managers, and HR Professionals" before the October 29, 2010 deadline.

William Wayman represented the Regional Fisheries Center on the Region 4 Fisheries Budget Team. The team met on November 30 and December 1, 2010 to attempt to develop a budget for FY 2011. The process begins by sending out budget request sheets to each Fisheries office. These sheets are then collected and evaluated against a predicted Regional Fisheries budget. The team then makes recommendations to the Assistant Regional Director for Fisheries on how best to meet the predicted budget based on the requests submitted.

Chester Figiel, Jr. participated in the NCTC webinar "Climate Vulnerability Analysis for Amphibians and Reptiles" presented by Kyle Barrett on December 1, 2010.

Chester Figiel, Jr. participated in the two-day U. S. Forest Service webcast, "Understanding and Adapting to Climate Change in Aquatic Ecosystems at Lands cape and River Basin Scales: A Decision Support Workshop for Integrating Research & Management" on February 28 and March 1, 2011.

William Wayman attended the Applied Supervision class at NCTC from August 15-19th. The class centered on effectively performing roles and responsibilities as Supervisors. Main areas of focus included: employee performance and conduct, communication skills, and creating a work environment conducive to high productivity.

Chester participated in the Scientific Writing for Publication course at NCTC on Aug 29 – Sept 2, 2011. He taught and mentored fellow biologists on how to improve their scientific writing so that it becomes clear, concise and interesting to the reader.

Mike Hassett completed his Student Conservation Association internship at the FTC in late June 2011. His responsibilities included performing animal husbandry; assisting with striped bass spawning; assisting with rainbow trout, pallid sturgeon, and other cryopreservation projects; developing a project to detect triploid versus diploid grass carp; and helping with numerous outreach events. Mike had the unique opportunity to work at numerous USFWS facilities including the Fish Health Center, Warm Springs NFH, Warm Springs RFC, Bears Bluff NFH, Erwin NFH, and Private John Allen NFH. Mike gained valuable work experience during his time in Warm Springs, and recently, he was selected for a research assistantship at Loyola University Chicago while pursuing a Master of Science degree in Biology. Before coming to Warm Springs, Mike graduated from Michigan State University with a Bachelor of Science in Fisheries and Wildlife. Good Luck and Thanks Mike! We appreciate your hard work and wish you good luck in with your graduate work.

Nicole M. Rankin has accepted a new position within the Service, and her last working day at Warm Springs was August 11. She is working in the Refuge Inventory and Monitoring Program as the new coastal ecologist and is located at Cape Romain NWR in Awendaw, South Carolina. She is working with South Atlantic Landscape Conservation Cooperative (LCC) refuges' staff to help identify monitoring needs, design consistent surveys for multiple refuges, implement monitoring protocols, and provide timely data analysis. She is also helping to coordinate a project that will monitor the effects of sea level rise across coastal refuges within the SALCC. While at Warm Springs, she worked as a biologist and managed the National Fish Strain Registry database and website where she collected, compiled, standardized, and analyzed fish strain information. She also planned and participated in field investigations, collecting and inventorying fish and freshwater mussels, and conducted age and growth studies on threatened and endangered freshwater mussel populations, including fat threeridge, oval pigtoe, and purple bankclimber mussels. Before working with the Service, Nicole worked for one year as a Knauss Marine Policy Fellow at NOAA's Office of Ocean Exploration and Research coordinating international and domestic multidisciplinary expeditions that explored and investigated extreme ocean ecosystems including hydrothermal vents and hydrocarbon seeps. Nicole earned her Master of Science in Biology (May 2007) from the University of West Florida with a thesis titled "The role of World War II era shipwrecks, ranging in depth from 84 to 1,964 m, as artificial reefs by fishes in the northern Gulf of Mexico."