

Panama City Fisheries Resources Office FY 2003 Annual Report



Panama City Fisheries Resources Office participated in the "Junior Angler's Fishing Rodeo" held at the Panama City Marina.

ANNUAL REPORT

FISCAL YEAR 2003

**U.S. FISH & WILDLIFE SERVICE
FISHERIES RESOURCES**

**PANAMA CITY FIELD OFFICE
PANAMA CITY, FLORIDA**

Organizational Code: 41310

INTRODUCTION

The Bureau of Sport Fisheries and Wildlife established a field office in Panama City, Florida, in 1968. The office was shared by Fishery Research, Fishery Services, and Law Enforcement. The focus of the Fisheries Office was restoration of Gulf of Mexico anadromous fish stocks, especially Gulf strain striped bass. Other program priorities have been developed since the office was established. These currently include: providing technical assistance for the management of fishery resources on Federal lands in Florida and Georgia (1970s); restoration and recovery of Gulf sturgeon (1980s); ecosystem monitoring on Eglin Air Force Base (Eglin) (1999); Partners for Fish and Wildlife (2000); and freshwater mussel restoration, recovery, and conservation (2002).

In January 1987, the Fisheries Resources Office (FR) was reorganized as a combined office with Ecological Services (ES) under one Project Leader at the Panama City Field Office (PCFO). Since that date, both programs have benefited by pooling the office's resources to implement the mission of the U.S. Fish and Wildlife Service (USFWS). During FY03, the fisheries staff was reduced as one biologist (Laura Jenkins) began working intermittently. This position, Recreational Fisheries Biologist, was not filled due to budget constraints. Currently, the staff consists of five biologists, two student conservation association interns, one office assistant and other support staff shared with ES (Table 1; Figure 1). PCFO is located at 1601 Balboa Avenue, Panama City, Florida 32405. Contact PCFO by phone at (850) 769-0552 or by fax at (850) 763-2177.

Table 1. Panama City Fisheries Resources Office Staff during FY 2003.

Staff Name	Status	Program Lead
Holly Blalock-Herod	FTE	Freshwater Mussel Recovery and Restoration
Gail Carmody	FTE*	Project Leader
Jason Dickey	SCA Intern	Technical Assistance Fisheries–Aug. 2002 to Aug 2003
Jeffrey Herod	4-yr Term	Eglin, Ecosystem Monitoring Using Fishes
Kelly Huizenga	SCA Intern	Technical Assistance Mussels – Sept. 2003 to current
Bob Jarvis	FTE*	Biological Technician
Laura Jenkins	INT**	Striped Bass Restoration
David LaPlante	SCA Intern	Technical Assistance Eglin – June 2003 to current
Chris Metcalf	FTE	Partners for Fish and Wildlife
Frank Parauka	FTE	Gulf Sturgeon Recovery
Barbara Stanley	FTE	Office Automation Assistant
Theresa Thom	SCEP	Eglin, Ecosystem Monitoring Using Aquatic Insects

* Indicates FR staff shared with Ecological Services.

** Intermittent



Figure 1. PCFO staff. Back Row, left to right: Hildreth Cooper (ES), Patty Kelly (ES), Holly Blalock-Herod (FR), Mike Brim (ES), Stan Simpkins (ES), Gail Carmody (ES/FR Project Leader), Chris Metcalf (FR), Frank Parauka (Fr), Barbara Stanley (FR), Jeffrey Herod (FR), Kathy Hoffmaster (ES), Jerry Ziewitz (ES), Bill Lynn (ES), Connie Bowman (Contractor), Mary Mittiga (ES), Jon Hemming (ES), Paul Lang (ES), Denise Hinegardner (ES). Front Row, left to right: Wendy Gierhart (ES), Janet Mizzi (ES – Assistant Project Leader), Lorna Patrick (ES), Laura Jenkins (FR). (Photo taken at Florida State University Ed Ball Marine Laboratory, November 2003).

HIGHLIGHTS FOR FY 2003

1. Continued a 3-year threatened Gulf sturgeon population estimate in the Escambia River, Florida and conducted presence-absence surveys in 4 other Florida river systems and 1 bay.
2. Five juvenile Gulf sturgeon collected, near the mouth of the Choctawhatchee River, Florida, were equipped with sonic tags and monitored while over-wintering in Choctawhatchee Bay.
3. Continued to examine Gulf sturgeon marine habitat use.
4. Implemented Gulf Striped Bass Restoration Plan by coordinating the 20th Annual *Morone* Workshop, leading the technical committee, transporting broodfish, and

- coordinating the stocking on the Apalachicola-Chattahoochee-Flint (ACF) river system.
5. Over 73,000 Phase II Gulf striped bass were marked with sequential coded wire tags and stocked in the Apalachicola River. Post-stocking evaluations were conducted at 31 sites.
 6. Three stream fisheries assessments were completed to evaluate the fish community at sites slated for habitat restoration by the Partners for Fish and Wildlife Program (PFW).
 7. PFW program identified restoration needs and opportunities for 10 areas.
 8. Developed an Unpaved Road Evaluation Handbook.
 9. Completed restoration of Chipola River Greenway, Seibenhener Streambank Restoration, Blackwater River State Forest, and Anderson Property.
 10. Assessments for fluvial geomorphic conditions for design criteria were completed for 3 projects.
 11. Geomorphology in Florida streams initiated development of Rosgen regional curves for Northwest Florida for use by the Florida Department of Transportation.
 12. Developed a Memorandum of Understanding between partners for enhancing, protecting, and restoring stream, wetland, and upland habitat in northwest Florida.
 13. Completed aquatic fauna and fish surveys with new emphasis on integration of data from reach level into watershed and landscape scale and keeping database current.
 14. Compliance based sampling of impaired waterbodies on Eglin Air Force Base in conjunction with Florida Department of Environmental Protection for Total Maximum Daily Load development support.
 15. Surveyed 20 sites for the federally endangered Okaloosa darter, provided habitat descriptions, worked with partners to implement key recovery tasks and set priorities for restoration.
 16. Worked with partners to develop a freshwater mussel survey protocol to provide standard operating procedures for establishing the presence/absence of federally listed mussel species within a Federal project area.
 17. GIS database was created to identify all known freshwater mussel records from the northeast Gulf ecosystem.
 18. Completed recovery plan for seven freshwater mussels and drafted candidate elevation package for seven additional mussels. Developed proposals to implement recovery plan.
 19. Worked with Corps of Engineers and State partners to develop improved reservoir operating policies to benefit both riverine and reservoir fisheries for the ACF river system.
 20. Multiple outreach projects were completed to detail aquatic resources conservation opportunities.
 21. Multiple stream restoration and watershed management projects initiated or completed (see Appendix A).

PROGRAMMATIC OPERATIONS

I. Gulf Sturgeon Recovery

Gulf Sturgeon Population Survey in the Escambia River, Florida

The Gulf Sturgeon Recovery/Management (GSRM) Plan emphasizes that the knowledge of Gulf sturgeon distribution and relative abundance are important components in evaluating the success of recovery and management programs. The first year of a three year Gulf sturgeon population survey was conducted in the Escambia River from October 2 through November 5, 2002, to coincide with the species fall migration from freshwater to the marine environment. Gulf sturgeon were captured from dawn to dusk using four sinking gill nets (8 ft to 20 ft deep; 140 ft to 250 ft long; 5 in to 14 in stretch mesh) set perpendicular to the river bank, covering about 75% of the river (Figure 2). In addition, drift gill nets were used on occasion to capture fish. A houseboat anchored at the netting site provided a base of operations and living quarters for personnel conducting the survey. All sturgeon captured were weighed and measured (fork length and total length). Each fish was tagged with a Passive Integrated Transponder tag (PIT) injected into the tissue at the base of the dorsal fin, and T-bar anchor tags attached to both pectoral fins.

Normal daily stream flow discharge for the Escambia River in October is 2,000 to 3,000 cubic feet per second (cfs). During the sturgeon survey, several tropical storms and heavy rain events resulted in stream flow discharges above 35,000 cfs on several occasions, and rarely were discharges under 8,000 cfs during the period. Only 12 fish were collected in the set gill nets however, 35 fish were collected using drift nets. The fish ranged in weight from 1 to 103 pounds. The population of Gulf sturgeon in the Escambia River was estimated at 687 fish using the NOREMARK program (95% Confidence Interval: 316.3-1057.7).

Recommendations:

- A. Conduct second year of the Gulf sturgeon population study in the Escambia River drainage.***

Gulf Sturgeon Investigations in Other River Systems

Gulf sturgeon were collected with sinking and drift gill nest in the Ochlockonee (N=22), Apalachicola (N=27) and Choctawhatchee (N= 23) rivers in FY 2003. The fish ranged from 2 to 140 pounds and measured up to 77 inches in length. A representative number of fish from each river system was equipped with external sonic tags (18 month battery life) attached to the base of the dorsal fin in order to monitor marine movement and habitat use FY04 (see Gulf sturgeon marine habitat use). Also, a Gulf sturgeon collected in the Ochlockonee River was equipped with an archival pop-off tag that records water temperature, depth, and light penetration (to calculate geo-location) and is expected to release from the fish during the first week of February 2004.

Recommendations:

- A. Continue to investigate river systems for the presence of Gulf sturgeon.***
- B. Describe habitat types that Gulf sturgeon are using.***



Figure 2. Rachel Semolinski and Laura Kovatch, Student Conservation Association interns, assisting with Gulf sturgeon population studies.

Gulf Sturgeon Trawl Avoidance Study

PCFO assisted researchers from the University of Southern Mississippi (USM); Louisiana Department of Fish, Wildlife and Parks (LA DFWP); National Marine Fisheries Service (NMFS); and other USFWS offices in Alabama and Louisiana in conducting a study to determine if Gulf sturgeon were susceptible as by catch during winter shrimp trawling operations. The Caretta, a 40-foot NMFS trawler, made several passes through areas in the Mississippi Sound offshore of Pascagoula, Mississippi where adult Gulf sturgeon equipped with sonic tags were located (Figure 3). A camera attached in the throat of the trawl recorded the forward progress of the trawl as it passed through designated Gulf sturgeon locations. No Gulf sturgeon were captured in the trawl or were recorded in the trawl camera. Furthermore, triangulation telemetry monitoring of a Gulf sturgeon indicated that the fish moved away from the trawler on several successive trawling attempts to capture the fish.

Recommendations:

- A. Determine if subadult Gulf sturgeon are susceptible to capture during shrimp trawling operations.***



Figure 3. NMFS trawler “Caretta” was used to examine Gulf sturgeon avoidance of trawling operations.

Gulf Sturgeon Diet Studies

The majority of Gulf sturgeon feeding and growth occurs in the marine environment during the winter period. PCFO biologists assisted University of Florida researchers in collecting Gulf sturgeon in Alaqua Bayou, Choctawhatchee Bay, Florida in April 2003. Five Gulf sturgeon weighing from 10-135 pounds were captured using stationary sinking gill nets. Food items were extracted from the fish using a non-lethal lavage procedure. PCFO biologists conducted a follow-up study in the eastern portion of Choctawhatchee Bay in May 2003. Thirty-two fish weighing from 1.5 to 57 pounds were collected using stationary gill nets. Eleven of 14 fish subjected to the lavage procedure yielded food items. Preliminary analysis of the food items indicated that Gulf sturgeon collected in both areas were feeding primarily on amphipods and lancelets. All fish were released without any ill effects following the procedure.

Recommendations:

- A. Examine and identify benthic invertebrate assemblages in areas known to support over-wintering populations of Gulf sturgeon.***

Gulf Sturgeon – Historic and Current Information

Gulf sturgeon are found in a number of large river systems from Louisiana to Florida; however, very little is known about the distribution of these fish outside the large watersheds. In addition, even in these watersheds (> 100 miles in length) the fish may occupy only several discrete areas during the summer and are largely unnoticed by researchers. Furthermore, the upper reaches of the river systems and numerous tributaries are not thoroughly investigated for Gulf sturgeon due to limited personnel and time constraints. The PCFO initiated a study seeking historic and current Gulf sturgeon information in largely uninvestigated areas. Over 100 signs requesting Gulf sturgeon information were placed at boat ramps and high use areas in Florida, Alabama, Mississippi, and Louisiana (Figure 4). USFWS personnel from Daphne, Alabama, and others from LA DFWP, USM, Mississippi State University, and Troy State University (TSU) assisted with placing the signs.

Although response to the Gulf sturgeon information request has been limited, several reports were noteworthy. These included recent Gulf sturgeon sightings in the Mobile Delta, Intercoastal Waterway near Orange Beach, Alabama and a number of reports from anglers fishing off Panama City Beach, Florida piers indicating that Gulf sturgeon were swimming along the Gulf coast.

Recommendations:

- A. Continue to document Gulf sturgeon historic and current information.***



Figure 4. Signs were posted requesting historical and current Gulf sturgeon information.

Juvenile Gulf Sturgeon Movement and Habitat Use

Gulf sturgeon over-winter in the marine estuaries, bays, and the Gulf of Mexico. It is during the over-wintering period in marine waters that most of the feeding and growth occurs for Gulf sturgeon. Documenting the marine habitat use of Gulf sturgeon is a priority task identified in the Gulf Sturgeon Recovery/Management Plan, and very little information is available regarding the over-wintering behavior of juvenile Gulf sturgeon. Five juvenile Gulf sturgeon, weighing from 2 to 4 pounds, were collected with sinking gill nets near the mouth of the Choctawhatchee River in December 2002. The fish were equipped with 12-month battery life sonic tags at frequencies 31 to 35 kHz. The fish were monitored for six months with all fish relocated at least once. Three of the fish over-wintered in the eastern part of the bay within 2.5 miles of the river mouth. Two fish were located 10 to 15 miles away from the capture location, but still within Choctawhatchee Bay. All fish were located in near-shore habitat consisting of sand or mud in less than nine feet of water. Salinity ranged from 0 at the river mouth to 1.5 ppt at the location of the fish furthest from the capture site. In May 2003, one fish was located in the Choctawhatchee River at a known Gulf sturgeon summer resting area. This location is about 30 miles upstream from the bay and original tagging area.

Recommendations:

- A. Continue to gather information regarding the over-wintering period for juvenile Gulf sturgeon.***

Gulf Sturgeon Marine Movement and Habitat Use

Priority action items identified in the GSRM Plan include identification of estuarine and marine habitat used by Gulf sturgeon. Three Gulf sturgeon (Apalachicola River - N=2, Yellow River - N=1) were equipped with pop-up archival tags in October 2002 in an effort to document Gulf sturgeon movement and habitat use during the over-wintering period in marine waters. It is during the over-wintering period in marine waters that most of the feeding and growth occurs for Gulf sturgeon. The pop-up tags were attached to the base of the dorsal fin with 100-pound monofilament line. The tags record water temperature, depth, and light penetration (to calculate geo-location) and were set to release from the fish during the first week in February 2003. Upon release, tag data are transmitted to a satellite. In addition to the pop-up tag, each fish was equipped with an external sonic tag to verify the presence, and continue monitoring movement of the fish once the pop-up tag was released.

Two pop-up tags (Apalachicola River) transmitted location data only while the remaining tag (Yellow River) did not respond. One pop-up tag surfaced in the Gulf of Mexico about one mile offshore of Tyndall Air Force Base, which is a known area for Gulf sturgeon over-wintering. This fish was located by its sonic tag signature and was monitored prior to and after its pop-off tag was released. The other pop-up tag surfaced in the Gulf of Mexico about 4 miles offshore near the mouth of the Ochlockonee River. The presence of the fish associated with this tag could not be verified by sonic signature

detection. Two other Gulf sturgeon, one from the Choctawhatchee River and one from the Apalachicola River, were located in the Gulf of Mexico off Tyndall Air Force Base. These fish were from 0.5 to 1 mile from shore in water depths ranging from 12 to 20 feet. The fish from the Choctawhatchee River was located in the same area used during the previous winter.

An additional study to provide information regarding Gulf sturgeon marine movement was initiated in November 2002. Sonic receivers and data loggers were placed on piers in Panama City Beach, Florida and Gulf Shores, Alabama in an effort to record coastal movement of sonic tagged Gulf sturgeon. The study was terminated within three weeks after heavy seas knocked the hydrophones off pier supports at both sites. No data were obtained from either site.

Recommendations:

- A. Continue to monitor Gulf sturgeon marine movement patterns and characterize habitat use.***
- B. Develop report or peer-reviewed publication to disseminate results.***

Gulf Sturgeon Restoration and Recovery Coordination

PCFO participated in a Gulf Sturgeon Workshop hosted by USM, where Federal, State and university researchers presented technical and scientific information regarding current Gulf sturgeon studies. In addition, the workshop stressed the need to address the priority action items identified in the GSRM Plan in order to achieve successful recovery of the species. Tissue samples (N=13) from Gulf sturgeon captured in the Escambia River were submitted to USM researchers to evaluate population level genetic diversity and divergence of Gulf sturgeon that return to Florida, Mississippi, and Louisiana freshwater river systems. Also, USM researchers accompanied PCFO biologist during the Gulf sturgeon population survey on the Escambia River. USM researchers removed external parasites from captured Gulf sturgeon for identification and classification. PCFO assisted other biologists from Florida Aquatic Preserves, Florida Department of Environmental Protection (FDEP), and U.S. Geological Survey (USGS) in conducting Gulf sturgeon investigations in the Yellow River, Florida.

Recommendations:

- A. Continue to provide partners with technical assistance to further Gulf sturgeon recovery.***
- B. Request final reports from partners.***

II. Striped Bass Restoration

Apalachicola-Chattahoochee-Flint River System Striped Bass Restoration and Coordination

Gulf of Mexico striped bass restoration activities are guided by the Apalachicola-Chattahoochee-Flint (ACF) River System Restoration and Evaluation Plan that implements the ACF Cooperative Agreement. The ACF Cooperative Agreement is a component of the Gulf States Marine Fisheries Commission (GSMFC) Gulf Striped Bass Fishery Management Plan. As part of this partnership restoration effort, PCFO coordinates many activities including: 1) an annual meeting with the cooperating agencies in order to report progress and to discuss stocking goals and future directions, 2) stocking strategies and implementation of the stocking plan, and 3) transportation of broodstock collected by State resource agencies in Florida and Georgia.

PCFO also serves as the lead for the ACF striped bass technical committee which meets annually to discuss status of plan implementation and is a member of the GSMFC Anadromous Fish subcommittee. Copies of minutes from the annual *Morone* Meeting or the ACF striped bass technical committee are available at PCFO.

Recommendations:

- A. Continue to participate in the annual Morone meetings and provide technical assistance as staff time permits.***
- B. Continue to lead the ACF technical committee.***

Hatchery Product Evaluation of Phase II Gulf Striped Bass Stocked in the Apalachicola River, Florida

The USFWS signed a Cooperative Agreement in 1987, with the States of Alabama, Florida, and Georgia to restore a self-sustaining stock of striped bass in the ACF river system and to maintain the genetic integrity of the Gulf race striped bass. This agreement was established to restore and protect this depleted nationally significant inter-jurisdictional fishery resource. In FY00, over 7,900 Phase II fish were stocked with internal anchor tags. Over the last three years, total tag returns have amounted to 5% with movement documented in excess of 100 miles.

Between 2000 and 2003, approximately 2,735,035 Phase I and 450,405 Phase II striped bass were stocked. All hatchery fish were marked with OTC and all Phase II fish were marked with a coded wire tag (Figure 5). During FY 03, a total of 54 striped bass, 65 hybrid striped bass, and 3 white bass were collected during 20.4 hours of electrofishing to evaluate Gulf striped bass Phase II stockings (Figure 6). These catches equated to catch per unit effort (CPUE) values of 2.6 fish/hr for striped bass, 3.2 fish/hr for hybrid striped bass, and 0.15 fish/hr for white bass. CPUE of coded wire tagged stripers stocked as Phase IIs was 0.44 fish/hr or 0.40 fish/hr/100,000 stocked. Otoliths were removed from all other striped bass in an effort to detect oxytetracycline (OTC) marks applied to stripers stocked as Phase Is into Lake Seminole. Unfortunately these otoliths were

overexposed to sunlight and could not be accurately screened. Consequently, the relative contribution of wild spawned and Phase I hatchery fish to the catch could not be determined. This study will continue through FY08 to determine the relative contribution of Phase I, Phase II, and wild fish to the broodstock.

Recommendations:

- A. Find a means to hire a FTE fishery biologist to coordinate and implement striped bass restoration activities.***
- B. Continue fall evaluations of Phase I, Phase II, and wild striped bass to the broodstock.***
- C. Conduct a FY04 spring evaluation to compare cost/benefits of evaluation times.***



Figure 5. Laura Jenkins tagging Phase II Gulf strain striped bass at Welaka National Fish Hatchery.



Figure 6. SCA volunteer, Jason Dickey, capturing a Gulf strain striped bass.

Enhanced Passage of Striped Bass into Coolwater Habitat at Radium Springs, Georgia

The ACF River System supports the largest population of Gulf striped bass in the US, and as such, serves as the broodstock source for the entire Gulf region. This broodstock population is severely limited by the amount of cool water refugia available to adult fish during the summer months. Radium Springs, Georgia, is a major cool water spring on the Flint River to which access is currently blocked by a historic water control structure. During FY02, Ben Rizzo, the Northeast Region Fishway Engineer, was contracted to assess passage, and determine the most appropriate means for modifying the structure to maximize access to cool water habitats. An on-site visit to determine the feasibility of improving access to the spring was conducted. During FY03, Mr. Rizzo provided recommendations for providing fish passage, or other means to modify the structure or outflow channel to enhance thermal habitat conditions for striped bass at the site. Unfortunately, recommendations from this site visit were limited since Mr. Rizzo determined that thermal refuge habitat was not available for striped bass due to "No Flow" conditions from the spring. No flow conditions resulted from lowered ground water levels due to drought and groundwater withdrawals from large industrial and municipal wells in the Albany, Georgia area.

Recommendations:

- A. Re-evaluate situation at Radium Springs once the drought has ended.***
- B. Work with partners to reduce groundwater withdrawals.***
- C. Examine the Flint River for other cool water refugia and evaluate feasibility of striped bass using these habitats.***

III. Fishery Assistance on Federal Lands – Eglin Air Force Base Ecosystem Monitoring

Aquatic Ecosystem Adaptive Management Plan

Eglin Air Force Base (Eglin) is a 465,000-acre reservation that is home to one of the most unique and diverse aquatic faunas in Florida, including the endangered Okaloosa darter. The reservation contains 1,200 river km in diverse habitats ranging from nearly pristine to heavily impacted. Study plans examine the incorporation of a stepwise approach using fishes and insects to assess stream condition. Three indices used to evaluate fish communities as an indicator of aquatic health and thresholds for condition are being established based on existing conditions at “least impacted sites” (LIS). The four indices used for aquatic insects are: a diversity index, Index of Biotic Integrity, Florida Index, and EPT Index (referring to the three sensitive orders of insects; Ephemeroptera, Plecoptera, and Trichoptera). Quantitative samples of study reaches were evaluated for fishes and aquatic invertebrates. Databases were developed and integrated with Eglin's overall ecosystem management database. Peer review of the annual scope of work was obtained from the Eglin Working Group for Ecological Management (EWGEM) and managers at Jackson Guard. A final report outlining our recommendations for aquatic monitoring at Eglin is due in FY05. It will include calibrated and tested multimetric indices, measures of stream morphology, and a conceptual model to provide an understanding of what stream health should look like for Eglin stream systems. This program will provide adaptive approaches to assessing stream systems (Figure 7), staffing needs, a conceptual model, as well as providing options for long-term monitoring of stream ecosystem health (i.e., form and function).



Figure 7. Jeffery Herod (left) and a volunteer conducting stream assessments on Eglin.

Diversity Index Evaluation

Fishes and fish communities are strategically sampled across various strata, which have provided a gradient of results regarding species diversity (number of species and species contribution to individuals in sample), fishes utility to measure degradation, setting thresholds for reference conditions, and needs for elevating assessments to watershed level. Generally, there are observable areas within the sampling segment that have been disturbed and can be attributed to low species richness or measurable differences from expected types of species (e.g., absence of phytophillic spawners). Habitat degradation has been documented as extreme stream width, extreme depth reduction, absence of canopy cover, and braided channels. Raw scores for species diversity range from 0.5- 2.0. The interpretation for a score of diversity is imperfect, but does provide a rough measure of condition. The caveat is that diversity does not always equate with ecosystem health. An example of this problem is due to introduced species. A new species adds to the species richness and/or diversity, but these species may be devastating to ecosystem health by impacting native species. The recommendation is to develop an Index of Biotic Integrity, which incorporates numerical values, but these values are categorical. Categories include behavior and ecological understanding of reproduction, feeding, and general habitat needs.

Additional results indicate that fishes and fish communities may be sensitive to many of the suspect sources of degradation as well as certain habitat variables within the stream reach. An example of this is the species of *Elassoma* spp., Pygmy sunfish, which appears to have preference for slow flowing water that is acidic and contains numerous patches of aquatic vegetation or leaf litter (i.e., pine needles). Another example relates to a multi-species and habitat association. The species of *Elassoma* spp., *Lepomis marginatus* (Dollar sunfish), and *Fundulus escambiae* (Russetfin topminnow) have been collected together at several areas where overland sediment has been abated, but instream channel restoration is needed. The specific conditions in channel are extreme wetted width (2-3 times expected width), extreme decrease in depth (inches deep except for occasional pools), channel braiding, numerous emergent plant types, and extreme low flows. The project is still collecting data based on a power analysis. Data are being analyzed as the project continues. Future analysis will incorporate habitat-fishes associations to test observations for significance, such as principle components analysis (PCA).

The next step in this process is to determine current stream condition as it relates to reference conditions identified as healthy or deemed least impacted. Least impacted sites (LIS) are useful for conceptual designs, setting expectations for assessment communities, and determining measures of success for restoration projects. These sites are sought due to our current understanding that they have the form and that they function as healthy stream ecosystems. Conceptually, there are certain parameters beyond aesthetics that restoration attempts to integrate (i.e., form and function). The conceptual model was recommended by EWGEM as a worthy endeavor from which adaptive management of Eglin stream systems would be enhanced. Once LIS have been identified, a series of measurements that allow us to design a template for stream health will be sampled, and

long-term monitoring will be implemented. The template is applied to degraded sites slated for restoration and this template has value in that measures of success are identified and quantified. Additionally, LIS are needed for setting threshold values for fishes and fish communities. Developing thresholds allows the gradient of diversity scores to be stratified so as to set expected values for diversity across stream systems and among “health” categories (e.g., poor-fair-good). An example of this would be defining that 1st order streams have a range of 6-8 total number of species and diversity scores for good sites of 1.7-2.0, but 3rd order streams have a range of species from 12-14 and healthy 2nd order stream scores are the same as in 1st order streams.

Recommendation:

- A. Stratify data groups for analysis based on reference conditions and use scientific literature to estimate appropriate amounts of habitat types in alluvial stream systems.***

IBI Development

A multimetric index, which uses fishes and fish communities, is being developed as an alternative assessment tool for Eglin streams. The index of biotic integrity, or IBI, has been developed and implemented in many states. This tool supports the Clean Water Act by identifying areas that are meeting or failing to meet the “...fishable, swimmable...” standard. Literature review is in progress and currently has identified many sources for metrics to be tested, statistical methods for inclusion or exclusion of metrics, sampling considerations, and guidelines for scoring criteria. There are 30 sites sampled on Eglin. There will be a sample of approximately 30 more sites, 3 weeks of effort, which will be focused on LIS sites.

Recommendations:

- A. Continue with process to identify LIS through abiotic variables at the watershed level through remote sensing and GIS and then sample these areas to define thresholds in diversity and species compositions.***
- B. Use abiotic watershed variables and statistically test covariation or redundancy among metrics to be used in IBI.***

Okaloosa Darter Recovery on Eglin

A fishery biologist at Eglin has taken on the duties of coordinating recovery tasks for the Okaloosa darter. The coordination effort is focused on the following activities; Habitat Restoration, Threat Assessment and Model Building, Okaloosa Darter Coordination, and Okaloosa Darter Monitoring.

Habitat Restoration. The vast majority of the range of the endangered Okaloosa darter is on Eglin. At Eglin, managers requested identification of stream restoration needs to enhance recovery of Okaloosa darter populations. These restoration needs were reviewed and discussion was initiated about potential restoration sites, prioritization of tasks, ground-truthing and identifying other needs. Active coordination has led to restoration of

numerous, highly eroded sites and the acknowledgement of the need to restore hydrology and minimize erosion at road crossings. Additionally, habitat fragmentation and alteration is occurring at road crossing structures that are improperly implemented or designed for the particular stream area. To abate these threats, fish passage projects are being designed with a new consciousness about how road crossings interact with stream channels so as to promote stream ecosystem health (Figure 8).

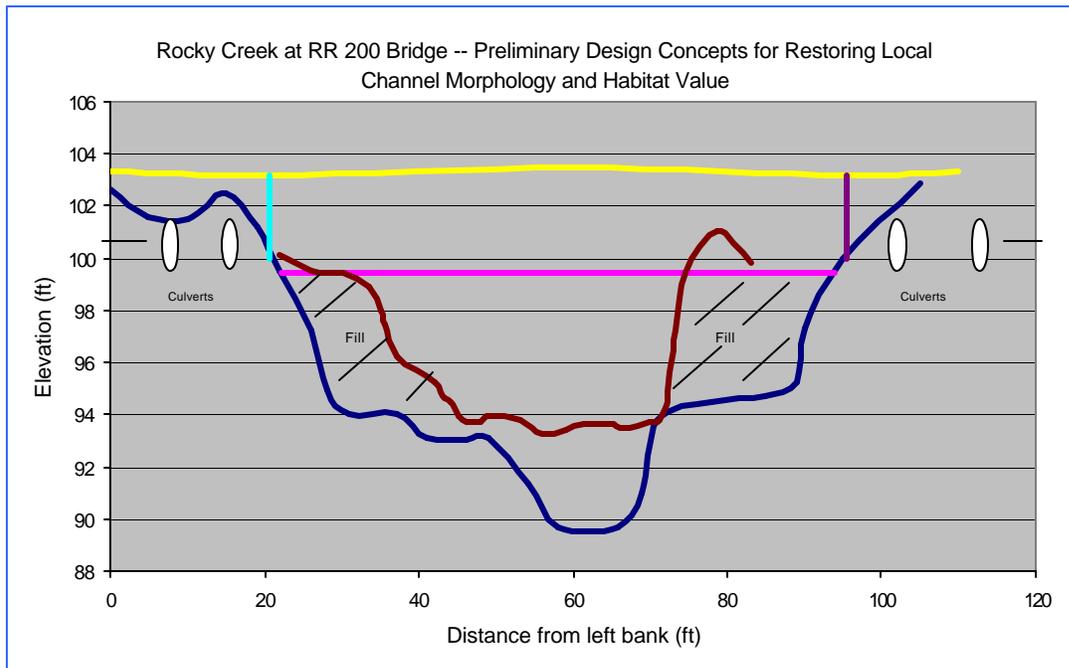


Figure 8. Example of channel morphology measured at a restoration area.

Threat Assessment and Model Building. PCFO at Eglin assisted partners in the development of a set of models that: 1) examine the relationships of darter populations and habitat variables within stream reaches, and 2) incorporates landscape variables into a meaningful threat scale and suggests a ranking of catchments for threat abatement for Okaloosa darter recovery. Data layers incorporated into the models include variables such as population demographics, substrate type, impervious surface, fire history, and habitat specifics (e.g., water chemistry, road crossing structure type). Preliminary versions of the second model examined the scores and the differences in model outputs when using submodels or an additive process during model construction. The second model is prescriptive in nature and allows managers to address management needs based on effort needed within a watershed (Figure 9). This technical tool will provide an additional option to Eglin by evaluating threats to the Okaloosa darter and its habitats and by providing a more efficient process to implement management activities associated with the recovery of this species.

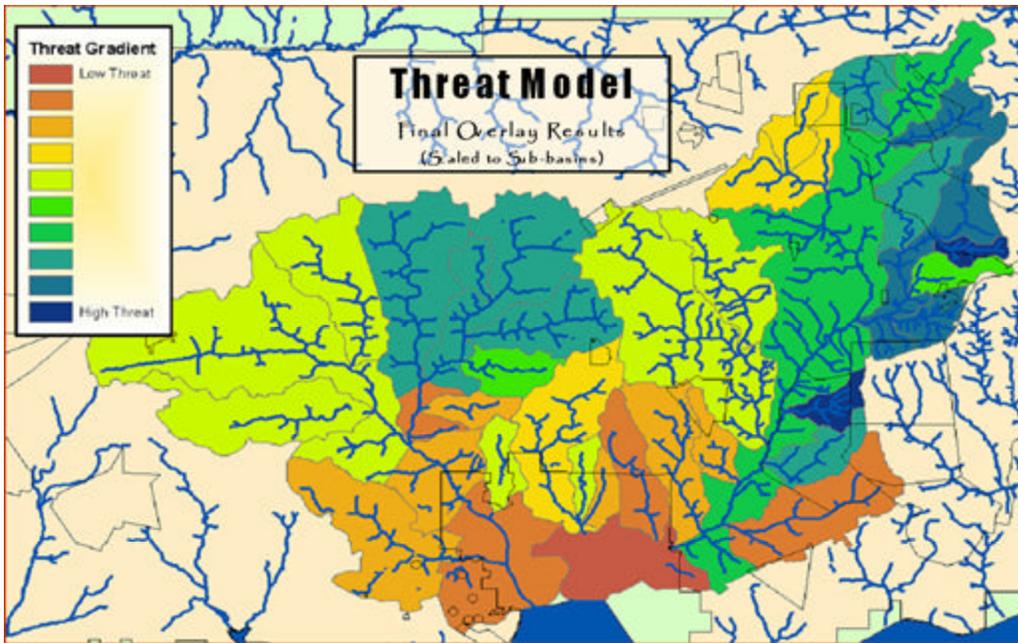


Figure 9. Watershed level analysis from the Okaloosa darter threat model.

Okaloosa Darter Coordination. PCFO at Eglin has coordinated activities involving meetings among partners that focus on issues pertaining to recovery tasks for the Okaloosa darter. Activities can be summarized as providing assistance in maintaining communications among partners, initiating dialogue with Eglin managers about potential restoration sites, providing assistance with prioritization of tasks, and assisting with the Recovery Biologist by providing information gathered through ground-truthing or other means of technical assistance.

Okaloosa Darter Monitoring. A need to monitor Okaloosa darter populations was defined in the recovery plan (Figure 10). During this study, 187 darters, representing three species, were present at 15 out of 20 sites sampled using a seine. Three of the five sites with no darters were located near County Road 190 (College Blvd). Okaloosa darters were collected at 10 out of 20 sites sampled. A total of 98 Okaloosa darters, 26 brown darters, and 63 blackbanded darters were observed during this study. Brown darters were collected at three out of 20 sites and blackbanded darters were sympatric with brown and Okaloosa darters. Blackbanded darters were collected at 12 sites and resulted in a total of 63 individuals. Blackbanded darters were the only darter species collected at Sites #8 and #24. Demographic data were collected for all darter species. Several sites were suggested for no further monitoring effort and other stream systems were recommended for increased monitoring effort. A report is available upon request. A total linear search area of approximately 0.75 mile (1.2 km) was sampled over approximately 19 hours.

Recommendations:

- A. Assist Eglin with compiling known data about Okaloosa darters and habitat for inclusion into a centralized database at Jackson Guard.**
- B. Conduct a presence/absence census every stream kilometer, to determine range occupied by Okaloosa darter to evaluate a change in listing status.**
- C. Establish type and condition of road crossings and set priorities for management actions.**
- D. Encourage partners to analyze trend data for habitat preferences or correlations with habitat parameters. Take relationships and apply to census sites and attempt to quantify available quality habitat. Develop strategies to test habitat restoration and generation through habitat manipulation (e.g., fire through canopy, planting aquatic macrophytes, removal of impoundments).**
- E. Provide technical assistance to Eagle and Falcon Golf courses regarding operations (e.g., BMPs with fertilizers and herbicides) and habitat recovery.**



Figure 10. Okaloosa darter (18 mm).

Total Maximum Daily Load (TMDL) Development Support

Compliance based sampling of waterbodies was conducted on Eglin in conjunction with FDEP. During the month of July, PCFO at Eglin assisted FDEP biologists as part of TMDL compliance monitoring. A total of 7 site locations were sampled, totaling 0.4 mile (700 m) of stream surveyed. Water samples were collected from Eglin streams and sent for analysis by the FDEP central lab in Tallahassee, Florida. Data will be used to determine TMDL criteria and evaluate streams for possible impairments.

Recommendations:

- A. Continue to assist with water sampling for TMDL development.**

Biomonitoring

Biological monitoring, or biomonitoring, is the systematic use of living organisms or their responses to determine the quality of the aquatic environment (Figure 11). Aquatic insects and other bottom-dwelling organisms in freshwater systems are monitored in order to gauge subtle and profound effects that changes in water quality have on aquatic life. Changes in the composition of insect communities measured both quantitatively and qualitatively will reflect, to various degrees, shifts that result from the addition of pollutants to the water. Benthic macroinvertebrates were collected based on methods

outlined for the Stream Condition Index. This procedure includes performing physical and chemical stream characterization, habitat mapping, habitat assessment and macroinvertebrate sampling.

Recommendations:

- A. Complete all insect identifications and habitat assessments.***
- B. Complete final report and dissertation related to invertebrate biomonitoring.***



Figure 11. Mayfly larvae (*Dolania americana*) from biomonitoring sample.

IV. Partners For Fish and Wildlife

Northwest Florida Conservation Agreement - Memorandum of Understanding

The MEMORANDUM OF UNDERSTANDING (MOU) was made among United States Department of Agriculture Natural Resources Conservation Service (NRCS), the Florida Three Rivers and West Florida Resource Conservation and Development (COUNCIL), and U.S. Department of the Interior, Fish and Wildlife Service (USFWS PCFO), hereinafter referred to as “the Parties.” The parties agree to collectively participate in the restoration and enhancement of upland and water related projects throughout the 16 counties of the Florida panhandle. The NRCS and the COUNCIL possess the required technical expertise and the ability to deliver critical area treatment, assessment, design; and the responsibility to deliver such expertise for the general benefit. Additionally, the USFWS has particular expertise in providing technical assistance for project implementation including pre- and post-monitoring of aquatic resources and physical habitat, design criteria and conceptual drawings, field construction and outreach capabilities. Under the MOU, fish passage needs at Eglin will be inventoried and restoration projects initiated. Stream restoration projects throughout the Florida panhandle will be high priority for this partnership. Several projects have been identified and are in the design phase.

Recommendations:

- A. Continue to develop and coordinate with MOU partners for restoring and enhancing natural habitats in the Florida panhandle.***
- B. Identify three new projects for restoration.***

Identification and Removal of Barriers to Fish Passage within the Northeast Gulf Ecoregion

Panama City FRO biologists have begun identifying fish passage barriers which inhibit movement of fish and other aquatic species. Fragmentation of rivers, diversion structures and habitat alteration has caused the degradation of aquatic resources including water quality, fish passage, natural sediment transport, and stream bank stabilization. Several potential projects have been identified for removal. Once funding is secured for restoration, a project will be conducted along with monitoring changes in physical, chemical, and biological parameters. A GIS data layer of dam locations has been developed to begin assessing possibilities for removal projects. Culverts throughout the Northeast Gulf Ecosystem will be assessed for potential projects. Sites on Eglin have also been identified and should be prioritized in the future.

Recommendations:

- A. Conduct two fish passage restoration projects on Eglin.***
- B. Continue to develop and support fish passage projects on Eglin.***

Evaluation of Stream Restoration Projects using Fish Communities as Indicators

In order to evaluate the success of stream restoration projects completed by the PCFO - PFW Program, fish communities were sampled before and will be sampled at multiple intervals after habitat restoration is complete in a Before-After-Control-Impact (BACI) design.

During FY03, PCFO provided technical assistance for design and project construction for the removal of an impoundment structure blocking fish passage along an unnamed tributary of Magnolia Creek. Pre-existing conditions were surveyed by PCFO and Florida DEP. Design criteria were provided for dam removal along with placement of a culvert with floodplain drains for continued off-road vehicle traffic. Fish communities were sampled in the unnamed tributary to Magnolia Creek, as the Before-Impacted sites. A third site, Fourmile Creek, Walton County, Florida was sampled as the Before-Control site. The project has resulted in partnership development with local governmental agencies, and provides a demonstration of appropriate methods for stream restoration including fluvial geomorphology function and culvert placements with floodplain drains.

PCFO provided technical assistance for design and restoration of Tenmile Creek, Escambia County, Florida. Three Rivers RC&D will complete the project in FY04. PCFO also conducted fish surveys in Tenmile Creek as the Before-Impacted sites. The Before-Control site will be selected in FY04.

A large-scale restoration project is slated to begin in FY04 on Big Escambia Creek (BEC), Escambia County, Florida (Figure 12). Funding by the U.S. Army Corps of Engineers (ACOE) and several other entities will restore a natural channel design to BEC. The PCFO provided design criteria, construction specifications and is assisting with on-the-ground restoration. The role of PCFO is to evaluate the success of the \$7 million project using a BACI analysis of the fish community. Baseline data collected in FY02 and earlier were analyzed in FY03 (report available upon request). The results obtained from the BEC site were compared with a control site from Little Escambia Creek, Escambia County, Alabama, in order to determine if variations in fish community structure are due to natural phenomenon or restoration activities. Methods for subsequent samples were described and recommended to the ACOE.

Recommendations:

- A. Complete "After" surveys for the control and impacted sites once construction is complete. Formalize results in a peer-reviewed publication to increase information exchange (within and outside the USFWS) about aquatic restoration and assessment tools.***
- B. Continue to use BACI design to evaluate other stream fish restoration projects.***



Figure 12. Big Escambia Creek Project before construction.

Regional Channel Characteristics for Maintaining Natural Fluvial Geomorphology in Florida Streams

The PCFO is leading a cooperative study with the Florida Department of Transportation (FDOT) to develop regional curves (Rosgen 1996; Leopold 1997). These regional curves will assist in predicting bankfull discharge and channel attributes in un-gauged stream reaches and aid in natural channel design for FDOT and USFWS projects. This study will provide a model for future efforts to analyze streams statewide. By furthering our understanding of regional stream stability, improved guidelines can be developed for designing culverts and bridges to preserve natural bankfull channel dimensions and their associated floodplains and wetlands. A task force meeting was held with technical assistance personnel to identify reporting requirements and review of several sites previously surveyed by PCFO. A decision will be made about using the previous data, which may be included in the current project.

Recommendations:

- A. Begin collecting data at gauged sites and produce a final report in FY05.***

On-The-Ground Restoration

In FY03, the Partners for Fish and Wildlife Program contributed \$46,850 toward a variety of projects which leveraged an additional \$288,950 for their completion. These projects are described below.

Seibenhener Streambank Restoration Project. The Choctawhatchee River watershed supports the threatened Gulf sturgeon, several potential candidate mussels (southern sandshell, fuzzy pigtoe, Choctaw bean, southern kidneyshell, and tapered pigtoe), several endemic snail species, and may still support the endangered Alabama moccasinshell. TSU, Alabama, Center for Environmental Research and USFWS, members of the TSU Environmental Club, Riley Seibenhener, and PFW coordinator planted vegetation approximately 500 feet of unstable and eroding riverbank near Bellwood, AL. Site restoration consisted of applying appropriate seed and seed mixtures, installation of erosion control blankets, installing willow stakes, and planting hundreds of potted willows and other native plants including feather bush and sweet pepper bush (Figures 13 and 14). At another site, seeds were applied to assist with bank stabilization, a berm was constructed above gullies, and brush was placed in the gullies. A follow-up visit will be conducted in FY04 to evaluate restoration efforts and to complete any additional seeding or repairs, if necessary. Additionally, through technical assistance by PCFO-PFW and NRCS funding, approximately 3,500 feet of stream bank was restored without any plantings by installing livestock fencing along the streambank.



Figure 13. View of Seibenhener project before restoration efforts.



Figure 14. View of Seibenhener project after restoration efforts.

Chipola River Greenways Restoration, Marianna, Florida. The Chipola River watershed supports the endangered fat threeridge, Gulf moccasinshell, oval pigtoe, shinyrayed pocketbook; and the threatened Chipola slabshell, purple bankclimber, Gulf sturgeon, and offers refugia for striped bass. Habitat is degraded in part due to tributary channel instability and poor water quality. Technical assistance was provided in the form of assisting with the conversion of 40 acres of cultivated hay field to indigenous bottomland forest trees along the Chipola River floodplain. Approximately 4,000 trees of various species were planted. The project was a joint effort between Jackson Academy of Science, FDEP, National Fish and Wildlife Foundation, and many other interested parties. A large bat house and video production of the project and surrounding ecosystem were also completed.

Blackwater River State Forest Restoration and Protection. Blackwater River restoration project was conducted to minimize sediment deposition into the river. Funds from this grant project treated a total of 52 (21.92 miles) roads or road segments along the north side of the river. Forty-four (18.12 miles) roads were closed and restored, and six (3.8 miles) were repaired and improved. Closed roads were restored using techniques that include the construction of water bars, fitting of erosion control fabric, seeding, fertilizing, planting native plants and trees, and transplanting trees and shrubs with the use of a tree spade. Geotextile fabric and crushed stone were used on highly eroded areas

of these roads. There are several areas where the riverbank has been damaged by improper vehicle access and recreation use. These areas were blocked off and re-vegetated with native wetland vegetation. Approximately 7.5 rivermiles were restored from closing off these unpaved roads.

Restoration of Reilly Bluff was completed to reduce direct sedimentation to the Blackwater River. Live cuttings of native woody vegetation, such as willows, cottonwood, Atlantic white cedar, and red maple were planted at Reilly Bluff to restore what is now a very unstable riverbank. Other Atlantic white cedar were transplanted into the bluff using a tree spade. Pilings were used to restrict vehicle access to the bluff. Water bars and berms were used to prevent water from flowing over the bluff's edge. All non-vegetated areas above the bluff were planted with native vegetation. Approximately 600 feet of streambank was stabilized and restored. PCFO conducted a pre-monitoring channel assessment and established two permanent cross-section transects to monitor the Blackwater River cross-section at Reilly's Bluff restoration site. These data will be used to document success of the restoration project and to make future recommendations for other project sites.

Finally, an existing gully along the north side of Sweetwater Creek was stabilized. Water was diverted away from areas where head cutting has occurred. Vegetation was transplanted into and above the gully by use of a tree spade. Tublings longleaf, containerized hardwoods and bareroot seedlings were also used in this phase of the project. Approximately 1,378 feet of instream channel was restored by minimizing sediment input.

Anderson Property Longleaf Pine Restoration Project. Over 90% of the longleaf pine-wiregrass community has been lost in the Southeast. Several listed species are dependent upon this community. The Anderson property is a private parcel focused on multi-use management. The primary objective of this restoration project was to encourage responsible conservation stewardship through restoration and enhancement of native wildlife habitat, increasing aesthetic qualities, and stabilization of non-active rangeland that has a potential effect on Econfina Creek. Stabilizing sediment input into the creek will help protect the federally endangered oval pigtoe and Gulf moccasinshell. The project was divided into two sections for restoration: 1) restoration of 60 acres of upland habitat with longleaf pine and native ground cover; and 2) enhancement of approximately five acres of bottomlands with wildlife clearings and preferred vegetation plantings. Site preparation included establishing firelines, brush removal, and a prescribed burn. Restoration activities included planting longleaf pine seedlings at 375 to 400 trees per acre. Through a prescribed burning program, the natural fire cycle will be reinstated in the longleaf pine areas.

Exotic Species Control. The PFW program funded \$1,100 to the Bay County Conservancy at a 50/50 cost share to eradicate 60 acres of exotic plant species, mainly Chinese Tallow trees in wetland habitat. Exotic species were removed mechanically and by using a concentrated herbicide. Removing exotic species is considered a high priority by the USFWS and the State of Florida.

Sea Turtle Friendly Lighting. Several partnerships were developed along the panhandle of Florida to enhance coastal strand areas for sea turtle habitat protection. This was accomplished by installing sea turtle friendly lighting and window tinting at several private landowner beachfront sites, which should limit disorientation of sea turtles after nesting.

Recommendations:

- A. Complete three to five longleaf pine projects and/or exotic plant species removal projects.***
- B. Continue to fund sea turtle lighting projects, environmental outreach, and stream restoration workshops in the Florida Panhandle counties.***
- C. Continue to conduct stream restoration project in the NEG ecosystem.***

Technical Assistance

Unpaved Road Interagency Team. The Unpaved Roads Interagency Team (URIT) was developed as a collaborative effort among government agencies, non-government agencies, and other interested parties to expedite the design and implementation of unpaved road-stream crossing projects, programs, and technological tools needed to ensure the recovery and conservation of aquatic and wetland ecosystems in northwest Florida. The goal of this Agreement is threefold: 1) significantly reduce the sedimentation of aquatic and wetland resources associated with unpaved roads and road-stream crossings, 2) develop cost-effective approaches for managing and maintaining unpaved road-stream crossings, and 3) establish a proactive approach to address aquatic resource issues and concerns. A Conservation Agreement between all active parties is in development and should be formalized in FY04. A GIS layer of all unpaved road/stream crossings has been completed. BMP's are in the process of being finalized.

Escambia County Bridge and Culvert Improvements. The Escambia River watershed supports the threatened Gulf sturgeon, a candidate mussel species (Alabama pearlshell), several potential candidate mussels (round ebonyshell, southern sandshell, fuzzy pigtoe, narrow pigtoe, Choctaw bean and southern kidneyshell), and may still support the endangered Alabama moccasinshell. Habitat within the Escambia River watershed is degraded in part due to inadequate stream crossing structures. PCFO provided technical assistance to Escambia County (Florida) officials concerning the impacts of different types of bridges and roads to streams throughout the northern section of Escambia County. Several alternatives for improving habitats were suggested including: controlling stormwater runoff, spanning floodplains with bridges, floodplain drains and proper culvert sizing.

Blackwater River State Forest Restoration and Protection. Portions of the Blackwater River provide critical habitat for the threatened Gulf sturgeon and support populations of the imperiled blackmouth shiner. PCFO conducted a site visit at Blackwater River State Park, with representatives from FDEP, to provide technical assistance on restoring the Blackwater River inside park boundaries. An informative discussion on the instability of

the stream channel and corrective measures to minimize loss of lands and streambanks was provided to Park managers. Recommendations were made to the Park, which entail constructing a new channel, riparian area, and bank stabilization. A multi-agency partnership has initiated several tasks including restricting access to severely eroded roads, re-engineering remaining roads, and reclaiming damaged or destroyed plant communities that lead to tributaries of the Blackwater River.

Whites Creek Culvert Replacement Project. The Choctawhatchee River watershed supports the threatened Gulf sturgeon, several potential candidate mussels (southern sandshell, fuzzy pigtoe, Choctaw bean, southern kidneyshell, and tapered pigtoe), several endemic snail species, and may still support the endangered Alabama moccasinshell. Habitat is degraded in part due to inadequate stream crossing structures. PCFO provided technical assistance to Walton County for culvert replacement, retrofitting the crossing structure, and spanning part of the floodplain with a new bridge with floodplain drains at Whites Creek. Additionally, PCFO suggested recreating floodplain bench and narrowing stream width to reflect natural conditions.

Rattlesnake Lake Upland Erosion Stabilization Project. PCFO conducted a site visit to Rattlesnake Lake (an important sinkhole lake in karst formation) in Washington County, Florida. Representatives from Northwest Florida Water Management District were also present. PCFO suggested several methods to stabilize sediments and prevent erosion into Rattlesnake Lake including: berming, vegetation plantings, stormwater management, and erosion control blankets.

Carpenters Creek Stabilization Project. The Pensacola Bay watershed supports habitats used by the threatened Gulf sturgeon. Habitat is degraded in part from tributary channel instability and poor water quality. PCFO provided technical assistance to the City of Pensacola for Carpenters Creek restoration. PCFO conducted site assessments on riparian area, stormwater discharges, streambanks and channel bed alterations. PCFO suggested that City engineers and planners, present at the site assessment, monitor several stream reaches to identify sources of sediment inputs.

Liberty County Unpaved Road Stabilization Project. The Apalachicola River and Bay watershed supports the endangered fat threeridge, Gulf moccasinshell, shinyrayed pocketbook, oval pigtoe, and the threatened Chipola slabshell, purple bankclimber and Gulf sturgeon. Habitat is degraded due, in part, to tributary channel instability and poor water quality. Unpaved road stabilization, stormwater control, waterbar and turnout restoration, ditch stabilization, and vegetation management were suggested as means to improve stream quality (Figure 15).



Figure 15. Stormwater drainage failure in Liberty County, Florida.

Clear Creek Restoration Project and Blackjack Creek Reference Reach Assessment. The Blackwater River includes the threatened Gulf sturgeon critical habitat and several imperiled freshwater mussels. Habitat is degraded in part tributary channel instability and poor water quality. The specific project will include stabilizing 45 acres of eroding gully which was an abandoned borrow pit. Historically, an ephemeral channel flowed down the valley and discharged into the main stem of Clear Creek. The stream eroded into an adjacent borrow pit causing mass wasting, stream bank erosion, and hillside slope failure and serious stream degradation. The project will create a new channel in the bottom of the gully with plantings and instream habitat and morphology structures. Berms will be created around the upper portions of the borrow pits, slopes will be reduced in some areas, heavy equipment grading to reduce gully development, and hydroseeding with natural grasses will be planted. Long leaf pine, oaks, and other native ground cover will be planted at the site. Some isolated wetlands will be created to handle excessive flows from secondary gullies. Stormwater management will also be controlled at adjacent Federal and private lands. Blackjack Creek, an E5 stream type, was surveyed to support design criteria for stabilizing Clear Creek Restoration Project (Figure 16). Data will be used to identify appropriate width/depth ratio, pool to pool spacing, maximum pool and riffle depth, slope, and several other parameters for a stable stream type.



Figure 16. Volunteer measuring Blackjack Creek reference reach.

Augusta-Richmond County Flood Reduction Study. The Augusta-Richmond County Flood Control Study was funded to investigate strategies to reduce flood damages in Rae's Creek and Rocky Creek watersheds, and along Augusta Canal and Phinzy Swamp. PCFO participated as a team member with the ACOE under authority of the Fish and Wildlife Coordination Act and the Endangered Species Act with a view to the conservation of fish and wildlife resources. PCFO's goal in this project is to identify measures to minimize adverse impacts to fish and wildlife resources and to provide for the development and improvement of these fish and wildlife resources as part of the overall flood control strategies. The creeks were assessed for restoration and stabilization purposes.

Spring Creek Watershed Partnership. The Spring Creek watershed supports the endangered shinyrayed pocketbook, Gulf moccasinshell, oval pigtoe and provides refugia for Gulf strain striped bass (Figure 17). The watershed is degraded due to erosion and other water quality concerns. PCFO will lead a cooperative effort with NRCS, SWCD, RC&D Council, and six counties in Georgia to develop a Spring Creek Watershed Partnership (SCWP or Partnership) to facilitate conservation action and environmental outreach for natural environments surrounding areas of Spring Creek, Georgia. The parties agree to collectively participate in the restoration and enhancement of upland and water related projects as well as coordinate and manage activities within the Spring Creek

Watershed. A Conservation Agreement was signed in FY03 between the parties to guide appropriate actions for resources in Spring Creek.



Figure 17. Location of the Spring Creek Watershed, Georgia.

As part of the Spring Creek Watershed Partnership, the USFWS is conducting a basin wide assessment to determine all non-point and point source pollution that may affect Spring Creek. There are several areas of concern including streambank erosion, riparian buffers, agricultural uses, unpaved roads/stream crossings, fish passage, natural springs, and irrigation uses. Initial assessment has focused on stream habitat and streambank erosion. Unpaved road/stream crossing interactions and cattle access have been assessed as well.

PCFO conducted a site visit with Georgia NRCS on a natural spring restoration project, located in the Spring Creek Watershed, Miller County, Georgia. PCFO suggested several alternatives for restoring the natural spring including dredging, controlling soil runoff from adjacent agriculture fields, stormwater control into spring, and road runoff. This project is being funded by the Georgia Department of Natural Resources and is being designed by the NRCS and PCFO. PCFO and NRCS will conduct the project once a final design has been completed.

Pine Barren Creek Flood Control Project. Escambia River watershed supports the threatened Gulf sturgeon, a candidate species (Alabama pearlshell), several potential candidate mussels (round ebonyshell, southern sandshell, fuzzy pigtoe, narrow pigtoe, Choctaw bean and southern kidneyshell), and may still support the endangered Alabama moccasinshell. Habitat is degraded in part due to tributary channel instability and poor water quality. PCFO provided technical assistance for the Pine Barren Creek flood control project. A meeting was held in Atmore, Alabama, with FDEP, Pensacola and Mobile ACOE Districts, USFWS's Daphne Field Office, and NRCS to discuss the project proposal and offer alternative design criteria. The existing proposal was to channelize Pine Barren Creek in Florida to help minimize flooding in Atmore. The proposed site was visited and PCFO discussed several other options for the project including: wetland creation, dam removal, increase floodplain capacity, and removal of some homes.

Recommendations:

- A. Continue to provide technical assistance through the PFW program for private landowners, local and State governments, and Federal agencies.***
- B. Continue to provide leadership for the Spring Creek Watershed Partnership.***

V. Native Freshwater Mussel Recovery and Restoration

Freshwater Mussel Survey Protocol

Within the Southeastern Atlantic Slope and Northeastern Gulf Drainages of Alabama, Florida, and Georgia, the USFWS has identified a need for a standardized mussel survey protocol that can be used across physiographic provinces. PCFO, Georgia ES offices, and Georgia Department of Transportation (GDOT) worked cooperatively to develop this DRAFT Mussel Sampling Protocol (Protocol) to ensure that it fulfills the dual objectives of the USFWS and GDOT. This Protocol is designed to serve as a tool to: 1) qualitatively determine if federally protected species are present within a given area; 2) ensure a level of consistency, comparability, and QA/QC among surveys; and 3) be applied for all mussel surveys that are funded, permitted, or requested by the USFWS in this area. Minimum qualifications of surveyors, permit requirements, preliminary research needs, standard operating procedures, and guidance for deliverables are discussed. The standard operating procedure outlines two methods for determining a prescribed search area to ensure that appropriate stream coverage is achieved among various projects while searching for mussels.

Recommendations:

- A. Continue to test mussel survey protocol and revise earlier draft.***

Recovery of Endangered Ochlockonee Moccasinshell, Ochlockonee Basin Georgia and Florida.

The Ochlockonee moccasinshell has not been located in recent years and is feared potentially extinct. Flex funding was received to work with partners in the Ochlockonee basin (Figure 18) to more fully survey the river for the presence of the endangered mussel, and to initiate watershed protection strategies to address water quality or geomorphology issues. The sampling season of FY03 was postponed due to high water events. Sampling will continue when water conditions are optimal for detecting the listed species. An interim report was completed detailing results from surveys in July/Aug 2002. These results were presented to the Northeast Gulf (NEG) Ecoteam, the Freshwater Mollusk Conservation Society, and the Apalachee Bay Conservancy. Additional efforts were expended to develop a study plan to evaluate water quality and contaminant threats to freshwater mussels within the Ochlockonee Basin. Implementation is scheduled to begin in September 2003.

Recommendations:

- A. Complete mussel “blitz” and remainder of survey work.***
- B. Complete threat analysis and develop a partnership to seek funds and implement restoration work based on analysis.***



Figure 18. Ochlockonee River, Florida.

Geographic Information Systems Database for Freshwater Mussel Sampling Sites

During the past two centuries, over 800 unique sites have been sampled for mussels from Northeastern Gulf (NEG) Coastal drainages in Alabama, Georgia, and Florida (Figure 19). These data are available in published and unpublished manuscripts, field notes, and museum records but have not been compiled in one uniform catalogue. In order to initiate freshwater mussel conservation actions in NEG aquatic systems, a consolidated approach was needed to track mussel sampling site locations. A GIS database was established to serve as a host for data from any sites sampled for mussels in NEG rivers to: 1) provide one system to combine records from various reports and published literature; 2) track ongoing survey sites; 3) identify locations of past and present communities that support(ed) federally listed or other species considered imperiled; 4) determine where data gaps exist; and 5) aid in the decision-making process concerning habitat restoration, long-term monitoring, and permitting/consultation issues. The database consists of linked tables that contain locality, collection, and species information, along with a spatial component of these locations. QA/QC procedures are performed by personnel at PCFO.

Recommendations:

- A. Complete GIS database so that it is fully functional.***

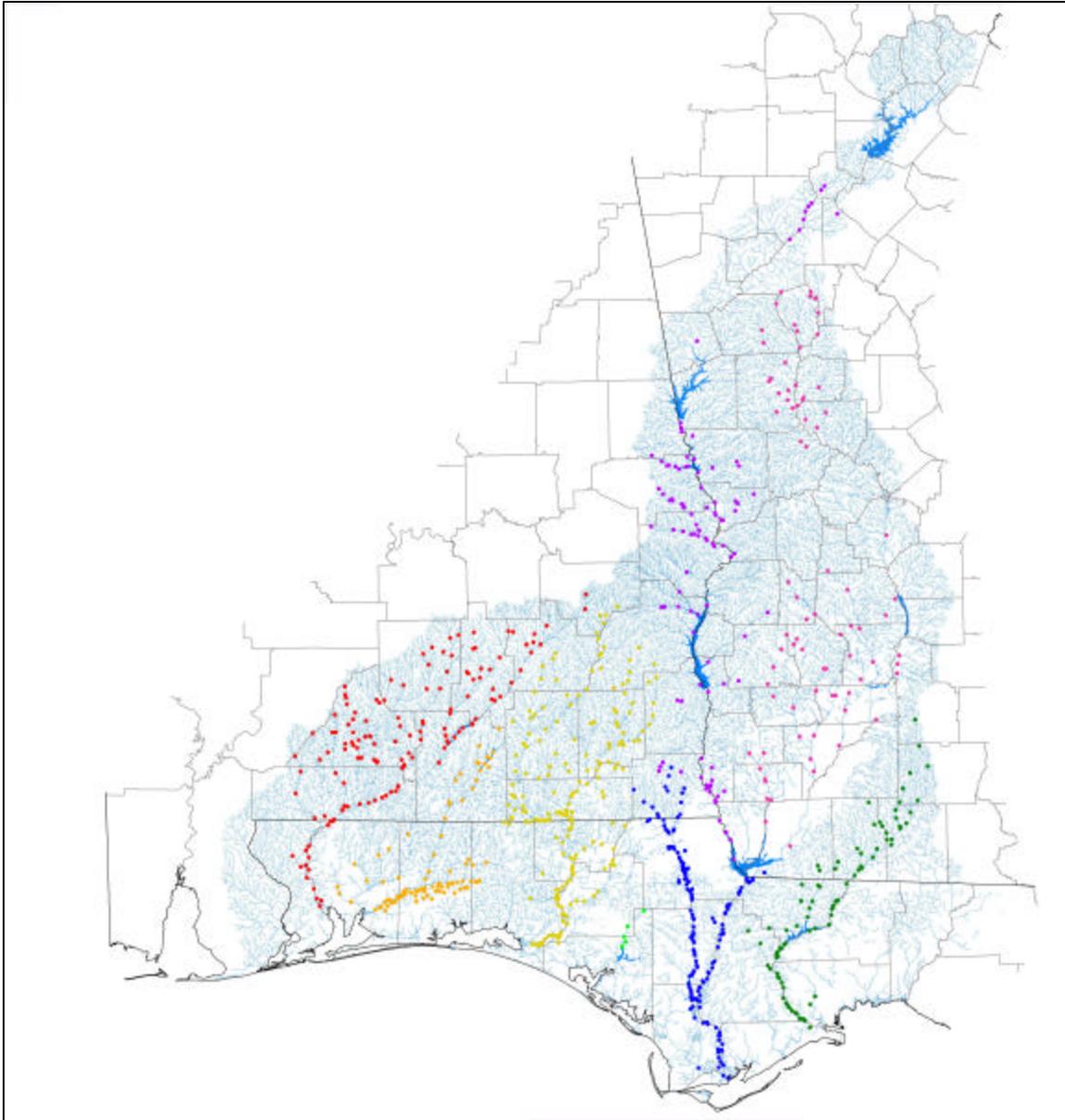


Figure 19. Sites in Northeastern Gulf Coastal drainages of Alabama, Florida, and Georgia sampled between the early 1800s and 2003 for freshwater mussels.

Recovery: Endangered, Threatened, and Imperiled Northeast Gulf Freshwater Mussels

Freshwater mussels are significantly imperiled in the Northeast Gulf watersheds. PCFO provided technical assistance to protect and restore selected mussels by drafting revisions to recovery criteria and completing the recovery plan for seven freshwater mussels in the Econfinia Creek, ACF, Ochlockonee, and/or Suwannee river basins (Figure 20). PCFO also completed a candidate elevation package for seven other mussel species occurring in the Escambia, Yellow, and/or Choctawhatchee River drainages in Alabama and Florida. PCFO developed various proposals to seek additional funds to implement the recovery plan, and continued to network with partners by participating in the Georgia Mollusk

meeting and providing an update for the Alabama Mollusk Meeting. In lieu of a meeting for Northeastern Gulf Mussels, we initiated an email roundtable among partners for the sharing of information and improving our science.

Recommendations:

- A. Develop a recovery implementation team.***
- B. Query GIS database to identify areas in need of protection and further surveys or additional actions.***
- C. Conduct a study to update potential candidate status, reproductive biology, and habitat needs.***



Figure 20. Freshwater mussels from the Ochlockonee River.

VI. Quality Assurance / Quality Control: Fish and Wildlife Projects

Good science is a top priority for the USFWS. A quality control/quality assurance program was rejuvenated for the PCFO to include a study plan peer review system. A study plan tracking system was developed to keep personnel informed regarding the status of submitted plans, products, and any quality control needs. Two Biological Opinions, seven study plans, and eight manuscripts/reports were reviewed and improved with these new procedures. All new and ongoing Fishery Resources and Ecological Resources projects at PCFO are required to have a peer-reviewed study plan on file.

Additionally, technical assistance was provided to other USFWS field offices and the Regional Office in Atlanta, Georgia, by reviewing Section 10 permits and Biological Opinions and identifying measures to avoid/minimize harm to listed species from proposed activities.

Recommendations:

- A. Continue to provide technical assistance to PCFO and other Field Offices to ensure “Best Science.”***

OTHER PARTNERSHIPS

Reservoir Operations of the Apalachicola-Chattahoochee-Flint River System

The Apalachicola River is an important resource to listed, anadromous, and interjurisdictional fishes that are dependent upon a natural flow regime. Policies to enhance reservoir fish spawning were having an adverse effect on riverine fish spawning especially during times of drought. At the request of FWC, PCFO facilitated discussions among the three states and the Corps of Engineers to identify ways that operations for reservoir fisheries management did not sacrifice downstream riverine fisheries habitat in the Apalachicola River. Several alternative operating procedures were identified and incorporated into Corps policy. An improved communication network among the agencies was established.

Choctawhatchee Audubon Society

PCFO participated with 10 other volunteers in the third annual North American Butterfly Association July butterfly survey. Forty species were identified and 511 individuals were counted. Highlights included a new Okaloosa County record for the Southern Pearly-eye (*Enodia portlandia*) and sightings of both the Cofaqui Giant Skipper (*Megathymus cofaqui*) and the very “uncommon” Common Roadside Skipper (*Amblyscirtes vialis*).

List of Other Partners

Choctawhatchee Basin Alliance
Florida Fish and Wildlife Conservation Commission
Georgia Natural Heritage
Georgia Department of Natural Resources
Alabama Department of Natural Resources
Florida Department of Environmental Protection
Florida A&M University
Gulf Coastal Plain Ecosystem Partnership
Northwest Florida Water Management District
Science Applications International Corporation
University of West Florida
University of Georgia
U.S. Geological Survey

PUBLIC OUTREACH

Numerous presentations were made to potential and existing partners on the benefits of the PFW program, specifically aquatic resources conservation opportunities.

A two-day stream restoration workshop in Quincy, Florida was offered by PCFO – PFW in conjunction with both Leon and Santa Rosa Sea Grant Extension Offices. The main objective was to introduce the principles of fluvial geomorphology for application in restoring impaired stream channels. Forty-five participants from FDEP, NFWFMD,

City of Tallahassee Planning Commission, USGS, Suwannee River Partnership, Florida Master Wildlife Program, and private engineering firms attended the course.

A seminar was presented at NRCS Landowner Meeting to discuss potential types of projects, priority areas, and financial and technical assistance opportunities through the PFW program.

A seminar was presented to the Conecuh-Sepulga Clean Water Partnership meeting to discuss the PFW program, opportunities for stream restoration, stream restoration techniques, unpaved road stabilization, water quality monitoring, and the important role that partnership development plays for protecting and restoring listed and imperiled species.

A presentation covering sea turtle biology was given to 100 kindergarten students at Bay Haven Charter Academy School.

One outreach program was completed by the Pensacola Bay Watershed Partnership and the PFW program in FY03. The first pilot video is for an environmental/natural resources television show, which was produced on stormwater. It will lead into a series of five more shows that focus on ecosystem restoration and enhancement, estuaries, streams, wetlands, and ozone issues. The show was filmed at various locations throughout the county and experts within a particular field of discussion were featured. This program will inform citizens of their surrounding environments, and hopefully foster a conservation ethic within the community. In addition, an environmental outreach and educational club was formed for children called the "Resources Rangers Club."

A presentation was given to the general public to detail the biology and ecology of freshwater mussels in the Ochlockonee River. The talk also focused on habitats that are necessary to support mussels and actions the general public can do to protect mussels and restore their habitats. Actions to prevent the spread of non-indigenous species introductions were also discussed. The presentation has led to many dedicated volunteer hours to assist with sampling and additional outreach.

The Gulf Sturgeon Recovery/Management Plan points out the need to develop a public information program directed toward enhancing recovery actions. Information describing Gulf sturgeon life history, reasons for its decline, current threats and recovery efforts was presented to 4 civic groups and 1 professional organization. The groups included the Retired Federal Employees; Panama City Beach Optimist Club, Panama City Power Squadron, Panama City AARP, and the Florida Chapter of the American Fisheries Society. Attendees totaled 200.

Frank Parauka, Bob Jarvis, Patty Kelly, and Jason Dickey participated in this year's National Fishing Week event at the Panama City Beach Pier. The event, "Kids Fishing Clinic," is sponsored by the Florida Department of Environmental Protection. In addition to receiving a free fishing rod and reel, the 150 participants, ages 3-16, learned about fish habitat, fishing ethics, casting, fishing safety and knot tying. In addition, we also assisted

the Bay County Boys and Girls Club in conducting a “Junior Angler’s Fishing Rodeo” held at the Panama City Marina. The event drew 50 children ages 4-15. (See cover page).

Jason Dickey, Student Conservation Association intern, initiated a program in the Panama City area to recover and recycle monofilament fish line. Ten bins were placed at high use boat ramps, fishing piers and fishing tackle stores within the area as drop-off locations for monofilament line.

PCFO participated in a day-long birthday and centennial celebration held at St. Vincent NWR (Figure 21). Gulf sturgeon and striped bass recovery, restoration, and management efforts and recycling for monofilament fishing line were discussed with the public.



Figure 21. Frank Parauka discussing Gulf sturgeon recovery at the St. Vincent NWR centennial celebration.

PCFO staff and volunteers participated in a “National Coastal Cleanup” project (Figure 22). Several hundred pounds of trash were removed from a one-mile stretch of beach on St. Andrew Bay.



Figure 22. PCFO staff participated in a “National Coastal Cleanup” project.

MEETINGS AND PRESENTATIONS

- Alabama Fisheries Association Meeting - Frank Parauka
- Apalachee Ecological Conservancy, Inc. – Presentation – Holly Blalock-Herod
- Dragonfly Society of The America’s Southeastern Meeting – Host – Theresa Thom
- Eglin Working Group for Ecological Monitoring, Aquatics Sub-meeting – Presentation
Jeff Herod
- Florida Chapter American Fisheries Society – Presentation – Laura Jenkins, Chris
Metcalf.
- Freshwater Mollusk Conservation Society – Presentations – Holly Blalock-Herod
- Graduate Student Symposium at the University of Georgia’s Institute of Ecology –
Presentation – Theresa Thom
- Gulf Sturgeon Workshop – Presentation – Frank Parauka
- Morone* Workshop – Presentation – Gail Carmody, Laura Jenkins
- National Fisheries Leadership Conference – Gail Carmody and Frank Parauka
- Panama City Beach Optimist Club – Presentation – Frank Parauka
- Panama City Garden Club – Presentation – Jason Dickey
- Panama City Power Squadron – Presentation – Frank Parauka
- Panama City Bass Club – Presentation – Jason Dickey
- Panama City Speckled Trout Club – Presentation – Jason Dickey
- Panama City AARP – Presentation – Frank Parauka
- Retired Federal Employees – Presentation – Frank Parauka

Southeastern Water Pollution Biologists Association Annual Meeting – Presentation –
Theresa Thom and Jeffrey Herod
St. Andrew Bay Resource Management Association – Presentation – Jason Dickey

REPORTS AND PUBLICATIONS

- Blalock-Herod, H.N., J.J. Herod, J.D. Williams, B.N. Wilson, and S.W. McGregor. *In Revision*. A historical and current perspective of the freshwater mussel fauna (Bivalvia: Unionidae) of the Choctawhatchee River drainage in Alabama and Florida. Bulletin of the Alabama Museum of Natural History.
- Blalock-Herod, H.N. 2003. Freshwater mussels of the Ochlockonee River basin: year 1. Interim Report to U.S. Fish and Wildlife Service, Panama City, Florida. 7 pp.
- Blalock-Herod, H.N. 2003. Candidate and listing priority form and elevation package for seven Gulf Coast mussels from Alabama and Florida. U.S. Fish and Wildlife Service, Region 4, Atlanta, GA. 21 pp.
- Blalock-Herod, H.N. and J.J. Herod. 2003. Fish Community Structure Before Habitat Restoration in Big Escambia Creek, Escambia County, Florida: Interim Report to U.S. Fish and Wildlife Service, Panama City, Florida. 20 pp.
- Butler, R.S., J. Ziewitz, S. K. Alam, and H.N. Blalock-Herod. 2003. Recovery Plan for endangered fat threeridge (*Amblema neislerii*), shinyrayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell (*Medionidus penicillatus*), Ochlockonee moccasinshell (*Medionidus simpsonianus*), oval pigtoe (*Pleurobema pyriforme*) and threatened Chipola slabshell (*Elliptio chipolaensis*), and purple bankclimber (*Elliptioideus sloatianus*). U. S. Fish and Wildlife Service. Atlanta, Georgia. 149 pp.
- Carlson, S., A. Palmer, H.N. Blalock-Herod, K. McCafferty, and S. Abbott. 2003. DRAFT Freshwater mussel survey protocol for the Southeastern Atlantic Slope and Northeastern Gulf drainages in Florida and Georgia. U.S. Fish and Wildlife Service, Brunswick, GA. 22 pp.
- Garner, J.T., H.N. Blalock-Herod, A.E. Bogan, R.S. Butler, W. R. Haag, P. D. Hartfield, J.J. Herod, P. D. Johnson, S.W. McGregor, and J.D. Williams. *In Review*. Freshwater mussels and snails *in Review*. Alabama Non-Game Symposium. University of Auburn Press.
- Thom, T. and J. Herod. 2002. Stream monitoring program FY2002 annual report and program summary for fiscal year 1999 – 2002. Report to Eglin Air Force Base, Jackson Guard, Niceville, Florida. 25 pp.
- Ziewitz, J., C. Metcalf, H.N. Blalock-Herod, and J. Herod. 2003. Fish and Wildlife Coordination Act report Big Escambia Creek Aquatic Ecosystem Restoration Project near Flomaton, Alabama and Century, Florida. U.S. Fish and Wildlife Service, Panama City, Florida. 35 pp + appendices.

TRAINING

Conference for Administrative Assistants 2003 – Barbara Stanley
Customer Assistance Seminar – Barbara Stanley
Department of Defense Common Access Card Training – Jeff Herod and Theresa Thom

Federal Information Systems Security Awareness Training – Jeff Herod and Theresa Thom

First Aid and CPR – Holly Blalock-Herod and Jeff Herod

Fisheries Program Overview, NCTC – Holly Blalock-Herod and Jeff Herod

Natural Rivers: Mechanisms, Morphology and Management, Baltimore, MD – Chris Metcalf

Procedures Used For Sturgeon Age Determination – Frank Parauka

Safety and Security Measures for Front Desk Personnel – Barbara Stanley

Surgical Implantation of Telemetry Tags for Sturgeon – Frank Parauka

U.S. Air Force Network User Licensing Training, Eglin, Florida – Jeff Herod and Theresa Thom

VOLUNTEER ACTIVITY

Eglin aquatic monitoring could not be accomplished without the help of many dedicated volunteers. Eighteen volunteers worked a total of 348 hours in FY03. Volunteers worked primarily to help with baseline data collection in streams on Eglin Reservation, including adult dragonfly surveys.

A freshwater mussel conservation volunteer committed 76 hours towards completing QA/QC for all mussel species locality data from all northeast Gulf coastal rivers in Alabama, Florida, and Georgia before entry into a GIS database.

Gulf sturgeon monitoring and evaluating stocking success of striped bass would not have been completed without the help of many volunteers. Seventeen people contributed a total of 788 volunteer hours in FY03.

STATION CYCLICAL MAINTENANCE/CONSTRUCTION

None to report.

PRIMARY ACTIVITIES FOR FY 2004

It is very exciting to see how the Panama City Fisheries program has grown and matured in the past few years so that nearly all aspects of management of fish and their habitats is being addressed in the watersheds of the Florida panhandle. In the coming year we will continue much of the work described above. We will initiate in partnership with the NOAA-Fisheries and Eglin, a characterization of Gulf sturgeon wintering habitat between Mobile Bay and Apalachee Bay. Potential riparian areas of concern will be identified in areas of Gulf sturgeon critical habitat in the Choctawhatchee River basin. We will complete our initial assessment of the Ochlocknee River freshwater mussels and riparian habitats. We will oversee several new studies for freshwater mussel conservation including testing of survey protocol and status of several candidate species. With the assistance of Auburn University fisheries scientists, we will complete

manuscripts summarizing historic fishery data at Okefenokee NWR and Banks Lake NWR. Development of both a fish and aquatic invertebrate indices of biotic integrity for Eglin watersheds will be completed. We will also begin working with the Florida Fish and Wildlife Conservation Commission to propose a statewide fishery database and with the Florida Department of Environmental Protection on TMDL modeling. A status review for the endangered Okaloosa darter will be completed for use in reclassification of the species. We will assist the Corps of Engineers in completing the largest natural channel restoration project east of the Mississippi. We will sign several new watershed agreements and will work with these partners to identify funding opportunities for stream protection and restoration.

We will continue to struggle with the implementation of the ACF striped bass cooperative agreement as the coordinator position continues to be unfunded. With the assistance of many other offices, we will be able to continue with the long-term Phase II product evaluation study. However, this is not the most desirable approach, and we hope that funding will be forthcoming in the future. A full-time recreational fishery biologist will not only keep the ACF program on track, but will also serve the NWRs in the area as well as other Federal land managers who have requested fishery management technical assistance. Finally, the position would allow us to become more involved in partnerships to address aquatic nuisance species and “Scaling Up for Fisheries” outreach program.

APPENDIX A - Stream Restoration and Watershed Management Projects of the USFWS Panama City Field Office (FWS-PCFRO)

1. Coordinated three multi-partner stream restoration workshops hosted by the Sea Grant Extension Service that brought together consulting engineers, local government engineers, and biologists to better understand design needs to restore natural aquatic systems using natural channel design techniques.
2. Extensive negotiating with the Corps of Engineers to undertake the largest natural channel design stream restoration project east of the Mississippi River. Provided design criteria and on-site technical expertise to make sure the \$6 million job is completed with great success.
3. Obtained Florida Department of Transportation funds to develop bankful geometry regional curves. This \$250,000 study that FWS-PCFRO is administering will ultimately help to reduce adverse effects of highway bridge crossings on fish and aquatic invertebrates in northwest and northern Florida. The completed curves will help all involved in natural channel design.
4. Helped form the Spring Creek Watershed Partnership in southwest Georgia that includes NRCS, FWS, the Flint River Soil and Water Conservation District, the Golden Triangle Resource and Development Council, six counties, and private landowners. The watershed includes 2 listed freshwater mussels and striped bass refugia. The partners will address stream and upland conservation needs.
5. Initiated and helped form the Northwest Florida Conservation Agreement which includes NRCS, two resource conservation and development councils, and FWS to collectively participate in the restoration and enhancement of upland and water related projects throughout 16 counties of northwest Florida. This agreement will benefit the 43 listed species of the area.
6. Conceived and helped formed the Unpaved Roads Interagency Team (URIT) which is a collaborative approach of Federal, State, and local governments to expedite the design and implementation of projects that will reduce the significant sedimentation from unpaved roads in the coastal plain to the benefit of aquatic listed species, imperiled aquatic species, and anadromous fish. The Team is in the process of chartering a Southeast Road-Water Crossing Technical Center.
7. Developed criteria to build a threat assessment model for the 600 miles² of watersheds of Eglin Air Force Base to examine the relationships of endangered Okaloosa darter populations and aquatic habitat variables to landscape variables. The analysis will be used to rank catchments for threat abatement.
8. Assisted Florida Department of Environmental Protection in collection of aquatic invertebrate data and application of biotic indices for use in addressing total maximum daily load criteria on Eglin Air Force Base.

9. Identified 152 sites (58 miles) of potential spawning habitat of the threatened Gulf sturgeon in Florida and Alabama. Will begin working with adjacent private landowners to protect these sites and minimize nonpoint source perturbations.
10. Initiating a review of watershed protection strategies needed to address the recovery of the endangered Ochlocknee moccasinshell and associated other rare freshwater mussels.
11. Completed a database of over 800 unique sites that have been sampled for freshwater mussels in the Northeastern Gulf drainages in Alabama, Florida, and Georgia. Provides a single data set for use by watershed partners and will help in tracking locations for needed and implemented recovery actions.
12. Significant stream restoration projects recently completed or underway:
 - a. 2.5 miles of Big Escambia Creek being restored under Corps of Engineers Sec. 206 program. Largest natural channel design stream restoration project east of the Mississippi River. Benefits threatened Gulf sturgeon and imperiled mussels.
 - b. 0.75 mile of 10-mile Creek stabilized. Sediment reduction to Perdido Bay estuary. Benefits American eel and interjurisdictional estuarine species.
 - c. 0.3 mile of Wrights Creek stabilized. Restores historical channel used by threatened Gulf sturgeon and several potential candidate mussels and reduces sedimentation.
 - d. Passage restored to 5 miles of upstream habitat for endangered Okaloosa darter.
 - e. 0.75 mile stabilized and restored of tributary to Choctawhatchee River. Benefits Gulf sturgeon and potential candidate mussels.
 - f. 40 acres of floodplain restored along the Chipola River. Benefits listed mussels.
 - g. 7.5 miles of river protected by closing and repairing 40 miles of unpaved roads.
 - h. 1.6 miles of stream connectivity restored by removal of a dam on a tributary to the Black River benefiting stream fishes.
 - i. Restored natural spring hydrology to 2 springs. Benefits to 2 listed freshwater mussels and rare fish species.
 - j. Reducing massive sediment input to Clear Creek, a tributary to the Blackwater River. Benefits Gulf sturgeon and other stream fishes.
 - k. 0.1 mile of Horsehead Creek to be stabilized and restored.

13. Development and calibration of an Index of Biotic Integrity (IBI) to be implemented on Eglin and in Northeast Gulf watersheds for assessing biotic integrity and existing community characteristics. These data will be used for setting restoration goals and setting endpoints for monitoring biological integrity during system recovery.
14. Initiated and calibrating data for a strategy which assists in setting project priorities, measures of success, and monitoring objectives for fish passage barriers and restoration projects.