AFA 2008 Abstracts
Watershed and Riverine Session

DELINEATION OF ICHTHYOREGIONS FOR USE WITH THE INDEX OF BIOTIC INTEGRITY IN ALABAMA

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A statewide effort has been undertaken by three natural resource, conservation, and environmental agencies (GSA, WFFD, and ADEM) to adapt and calibrate the Index of Biotic Integrity (IBI) for use in Alabama's river and streams. The goal of this six year project is to create a comprehensive water-quality bioassessment tool to help agencies better manage water quality and habitat more efficiently and effectively. Four tasks were identified as critical to successful implementation of the IBI on a statewide basis: 1) a standardized wadeable stream sampling protocol must be developed, 2) the IBI must be calibrated to Alabama's high fish biodiversity and diverse ecoregions, 3) IBI metrics must be selected and evaluated for their ability to detect water-quality and habitat changes and 4) regional reference sites need to be established. Task 1 has been completed and consists of a habitat-effort sampling design where a fixed amount of effort is expended in four basic habitat strata (riffles, runs, pools, and shorelines). For task 2, a comprehensive database of 855 historical fish community samples, compatible for use in the IBI, was compiled and analyzed using heirarchical cluster analysis and discriminant analysis to determine the most favorable and consistent groupings of these samples within the confines of ecoregions and river drainages. Five preliminary ichthyoregions were delineated in Alabama–Tennessee Valley, Plateau, Ridge and Valley/Piedmont, Hills and Coastal Terraces, and Southern Plains. The analysis produced a classification with two major regions, one for ecoregions above the Fall Line (uplands) and one for ecoregions below the Fall Line (lowlands). The analysis further divided the upland region into three clusters (Tennessee Valley, Plateau, Ridge and Valley/Piedmont), while it divided the lowland region into two clusters (Coastal Terraces, and Southern Plains). These five cluster groups form the basis of our ichthyoregion classification and illustrate the spatial relationships between level IV ecoregions, major drainages, and between combinations of drainages and ecoregions. As more data are collected during this project, these preliminary ichthyoregion boundaries may be refined or perhaps changed to better reflect the natural organization of fish communities and to assist in the assignment of all the State's waters to designated water-use classifications

DAILY GROWTH DIFFERENCES OF THE JUVENILE ALABAMA SHAD, *ALOSA ALABAMAE* IN RELATION TO MEAN DAILY RIVER FLOW WITHIN THE PASCAGOULA RIVER DRAINAGE, MS

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In relation to life history, otoliths are a useful tool when aging fish whether it is on an annual or daily level. It is known that otolith daily ring width is related to growth rate, and differences in ring widths may be used to compare growth differences. Daily growth rings of the juvenile Alabama shad revealed that rings were not uniform throughout the otolith. Growth and larger ring widths may be a direct result of disparate flow levels in river systems. After determining spawn date from the otolith, the age data was overlaid with flow data to compare river flows with growth rate. 45 otoliths were analyzed in relation to ring width and compared with mean daily flow data. Flow differences may be a mechanism in relation to ring width differences (growth) within this species of fish as well as others. The flow differences and ring width relation is not fully understood, but may be used to address other species in rivers that are impounded and have altered flow levels.

MOVEMENTS OF AN ENDANGERED ALABAMA STURGEON (*SCAPHIRHYNCHUS SUTTKUSI*)

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Abstract. On April 3, 2007, we collected an endangered Alabama sturgeon below Claiborne Lock and Dam in the Alabama River. This is the first specimen collected in nearly 8 years as part of an Alabama sturgeon collection and propagation project. The fish was determined to be a mature, reproductively-inactive male and was the second largest ever captured. The fish was implanted with a 48-month sonic tag and returned to the site of capture on April 17, 2007. Details on movement and habitat use will be presented.

EXAMINATION OF REDBREAST SUNFISH NEST SURVIVAL AND SPAWNING BEHAVIOR BELOW R.L. HARRIS DAM ON THE TALLAPOOSA RIVER, ALABAMA.

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Monitoring of nesting redbreast sunfish *Lepomis auritus* was conducted during their spawning season (May-August 2006; May-June 2007) to assess effects of adaptive flow management below Harris Dam, a peaking hydropower facility on the Tallapoosa River (Alabama). Previous research indicated nest success was related to discharge but critical flows and spawning window length were not assessed and both are important goals of the adaptive management project. Snorkeling was employed to monitor nest success, as defined by production of swim-up fry. Nesting behaviors related to flow regimes were also observed and recorded using underwater video equipment. Experimental flows (baseflow and generation flow) were implemented below the dam to determine critical flows and potential spawning window lengths. Nesting histories were created for both spawning seasons and discharge and temperature were used as covariates in nest survival analysis. Model averaged estimates of daily survival rate (DSR) and nest success (S) for redbreast sunfish were estimated in Program MARK. During underwater filming we determined behavioral responses to stable and rapidly rising water during experimental flows. Behavioral data were analyzed using BEAST software and both defend and leave behaviors were primarily observed during baseflow conditions and an increasing proportion of the leave behavior was apparent as discharge increased during 1-unit generation. One experimental two-unit generation was observed; however, we were unable to quantify responses to extreme flow conditions because visibility degraded rapidly (< 2 min). Data collected during this project were valuable for updating probabilities associated with the faunal response model used in the adaptive management process.

IMPACTS OF UNPAVED ROAD STREAM CROSSINGS ON FISH ASSEMBLAGES IN THE CHOCTAWHATCHEE-PEA WATERSHED.

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Aquatic biodiversity is plummeting in the southeastern United States. Unpaved road stream crossings contribute sediments and barriers to fish dispersal. This study examined fish assemblages to determine which variables could be attributed to differences found between upstream and downstream. There was a significant difference between upstream and downstream measurements of U.S. EPA's rapid bioassesment protocol habitat scores ($z = -3.013$, $p = 0.003$), evenness ($z = -1.977$, $p = 0.048$), and number of individuals ($z = -0.647$, $p = 0.10$). Results suggest that differences do exist between upstream and downstream fish assemblages that can be linked to unpaved road stream crossings.

POPULATION GENETIC STRUCTURE OF THE ENDANGERED WATERCRESS DARTER, *ETHEOSTOMA NUCHALE*

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The endangered Watercress Darter, *Etheostoma nuchale*, is native to only four springs of the Black Warrior River drainage in Alabama, including Glenn, Thomas, and Seven springs in the Valley Creek system and Roebuck Spring in the Village Creek system. It is also present in Tapawingo Spring (Turkey Creek system), where two-hundred individuals from Roebuck Spring were successfully introduced in 1988. A recent molecular phylogenetic analysis using the mitochondrial (mt) ND2 gene revealed a paraphyletic *E. nuchale*; Village Creek *E. nuchale* forms a monophyletic group with *E. swaini* (Gulf Darter) from Walker County Shoal Creek which is sister to Valley Creek *E. nuchale*. We used nine polymorphic microsatellite loci to further investigate genetic structure among *E. nuchale* populations, including *E. swaini* from Walker Co. Shoal Creek. We identified four distinct genetic populations: (1) Glenn + Thomas springs; (2) Seven Springs; (3) Roebuck + Tapawingo springs; (4) Walker Co. Shoal Creek (*E. swaini*). Though the Walker Co. Shoal Creek population was genetically distinct from *E. nuchale* populations, we found a greater degree of genetic structure among Roebuck Spring *E. nuchale* and all other taxa. We tentatively conclude that *E. nuchale* (as currently recognized) should be treated and managed as three genetically distinct populations as outlined above. Our results suggest that Roebuck Spring *E. nuchale* are substantially diverged from all other *E. nuchale* and from Walker Co. Shoal Creek *E. swaini*. Our data strongly suggest that *E. nuchale* is a complex of at least two different species, but additional molecular and morphological data are needed to substantiate this initial hypothesis.

Ecosystem Connections to River and Estuarine Fisheries – KEYNOTE SPEAKER

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Fisheries in rivers and estuaries reflect linkages to their watersheds and are influenced by the interactive dynamics of climate, geology, landscape characteristics, fluvial processes and anthropogenic activities. Within climatic eco-regions, soil characteristics tend to establish the foundation for fish production and help determine secondary influences (e.g., watershed and riparian zone vegetation, in-channel substrate, allochthonous

material inputs and processing, autochthonous production contributions, secondary production). Flow regimes, including flooding and groundwater inflows, ultimately determine how production potentials become manifest. As a result of environmental variability and evolutionary processes, the fishes and associated fisheries tend to be resilient to small-scale (spatial and temporal) influences, and more responsive to larger-scale influences at an ecosystem-level of resolution; and particularly to those affecting upstream-downstream and lateral connections along channels or throughout the drainage. Discontinuity in the above regard can have major negative impacts to the fisheries and if prolonged can lead to human disconnects from traditional interactions with the resources. Management of these fisheries is determined by cultural values in conjunction with political will.

COMPARISON OF THE STRUCTURE AND FUNCTION OF STREAM FISH ASSEMBLAGES IN BEAVER PONDS VS. FREE-FLOWING SOUTHEASTERN ALABAMA STREAMS.

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Beavers are returning to the southeastern United States after being nearly exterminated during the previous two centuries. Beaver dams alter the physical and chemical characteristics of free-flowing streams. This study examined fish assemblages, water quality, and habitat characteristics of 25 beaver ponds and 50 free-flowing streams in southeastern Alabama (coastal plain ecoregion). The number of species, percent tolerant individuals, number of intolerant individuals, and percent lithophilic species differed significantly between the two stream categories. This study suggests that the return of a key species in the area may serve to restore the habitat mosaic that once existed in the region.

OCCURRENCE OF HOLIDAY DARTER, *ETHEOSTOMA BREVIROSTRUM*, IN TALLADEGA NATIONAL FOREST.

Turner, Joshua, Mark Meade, and Gregory Scull. Jacksonville State University –

The holiday darter, *Etheostoma brevirostrum*, is a threatened species with populations observed in NE Alabama and NW Georgia. In Alabama the species is endemic to the Coosa River Basin in the Valley and Ridge province. Populations of holiday darters have primarily been documented at Pine Glen Campground along Shoal Creek in the Talladega National Forest. Holiday darters have also been recorded in spring-fed tributaries of Choccolocco Creek (which directly enters the Coosa). Surveys of other sites in the area have not been reported mainly due to accessibility in this mountainous region of the state. Ichthyofaunal surveys were conducted in the summer and fall of 2007 using standard electroshocking and seining techniques to evaluate population viability and distribution of the species.