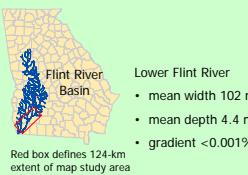


# Assessing Shoal Bass Habitat Use in the Lower Flint River from Low-cost Side Scan Sonar and Electrofishing Data

Inspecting substrate with a drop camera



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Inspecting substrate with a drop camera

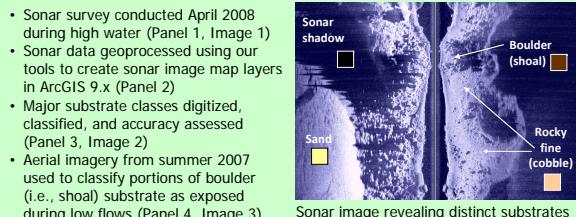
## Shoals are Important, Complex Habitats

- Shoals (i.e., shallow, boulder-strewn areas with swift currents) are areas of high biological diversity and productivity, used by shoal bass and other endemic species in the Flint River (e.g., Alabama shad, Gulf sturgeon)
- Shoal habitat quality likely differs on a variety of characteristics and scales, but an assessment of such characteristics at the landscape scale (i.e., throughout the river) is unfeasible using traditional approaches
- Adult shoal bass are difficult to sample, but appear to migrate long distances to specific shoals where they form spawning aggregations.
- Narrowing the search for spawning sites by identifying key spawning site characteristics may improve our ability to collect and tag adult shoal bass for research and management investigations.



**OBJECTIVES:** 1) map and characterize shoal habitat throughout the lower Flint River using our low-cost, sonar habitat mapping approach  
2) identify shoal characteristics associated with spawning site selection  
3) use this information to screen and identify other potential spawning locations

## Mapping Habitat Throughout the River



### Map Results

- Sonar survey conducted April 2008 during high water (Panel 1, Image 1)
- Sonar data geoprocessed using our tools to create sonar image map layers in ArcGIS 9.x (Panel 2)
- Major substrate classes digitized, classified, and accuracy assessed (Panel 3, Image 2)
- Aerial imagery from summer 2007 used to classify portions of boulder (i.e., shoal) substrate as exposed during low flows (Panel 4, Image 3)

### Map Results

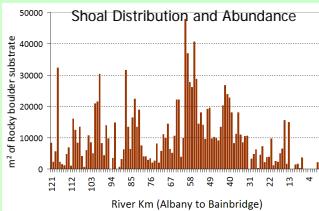
124 km river map produced by summer intern

607 shoals (boulder polygons) represented in map, with several areas of high concentration (e.g., km 35-60, see adjacent figure)

Classification accuracy for boulder was very high (94%)

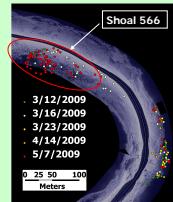
13.4% of boulder substrate

exposed during extreme low flows

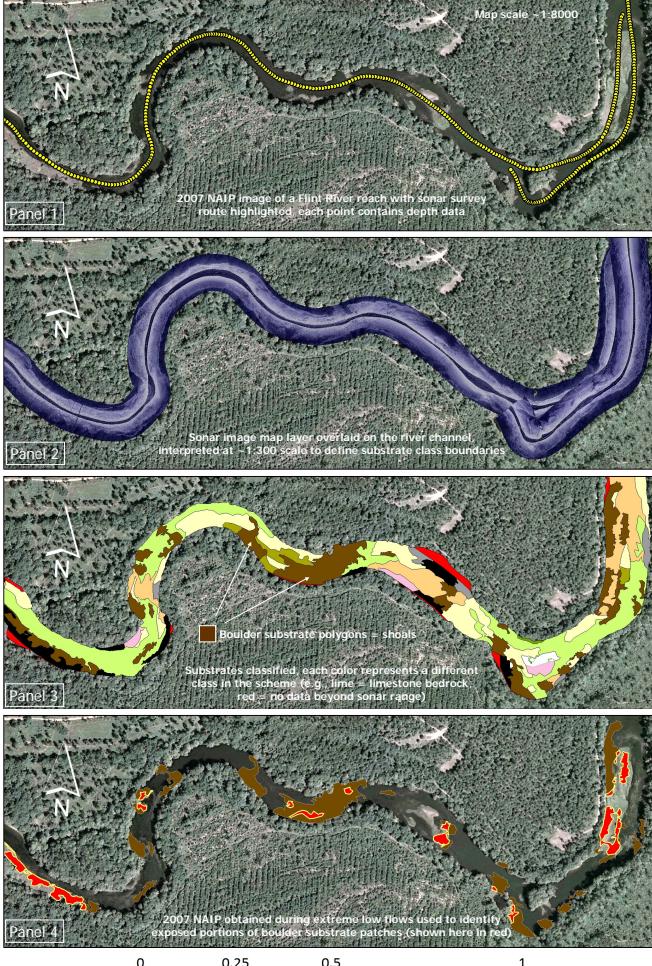


## A Spawning Aggregation found at Shoal 566

- During spring 2009, a large group of adult shoal bass was located during electrofishing efforts aimed at capturing adult fish for a tag-return, exploitation study
- Subsequent sampling of the area revealed that these fish moved between a deep, outside bend of the river (a staging area), and a shoal located on the inside bend ~250 m upstream
- Observations in early May suggested that the group had moved from the staging area to the shoal site to spawn
- Why so many fish chose to spawn at this site, and how far they traveled to do so, are important questions



## Evolution of the Lower Flint River Habitat Map



## Extracting Characteristics from the Habitat Map

### Patch Level Variables

- Size (area)
- Shape (perimeter)
- Edge:Area ratio
- Edge within 15 m buffer
- % Exposed
- Distance to nearest shoal (centroid-centroid)
- Size (area) of nearest shoal



### Neighborhood Variables

- Mean, Min, Max, SD, Range of mid-channel depth
- Additional shoal area (Rb)
- Area of each additional substrate class present
- Total edge (heterogeneity)



\*For more information on low-cost, sonar habitat mapping contact Adam at adam.kaeser@dnr.state.ga.us

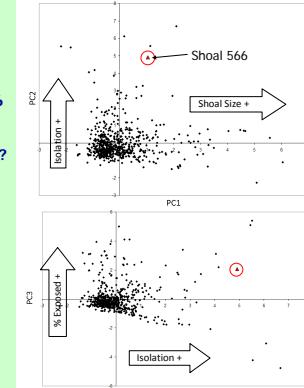
## Is Shoal 566 (a Spawning Site) Unique?

### Principal Components Analysis (PCA)

#### Patch Variables

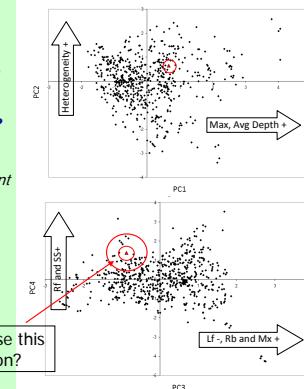
Variable	PC1	PC2	PC3
Length	0.93	-0.01	0.04
Area	0.93	0.04	0.01
Ratio	-0.62	-0.06	0.21
% expo	0.35	-0.04	0.74
Edge	0.69	-0.28	-0.02
Dist near	0.29	0.73	-0.38
Area near	-0.10	0.70	0.45

### PCA Plots - Patch Variables



Shoal 566 appears to be:  
• Larger in size  
• More isolated  
• More exposed during low water than most other shoals

### PCA Plots - Neighborhood Variables



Shoal 566 appears to have:  
• Higher Average and Maximum Depth within 250 m buffer  
• Greater range and variability in Depth, Lower Minimum Depth, Less Sand, and More Edge in its neighborhood than other shoals

## Will these associations help us locate additional spawning areas?

- Whether the distinct characteristics of shoal 566 and its neighborhood truly relate to spawning habitat selection or are merely coincidental requires further investigation
- Two sets of shoals (one set similar and another dissimilar to shoal 566) have been identified using PCA scores; these shoals will be sampled to determine if other spawning aggregations of shoal bass can be located
- Beyond shoal bass, the generated data set of shoal characteristics is available for future studies involving Alabama shad and Gulf sturgeon, two species that selectively spawn over coarse, rocky substrate