An Assessment of Shoal Habitat throughout the Lower Flint River using Low-cost Side Scan Sonar and GIS

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Abstract: The Lower Flint River is characterized by a deeply incised, stable channel with sandy, rocky, or limestone bedrock composition. Scattered throughout the river are patches of rocky boulder substrate. These boulder fields, or shoals, are ecologically important areas of solar input, organic matter retention, and primary and secondary productivity. River shoals serve as important spawning, nursery, and foraging areas for a variety of endemic fishes such as the shoal bass (*Micropterus cataractae*), Alabama shad (*Alosa alabamae*), and Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Shoals differ, however, by size and shape, depth, spatial proximity to other habitats, areas exposed during low flows, and various other factors that may influence their attractiveness to fish. Although the mapping and classification of shoals throughout the Lower Flint River was identified as an important objective of several fisheries management and restoration efforts, traditional methods of assessment were deemed costly and ineffective due to water depth, turbidity, and scale. As an alternative we employed a newly developed, image processing technique that utilizes low-cost, side scan sonar data. This technique provided continuous, bank-to-bank "georeferenced" sonar imagery for 122 km of river bottom from which we digitized all major substrate classes. Recent National Agriculture Imagery Program (NAIP) aerial imagery captured during a low flow period was used to further classify boulder habitat as either shallow or deep. To evaluate the local habitat heterogeneity of each shoal, we developed a simple spatial model that ranked each polygon based on local variation in mid-channel depth and the amount of edge (boundary between classes) around the polygon centroid. A series of maps illustrating the spatial distribution, quantity, and heterogeneity of shoal habitats were produced that will be applied in upcoming studies of fish/habitat relationships.

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