Analysis of the demographic and environmental dynamics of the American Horseshoe Crab (Limulus polyphemus) and watershed modeling in the coastal northcentral Gulf of Mexico plus a brief description of opportunities in the NASA Applied Sciences Program

This study provides the first regional-scale data on drivers of horseshoe crab (*Limulus polyphemus*) presence along the north central Gulf of Mexico (nGOM) coast and has implications for understanding habitat suitability for sparse horseshoe crab populations of conservation concern worldwide. To collect baseline data on the relationship between environmental factors and presence of horseshoe crabs along the nGOM coast, we surveyed four sites from the Fort Morgan peninsula of Mobile Bay, Alabama to Horn Island, Mississippi. During two years, we documented number, size and sex of live animals, molts, and carcasses as metrics of horseshoe crab presence and demographics. Data were compared to in situ and remotely sensed environmental attributes to assess environmental drivers of occurrence. Overall, greater evidence of horseshoe crab presence was found at western sites (Petit Bois and Horn Islands) compared to eastern sites (Dauphin Island and Fort Morgan peninsula), consistent with our hypothesis that horseshoe crab numbers would decrease with proximity to the mouth of Mobile Bay, which is among the largest freshwater conveyances in the US. Our findings suggest that local area (size) of suitable habitat may be a significant component of habitat quality even among sparse populations where regional habitat size does not appear to be limited. Furthermore, among sparse populations and fringe habitats like those in the nGOM, including data from molts and carcasses in surveys is a practical approach to enhance datasets for ecological assessment to support conservation and management.

Watershed modeling work in the northcentral Gulf of Mexico focused on the Mobile Bay subwatersheds and associated impacts from climate and land cover land use change on shallow benthic environments will be discussed along with ongoing water quality modeling efforts with the United States Geological Survey to develop and implement dynamic coastal watershed models in the Tampa Bay and Sarasota Bay watersheds and other selected coastal watersheds in the southeast. The goal of this NASA-funded project is to develop a dynamic decision support system to enhance the southeast SPARROW water quality model and finer scale dynamic models for selected coastal watersheds through the use of remotely-sensed data and other NASA Land

Information System (LIS) products. The seminar will conclude with a description of the NASA Applied Sciences Program with a focus on the biodiversity and ecological forecasting components and future opportunities.