Workshop on the Biodiversity and Ecosystems Informatics
for the Indian River Lagoon[1]

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A workshop on biodiversity and ecosystem informatics (BDEI) was held on February 7th and 8th, 2002 at the Doubletree Hotel in Cocoa Beach, Florida. The purpose of the BDEI workshop was to provide the necessary venue and resources needed to foster novel and synergistic interdisciplinary work. Twenty five researchers from diverse fields of biological sciences, ecological sciences, remote sensing, spatial information systems, computer sciences, and intelligent systems met to examine the prospects of advancing the research in biodiversity of the Indian River Lagoon (IRL) incorporating novel techniques in informatics. They discussed the issues and challenges facing the long-term sustainability of the IRL ecosystem and explored possible solutions using computational intelligence and data management techniques. Using these techniques, the wealth of ecological information that exists for the IRL can be integrated into regional land and estuarine management models. The researchers involved in the workshop have considerable expertise in their respective fields.

The Indian River Lagoon (IRL) is one of the nation's most biologically diverse estuarine systems. It provides a habitat for hundreds of species of animals and plants, many of which are rare or endangered. The area has been recognized as a National Estuarine Program site by the Environmental Protection Agency which focuses agencies and communities on its protection and recovery. The National Oceanographic and Atmospheric Administration has also nominated IRL for a National Estuarine Research Reserve Program site. The Indian River system faces many environmental problems and challenges such as eutrophication from surface water runoff, excessive freshwater inflow due to watershed management practices, toxic chemicals from agricultural and urban development, pathogens, habitat loss and fragmentation from development, and introduction of invasive exotic species.

The workshop provided the opportunity for discussion about the issues and challenges facing the IRL. The issues were categorized under three main areas: 1) Data Acquisition and Conversion, 2) Analysis and Synthesis, and 3) Dissemination of Data. The long-term and short-term needs of the research community in these areas were investigated and a set of recommendations was made. To act on these recommendations, the workshop emphasized the need for future meeting and collaborative research between the computational intelligence, computer science, spatial information systems, remote sensing, biological and the ecological research communities. These collaborations must

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be conducted with the goal of getting to a point of ecological forecasting so that aspects of global climate change, regional development patterns and politico/economic factors that ultimately affect the stability of the IRL can be coupled in a meaningful way to understand the biocomplexity of the IRL system.

While a great deal of data has been acquired to define the IRL system's biodiversity and ecosystem processes, the data were acquired at different temporal and spatial scales by numerous investigators, and the data exist in disparate formats. The available data sets lie within the purview of local, state and federal agencies, universities and some private organizations. Considering the availability of data and its ease of use, at least three areas emerged as being readily appropriate for informatics techniques. The biological species inventory data housed by the Smithsonian Marine Research Laboratory at Ft. Pierce, ichthyological data from long term studies by scientists currently with Dynamac Corporation and the long term submerged aquatic vegetation data and water quality data of the South Florida and St. Johns River Water Management Districts and NASA/Dynamac are of the spatial and temporal extent compatible for application of Informatics analysis techniques. Computational intelligence techniques such as neural networks, fuzzy logic, and genetic algorithms provide promise toward identifying and understanding underlying patterns in the data that may well reflect temporal and spatial dynamics pertinent to real ecological patterns/processes inherent in the IRL ecosystem. These intelligent processing systems have great potential in expanding ecosystem models of the IRL incorporating physical, chemical, biological and socioeconomic factors into an integrated assessment tool.

Participants at the workshop included researchers from the Departments of Electrical and Computer Engineering, Spatial Information Science and Engineering, and Computer Science at the University of Maine, NASA Stennis Space Center (MS), Dynamac Corporation at NASA Kennedy Space Center (FL), Smithsonian Environmental Research Center (MD), Smithsonian Marine Station (FL), National Museum of Natural History (DC), American Museum of Natural History (NY), St. John River Water Management District (FL) , South Florida Water Management District (FL), Hubbs-SeaWorld Research Institute (FL), US Army Corps of Engineers (FL), University of Florida, and University of Central Florida.

Based on the recommendations at the workshop, the researchers are in the process of exchanging the data from the IRL with the computational scientists for effective data management, modeling, analysis and synthesis. In addition, funding requirements and potential to leverage resources are being identified. The preliminary work initiated by the researchers will result in a competitive proposal in the near future.