DEPARTMENT OF ENVIRONMENTAL SCIENCE & TECHNOLOGY

Undergraduate Program	Graduate Program
Ecological Technology Design	Soil and Watershed Sciences
Ecosystem Health	Ecological Technology Design
Soil and Watershed Science	Wetland Science
Natural Resources Management	Ecosystem Health & Natural Resource Management
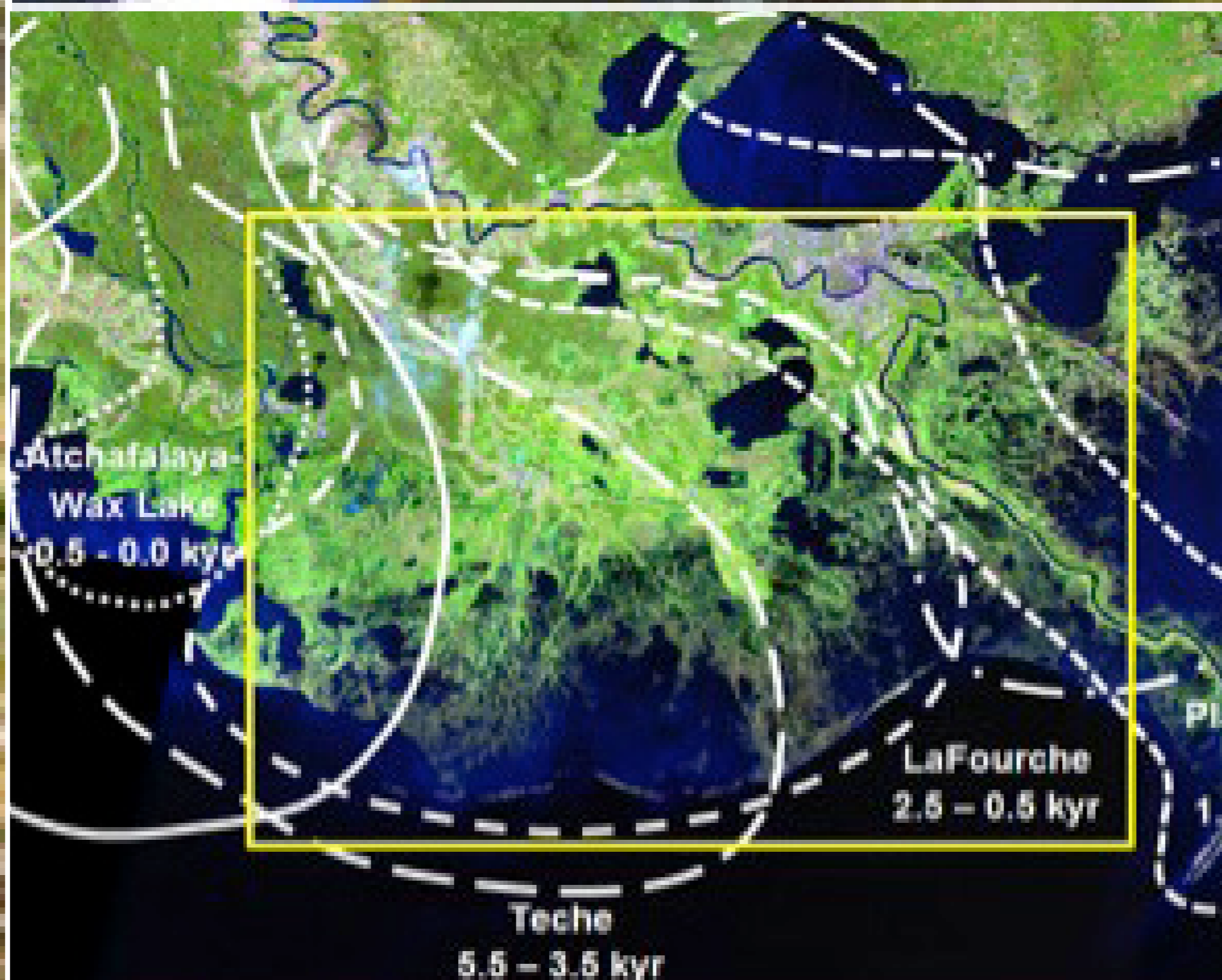
Using Remote Sensing and Spatial Analysis for Studies of Coastal Marshes

Professor Kearney has been developing techniques for applying satellite remote sensing methods to developing large scale evaluation marsh vigor for over twenty years. In recent years, he and Research Associate, Dr. Alex Riter, have been studying the impact of hurricanes, excess nutrients, and oil from the Deepwater Horizon Macondo Oil Spill in Louisiana's marshes using Landsat Thematic Mapper imagery, airborne Lidar and hyperspectral optical sensors, to determine the damage wrought by these stressors on the marshes, the pace of recovery after hurricanes, and long term sustainability.

The Need for Landscape Level Studies

Coastal marshes are widely recognized as one of the fundamental components of littoral ecosystems. However, coastal marshes face a significant numbers of threats (e.g., sea level rise) that could result in the loss of significant areas of coastal marshes and in other instances, sufficient damage to marsh functioning limiting the provision of ecosystem services. Traditional approaches to assessing the vulnerability of coastal marshes to natural and (increasingly) anthropogenic stressors have focused on field-based studies. Such studies have added fundamental concepts to our marsh processes, especially in relation to adjusting to rising sea levels and biochemical contributions to water quality and pollutant buffering. However, the vast area of coastal wetlands in Chesapeake Bay, southeast U.S. Atlantic Coast, and in the Gulf of Mexico (in particular, Louisiana) has long called for new technologies to accommodate large scale issues of marsh ecological functioning and sustainability.

New Technologies

The methods they have developed with graduate students have shown that oil and other impacts can be mapped using conventional satellite imagery like Landsat, and also can be integrated with field-based studies to develop better understanding of the spatial and temporal dimensions of marsh dynamics in one of the most important coastal systems in the country. The methods also can be applied to land-based studies at the landscape level to provide better estimates of wetland contributions to watershed health.

The technologies being applied range from satellite sensors like Landsat Thematic Mapper (TM) and Operational Land Imager (OLI) to airborne C-band radars and hyperspectal sensors with 255 bands, and can provide new insights into marsh biomass, photosynthetic functioning, and sustainability. Also, because satellite sensors have repeat observations from approximately monthly to daily, there is the capability of monitoring changes at different temporal resolutions for obtaining details on annual phenology to immediate post-storm damage assessments