**NASA DEVELOP National Program**

****NASA Jet Propulsion Laboratory

**Fall 2015**

**Short Title: Louisiana Ecological Forecasting**

**Subtitle:** Using UAVSAR, AVIRIS, and AirSWOT to Examine Historic Trends and Model Sediment Transport within the Wax Lake Delta, Louisiana to Inform Coastal Restoration Efforts

**VPS Title:** Water’s going on? Using models to inform wetland restoration.

**Project Team & Partners**

**Project Team:**

Emily Beck (Project Lead), Emily.C.Beck@JPL.NASA.gov

Brittany Zajic

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**Advisors & Mentors:**

Dr. Cathleen Jones (NASA Jet Propulsion Laboratory)

Dr. Marc Simard (NASA Jet Propulsion Laboratory)

**Partner Organizations:**

Naval Research Laboratory (End-User), POC: Richard Crout

Louisiana Universities Marine Consortium (Collaborator/Boundary Organization), POC: Alexander Kolker

**Project Details**

**Applied Sciences National Applications Addressed:** Ecological Forecasting

**Study Area:** Wax Lake Delta, LA

**Study Period:** May 2009 – May 2015

**Earth Observations & Parameters:**

UAVSAR, NASA Gulfstream III – vegetation biomass

AirSWOT, NASA King Air B200 – water height

AVIRIS – vegetation type

**Ancillary Datasets Utilized:**

* DNR Strategic Online Natural Resources Information System (SONRIS) – bathymetric data
* DNR (SONRIS) – infrastructure (levees, etc)
* CPRA Coastal Information Management System (CIMS) – accretion estimates
* CPRA Coastwide Reference Monitoring System (CRMS) – vegetation species
* USGS National Land Cover Dataset (NLCD) - land cover

**Models Utilized:**

* Deltares Delft3D modeling suite

**Software Utilized:**

ArcGIS – raster manipulation, model input preparation and map creation

QGIS – radiometric correction of UAVSAR data

ENVI – classification, image analysis, and enhancement of AVIRIS data

Delft-3D – modeling sediment transport within the Delta

**Project Overview**

**80-100 Word Objectives Overview:**

To use remotely sensed data, *in situ* data, and Deltares Delft3D modeling software suite to model water flow and sediment transport within the Wax Lake Delta in order to predict the future extent of the Delta and obtain a better understanding of why the area is experiencing aggregation. The results will provide crucial data to coastal scientists and managers and offer insight into how to direct coastal restoration projects in areas of Louisiana where coastal marshes are eroding, often at rapid rates.

**Abstract:**

Land loss due to erosion, land subsidence and sea level rise along the Louisiana coast has amounted to 4900 km2 since the 1930s, and an additional 4500 km2 could be lost within 50 years if no action is taken. While most of the coastline is suffering land loss, the Wax Lake Delta has been building at a rate of approximately 5 km2 per year since the early 1970s. This study used remotely sensed and *in situ* data as well as Deltares Delft3D hydrological modeling software to model water flow and sediment transport in the Wax Lake Delta in order to better understand deltaic sediment dynamics and forecast delta formation. Outputs from the model include modeled sediment transport, water flow and an elevation time series. These outputs will be used to inform coastal research by project partners at the Naval Research Laboratory in Mississippi and the Louisiana Universities Marine Consortium, and to direct restoration projects in areas of the coast where marshes are eroding.

**Community Concerns:**

* 4900 km2 of land loss along Louisiana’s coastline has occurred since the 1930s due to erosion, land subsidence, and sea level rise, threatening one of the most economically important port systems in the United States; where state and local tax collections amount to $517 million per year with approximately $289 million going to the state government and $228 million going to the various local governments.
* The State of Louisiana’s Comprehensive Master Plan for a Sustainable Coast (2012) confirmed that Louisiana has the potential to lose up to an additional 4500 km2 over the next 50 years

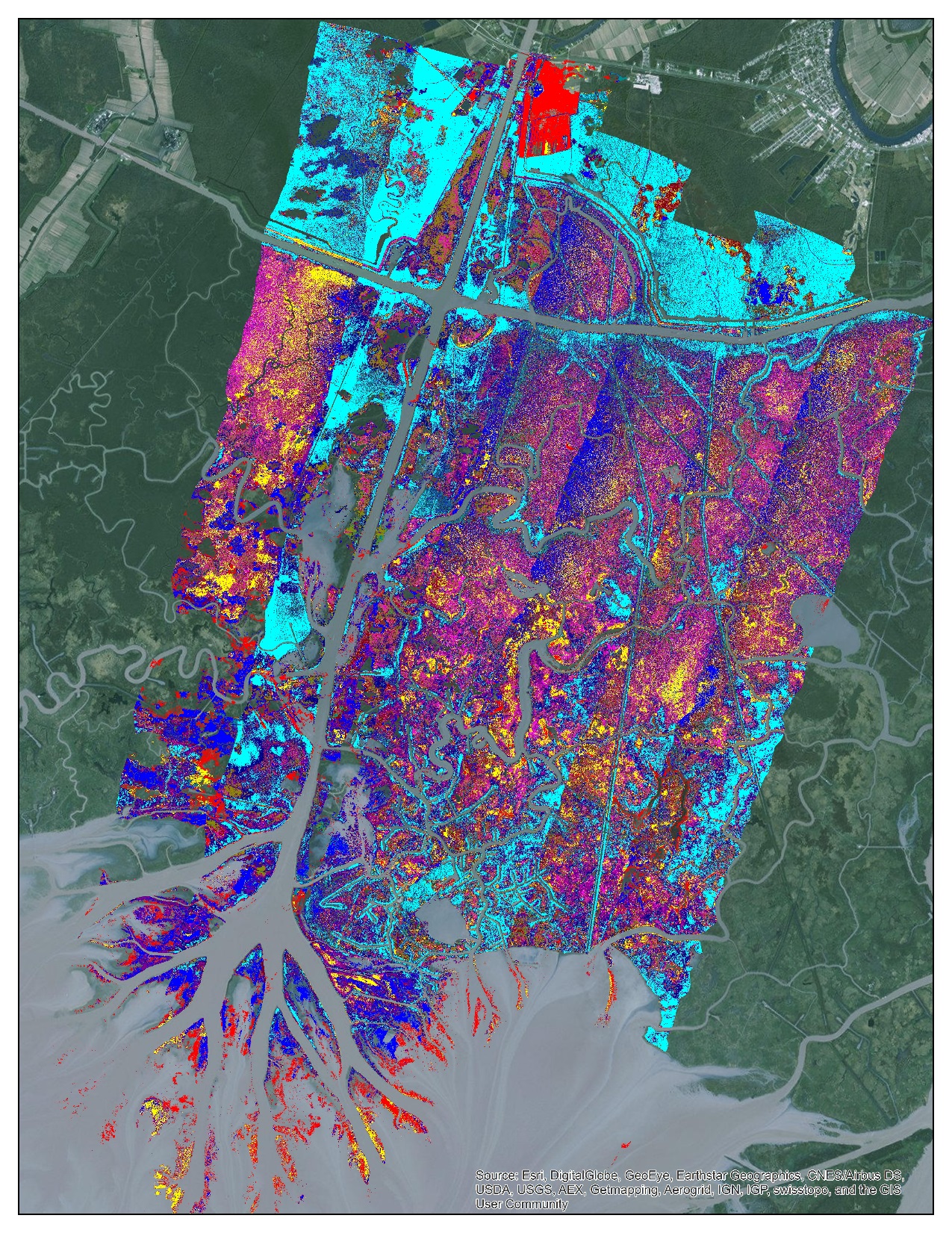
**Current Management Practices & Policies**:

Currently, restoration decisions are based on findings from ~400 projects identified by experts, citizens, and government studies. Restoration efforts can take the form of structural protection, bank stabilization, oyster barrier reefs, ridge restoration, shoreline protection, barrier island restoration, marsh creation, sediment diversion, and hydrological restoration. Nearly all of these projects rely on moving or trapping sediment, yet Louisiana has limited supplies of, or access to, usable sediment. Thus, it is, imperative to understand the dynamics of delta building to maximize the use of the limited sediment available. These dynamics are currently studied using spot field measurements and labor-intensive, boat-based, surveys.

**Decision Support Tools & Benefits:**

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| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Time Series of AirSWOT data | AirSWOT | Information on where and how restoration is conducted |
| Modeled Elevation Time Series | UAVSAR, AVIRIS | Illustrates where risk zones are located |
| Comparison of Different Datasets | UAVSAR, AirSWOT, AVIRIS | Information on where and how restoration is conducted |

**Project Imagery**





**Caption:** Classified AVIRIS vegetation layers were used to determine roughness for the Delta model. Image Credit: Louisiana Eco Forecasting Team.

**Image:** VPS\_Image\_Final.jpeg (Please submit your image as a separate .jpeg as well as inserting it in this document)

**Software Release Requirements**

What category do the tools your project is creating fall within?

Category I