**NASA DEVELOP National Program**

****Mobile County Health Department

**Fall 2015**

**Short Title: Natchez Trace Ecological Forecasting and Water Resources**

**Subtitle:** Utilizing NASA Earth Observations to Assess Current and Historic Wetland Extent along the Natchez Trace Parkway

**VPS Title:** Wetlands be Dammed: Mapping Wetlands Extent along the Natchez Trace Parkway

**Project Team & Partners**

**Project Team:**

Jennifer Rackley (Project Lead), rackleyjl87@gmail.com

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**Advisors & Mentors:**

Joe Spruce (NASA Stennis Space Center)

James “Doc” Smoot (NASA Stennis Space Center)

Bernard Eichold, M.D., Dr. PH (Mobile County Health Department)

**Partner Organizations:**

National Park Service, Natchez Trace Parkway (End-User), POC: Deanna Boensch

**Project Details**

**Applied Sciences National Applications Addressed:** Ecological Forecasting, Water Resources

**Study Area:** Natchez Trace Parkway, AL, MS, TN

**Study Period:** January 2000 - January 2015

**Earth Observations & Parameters:**

Landsat 5, Thematic Mapper (TM) – land cover classification

Landsat 7, Enhanced Thematic Mapper Plus (ETM+) – land cover classification

Landsat 8, Operational Land Imager (OLI) – land cover classification

**Ancillary Datasets Utilized:**

* USDA National Agriculture Imagery Program (NAIP) - high resolution aerial imagery
* USGS National Gap Analysis Program (GAP) - species presence and distribution map

**Models Utilized:**

* TerrSet Land Change Modeler (LCM)

**Software Utilized:**

ERDAS IMAGINE - land cover classification of Landsat imagery

ArcGIS - raster manipulation/analysis and map creation

TerrSet - land modeling and forecasting of wetlands

dnppy - scripts used for converting Landsat imagery to TOA reflectance

**Project Overview**

**80-100 Word Objectives Overview:**

This project partners with the National Park Service to address community concerns regarding the ecological impacts of beaver populations on historic, current, and future wetland extent within the Natchez Trace Parkway. Landsat data from 2000-2015 were utilized to generate a time series of land use/land cover classification maps of the Natchez Trace Parkway in Mississippi, Alabama, and Tennessee. The TerrSet Land Change Modeler (LCM) was used to analyze wetland extent changes within the parkway throughout the study period to determine trends in wetland boundaries. The TerrSet LCM was also used to project similar changes in future wetland extents.

**Abstract:**

This project partnered with the National Park Service to address community concerns involving the past, current, and future wetland extents along the parkway in Mississippi, Alabama, and Tennessee. Beavers within wetlands throughout the Natchez Trace Parkway have altered current and historic wetland extent by changing streamflow along adjacent rivers and tributaries. While the ecological services provided by these beavers are necessary for wetland ecosystems, indiscriminate and excessive dam building has caused issues with flooding, property damage, and road maintenance within the parkway. To analyze wetland changes, NASA Earth observations (Landsat 5 TM, 7 ETM+, and 8 OLI) and ERDAS IMAGINE were used to generate a time series of land use/land cover (LULC) classification maps from January 2000 to January 2015 showing wetlands extent within the parkway. The TerrSet Land Change Modeler (LCM) software was used to analyze changes in the landscape throughout the study period. A projected LULC classification map was also produced using TerrSet LCM software. This LULC time series and modeled projection will aid the National Park Service in wetland conservation and beaver management plans throughout the Natchez Trace Parkway.

**Community Concerns:**

* Beaver populations along the Natchez Trace Parkway are affecting the extent of the area’s wetlands, causing flooding on the road and private lands.
* A management strategy is needed for these beaver populations, as they are a keystone species for wetland habitats.
* A historic context for wetland regions along the parkway is needed to determine trends in wetlands shifts.

**Current Management Practices & Policies**:

The National Park Service at the Natchez Trace Parkway is in the process of determining best management strategies for beaver dams and populations within the parkway region. Currently, problematic beaver dams are selected based on their obstruction of roads, impacts on parkway maintenance, or complaints from local landowners. When action is needed, multiple actions are available for beaver management: 1) leaving the beaver dams in place, which produces the least amount of disturbance, but may increase erosion, cause flooding, or require a rerouting of the parkway; 2) utilization of “levelers”, which involve the installation of pipes below the dams to provide a route for water to avoid excessive flooding; 3) recurring deconstruction and removal of dams, which may encourage beavers to move to a new location; and 4) lethal beaver population removal, including traps and shooting. The Natchez Trace Parkway management team uses the National Wetlands Inventory to provide a general extent of the parkway’s wetlands for management and conservation purposes.

**Decision Support Tools & Benefits:**

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| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Land use/land cover map time series | Landsat 5 TM, Landsat 7 ETM+, Landsat 8 OLI | Products will provide insight into how wetland extent has changed throughout recent years for current management purposes/adjustments |
| Wetlands extent prediction map | Landsat 8 OLI | Product will show predicted wetlands extent for future management purposes |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (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 to V]