**NASA DEVELOP National Program**

**Spring 2016 Project Proposal**

**University Of Georgia**

**Atlanta Water Resources**

Identifying Key Urban Areas to Reduce Stormwater Runoff in Metropolitan Atlanta and Maximize Conservation Efforts

**Project Overview**

***Objective:*** To assist The Nature Conservancy (TNC) in identifying locations within metro Atlanta to focus reforestation of degraded areas and forested land protection efforts, which will reduce sediment and nutrient-laden stormwater runoff in the Chattahoochee River watershed.

***Community Concern:*** Residents of the metro Atlanta area pay the highest rates in the nation for municipal water and sewer, in part due to massive recent investments in infrastructure to manage stormwater runoff. As development continues at a rapid pace in the city and its suburbs, expanding areas of impervious surface will continue to exacerbate this problem. Forested land is known to slow runoff during storms, allowing water to infiltrate, and the soil to absorb particles and contaminants before entering the surface water. Enabling the protection of existing green infrastructure, or strategically planting more trees to intercept stormwater runoff, will help limit future “gray infrastructure” needs at a much higher cost. The Nature Conservancy is pursuing this strategy as part of a multi-city urban conservation strategy to demonstrate the value of natural solutions for the sustainability of cities.

***National Application Area Addressed:*** Water resources, Ecological forecasting

***Study Location:*** Atlanta, Georgia

***Study Period:*** January 2016 (or most current data available)

***Advisors:*** Marguerite Madden (University of Georgia), Rosanna Rivero (University of Georgia)

***Source of Project Idea:*** The Nature Conservancy in Georgia initiated this project idea as a needed baseline for an ongoing urban conservation strategy. Sara Gottlieb, a Conservation Planner for TNC, presented for The University of Georgia’s Integrative Conservation Program in March of 2015. Steve Padgett-Vasquez spoke with her about NASA DEVELOP and she became interested in collaborating with the program.

**Partner Overview**

***Partner Organization(s):***

The Nature Conservancy (End-user POC: Sara Gottlieb, Conservation Planner and Deron Davis, Executive State Director)

Atlanta Regional Commission (End-User, POC: Dan Reuter, Community Development Manager)

Trees Atlanta (End-User, POC: Greg Levine, Executive Director)

***End-User Current Decision Making Process:***

The Nature Conservancy in Georgia uses a standard framework for decision-making and planning for conservation projects referred to as Conservation By Design. The framework takes into account science-based information about the current status of conservation “targets” which is assessed through on-the-ground surveys, remote sensing (most often from freely-available sources such as NAIP imagery), or expert opinion. Stakeholder values are also assessed and considered before implementing the development of project goals and strategies. Project investments are monitored by senior managers and volunteer Board members to ensure sound financial practices and adequate monitoring of project outputs and outcomes.

The Atlanta Regional Commission is assessing impacts of the long-range transportation plans on air quality, working with local and state partners on strategies that protect watersheds and conserve resources and developing a comprehensive regional greenspace plan with local governments.

Trees Atlanta works to protect and improve Atlanta’s urban forest by planting, conserving, and educating. All of the partners have similar missions and work with each other and many other organizations that address this project’s community concern.

***NASA Earth Observations Capacity:***

The Nature Conservancy – TNC of Georgia is familiar with remote sensing, most often from freely-available sources such as NAIP imagery. However, they have not used NASA Earth observations and are eager to incorporate them immediately to inform their decisions about land protection and reforestation efforts.

Atlanta Regional Commission – The Atlanta Regional Commission is familiar with remote sensing, most often from freely-available sources such as NAIP imagery. However, they have not used NASA Earth observations and are eager to incorporate them immediately to inform their decisions about land protection and reforestation efforts.

Trees Atlanta – Trees Atlanta is familiar with remote sensing, most often from freely-available sources such as NAIP imagery. However, they have not used NASA Earth observations and are eager to incorporate them immediately to inform their decisions about land protection and reforestation efforts.

***Collaborator & Boundary Organization Support:***

The Nature Conservancy – TNC will provide useful data sets that include: land use/land cover, hydrographic networks (National Hydrography Dataset), soils (STATSGO, SSURGO), road networks, dams, protected land parcels, urban growth projections, elevation models (DEM), and ground survey data. Partners’ local knowledge and interaction with the community will inform the team’s work.

***Communication Plan & Transition Approach:***

Bi-weekly telecons will be planned to ensure frequent communication between the team and TNC. Deliverables with be shared with partners through Google Drive and a videoconference will be scheduled at the end of the term. Final results will be used immediately to inform decisions about land protection and deforestation.

***End-User Benefit:***

End-users are looking forward to receiving project results to inform their decisions about where to focus land protection and reforestation efforts to benefit communities by protecting drinking water supplies, providing opportunities for outdoor recreation, and serving as educational settings to demonstrate the importance of maintaining green infrastructure in urban areas.

**Letters of Support:** The Nature Conservancy in Georgia, Deron Davis, Executive Director

**Earth Observations Overview**

***Earth Observations:***

|  |  |  |
| --- | --- | --- |
| **Platform** | **Sensor** | **Geophysical Parameter** |
| **Terra** | ASTER | Spectral vegetation indices, DEM |
| **Landsat 8** | OLI, TIRS | Land cover |
| **TRMM** | PR | Historic rainfall |
| **GPM** | DPR | Surface rainfall  |
| **GRACE** | GRACE | Ground water storage |

***NASA Earth Observations Use:***

ASTER data will provide high spatial and temporal resolution elevation data.

The Landsat data will allow for the classification of current and historical land use and land cover changes.

GRACE data will provide estimates of groundwater changes in the region.

TRMM could potentially be used to assess historical rainfall if needed. It uses several space-borne instruments to increase our understanding of the interactions between water vapor, clouds, and precipitation.

GPM could potentially be used to access current precipitation. The GPM constellation of satellites can observe precipitation over the entire globe every 2-3 hours. The Core satellite measure rain and snow using two science instruments: the GPM Microwave Imager (GMI) and the Dual-frequency Precipitation Radar (DPR).

***Ancillary Datasets:***

Land use/land cover information; hydrographic networks (National Hydrography Dataset); soils (STATSGO, SSURGO); road networks; dams; protected land parcels; urban growth projections; local ground surveys.

***Models:***

Land Use Conflict Identification Model (LUCIS Plus model) (POC: Paul Zwick, University of Florida)

The Soil and Water Assessment Tool (SWAT) Model (POC: Jeff Arnold, [USDA Agricultural Research Service)](http://www.ars.usda.gov/).

**Decision Support Tool & End-Product Overview**

|  |  |  |
| --- | --- | --- |
| **Proposed End Products** | **Decision to be Impacted** | **Current Partner Tool/Method** |
| Analysis of Currently Forested Watersheds | Where The Nature Conservancy may invest or advise partners in forested land protection | Aerial imagery (NAIP, ESRI World Imagery Map Service), land cover/land use, field surveys, expert knowledge |
| Analysis of Potential Reforestation Areas | Where The Nature Conservancy may invest or advise partners in reforestation | Aerial imagery (NAIP, ESRI World Imagery Map Service), land cover/land use, field surveys, expert knowledge |

*Analysis of Currently Forested Areas* – Either a vector or grid file containing areas in metro Atlanta that scored for priority for land protection based on current level of forest cover, size, proximity to current and predicted development, proximity to waterways, condition of nearby waterways, and proximity to existing water quality impacts.

*Analysis of Potential Reforestation Areas* – Either a vector or grid file containing degraded areas in metro Atlanta that scored for priority for reforestation based on current level of forest cover, historic level of forest cover and/or suitability for reforestation based on current site conditions (land use), size, proximity to current and predicted development, proximity to waterway, condition of nearby waterways, and proximity to existing water quality impacts.

**Project Timeline & Previous Related Work**

***Project Timeline:*** 1 Term: Spring 2016

**Project Needs/Requests**

***Participants Requested:*** 5-6

***Software & Scripting:***

ArcGIS - Raster Manipulation/Analysis, Image Enhancement & Map Creation of Landsat ETM+, NPP VIIRS, Aqua/Terra MODIS

ENVI – Atmospheric correction