**NASA DEVELOP National Program**

**Fall 2016 Project Proposal**

**University of Georgia**

**Atlanta Water Resources III**

Characterizing Biophysical Features in Key Urban Areas Prioritized for Tree Planting to Reduce Stormwater Runoff in Metropolitan Atlanta to Maximize Conservation Efforts

**Project Overview**

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

***Community Concern:*** Residents of the Atlanta metro area pay the highest rates in the nation for municipal water and sewer. In part, this is due to massive recent investments in infrastructure to manage storm water runoff. However, as urban and suburban development continue at a rapid pace, expanding areas of impervious surface will only exacerbate this problem. On the other hand, forested land is known to slow runoff during storms, allowing water to infiltrate into the soil which absorbs particles and contaminants before entering surface water. Enabling the protection of existing “green infrastructure” and strategically planting more trees to intercept storm water runoff will help reduce the need for costly “gray infrastructure” in the future. The Nature Conservancy (TNC) 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 Areas Addressed:*** Water Resources, Ecological Forecasting

***Study Location:*** Atlanta, GA

***Study Period:*** January 2001 to October 2015

***Advisors:*** Marguerite Madden (Department of Geography, University of Georgia), Rosanna Rivero (College of Environmental Design, University of Georgia), Adam Milewski (University of Georgia, Department of Geology)

***Source of Project Idea:*** The Nature Conservancy (TNC) 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:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Organization** | **POC (Name, Position/Title)** | **Partner Type** | **Boundary Org?** |
| The Nature Conservancy (TNC) | Sara Gottlieb, Conservation Planner | End-User | Yes |

***End-User Overview***

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

The Nature Conservancy 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 in the development of project goals and strategies to be implemented. Project investments are monitored by senior managers and volunteer Board members to ensure sound financial practices and adequate monitoring of project outputs and outcomes.

By working closely with TNC, 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. It is also developing a comprehensive regional greenspace plan with local governments.

Additionally, TNC has an active collaboration with Trees Atlanta to protect and improve Atlanta’s urban forest by planting, conserving, and educating. The Nature Conservancy is pursuing similar missions and work with each of their collaborators and many other organizations that address this project’s community concerns.

***End-User’s Capacity to Use NASA Earth Observations:***

The Nature Conservancy – The organization has significant familiarity and usage of NASA Earth observations to visualize and characterize natural habitats at scales ranging from locally, regionally and globally.

***Collaborator & Boundary Organization Overview***

***Boundary Organization Dissemination:***

The Nature Conservancy – plans to use the results of the spatial analysis to refine strategies for improving watershed dynamics in the Atlanta Metro Area. Implementation of these strategies will depend on interagency collaboration between nonprofits, the public and private sectors, and local community groups. Partnership development is underway with local nonprofits such as Trees Atlanta, The Chattahoochee Riverkeeper, and the Conservation Fund, as well as relevant departments in the City of Atlanta. Neighborhoods identified in the spatial analysis will be targeted for information dissemination through in-person meetings, technical reports, and other means, depending on the audience.

***Project Communication & Transition Overview***

***In-Term Communication Plan:***

Bi-weekly telecons will be planned to ensure frequent communication between the team and partners at The Nature Conservancy.

***Transition Approach:***

Deliverables will be shared with partners through Google Drive and an in-person presentation to The Nature Conservancy will summarize the results of this project. Final results will be used immediately to inform decisions about land protection and deforestation.

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

**Earth Observations Overview**

***Earth Observations:***

|  |  |  |
| --- | --- | --- |
| **Platform & Sensor** | **Parameter(s)** | **Use** |
| **Terra ASTER** | Elevation  | Data will provide information about watershed slopes and extent, enhancing understanding of watershed connectivity and delineation.  |
| **Landsat 8 OLI, TIRS** | Land cover | Land cover data will be used to identify current and historic land use trends for target conservation parcels.  |

***Ancillary Datasets:***

TNC – Land use/land cover information – Analysis of land use trends

TNC – Road networks – Identifying proximity of parcels to road infrastructure

TNC – Dams – Mapping the location of impoundments within target parcels

TNC – Protected land parcels – Conservation areas within study region

TNC – Urban growth projections – Trends in associated conservation parcels

TNC – Local ground surveys – Validation of model outputs and identification of features or land cover characteristics

USGS National Hydrography Dataset – Mapping of existing hydrologic features within study area

USDA STATSGO – Identification of soil types within each parcel

USDA SSURGO – Identification of soil types within each parcel

***Modeling:***

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

Soil and Water Assessment Tool (SWAT) Model (POC: Jeff Arnold, USDA Agricultural Research Service)

***Software & Scripting:***

ArcGIS – Raster manipulation/analysis, image enhancement, & map creation of Landsat ETM+

ENVI – Atmospheric correction

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

***End Products:***

|  |  |  |  |
| --- | --- | --- | --- |
| **End Products** | **Partner Use** | **Datasets & Analyses** | **Software Release Category** |
| Land Use Allocation Scenario Maps | Identify areas under-served by forested land and green infrastructure for water resource protection | Derived from Landsat 8 OLI, Terra ASTER, soil, and hydrology datasets integrated into the LUCIS and SWAT models. This analysis will use the LUCIS outputs to generate land use maps following community preference assignments for local water resource management.  | N/A |
| Forested Land Connectivity Assessment | Prioritize forest protection efforts based on connectivity of existing patches and waterways  | Landsat 8 OLI will be used to calculate landscape metrics associated with forested watersheds to provide The Nature Conservancy an assessment that will identify potential corridors and linkages across watersheds.  | N/A |

***End-User Benefit:***

TNC is in the process of developing an urban conservation program focused on reducing storm water impacts in the Atlanta metro area by protecting key forested areas or by reforesting areas that will also provide co-benefits to targeted communities. Given the scale of the potential project area, a spatial analysis to prioritize specific locations to focus project implementation is necessary. The results of this work will help to identify high priority locations for conservation and better characterize community features identified by project stakeholders as important to project success.

**Project Timeline & Previous Related Work**

***Project Timeline:*** 3 Terms: 2016 Spring (Start) to 2016 Fall (Completion)

***Multi-Term Objectives:***

* **Term 1:** 2016 Spring (UGA) – Atlanta Water Resources I
	+ Analysis and characterization of metro Atlanta watersheds associated with the Chattahoochee River; watershed assessment following LUCIS model; identification of target conservation parcels and areas of interest for project partners
* **Term 2:** 2016 Summer (UGA) – Atlanta Water Resources II
	+ SWAT model analysis and calibration. In-depth analysis of parcel features and characteristics following project partner criteria for suitability and planning incorporated into the LUCIS analysis.
* **Term 3 (Proposed Term):** 2016 Fall (UGA) – Atlanta Water Resources III
	+ Finalization of SWAT and LUCIS outputs. Integration of SWAT model outputs into LUCIS model criteria. Evaluation of community preference scores for land use allocation scenarios, emphasizing conservation and reforestation land management practices. Determination of forest connectivity and watershed linkages using Landsat 8-based landscape metrics

***Related DEVELOP Work:***

Summer 2014 (UGA) – Miami-Dade Ecological Forecasting: Utilizing NASA Imagery and GIS Modelling for the Design and Implementation of the Miami-Dade Western Greenway

**Notes & References:**

***Notes:*** The following organizations and individuals have assisted The Nature Conservancy throughout the course of their work in the metro Atlanta area:

* Atlanta Beltline (POC: Catherine Owens, Principle Investigator)
* The Conservation Fund (POC: Stacey Funderburke, Southeast Regional Assistant)
* City of Atlanta, Department of Watershed (POC: Susan Rutherford, Watershed Manager)
* Georgia Institute of Technology (POC: Tony Giarusso, Research Scientist; Nisha Botchwey, Associate Professor)
* Emory University (POC: Gonzalo Vazquez-Prokopec, Assistant Professor)