**NASA DEVELOP National Program**

**2017 Summer Project Proposal**

**University of Georgia**

**Georgia Energy**

*Reducing Conflicts in Siting Solar Power Generating Facilities by Identifying Sensitive Habitats and Wildlife Populations in Areas with High Solar Power Generation Potential*

**Project Overview**

***Project Synopsis*:** The goal of this project is to develop a set of data layers and model outputs for the state of Georgia to be used to support decisions about where to site solar power generating facilities, while taking account of conservation factors to avoid negative environmental impacts. The work will proceed in consultation with key stakeholders, including Southern Company, the Georgia Department of Natural Resources, and the US Fish and Wildlife Service and will be incorporated into a public information portal for use in permitting decisions.

***Community Concern:*** The pace of utility-scale solar power development in the United States is growing at an annual rate 30-45%, with Georgia being one of the top five states for solar capacity added in 2016. While this is good news from the standpoint of mitigating the effects of a changing climate, large-scale solar arrays (or solar farms) can have significant impacts on sensitive habitats for vulnerable species such as the gopher tortoise. In order to avoid siting new solar farms where these impacts would be most damaging, environmental information needs to be made readily available to state officials involved with siting and permitting these facilities.

***Source of Project Idea:*** The Nature Conservancy has been aware of this issue for several years and has collaborated with the GA Department of Natural Resources, US Fish and Wildlife Service and Southern Company on potential solutions. We are modeling the concept on similar work done by other chapters of The Nature Conservancy, namely Kansas.

***National Application Area Addressed:*** Energy

***Study Location:*** GA, USA

***Study Period:*** January 2010 – June 2017

***Advisor:*** Dr. Marguerite Madden, University of Georgia

**Partner Overview**

***Partner Organizations:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Organization** | **POC (Name, Position/Title)** | **Partner Type** | **Boundary Org?** |
| The Nature Conservancy (TNC) | Cassidy Jordan, Conservation Coordinator | End-User | Yes |
| Georgia Department of Natural Resources | Matt Elliott, Non-game Conservation Program Manager | Collaborator | No |
| US Fish and Wildlife Service, Georgia Ecological Services Field Office | Dr. Michele Elmore, Fish and Wildlife Biologist and Eastern Indigo Snake Lead Biologist; Tamara Johnson, Lead Energy Biologist | Collaborator | No |

***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 regarding 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 to ensure sound financial practices and adequate monitoring of project outputs and outcomes.

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

*The Nature Conservancy* – The organization has significant familiarity with NASA Earth observations and uses them to visualize and characterize natural habitats at local, regional, and global scales.

***Collaborator & Boundary Organization Overview***

***Collaborator Support:***

*Georgia Department of Natural Resources* – Mr. Elliott is an expert in herpetofauna, especially gopher tortoise, indigo snake, and other species associated with habitats at risk from solar siting in Georgia. He also has significant expertise in spatial analysis and habitat delineation, and will be a frequent advisor and consultant on this project through an existing relationship with The Nature Conservancy and the other project collaborators.

*US Fish and Wildlife Service, Georgia Ecological Services Field Office* – Dr. Elmore is a former employee of The Nature Conservancy who now serves as the Lead Biologist for the Eastern Indigo Snake program within the Georgia Ecological Services Field Office at Fort Benning. Therefore, she is familiar with both The Nature Conservancy’s and the Fish and Wildlife Service’s operations, priorities, and decision-making process in addition to being an expert in solar energy. She will be a frequent advisor and consultant on this project.Ms. Johnson is the lead energy biologist in the Georgia Ecological Services Field Office. She has coordinated with state and industry partners on wind, solar, and hydropower projects for the past six years, and has helped develop and implement best management practices for solar projects that are being utilized by the FWS throughout the Southeast.

***Dissemination by Boundary Organization*:**The Nature Conservancy has a long history of disseminating data products and decision support tools through its many communications channels. The Georgia Chapter intends to develop a web-based portal through which the broader community can access and use the data products and decision-support tools for making decisions about siting solar power generating facilities throughout the state. Staff will also organize in-person or web-based seminars to introduce partners and the broader community to the existence of these data and tools. The primary targets of outreach will include members of the energy generation community in Georgia, major land-owners, including military installations, and agencies with regulatory authority over land use decisions in the state.

***Project Communication & Transition Overview***

***In-Term Communication Plan*:** The Nature Conservancy will hold at least one partner meeting prior to the initiation of the NASA DEVELOP term to collaborate on the data inputs, outputs, and prioritization of model factors. During the term, The Nature Conservancy contact, Cassidy Jordan, will meet weekly via Skype with the NASA DEVELOP team to discuss any aspects of the project, including data needs, modeling approaches, output formats, and delivery of final products for dissemination to the partners.

***Transition Plan*:** The Nature Conservancy intends to incorporate the products of this project into a web-based portal hosted on its internal servers. The portal will be similar to The Nature Conservancy’s web-portal for low-risk wind power in the Great Plains.

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

**Earth Observations Overview**

***Earth Observations:***

|  |  |  |
| --- | --- | --- |
| **Platform & Sensor** | **Parameter(s)** | **Use** |
| **Landsat 5 TM** | Land cover | Habitat mapping and land cover type |
| **Landsat 8 OLI** | Land cover | Habitat mapping and land cover type |
| **Terra CERES** | Radiation and insolation | Cloud and solar statistics |
| **TRMM CERES** | Radiation and insolation | Cloud and solar statistics |
| **Suomi NPP CERES** | Radiation and insolation | Cloud and solar statistics |

***Ancillary Datasets:***

The Nature Conservancy – Soils Profile Layer – for use in developing habitat models

The Nature Conservancy – Digital Elevation Model – for use in developing habitat models

The Nature Conservancy – Solar Power Potential Layer – for use in developing siting conflict models

The Nature Conservancy – Electricity Infrastructure Layer – for use in developing siting conflict models

GA Department of Natural Resources – Element Occurrence Layer – for use in developing habitat models

GA Department of Natural Resources – Gopher Tortoise Habitat prioritization model result layer – for use in developing gopher tortoise habitat models

Other datasets may be identified prior to the start of the NASA DEVELOP term in consultation with the project partners and they will be provided by The Nature Conservancy or the partners.

***Modeling:***

MaxEnt (Rachel Boreman, Warnell School of Forestry and Natural Resources)

Tortoise-specific Soil Prioritization Model (Dee Peterson, NRCS USDA)

***Software & Scripting:***

Esri ArcGIS – raster manipulation and analysis, image enhancement & map creation

MaxEnt – habitat suitability analysis and modeling

**Decision Support Tool & End Product Overview**

***End Products:***

|  |  |  |  |
| --- | --- | --- | --- |
| **End Product(s)** | **Partner Use** | **Datasets & Analyses** | **Software Release Category** |
| **Radiation and Insolation Time Series** | This time series will provide partners with information about changing solar conditions across Georgia over the past 7 years. | CERES data will be used to analyze trends and changing solar conditions across Georgia. | N/A |
| **Land Cover Time Series** | This time series will provide partners with information about changing land cover, development, and habitat extent across Georgia over the past 7 years. | Landsat 5 & 8 will be used to analyze trends in changing land cover conditions across Georgia. | N/A |
| **Georgia Low-Risk Solar Siting Suitability Map** | The final end products will be provided for free to the public via a web-based portal to enable partners, private individuals, and solar industry developers to make better decisions about siting solar facilities in a manner that will reduce impacts to sensitive habitats. | Landsat 5 TM, Landsat 8 OLI, and CERES data will be used to identify optimal areas for solar power facilities that minimize negative impacts to sensitive wildlife habit. | N/A |

***End-User Benefit*:** The Nature Conservancy and our partners are committed to supporting a renewable energy future in order to mitigate the predicted impacts of human-caused climate change. Georgia has a high potential to generate a significant portion of the power used in the state through solar photovoltaic panel installations on rooftops and in undeveloped areas. As the pace of this solar power generating infrastructure has increased over the past several years, the instances of conflict between the need to generate renewable energy and the need to protect sensitive habitats from incompatible development have also increased. The Nature Conservancy has a track record of bringing stakeholders to the table to agree on shared outcomes and ways to reduce conflicts among different interests by using the best-available information and generating new information and model results to avoid conflict when possible. The end products of this NASA DEVELOP project will be extremely valuable in helping The Nature Conservancy in Georgia work with our partners to achieve a more sustainable energy portfolio while protecting sensitive habitats.

**Project Timeline & Previous Related Work**

***Project Timeline:*** 2 Terms: 2017 Summer (Start) to 2017 Fall (Completion)

***Multi-Term Objectives:***

* **Term 1 (Proposed Term):** 2017 Summer (UGA) – Georgia Energy
  + This term of the project will focus on creating the radiation and insolation time series and the land cover time series. These products will serve as inputs for the solar siting suitability analysis. The team will provide partners with the time series at the end of the term to establish a framework of the upcoming suitability analysis.
* **Term 2:** 2017 Fall (UGA) – Georgia Energy II
  + The second term of the project will use the results of the previous term to conduct the suitability analysis and produce maps displaying optimal areas for solar power facilities that minimize negative impacts to sensitive wildlife habit.
  + Explore opportunities to use a story map to display suitability results.

***Related DEVELOP Work:***

2015 Fall (University of Georgia) – Atlanta Water Resources: Identifying Key Urban Areas to Reduce Stormwater Runoff in Metropolitan Atlanta to Maximize Conservation Efforts (Term I)

2016 Spring (University of Georgia) – Atlanta Water Resources: Identifying Key Urban Areas to Reduce Stormwater Runoff in Metropolitan Atlanta to Maximize Conservation Efforts (Term II)

2016 Summer (University of Georgia) – Atlanta Water Resources: Identifying Key Urban Areas to Reduce Stormwater Runoff in Metropolitan Atlanta to Maximize Conservation Efforts (Term III)

**Notes & References:**

***References:***

Berkeley Law. (Accessed January 2017). Mapping Lands to Avoid Conflict for Solar PV in the San Joaquin Valley. Retrieved from https://www.law.berkeley.edu/research/clee/research/climate/solar-pv-in-the-sjv/

Chapman, D. (2015, September 18). Clean energy in Georgia comes with some nasty side effects. The Atlanta Journal Constitution. Retrieved from http://www.myajc.com/news/state--regional-govt--politics/clean-energy-georgia-comes-with-some-nasty-side-effects/d0PvKFIS2IxAb307Wk0AaP/

Fuhr, M. & Hawk, K. (2016, September 20). Where Does Your Wind Energy Come From and Is It Really ‘Green”? Retrieved from http://blog.nature.org/conservancy/2016/09/20/where does-your-wind-energy-come-from-and-is-it-really-green/

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The Nature Conservancy. (Accessed January 2017). Wind Energy and Wildlife: Site it Right. Retrieved from http://www.nature.org/ourinitiatives/regions/northamerica/areas/greatplains/conservation-priorities/eco-friendly-energy.xml

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