**NASA DEVELOP National Program**

****University of Georgia, Athens, GA

*Summer 2017*

**Short Title: Georgia Energy**

**Subtitle:** Mitigating Conflicts in Siting Solar Power Facilities by Identifying Sensitive Wildlife Habitats in Areas with High Solar Power Generation Potential

**VPS Title:** Georgia Forecast: Sunny with a Chance of Energy

**Project Team**

**Project Team:**

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**Project Overview**

**80-100 Word Objectives Overview:**

The Georgia Energy project examines the environmental impact generated by the rapid growth of solar energy in Georgia, and aims to raise awareness for future utility-scale solar installation planning. The research will employ several datasets necessary for identifying suitable sites for solar farms and environmentally sensitive habitats. Analysis will proceed to examine conflicts between those two interests, and generate a prioritization map for conscious solar farm development. Results of this suitability analysis will create a framework our partners, The Nature Conservancy and the Georgia Department of Natural Resources, can use as a platform to communicate with solar energy developers.

**Abstract:**

Solar energy is a rapidly growing industry in the state of Georgia. The increasing popularity of solar farms is encouraging decision makers and developers to incorporate a sustainable plan for utility scale solar developments. However, the construction and siting of solar farms could have a threatening impact on environmentally sensitive habitats and associated species. NASA DEVELOP has partnered with The Nature Conservancy and the Georgia Department of Natural Resources to conduct an analysis that will be used to inform solar site planning and to communicate with key stakeholders. The team analyzed land cover trends from Landsat 8 OLI in addition to solar insolation data sets from Terra CERES. These Earth observations were combined to classify and extract data layers for a solar site suitability and conflict identification model. Additionally, the DEVELOP team utilized endangered species habitat layers and focused on the gopher tortoise (*Gopherus polyphemus*) primarily due to its role as a keystone species in these sensitive areas. These data were used to generate end products that depict potential conflicts between ideal solar energy sites and endangered species habitats, and prioritize development areas outside of these conflicts. This project also developed a case study with higher resolution and supplementary ancillary data tailored to Taylor County, GA. The results of this project will be utilized by The Nature Conservancy and Georgia Department of Natural Resources to recommend suitable sites for environmentally conscious solar farm construction.

**Keywords:**

Remote sensing, Land cover, Landsat, Terra, Aqua, Gopher tortoise, Suitability analysis, Solar energy, Solar farm.

**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 (GDNR) | Matt Elliott, Non-game Conservation Program Manager;  ‎Jon Ambrose Chief of Nongame Conservation | Collaborator | No |
| U.S. Fish and Wildlife Service, Georgia Ecological Services Field Office (USFWS) | Dr. Michele Elmore, Fish and Wildlife Biologist and Eastern Indigo Snake Lead Biologist; Tamara Johnson, Lead Energy Biologist | Collaborator | No |

**Community Concerns:**

* The rapid pace of utility-scale solar power development in the state of Georgia is now growing at a 30-45% annual rate, raising more opportunities for large-scale solar array installation. Such projects can have significant impacts on sensitive habitats for vulnerable species.
* There is a need for utility developers to consider endangered species habitats and the environmental risks that solar farm development poses for critical wildlife in Georgia.
* Environmental information must be made readily available to state officials involved with siting and permitting these facilities.

**Current Decision Making Practices & Policies**:

TNC 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. GDNR dedicates its efforts to sustain, enhance, protect and conserve Georgia’s natural, historic and cultural resources for present and future generations, while recognizing the importance of promoting the development of commerce and industry that utilize sound environmental practices. This project’s contribution will fit into both frameworks, but will not replace any current processes. Instead, it will anchor these partnerships’ previous and ongoing endeavors, venture into a new topic of interest while increasing occurrences of use of geospatial analysis to address issues at the nexus of utility development and environmental concerns.

**Decision Support Tools & Benefits:**

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| --- | --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Partner Benefit & Use** | **Software**  **Release** |
| Solar Farm Installation Time Series | Landsat 8 OLI, Terra CERES, Aqua CERES | This time lapse product will map the rapid growth of the solar energy farm industry in the state of Georgia. Representing this growth will allow users to visualize footprints and trends, which will facilitate decision making. | N/A |
| Solar Farm Potential & Conflict Identification Model | Landsat 8 OLI, Terra CERES, Aqua CERES | This model will create a framework for final end products that will be used in a web-based portal that enables partners, private individuals, and solar industry developers to make better decisions about siting solar facilities in a manner that will reduce impacts on sensitive habitats. | N/A |

**Project Benefit to End-User**:

The Nature Conservancy is committed to supporting a renewable energy future in order to mitigate the predicted impacts of a changing climate. 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 work with their partners to achieve a more sustainable energy portfolio while protecting sensitive habitats.

**Project Details**

**Applied Sciences National Applications Addressed:** Energy

**Study Area:** GA

**Study Period:** Jan 2015 – June 2017

**Earth Observations & Parameters:**

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| --- | --- | --- |
| **Platform & Sensor** | **Parameter(s)** | **Use** |
| Landsat 8 OLI | Land cover classification | OLI images will be used for land cover classification and identification of large solar sites. |
| Terra CERES | Cloud cover | The FM1-FM4 products will provide cloud cover data as an indicator for solar farm installation and potential |
| Aqua CERES | Solar Radiance | The FM1-FM4 products will provide cloud cover data as an indicator for solar farm installation and potential |

**Ancillary Datasets Utilized:**

* University of Georgia Warnell School of Forestry & Natural Resources- Gopher Tortoise Habitat
* Natural Resources Conservation – Soils
* US Department of Agriculture CropScape – Land cover
* NASA CERES – Solar Isolation
* Georgia Clearing House- FEMA floodplains, Roads
* Carl Vinson Institute of Government – Digital Elevation Model, Taylor country roads and parcel data
* The Nature Conservancy- Electricity Infrastructure Layer
* SouthFace Energy Institute Ground- Solar Farm Locations
* Georgia Department of Natural Resources- Conservation Lands
* US Fish and Wildlife Services – Streams in Georgia

**Software Utilized:**

* Esri ArcGIS – raster manipulation to create overlay analysis, image enhancement & creation of Landsat 8 OLI and Terra CERES map products

**Project Handoff Package**

**Transition Plan:**

The Georgia Energy team is planning to hold an in-person event where the NASA DEVELOP participants The Georgia Energy team plans to hold an in-person event where the DEVELOP participants will present their end-results (an ArcGIS story map, interactive map platform, and a sequence of overlays) and discuss their findings from this term. The presentation will be open to a wider audience for outreach along with project partners at GDNR and TNC. Additionally, the DEVELOP team will meet separately with partners to provide final deliverables and discuss any questions about the project or planning future terms.

*Project Continuation Plan*: The next term will result into one of two directions (based on partner feedback):

* Refining the variables into the delivered statewide analysis, venturing into a deeper level of detail for additional results, and yielding a similar range of deliverables.
* Focusing in on a few areas that appear viable for solar farm development (from initial analysis) and exploring additional data layers to consider when siting future development sites: such as zoning, view shed analysis, utility maps, etc. This direction will yield a similar range of deliverables, but may be developed into tools that can be used by future planning stakeholders.

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**Partner POC**: Cassidy Jordan, cassidy.jordan@tnc.org

**Handoff Package:**

* Land cover mapped time lapse to show growth of the solar energy industry
* Interactive map allowing user to observe layers used in the analysis, and communicating data
* Story map delineating the elements shaping this research along with photos and footage
* Suitability map showing areas that are appropriate for solar panel installation with minimal ecological impact
* Final Draft project deliverables
* Project Video