**NASA DEVELOP National Program**

**Summer 2016 Project Proposal**

**NASA Langley Research Center**

**Southwest Ecological Forecasting**

Utilizing NASA Earth Observations to Identify Locations of Invasive Species to Better Allocate Management Resources.

**Project Overview**

***Objective:*** To identify patches of invasive species using remote sensing to better allocate resources and management efforts.

***Community Concern:*** Land managers require accurate information about invasive species patch locations in order to effectively allocate resources and management efforts. However, searching for invasive species patches is time intensive and may not be feasible on large spatial scales. Invasive species can dramatically alter the function of natural ecosystems, so effective monitoring and management is essential to future ecosystem stability.

***National Application Area(s) Addressed:*** Ecological Forecasting

***Study Location:*** Southwest United States (Bandelier National Monument [NM], Valles Caldera National Preserve [NM], Glen Canyon National Recreation Area [AZ, UT], and Big Bend National Park [TX])

***Study Period:*** 2000 to September 2016; Forecasting up to 2035

***Advisor(s):*** Dr. Kenton Ross (NASA DEVELOP National Program Science Advisor)

***Source of Project Idea:*** This project was proposed to the DEVELOP National Program Office by the National Park Service.

**Partner Overview**

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Organization** | **POC (Name, Position/Title)** | **Partner Type** | **Boundary Org?** |
| National Park Service | Charles Schelz, Ecologist; Todd Chaudhry, Research Coordinator Colorado Plateau Cooperative Ecosystem Studies Unit; Steven Buckley, Ecologist | End user | Yes |

***End-User Overview***

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

The NPS currently utilizes *in situ* measurements to identify patches of invasive species. They are expanding to using more remote sensing-based technologies, but still rely primarily on field observations. They utilize these observations to deploy resources to mitigate and remove invasive species.

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

National Park Service – The end user is familiar with NASA Earth observations, but they have not been widely implemented in their management practices. This project would further develop the NPS’s ability to identify invasive species patches on large spatial scales without the intensive efforts required for field-based studies.

***Collaborator & Boundary Organization Overview***

***Boundary Organization Dissemination:***

The National Park Service will be disseminating these results to parks managers to monitor invasive species, and further identify patches in other locations. These results and the methodologies will be readily available to the NPS so that they can duplicate this methodology at other parks or with similar species.

***Project Communication & Transition Overview***

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

The project lead will communicate with project partners weekly via email (and by telephone as needed) over the course of the term.

***Transition Approach:***

End products will be delivered to the end users electronically during the last week of the term. The products will be readily available upon delivery for future use by the end users.

**Earth Observations Overview**

***Earth Observations:***

|  |  |  |
| --- | --- | --- |
| **Platform & Sensor** | **Parameter(s)** | **Use** |
| **Landsat 8 OLI/TIRS** | Land cover and temperature | Used to identify patches of giant reed |
| **Terra MODIS** | Vegetation | Used to identify patches of cheatgrass |

***Ancillary Datasets:***

NPS – Identified locations of invasive species; used to validate model results

EMODIS – NDVI; used to identify patches of cheatgrass

***Models:***

Terrset

SAHM (USGS – Fort Collins)

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

***End Products:***

|  |  |  |  |
| --- | --- | --- | --- |
| **End Product(s)** | **Partner Use** | **Datasets & Analyses** | **Software Release Category** |
| Cheatgrass Distribution Map | Used to locate patches of cheatgrass | Terra MODIS and Landsat OLI/TIRS | N/A |
| Giant Reed Distribution Map | Used to locate patches of giant reed | Landsat, Sentinel, eMODIS | N/A |
| Cheatgrass Phenology Time Series | Used to predict locations of cheatgrass | Species Distribution Model | N/A |

***End-User Benefit:***

End users will gain updated distribution maps of select invasive species, as well as a less time and resource intensive methodology to track invasive species. This process could enhance decision-making by park managers by providing a more holistic understanding of invasive species distributions. Additionally, this methodology could then be adapted to other select species that were not the focus of this project, or could be extended to other parks. Ultimately, this information will allow for better tracking of the effects of invasive species on ecosystem stability and resilience in the National Park system.

**Project Timeline & Previous Related Work**

***Project Timeline:*** 1 Term: Summer 2016

***Related DEVELOP Work:***

Fall 2015 (FC) – Wyoming Ecological Forecasting: Mapping Cheatgrass Distribution and Phenology in a Post-Wildfire Landscape in Wyoming's Medicine Bow National Forest

**Project Needs/Requests**

***Participants Requested:*** 3

***Software & Scripting:***

ESRI ArcGIS – processing Landsat data and map production