2019 Spring Preview

DEVELOP National Program

Disasters

Urban Development

Water Resources

Ecological Forecasting

Agriculture & Food Security

3rd Term (1)

2nd Term (1)

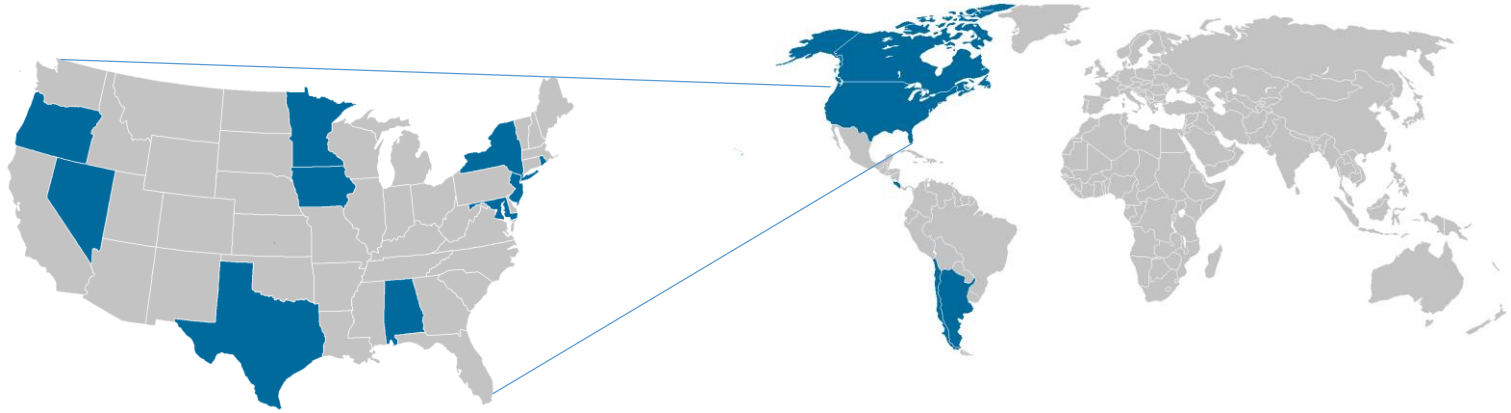
1ST Term (14)

2019 Spring Portfolio

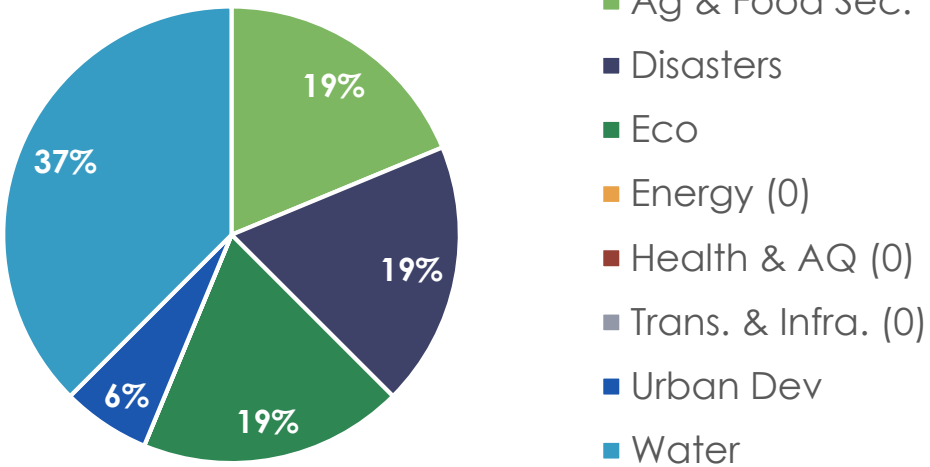
65 Participants
16 Projects

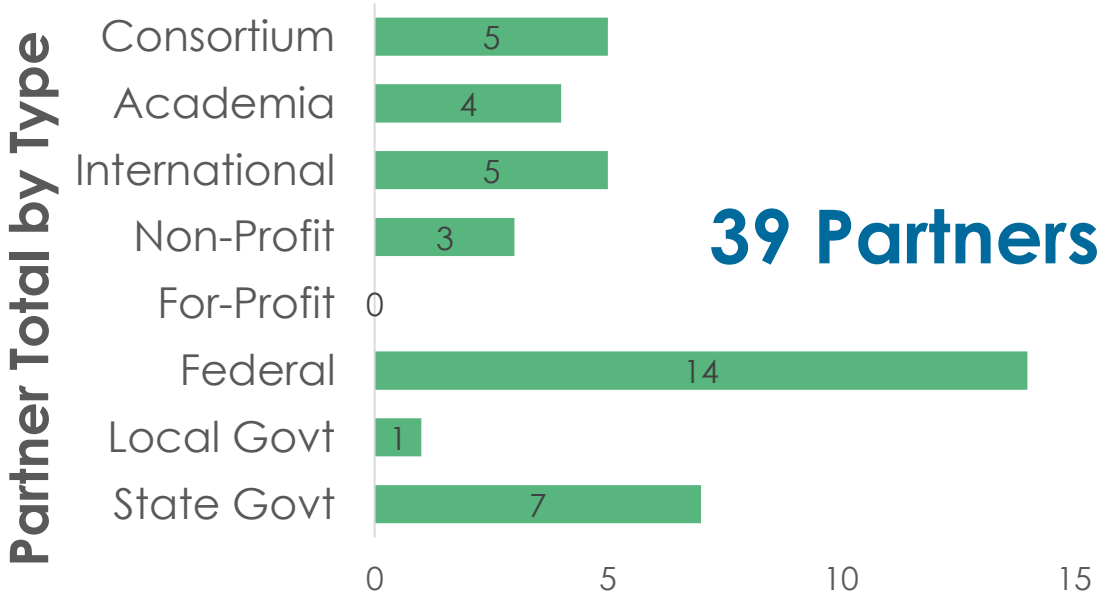
75% Domestic
25% International

11 States &
5 Countries Impacted



Application Areas Addressed





39 Partners

*Impacts and partners are tentative

Alaska Disasters

Alabama - Marshall

Community Concern: Fires improve the environment by recycling nutrients into the soil and making way for new grasses and shrubs. However, they can also destroy homes, wildlife habitats, and release pollutants into the air. Managers must decide whether or not they should take action against fires, and access to the most accurate information on weather conditions and dry fuels is critical to this decision making process. Each season is highly variable, and depends on dry fuel availability, weather, and ignition sources. Fire is much more likely to start and spread in areas experiencing vegetation stress. Vegetation stress index products have been successfully incorporated into fire management practices around the world but they cannot be directly transferred to Alaska. Unique effects of a high latitude environment, including sun angle and day length, as well as the composition of the boreal forest and taiga, require specific analysis of such products before implementation.

Earth Observations:

- Aqua MODIS
- Terra MODIS
- Suoni NPP VIIRS
- JPSS-1/NOAA 20 VIIRS

Partners:

- Alaska Interagency Coordination Center
- Alaska Fire Science Consortium
- NASA Short-term Prediction Research and Transition Center (SPoRT)

Impact & Benefit: The ESI product provides more lead-time on vegetation degradation than other indices. Comparison with the Canadian Forest Fire Danger Rating System (CFFDRS) Fire Weather Indices will also help to provide a context for the ESI in Alaska. The Alaska Specific Parameters for ESI will tailor the current ESI product to assist decision makers in selection of prescribed burn areas and allocation of resources in Alaska. The Fire Occurrence Time Series and Ongoing Drought Map will assist the partners in determining which areas are more likely to burn, thus improving efficiency and safety.

Niagara Falls Disasters

Massachusetts - Boston

Community Concern: Extreme high water events in spring of 2017 caused flooding in homes, businesses, and recreation areas along the coast of Lake Ontario. Niagara Falls, NY was unable to accommodate floodwater inundation during the worst of these events, resulting in property damage and dangerous conditions for residents. Niagara Falls managers require further assessment of flood extent and risk.

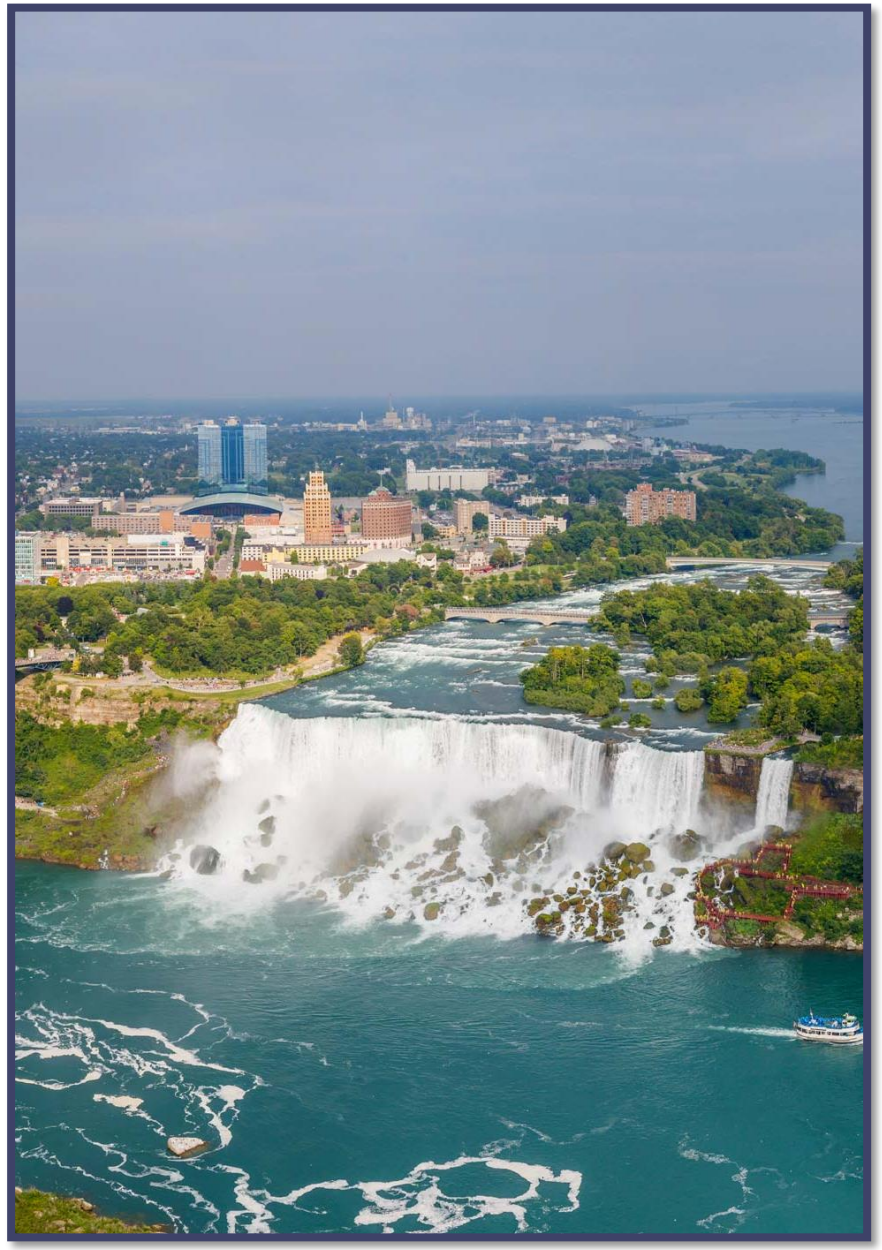
Partners:

- City of Niagara Falls
- Great Lakes and St. Lawrence Cities Initiative
- Cornell University
- University of Michigan

Earth Observations:

- Aqua & Terra MODIS
- Sentinel-1 C-SAR
- GPM IMERG
- SMAP
- SRTM
- Landsat 8 OLI

Impact & Benefit: End products and tools will be used to identify areas most at risk of flooding during high water events and examine trends in watershed conditions. This will ultimately benefit flood management practices and improve spatially explicit risk assessment.



Lake Ontario Disasters

Arizona – Tempe

Community Concern: In 2017, Lake Ontario water levels were abnormally high, leading to massive flooding events. Flooding events are costly as it damages infrastructure and hinders economic activity. It also poses public health and safety as standing water can host diseases and unsafe conditions on the road. There is a need to better inform river flow decisions and better equip communities vulnerable to flooding.

Partners:

- Great Lakes and St. Lawrence Cities Initiative
- City of Mississauga, Community Services Dept, Environment Division
- City of Toronto, Office of Emergency Management
- University of Michigan

Earth Observations:

- GPM
- Sentinel-1 C-SAR
- Aqua & Terra MODIS
- SRTM
- SMAP

Impact & Benefit: The partners are actively looking for data and information that can aid in their flood preparation and mitigation efforts. The project aims to provide flood extent maps and help inform the partners about the environmental parameters that contribute to flooding that in turn could help their member municipalities better prepare for more extreme weather and other expected impacts.

Providence & Elizabeth Urban Development

Virginia – Langley

Community Concern: Providence, RI, and Elizabeth, NJ, are both densely populated urban environments in low-lying areas proximal to bodies of water. These conditions make the communities that live in these cities vulnerable to extreme urban heat and potential flooding.

Earth Observations:

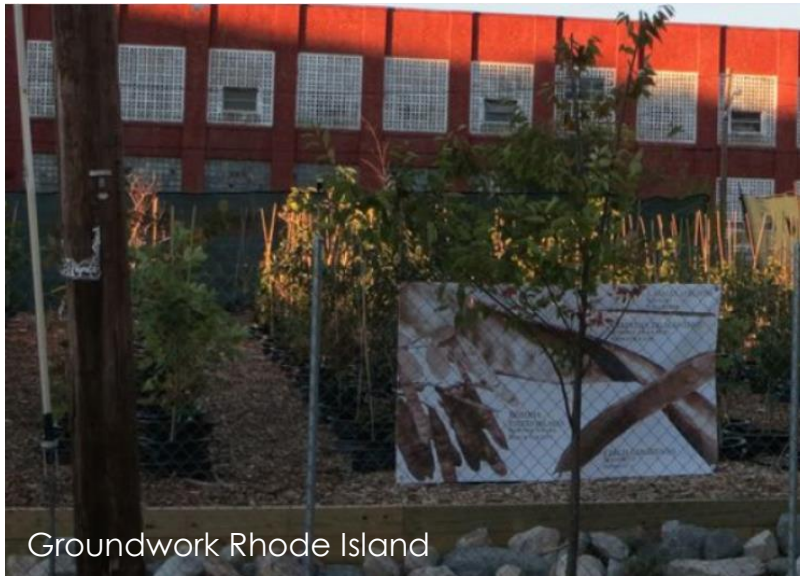
- Landsat 8 OLI & TIRS
- Suomi-NPP VIIRS
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- Terra & Aqua MODIS

Partners:

- Groundwork USA
- Groundwork Rhode Island
- Groundwork Elizabeth

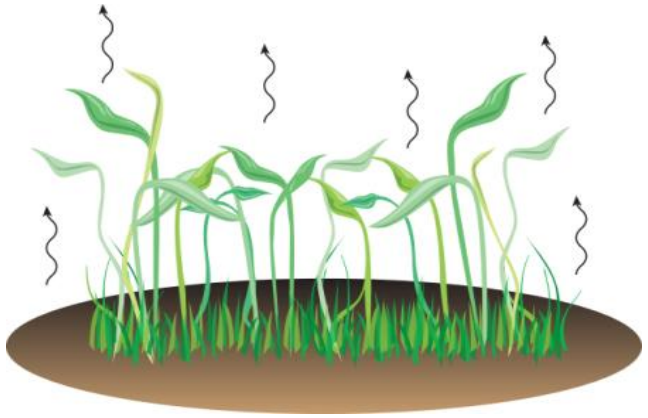
Impact & Benefit: Allow Groundwork to better understand heat- and flood-related vulnerabilities in Providence, RI, and Elizabeth, NJ. In the long term, the refined project methodology will allow Groundwork USA to generate a consistent and reproducible set of map packages that can be applied to any of its local trusts.


Groundwork Elizabeth


Groundwork Rhode Island

Argentina Water Resources

Idaho - Pocatello



Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SMAP
- GPM GMI
- Aqua & Terra Modis
- ECOSTRESS
- SRTM

Community Concern: The National Scientific and Technical Research Council of Argentina is tasked with the promotion of science and technology within Argentina. Providing researchers and land and resource managers with a calibrated methodology for effectively modeling ET rates and soil moisture utilizing NASA Earth observations will allow more targeted and effective water conservation strategies.

Impact & Benefit: This project will rapidly allow the National Scientific and Technical Research Council to repeat the modeling processes and evaluate the soil moisture and ET model performance between both Patagonian Steppe of Argentina and Snake River Plane, resulting in a potentially more fine-tuned ET model. The project also enables future analysis across larger scales that would not be possible without utilizing NASA Earth observations.

Partners:

- National Scientific and Technical Research Council (Argentina)

Chile Water Resources

California - Ames

Community Concern: Chile's saline systems are considered an oasis due to their biotic richness and limited water accumulation. However, over the past decades, the extent of northern Chile's unique saline systems has diminished as the result of mining for lithium, potassium, and boron. Currently, the Chilean government does not have data documenting the decrease in the extent of these systems.

Partners:

- Servicio Nacional de Geología y Minería (SERNAGEOMIN)
- Centro de Información de Recursos Naturales (CIREN)
- Universidad de La Serena

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI/TIRS
- Sentinel-2 MSI

Impact & Benefit: The project will provide the end users with a set of analyses that determine both **current** and **historical** extents of remote saline systems in the Atacama Desert and the nearby Andes mountain range, thus enabling the partners to make informed decisions regarding resource management well into the future.

Great Lakes Water Resources

California – JPL

Community Concern: Wetland managers, highway engineers and farmers all need current and accurate wetland maps to plan for conservation, home development, transportation infrastructure, and agriculture management. Wetlands are one of the most difficult and expensive features to map. Minnesota spent a decade and $8 million dollars to remap the 1982 wetland map and would prefer to use the automated approach to save these costs.

Partners:

- US Fish and Wildlife Service, National Wetlands Inventory
- Minnesota Department of Natural Resources
- US Environmental Protection Agency
- Ducks Unlimited
- University of Minnesota

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- Sentinel-1 C-SAR
- WorldView
- RADARSAT-2

Impact & Benefit: This project will help lower the partners' costs to keep the wetland inventory up-to-date and help them create seasonal wetland maps more often. The planned tool will be a valuable addition to the partners' efforts to maintain their wetland inventory.

Mobile-Tensaw Delta Water Resources

Alabama – Mobile

Community Concern: Situated in southern Alabama, the Mobile - Tensaw Delta represents the convergence of nine major rivers. The delta provides a plethora of ecosystem services to the surrounding area including carbon sequestration, pollution management, climate regulation, and water filtration of approximately 15% of the nation's fresh water. The Mobile-Tensaw Delta has been coined "America's Amazon" because of its rich biodiversity and ecological importance. It is home to more species of plants and animals than anywhere in the United States. Dams upstream are negatively affecting stream flow and sediment loads invasive species threaten the delicate ecosystems. Human-induced ecological alterations could have disastrous effects on the delta, the surrounding communities and beyond.

Impact & Benefit: The primary goal of this project is to use Earth observations to conduct a time-series analysis of water degradation in the Mobile-Tensaw Delta and Mobile Bay caused by anthropogenic expansion and industry upstream. The project analysis can promote the agencies' future conservation policies to better protect the Mobile-Tensaw Delta and its vital ecosystems

Earth Observations:

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Sentinel-2 MSI

Partners:

- Alabama Department of Conservation and Natural Resources
  - State Lands Division
  - Weeks Bay National Estuarine Research Reserve

Patuxent Water Resources

Virginia – Langley

Community Concern: The affect of changing LU/LC on water quality within the Patuxent Reservoirs watershed. The TAC is particularly interested in changes in forests, croplands, wetlands, and impervious surfaces. Currently, the land cover and land use information is inconsistent across the three counties. The TAC desires a reproducible land cover and land use mapping methodology that can be consistently applied across the entire watershed and provide an analysis of changes in the watershed since 1996.


Montgomery County

Earth Observations:

- Landsat 8 OLI
- Landsat 5 TM
- Sentinel-2 MSI
- Sentinel-1 C-SAR

Partners:

- Patuxent Reservoirs Watershed Protection Group, Technical Advisory Committee

City of Bethesda

Impact & Benefit: Watershed wide land cover assessment – replicable across all jurisdictions within the watershed

Texas Water Resources

North Carolina – NCEI

Community Concern: Urban trees provide ecosystem services that benefit storm-water management, energy costs, urban pollution, & more. The historic 2011 Texas drought resulted in the death of more than 5 million urban trees, costing the state more than $500 million in hazardous tree removal.

Earth Observations:

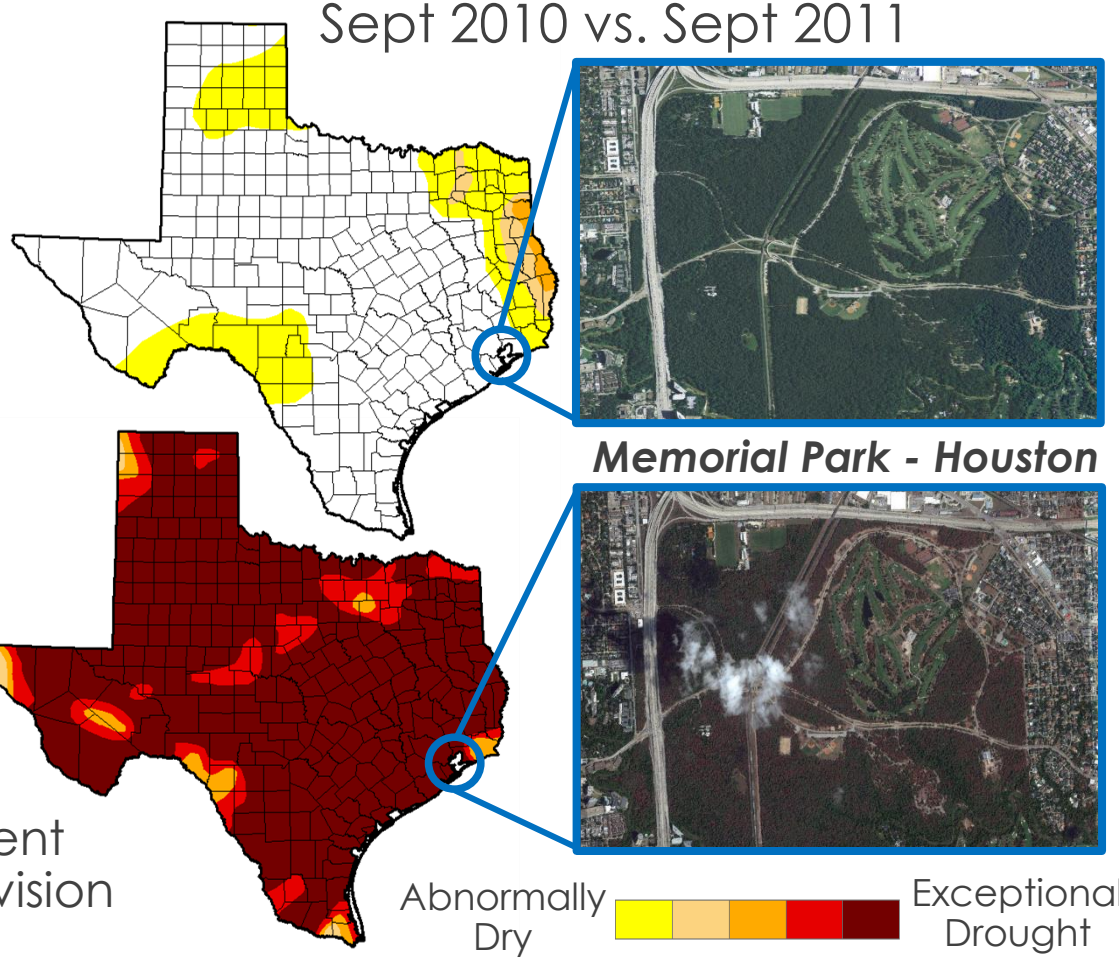
- Sentinel-2 MSI
- Landsat 8 OLI
- Landsat 5 TM

Partners:

- Texas A&M Forest Service, Sustainable Forestry Department
- Texas A&M Forest Service, Forest Resource Protection Division
- USDA Forest Service, Southern Research Station Threat Assessment Center

U.S. Drought Monitor - Texas

Sept 2010 vs. Sept 2011



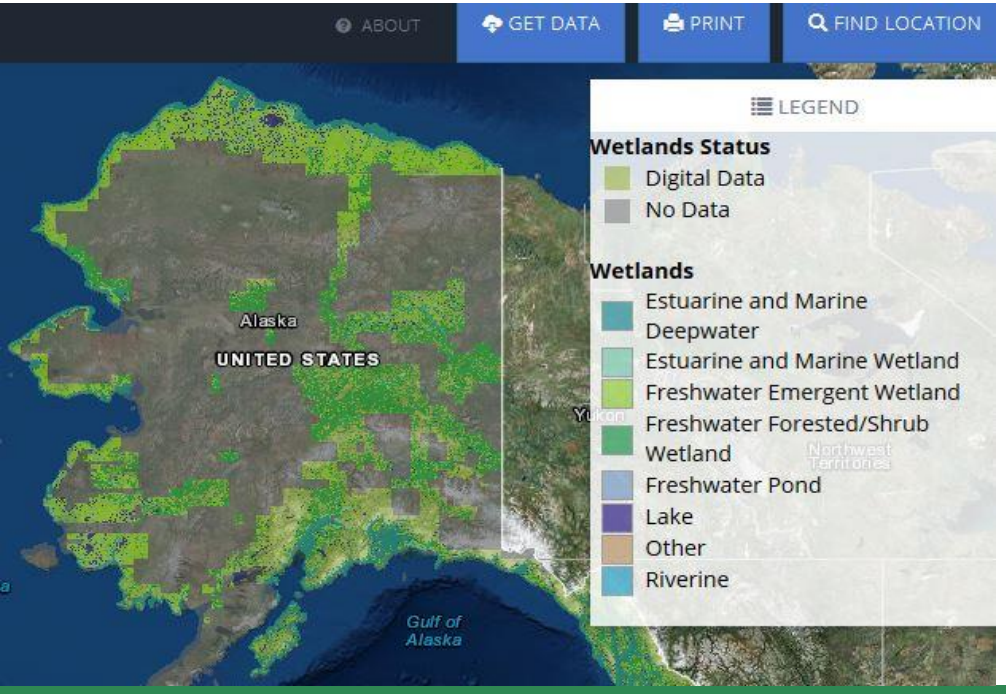
Impact & Benefit: Remote-sensing analyses of drought impacts to urban tree inventories will help the Texas A&M Forest Service identify most impacted species, monitor tree recovery in post-drought years, and enhance the information available through their My City's Trees application.

Alaska Eco Forecasting II

California – JPL

Community Concern: Wetlands are considered kidneys of the Earth since they store, protect, and improve water quality. Currently, only a third of Alaska has been mapped and there is a need to know the accurate extent of wetlands to help developers and managers make decisions about where human development can take place and to aide in wetland protection efforts.

Impact & Benefit: This project will build upon previous work using SAR and optical data to map wetland inundation extent. The tool will be further refined and it is planned for the algorithm to be integrated on the ASF's HyP3 pipeline so inundation maps can be created on demand by the user.



Earth Observations:

- Sentinel-1 C-SAR
- Landsat 8 OLI
- RapidEye & PlanetScope

Partners:

- US Fish and Wildlife Service, National Wetlands Inventory
- Alaska Satellite Facility
- University of Alaska Fairbanks

Oregon & Nevada Eco Forecasting

Colorado - Fort Collins

Community Concern: North Rocky Mountain EPMT provides expert knowledge towards preventing introduction of new species, reducing existing infestations, and restoring native plant communities and ecosystem functions across a wide diversity of landscapes. Creating management level and ecologically significant environmental layers, using data captured by NASA Earth observations, along with testing these layers in a SDM forecasting framework can provide the North Rocky Mountain EPMT with improved and additional information for future management activities.

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- Aqua & Terra Modis
- SRTM

Partners:

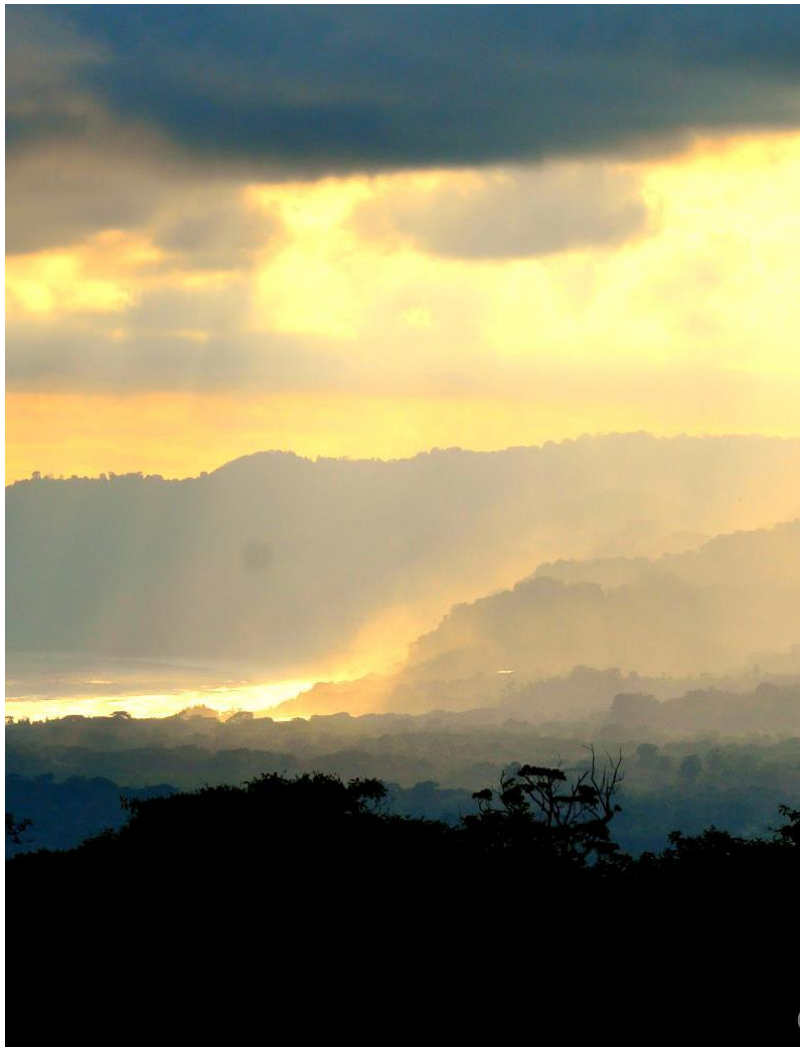
- NPS, Biological Resource Division, North Rocky Mountain Exotic Plant Management Team
- USGS, Fort Collins Science Center

Impact & Benefit: This project will save the NPS North Rocky Mountain EPMT significant time and money by further refining invasive species predictive mapping with the incorporation of newly derived geospatial layers. The project is designed to enable future analysis across larger scales and with new species.

Talamanca-Osa Ecological Forecasting

Georgia – Athens

Community Concern: In Costa Rica, deforestation for towns, roads, and agriculture has led to habitat loss for many species in the biodiverse country. Remaining habitat is broken up into smaller and more fragmented habitats. This is especially a problem for species that need large areas to survive, like the jaguar. With limited habitat available, jaguars are forced to move closer to human populations, which has increased conflict with humans.



Earth Observations:

- Terra/Aqua MODIS
- Terra ASTER
- Landsat 8 OLI
- PlanetScope

Partners:

- Arizona Center for Nature Conservation
- Osa Conservation

Impact & Benefit: Researchers at the Arizona Center for Nature Conservation are working to research, design and implement a biological corridor connecting the existing jaguar population in La Amistad International Peace Park in the Talamanca Mountains to the shrinking populations in Corcovado National Park in the lowlands on the Osa Peninsula. NASA DEVELOP and the Arizona Center for Nature Conservation are collaborating to update and extend the current land use/land cover dataset created in previous NASA DEVELOP projects, model areas of current and future human-jaguar conflict, and identify optimal corridors maximizing jaguar movement between protected areas.

Chesapeake Bay Agriculture & Food Security III

Maryland – Goddard

Community Concern: The use of winter cover crops on agricultural fields has been identified as a key conservation management practice for reducing the loss of nitrogen and sediment from farmland. The remote verification of farmer-induced spring crop kill date, as mandated by the Cover Crop Program, is necessary to boost department efficiency.

Partners:

- Maryland Department of Agriculture
- USGS EGSC
- USDA ARS
- EPA Chesapeake Bay Program

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-2 MSI

Impact & Benefit: The MDA conducts cover crop compliance site visits for 10% of enrolled fields to ensure cover crops are not harvested by the farmers. This project will save MDA resources in the form of both time and money by providing them with a remote tool to verify that winter cover crops are being managed according to the guidelines set by the department. The results will streamline the verification process for the MDA, providing more resource flexibility.

Iowa Agriculture & Food Security

Alabama – Marshall

Community Concern: The state of Iowa leads the nation with the greatest percentage of land used for agriculture, dedicating 92% of state lands to the production of important crops such as corn and soybeans. With increasing temperatures and decreasing precipitation trends increasing across the United States, drought and water stress have become limiting factors to productivity and crop yield. Between 2010 and 2014 Iowa experienced the longest drought in the state since 2000, lasting 151 weeks, portions of which were considered to be exceptionally dry. This drought caused shortages of water across the state, leading to widespread crop loss and water emergencies. More recently, Iowa experienced a severe drought in the fall and winter of 2018.

Impact & Benefit: This project will provide additional resources to the climatology bureau's current assessments of drought. In particular, this project will utilize the recently launched ECOSTRESS to assess vegetative stress, which is a unique indicator not included in any of their other sources. Additionally, the team will produce end products which the state climatologist can use to compare drought parameters and indices for the past year, this work will help them prepare for the upcoming summer.

Partner:

- Iowa Department of Agriculture and Land Stewardship, Climatology Bureau

Earth Observations:

- ECOSTRESS
- SMAP
- Landsat 8 OLI
- Suomi NPP VIIRS
- GPM IMERG

Minnesota Agriculture & Food Security

Colorado - Fort Collins

Community Concern: The USDA ARS National Laboratory for Genetic Resource Preservation (NLGRP)is tasked with collecting, preserving, and making available for research an array of crucial species. Identifying crop wild relatives' distributions by utilizing spectral detection models fit with data captured by NASA Earth observations can provide resource managers with additional information to pursue more targeted and effective species conservation strategies.

Earth Observations:

- Landsat 5 TM,
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SRTM

Partners:

- USDA ARS, National Plant Germplasm System
- Minnesota Department of Natural Resources
- University of Minnesota

Impact & Benefit: This project will rapidly allow the USDA to refine monitoring and field survey collection efforts. The project also enables future analysis across larger scales and new species and study sites that would not be possible without full utilization of NASA Earth observations. End products will be integrated in the USDA decision making and conservation.