DEVELOP

2019 Summer Preview

Health & Air Quality

Urban Development

Ecological Forecasting

Transportation & Infrastructure

Energy

Water Resources

Agriculture & Food Security

Disasters

3rd Term (1)

2nd Term (5)

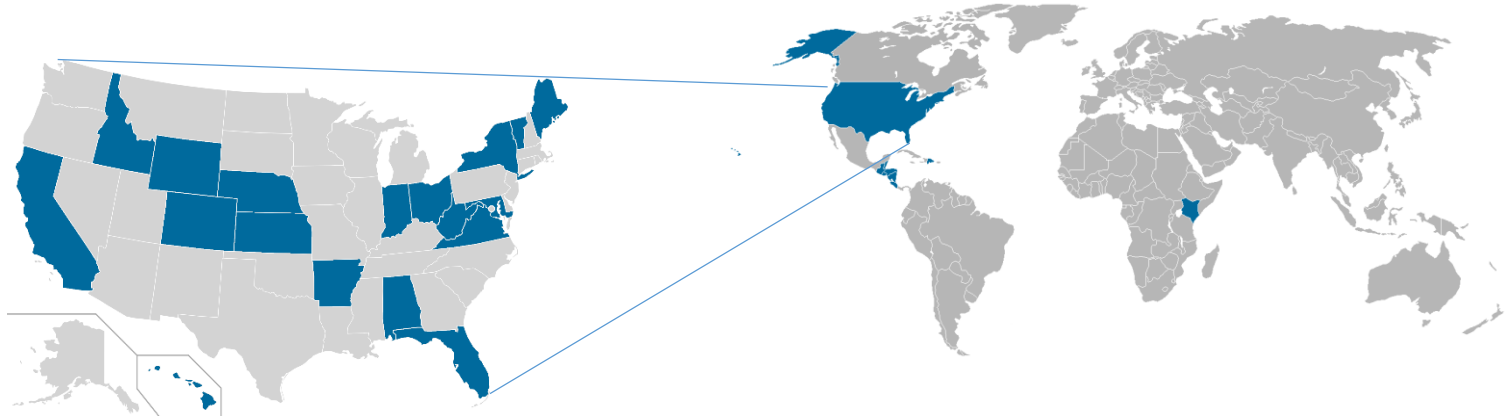
1ST Term (16)

2019 Summer Portfolio

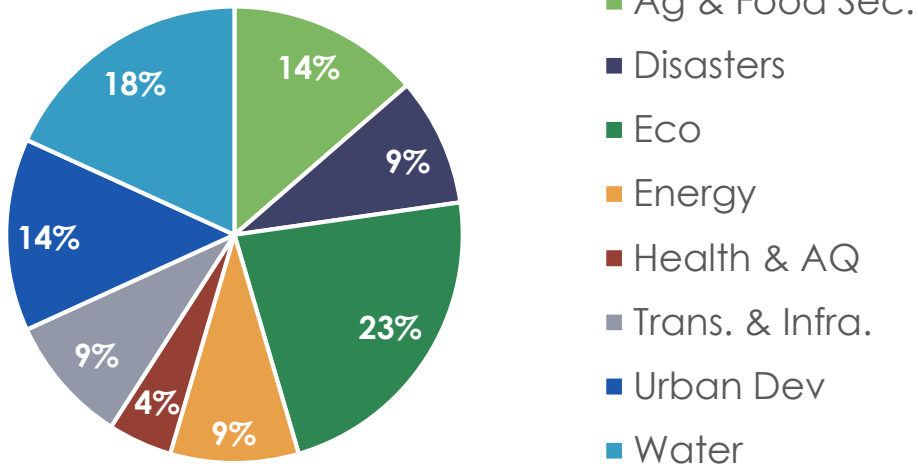
87 Participants
22 Projects

77% Domestic
22% International

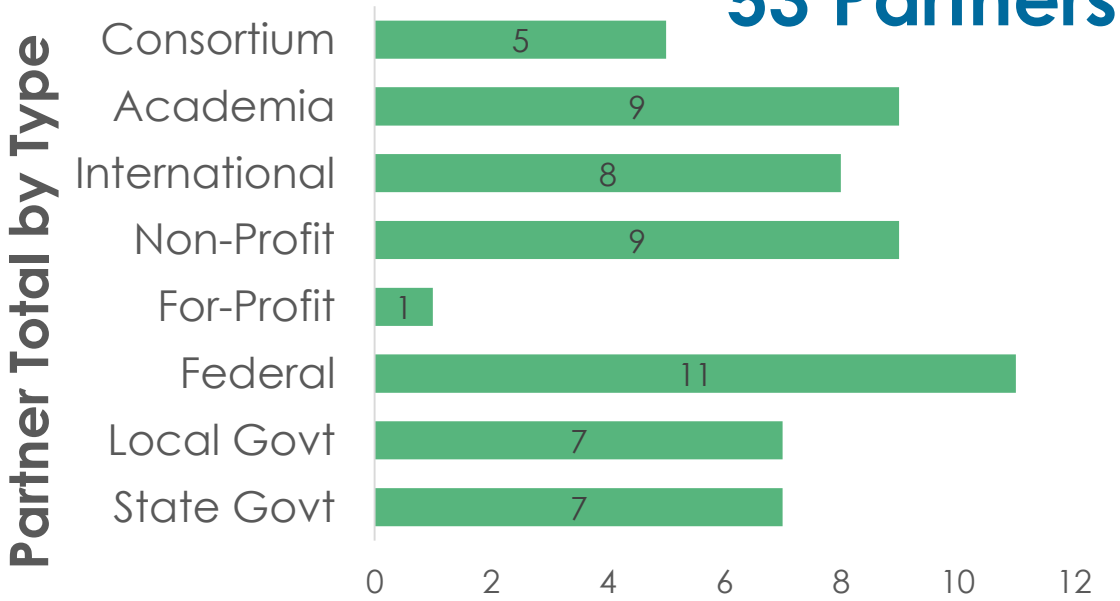
18 States &
9 Countries Impacted



Application Areas Addressed



53 Partners



*Impacts and partners are tentative

Central America Transportation & Infrastructure

Alabama - Marshall

Community Concern: The SICA region is composed of eight countries who all share high risk of coastal flooding that threatens vulnerable communities and key infrastructure. Storm surges and high rainfall during extreme tropical weather events pose the highest threats. The storm damage is often elevated with landslides after heavy rains. Little progress has been made to delineate coastal flood risk areas in Guatemala, El Salvador, Honduras, and Nicaragua, all of which were severely flooded during Hurricane Mitch in 1998 and Storm Stan in 2005. In 2008, a tropical depression caused rivers to swell and landslides affecting over 410,000 across Central America.

Partners:

- National Commission for Disaster Reduction (Guatemala)
- Ministry of Environment and Natural Resources (El Salvador)

Earth Observations:

- CYGNSS
- Sentinel-1 C-SAR
- SRTM
- Landsat 8 OLI
- TRMM

Impact & Benefit: By leveraging NASA Earth observations to identify areas most at risk of flooding, the partners (and their cohorts in other SICA countries) can determine the best allocation of funding and support to help mitigate flood threats and increase the resilience of vital transportation infrastructure in the region. These products can provide the partners with the information to assess relevant risk and make subsequently informed decisions.

Powder River Basin Transportation & Infrastructure

California – Ames

Community Concern: The primary environmental concerns regarding Powder River Basin coal mining revolve around mining land disturbances, deforestation, groundwater depletion, and decreased air quality from dust and blasting. Additionally, the financial condition of the coal industry and its long-term ability to properly finish reclamation processes has become a rising concern.


Black Thunder Coal Mine
Ecoflight, hcn.org

Partners:

- Powder River Basin Resource Council
- Clemson University, Energy-Economy Environment Systems Analysis Group
- SkyTruth

Earth Observations:

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

Impact & Benefit: The results will help the end users recognize the transformation of the land cover into mining and urban infrastructures associated with coal mine facilities, monitor vegetation health, and observe overall topography alterations in this region over time to better inform land conservation efforts and mining reclamation strategies.

Dominican Republic Disasters

Virginia – Langley

Community Concern: The Dominican Republic is often considered a hotspot for natural disasters, and the country is frequently exposed to flooding, earthquakes, and landslides. A fundamental aspect of landslide mitigation, response, and recovery is the ability to determine how landslide hazards vary based on factors such as geography and precipitation. A near-global landslide hazard assessment model for situational awareness (LHASA) has been developed to indicate potential landslide activity at the global scale every 30 min. This system can also utilize satellite precipitation data to understand trends in potential landslide activity.

Partners:

- Servicio Geologico Nacional (Dominican Republic)

Earth Observations:

- GPM IMERG
- Landsat 8 OLI
- Terra ASTER

Impact & Benefit: Creating a susceptibility map for areas of interest in the Dominican Republic and implementation within the LHASA model will help managers more effectively mitigate or respond to landslide events. Implementation of the model into Google Earth Engine will make the model easier to use for partner organizations.

Source: BRGM, French Geological Survey

Ellicott City Disasters

Maryland – Goddard

Community Concern: Over the past decade, Ellicott City, MD, has been the victim of multiple detrimental flooding events which have claimed human lives and caused millions of dollars in property damage. The frequency and intensity of flooding events have recently increased and both are projected to get worse with changing environmental conditions, thus escalating the need for better flood monitoring and prediction in the region.

Partners:

- Howard County Office of Emergency Management
- Howard County Government, Storm Water Management Division
- NOAA National Weather Service, Baltimore-Washington Weather Forecast Office

Earth Observations:

- GPM IMERG
- SMAP L-band Radar & L-band Radiometer
- Sentinel-1A C-band Radar

Impact & Benefit: Accurate, timely, and detailed data reports are necessary to mitigate the effects of severe flooding in the region. A flood risk model and derived maps will supplement emergency management actions to help enhance early warning decision making in the presence of potential flooding conditions.

Hampton Roads Urban Development II

Virginia – Langley

Community Concern: The City of Hampton is a low-lying coastal community near the mouth of the Chesapeake Bay. Hampton city officials are focused on ways to make their local environment safer and more resilient to extreme weather events. One way to accomplish this is to design urban landscapes that slow, store, and divert water during high flow events, limiting flood damage. This project will quantify the distribution of impervious surfaces and urban tree canopies within the City of Hampton to help city staff integrate spatial data into their decision making.


Source: Virginia.org

Partners:

- City of Hampton

Earth Observations:

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

Impact & Benefit: The results of this project will allow end users at the City of Hampton to better understand the distribution of impervious surfaces and urban vegetation and build these parameters into hydrologic models and urban planning procedures. This will allow them to make better-informed decisions about tree planting and planning procedures.

Mobile Urban Development

Alabama – Mobile

Community Concern: Mobile, Alabama is vulnerable to flooding caused by extreme weather events due to the city's low elevation and proximity to Mobile Bay. During Hurricane Katrina in 2006, a storm surge of 12 feet inundated downtown Mobile leaving historic buildings and homes flooded and landmarks destroyed. Local organizations are working to implement green infrastructure to mitigate flood risks in urban areas like Mobile.

Partners:

- Groundwork Mobile
- Downtown Parks Conservancy

Earth Observations:

- Landsat 8 OLI/TIRS
- Sentinel-2 MSI

Impact & Benefit: The implementation of green infrastructure can be improved by targeting areas most at risk of flooding and extreme heat. This geospatial approach can be a timesaving and cost effective strategy for all partners involved. With this data, the partners will be able to strategically plan and implement future green initiatives by identifying the relationship between extreme urban heat and green infrastructure in the city.


Source: Downtown Parks Conservancy


Source: Downtown Parks Conservancy


Source: Downtown Parks Conservancy

US Urban Development II

Virginia – Langley

Community Concern: Artificial sky brightness in national parks can have harmful effects on both wildlife and visitor experience. When skies brighten as a result of human activity, the cyclic behavior of wildlife and astronomical viewing of park visitors are disrupted. The park service is tasked with maintaining landscapes free from human effects, which incudes managing artificial sky brightness. Remote sky glow estimation tools will help the NPS monitor artificial light.

Source: NPS / Greg Redfern

Earth Observations:

- Suomi NPP VIIRS

Partners:

- National Park Service, Natural Sounds and Night Skies Division, Night Skies Program


Source: NPS / Jacob Frank

Impact & Benefit: The project partners currently rely on *in situ* measurements to make decisions about artificial sky brightness. Their current data sources only assess sky brightness directly above the monitoring instrument. This project will provide a reproducible monitoring method that can be implemented at any location, and at any specified altitude, from horizon to zenith. The tool can be easily implemented in multiple locations on a recurring basis.

American Samoa Water Resources

California – Ames

Community Concern: Land-based sources of pollution (LBSP) have increased along the coast of American Samoa due to extensive agricultural activities, poor septic services, and a high number of illegal piggeries. As a consequence, reefs and associated marine ecosystems, such as mangroves and seagrasses, have been deteriorating, which, in turn, affects coastal protection, biodiversity, fisheries, and recreational activities.

Partners:

- US Coral Reef Task Force, Watershed Partnership Initiative
- American Samoa Department of Marine and Wildlife Resources, Coral Reef Advisory Group

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI

Impact & Benefit: Project results will allow the partners to identify watersheds that need to be prioritized for management actions and interventions. Additionally, the results can further be correlated with the present condition of coral reefs and other marine ecosystems located along the American Samoa coastline to better inform future conservation efforts.

Belize Water Resources

California – Ames & California – JPL

Community Concern: Reef ecosystems are home to unique and diverse aquatic species and provide essential ecosystem services. These ecosystems are responsible for 12-15% of Belize GP. Belize and other countries in Central America face great challenges in implementing monitoring approaches that can be maintained over time and, as a by-product, ensuring sustainable management of these vast and disparate environments.

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- Sentinel-3 OLCI

The Belize Barrier Reef, 2016
International Space Station

Partners:

- Wildlife Conservation Society
- Coastal Zone Management Authority and Institute
- SICA-CCAD
- SICA-OSPESCA

Impact & Benefit: The proposed end products will allow partners to monitor and see where there are abnormal or high levels turbidity and chlorophyll-a patterns. This will help partners prioritize areas for coastal monitoring and understand the prevailing water quality conditions that impact coral reef health.

Moloka'i Water Resources

Colorado – Fort Collins

Community Concern:

- The native **ōhi'a tree** (*Metrosideros polymorpha*) is a particularly iconic and culturally important native species, providing crucial ecosystem services and aesthetic beauty.
- Due to outbreak of **Puccinia rust** on the island of **Moloka'i** in **2017**, this species experienced widespread defoliation and mortality.
- Forest overstory loss from the Puccina rust can lead to an **increase in runoff and erosion**, resulting in higher turbidity in coastal waters.

Earth Observations:

- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SRTM

Partners:

- The Nature Conservancy
- USGS
- Pu'u O Hoku Ranch

Impact & Benefit: This project will **inform** The Nature Conservancy on how their **restoration efforts** (e.g. exclosures) impact forest recovery. It will also help them better understand the connection between **o'hia forest health and water quality.** The project will also support the USGS in their monitoring and detection of **invasive species**. End products will be integrated into both The Nature Conservancy and USGS's decision making, environmental monitoring and conservation processes.

Rocky Mountain Water Resources II

Colorado – Fort Collins

Community Concern:

- Alpine lakes in **Rocky Mountain National Park** have experienced an increase in nitrogen and phosphorus concentrations resulting in **increased algal productivity.**
- High algal concentrations negatively affect **water quality** through eutrophication and the creation of anoxic events.
- Increased algal biomass is concerning for RMNP because alpine lakes serve a **crucial ecological function** within the park and serve as a main economic and aesthetic driver of tourism to the park.

Earth Observations:

- EO-1 Hyperion
- Landsat 8 OLI
- Sentinel-2 MSI
- Sentinel-1 C-SAR

Partners:

- USGS, Fort Collins Science Center
- National Park service, Rocky Mountain National Park

Impact & Benefit: The **integration** of our end products into organizational workflows will allow the USGS and NPS to more efficiently and effectively **monitor algal bloom status**. This collaboration will allow for quicker and cost-effective decision making about habitat management.

New York Eco Forecasting II

Maryland – Goddard

Community Concern: The invasive hemlock wooly adelgid (HWA) has decimated populations of eastern hemlock and continues to spread northward into New York. Detecting new HWA infestations at the leading edge of its range is critically important for slowing the spread of this destructive insect.

Partners:

- New York State Department of Environmental Conservation
- Adirondack Research LLC
- Cornell University, NY Invasive Species Research Institute
- University of Vermont

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- ISS GEDI
- ICESat-2 ATLAS
- AVIRIS

Impact & Benefit: This continuation project will build upon the results of the first project term and newly collected *in-situ* data, comparing space-based and newly released datasets to airborne data in habitat modeling processes. These repeatable models will also guide prioritization of future ground survey locations to conserve resources in the efforts to slow the spread of HWA in New York.

Santa Monica Mountains Eco Forecasting III

California – JPL

Community Concern: The Woolsey Fire (November 8-21, 2018) burned over 80% of the study area. To prevent a collapse of the native oak and riparian woodlands and to direct restoration efforts, there is a need to know where the trees survived, what physical characteristics on the ground supported that survival, and the extent of fragmentation. It is important to restore this ecosystem since it is home to hundreds of endangered, threatened, and sensitive species, in addition to providing billions of dollars in ecosystem services to the Los Angeles region.

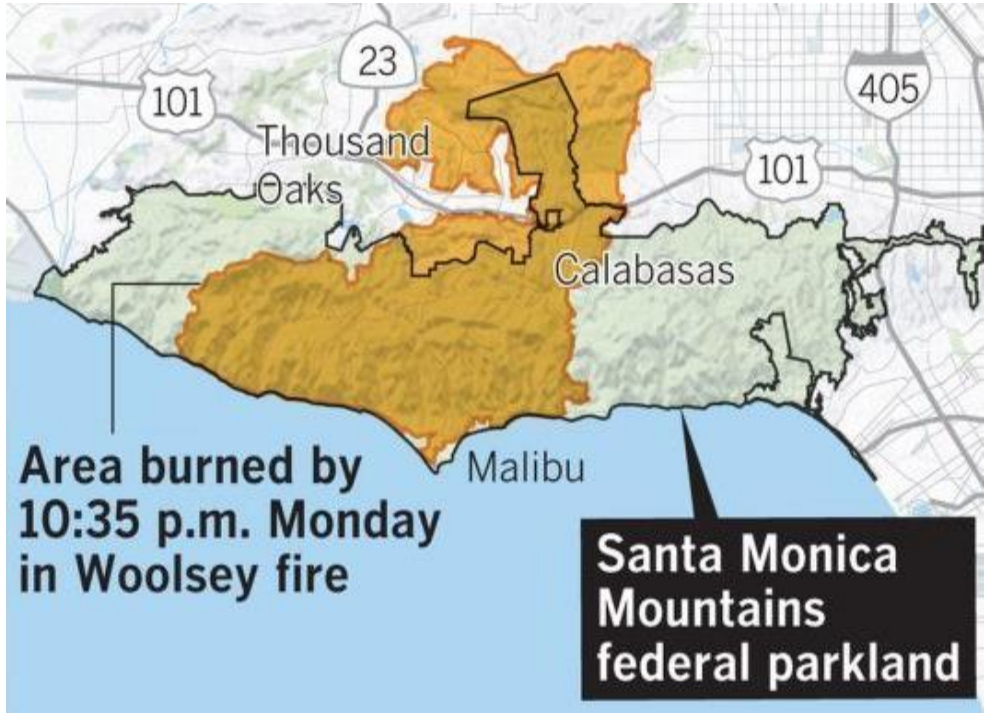
Impact & Benefit: The end products will be used to prioritize risk areas, examine the rate of mortality and potential causal factors, focus monitoring efforts, as well as prioritize where to protect existing stands and replant new trees.

Partners:

- Resource Conservation District of the Santa Monica Mountains
- National Park Service
- California Department of Parks and Recreation
- County of Los Angeles Fire Department
- County of Los Angeles Department of Regional Development

Earth Observations:

- Landsat 8 OLI
- AVIRIS
- UAVSAR
- SRTM



Southern Alabama Eco Forecasting

Alabama – Marshall

Partners:
- US Forest Service, Conecuh National Forest
- Alabama Department of Conservation & Natural Resources
- Mississippi State University, College of Forest Resources

Earth Observations:
- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SRTM


Source: herpsofnc.com

Community Concern: The gopher frog (*Lithobates capito)* will likely be extinct within 100 years without human intervention, according to the Florida Fish and Wildlife Conservation Commission. The single greatest threat to the gopher frog is the loss or modification of its habitat that is marked by its sandy soils, open longleaf pine forests, and wetlands. In Alabama, there are five known breeding populations two of which inhabit two ponds in Conecuh National Forest. The loss of amphibians in an area signal the onset of forthcoming ecosystem change, which can in turn affect other keystone species; for this reason, it is important to restore areas that are experiencing a decline in frog populations.


Source: americaslongleaf.com

Impact & Benefit: The end products will assist the partners in monitoring gopher frog habitat management and restoration efforts, while also identifying potential areas for wetland creation. The use of NASA Earth observations will supplement ground verification done by the department and improve the spatial extent of its data collection. The partners will use these products to justify wetland creation and resource allocation.


Source: gulflive.com

Talamanca-Osa II Eco Forecasting

Georgia – Athens

Community Concern: In Costa Rica, deforestation has led to habitat loss and fragmentation. This is especially a problem for species that need large areas to survive, like the jaguar. Our partners are working to establish a biological corridor to connect two isolated jaguar populations one in the Talamanca Mountains and another on the Osa Peninsula.

Impact & Benefit: The corridor model and forecasted vulnerability risk map will be combined to assist partner decisions on optimal corridor routes and inform priority areas to focus efforts to establish the jaguar corridor.

Partners:

- Arizona Center for Nature Conservation – Phoenix Zoo
- Osa Conservation

Earth Observations:

- Landsat 8 OLI
- Terra ASTER
- Sentinel-2 MSI

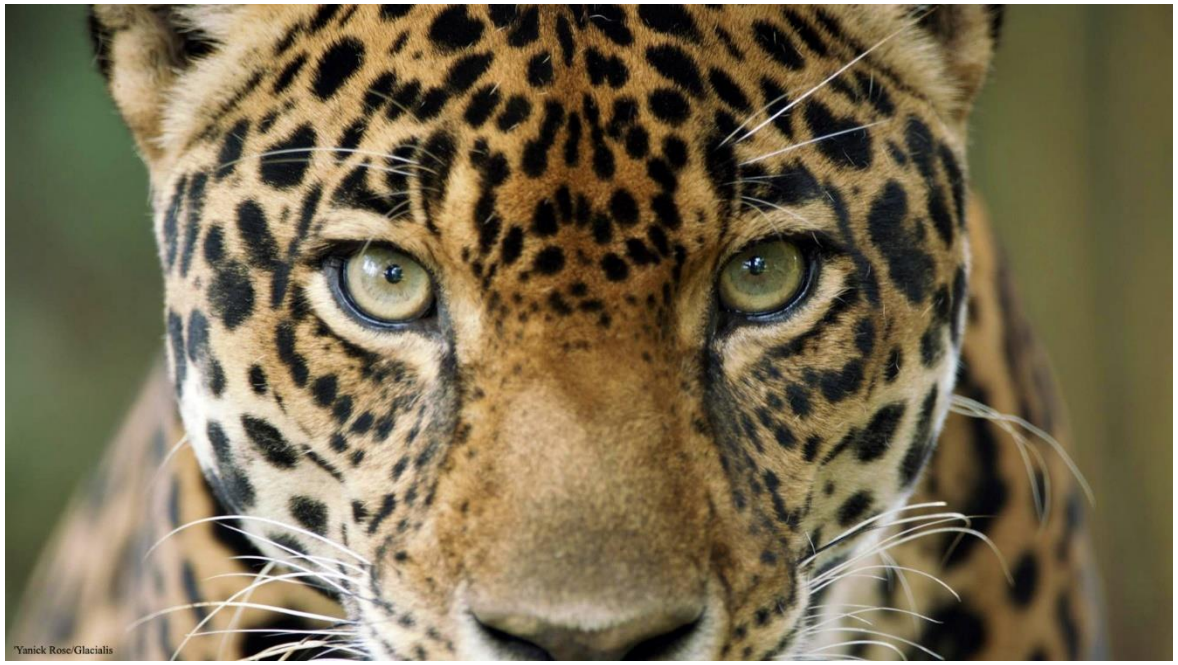


Photo Credit: Arizona Center for Nature Conservation

West Virginia Eco Forecasting

Idaho - Pocatello

Community Concern:

- Landscapes in West Virginia, especially **forests**, have been significantly altered due to **anthropogenic impacts** resulting from excessive logging and mining practices over the past century.
- The USFS, along with various partners devised the **Sharp Knob Red Spruce Restoration Project** to establish and **restore native species** of trees, shrubs, and herbaceous plants.
- The project has a short-term goal **(5-20 years)** of enhancing **habitat suitability** for early successional species, and a long-term goal of spruce **ecosystem restoration**.

Impact & Benefit: This project will allow the Monongahela National Forest to **refine their monitoring** and survey effort to identify locations likely to have Red Spruce. These areas can be targeted for removal of non-native vegetation and dominant hardwood overstories, which will increase succession. The project **enables analysis** of areas at scales that would not be feasible without **utilization of NASA Earth observations**. End products will be integrated in the USFS decision making and conservation processes.

Earth Observations:

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

Partners:

- USDA, US Forest Service, Monongahela National Forest
- USDA, US Forest Service, Northern Institute of Applied Climate Science

Kansas Agriculture & Food Security

North Carolina – NCEI

Community Concern: Kansas is one of the leading states in agricultural exports, but during drought, soil moisture depletion negatively impacts production. In the summer of 2018, the Governor's Office declared 'emergency drought' status in nearly half of the state's counties, and some farmers reported up to 25% less wheat output than the previous year. The Kansas Water Office uses drought data produced by Kansas State University to recommend mitigation practices for producers.


Source: Kansas State University

Partners:

- Kansas Water Office
- Kansas State University, Office of the State Climatologist
- Desert Research Institute,Western Regional Climate Center

Earth Observations:

- SMAP/Sentinel-1 C-SAR enhanced
- GPM IMERG
- Suomi NPP VIIRS


Source: Kansas State University

Impact & Benefit: Kansas State University relies on 41 *in situ* stations to measure soil moisture for the 105 counties in the state. Modeling soil drydown using Earth observations will provide spatially comprehensive and sub-county level data under various drought scenarios. The Kansas Water Office will be able to make enhanced recommendations based on rates of drydown and identify the most-impacted counties.

Kenya Agriculture & Food Security

Alabama – Marshall


Source: crs.org


Source: tearfund.org

Partners:
- National Drought Management Authority
- Regional Centre for Mapping of Resources for Development
- NASA SERVIR Science Coordination Office

Community Concern: In East Africa, severe drought commonly plagues the countries of Ethiopia, Kenya, and Somalia leaving over 10 million people hungry. With dependence on rain-fed agriculture in a highly variable climate, both crop and livestock production are extremely vulnerable to the impacts of drought. In Kenya, arid land comprises over 80% of the country and is home to 70% of its livestock. During the 2016 to 2017 drought in Kenya, over 3 million people experienced food insecurity related to drought conditions. To lessen the threat of drought-related crises, local authorities are working to establish regulations for the sustainable management of drought to prevent acute agro-pastoral loss.

Earth Observations:
- SMAP
- SMOS
- Suomi NPP VIIRS
- Aqua MODIS
- Terra MODIS
- Aqua ASMR-E

Impact & Benefit: Unlike other monitoring systems, the Regional Hydrologic Extremes Assessment System (RHEAS) model allows for unlimited variables and can easily be customized and interfaced for use with the partners' current systems. The integration of Early Warning Bulletins with this new information will improve agro-pastoral management practices through the assimilation of additional Earth observations.

Northern Forest Agriculture & Food Security

Georgia – Athens

Community Concern: The Northern Forest covers 26 million acres from Maine to northern New York and produces over 80% of maple syrup in the United States. Maple production relies on very precise and timely weather and unseasonably warm or cold temperatures can interrupt sap flow and decimate syrup yield and quality.

Partners:

- University of Vermont Extension Maple Program
- University of Vermont Spatial Analysis Laboratory
- University of Vermont Proctor Maple Research Center

Earth Observations:

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

Impact & Benefit: Project end products will provide information on forest health and threats to maple syrup production. The end users will inform producers of optimal locations for sugarbush that will maintain sap flow during unseasonably warm or cold spells.

Photo Credit: Marie Bouffard

Douglas County Energy

California – JPL

Community Concern: The City of Lawrence and Douglas County are working to reduce greenhouse gas emissions and build a framework to transition to 100 percent renewable energy. The community is interested to see the potential for community-scale solar and converting vacant tracts of land within Douglas County into solar farms.

Partner:

- Douglas County

Earth Observations:

- Landsat 8 OLI
- Aqua & Terra CERES
- SRTM
- RapidEye

Impact & Benefit: This project will help the partner to decide which sites have the highest potential to increase green energy use and if it is better to target city-owned or privately-owned buildings. End products would be integrated into the partner's decision making process to assess solar potential in underutilized areas.

Ohio Energy

Arizona – Tempe

Community Concern: Cleveland and Cuyahoga County has committed to 100% renewable energy by 2050 and 2035, respectively. Cleveland seeks to increase renewable energy usage since it was once considered one of the most polluted U.S. cities.

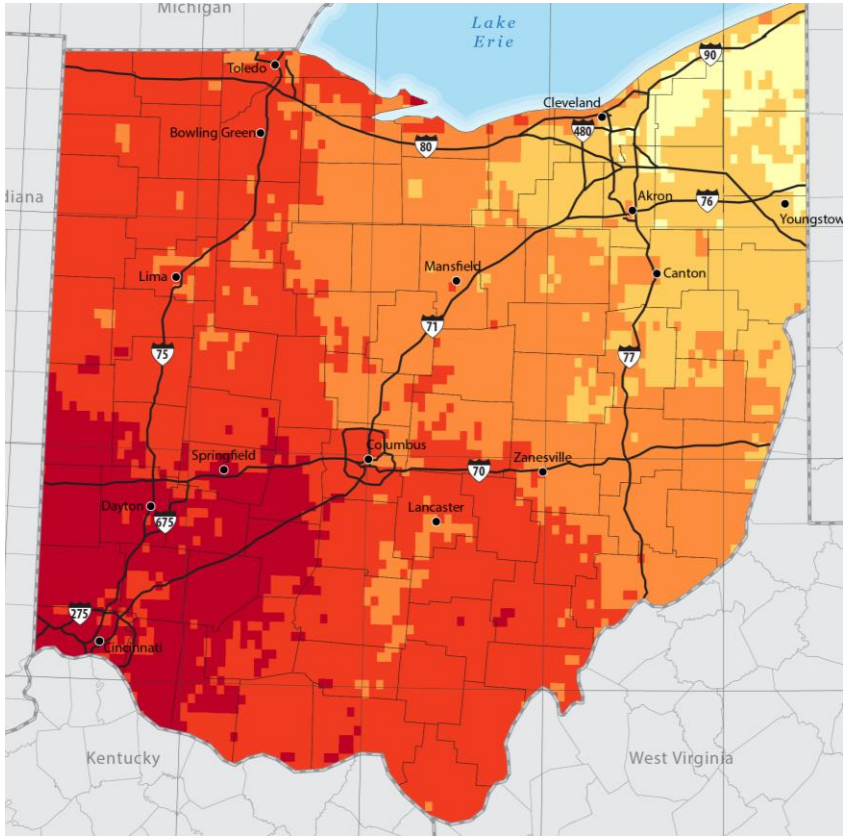
Partners:

- City of Cleveland, Office of Sustainability
- Cuyahoga County, Department of Sustainability

Earth Observations:

- Aqua & Terra CERES
- Terra MISR
- RapidEye

Impact & Benefit: The project will identify the most suitable sites for solar development, thereby increasing the likelihood of future solar power development in city-owned properties and in underutilized parcels of land in the county. Partners mainly use LiDAR, and this project will build the partners capacity to use NASA Earth observations and provide additional methods of using remotely sensed data to help identify locations that have a high potential for solar energy.



Ohio Solar Resource Range (kWh/Day)

4.2 4.1 3.9 3.8 3.6 3.5

Southern Maine Health & Air Quality

Massachusetts – Boston

Community Concern: Tick-borne illnesses, including Lyme disease, are of great concern to communities and recreationists in Maine. The Maine DHHS reported 1,769 confirmed or probable cases of Lyme disease in 2017, and recent estimates suggest that as little as 1 in 10 cases of Lyme disease are reported. Efforts to identify community-level locations of high tick encounter/disease risk are necessary to provide the public with informative disease risk advisories.

Partners:

- Maine Vector-Borne Disease Working Group
- Bigelow Laboratory for Ocean Sciences
- Maine Medical Center Research Institute, Lyme & Vector Borne Disease Laboratory

Earth Observations:

- Aqua & Terra MODIS
- Aqua AIRS
- Landsat 8 OLI
- GPM IMERG

Impact & Benefit: An accurate land cover map and analysis of the relationship between remotely sensed environmental parameters and tick-borne illness incidence will allow for improved public awareness of those areas and conditions conducive to high disease risk. The project partners will use these tools to improve their current tick-borne illness mitigation efforts and to explore further research options utilizing NASA Earth observations.

Source: mmcri.org