DEVELOP

2019 Fall Preview

Health & Air Quality

Urban Development

Ecological Forecasting

Energy

Water Resources

Food Security & Agriculture

Disasters

DEVELOP 2019 Fall Portfolio

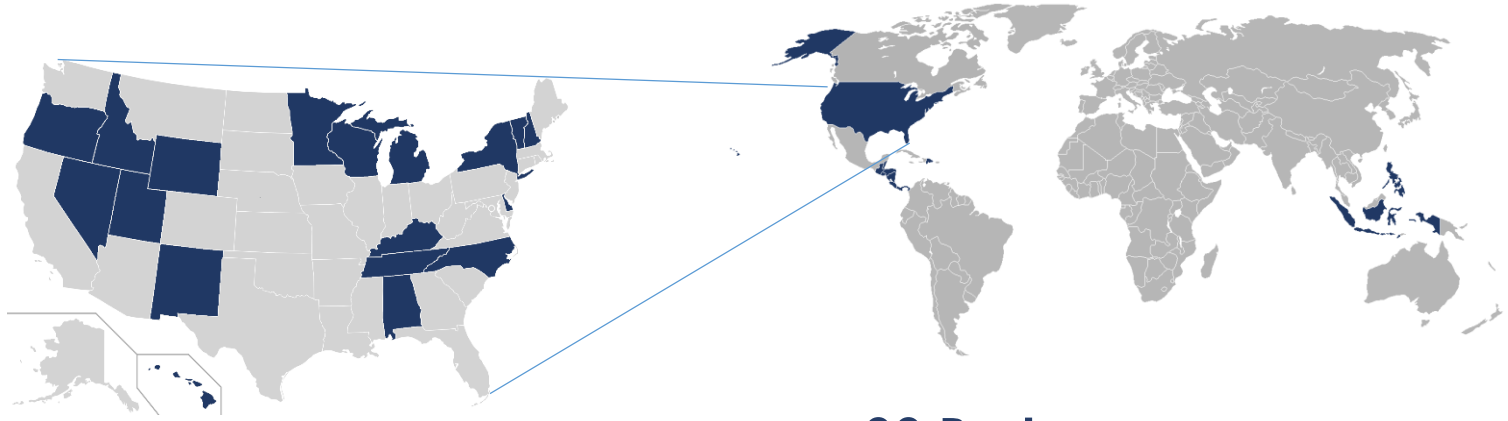
2nd Term (2)

1ST Term (16)

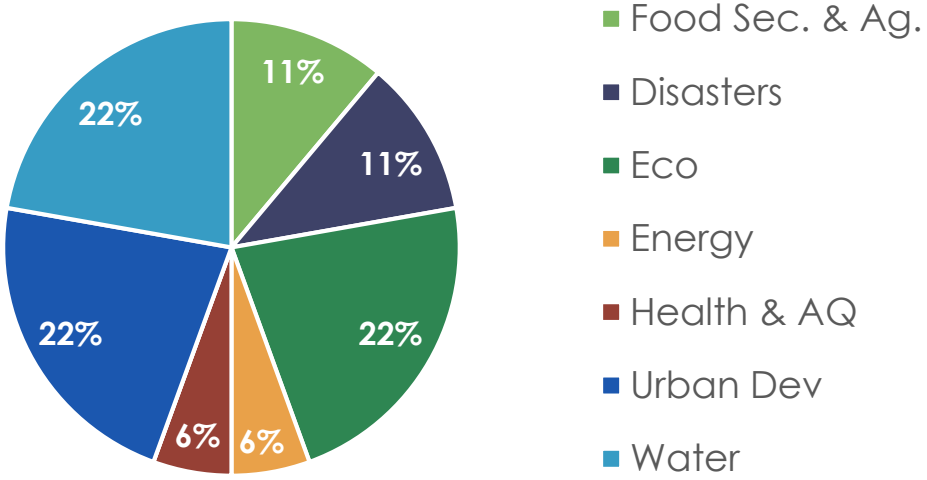
72 Participants
18 Projects

61% Domestic
39% International

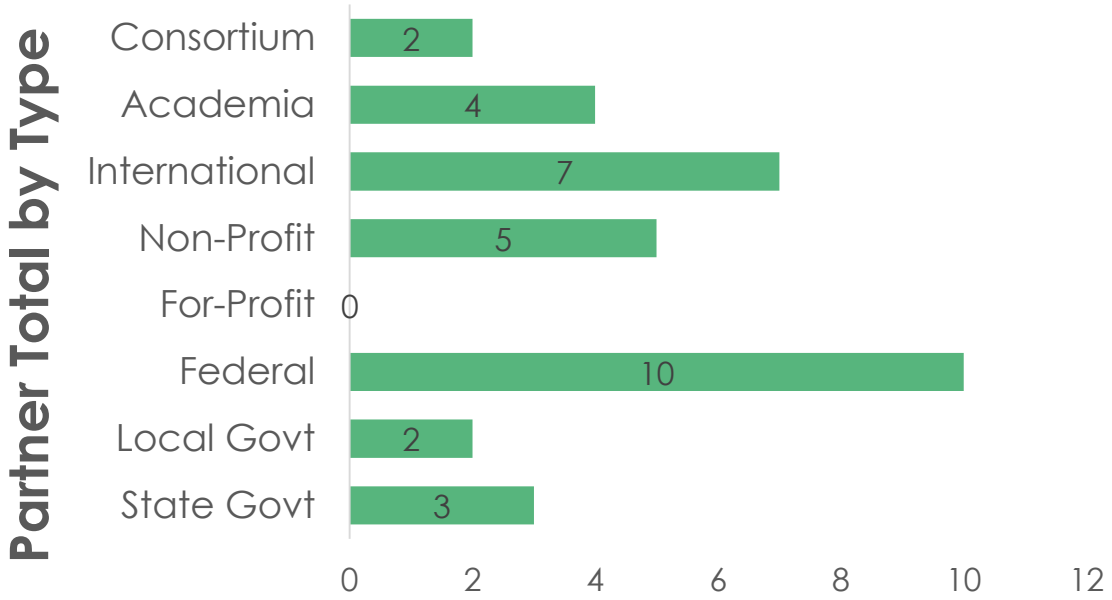
18 States & 11 Countries Impacted



Application Areas Addressed



33 Partners



*Impacts and partners are tentative

Central America Health & Air Quality

Virginia – Langley

Community Concern: Central America's dry season is accompanied by an increase in both natural and anthropogenic fires. Smoke plumes from these fires degrade the air quality in the region by contributing to a higher concentration of $PM_{2.5}$, a pollutant that can cause health problems such as lung disease, asthma, and heart problems. High concentrations of fine particulate matter can contribute to the acidification of nearby water bodies, deplete nutrients in the soil, and damage sensitive crops and forest systems.

Partners:

- Ministerio de Medio Ambiente y Recursos Naturales (El Salvador, Guatemala)

Earth Observations:

- Aqua MODIS
- Terra MODIS
- Suomi NPP VIIRS
- NOAA-20 VIIRS
- CALIPSO CALIOP

Impact & Benefit: The baseline air quality maps for the entire region will help end users identify areas experiencing poor air quality in the wake of fire events. A geodatabase of fire events will distinguish wildfires from biomass burning events and identify the source of fires that negatively impact air quality. A tutorial of methods will allow the end-user to continue to ingest Earth Observation data and record fire events as they occur, which will help them provide more extensive air quality information to the public.

Asheville Urban Development

North Carolina – NCEI

Community Concern: Tree canopy cover provides cooling shade and evapotranspiration that can reduce heat exposure to urban communities. Over the past decade, Asheville's population has grown 10%, whereas urban tree canopy cover has reduced up to 8%. In 2019, the City of Asheville Tree Commission proposed a management plan to protect and promote urban forests in the city.

Impact & Benefit: The Tree Commission wants to quantify the benefits of urban tree canopy cover in support of their management plan. The end products will identify areas of heat exposure and communities in the city that could benefit from canopy cover.

Partners:

- City of Asheville, Tree Commission
- USDA, US Forest Service, Eastern Forest Environmental Threat Assessment Center

Earth Observations:

- Terra MODIS
- Landsat 5 TM
- Landsat 8 OLI

Delaware Urban Development

Alabama – Marshall

Community Concern: Delaware sits on a level plain with nearly 30 miles of ocean coastline (and an additional 350 miles of inlets, bays, and rivers) and has the lowest mean elevation in the US. This unique topography elevates Delaware's risk to damage and erosion during extreme weather events. Delaware experienced unprecedented tidal flooding during Hurricane Sandy in 2012. In 2011, a historic nor'easter ravaged the East Coast with 40 mph winds along the Delaware coast. Over the past two decades, the state and federal government organizations like the State of Delaware's Shoreline and Waterway Management Program have invested over $100 million to create dunes and dredge sand to strengthen the shoreline's resilience to storms.

Earth Observations:

- Landsat 7 ETM+
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SRTM

Partners:

- Delaware Department of Natural Resources and Environmental Control, Division of Watershed Stewardship

Impact & Benefit: The end products of this project will support the partner in their efforts to restore coastlines following a natural disaster. The Coastline Erosion Susceptibility Maps will be used for erosion monitoring and will assist the partners in identifying locations that need immediate attention. Information gathered and presented by this project will also help the Delaware Shoreline and Waterway Management Program assess the success of its ongoing replenishment programs.

Louisville Urban Development

Arizona – Tempe

Community Concern: City leaders frequently request that the CHD team add a metric related to the impact of climate on health to their site, as cities are vulnerable to the physical, financial, and health effects of changes in climate and are significant contributors of greenhouse gas emissions. Urban green infrastructure is associated with extreme weather resilience and improved health outcomes. With this in mind, the CHD seeks to develop a green health benefit data layer derived from land use measures to help cities identify health-improving interventions, such as planting more trees and expanding or improving access to parks.

source: Louisvilleky.gov

Impact & Benefit: This project will introduce the partners to the capabilities of NASA Earth observations which will help them to identify areas that are lacking in green infrastructure as well as to identify a viable climate-influenced metric. This metric can be incorporated within the City Health Dashboard, using this pilot study of Louisville, KY, as an example. With the tutorials and assistance provided by NASA DEVELOP team, the CHD team hopes to expand this methodology to generate metric estimates for its additional 499 cities. End products have the potential to change public policy related to improving the health of cities across the country by adding to the visibility of these metrics and the importance of increasing tree coverage for better health.

Partners:

- City Health Dashboard
- University of Louisville, Envirome Institute

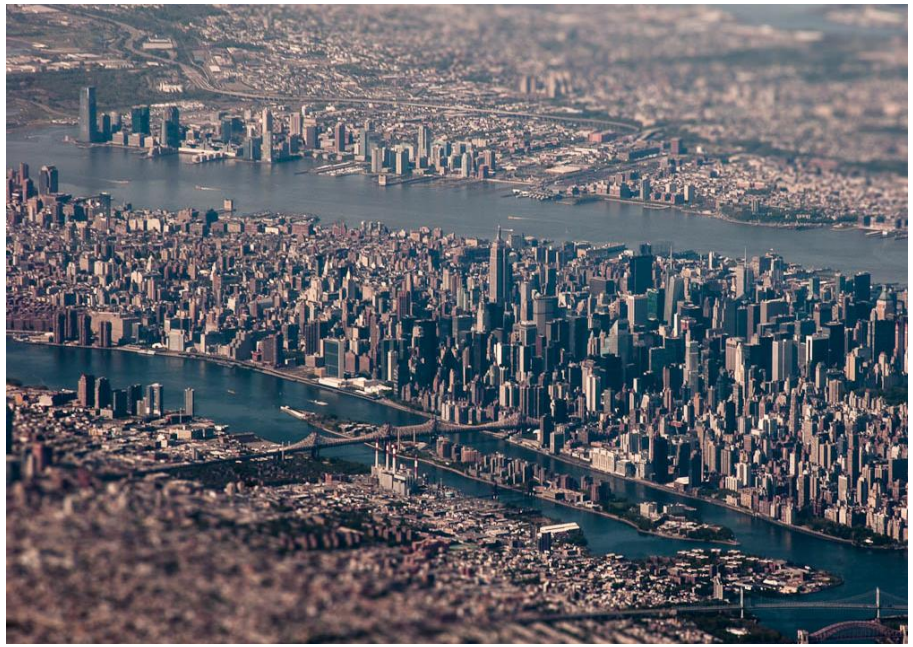
Earth Observations:

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

New York City Urban Development

Virginia – Langley

Community Concern: New York City, the most populous and densest urban center in the United States, is likely to reach nine million inhabitants by 2040. By that time, average temperatures could increase 5.7 degrees Fahrenheit across the city. Currently, about 130 New Yorkers die each summer from intense heat. Older adults, low income populations, non-Hispanic black residents, and those with pre-existing health conditions are all more susceptible to heat-related illness or death.



Partners:

- City of New York, Mayor's Office of Resiliency

Earth Observations:

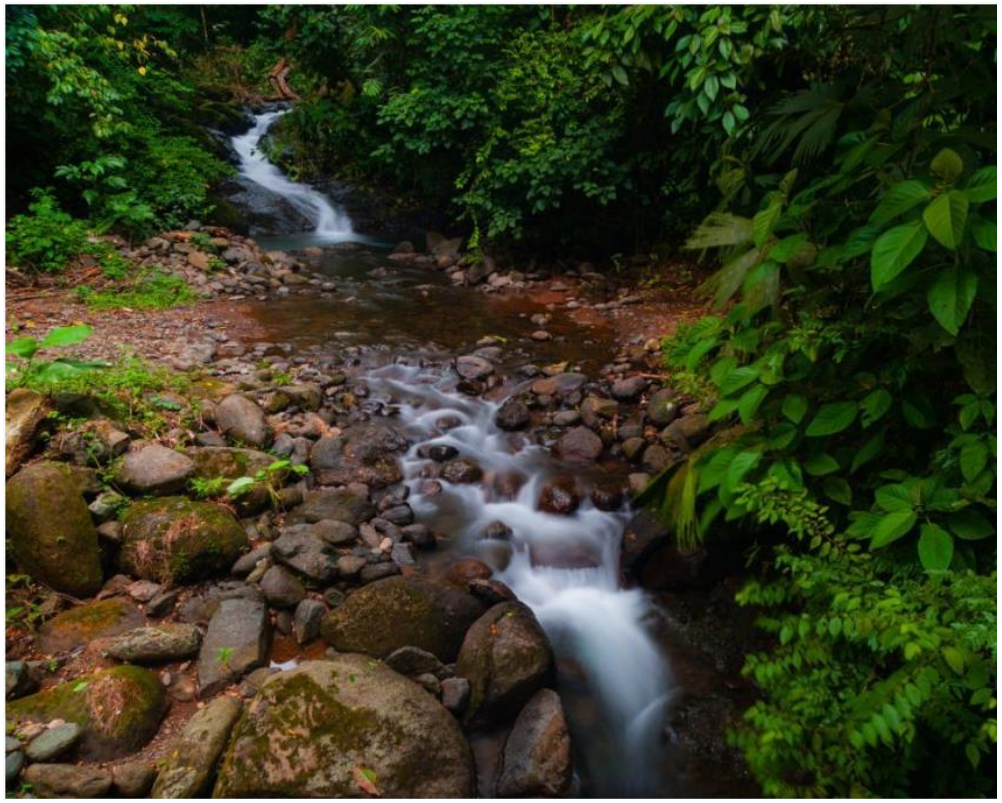
- Landsat 5 ETM
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 8 TIRS
- Terra MODIS
- Terra ASTER

Impact & Benefit: This project will provide a historical record of hotspot locations that can be used to study how hotspots are correlated with changes in land cover, and consequently, inform decision makers about how planned changes in land cover may result in surface temperature fluctuations. To increase community resilience and promote equity, the City seeks to strategically prioritize the implementation of green infrastructure. The end user aims to use these products to communicate heat risk information more effectively to a broad audience.

Costa Rica & Panama Eco Forecasting

Georgia – Athens

Community Concern: Due to a lack of biodiversity conservation in the area, the SICA countries of Mesoamerica banded together to create the Mesoamerican Biological Corridor (MBC), with the idea of preserving biodiversity and supporting sustainable economic development. Since the establishment of the MBC in 1997, deforestation has continued to plague the area and the sustainability of the corridor continues to be a challenge, with indigenous land rights being impacted and the strain on financial and natural resource management. The ecological need for the MBC still exists and could benefit native groups and governments if updated maps were created and links were reassessed.



Partners:

- SICA

Earth Observations:

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

Impact & Benefit: This project will benefit conservation goals throughout the MBC. Areas that have been impacted by deforestation will be evident and officials will be able to decide on the future course of action in those areas. Land managers will also be able to communicate conservation needs and future plans for the land to its inhabitants.

Great Basin Eco Forecasting

Idaho – Pocatello


John Ewing

Community Concern: Whether caused by lightning strikes or other ignition sources, wildfires have increased in both frequency and size across the western U.S. since the 1950's. As a result, wildfires cost billions of dollars in suppression and rehabilitation. A key component to fire management is measuring Live Fuel Moisture (LFM), which is a measure of the amount of moisture in biomass/fuel sources. LFM can be help determine how susceptible an area is to wildfire as wet vegetation requires more energy to combust. Partners are interested in incorporating NASA Earth observations into the predictive modeling of LFM. Better fuels management is integral to reduce wildfire hazards to human communities and mitigate ecological impacts of climate change.

Partners:

- Idaho Fish and Game, Southeast Regional Office
- NOAA, National Weather Service
- Great Basin Coordination Center
- Bureau of Land Management, Upper Snake Field Office

Earth Observations:

- Terra/Aqua MODIS
- Terra ASTER
- NOAA-20 VIIRS
- ECOSTRESS
- SMAP/Sentinel-1 Enhanced
- Landsat 8 OLI/TIRS

Impact & Benefit: Using NASA EOs, the project partners and their partners can assess areas in the Great Basin at risk of wildfires more accurately with more than limited *in-situ* field observations. The new datasets that will be provided will allow partners to better prepare for and deal with wildfires in the Great Basin.

Visayan Islands Eco Forecasting

Georgia – Athens

Community Concern: The West Visayan Island group of the Philippines contains the last wild populations of the critically endangered Visayan warty pig and endangered Visayan spotted deer. Determining the presence of native forest and change over time is a critical need for all forest species in the Philippines. The Talarak Foundation has been successful in its efforts to breed these species in captivity for conservation purposes and is looking to move forward on rewilding projects. It is unknown where specific vegetation types occur and where species of concern remain due to complex governance and land rights issues.

Partners:

- Arizona Center for Nature Conservation – Phoenix Zoo
- International Union for Conservation of Nature, Species Survival Commission
- Talarak Foundation Inc.

Earth Observations:

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

Impact & Benefit: Gaining access to spatial data will allow end users to conserve time and money. Without the spatial data, the end users are suggesting areas of suitable habitat by looking at the region via Google Earth. Additionally, many of the viable habitats lie within dangerous terrain for humans. Limiting the number of visits to these dangerous sites will be beneficial to end-user safety.

Tennessee Valley Energy

Alabama – Marshall

Community Concern: The Browns Ferry Nuclear Plant recently increased its power production by 465 megawatts, an expansion powerful enough to power an additional 280,000 homes in the Tennessee Valley. The Browns Ferry site, along with other TVA nuclear plants, relies on the Tennessee River to cool the facility. Despite the increase in energy production, the TVA must continue to meet preexisting water temperature regulations. These regulations ensure a healthy environment for a balanced, indigenous population of fish and wildlife in the Tennessee River. The Paint Rock River, a major tributary of the Tennessee River, is one of those most diverse streams in the county and is known for its diverse mussel and snail populations.

Impact & Benefit: The TVA's Hydrothermal Group will use the results of this project to expand their assessments of its facility outputs into the Tennessee River. The Hydrothermal Group hopes that the project's remotely sensed products will save them time and expedite their decision making process, as it will not have to collect and rely on limited *in situ* measurements. The end products will also demonstrate the feasibility of incorporating remotely sensed data into their assessments and help refine models with real-time data.

Earth Observations:

- Landsat 7 ETM+
- Landsat 8 OLI
- Aqua MODIS
- Terra ASTER
- ISS ECOSTRESS

Partners:

- Tennessee Valley Authority, Hydrothermal Group

Apostle Islands Water Resources

Colorado – Fort Collins

Community Concern:

- Algal blooms might increase in numbers due to changes in regional precipitation patterns and increases in extreme precipitation events.
- In this area, algal blooms have been observed following large sediment plume events.
- Understanding these events is important to maintaining water quality, ecosystem health, and tourism.

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-2 MSI
- Aqua MODIS
- Terra MODIS

Partners:

- National Park Service, Water Resources Division
- University of Minnesota, Duluth Large Lakes Observatory

Impact & Benefit: End products will provide partners with better documentation of the spatial extent and duration of previous sediment plume and algal bloom events, identify longer-term trends in sediment plume presence and algal bloom occurrence, and explore potential interactions between sediment plumes and algal blooms.

Belize & Honduras Water Resources II

California – JPL

Community Concern: Due to warmer ocean temperatures, coral bleaching events are predicted to be more frequent and more damaging to existing corals, but there is hope to see gradual increases in coral reef health with better reef management practices. Belize and Honduras face great challenges in implementing monitoring approaches that can be maintained over time and ensuring sustainable management of these vast and disparate environments.

Partners:

- Coastal Zone Management Authority and Institute (Belize)
- Wildlife Conservation Society
- University of Minnesota, Water Resources Center
- Honduras Partners (TBD)

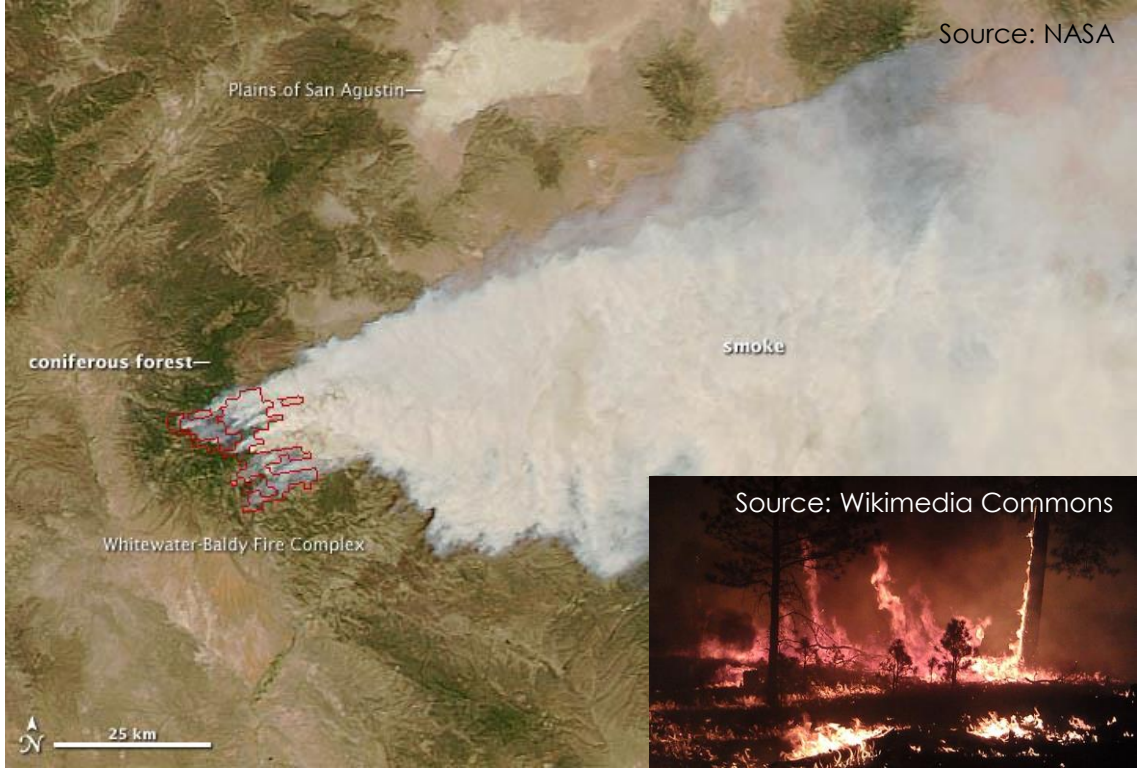
Impact & Benefit: Through NASA Earth observations, a Google Earth Engine tool will be built upon that not only allows decision-makers to prioritize areas for coastal monitoring and to understand the water quality conditions that impact reef health, but also to continue to update reef health maps through the Optical Reef and Coastal Area Assessment (ORCAA) tool.

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- Aqua MODIS
- Terra MODIS
- Sentinel-3 OCLI

Gila Water Resources

Maryland – Goddard



Community Concern: The Gila National Forest (Gila NF) Whitewater-Baldy Complex Fire of 2012 was the largest wildfire in New Mexico state history. USFS land managers and scientists expect that the wildfires, like those that occurred in 2012 and 2013, will become a more common occurrence in National Forests across the country. In recent years, the Gila NF has also faced growing demand on its water resources from downstream users. Wildfires can significantly impact watershed hydrologic functions and water and sediment yields. More information is required on watershed recovery. Project partners are interested in using geospatial data to support future targeted restoration activities in the Gila NF.

Partners:

- USDA, US Forest Service, Gila National Forest
- USDA, US Forest Service, Region 3

Earth Observations:

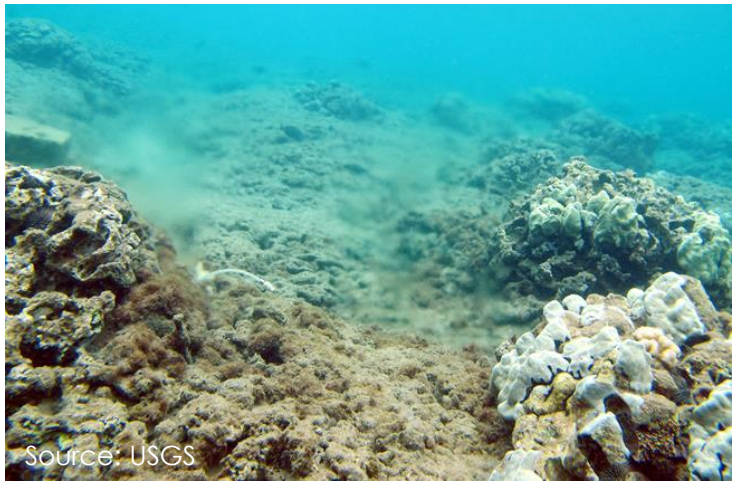
- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Sentinel-2 MSI
- GPM IMERG
- SMAP V3

Impact & Benefit: This project will help partners better understand and adapt to the short, medium, and long term recovery of watershed hydrological processes following wildfires. The outcomes from the project will strengthen the ability of forest managers to make crucial decisions around restoration prioritization and inform decisions related to the reduction of fire and drought vulnerability. Findings from this work could lead to the adoption of similar methods developed for other National Forests.

Hawaii Water Resources

California – Ames

Community Concern: Water quality has been degrading along the coast of West Maui due to excessive amounts of sediment and nutrient fluxes caused by urban development and agricultural activities, intense fishing practices, insufficient watershed management, and natural events such as tropical cyclones. Poor water quality severely impacts the condition of the coral reefs in this region, thus negatively affecting coastal protection, aquatic biodiversity, fisheries, and recreation. Currently, the West Maui Ridge to Reef Initiative and DLNR-DAR have limited personnel and technical capacity to properly monitor the condition of the coral reefs in the area.



Partners:

- US Coral Reef Task Force, West Maui Ridge to Reef Initiative
- Hawaii Department of Land and Natural Resources, Division of Aquatic Resources
- USGS Pacific Coastal and Marine Science Center

Earth Observations:

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

Impact & Benefit: This project will allow the end users to build their organizations' capacities in monitoring urban and agricultural activities and water quality conditions along the coast of West Maui while also helping them better locate impacted sites for future coral reef restoration efforts. The results can assist partners in better understanding land and water quality changes over time and identifying vulnerable coral reef areas.

Panama Water Resources

California – JPL

Community Concern: Water management is critical for the continuous operation of the Panama Canal. The construction of a larger set of locks and the occurrence of stronger El Niño events have placed critical importance on the management of freshwater in the Panama Canal Watershed to support Canal operation. There is a concern that as water gets scarcer, the Panama Canal will only be able to operate at limited capacity and the viability of the canal as a major transportation corridor will be threatened, having a global impact on maritime shipping.

Partners:

- Panama Canal Authority
- Smithsonian Tropical Research Institute (Panama)

Earth Observations:

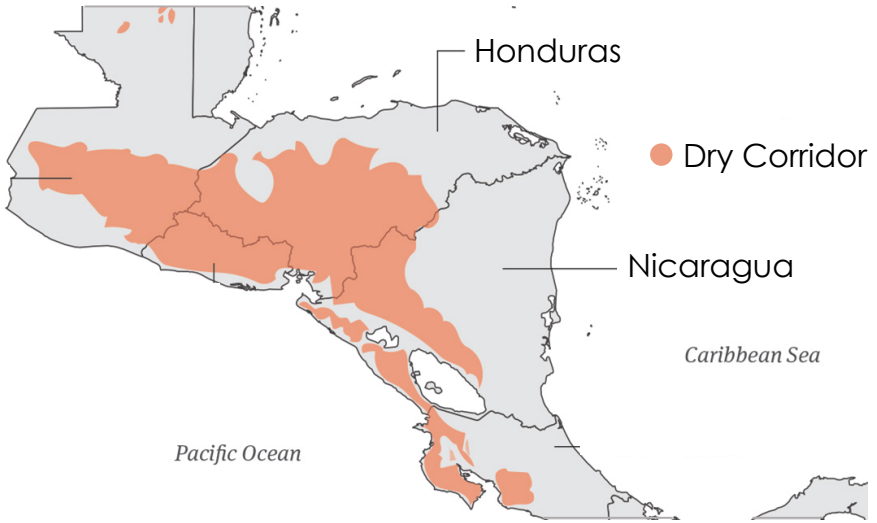
- NASA Gulfstream III UAVSAR
- Sentinel-1 SAR
- PALSAR
- NOAA GOES-16
- ECOSTRESS

Impact & Benefit: Through the applications of NASA Earth observations, the end users will be able to better understand the role of land cover on vegetation water use and water flows in the Panama Canal watershed. In addition, the end products enable the partners to identify the vegetation types best suited for water retention within the watershed, leading to increased capacity for land use planning and reforestation endeavors.

Honduras & Nicaragua Food Security & Agriculture

North Carolina – NCEI

Community Concern: The Central American Dry Corridor is home to nearly half of the small producers of basic grain crops in the region. The 2015/2016 drought left over three million people in conditions of acute food insecurity, and for the 2018/2019 El Niño season, the United Nations Food and Agriculture Organization (FAO) issued a 'high risk' warning for drought in Central America.



SICA Partner Countries:

- Honduras
- Nicaragua

Earth Observations:

- Aqua & Terra MODIS
- Suomi NPP VIIRS
- GPM IMERG

Impact & Benefit: This project will explore the relationship between meteorological and agricultural drought in the Dry Corridor of Honduras and Nicaragua, where there are few publicly accessible weather stations. The partners will gain understanding of satellite-derived precipitation anomalies (Standardized Precipitation Index) for drought indication. The end products will analyze the response of vegetation health to precipitation anomalies throughout the agricultural cycle.

Northern Forest Food Security & Agriculture II

Georgia – Athens

Community Concern: The maple production industry relies on very precise and timely weather conditions that occur in the spring when temperatures are above freezing during the day and below freezing at night. Unseasonably warm or cold temperatures can decimate syrup yield and quality.

Partners:
- University of Vermont Extension Maple Program
- University of Vermont Proctor Maple Research Center
- Cornell Maple Program

Earth Observations:
- Terra ASTER
- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-2 MSI

Impact & Benefit: Maple producers can benefit from information on trends in forest type and health across the Northern Forest, combined with data on temperature trends, elevation, slope, and aspect, to model optimal conditions for sugarbush production and resilience to anomalous weather patterns.

Central Java Disasters

Massachusetts – Boston


Source: ABC

Community Concern: Coastal damage caused by tidal inundation is of great concern to managers in Central Java. For example, in 2015 more than 1,000 ha in Semarang City and 2,116 ha in Demak were inundated. Since these events, tidal inundation and coastal flooding have continued to be persistent issues that the highly populated region must manage and mitigate. Inundation events have caused a loss of housing, infrastructure damage, health problems, and transportation issues. Fluxes in coastal turbidity associated with tidal inundation and land loss also threaten marine ecosystems and affect projects that rely on sedimentation to restore flooded lands.

Partners:

- Water Resources and Spatial Planning Office of Central Java Province
- Diponegoro University, Center for Coastal Rehabilitation and Disaster Mitigation Studies

Earth Observations:

- Landsat 8 OLI
- Aqua MODIS
- Terra MODIS
- Sentinel-1 C-SAR

Impact & Benefit: The team's products will assist end users with ongoing efforts to assess tidal inundation and its effects on populated areas and neighboring marine ecosystems. Methods and maps created throughout the term will serve as the basis of a greater effort to use satellite remote sensing to save time and resources typically associated with field environmental monitoring. Turbidity maps will also provide insight into sedimentation potential, which is vital for land restoration.

Medicine Bow Disasters

Colorado – Fort Collins

Community Concern :

- The 2012 Squirrel Creek Fire in the Medicine Bow National Forest located in southeastern Wyoming burned over 40,000 ha, leaving the area susceptible to cheatgrass encroachment.
- Cheatgrass can alter historic fire regimes increasing the frequency of fires which can have ongoing negative impacts to native ecosystem.
- There is a need to gain a better understanding of how cheaatgrass is responding to aerial sprays in subsequent years.

Impact & Benefit: Showing the effectiveness of the aerial herbicide treatment, and the progression thereafter, will help elucidate the benefit partner management actions have had on the landscape and guide how land managers respond to fires in the future.

Partner:

- USDA, US Forest Service, Laramie Ranger District of Medicine Bow-Routt National Forests and Thunder Basin National Grassland

Earth Observations:

- Landsat 8 OLI
- SRTM