

DEVELOP

2022 Summer Preview



DEVELOP

2022 SUMMER PORTFOLIO

*IMPACTS AND PARTNERS ARE TENTATIVE

ENGAGEMENT:

110



PARTICIPANTS

64



PARTNER ORGS

27



PROJECTS

TERM I: 23

TERM II: 3

TERM III: 1

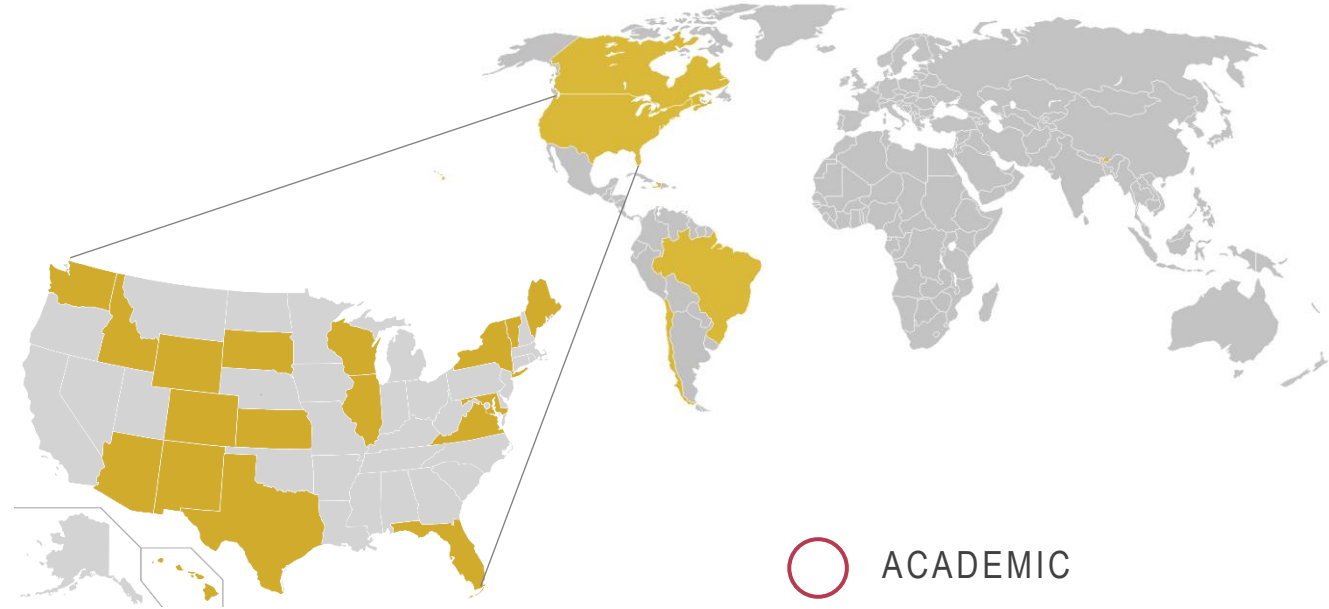
IMPACT:

18

U.S. STATES

6

COUNTRIES



DISASTERS



WILDFIRES



AGRICULTURE



ENERGY



ECOLOGICAL FORECASTING



WATER RESOURCES



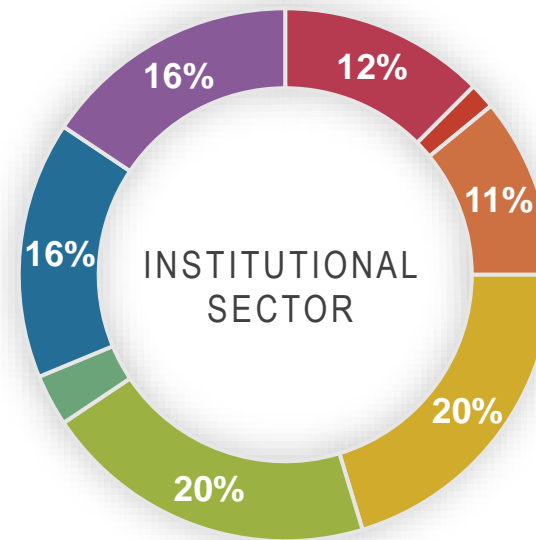
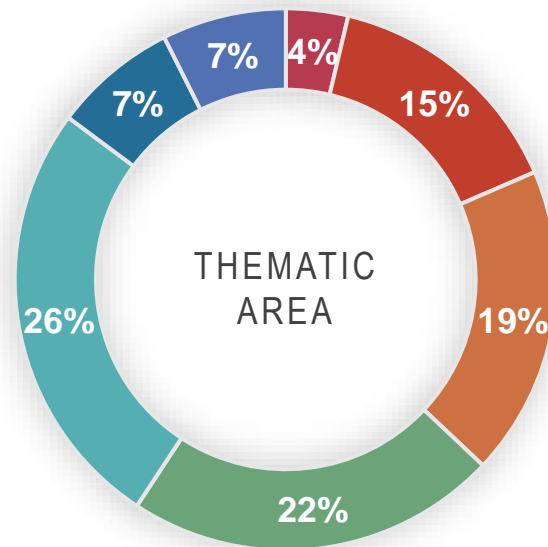
URBAN DEVELOPMENT



CLIMATE



HEALTH & AIR QUALITY



DEVELOP

2022 SUMMER PARTICIPANTS

110



PARTICIPANTS

26 (24%)

RETURNERS

84 (76%)

NEW
PARTICIPANTS

66 (60%)

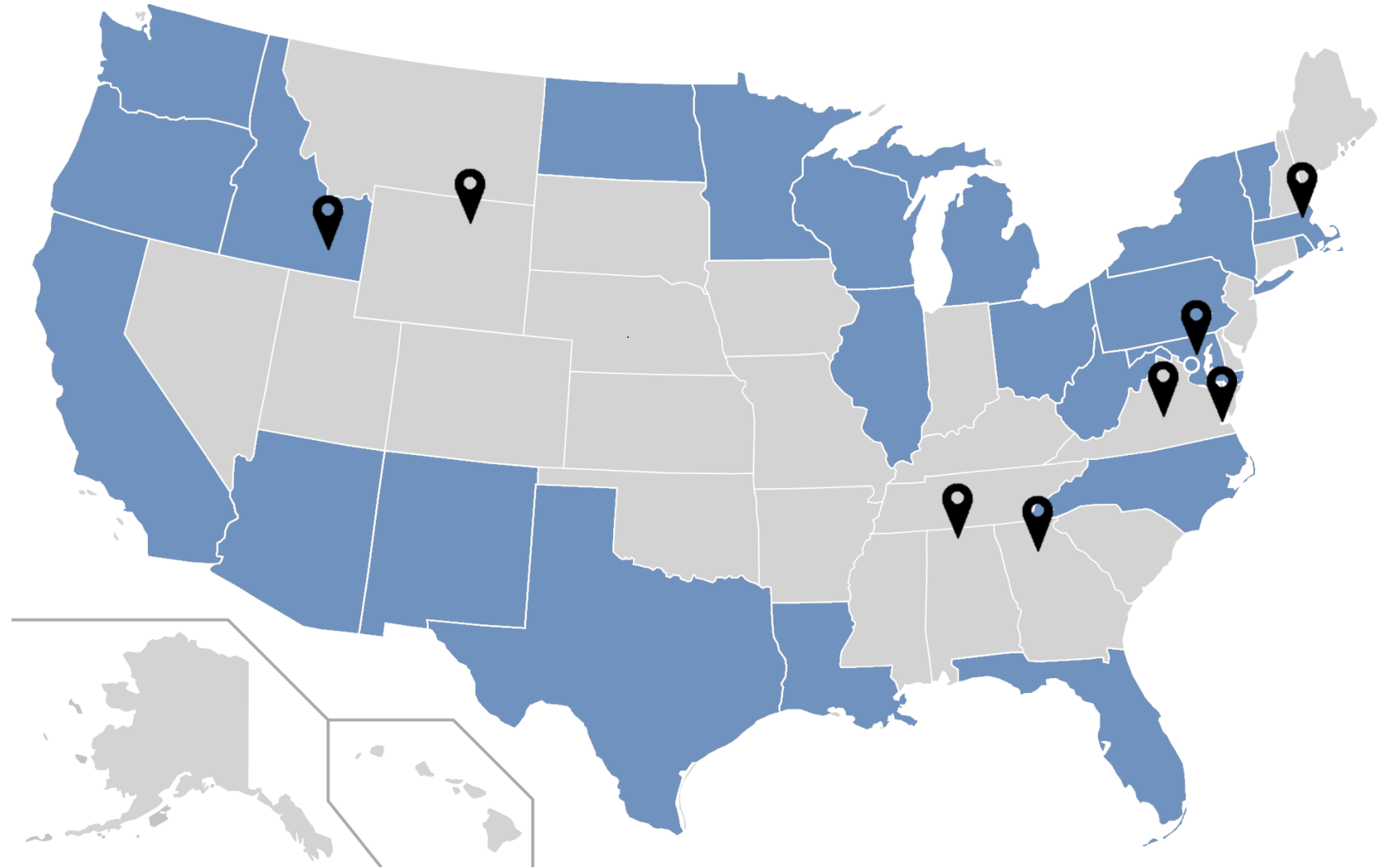
VIRTUAL

44 (40%)

IN PERSON

23

STATES +
WASHINGTON DC



Lower Illinois Ecological Forecasting

Community Concern: There has been extensive agricultural development in the Lower Illinois River Valley, which is contributing to floodplain erosion, flooding, and overall wetland degradation.



Partners:

- Great Rivers Land Trust
- National Great Rivers Research & Education Center
- AGU Thriving Earth Exchange
- Principia College

Earth Observations:

- Sentinel-1 C-SAR
- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI

Impact: Resulting maps of wetland extent will be incorporated into a geodatabase tool being developed for the Great Rivers Land Trust to query and identify parcels available for purchase to execute wetland restoration and conservation projects.



New York Ecological Forecasting

Community Concern: The invasive species *Agrilus planipennis*, otherwise known as the emerald ash borer, has been infesting New York's ash trees since 2009. To further understand ecosystem response from emerald ash borer outbreaks in New York's Adirondack Park, this project will monitor ash tree distribution and forecast emerald ash borer susceptibility to 2027.

Partner:

- New York State Department of Environmental Conservation, Partnerships for Regional Invasive Species Management, Adirondack Park Invasive Plant Program

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI
- AVIRIS
- DESIS



Impact: End products will further assist the Adirondack Park Invasive Plant Program with their invasive species management practices as they continue their efforts to reduce EAB presence within the park.



Yellowstone Ecological Forecasting

Community Concern: While wolf removal and reintroduction in Yellowstone National Park is a textbook example of multi-trophic level dynamics, its cascading effects on aspen stands have yet to be fully examined.

Partners:

- Yellowstone National Park
- Utah State University
- University of Wisconsin, Stevens Point

Earth Observations:

- Landsat 9 OLI-2
- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-2 MSI
- Landsat 7 ETM+

Impact: The end products will assist the National Park Service in its management practices and inform wildlife restoration and rewilding decisions beyond Yellowstone National Park.



Image Credit: Jim Peaco



Delaware Basin Ecological Forecasting

Community Concern: In recent years temperatures have increased while precipitation has decreased in Carlsbad Caverns and Guadalupe Mountains National Parks. The NPS is concerned about how this will impact the flora and fauna of the parks.



Partners:

- National Park Service, Intermountain Region

Earth Observations:

- Landsat 7 ETM+
- Landsat 8 OLI
- ISS ECOSTRESS
- Sentinel-2 MSI
- GPM IMERG
- Aqua MODIS
- Terra MODIS

Impact: The end products from this project, which include an NDVI map, a precipitation time series and a water stress map, will allow partners to evaluate vegetation health and effectively plan for resource preservation and management.



Grand Valley Ecological Forecasting II

Community Concern: Disturbances including drought, wildland fires, and beetle infestation are causing changes to the juniper-pinyon and sagebrush ecosystems of Grand Valley, CO.

Partners:

- National Park Service, Colorado National Monument
- Bureau of Land Management, McInnis Canyon National Conservation Area

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Landsat 9 OLI-2
- Terra/Aqua MODIS
- SMAP

Impact: Forecasted landcover change, fire impact, treatment impact, and beetle infestation scenarios in combination with historical trend analysis of these landscape level changes and disturbances will provide historical context, modeled outlooks, and scientific grounding for wildland fire management in the region moving forward.



Maine Ecological Forecasting III

Community Concern: Changes in temperature and precipitation patterns, along with alterations in land cover across Maine threaten ongoing conservation efforts for Federally Endangered Atlantic salmon (*Salmo salar*).

Partners:

- Downeast Salmon Federation
- Department of Marine Resources, Division of Sea-run Fisheries and Habitat

Earth Observations:

- Aqua MODIS
- Terra MODIS
- Landsat 5 TM
- Landsat 8 OLI
- Sentinel-1 SAR
- Sentinel-2 MSI
- PlanetScope

Impact: The goal of this project is to not only inform the partner's ongoing Atlantic salmon population recovery and habitat restoration initiatives, but provide tools to continue integrating Earth observations into their work. The team will generate resources and plan a workshop that demonstrates how NASA Earth observations can be used to assess temperature, precipitation, and land use land cover (LULC) over time.



Image Credit: Downeast Salmon Federation



Western Sonoran Desert Water Resources

Community Concern: The western Sonoran Desert is one of the driest places in North America and seasonal freshwater rock pool habitats are threatened by continued warming and drying climate trends.

Partners:

- National Park Service, Organ Pipe Cactus National Monument
- University of Arizona

Earth Observations:

- Aqua MODIS
- Terra MODIS
- Suomi NPP VIIRS



Image Credit: Susan Washko

Impact: Climatology time series and a hydroperiod trend analysis will quantify historical trends of wet and dry periods that influence rock pool water persistence and will be used to inform park management practices including restricting public access to rock locations and coordinating disbursement of supplemental water resources.



Yampa Water Resources

Community Concern: The Yampa River is known for its mostly unaltered natural condition, biological diversity, and water quality. A recent increase in algae blooms in the Upper Yampa River Watershed is threatening water quality and overall ecosystem health.

Partners:

- Upper Yampa Water Conservancy District
- Colorado State University

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI
- Landsat 5 TM
- Sentinel-2 MSI
- Aqua MODIS
- Terra MODIS

Impact: Validating a time series of lake color will communicate to partners the reliability of using satellite observations to track water quality. Identifying drivers of algae blooms will enable partners to work towards solutions to address water quality concerns.



Puget Sound Water Resources

Community Concern: The Puget Sound is experiencing extensive losses to bull kelp beds. Kelp supports the food web and provides critical habitat for marine life therefore kelp bed losses could have devastating effects on the Puget Sound ecosystem.

Partners:

- Port of Seattle
- Washington State Department of Natural Resources

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI
- Sentinel-2 MSI

Impact: Kelp extent and time series maps will help partners understand kelp abundance and spatial distribution patterns so they can best inform their conservation, restoration, and mitigation activities.



Lake Champlain Water Resources

Community Concern: Lake Champlain's health is strongly tied to the local economy and is used for fishing, boating, tourism, and drinking water; but recently the occurrence of cyanobacterial blooms in Lake Champlain has been harming local ecological health and the greater economy of the Lake Champlain basin area.

Partner:

- USDA NRCS

Earth Observations:

- ISS DESIS
- Landsat 9 OLI-2
- SRTM
- GPM IMERG
- Sentinel-3

Impact: This project will use Earth observations to identify sources of sediment runoff associated with resulting algal blooms to be used in the mitigation of future bloom events, as well as differentiate phycocyanin presence from algae within the water body.



Florida Water Resources

Community Concern: Over the last 20 years, major storm events have had devastating effects on mangrove forests within Florida's aquatic preserves, which protect nesting areas and are vital to the preservation of the area's shoreline.

Partner:

- Florida Department of Environmental Protection, Office of Resilience and Coastal Protection, Aquatic Preserves Program

Earth Observations:

- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI
- Aqua MODIS

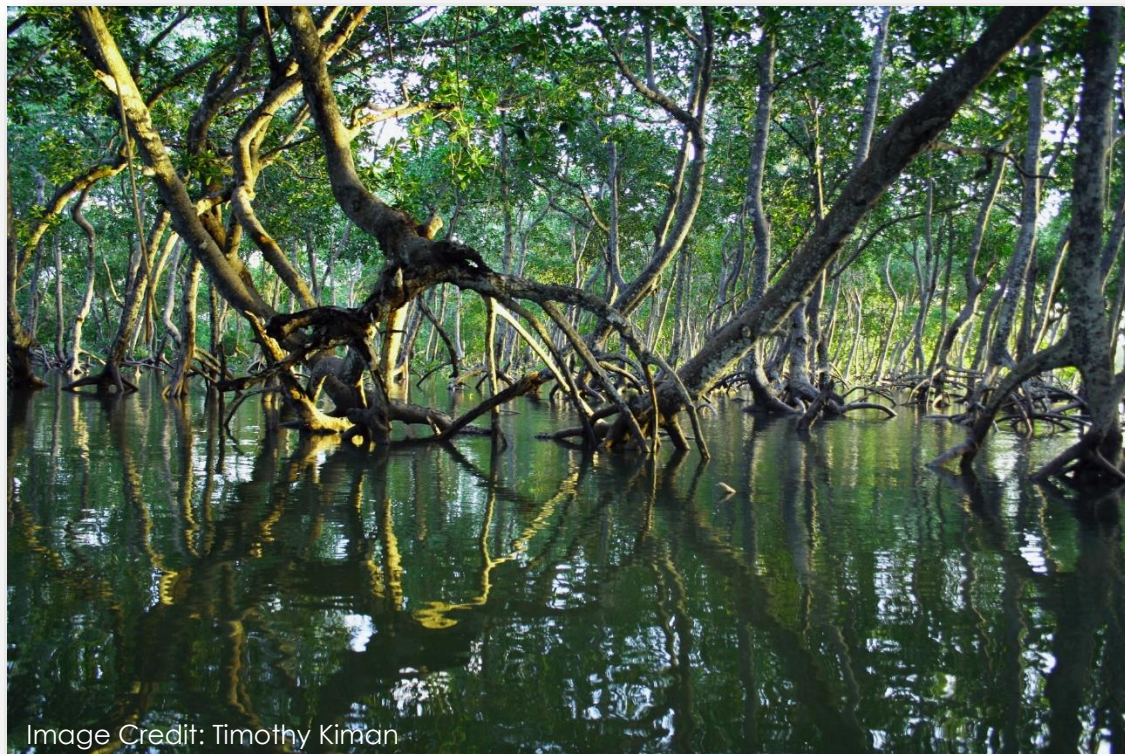


Image Credit: Timothy Kiman

Impact: End products provided by this project will provide both historical context and near real-time information that can assist partners in making informed decisions about the locations of future habitat conservation efforts.



Great Slave Lake Water Resources

Community Concern: The Great Slave Lake and Slave River Delta have experienced changes in delta structure, especially as a result of varying water levels, threatening important transportation routes and fishing resources for local communities, as well as vital ecosystems for aquatic and terrestrial species.

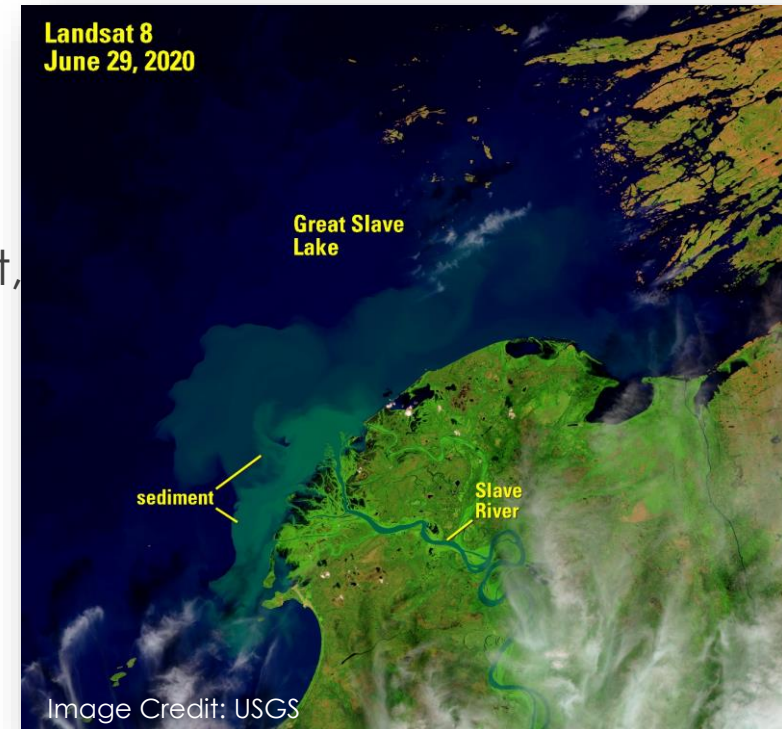
Partners:

- Fort Resolution Métis Government
- Deninu K'ue First Nation, Aquatics and Lands Divisions
- Aboriginal Aquatic Resources & Oceans Management, Akaitcho Territory Government
- Environment and Climate Change Canada

Earth Observations:

- | | |
|------------------|--------------------|
| • Landsat 5 TM | • JASON Series |
| • Landsat 8 OLI | • GPM IMERG |
| • SRTM | • Sentinel-2 MSI |
| • Topex/Poseidon | • Sentinel-1 C-SAR |

Impact: Land cover change maps and a timeseries of delta evolutions will assist partners in understanding changes in the Delta. These products will make research more accessible to the community and provide resources to support bottom-up efforts to influence regional decision-making to protect the Lake and River Delta.



Chesapeake Bay Water Resources

Community Concern: Coastal sediments, often derived from agricultural and urban lands, erosion, algal production, and bottom sediment resuspension, are known to impact aquatic ecosystems. Increasing concentrations of suspended sediments in the Chesapeake Bay has been a major contribution to bay's poor health and water quality.

Partners:

- Virginia Department of Environmental Quality
- GEO AquaWatch
- CEOS COAST

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- GRIDMET
- GPM IMERG

Impact: Examining spatial and temporal total suspended sediment trends in the Chesapeake Bay will help our partners utilize Earth observations and incorporate new models and methodologies into their workflow. This project will also act as an example of related Chesapeake Bay initiatives with GEO AquaWatch and CEOS COAST.



Chesapeake Bay Agriculture

Community Concern: The effects of saltwater intrusion and increased salinization can be widespread and include marsh migration, loss of cropland, and decreased agricultural productivity; all of which jeopardize the livelihoods of farmers and other coastal agriculture industries.



Partners:

- Eastern Shore Land Conservancy
- Maryland Department of Planning

Earth Observations:

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

Impact: The team will generate Land Use Land Cover (LULC) maps that identify agricultural land, open water, and marsh habitat. Assessment of LULC change over time will be used to monitor marsh migration and loss of agricultural land, highlighting agricultural land at risk to the impacts of salinization.

Maipo River Valley Agriculture

Community Concern: Crop coefficients (K_c) are commonly used to calculate actual crop evapotranspiration and assess irrigation. Although variability between growing seasons, frequently used K_c estimates do not account for geographic and climate conditions which commonly results in inaccurate representations of water usage needs.

Partners:

- Centro de Información de Recursos Naturales (CIREN)
- Oficina Agrícola de la Embajada de Chile en los Estados Unidos de América

Earth Observations:

- Landsat 8 OLI
- Suomi NPP VIIRS
- Aqua MODIS
- ISS ECOSTRESS
- Terra MODIS

Impact: Dual crop coefficient methodologies will provide the partners more accurate approaches to evaluating irrigation needs among crop fields in the Maipo River Valley in Chile.



Image Credit: robsonfilho



Mato Grosso Agriculture

Community Concern: Agricultural management and policy making are dependent on crop monitoring and classification, however, dense cloud cover in the tropics often limits crop classification from optical imagery alone.

Partners:

- USDA Foreign Agriculture Service
- USDA World Agricultural Outlook Board

Earth Observations:

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



Image Credit: Pexels

Impact: The crop classification maps created utilizing both optical and radar imagery will improve the accuracy and spatial coverage of classification maps to enhance commodity estimates and policy decisions.

Bhutan Agriculture II

Community Concern: Bhutan's national economy is primarily agrarian and rural areas especially rely on agriculture as an important source of income, yet farmers struggle against crop disease and pests. Utilizing Earth observations to more effectively monitor agriculture will allow for the Department of Agriculture to supplement field surveys and improve monitoring.

Partners:

- Bhutan Department of Agriculture
- Bhutan Foundation
- Ugyen Wangchuck Institute for Conservation and Environmental Research

Earth Observations:

- Landsat 5 TM
- Sentinel-1 C-SAR
- Landsat 7 ETM+
- Sentinel-2 MSI
- Landsat 8 OLI
- Planet

Impact: The project will enable future analysis of rice crops that would not have been possible without the utilization of Earth observations, including the refining of the first term's crop mask and sampling protocol.



Haiti Agriculture II

Community Concern: Haiti has lost a large portion of its primary and secondary forests which impacts local communities by depleting reliable resources that bolster the economy. This loss also impacts the global community by decreasing biodiversity and carbon sequestration. A way to address these community concerns is through reforestation.



Partners:

- Haiti Reforestation Partnership

Earth Observations:

- Landsat 9 OLI-2
- Landsat 8 OLI
- Sentinel-2 MSI
- PlanetScope & RapidEye

Impact: The tropical deciduous tree habitat suitability map will inform the Haiti Reforestation Partnerships' future silvicultural decisions by identifying ideal planting areas.

Washington Wildfires

Community Concern: Fires on the west coast of the United States are increasing in severity and frequency. As such, fire response teams and mitigation efforts need up to date data and methods for predicting fire behavior.



Partners:

- Pacific Northwest National Laboratory
- USDA Forest Service

Earth Observations:

- ISS ECOSTRESS
- SRTM
- ISS GEDI
- Landsat 8 OLI

Impact: Partners will be able to compare fuel moisture maps created using ECOSTRESS with existing products. They can then incorporate these updated fuel maps into their fire behavior models used for directing fire response teams.



Black Hills Wildfires

Community Concern: The 2000 Jasper fire resulted in high severity burn patches with high levels of tree mortality. As fires in the western US increase in severity understanding the regeneration of forests and their management needs is increasingly important.

Partners:

- USDA, US Forest Service, Black Hills Experimental Forest
- USDA, US Forest Service, Rocky Mountain Research Station
- USGS, Geosciences and Environmental Change Science Center

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI



Image Credit: Joyce Williamson

Impact: The evaluation of the tree detection method will inform how to target management resources. Time series maps of tree regeneration will improve understanding of natural regeneration dynamics and the impacts of management on forest regeneration.



Idaho Wildfires

Community Concern: Historic drought conditions in the state of Idaho are contributing to severe fire seasons and managers need a better understanding of how drought conditions are impacting fire occurrence to make informed updates to the State Drought Plan.



Partners:

- Idaho Office of Emergency Management
- Idaho Department of Water Resources
- Idaho Department of Lands

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI-2
- MODIS Terra/Aqua
- Suomi NPP VIIRS
- SMAP
- ISS ECOSTRESS

Impact: This project will result in the development of a repeatable workflow for implementing current Earth observation including evapotranspiration, soil moisture, and vegetation health indices in conjunction with ground data for continuing drought and fire impact monitoring. Partners plan to use data from this project to aid in updating Idaho's State Drought Plan.

Chile Wildfires

Community Concern: In early 2017 high heat and drought contributed to some of the most damaging fires in Chilean history. One of the ways CONAF is preparing for preventative fire management is by quantifying fires ignited by lightning strikes.

Partners:

- Corporación Nacional Forestal (CONAF)
- Embassy of Chile, Agricultural Office

Earth Observations:

- | | |
|-------------------|-----------------|
| • GOES-16 GLM | • Terra MODIS |
| • Suomi NPP VIIRS | • Aqua MODIS |
| | • Landsat 8 OLI |

Impact: This work will benefit end users by providing trends in lightning strike location and frequency, as well as observing vegetation health within those high frequency areas. This will allow partners to plan preventative fire measures for areas most at risk for wildfire ignition.



Image Credit: Jonas Kaiser on Unsplash



Kansas City Disasters

Community Concern: Partners are concerned about neighborhoods around Kansas City experiencing disproportionate vulnerabilities to urban flooding. Understanding the environmental and socioeconomic factors involved are necessary to support and protect these communities in the future.

Partners:

- Groundwork USA
- Groundwork Northeast Revitalization Group

Earth Observations:

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



Impact: The products will support the partners' efforts to identify areas where interventions should occur to mitigate disproportionate flood risk. The creation of a HUC-14/16-equivalent watershed layer will assist in neighborhood-level analysis and the results from the InVEST Urban Flood Risk Mitigation Model will inform socioeconomic implications of flood vulnerabilities.



Hawai'i Island Climate

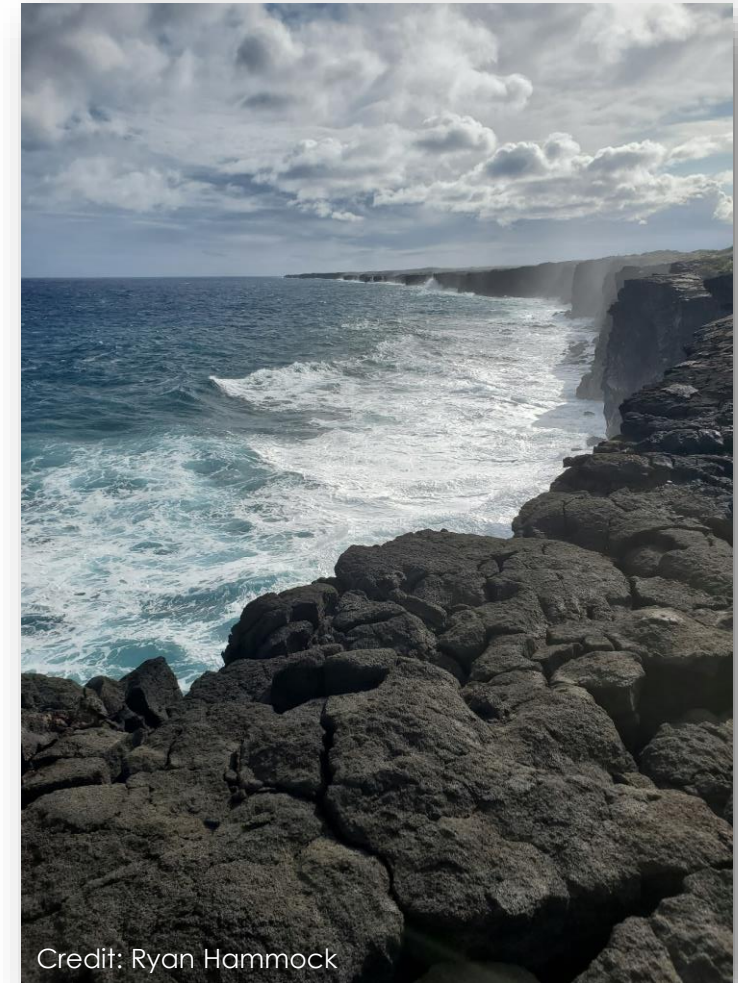
Community Concern: Hawai'i Island (aka the Big Island) is currently threatened by sea level rise which impacts the number of coastal wetlands around the island under the protection of the County and State of Hawaii. In addition to the protection of wetlands, the State is concerned with the many historic cultural lands and heritage sites that are threatened by sea level rise.

Partners:

- County of Hawai'i
- State of Hawaii, Department of Land and Natural Resources
- Arizona State University, Center for Global Discovery and Conservation Science

Earth Observations:

- Sentinel-6
- Jason-2
- Jason-3
- Landsat 8 OLI
- Sentinel-1 C-SAR
- PlanetScope



Credit: Ryan Hammock

Impact: This project will provide the partners with updated wetland extent maps outlining changes over time due to sea level rise. Additionally, this project will provide sea level rise inundation vulnerability maps for coastal heritage sites. These end products will help aid in the development of the Hawai'i Island Shoreline Setback Plan.

Wichita Climate

Community Concern: The City of Wichita is facing increasing urban temperature and are hoping to leverage NASA Earth observations to inform their climate adaptation strategies, especially related to potentially adverse impacts to minority communities.



Partners:

- City of Wichita

Earth Observations:

- Landsat 7 ETM+
- Landsat 8 OLI/TIRS
- Landsat 9 OLI-2/TIRS-2
- ISS ECOSTRESS
- PlanetScope

Impact: This project will provide the city with heat vulnerability and tree canopy coverage maps to understand where interventions should take place. Relatedly, partners and participants aspire to find community organizations active in Wichita to assist in the implementation of green infrastructure and climate adaptation.

Albuquerque Urban Development

Community Concern: The urban heat island effect in Albuquerque, NM has contributed to widespread heat disparities between wealthy and low-income communities as extreme heat is expected to persist and intensify due to climate change. As a result of increasing temperatures and lack of cooling infrastructure, heat-related illnesses and mortality has been of great concern.

Impact: This team will develop maps derived from the InVEST Urban Cooling and ENVI-Met models to allow partners prioritize areas in need of tree planting. This will help the City of Albuquerque achieve its goal of planting 100,000 trees by 2030.



Earth Observations:

- Landsat 8 TIRS
- Landsat 9 TIRS-2
- ISS ECOSTRESS
- ISS GEDI

Partners:

- City of Albuquerque
- Let's Plant Albuquerque



Milwaukee Urban Development

Community Concern: Having shown apparent flood risk with select neighborhoods at more serious risk, partners hope to assess urban flooding vulnerability, identify neighborhoods where future intervention projects should happen, and improve stakeholder accessibility to data.

Impact: This project will use GPM IMERG and ancillary datasets to calculate rainfall runoff and create maps of runoff retention in Milwaukee using the InVEST Urban Flood Risk Mitigation Model. This project will also update and refine tutorials for assessing flood vulnerability to build organizational capacity at both the local and the national levels of Groundwork USA.



Earth Observations:

- GPM IMERG

Partners:

- Groundwork USA
- Groundwork Milwaukee

