DEVELOP

2022 Fall Preview

EARTH SCIENCE
APPLIED SCIENCES

*IMPACTS AND PARTNERS ARE TENTATIVE

DEVELOP 2022 FALL PORTFOLIO

ENGAGEMENT:

86 PARTICIPANTS

50 PARTNER ORGS

22 PROJECTS

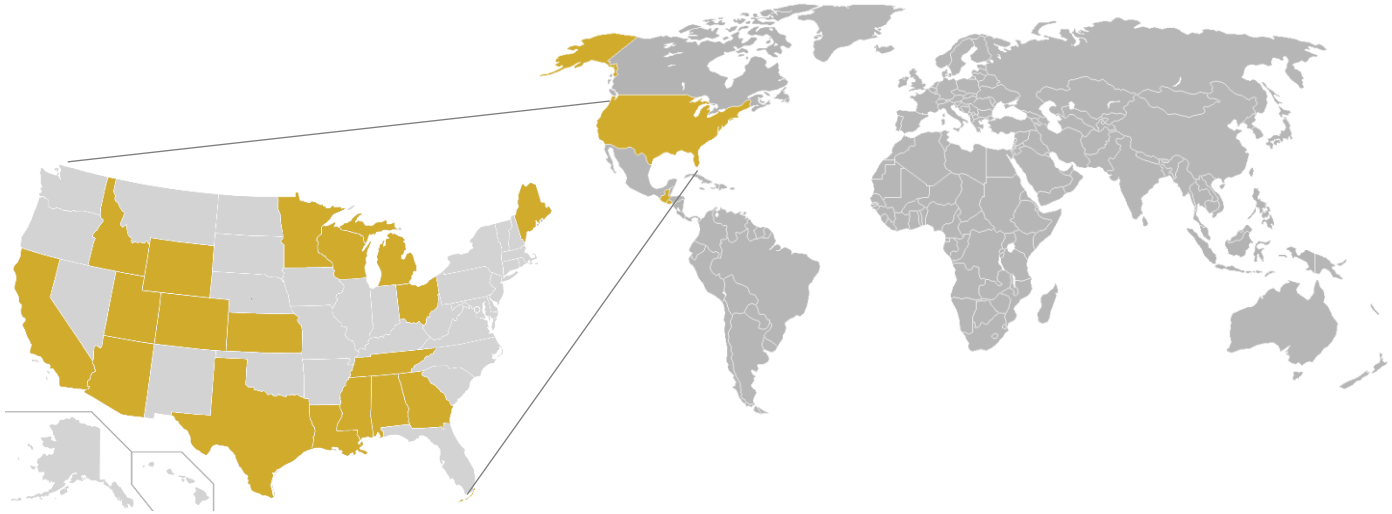
TERM I: 15

TERM II: 7

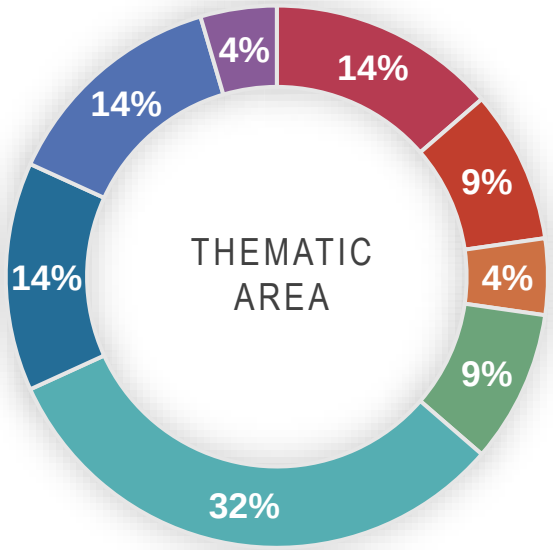
IMPACT:

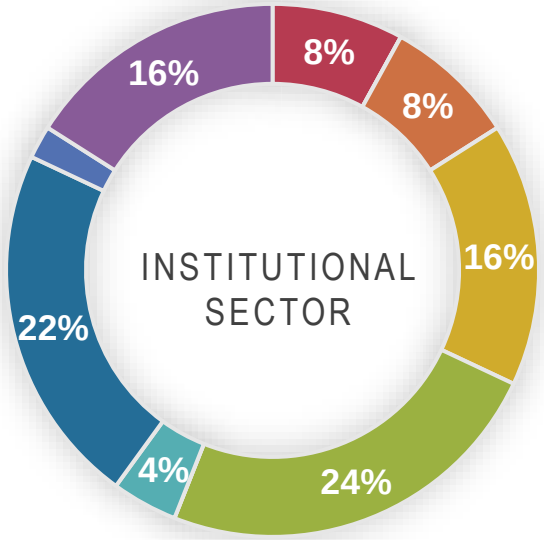
18 U.S. STATES

4 COUNTRIES



- DISASTERS
- WILDFIRES
- AGRICULTURE
- ENERGY
- ECOLOGICAL FORECASTING
- WATER RESOURCES
- URBAN DEVELOPMENT
- CLIMATE
- HEALTH & AIR QUALITY





- ACADEMIC
- CONSORTIUM
- LOCAL GOVERNMENT
- STATE GOVERNMENT
- FEDERAL GOVERNMENT
- INTERGOVERNMENTAL
- FOR-PROFIT
- NON-PROFIT
- TRIBAL
- INTERNATIONAL

Western Tennessee Water Resources

Community Concern: Western Tennessee expects an increase in development with the construction of a Ford Plant at the Memphis Regional Megasite, which has implications for groundwater recharge in the Memphis Sand Aquifer.

Partners:
- Protect Our Aquifer
- University of Memphis, Center for Applied Earth Science and Engineering Research

Earth Observations:
- ECOSTRESS
- GPM IMERG

Impact: Maps of the evaporative stress index and water balance will be used evaluate drought risk and used by partners to identify thriving areas for conversation and areas requiring additional groundwater monitoring in preparation for future urban development related to the Ford Plant.


Image Credit: Brian Stansberry

California – JPL

Keweenaw Bay Water Resources

Community Concern: The Keweenaw Bay Indian Community manages natural and cultural resources along the shores of Lake Superior that are threatened by erosion and flooding. They face issues such as re-deposition of stamp sands onto key wetland habitat, loss of public beaches, coastal highway flooding, and risk of contaminated drinking water.

Partners:

- Keweenaw Bay Indian Community, Natural Resources Department
- Environmental Protection Agency, Office of Community Revitalization

Impact: Project results and methodologies will support KBIC in understanding change over time and support informed decision making relating to shoreline management and future armoring/nature-based shoreline erosion solutions.


Image Credit: Royalbroil

Earth Observations:

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI/TIRS
- Landsat 9 OLI-2/TIRS-2
- GPM IMERG
- Sentinel-2 MSI
- WorldView-2
- WorldView-3
- IKONOS-2 OSA
- QuickBird-2

San Diego Water Resources

Community Concern: The San Diego Bay and the Tijuana River Watershed provide both critical habitat for species of concern and recreational opportunities for residents and tourists of Southern California. However, storm-induced runoff often pollutes these waters to dangerous levels that can cause health problems for beachgoers and wildlife alike.

Partners:

- Tijuana River National Estuarine Research Reserve
- Port of San Diego

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI
- AVIRIS – NG
- PRISM
- PlanetScope


Image Credit: US Fish and Wildlife


Image Credit: US Fish and Wildlife

Impact: The team will improve the monitoring and understanding of runoff extent within San Diego's coastal waters and enhance project partners understanding of NASA Earth observations applicability to observing water quality within Southern California and monitoring the extent of pollution.

California – Ames

Gulf of Maine Water Resources

Community Concern: The Gulf of Maine experiences periodic blooms of the toxic dinoflagellate, *Alexadrium catenella*, that pose a danger to regional water quality. These blooms increase coastal toxicity, threaten aquatic resources and public health, and, at peak concentrations, turn the water visibly reddish-brown.

Earth Observations:

- Suomi-NPP VIIRS
- Envisat MERIS
- Sentinel-3 OLCI

Image Credit: Taylor Crockford

Partners:

- Woods Hole Oceanographic Institution
- Massachusetts Water Resources Authority
- NOAA, Stellwagen Bank National Marine Sanctuary

Impact: This project will explore applications of the normalized fluorescence line heigh and Algal Bloom Index for identifying *A. catenella* blooms. The end products will inform the feasibility of applying these methods to identify future blooms to support local response programs.

Shoshone River Water Resources


Image Credit: Jim & Robin

Partners:

- Wyoming Department of Environmental Quality
- Wyoming Department of Environmental Quality, Shoshone River Partners
- USGS, Wyoming-Montana Water Science Center

Community Concern: Decreases in the water quality of the Shoshone River attributed to the downstream release of accumulated sediments at Willwood Dam in Wyoming has led to the deterioration of riparian habitats and aquatic life. This greatly impacts the fishing industry in which the local community heavily relies on for food and economic benefits.

Earth Observations:

- GPM IMERG
- PlanetScope
- Sentinel-2 MSI

Impact: The precipitation time series, land cover analysis, and categorical sediment contribution maps using high-resolution imagery will help the partners identify where to best target their current management, planning, and restoration practices in the watershed.

Bryce Canyon Water Resources

Community Concern: Bryce Canyon National Park contains unique groundwater-dependent ecosystems (GDE), including aspen groves and fens. However, the National Park Service (NPS) has observed changes in temperature and precipitation, including pervasive drought conditions, that threaten the park's natural springs, seeps, and wetlands.

Partners:

- National Park Service, Bryce Canyon National Park

Earth Observations:

- Landsat 8 OLI/TIRS
- Landsat 9 OLI-2/TIRS-2
- Sentinel-2 MSI
- Sentinel-1 C-SAR
- SMAP
- GPM IMERG
- Terra MODIS
- SRTM
- PlanetScope


Image Credit: Rich Martello

Impact: The goal of this project is to map GDE's throughout the park in relation to climate variables including temperature and precipitation. The end products from this project aim to inform management decisions on the ground that monitor these critical ecosystems.

Maryland – Goddard

Arizona Water Resources II

Impact: Refined mortality maps will identify the extent of pinyon-juniper mortality across the landscape. An expanded assessment of mortality in relation to precipitation, soil moisture, elevation, and soil type have the potential to directly inform vegetation management, at Wupatki National Monument.

Partners:

- National Park Service, Flagstaff Area National Monuments

Earth Observations:

- Landsat 8 OLI/TIRS
- GPM IMERG
- SRTM
- Sentinel-2 MSI
- Terra MODIS
- Landsat 9 OLI-2/TIRS-2
- SMAP

Image Credit: Mark Szydlo

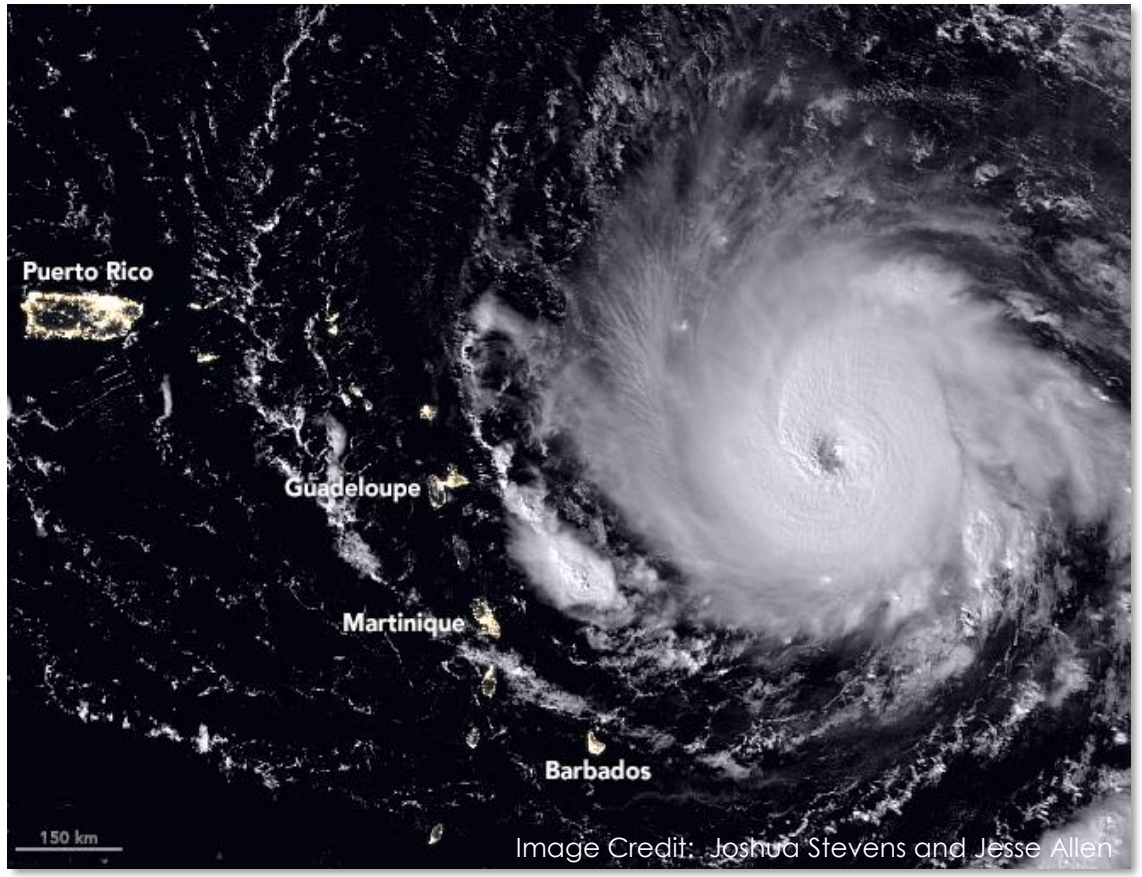
Community Concern: Prolonged drought conditions threaten Pinyon-juniper woodlands, known to support a diverse wildlife community. In 2021, the National Park Service observed dramatic tree mortality throughout Wupatki National Park.

Georgia Disasters

Community Concern: After 2017 Hurricane Irma, the state of Georgia received federal funding to aid in natural disaster recovery. Often, heirs property owners did not qualify for assistance due to fractured or tangled titles.

Partner:

- Georgia Heirs Property Law Center



Earth Observations:

- Landsat 8 OLI
- Landsat 7 ETM+
- Sentinel-2 MSI
- Sentinel-1 C-SAR
- PlanetScope
- GeoEye-1
- WorldView-4

Impact: The team will produce flood extent maps, identify structural damage, and overlay computer-assisted mass appraisal and socioeconomic data to determine Hurricane Irma's impact on potential heirs property owners. These end products will assist the Georgia Heirs Property Law Center's Disaster Mitigation Planning efforts by suggesting areas of outreach and presenting a case study to visualize the importance of their work.

Youngstown & Warren Disasters

Community Concern: Flooding is a major concern in both Youngstown and Warren, OH and partners are looking to better understand vulnerability and risk to support future mitigation strategies and zoning decisions.

Partners:

- City of Youngstown, Public Works Department
- City of Warren, Water Pollution Control Department
- Environmental Collaborative of Ohio

Earth Observations:

- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- GPM IMERG
- PlanetScope

Impact: The products and methodologies will support the cities in their actions to implement preventative flood mitigation measures.

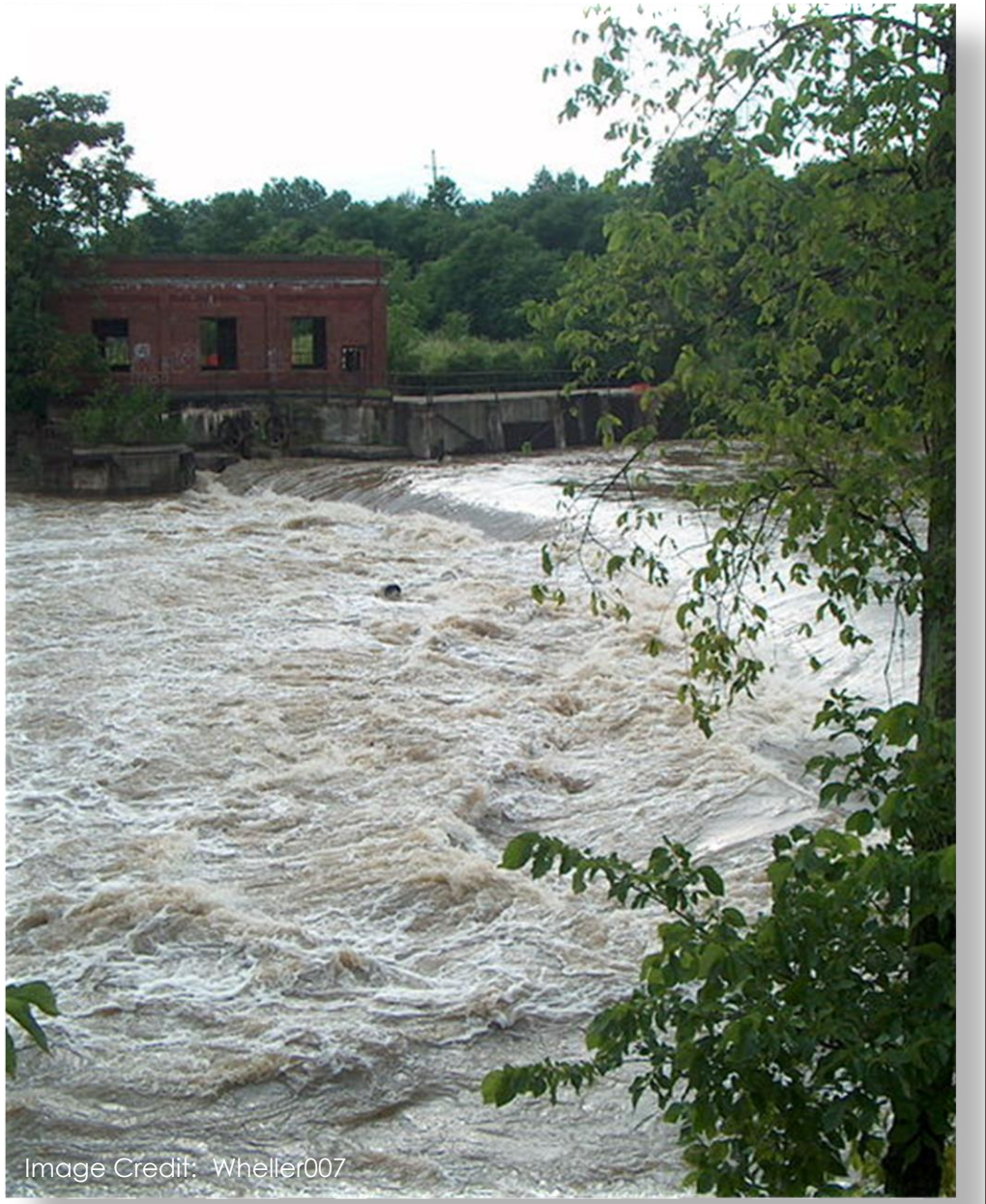


Image Credit: Wheller007

Virginia – Langley

Kansas City Disasters II


Image Credit: US Army Corps of Engineers

Impact: Groundwork NRG works on the ground to connect with communities and advocate for policy changes to alleviate environmental risks, such as flooding. Contextualizing local flooding impacts for Groundwork NRG will support their allocation of resources in impacted communities and advocation for policy change to address long-term impacts.

Community Concern: Kansas City, Kansas faces an increasing threat of urban flood events that disproportionately impact marginalized communities. The current drainage infrastructure is an outdated combined drainage infrastructure consists of an outdated combined sewer system that pose additional health hazards to the vulnerable populations.

Partners:

- Groundwork USA
- Groundwork Northeast Revitalization Group (NRG)

Earth Observations:

- GPM IMERG

Gatlinburg & Beatty Wildfires

Community Concern: Wildfire warning systems rely on indices such as fuel load and vegetation health to measure wildfire risk. However, soil moisture observations are not integrated as widely into wildfire-risk monitoring.


Image Credit: National Interagency Fire Center

Partners:

- Desert Research Institute, Western Regional Climate Center
- NOAA, National Integrated Drought Information System
- North Carolina State Climate Office
- Oklahoma State University

Earth Observations:

- Landsat 8 OLI
- SMAP

Impact: Analyses of fuel load, vegetation health, soil moisture, and comparisons among these indices will support partners' understanding of conditions leading up to the Gatlinburg and Bootleg Wildfires that occurred the Great Smoky Mountains and Beatty, OR in 2016 and 2021, respectively. These analyses can inform future fire and drought monitoring efforts.

Idaho Wildfires II

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.


Image Credit: USDA

Partners:

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

Earth Observations:

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

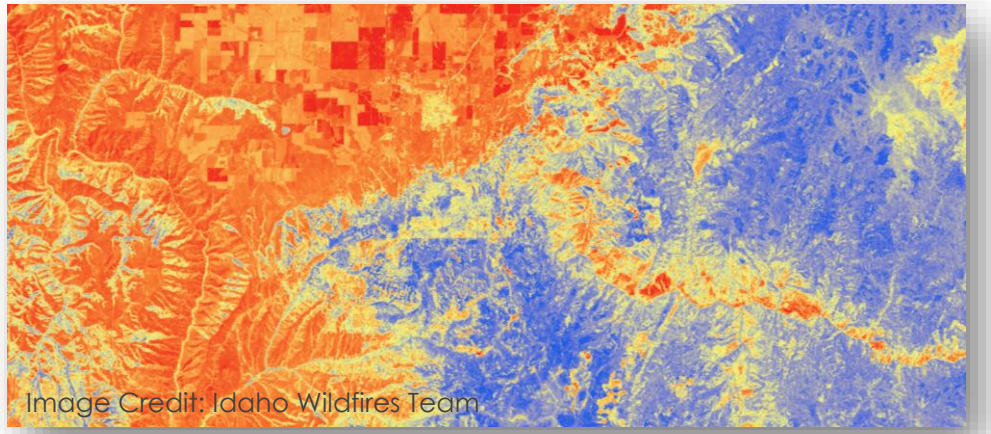


Image Credit: Idaho Wildfires Team

Impact: This project will further assess the relationship between remotely-derived drought indicators and fire risk in additional ecoregions. The team will create a guide for partners to replicate and customize the drought-enhanced fire risk model. Partners will use findings from this project to inform updates to Idaho's State Drought and Wildfire Hazard Mitigation Plans.

Idaho – Pocatello

Colorado Eastern Plains Agriculture

Community Concern: Conventional fencing has been used at Red Top Ranch to move cattle into different grazing areas. Moving physical fence lines is resource intensive and often leads to the overgrazing of pastureland. Overgrazing can lead to negative environmental impacts such as soil erosion and vegetation degradation. Partners have been working to promote biodiversity by experimenting with the use of virtual fencing.

Earth Observations:

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

Impact: Monthly productivity and bare ground maps will allow partners to identify the differences between pastures and ecological sites across the ranch. The summary of productivity trends by pasture and ecological sites will inform land managers on the effectiveness of conventional and virtual fencing for promoting biodiversity. These end products will ultimately inform grazing management plans.

Partners:

- The Nature Conservancy, Colorado
- Red Top Ranch

Colorado – Fort Collins

Yellowstone Ecological Forecasting II

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:

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

Earth Observations:

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

Impact: Aspen stand extent maps and timeseries 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

Georgia – Athens

Mesoamerica Ecological Forecasting

Community Concern: The Mesoamerican Biological Corridor (MBC) has managed 600 acres of protected lands since 1992, but recent deforestation efforts have intensified around those regions. Half of the natural habitats of Central America have been converted to agriculture or rural development, damaging the greater ecological health of the MBC.

Partners:

- Sistema de la Integración Centroamericana (SICA)
- SICA, Comité Regional de Recursos Hidráulicos (CRRH)

Earth Observations:

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

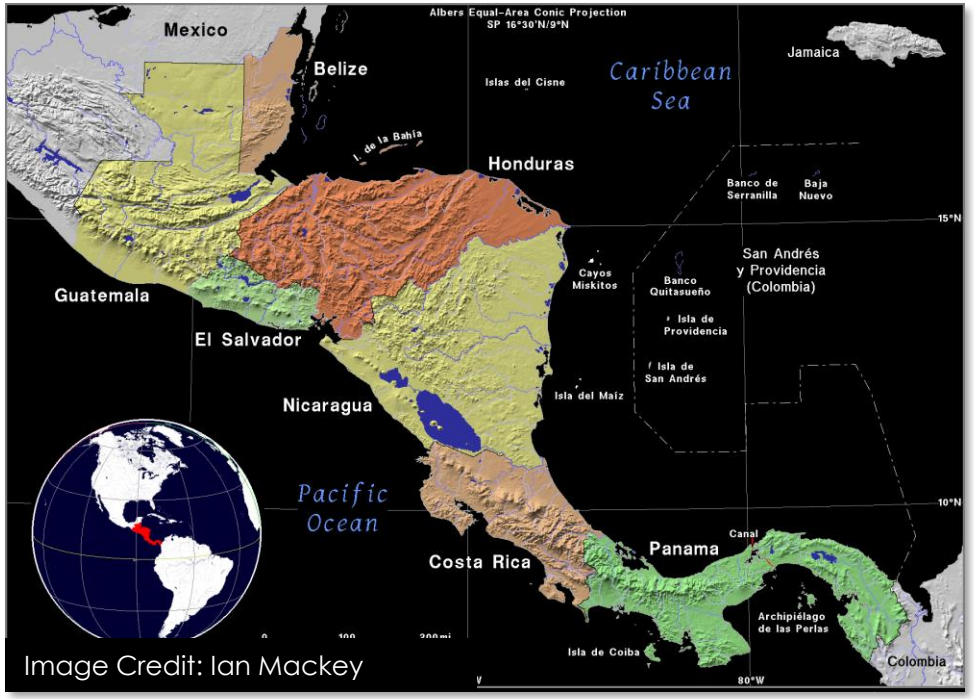


Image Credit: Ian Mackey

Impact: Land use land cover change maps, deforestation detection time series analysis charts, and habitat connectivity analysis maps will help the partners identify habitat corridor changes within MBC since 1992. Land use change scenario maps for 2030 will also help partners focus mitigation efforts to areas subject to potential deforestation.

Alabama – Marshall

Mesoamerica Urban Development

Community Concern: Central America is one of the fastest urbanizing regions in the world, but unplanned urbanization is driving multiple societal issues. Local agencies need to expand their capacity to plan for continued urban expansion to prevent future environmental risk and reduce socioeconomic vulnerability.


Image Credit: Brian Gratwicke

Partners:

- Sistema de la Integración Centroamericana (SICA)
- Secretariat of Central American Social Integration (SISCA)
- Deutsche Gesellschaft für Internationale Zusammenarbeit(GIZ)
- Centro de Coordinación para la Prevención de los Desastres en América Central y República Dominicana (CEPREDENAC)

Earth Observations:

- Landsat 7 ETM +
- Landsat 8 OLI
- Landsat 9 OLI-2
- Maxar WorldView-2
- Maxar WorldView-3
- PlanetScope

Impact: Urban extent maps and roof material type maps with help the partners identify growth and vulnerability of major urban areas in Guatemala City, Guatemala and Panama City, Panama. Maps of vulnerable settlements will help partners to identify areas of greatest concern for future decision making, and methodology tutorials will allow them to re-create this project in the future.

Alabama – Marshall

Carmel Valley Urban Development

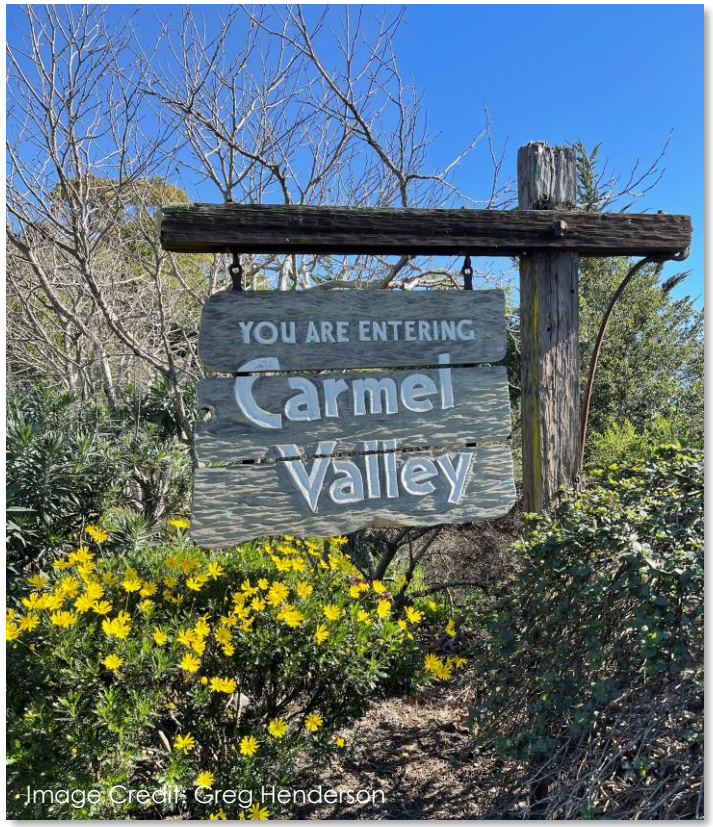


Image Credit: Greg Henderson

Community Concern: Carmel Valley, California has been impacted over the past 80 years by an increasing population. This small coastal community is interested in tracking the development within their community to manage urban development and sprawl.

Partner:

- Santa Lucia Conservancy

Earth Observations:

- Landsat 4/5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2

Impact: A time series of Carmel Valley and Santa Lucia forest cover will evaluate whether the Santa Lucia Conservancy's conservation model has reduced the rate of forest loss in comparison to other neighboring land use types. Land cover maps from the 1940s and 2021 will determine how habitat distribution and type has changed over time informing urban planning-based management decisions.

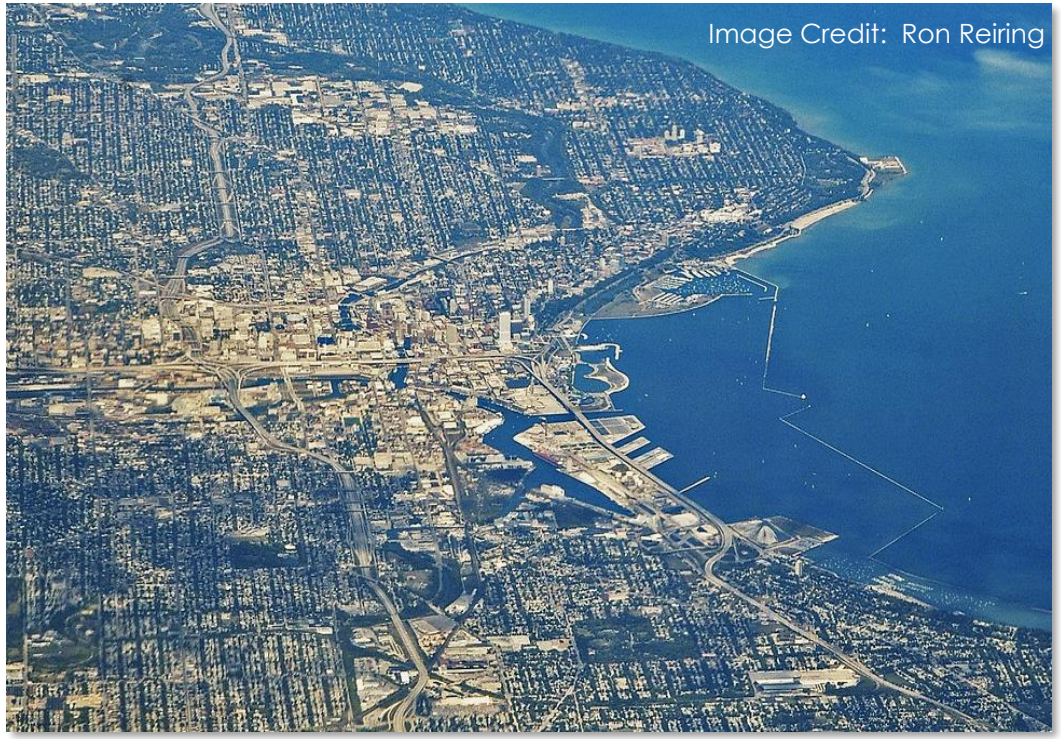
Milwaukee Urban Development II

Community Concern: In addition to disparities in flood vulnerability and impact, marginalized communities in Milwaukee, Wisconsin also experience heat disproportionately. Aging infrastructure, changing land use, and climate change are exacerbating conditions in one of the most segregated cities in the United States.

Partners:

- Groundwork Milwaukee
- Groundwork USA

Impact: With flooding and urban heat maps, partners will be able to assess these issues simultaneously and identify sites for future disaster intervention projects. Increased partner capacity from a tutorial and StoryMap will also assist in their creation of training materials for local community organizations.



Earth Observations:

- GPM IMERG
- Landsat 8 OLI/TIRS
- Landsat 9 OLI-2/TIRS-2
- ISS ECOSTRESS

Wichita Climate II


Image Credit: WeaponizingArchitecture

Community Concern: Urban heat island effect is increasing in Wichita, Kansas due to climate change and the loss of tree canopy cover. This heat is unevenly distributed, impacting already socially vulnerable populations the most.

Partners:

- City of Wichita

Earth Observations:

- Landsat 8 OLI/TIRS
- Landsat 9 OLI-2/TIRS-2
- ISS ECOSTRESS

Impact: Surface temperature and heat vulnerability maps will inform cooling interventions as the partner creates their Climate Adaptation and Mitigation Plan. Conversations with local groups will also support the engagement of citizens in these climate adaptation strategies.

Maldives Climate

Community Concern: The Republic of Maldives has experienced the severe impacts of climate change for decades. Sea level rise and shoreline erosion have already affected most of the country's islands

Partners:

- Maldives Ministry of Environment, Climate Change and Technology
- U.S. Department of State, Bureau of South and Central Asian Affairs, Office of Bangladesh, Nepal, Sri Lanka, Maldives, and Bhutan
- USAID, Maldives Office

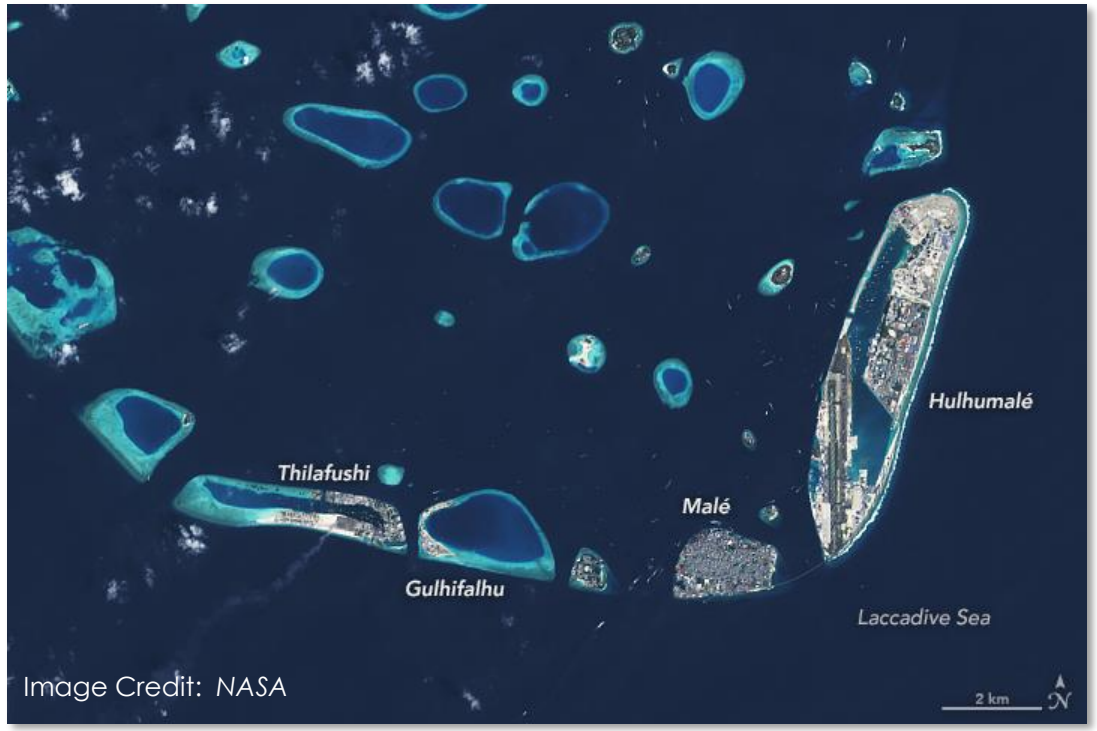


Image Credit: *NASA*

Earth Observations:

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI
- Aqua MODIS
- NICFI PlanetScope

Impact: The team will provide maps, data, and charts which will equip the partners with decision making for their adaptation and mitigation plans.

California – Ames

Southeast U.S. Climate

Community Concern: With the need to develop and implement climate mitigation strategies globally, the demand for estimating carbon emissions becomes increasingly apparent for decision-makers and end user organizations.

Partners:
- NASA SERVIR Science Coordination Office

Earth Observations:
- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- ISS GEDI
- ICESat-2 ATLAS


Image Credit: steve

Impact: Internal Google Earth Engine JavaScript API scripts and a detailed tutorial demonstrating the methods developed by the NASA SERVIR-CArbon Pilot (S-CAP) will benefit future DEVELOP teams in generating carbon emission estimates for their location of interest and identify best datasets available for use.

Gulf of Mexico Health & Air Quality II

Community Concern: A third of methane emissions come from oil & gas activity, but it is difficult to regularly monitor offshore activity at the spatial and temporal scale needed.

Partners:

- Bureau of Safety and Environmental Enforcement
- Bureau of Ocean Energy Management
- SkyTruth

Earth Observations:

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

Impact: Methane and carbon dioxide emission plume maps will build partners capacity to monitor greenhouse gas emissions from a top-down approach, validate ground-based emission inventories, and develop rules regarding methane emissions.