DEVELOP | 2021 FALL PREVIEW

WATER
RESOURCES

HEALTH &
AIR QUALITY

ECOLOGICAL
FORECASTING

URBAN
DEVELOPMENT

DISASTERS

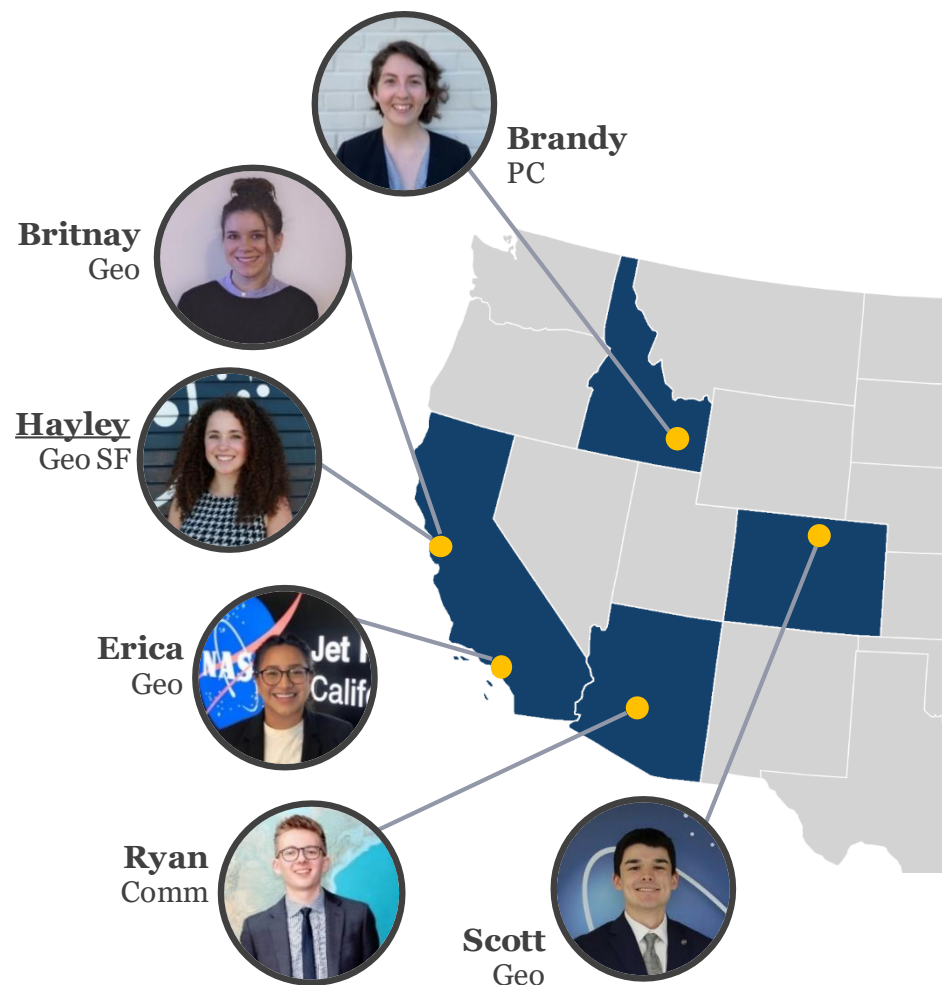AGRICULTURE

ENERGY

DEVELOP FELLOWS

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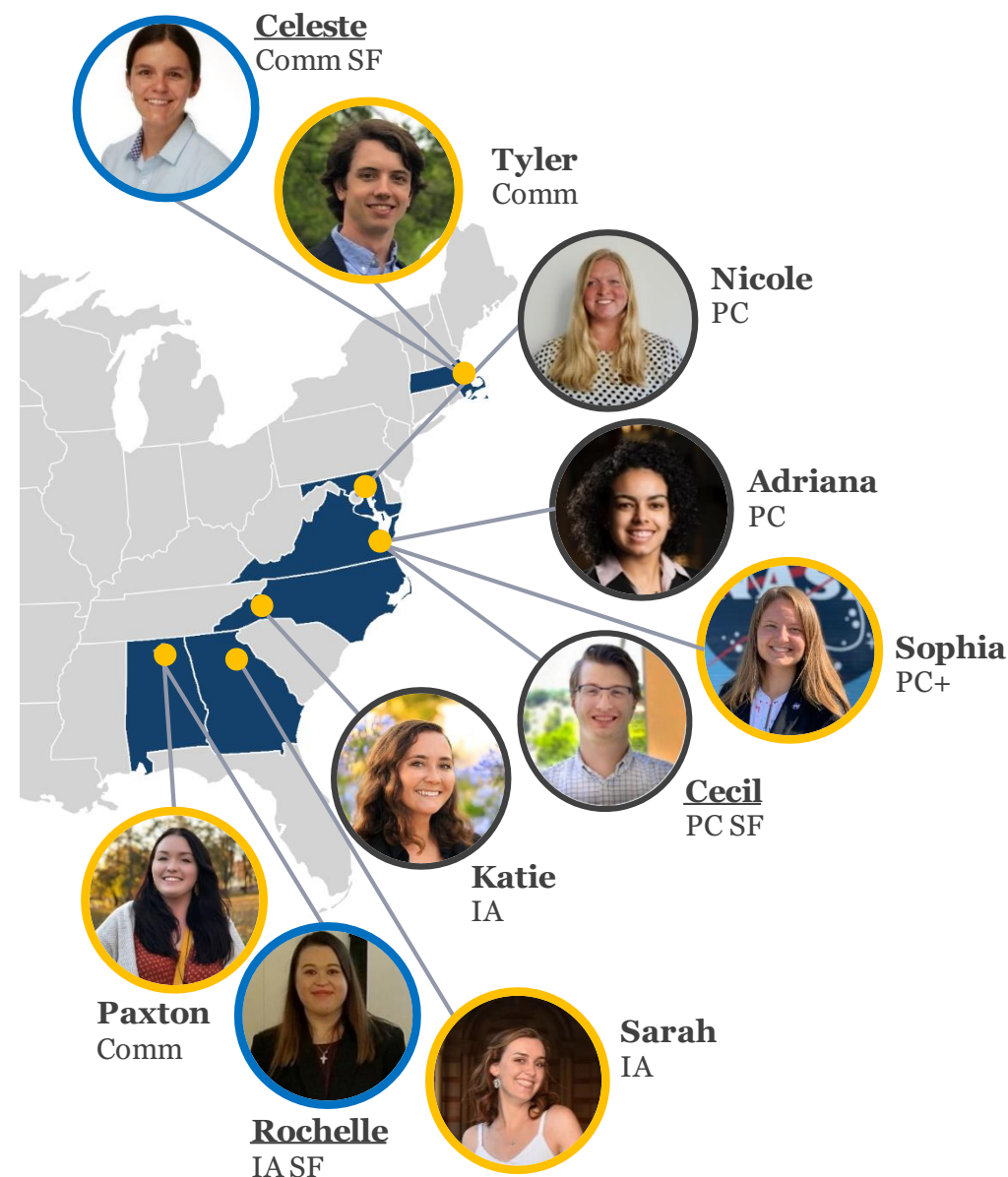- Nicole (GSFC)
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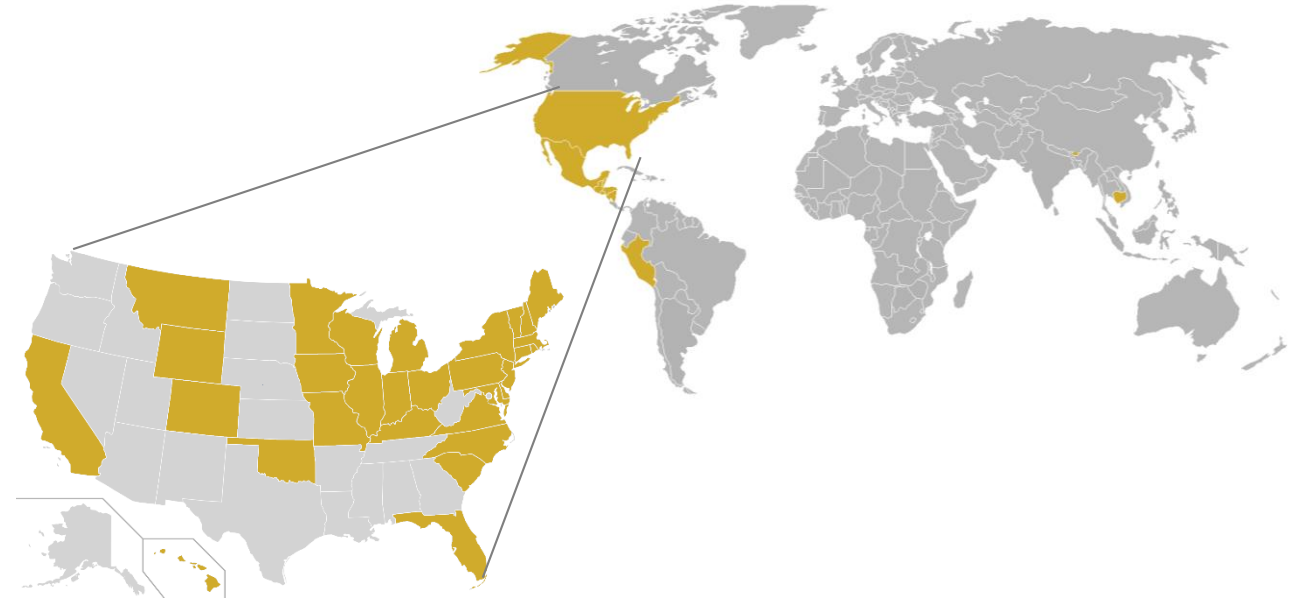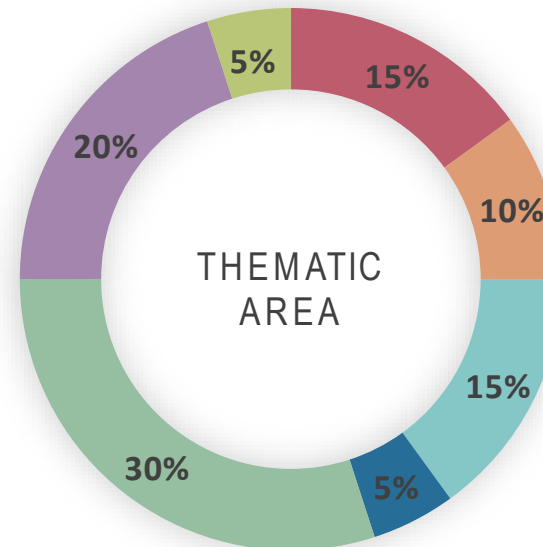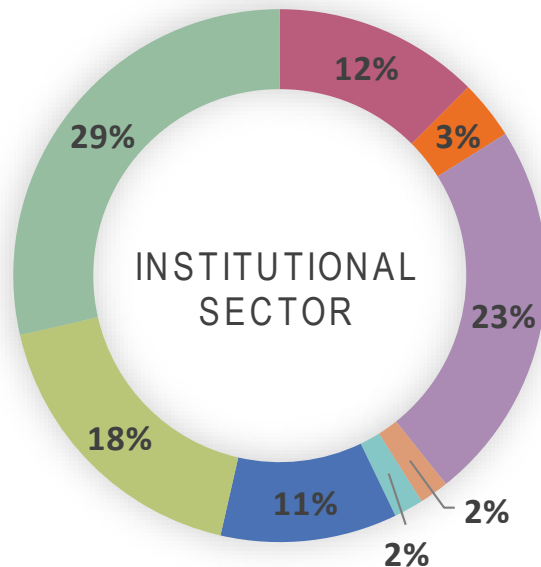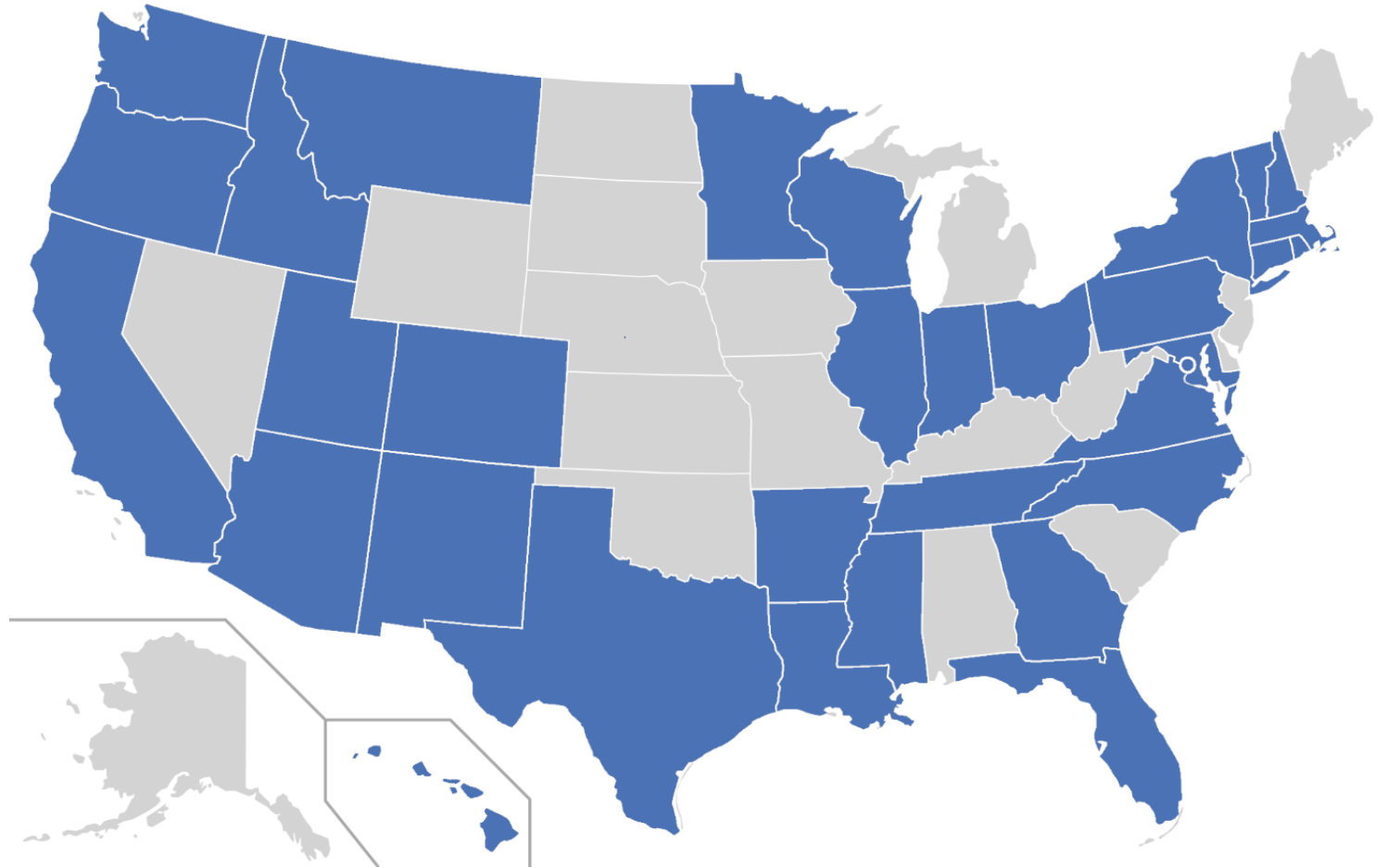
Maya Forest Water Resources II

Community Concern: Extreme weather events in relation to climate change are impacting wetland ecosystems, altering the frequency and levels of inundation which threaten water resource availability and land stability in these systems. These changes have negative impacts for surrounding community infrastructure and agriculture that rely on forested wetlands in the Maya Tri-National Forest.

Image Credit: Charlie Watson

Partners:
- Forest Department (Belize)
- Land Information Center (Belize)
- Center for Monitoring and Evaluation (Guatemala)
- El Colegio de la Frontera Sur (Mexico)
- UCSB MesoAmerican Research Center
- Boles Environmental Consulting
- SICA

Earth Observations:
- ICESat GLAS
- ICESat-2 ATLAS
- ISS GEDI
- ALOS PALSAR
- ALOS PALSAR-2

Impact: End users can use these products to identify areas prone to highly variable inundation, monitor forested wetland extent, and evaluate sustainable forest management activities and/or agricultural practices.

California – JPL

Midwest Water Resources

Community Concern: Understanding seasonal water variability is of vital importance to agriculturally intensive regions, affecting irrigation schedules and growing seasons. Evapotranspiration is a critical component of the seasonal hydrologic cycle, however sparse *in situ* measurements and short periods of record limit the historical perspective of this variable.

Image Credit: User 1778011 from Pixabay

Partners:
- USDA Midwest Climate Hub
- NOAA NIDIS, Midwest Drought Early Warning System
- Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division
- Michigan State University, Department of Geography, Environmental, and Spatial Sciences

Earth Observations:
- Terra MODIS
- GPM IMERG

Impact: Climatology maps and time series analyses of potential evapotranspiration, actual evapotranspiration, and precipitation will identify spatiotemporal shifts, trends, and anomalies in the seasonal water cycle and inform partner decisions regarding land management practices, water resource allocation, and drought mitigation strategies.

North Carolina – NCEI

Fire Island Water Resources

Community Concern: In recent years, Fire Island National Seashore in New York has experienced damaging amounts of coastal erosion, leading to the destruction of homes, rising groundwater, and risk to a globally rare, polymaritime forest. Beach nourishment efforts are crucial to protect high-risk areas, however in-person shoreline monitoring is expensive and time-consuming.

Image Credit: USFWS Photo/ G. Thompson

Partners:
- National Park Service, Fire Island National Seashore
- National Park Service, Ocean and Coastal Resources Branch, Water Resources Division, Northeast Region
- National Park Service, National Resource Stewardship and Science Directorate

Earth Observations:
- Landsat 8 OLI
- Sentinel-2 MSI
- Aqua MODIS

Impact: Maps of sediment dynamics, transport direction, and turbidity, as well as timeseries of sediment and turbidity patterns, will help partners understand nearshore movements and inform their future beach nourishment projects to better protect high-erosion areas.

Massachusetts – Boston

Hawai'i Island Disasters

Image Credit: NASA

Community Concern: Coastal communities on Hawai'i island are currently at risk due to sea-level rise as current projections indicate increases exceeding 1-2 m of rise by 2050. The County of Hawai'i is currently working on their Climate Adaptation Plan and have little island-specific data understanding coastal vulnerability and need direction on where to best allocate limited resources.

Partners:
- County of Hawai'i
- Arizona State University, Center for Global Discovery and Conservation Science
- University of Hawai'i - Hilo

Earth Observations:
- Sentinel-6 Michael Freilich Altimeter
- Landsat 8 OLI
- Sentinel-2 MSI
- Suomi NPP VIIRS

Impact: This project will provide partners island-specific datasets for sea-level rise and coastal vulnerability as the County of Hawai'i works on several initiatives including their Climate Adaptation Plan and development General Plan. End products from this project will help analyze current sea-level rise and understand future flooding and vulnerability to coastal development. Information from this project will allow the County to solicit additional funding towards adaptation and prioritize infrastructure and climate resiliency for coastal communities on the island.

Arizona – Tempe

Central America Disasters

Community Concern: Central America is often subject to extreme climatic events such as hurricanes and heavy rainfall leading to flooding-related disasters, including Hurricanes Eta and Iota in November 2020. This project will utilize NASA SERVIR's HYDRAFloods tool to aid local end users in monitoring surface water, preparing for flood event response, and inform potential risks.

Partners:
- Centro de Coordinación para la Prevención de los Desastres en América Central y República Dominicana
- Comité Regional de Recursos Hidráulicos
- Sistema de la Integración Centroamericana

Earth Observations:
- Landsat 7 ETM+
- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- Suomi NPP VIIRS
- MODIS
- SRTM

Image Credit: NASA GSFC

Impact: This project will aid partners in their efforts of monitoring, response to, and risk to inform on potential impacts of flooding taking place in the study region. The project will provide partners a way to visualize flooding in near real-time utilizing NASA Earth observations and the end products will provide partners with maps of surface inundation, an analysis of Hurricanes Eta and Iota, and a code tutorial to help with flood mitigation and decision-making processes.

St. Joseph Peninsula Disasters

Community Concern: St. Joseph Peninsula is vulnerable to future server storm events, and the state park is still recovering from October 2018's Hurricane Michael, which caused major damage to roads, utilities, facilities, and changes to land extent. The Florida Department of Environmental Protection wants to better understand changes to land cover and shoreline as they plan for future projects and possible infrastructure.

Earth Observations:
- Landsat 7 ETM +
- Landsat 8 OLI
- Sentinel-2 MSI
- Aqua MODIS
- Suomi NPP VIIRS

Partners:
- Florida Department of Environmental Protection

Image Credit: Mike Tilley

Impact: This project will aid the Florida Department of Environmental Protection on the St. Joseph Peninsula to better understand how land cover and shoreline have changed in recent years, analyze sediment transport around the entire cape, and provide a climatology timeseries. The project's end products will provide the partner with important analyses to help with future decision-making in the state park and for the cape.

Southern California Health & Air Quality

Community Concern: This past spring, data collected by Scripps Institution of Oceanography scientists reported the highest cell numbers of red tide algae (*Lingulodinium polyedra*) ever recorded in southern California, causing massive mortality of fish and invertebrates as well as widely reported respiratory distress in humans.

Image Credit: Kevin Baird

Partners:

- California Office of Environmental Health Hazard Assessment
- California Department of Public Health
- NOAA Southwest Fisheries Science Center
- University of California San Diego, Scripps Institution of Oceanography

Earth Observations:

- Landsat 8 OLI
- Aqua MODIS
- Sentinel-3 OLCI
- Suomi NPP VIIRS
- GCOM-C

Impact: This project aims to better understand the frequency, drivers, and remote detection of red tide blooms in California. Maps highlighting bloom areas and a seasonal water quality time series analysis via Google Earth Engine will further inform partners' decision-making practices related to *L. polyedra* management efforts.

California – Ames

Peru Health & Air Quality II

Community Concern: Communities bordering forests in rural Peru face hazards including elevated cases of malaria and dengue fever. Research institutions and conservation groups have assessed forest loss with an emphasis on threats to wildlife, but an integrated human-wildlife approach has yet to be taken.

Partners:
- Ministry of Health & Ministry of the Environment (Peru)
- Universidad Peruana Cayetano Heredia, Lab for EcoHealth and Urban Ecology
- Asociación para la Conservación de la Cuenca Amazónica
- Instituto del Bel Común
- The National Commission for Aerospace Research and Development (Peru)

Image Credit: CDC

Earth Observations:
- Landsat 5 TM
- Landsat 8 OLI
- SRTM
- PlanetScope
- PeruSAT

Impact: Partners will use maps of zoonotic disease outbreak and land use cover to understand the human health risks of deforestation by identify areas with high potential for zoonotic disease.

Georgia – Athens

Oklahoma Health & Air Quality

Community Concern: Oklahoma has recently seen a decline in air quality with the main contributors being ozone and fine particulate matter. There has been unexpected patterns with spikes in ozone in rural locations, where monitors are designed to capture background air quality, have even exceeded concentrations in Oklahoma's metropolitan areas.

Partners:
- Oklahoma Department of Environmental Quality, Air Quality Division

Image Credit: BrianKhoury

Earth Observations:
- Sentinel-5p TROPOMI
- Aura OMI
- Terra/Aqua MODIS

Impact: End-users can use the results to better understand this unexpected pattern in air quality, allowing them to identify and address contributors to emissions. Additionally, they can identify gaps in the ground monitoring network and implement regulations to improve air quality in Oklahoma.

California – JPL

Southeast Michigan Health & Air Quality

Community Concern: Asthma is the number one reason students miss class in southwest Detroit, and 5.5% of annual deaths in the Detroit area are due to exposure to PM 2.5. Southeast Michigan has historically been a heavily industrialized region and is currently an ozone non-attainment zone.

Partners:
- Michigan Department of Environment, Great Lakes, and Energy, Air Quality Division
- Lake Michigan Air Directors Consortium

Earth Observations:
- Sentinel-5P TROPOMI
- Aura OMI

Image Credit: United Nations Photo

Impact: This work will assist partners in identifying large emission sources as well as understanding the spatial distribution of atmospheric gases to inform potential control strategies for reaching ozone attainment.

Virginia – Langley

Bhutan Agriculture

Community Concern: Bhutan's national economy is primarily agrarian with approximately 80% of the population involved in agriculture, and rural areas especially relying on agriculture as an important source of income. Utilizing Earth observations to more effectively monitor agriculture and conduct land-use planning will allow for the Department of Agriculture to supplement field surveys and improve monitoring efficiency.

Image Credit: Gelay Jamtsho

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

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

Impact: This project will aid the Bhutan Department of Agriculture in its efforts to better understand crop distribution. The project will also enable future analysis of rice crops that would not have been possible without the utilization of NASA Earth observations, including the development of a crop mask and sampling protocol.

Tonlé Sap Agriculture III

Community Concern: Tonlé Sap, located in Cambodia's Lower Mekong Basin, is the largest freshwater lake in Southeast Asia and provides fisheries and freshwater to nearby agricultural communities. Increased pumping and shifts in global climate threaten the ecosystem's water quality and fish habitat.

Partners:
- Conservation International
- Ministry of Water Resources and Meteorology, Tonlé Sap Authority

Earth Observations:
- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Terra MODIS
- Aqua MODIS
- GRACE
- GPM IMERG

Impact: The third and final term of this project will provide partners with a comprehensive methodology to calculate the Freshwater Health Index using remote sensing data and allow partners to determine resource allocation in the basin.

Image Credit: Sebastian Pena Lambarri, Unsplash

Virginia – Langley

Maine Ecological Forecasting

Impact: Spatial and temporal assessment of temperature, precipitation, and land cover will provide a comprehensive understanding of how these factors have changed throughout critical salmon habitat over the past 30 years. Ultimately, this work will inform ongoing salmon recovery initiatives that aim to improve riverine habitat quality.

Partners:
- Department of Marine Resources
- Downeast Salmon Federation

Earth Observations:
- Aqua MODIS
- Terra MODIS
- Landsat 5 TM
- Landsat 8 OLI
- GPM IMERG

Community Concern: Shifting patterns in temperature and precipitation paired with changes in land use and land cover threaten the survival of Federally Endangered juvenile Atlantic salmon (*Salmo salar*) in Maine streams.
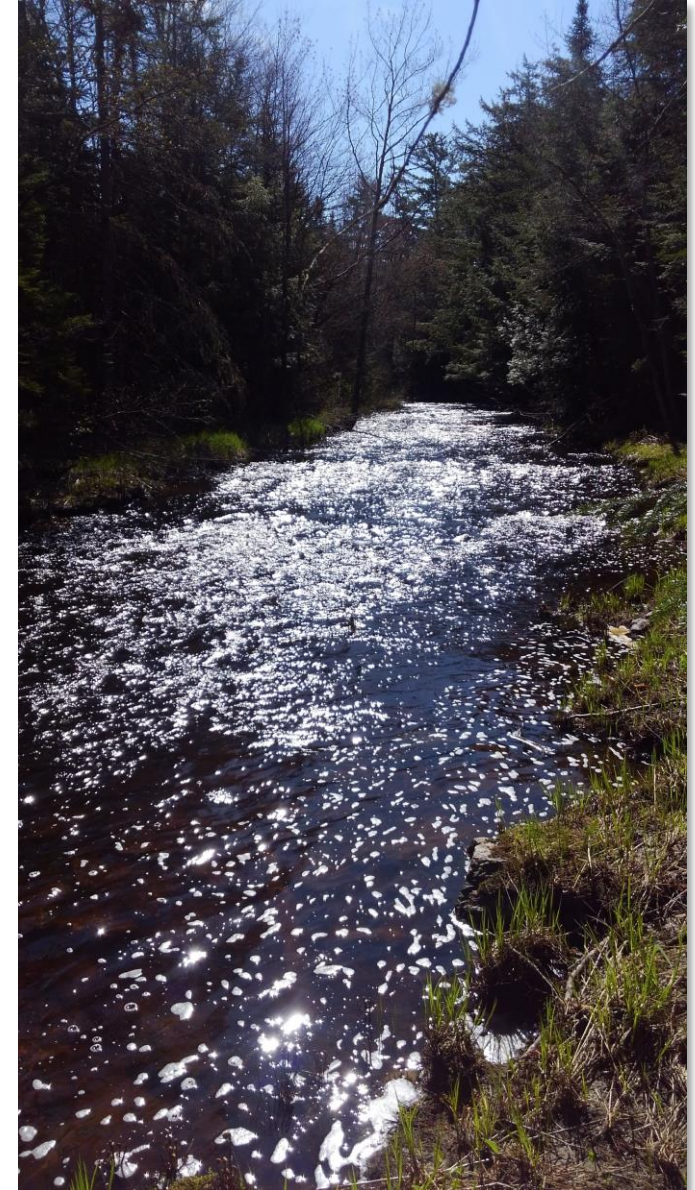

Image Credit: Nicole Ramberg-Pihl

Maryland – Goddard

Western Montana Ecological Forecasting II

Impact: Refined mink and otter habitat suitability models generated for an expanded study region along with site accessibility maps, will guide Working Dogs for Conservation in their efforts to collect contaminant samples from mustelid scat in Montana.

Partners:
- Working Dogs for Conservation
- Virginia Institute of Marine Science

Earth Observations:
- Landsat 8 OLI
- Terra MODIS
- GPM IMERG
- SRTM
- SMAP

Image Credits: Working Dogs for Conservation

Community Concern: Contaminants including flame retardants, pharmaceuticals, and heavy metals, are becoming increasingly prevalent in Western Montana's rivers. These contaminants easily travel up the food chain and threaten Montana's riverine ecosystems.

Maryland – Goddard

Carolina Coastal Plain Ecological Forecasting

Community Concern: The Venus flytrap *(Dionaea muscipula)* is endemic to a 90-mile range in North and South Carolina where its habitat is threatened by overharvesting, development, and fire suppression. More information is needed on how climate and land cover change could affect viable habitat for this vulnerable species.

Partners:
- North Carolina Botanical Garden
- University of North Carolina Herbarium
- North Carolina Natural Heritage Program

Earth Observations:
- Landsat 8 OLI
- Terra MODIS
- GPM IMERG
- SMAP L-Band Radiometer
- SRTM

Image Credit: USFWS Dale Suiter

Impact: The partners will be able to use Venus flytrap habitat suitability maps for more efficient data collection and more strategic conservation work. Furthermore, the partners will be able to assess future extent, informing discussions of reintroduction of the species and prioritization of persisting habitat.

Georgia - Athens

Grand Teton Ecological Forecasting

Community Concern: The survival of the ~125 high elevation wintering bighorn sheep in the Grand Teton Range is threatened by a combination of anthropogenic and climatic factors including increased winter disturbance and changing habitat and forage availability.

Image Credit: C. Adams, NPS

Partners:
- NPS, Grand Teton National Park
- Teton Range Bighorn Sheep Working Group

Earth Observations:
- Landsat 5 TM
- Landsat 8 OLI
- Terra/Aqua MODIS
- SRTM
- Sentinel-2 MSI

Impact: Historic and forecasted time series maps and analysis will help partners to understand climatic, vegetative, and habitat suitability trends impacting bighorn sheep summer and winter range. These results will also help inform future management strategies to ensure that bighorn continue to have suitable habitat in the range into the future.

Idaho – Pocatello

Northeast Ecological Forecasting

Community Concern: Invasive species continue to be an economic and ecological burden American in the Northeast and often outcompete native species and are cause for concern for their impact on forest biodiversity. Limiting the impact of these invaders could be greatly improved with accurate and reliable predictions of future spread.

Image Credit: National Park Service

Partners:
- National Park Service, Invasive Plant Management Team
- USGS, Fort Collins Science Center

Earth Observations:
- Landsat 8 OLI
- Sentinel-2 MSI
- SRTM

Impact: The team will evaluate effective US and global predictor variables to model invasive species risk. Results will inform partners on how to develop more efficient and accurate models of new invaders to the US.

Colorado – Fort Collins

Southern Wyoming Ecological Forecasting

Community Concern: The Mullen Fire burned nearly 180,000 acres and is raising concerns for issues such as impacts on water quality, vegetation recovery, and spread of invasive plants. Land managers need to know where recovery is happening, the magnitude of invasives species growth, and factors that impact recovery.

Partners:
- Medicine Bow-Routt National Forest
- Wyoming Game & Fish Department
- USGS, Fort Collins Science Center

Earth Observations:
- Landsat 8 OLI
- Sentinel-2 MSI
- SRTM

Impact: Maps of burn severity, species richness, native and invasive plant recovery, and an analysis of vegetation recovery patters, inform partners to recognize and understand recovery patters, and help them to rapidly detect and control invasive species.

Image Credit: Justin Hawkins, USFS

Colorado – Fort Collins

Washington DC & Maryland Energy

Community Concern: Washington DC has committed to reducing its greenhouse gas emissions by 50% by 2031 and 100% by 2050. Of the energy emissions in the District, 75% of those emissions come from the energy used to heat, cool, and power buildings.

Partners:
- Washington DC Department of Energy & Environment

Earth Observations:
- NASA POWER

Image Credit: Andra C Taylor Jr, Unsplash

Impact: This project will allow the end user to understand energy potential in areas where distributor feeder lines can reach new development of solar energy. This information can then inform the District's goal of reducing its greenhouse gas emissions.

Virginia – Langley

Yonkers Urban Development II

Community Concern: The urban heat island effect (UHI) in Yonkers, NY has contributed to excess heat in certain areas of the city and is expected to intensify with projected climate changes. The UHI contributes to heat-related illness and morbidity in response to hot-weather episodes and has been especially prominent in neighborhoods subjected to historical race-based housing segregation where little green infrastructure exists.

Credit: Groundwork HV

Partners:
- Groundwork Hudson Valley
- Groundwork USA

Earth Observations:
- Landsat 8 OLI
- Landsat 8 TIRS
- ISS ECOSTRESS

Impact: Utilizing NASA Earth observations and building on prior terms, end products from this project will be used to better understand the cooling capacity and thermal comfort that specific green infrastructure implementations can provide in identified vulnerable neighborhoods experiencing environmental inequities. This will allow end users to determine which infrastructure will be the most effective for mitigating UHI.

Arizona – Tempe