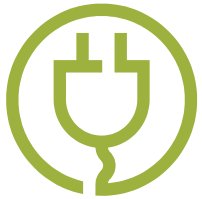
DEVELOP

2020 Fall Preview

Health & Air Quality

Urban Development

Ecological Forecasting



Energy

Water Resources

Food Security & Agriculture

Disasters

Transportation & Infrastructure

2020 Fall Virtual DEVELOP Term

September 14th – November 20th

- New node leadership – 2 Senior Fellows & 5 Fellows
- Participants working virtually from 20 states + Washington, DC
- Program-wide Software Carpentry workshop
  - *Topics*: Unix Shell, Git, Programming in Python & R
- Remote access to a cloud computing environment for data processing

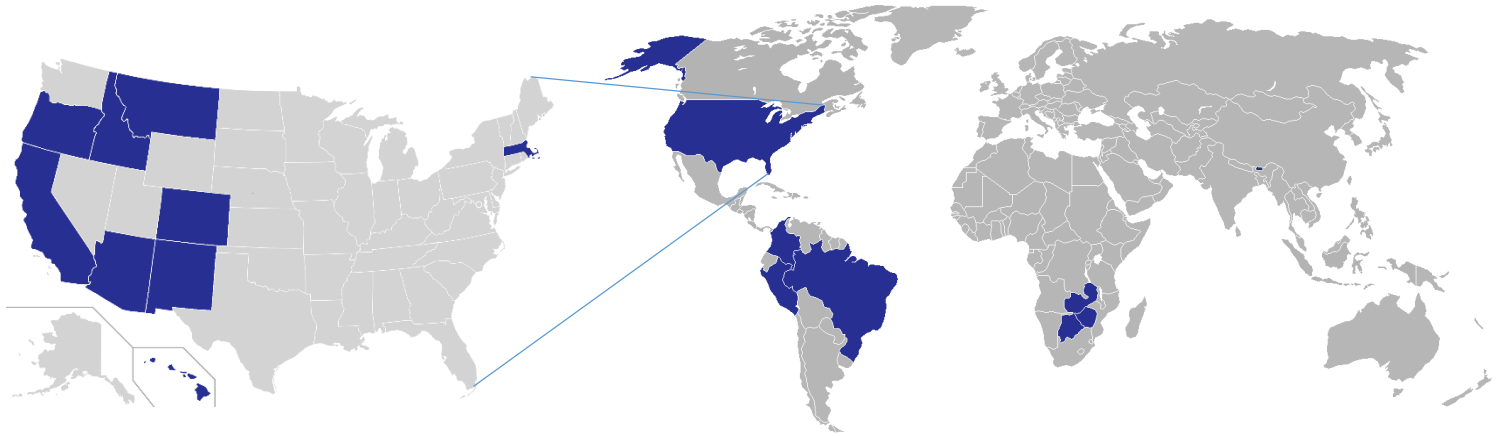
2020 Fall Portfolio

3rd Term (1)
2nd Term (2)
1ST Term (9)

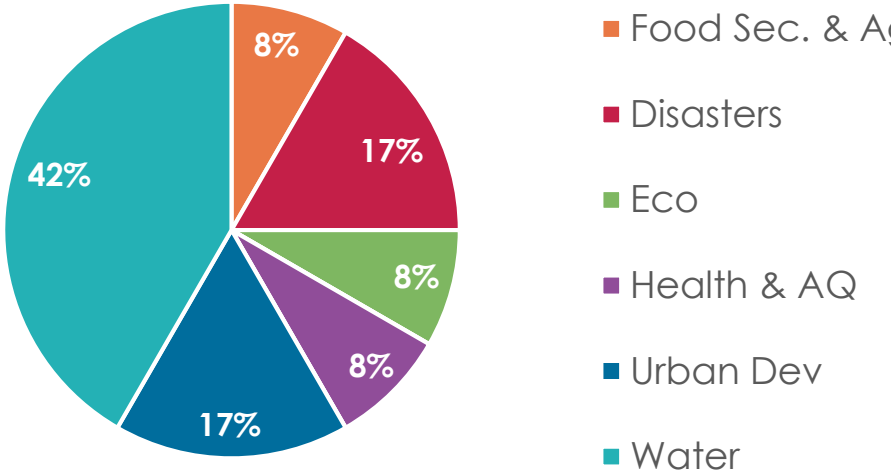
49 Participants
12 Projects

83% Domestic
17% International

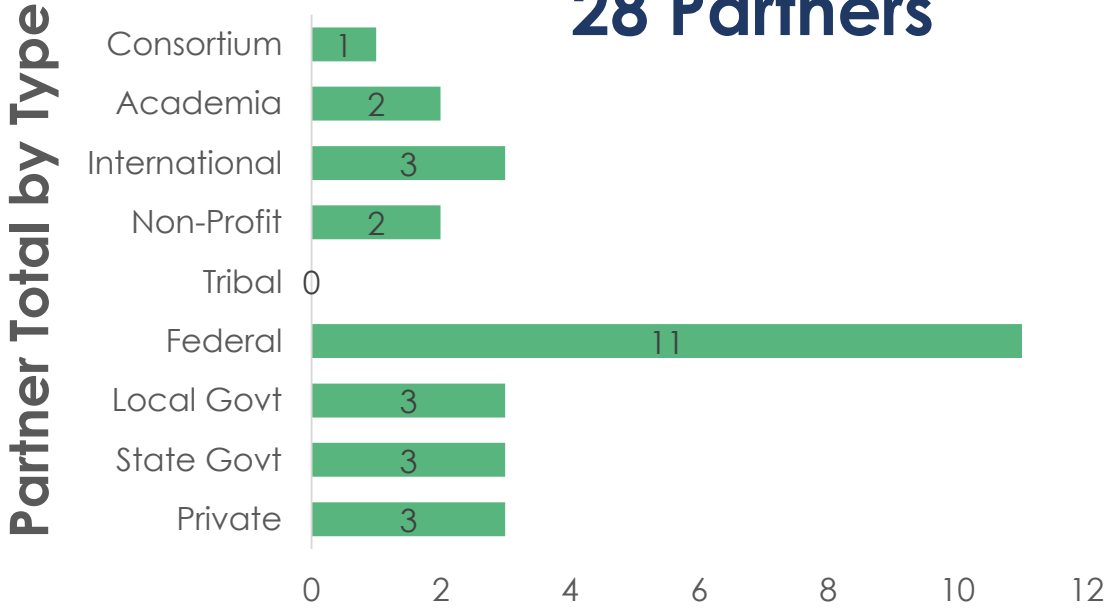
9 States & 7 Countries Impacted



Application Areas Addressed



28 Partners



*Impacts and partners are tentative

Southern Idaho Health & Air Quality

Idaho - Pocatello

Community Concern: Wildfires have increased in frequency across the US since 1950. Fires across the United States cause not only damage to landscapes and infrastructure but can also have long-term effects on human health due to smoke and ash spreading for potentially thousands of miles from a fire source. The National Weather Service (NWS) attempts to monitor these smoke and ash plumes mixing heights in the atmosphere and predict where they might travel. Past fires are used as an analog for predicting smoke expulsion from future fires. Better understanding and validation of aerosol mixing, and travel patterns will allow project partners to better allocate resource to manage public notices and air quality warnings.

Partners:

- NOAA, National Weather Service
- National Park Service, Fire Management Program Center
- Bureau of Land Management, National Interagency Fire Center

Earth Observations:

- CALIPSO, CALIOP
- Terra MODIS
- Aqua MODIS
- Suomi NPP VIIRS

Impact & Benefit: The partner organizations will be able to use the products created by the DEVELOP team to better allocate resources to deal with air quality warnings due to smoke and be better prepared to give go or no-go calls to areas with high human density due to air quality. These products will give the partners strong validation for their current models of smoke prediction and allow them to better allocate resources in the future.

Sacramento Urban Development

Virginia – Langley

Community Concern: Sacramento is California's fastest-growing large city in terms of population. The City wants to ensure that this growth is sustainable, equitable, and inclusive. The city also hopes to better adapt to the **urban heat island effect**. Some crucial steps include strategically prioritizing the implementation of green infrastructure, particularly in neighborhoods with a high proportion of **vulnerable populations** susceptible to heat-related illness or death.

Earth Observations:

- Landsat 8 TIRS
- ISS ECOSTRESS
- Suomi-NPP VIIRS

Partners:

- City of Sacramento
- Dyett & Bhatia

Impact & Benefit: A spatial analysis of **temperature disparities** during peak summer months will help the planning team at Dyett & Bhatia understand the implications of these interventions and **prioritize areas** of the city that are home to a high proportion of vulnerable populations or are most likely to experience rapid growth.

Tempe Urban Development II

Tempe – Arizona

Community Concern: Urban heat is a huge issue for Tempe, Arizona, with hundreds of heat deaths and thousands of heat-related hospitalizations reported in the last fifteen years. Municipalities around the city have competing interests and infrastructure priorities, which has made heat mitigation efforts challenging. The City is hoping to compile a heat intervention prioritization map using both micro-scale and macro-scale observations of factors that impact experienced heat.

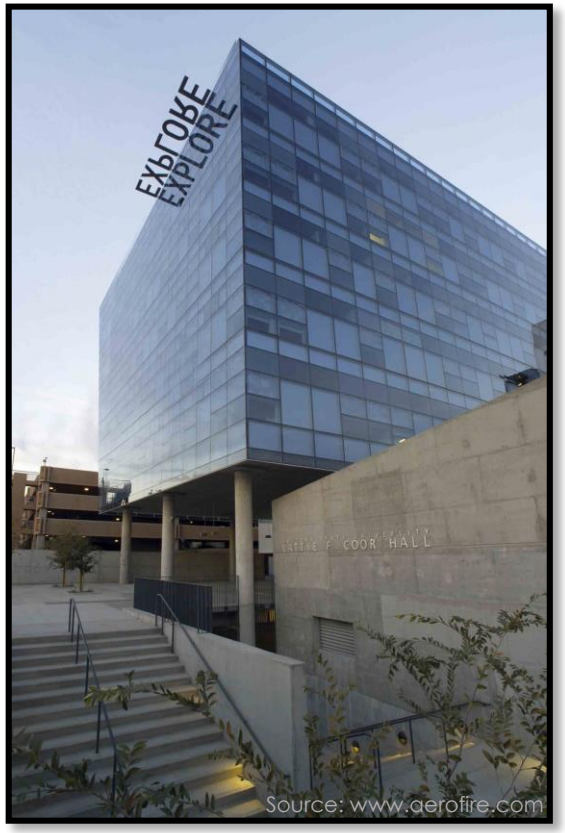
Source: Noun Project

Earth Observations:

- Landsat 8 OLI/TIRS
- Aqua MODIS
- Terra MODIS
- Terra ASTER
- Sentinel-2 MSI

Partners:

- City of Tempe
- Arizona State University, Urban Climate Research Center



Source: www.aerofire.com

Impact & Benefit: This work will give Tempe's heat mitigation goals a direction, allowing them to target their first efforts in the quantifiably hottest parts of the City. The Earth observation measurements and LiDAR-based shading analysis will expand their knowledge of experienced heat from their current discrete ground-based measurements. By simplifying the factors that contribute to urban heat into a four-tiered system of heat exposure severity, they will be able to more easily communicate prioritization needs across city departments.

California & Oregon Ecological Forecasting

Colorado – Fort Collins

Community Concern: Coast redwood, the tallest tree species in the world, is currently distributed along a narrow strip of coastline stretching from Curry County, Oregon to Monterey County, California. While **only a fraction of the species old-growth forests remain**, second- and third-growth forests are actively being conserved and restored, and **new conservation opportunities** remain to be actively sought. Recent research has pointed towards the **potential for expanding climatic suitability of coast redwood** at its northern range margin, but species-specific predictors of environmental suitability, such as the current and future distribution of fog, an important source of moisture and nutrients, and magnitude and extent of recent disturbances, are **not currently available** or included in these analyses and projections.

Impact & Benefit: This project will increase understanding of the **potential for a northern range expansion of coast redwood (Sequoia sempervirens)** under climate change. Project partners have requested habitat suitability projections to **prioritize their conservation work**, which includes property acquisition, restoration work, and research to protect and restore redwood forests. This work can **inform where conservation and restoration activities and resources** should be targeted.

Partners:

- Save the Redwoods League

Earth Observations:

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- GOES R

Central Valley Water Resources II

California – JPL

Community Concern: California's Central Valley has been acutely affected by widespread droughts, causing **groundwater depletion and land subsidence**. These factors endanger local communities and the country as a whole, as the Central Valley is one of the nation's **most productive agricultural areas**.

Earth Observations:

- GRACE
- GRACE-FO
- Sentinel-1 C-SAR
- ALOS-2 PALSAR-2

Partners:

- California Department of Water Resources (CA DWR)
- California State University, Los Angeles

Impact & Benefit: This project will enable the CA DWR to build an extensive water storage change dataset in the Central Valley, particularly helpful in rural areas without *in situ* data. The DWR will also use the results to verify Groundwater Sustainability Agencies' sustainability claims.

Image Credit: areadevelopment.com

Image Credit: USGS

Charles River Basin Water Resources

Massachusetts – Boston

Partners:

- Town of Natick, Office of Sustainability
- Massachusetts Audubon Society
- Charles River Watershed Association

Community Concern: When surveyed, town representatives in Massachusetts cited flooding as one of their greatest environmental concerns. Recent flooding has been attributed to increased development, impervious surfaces, and extreme weather events. Many local governments and organizations are interested in assessing their area's vulnerability to flooding and impact of increasing impervious surfaces on local water quality.

Earth Observations:

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

Impact & Benefit: Partners will use supplied water quality maps, as well as flooding vulnerability, susceptibility, and frequency maps to identify areas in need of increased resiliency efforts. Results will be used to inform ongoing flood risk modeling, as remote sensing has previously not been incorporated. Partners plan to share the results with neighboring governments and groups to help create a watershed-wide plan for how Charles River Watershed communities will prepare for future flood events.

Hawai'i Water Resources

California – Ames

Community Concern:
Papahānaumokuākea Marine National Monument has experienced the arrival and development of a previously undescribed algal species, *Chondria tumulosa*, which has begun to kill vast extensions of coral reefs. Based on the rapid rate of spreading, local managers predict the invasion of other atolls within the Monument and potential invasion of the main Hawai'ian Islands' reefs within the next year.

Impact & Benefit: End products will assist in understanding past environmental patterns that may be related to algal growth as well as assess ocean conditions to detect potential phase shifts in the Monument's atolls, and therefore inform coral conservation efforts.

Earth Observations:

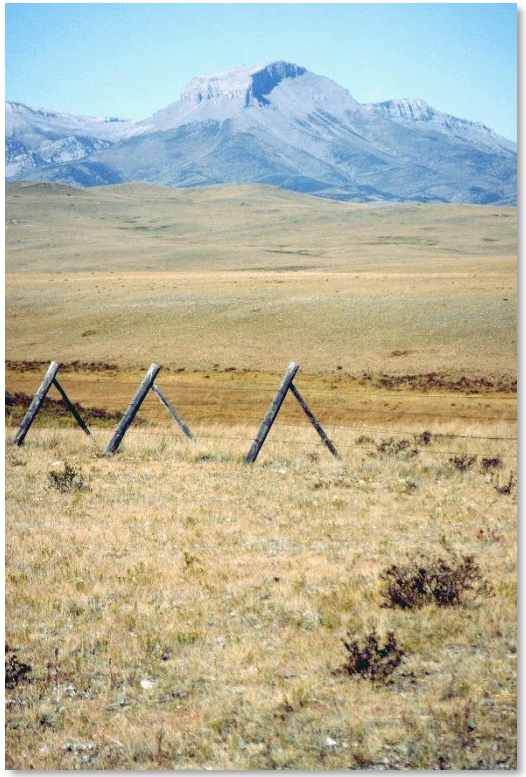
- Landsat 8 OLI
- Sentinel-2 MSI
- Aqua MODIS
- Terra MODIS

Partners:

- US Fish and Wildlife Service, Marine National Monuments of the Pacific
- National Oceanic and Atmospheric Administration
- National Marine Sanctuaries

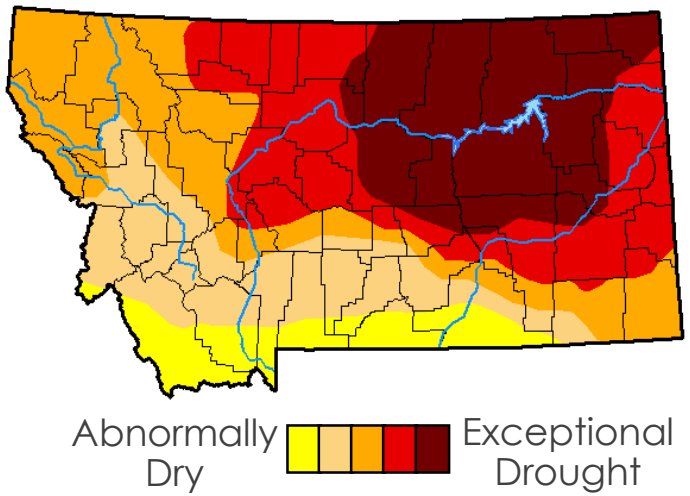
Montana Water Resources

North Carolina – NCEI



Community Concern: Montana and the U.S. Northern Plains experience cycles of moisture surplus and deficit. For example, 2017 summer drought conditions were driven by unpredicted and record low spring rainfall coupled with rapid soil moisture decline, resulting in wide-spread wildfires and an estimated $2.6 billion in agricultural losses.

U.S. Drought Monitor – 12 Sept 2017



Earth Observations:

- SMAP
- Terra MODIS
- GRACE-FO

Partners:

- Montana Climate Office
- NOAA Regional Climate Services, Central Region
- NOAA National Weather Service, Missouri River Forecast Center

Impact & Benefit: A Composite Moisture Index focused on October-March can provide context of antecedent conditions and relative moisture availability at the start of growing season. Anomalies of soil moisture, groundwater, & land surface temperature, as well as snow melt potential, can show a convergence of evidence of drought indicators.

Gila Water Resources III

Maryland – Goddard

Image credit: Gila National Forest

Impact & Benefit: This project will help inform the partner's selection of fire recovery treatments and ensure that their budget is used efficiently to maximize recovery rates.

Community Concern: Recent wildfires in New Mexico's Gila National Forest have significantly affected the landscape and stream dynamics in the forest. For the USFS Gila NF team, how to spend fire resources is constantly in question. While the restoration team uses several methods for restoring vegetation post-fire, the comparative success of these methods is unknown. The partners could benefit from a tool which allows them to understand likelihood of vegetation regrowth for each post-fire restoration technique they use.

Partners:

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

Earth Observations:

- SMAP
- Suomi NPP VIIRS
- Landsat 8 OLI
- Landsat 8 TIRS
- Terra MODIS
- GPM IMERG
- SRTM

Africa Food Security & Agriculture

Georgia – Athens

Community Concern: This project studies human-elephant conflict within the African Kavango-Zambezi Transfrontier Conservation Area where drought increasingly brings free-ranging elephants from national parks to developed areas. In these areas, they threaten residents, damage property, eat refuse from landfills and raid the crops of subsistence farmers

Impact & Benefit: Products analyzing urban/agricultural expansion, habitat condition, and crop health during drought will assist partners with protecting elephant corridors, making recommendations to local decision makers and fostering coexistence between agricultural lands, land owners, and elephants.

Earth Observations:

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

Partners:

- Ecoexist Project
- Connected Conservation, South Africa Office

Amazonia Disasters

Alabama – Marshall

Community Concern: Artisanal and small-scale gold mining (ASGM) are responsible for a large fraction of forest loss and disturbance in the Amazon. Compared to other deforestation drivers such as cattle ranching, agriculture, and selective logging, ASGM leads to loss of ecosystem services, removal of fine sediments, and decrease of water quality. Additionally, the use of liquid mercury for gold amalgamation not only causes severe impacts on the altered landscapes, but also negatively affects human health, and incurs social costs. With a better understanding of the change detection methods that will assist current monitoring systems, more timely and accurate decisions can be made in order to temper illegal gold mining activities in the Amazon region.

Impact & Benefit: This project will allow for the selection of an algorithm in GEE to help the partners in generating an early alert system with the best confidence in order to detect gold mining activity over the study region. And the results of this project can be used to monitor multiple other regions within Amazonia as well.

Partners:

- Asociación Para La Conservación De La Cunca (ACCA)
- NASA SERVIR Science Coordination Office
- Spatial Informatics Group

Earth Observations:

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

Southern Colorado Disasters

Colorado – Fort Collins

Community Concern: The western United States is facing a future with more **frequent** and **severe** wildfire. Communities are concerned about the impacts this will have on forests and the associated services they provide for water quality, wildlife, recreation, carbon storage, and economies. Aspen is a species of particular interest to communities and managers. Aspen resprouts following **disturbance** and can be one of the **first species to recover after fire**. The quick re-establishment of aspen can help **stabilize watersheds** and serves as important wildlife habitat.

Partners:

- Trinchera Ranch
- Colorado State Forest Service

Impact & Benefit: provide valuable data to project partners to **characterize post-fire forest recovery**, the impacts of the Spring Fire on aspen distribution, and potential drivers of these changes. The products will provide comprehensive maps **across this difficult to access terrain** and will harness the temporal power of remote sensing to identify where aspen was distributed before the fire. This will help **end users evaluate the impact of their forest management before and after the fire** to promote aspen growth, one of their primary management objectives.

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- SRTM