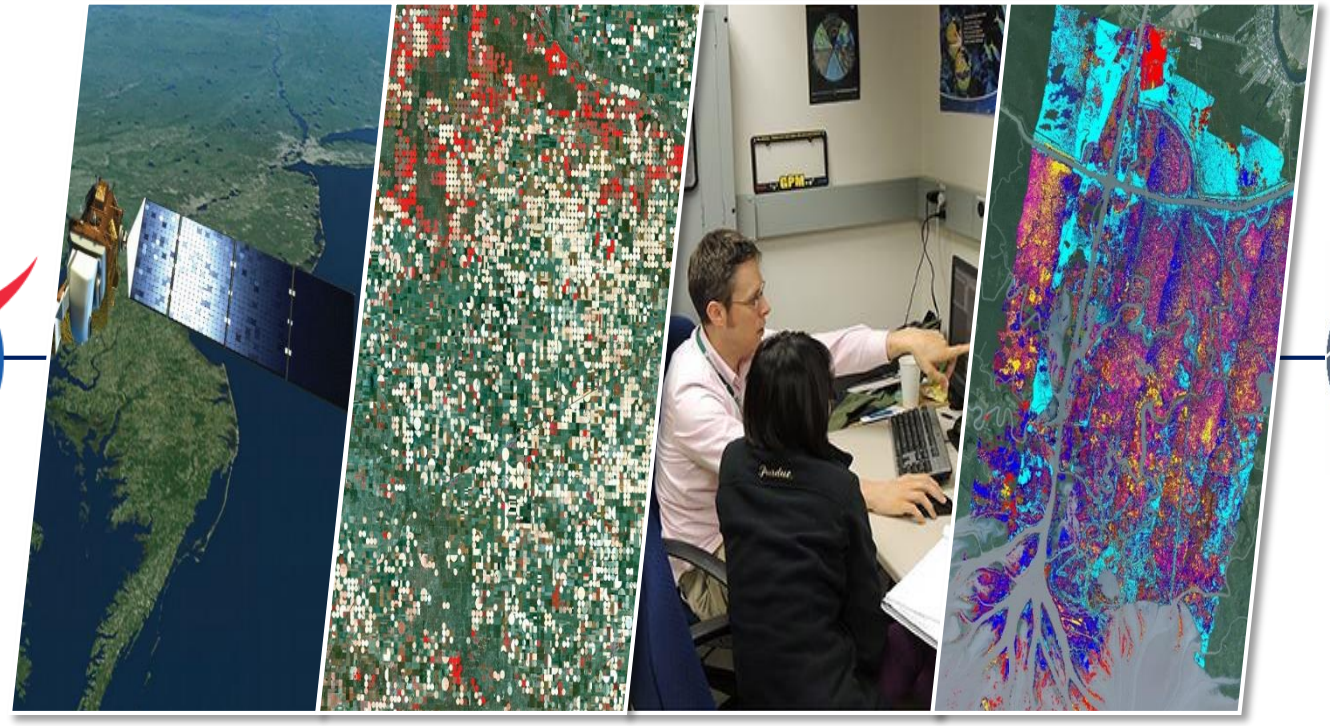
DEVELOP NATIONAL PROGRAM

INNOVATION • COLLABORATION • PASSION • DISCOVERY



Summer 2016 Term Preview

1 June 2016

Summer 2016

By The Numbers

Nodes

Projects

- **Campaigns & Strategic Partnerships**
  - National Park Service
  - UN's Sustainable Development Goals
  - Embassy of Costa Rica

- **Project Portfolio by App Area**
  - Agriculture
  - Climate
  - Disasters
  - Ecological Forecasting
  - Health & Air Quality
  - Water Resources
  - Oceans
  - Cross-Cutting

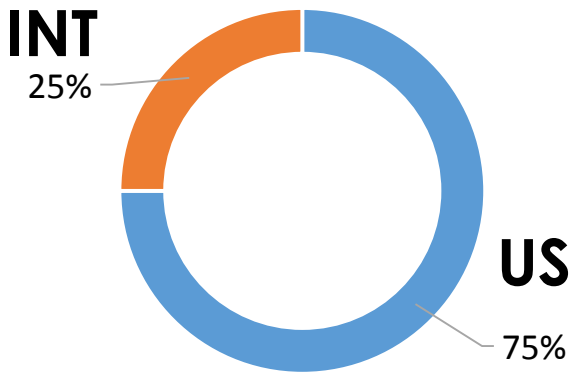
Useful Dates to Remember

By The Numbers

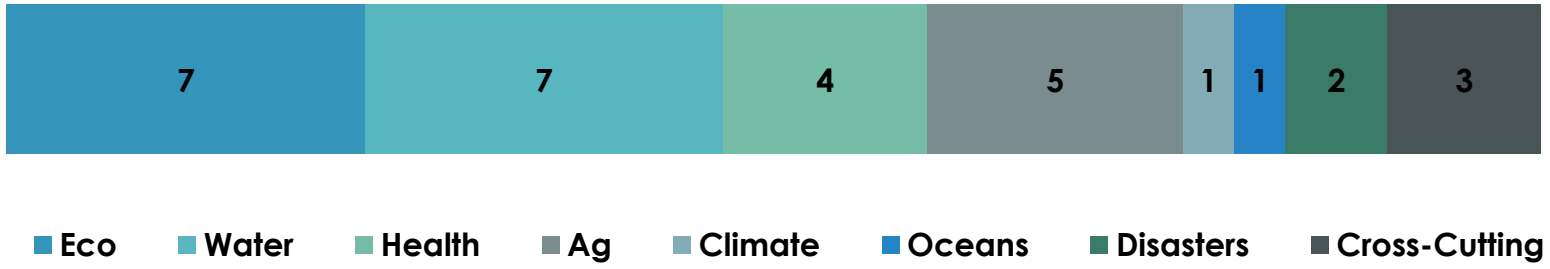
PROJECTS

PARTICIPANTS

PARTNERS



Project Metrics:



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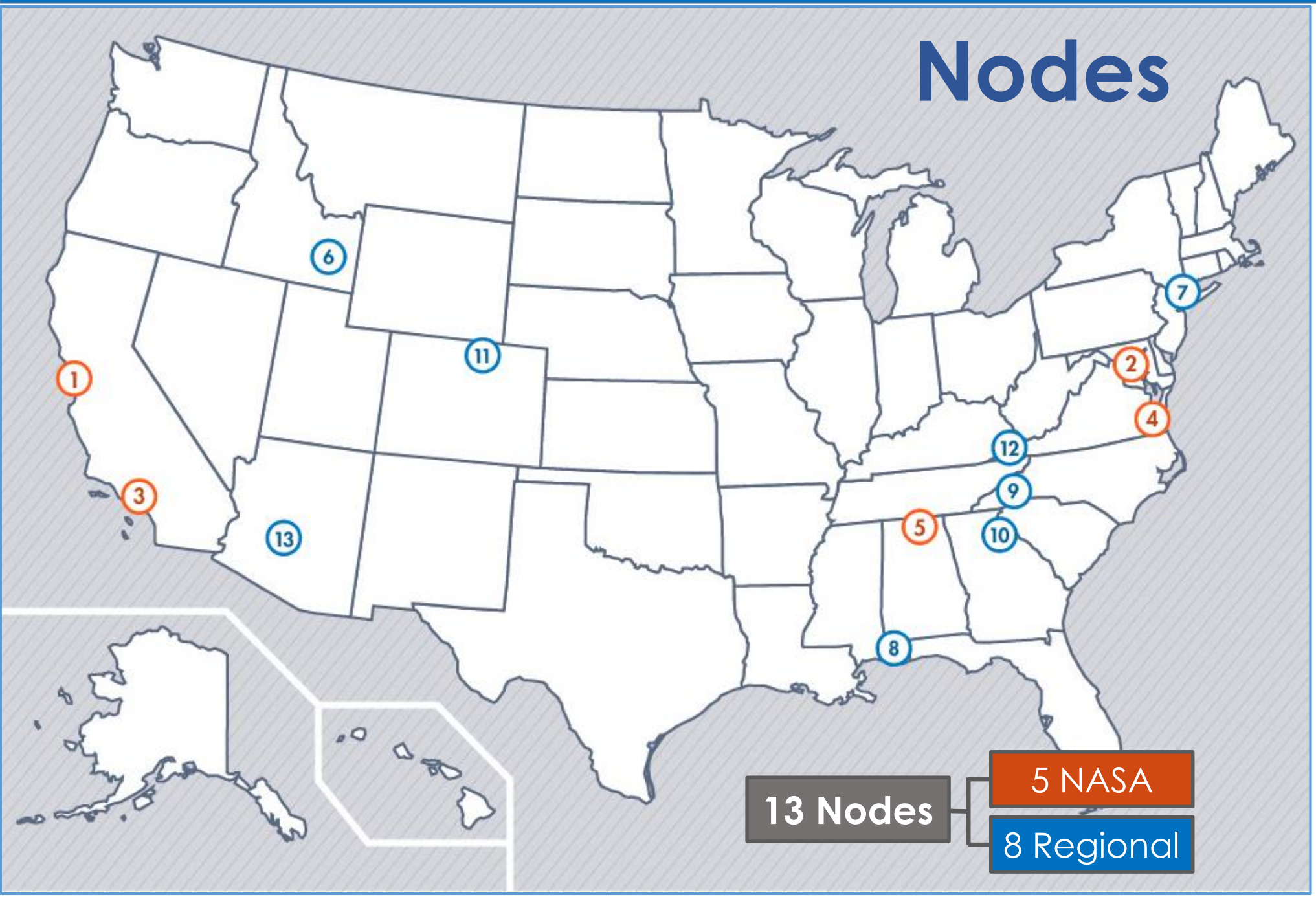


NASA Nodes

1. Ames
2. Goddard
3. JPL
4. Langley
5. Marshall

Regional Nodes

6. Idaho
7. IRI
8. Mobile
9. NCEI
10. UGA
11. Fort Collins
12. Wise
13. Arizona

Campaigns

2016

National Park Service™

CENTENNIAL

Rocky Mountain Agriculture

Community Concern: Rocky Mountain Conifer Forests have experienced extremely high levels of forest disturbances in recent decades. In an effort to increase forest stand resilience, managers are conducting extensive treatment activities, but their effectiveness in preventing fire and beetle kill on the landscape level is largely unknown.

Partners:

- National Park Service, Rocky Mountain National Park
- Colorado Forest Restoration Institute
- Bioenergy Alliance Network of The Rockies

Earth Observations:

- Landsat 4/5 TM
- Landsat 7 ETM
- Landsat 8 OLI/TIRS
- Space Shuttle SRTM

Impact & Benefit: This project will provide a new avenue for the organizations to analyze the effectiveness of historical forest management treatments on forest health and to make recommendations on how forested landscapes should be managed in the future. Additionally, knowledge of where past fuels reduction treatments occurred can inform where future treatments should be placed on the landscape.

East Idaho Disasters

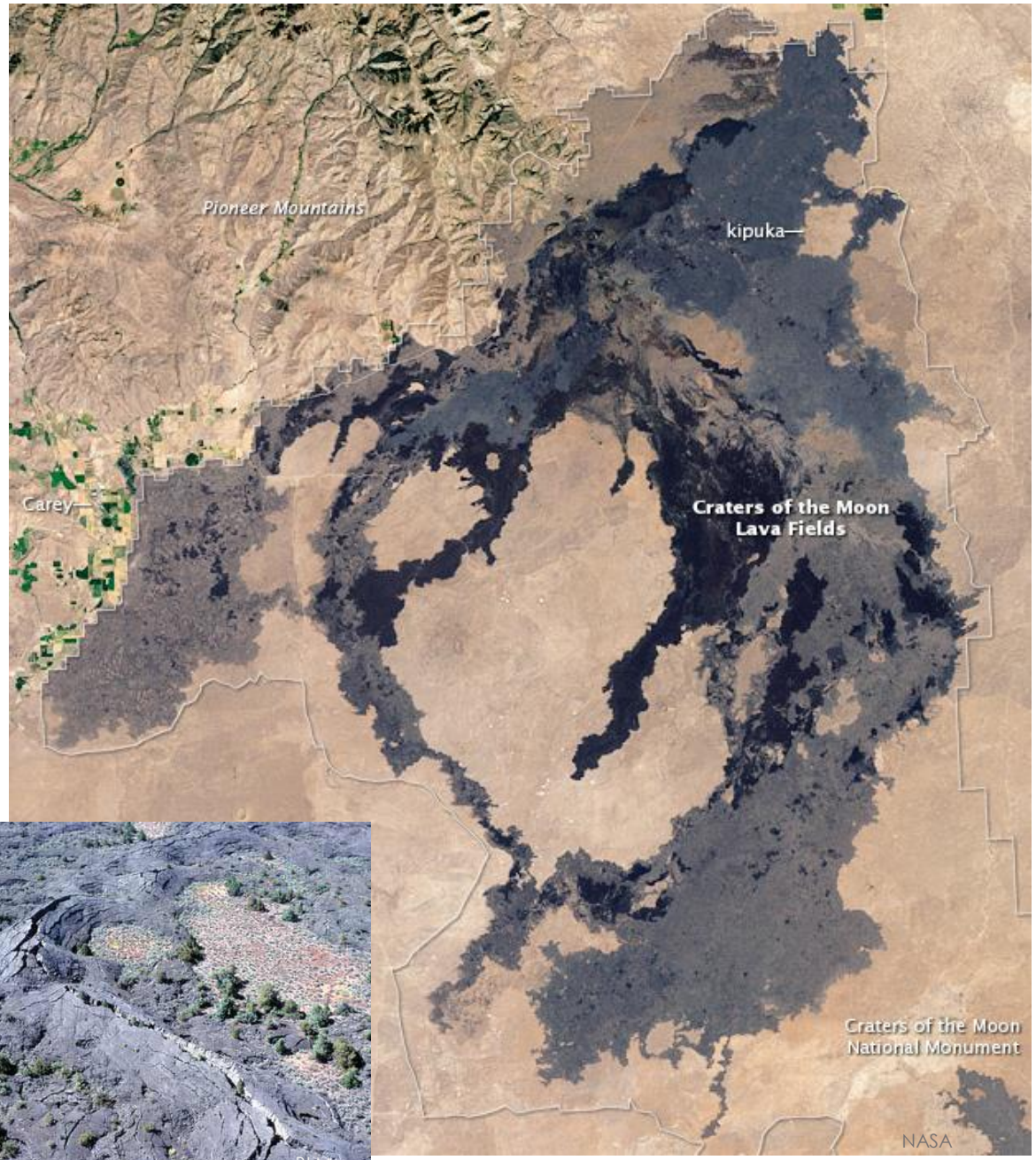
Community Concern: The Greater sage-grouse lives only in the sagebrush ecosystem. Sagebrush, although a resistant species, once killed be it by fire or other disturbances, it takes this species decades to reestablish. Invasion and encroaching species are increasing due to their adaptability to environmental variables such fire or drought.

Partners:
- National Park Service (NPS), Craters of the Moon National Monument and Preserve
- Bureau of Land Management
- Idaho Department of Fish and Game
- USDA Forest Service, Caribou – Targhee National Forest

Earth Observations:
- Landsat 8 OLI
- Sentinel 2
- MERRA 2
- Aqua/MODIS

Impact:
Highlighting Craters - Numerous islands called, kipukas, are home to a variety of different wildlife habitats. These kipukas exist throughout the lava flows and need to be incorporated into broader habitat management considerations. Similarly, while Craters experiences up to five wildfires annually, wildfire susceptibility layers typically do not consider this areas as burnable under the assumption that lava does not burn. This assumption overlooks the kipukas on Craters NPS lands.

Benefit:
The information for identifying habitat areas that are most susceptible to wildfire so management agencies can proactively target areas for fuel load reduction intervention to help these species survive.



DEVELOP @ BLM at ISU GIS TReC

Northern Great Plains Eco Forecasting

Community Concern: The invasive annual brome grasses, cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*), threaten National Park Service (NPS) units and their surroundings in the Northern Great Plains by impairing native grasslands and decreasing native species diversity.

Impact & Benefit: The ability to accurately identify the regional extent of invasive brome species across the NPS park units in the Northern Great Plains is necessary for the NPS to develop a successful annual brome management strategy. Incorporating remotely sensed data into a predictive model of annual brome abundance will allow NPS researchers to quantify the spatial and temporal variability of invasive bromes more effectively then current field monitoring at sample plots throughout the Northern Great Plains park units.

Partners:

- NPS – Northern Great Plains Inventory & Monitoring Network (End-User)
- USGS – Northern Prairie Wildlife (Collaborator)

Earth Observations:

- Landsat 5 TM, 7 ETM+ , 8 OLI
- Terra MODIS


Source: Wikimedia Commons

Everglades Eco Forecasting

Community Concern: One of the most threatened ecosystems are mangrove forests, which provide extensive ecosystem services. Due to changing environments, the health and extent of mangroves continues to decline. Understanding the economic value associated with these ecosystems (specifically as carbon sinks) would allow for carbon accounting to occur, in conjunction with the UN's Sustainable Development Goals.

Partners:
- Everglades National Park
- Group for Earth Observations Blue Planet Initiative (GEO BPI)
- Mitigation and Adaptation Research Institute (MARI)

Earth Observations:
- Landsat 5, 7, & 8
- Sentinel 1a & 2a
- USGS EDEN

Impact & Benefit: This project will help the ENP determine areas of mangrove forest to protect. The methodology developed in GEE will allow for continuous and efficient mangrove extent monitoring by the GEO BPI and by ENP.

Southwest US Eco Forecasting

Community Concern: Land managers are working to identify and mitigate invasive species impacts in several national parks in the southwestern US. These invasive species have the potential to significantly alter the function of natural ecosystems. Thus, better identification tools (rather than tracking in the field) would allow for quicker and more accurate response from land managers.

Partners:

- National Park Service Southwest Exotic Plant Management Team

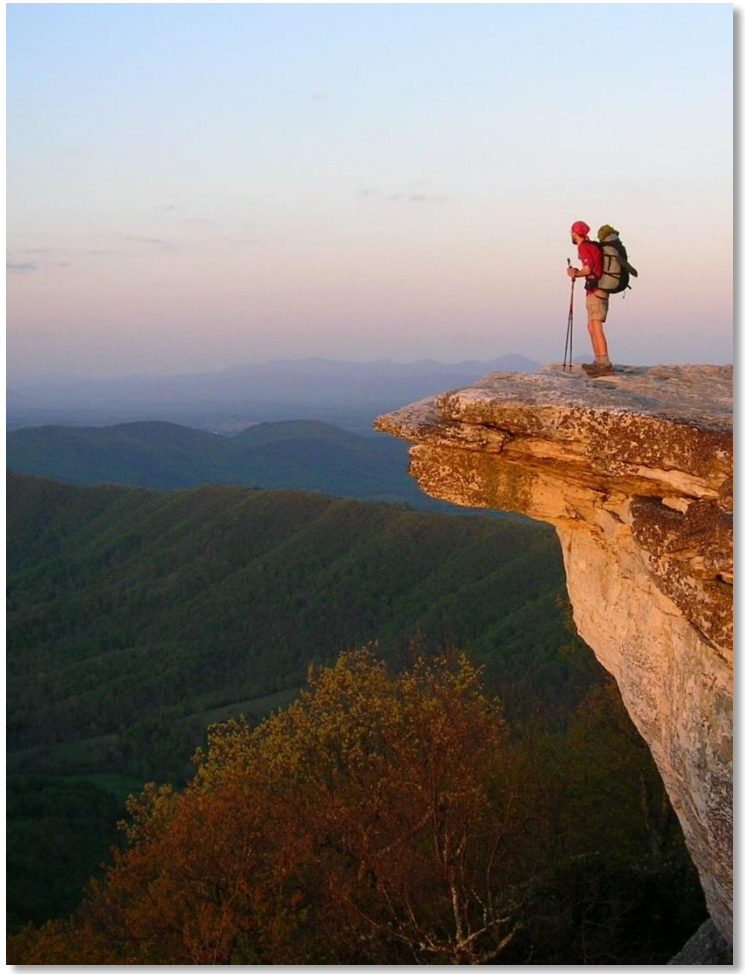
Earth Observations:

- EMODIS
- Landsat 8 OLI/TIRS
- Terra MODIS

Impact & Benefit: The updated distribution maps will provide a more time and resource efficient methodology to track invasive species, enhancing decision-making by park managers by providing a more holistic understanding of invasive species distributions.

Appalachian Trail Health & AQ

Community Concern: Ozone in the stratosphere is essential for protecting the Earth from UV radiation; however, ground-level – or tropospheric – ozone is a pollutant that poses significant health risks to plants and humans. Tropospheric ozone damages forests in many ways – including foliar damage, which decreases photosynthesis and increases leaf senescence, ultimately increasing vegetation's susceptibility to drought, invasive species, and wildfire.



Partners:

- Shenandoah National Park
- Harpers Ferry National Historical Park
- Appalachian Trail Conservancy
- Northwest Temperate Network
- NASA Langley Research Center

Earth Observations:

- Aura, OMI
- Aura, MLS
- Aura, TES
- Aura, AIRS

Impact & Benefit: Identifying locations of highest tropospheric ozone along the AT will allow for increased mitigation by the NPS. These products will also provide more continuous spatial, in-depth coverage of the AT where ground measurements are not available.

Western US Water Resources

Community Concern: Land managers require up-to-date information to plan for and adapt to the impacts of climate change, specifically how to identify vegetation shifts associated with a warmer, dryer climate that are early warning signs of changes to ecosystem stability.

Partners:
- National Park Service Inventory and Monitoring Program
- United States Geological Survey Southwest Biological Science Center

Earth Observations:
- MODIS
- TRMM
- GPM
- SMAP

Impact & Benefit: End products will provide project partners with a more detailed account of vegetation response and water balance pivot points in the select national parks, assisting land managers on a management unit scale rather than on much coarser spatial scales.

Northern Great Plains Water Resources

Community Concern: National Parks in the Intermountain region of the northern United States Great Plains region are experiencing snow and ice melt due to changes in climate. As the ice recedes, it has the potential to reveal previously undiscovered archeological sites, as well as alter the vegetation and fire regime of the area.

Partners:

- National Park Service

Earth Observations:

- Landsat 5 TM
- Aqua/Terra MODIS

Impact & Benefit: These end-products will be useful in testing hypotheses about the drivers of human behavioral variability as well as aid the NPS in its mission to protect and mitigate for impacts of climate change to mountain cultural heritage resources.

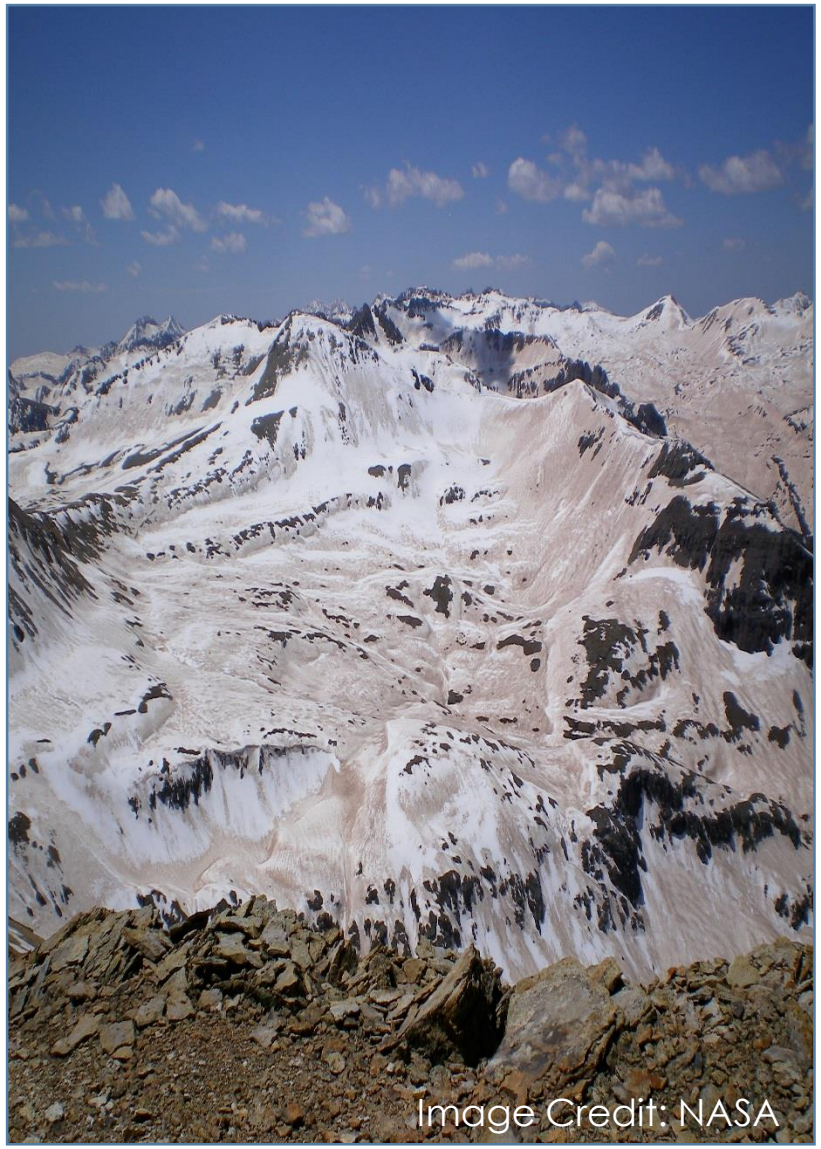


Image Credit: NASA

Chaco Canyon Cross-Cutting

Community Concern: Currently, the Chaco cultural landscape is under threat from horizontal drilling for oil and gas development making the landscape vulnerable to encroaching infrastructure associated with resource extraction

Partners:
National Park Service, Binghamton University, University of Nebraska-Lincoln, University of Colorado Boulder

Earth Observations:
Terra ASTER, Landsat 8 OLI, SRTM-v2 C-band

Impact & Benefit: The results of this project will contribute to identifying previously unknown Chacoan road and house locations throughout the San Juan Basin in northwest New Mexico. This project will help the project partners with preservation efforts by showing which Chacoan ruins are at risk of being affected by resource extraction and encroaching infrastructure.

SDGs Cross-Cutting

Community Concern: NASA's Applied Sciences Program is working to support the United Nation's Sustainable Development Goals (SDGs) by identifying how Earth observations can be utilized in the methodologies of the 17 SDGs.

Partners:

- NASA Applied Sciences Program

Earth Observations:

- Landsat 5, 7 & 8
- SRTM-v2 C-Band
- GPM iMERGE
- Aqua/ Terra MODIS
- TRMM PR

Impact & Benefit: This exploratory project will identify the indicators that can best utilize Earth observations and provide methodology "recipes" and case studies for each of the selected indicators. This will assist in efforts to incorporate Earth observations in the monitoring and evaluation of the SDG indicators.

Embassy of Costa Rica

Director of NASA Earth Science Division with Deputy Chief of Mission for the Embassy of Costa Rica at DEVELOP event in DC (2015)

Costa Rica Water Resources

Community Concern: Continued drought conditions in the Arenal-Tempisque Irrigation District is making water management more difficult and adversely affecting agriculture production.

Partners:

- Costa Rica's Ministry of Environment and Energy (MINAE)
- Costa Rica's National Service of Underground Water, Irrigation, and Drainage (SENARA)

Earth Observations:

- Aqua & Terra (MODIS)
- Landsat 8 (OLI & TIRS)
- Terra (ASTER)
- TRMM (PR)

Impact & Benefit: MINAE and SENARA will be able to ensure sustainable withdrawals and supply of freshwater to help benefit local agriculture.

Costa Rica Agriculture

Community Concern: Satellite based remote sensing provides an opportunity to help optimize water use by improving understanding of water stress conditions in croplands. This knowledge can inform irrigation practices so that water resources can be used more efficiently.

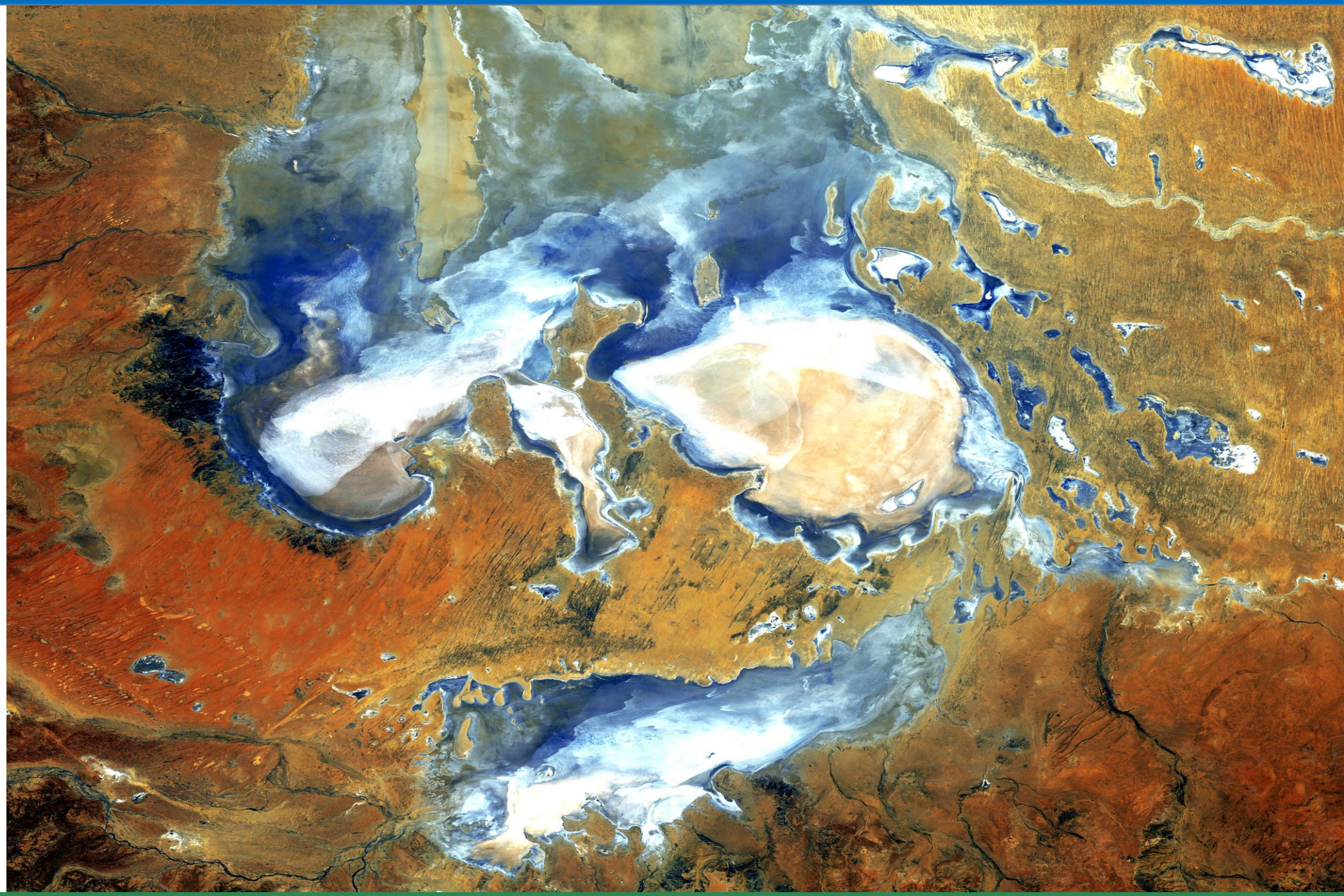
Partners:
End-User:
- Earth University

Collaborator:
- USDA-ARS U.S. Arid-Land Agricultural Research Center

Earth Observations:
- Suomi-NPP VIIRS
- ASTER GED
- Aqua (MODIS)
- Terra (MODIS)

Impact & Benefit: The data in this project will be used to optimize irrigation practices, which will save water and cost, and allow the partners to be able to allocate resources elsewhere.

Project Portfolio by App Area



Mekong River Basin Agriculture

Community Concern: This region is known for its rain fed rice crops which benefit the local economy and work force. Drastic changes in climatic conditions have the potential to drastically impact the rice yields which would result in a major economic loss throughout the region.

Partners:
Asian Disaster Preparedness Center/SERVIR Mekong Hub, Royal Thai Embassy

Earth Observations:
SMOS MIRAS, GPM GMI, Aqua/Terra MODIS, TRMM PR

Impact & Benefit: The created end-products will benefit the end-user by improving their decision making process when allocating resources, such as water, to rice paddies. They will also allow for a more strategic placement of water reservoirs that benefit crop productivity during flooding and drought conditions.

Puerto Rico Agriculture

Community Concern: The Red Palm Mite (*Raoiella indica* Hirst) is an invasive pest impacting ornamental and fruit-producing palm crops throughout Central and South America. Impacts include decreases in agricultural productivity and increase in pest management.

Impact & Benefit: The main benefit of the project is to understand the distribution of mite populations. Understanding areas affected by the mite, and distribution of palms, will establish more effective programs of management, prevention, and control of this pest. Local, state, federal, and university departments of agriculture, entomology or plant protection will use the information for understanding and management of this invasive species.

Partners:

- University of Puerto Rico (End-User/Boundary Organization)
- USDA-Agricultural Research Service (Collaborator)

Earth Observations:

- Landsat 5 TM, 7 ETM+ , 8 OLI
- Sentinel-2 MSI
- Resourcesat-1 LISS-4 & LISS-3


Source: Dr. Jose Verle

Southeast U.S. Agriculture

Community Concern: Regional climate variability in the southeast United States is a concern for agricultural and forestry management. This variability is causing droughts, heat stress, and flooding events while also expanding the growing season and changing pest phenologies.

Partners:

- USDA Southeast Regional Climate Hub

Earth Observations:

- SMAP
- Aqua MODIS – Land Surface Temperature

Impact & Benefit: "This will help farmers, foresters, extension, consultants, and field staff make timely, informed decisions based on the best available and most current climate observations." – Steven McNulty, Program Director, Southeast Regional Climate Hub

Image Credit: USDA

Peru Climate III

Community Concern: Shifting climatic conditions in the Peruvian Andes have meant a push of the native potato's geographic distribution into higher elevations and exposed crops to the risk of new pests and disease.

Partners:

- International Potato Center (CIP)
- Parque de la Papa & ANDES

Earth Observations:

- Landsat 5 (TM)
- Landsat 7 (ETM+)
- Landsat 8 (OLI & TIRS)
- SRTM

Impact & Benefit: By identifying characteristics for suitable potato crop locations throughout the Peruvian Andes, CIP will be able to help local communities sustain traditional agriculture practices.

East Africa Disasters II

Community Concern:
Due to a lack of spatial and temporal information, government officials face challenges in disaster risk management. Documenting known landslides and determining landslide-prone areas are important components for effective disaster risk management.

Partners:
Regional Centre for Mapping of Resources for Development, NASA SERVIR Coordination Office, SERVIR Applied Science's Team

Earth Observations:
Landsat 8 OLI, GPM IMERG, STRM-v2 C-band, SMAP

Impact & Benefit:
A Landslide Susceptibility Map and Landslide Hazard Map will be created showing areas and populations potentially at risk of a landslide. The end products will then be used to help disaster risk management efforts, land-use planning, and understanding what conditions may trigger a landslide.

Elkhorn Slough Eco Forecasting

Community Concern:
Elkhorn Slough faces high nitrate, phosphate, & turbidity levels, which can lead to eutrophication, hypoxia, and the death of aquatic & terrestrial species.

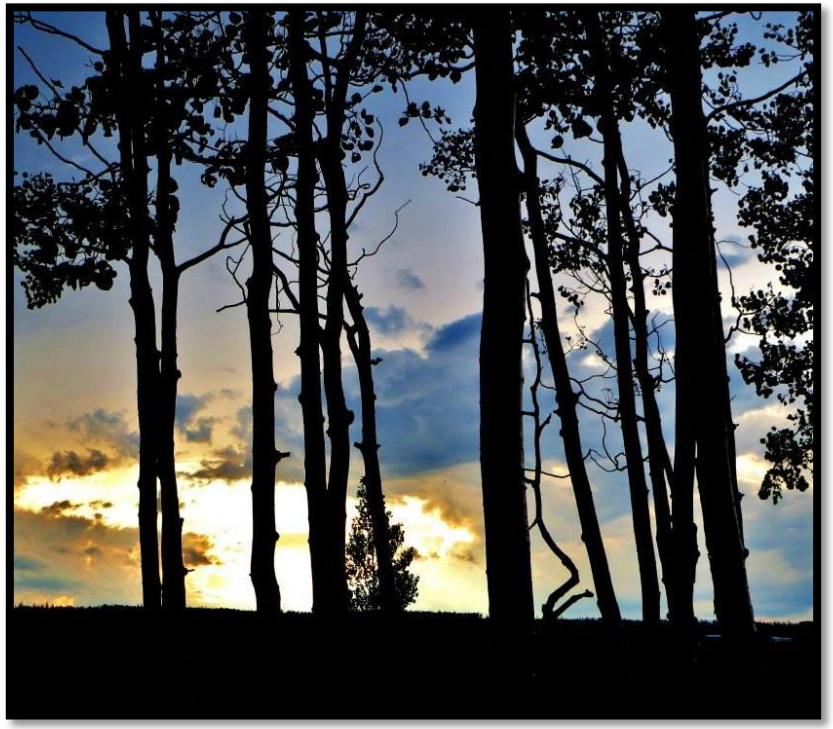
Partners:
- Elkhorn Slough National Estuarine Research Reserve (**ESNERR**)
- Monterey Bay Aquarium Research Institute (**MBARI**)
- United States Geological Survey (**USGS**)

Earth Observations:
- Landsat 5-8 (TM, EMT+, OLI)
- Aqua / Terra MODIS
- Airborne Visible / Infrared Imaging Spectrometer (AVIRIS)

Impact & Benefit: The first term of this project (Summer 2016) will assess the effects of nutrient loading into Elkhorn Slough from nearby agricultural plots, and determine eutrophication sources using the Soil & Water Assessment Tool (SWAT). This will help inform end-users for their marsh restoration project, and assist boundary organizations in setting agricultural regulations in the region.

Laramie Mountains Eco Forecasting II

Community Concern: Aspen stands provide critical habitat for wildlife and are one of the most species rich vegetation community types in Wyoming. However, sudden aspen decline is a growing concern, in addition to declining mule deer populations, throughout the Western US. As land management agencies are planning habitat improvement efforts, such as prescribed burning, to stimulate aspen regeneration, the effect of these management activities on mule deer carrying capacity is unknown.



Partners:
- Wyoming Game and Fish Department
- Natural Resource Ecology Laboratory

Earth Observations:
- Landsat 5, 7, 8
- MODIS Aqua/Terra
- Space Shuttle SRTM V2

Impact & Benefit: "This project will help my agency in identifying critical parturition habitats (i.e. fawning and calving) for ungulates in the Laramie Range and improve our current estimates of habitat carrying capacity. These estimates are important in deciding how to manage wildlife numbers to alleviate competition among ungulates and mitigate habitat conservation" (Ryan Amundson- Wyoming Game and Fish Department).

Mobile Bay Eco Forecasting

Community Concern:
Coastal marshes in Southern Alabama have decreased in extent and quality over the past few decades due to disturbances such as urban land use and sea level rise.

Earth Observations:
- Landsat Series
- MODIS
- Sentinel 2

Partners:
- Alabama Coastal Foundation
- Dauphin Island Sea Lab

Impact & Benefit: The forecast maps and data will aid the Alabama Coastal Foundation in their efforts to restore and converse vital marsh ecosystems.

Southeast Eco Forecasting III

Community Concern: *Hydrilla sp*. is an invasive aquatic plant that has become one of the most serious aquatic weed problems for the southeastern United States. It negatively affects the food chain, is associated toxic epiphytic cyanobacteria, and is a concern for the recreation industry.

Partners:

- US Army Corps of Engineers
- Henry County Water Authority

Earth Observations:

- Landsat 8 (OLI)

Impact & Benefit: Partners will use the benthic model for *Hydrilla sp*. and distribution maps to predict areas of concern for reducing the impacts of this invasive species. The results of this project will help inform partners' mitigation efforts and continued monitoring of local reservoirs.

Coastal US Health & AQ

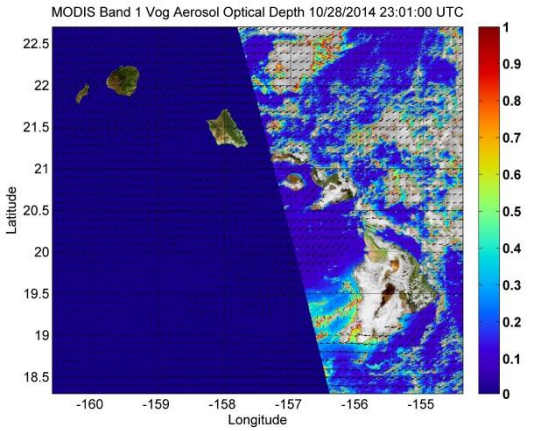
Community Concern: According to the EPA 1.34 million premature deaths were linked to outdoor air pollution in 2008. Within the U.S., air quality measurements are made using *in situ* monitoring stations. Satellite data has the capability to increase spatial coverage in data sparse areas especially for the study region – Hawaii and the Florida Coast.

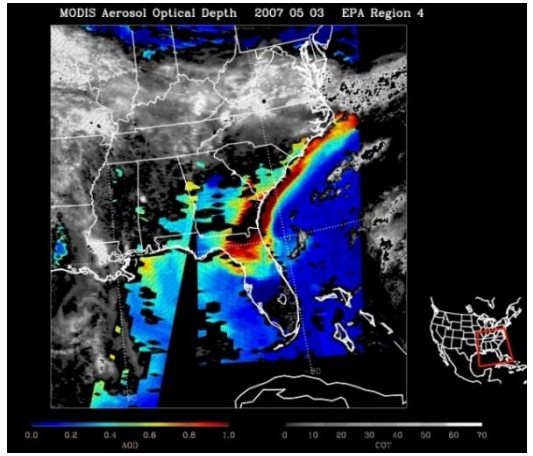
Partners:

- Environmental Protection Agency (EPA)
- Centers for Disease Control (CDC

Earth Observations:

- LPOES Aerosol Optical Thickness (AVHRR)
- MODIS Aerosol Optical Depth (Aqua & Terra)





Impact & Benefit: The goal of the first term is to perform long term aerosol studies on available satellite data for and compare it statistically with historic EPA air quality measurements. This project will create 30-year aerosol climatologies and script to perform these analyses in other regions.

Maricopa County Health & AQ

Community Concern: Exposure to air pollution can have a disproportionate effect on the nearly 4 million residents of Maricopa County and is associated with respiratory and cardiovascular disease.

Partners:
- Maricopa County Department of Public Health
- Maricopa County Air Quality Department

Earth Observations:
- Terra MISR
- Aqua/Terra MODIS
- Landsat 7/8 OLI

Impact & Benefit: Continuous high resolution estimates of air pollution can enhance the current monitoring network, which is limited in spatial coverage throughout the county. Additionally, the end products can help identify vulnerable populations, pollution sources, and enhance outreach and intervention efforts.

San Francisco Bay Area Health & AQ

Community Concern:
- Address underestimations of CH_4 emissions by bottom-up measurement approaches
- Contribute to the development of the BAAQMD Green House Gas Monitoring Network

Partners:
- Bay Area Air Quality Management District (BAAQMD)
- Alpha Jet Atmospheric eXperiment (AJAX)

Earth Observations:
- Aura, Tropospheric Emission Spectrometer (**TES**)
- Aqua, Atmospheric Infrared Sounder (**AIRS**)
- SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (**SCIAMACHY**)

Impact & Benefit:
To use satellite, aircraft, and ground-based measurements, and spatial activity inventory data to:
- Examine the spatial distribution and temporal variation of methane (CH_4) emissions in the San Francisco Bay Area
- Identify the gap between top-down and bottom-up CH_4 emissions estimates
- Better inform BAAQMD's regulatory measures to help meet their goal of reducing GHG emissions 80% below 1990 levels by 2050

Caribbean Oceans II

Community Concern: Large influxes of *Sargassum* (brown macroalga) threaten coastal species & tourism.

Partners:

- Consorcio de Instituciones de Investigación Marina del Golfo de México y del Caribe (**CiiMar-GoMC**)
- Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (**CONABIO**)
- Specially Protected Areas and Wildlife- Regional Activity Centre (**SPAW-RAC**)
- Sea Education Association (**SEA**)
- University of Puerto Rico, Department of Marine Sciences

Earth Observations:

- Landsat 8 OLI
- Aqua/Terra MODIS
- Suomi NPP VIIRS

Impact & Benefit: The second term of this project (Summer 2016) will investigate historical trends of *Sargassum* in the Caribbean, compare these trends to different environmental variables, and identify a successful detection algorithm to assess its origin and movement.

Atlanta Water Resources II

Community Concern: Rapid development in Atlanta and its suburbs is expanding areas of impervious surface that will continue to increase sediment and nutrient-laden stormwater runoff into local watersheds.

Partner:

- The Nature Conservancy

Earth Observations:

- Landsat 8 (OLI & TIRS)
- Terra (ASTER)

Impact & Benefit: The Nature Conservancy will be able to create an urban conservation program focused on reducing stormwater impacts in the Atlanta region through forest protection and reforestation strategies.

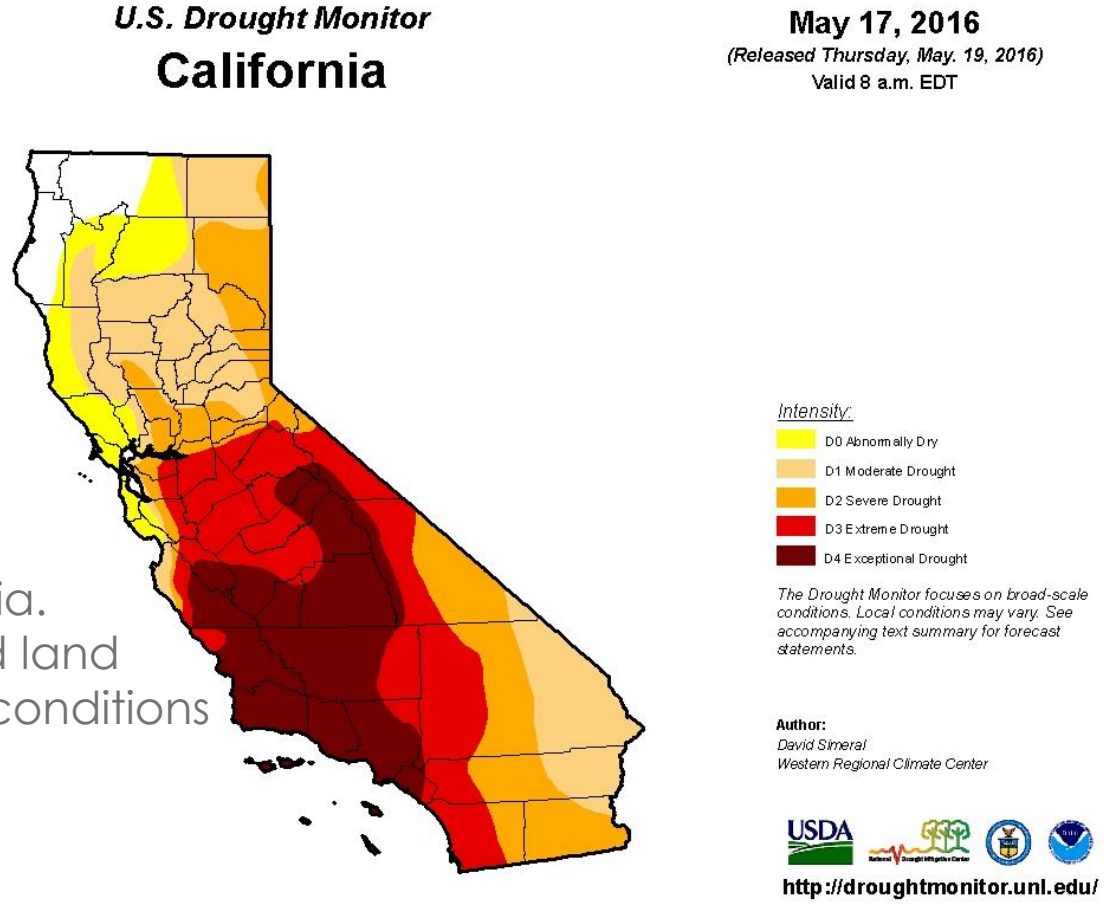
California Water Resources

Community Concern: 2015 marked the arrival of the strongest El Niño since 1998, which was previously the strongest on record. Residents hoped this would alleviate what the U.S. Drought Monitor classifies as "exceptional" drought across California, which is currently entering its fifth year and has left a severe strain on both municipal and agricultural water supplies throughout the state.

Partners:
End-User
- NOAA/National Weather Service

Earth Observations:
- GRACE
- GPM – DPR
- SMAP

Impact & Benefit: This project will embark on a qualitative assessment to further measure drought conditions in California. More accurate measurements will assist decision makers and land managers to prepare for the projected new normal of drier conditions across the state.



Middle East Water Resources

Community Concern: Jordan has an arid climate with low and intermittent rainfall. The main sources of water in these areas are surface water and groundwater reservoirs; however, the majority of water sources that still exist are polluted and are deteriorating as the demand for water rises. As a result, schools in the region have closed down because of insufficient water supply and lack of water accessibility.

Partners:

- Water Resources Action Project, Inc. (WRAP)

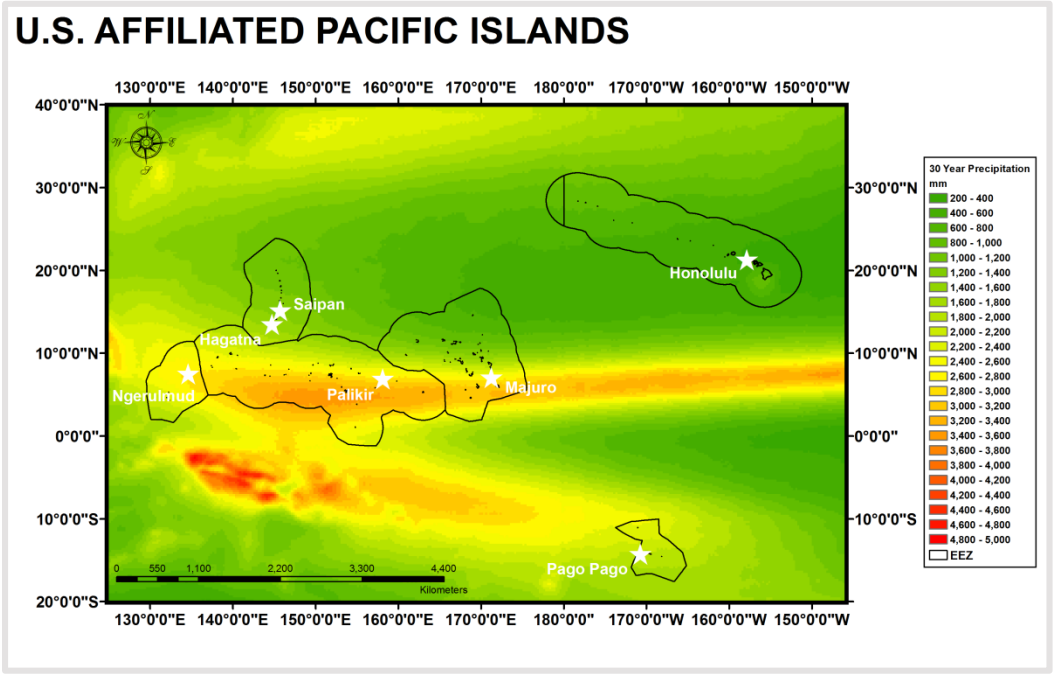
Earth Observations:

- TRMM
- GPM
- SRTM
- GRACE

Impact & Benefit: Enhanced understanding of precipitation conditions and trends in the Middle East will allow end users to determine the best school locations to implement their rainwater harvesting projects.

Pacific Water Resources II

Community Concern: The majority of the U.S. Affiliated Pacific Islands (USAPI) relies solely on precipitation for their fresh water. Being able to plan and manage fresh water resources for the USAPI depends on accurate precipitation forecasts across the islands.



Partners:

- Pacific ENSO Applications Climate Center (PEAC)

Earth Observations:

- CPC-Morphing Technique (CMORPH)

Impact & Benefit: The goal of this term is to develop methodology that will utilize enhanced precipitation estimates from the NOAA Climate Data Records (CDRs). This project will focus on the most effective ways to distribute high resolution precipitation estimates to decision makers across the USAPO and build off of the previous term's precipitation climatologies.

CALIPSO Cross-Cutting

Community Concern: Since its launch in 2006, the CALIOP sensor has made over 5 billion observations. The standard tool that scientists currently have to visualize this data is written in a proprietary language (IDL), making it difficult to tailor the tool to scientists' needs.

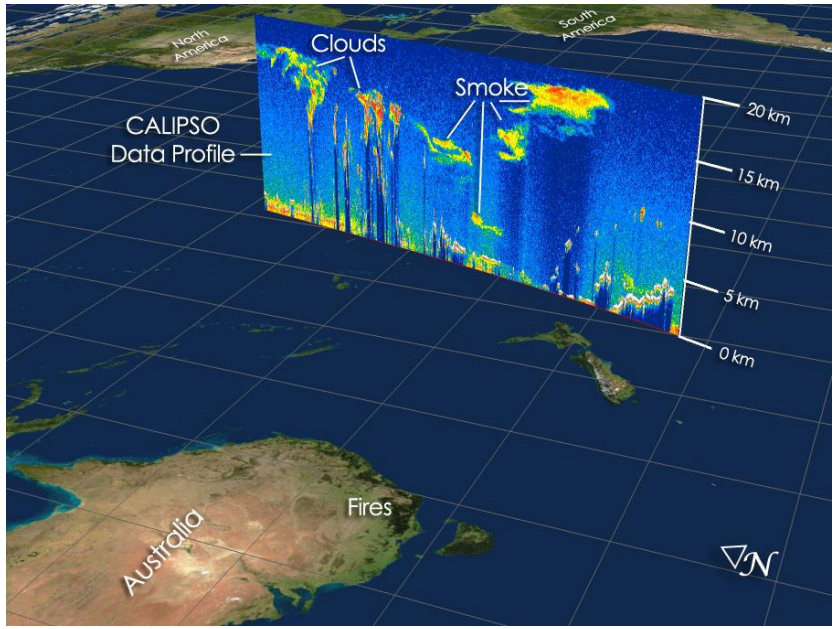
Partners:

- Dr. Charles Trepte,
  CALIPSO Science team at Langley Research Center

Earth Observations:

- CALIPSO, CALIOP

Impact & Benefit: DEVELOP has created VOCAL (Vizualization of CALIPSO), a new CALIPSO data visualizer. Summer 2016's DEVELOP team will continue to work with the CALIPSO science team to improve the back-end database for more flexible aerosol classification and data analysis. Another goal is to integrate NASA's OPeNDAP service for direct and automatic importing of data.



Useful Dates to Remember

- Project Deliverable Deadlines
  - **Project Summary** (RD – 24 June, FD – 14 July)
  - **Tech Paper** (RD – 30 June, FD – 11 Aug)
  - **Poster** (RD – 7 July, FD – 28 July)
  - **Presentation** (RD – 7 July, FD – 4 Aug)
  - **VPS Video & Transcript** (26 July, Launch – 11 Aug)
- Holidays
  - **Independence Day** (4 July)
- Others
  - **Myers Briggs & 4D Color Types** (10 June)
  - **Fall Application Window Closes** (1 July)
  - **Gear Order** – *online order now, processed at end of the month*

THANK YOU! • HAVE A GREAT TERM!