National Aeronautics and Space Administration

2013 Annual Report

DEVELOP
National Program
Applied Sciences' Capacity Building

www.nasa.gov

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DEVELOP's Mission:

Uniting NASA Earth observations with society to foster future innovation and cultivate the professionals of tomorrow by addressing diverse environmental issues today.

DEVELOP's Vision:

To maximize NASA's Earth science investments by enabling the next generation to accelerate innovative applications in technology, resource management, policy development, and decision making.

About DEVELOP:

DEVELOP addresses environmental and public policy issues through interdisciplinary research projects that apply the lens of NASA Earth observations to community concerns around the globe. Bridging the gap between NASA Earth Science and society, DEVELOP builds capacity in both participants and partner organizations to better prepare them to address the challenges that face our society and future generations.

Teams of DEVELOP participants partner with decision makers to conduct rapid feasibility projects that highlight fresh applications of NASA's suite of Earth observing sensors, cultivate advanced skills, and increase understanding of NASA Earth Science data and technology.

Applied Sciences' Capacity Building:

NASA Applied Sciences' Capacity Building Program sponsors the improvement of skills and capabilities of U.S. and international decision makers, community leaders, and resource managers related to the access and application of Earth observations. The program contributes to the strengthening of the U.S. and developing world's capacity to use NASA Earth observations data and products in decision making through four elements:

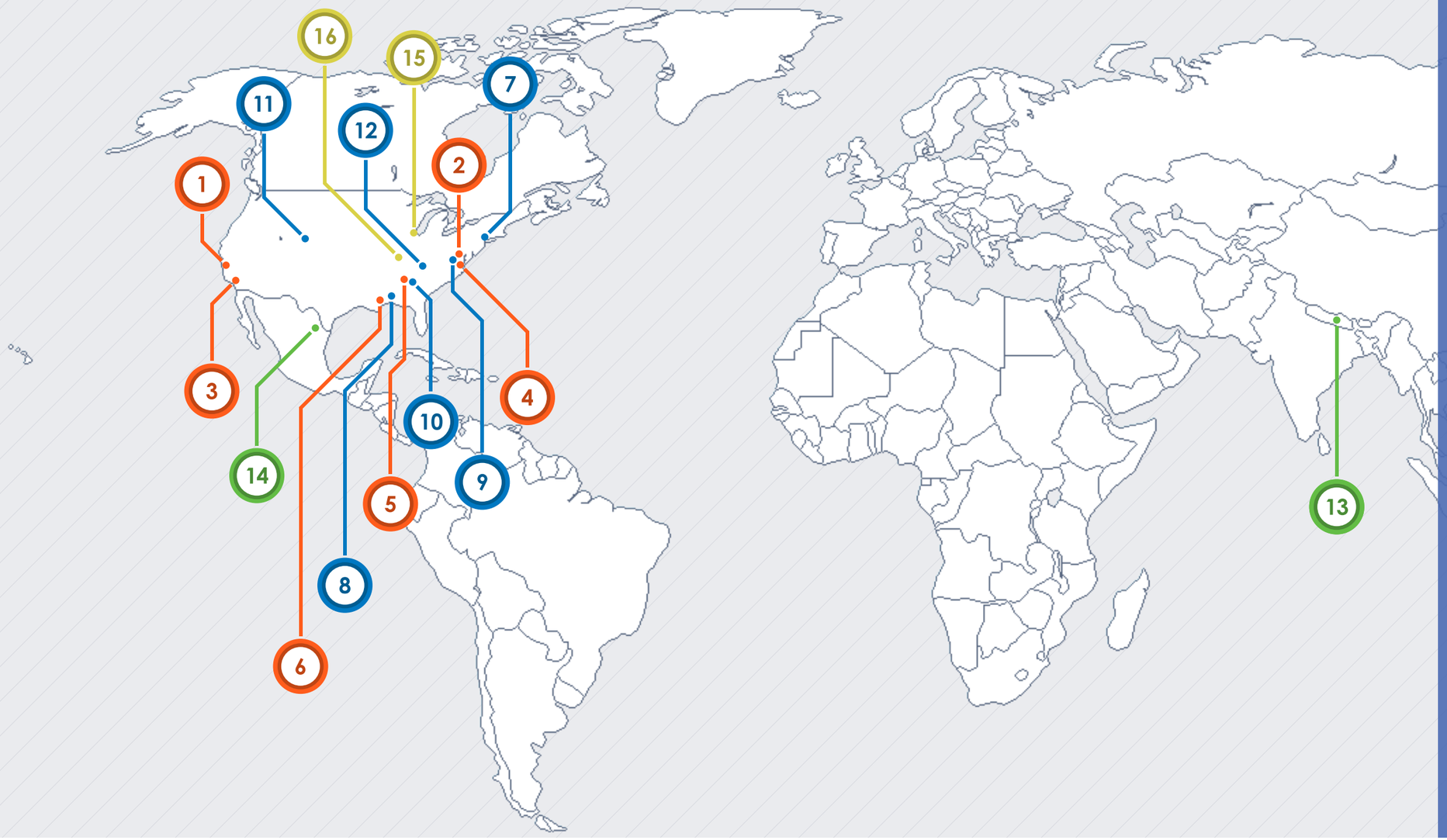
1. ***DEVELOP***
2. ***SERVIR***
3. ***Applied Remote Sensing Training (ARSET)***
4. ***Gulf of Mexico Initiative (GOMI)***

DEVELOP's Core Values:

- ***Innovation***
- ***Professionalism***
- ***Service***
- ***Stewardship***
- ***Integrity***
- ***Scholarship***
- ***Passion***
- ***Collaboration***

LOCATIONS

These are the DEVELOP nodes of 2013.
"Transitioned Locations" are not currently active.



1. **NASA Ames Research Center -** *Moffett Field, CA*
2. **NASA Goddard Space Flight Center -** *Greenbelt, MD*
3. **NASA Jet Propulsion Laboratory -** *Pasadena, CA*
4. **NASA Langley Research Center -** *Hampton, VA*
5. **NSSTC at NASA Marshall Space Flight Center -** *Huntsville, AL*
6. **NASA Stennis Space Center -** *Stennis, MS*

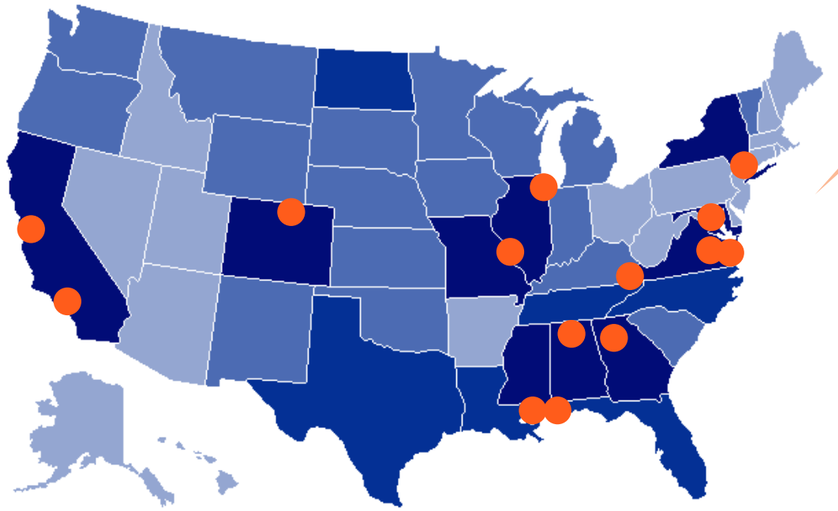
7. **International Research Institute for Climate and Society -** *Palisades, NY*
8. **Mobile County Health Department -** *Mobile, AL*
9. **The Patrick Henry Building -** *Richmond, VA*
10. **University of Georgia -** *Athens, GA*
11. **USGS at Colorado State University -** *Fort Collins, CO*
12. **Wise County and City of Norton Clerk of Court's Office -** *Wise, VA*

13. **International Centre for Integrated Mountain Development -** *Kathmandu, Nepal*
14. **Tecnológico de Monterrey Campus Saltillo -** *Saltillo, Mexico*

15. **The Great Lakes and St. Lawrence Cities Initiative -** *Chicago, IL*
16. **Saint Louis University -** *St. Louis, MO*

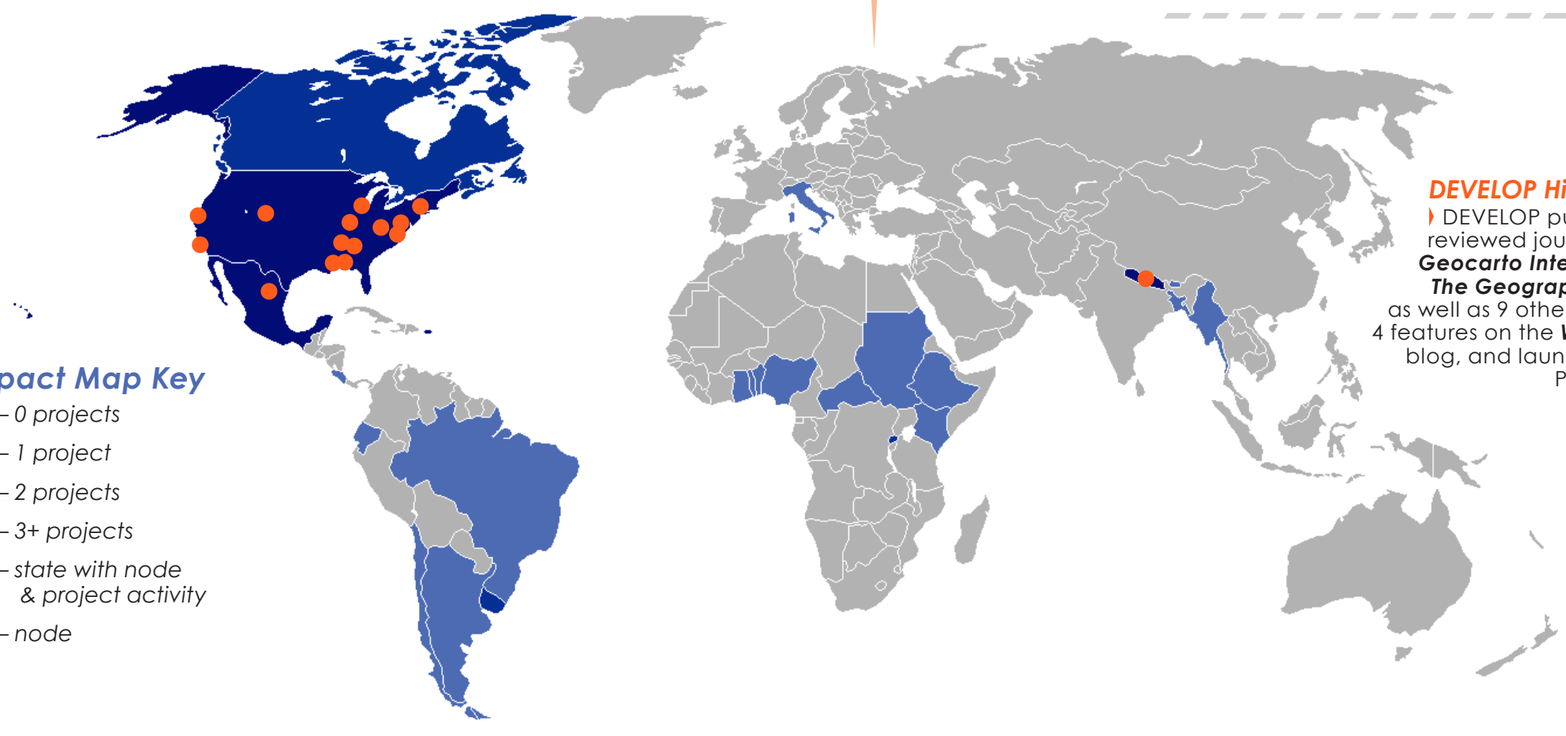
NASA Center Locations ***Regional & Academic Locations*** ***International Locations*** ***Transitioned Locations***

IMPACT



50 States Impacted

23 Countries Impacted



Impact Map Key

- — 0 projects
- — 1 project
- — 2 projects
- — 3+ projects
- — state with node & project activity
- — node

"It is a pleasure to be part of this program and watch young people develop into the next generation of scientists and community leaders. What people remember most are stories. DEVELOP is a story."

— Dr. Bernard Eichold II, M.D., Dr.P.H., F.A.C.P.
Mentor, DEVELOP office at Mobile County Health Department

DEVELOP Highlight

In 2013, DEVELOPers presented and participated in 28 science and policy conferences, as well as contributed to 10 NASA meetings and workshops.

16 Locations

348 Participants

78 Projects

153 Partners

DEVELOP Highlight

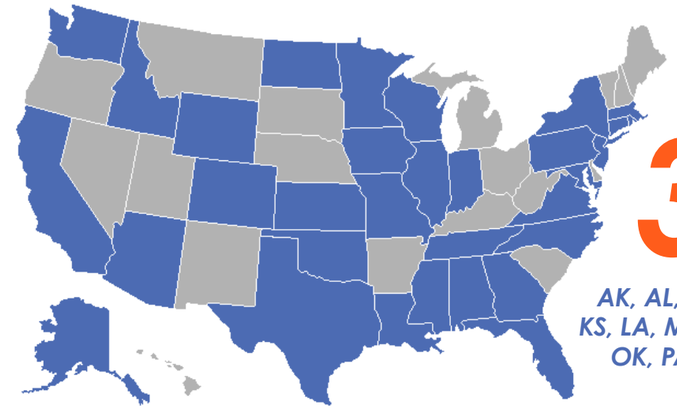
DEVELOP published peer-reviewed journal articles in ***Geocarto International*** and ***The Geographical Bulletin***, as well as 9 other publications, 4 features on the ***Women@NASA*** blog, and launched 3 Virtual Poster Sessions.

PARTICIPANTS

171 Female Participants

348 Total Participants

177 Male Participants



32 States Represented

AK, AL, AZ, CA, CO, CT, FL, GA, IA, ID, IL, IN, KS, LA, MA, MD, MN, MO, MS, NC, ND, NJ, NY OK, PA, RI, TN, TX, VA, WA, WI, WY, and DC

Participant Classifications

- 16 High Schoolers
- 6 Freshman Undergrads
- 12 Sophomore Undergrads
- 37 Junior Undergrads
- 73 Senior Undergrads
- 44 Recent Graduates w/ Bachelors
- 58 1st Year Grads
- 49 2nd Year Grads
- 15 3rd Year Grads
- 21 Recent Graduates w/ Masters
- 8 PhD Candidates
- 9 Early & Transitioning Career Professionals

DEVELOP Highlight

DEVELOP's National Lead, Lauren Childs-Gleason, received NASA's Silver Achievement Medal in recognition for her dedicated service and contributions to DEVELOP.

DEVELOP Highlight

Three DEVELOPers received NASA Group Achievement Awards for their contributions to the Ames Research Center Climate Adaptation Science Investigator project.

94% of Degree Seeking Participants in a STEM Field

"DEVELOP is a great opportunity to do so many different things, and learn about yourself and the world around you. No matter your path afterwards, you'll be able to contribute meaningfully because you had to think on your feet at DEVELOP. You realize that it was a human development program and no matter where you go, that growth will be there with you."

— Madeline Brozen,
Stennis Space Center / Jet Propulsion Laboratory
DEVELOPer 2008-2010

"DEVELOP was a life-changing experience for me. The internship gave me the skills to begin my geo-spatial career and has strengthened my curiosity to learn more about the Earth."

— Melissa Oguamanam,
Goddard Space Flight Center
DEVELOPer 2009-2013

PARTNERS

24 State Partners

1 Regional Partner

9 Local Partners

44 Federal Partners

153 Unique *Partner Organizations*

15 Academic Institution Partners

21 NGO Partners

39 International Partners

"Our current strategy for the 2013 planting season is completely derived from the DEVELOP maps, which give our groups a clearer understanding of the goals for reforesting the Central Wetlands. We hope to petition the Coastal Zone Manager to adopt these maps in the Parish's Master Plan."

— Blaise Pezold,
Wetland Tree Foundation

DEVELOP Highlights

- DEVELOP's team at Stennis Space Center received a second place 2013 Gulf Guardian Award in recognition for its partnerships established by the Louisiana Ecological Forecasting project that utilized NASA satellite data to assist with ideal planting locations for reforestation efforts in St. Bernard Parish.
- The DEVELOP node at the Mobile County Health Department celebrated its 10 year anniversary, which was honored by the City of Mobile issuing a proclamation that November 26th be "NASA DEVELOP Day" in Mobile in recognition of DEVELOP's contributions to the region.

"Increasing the understanding of drought severity and a decision support tool that can enhance decision making by reducing risk for these land managers is a beneficial contribution by the DEVELOP Program."

— Dr. Justin Derner,
USDA Agricultural Research Service

"The NASA DEVELOP Program has proven itself as a valuable resource to the Marine Debris Program (MDP). As a result of DEVELOP's work, MDP is actively engaged with the Texas Adopt-A-Beach Program, the Gulf of Mexico Foundation, and others."

— Nancy Wallace,
Director, NOAA Marine Debris Program

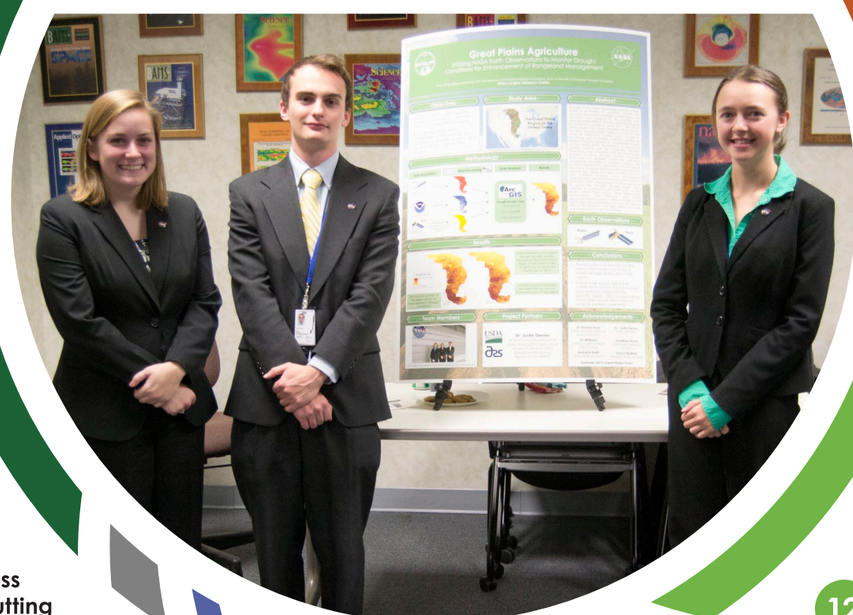
What is a Boundary Organization?

A boundary organization is a type of partner who works with many end users across a boundary, whether that boundary is between NASA Applied Science products and operational decision-makers or between science and policy. The purpose of working with that organization is to build a partnership that would then amplify the effects of our activities.

PROJECTS

78 Total Projects

- 12 Health & Air Quality Projects
- 12 Water Resources Projects
- 21 Ecological Forecasting Projects
- 9 Disaster Projects
- 12 Agriculture Projects
- 3 Climate Projects
- 3 Energy Projects
- 3 Ocean Projects
- 1 Weather Project
- 2 Cross-Cutting Projects



"I'm continually impressed by the evolution of DEVELOP projects – how a team can come together and rapidly set in a motion a project that applies NASA Earth observations to real world concerns, establishes strong relationships with partners and end-users, formulates innovative tools and products, and then enthusiastically presents their results and methodologies to the world. All in only ten weeks!"

— Lauren Childs-Gleason,
National Lead, NASA DEVELOP National Program

DEVELOP Highlights

- The Ambassador of Rwanda visited the DEVELOP team in Wise, Virginia in February, meeting with the spring participants to discuss their Rwanda-focused projects.
- The Chile Water Resources project presented their end results and handed-off their methodologies at the Chilean Embassy in Washington, D.C. in November.

"Beyond the exceptional quality of the project presentations, the application of data collected from space to address such a wide variety of real community and societal needs sets DEVELOP apart as a truly outstanding program. The program's collaboration with Earthzine has been an exciting opportunity to reach out to the next generation of Earth scientists around the globe."

— Dr. Paul Racette,
Earthzine Editor-in-Chief,
NASA Goddard Space Flight Center

50 ***Projects with a Domestic Focus***

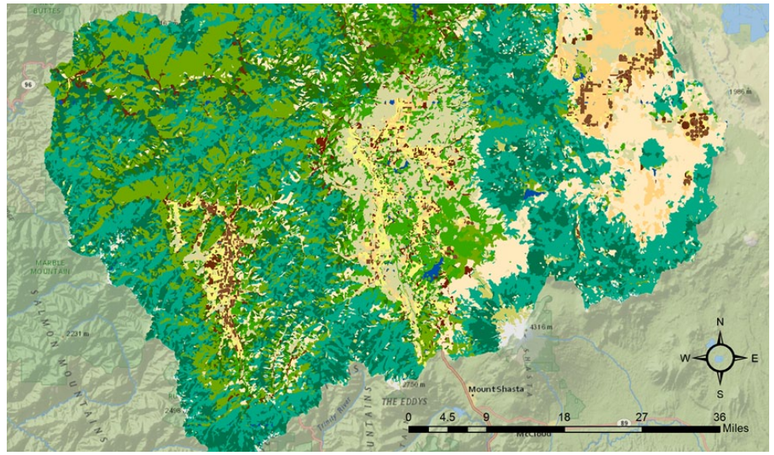
28 ***Projects with an International Focus***

DEVELOP Project Archive
hosted by Earthzine

Central Klamath Basin Ecological Forecasting

NASA Ames Research Center [Moffett Field, CA]

Bird Conservation through Assessment of Oak Habitats in the Central Klamath Basin



Land cover classified into 15 unique classes with 84% accuracy, a significant improvement in accuracy and land cover precision over the National Land Cover Dataset (NLCD).

The Community Concern

Oak habitats in the Pacific Northwest have decreased significantly due to agricultural and urban development, invasive species encroachment, and fire suppression. In the Central Klamath Basin of California and Oregon, numerous species, including a variety of resident and migratory birds of conservation concern, are dependent on these oak habitats necessitating restoration of oak habitat to support recovery of their species.

The Science

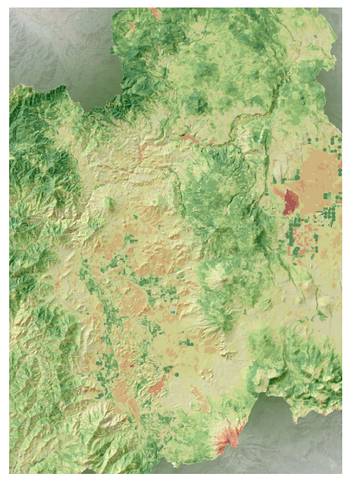
This project employed Landsat 5 TM and Landsat 8 OLI/TIRS imagery to identify past and present land cover distributions, as well as the relationship between oak habitat and bird abundance, and change detection analyses.

The Results

Trends in oak habitat loss resulted in a nonlinear response in the abundance of specific bird species, indicating some species may have a threshold response to changing oak habitat density. These project results provide project partners at the U.S. Fish and Wildlife Service and Klamath Bird Observatory with a new method to meet conservation objectives.

Project Authors

[left to right]: *Adam Chlus, Erika Edgar, Thomas Mathis, Tanvi Gambhir, Ryan Anderson*



A Normalized Difference Vegetation Index (NDVI) derived from 2011 Landsat 5 imagery for the Central Klamath Basin.

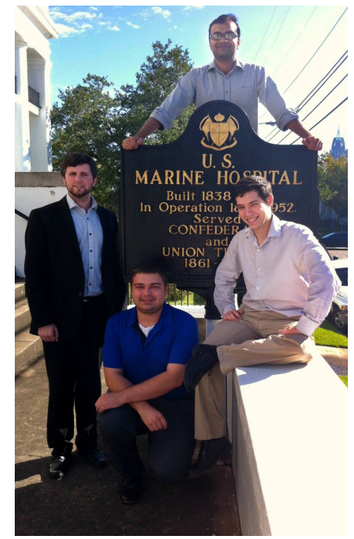
Summer 2013 Project Page

Mobile County Health Department [Mobile, AL]

Gulf Coast Health & Air Quality

Utilizing NASA Earth Observing Resources to Initialize an Environmental Suitability Model to Ascertain Transmission Risk of Chagas Disease along the Gulf Coast

Project Authors

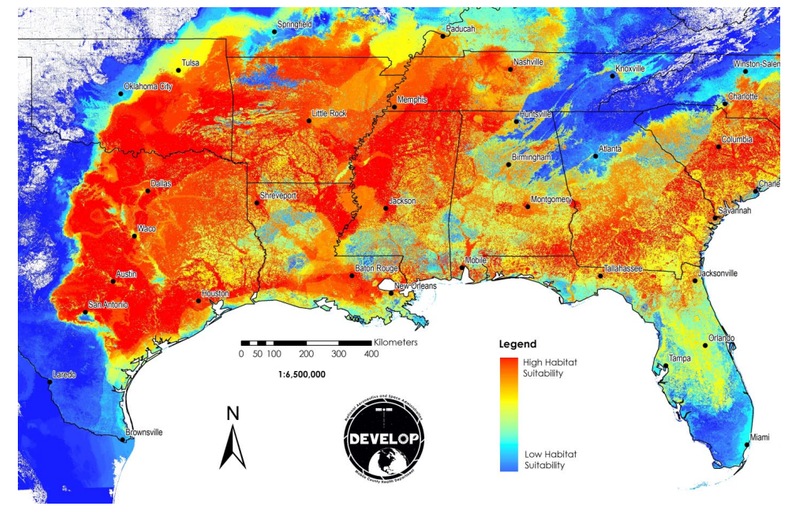


[clockwise from top]: *Shikher Mishra, James Pickett, Walt Clark, Sid King*

Fall 2013 Project Page

The Community Concern

Chagas disease is a chronic infection caused by the protozoan *Trypanosoma cruzi* that is carried and transmitted by Triatomine bugs (also known as "kissing" bugs or assassin bugs). Presently, little attention is given to Chagas Disease in the United States despite the presence of vectors and a large reservoir population.



An ecological niche risk map showing habitat suitability for the Gulf Coast region.

The Science

The objective of this project was to determine the risk of contracting Chagas Disease in the rural southeastern United States through environmental suitability modeling and spectral indices with inputs from NASA's Aqua/Terra MODIS, SRTM, Landsat 8 OLI, and TRMM PR.

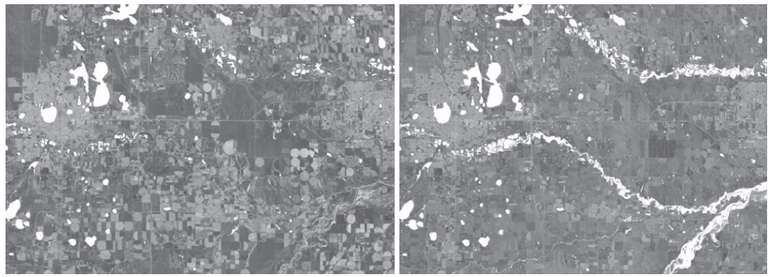
The Results

From this, project partners at the MCHD Vector Control and Epidemiology Department will collect specimens of T. sanguisuga in Mobile county and neighboring regions to test insect vectors for the disease causing protozoa. This targeted collection and analysis of specimens is a first for Alabama, and directly in response to project results.

Colorado Water Resources

Utilizing Landsat 8 to Assess Impacts of the Historic 2013 Flooding in Colorado's Northern Front Range

USGS at Colorado State University [Fort Collins, CO]



Modified Normalized Difference Water Index (MNDWI) from pre-flood (left) and during-flood (right) over section of the Colorado Front Range. White pixels indicate water. MNDWI derived from Landsat 8 OLI. Path/Row: 34/32. Image dates: 08/16/13 (pre), 09/17/13 (during).

The Community Concern

On September 12, 2013, tropical moisture drawn north from Mexico by a low-pressure system blew into the Rocky Mountains and began to release its contents over the Colorado Front Range. Over the next five days, over 17 inches of rain fell in some areas, flooding 17 counties and over 2,000 square miles of land, taking eight lives, displacing and stranding thousands of others, and causing an estimated $2 billion in property damage both to residential and commercial properties. In addition to the effects on Colorado's infrastructure, the state's $40 billion agriculture industry has seen many of its fields inundated, and there are now increasing concerns over environmental and public health in the face of groundwater contamination.

The Science

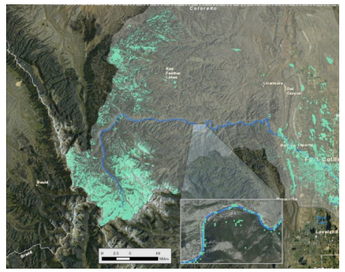
Utilizing a combination of remote sensing techniques and GIS data, this project employed Landsat 8 OLI imagery taken before and during the floods to calculate total inundated area and delineate flood extent. This data was then used to assess pre-existing flood hazard maps of the area, depict locations of future risk for flooding, and identify changes to the river's course and floodplain.

The Results

The results and methodologies from this project were delivered to the City of Fort Collins and local land managers and researchers to assist with recovery planning and risk mitigation throughout the region.

Project Authors

[left to right]: *Steve Chignell, Ryan Anderson, Sky Skach, Amber Weimer, Brenda Kessenich*



Predicted wetlands in Colorado's Cache la Poudre Watershed.

Summer 2013 Project Page

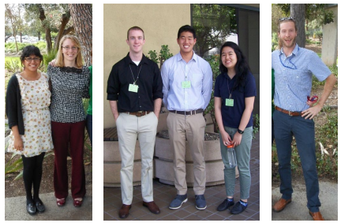
Fall 2013 Project Page

NASA Jet Propulsion Laboratory [Pasadena, CA]

California & Mississippi Disasters

Utilizing Airborne SAR Sensors to Assess Aqueduct, Levee and Road Conditions After Earthquake and Flood Events

Project Authors



[left to right]: *Priscilla San Juan, Andrea Thorstensen, Scott Barron, Kenta Ishii, Karen An, Austin Madson*

Spring 2013 Project Page

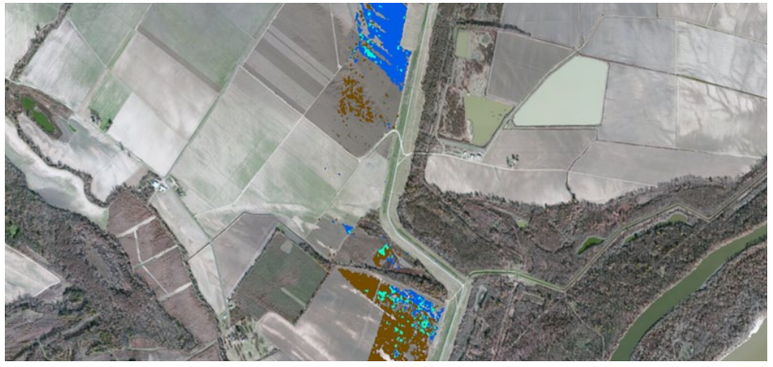
Summer 2013 Project Page

The Community Concern

The Sacramento-San Joaquin Delta and Mississippi River Basin levee systems are both vital pieces of water resource infrastructure that are located in areas of high risk for flooding and/or seismic activity. Project partners, the California Department of Water Resources and U.S. Army Corps of Engineers, manage the health of these levee systems through field assessments which are unsustainable for such large and complicated systems especially as high water events become more common with increasing sea level rise and the effects of climate change on freshwater runoff.

The Science

The field management of both levee systems can be improved through the use of polarimetric data from NASA's UAVSAR sensor. This study created user-friendly, automated support tools to locate areas of possible levee leakage, analyze changes in seepages over time, and predict infrastructure conditions after major earthquakes.



Output from the automated seep detection tool derived from polarimetric data acquired from NASA's UAVSAR sensor, where cyan pixels indicate possible leakage due to high soil moisture content, blue denotes no change, and brown signifies a decrease in soil moisture.

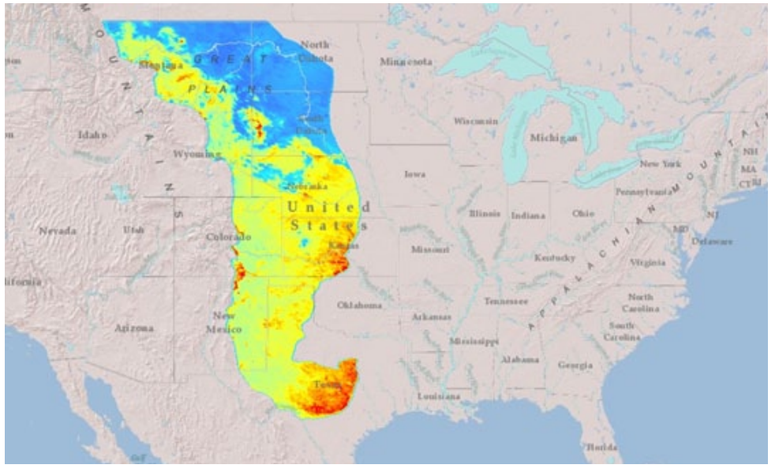
The Results

These user-friendly tools will save countless man-hours currently dedicated to field assessments of the health of these levee systems, and have the potential to be compatible with spaceborne data, which may be more readily available directly after a disaster event.

Great Plains Agriculture

Utilizing NASA Earth Observations to Monitor Drought Conditions for Enhancement of Rangeland Management

NASA Langley Research Center
[Hampton, VA]



Normalized Difference Vegetation Index (NDVI) for the Great Plains, calculated based on a Terra MODIS surface reflectance 8-day composite for March 6-13, 2012. Red areas indicate higher NDVI values and therefore more healthy vegetation, while blue areas indicate lower NDVI values and less healthy vegetation. The image is overlaid on an ArcGIS basemap.

The Community Concern

Drought in the Great Plains region of the United States is a matter of constant concern for ranchers and land managers. Since 2011, the region has been severely impacted, resulting in much of this region qualifying for federal drought assistance.

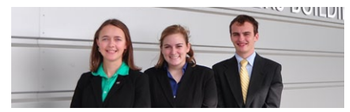
The Science

This project provided partners at the USDA Agricultural Research Services Rangeland Resources Research Unit with a sustainable methodology for using NASA's Terra/Aqua MODIS, AMSR-E, Landsat 5 TM, Landsat 7 ETM+, and NOAA's MPE to apply a local scale drought severity index throughout the Great Plains region and provide up-to-date drought severity information to ranchers and land managers.

The Results

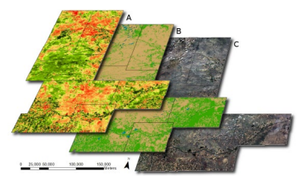
Identification of local changes in rangeland cover and drought severity through use of NASA Earth observations provide both federal and local land managers and ranchers a new tool to support future management decisions and reduce risk.

Project Authors



[left to right(top)]: *Lance Watkins, Alexandra Perillo, Jerrod Lessel*

[left to right(bottom)]: *Tiffani Orne, Emily Gotschalk, Eric Dobrowsky*



Drought Severity Index utilizing three components: Aqua MODIS LST, NOAA's MPE, and Terra MODIS NDVI.

Summer 2013 Project Page

Fall 2013 Project Page

2013 Project Portfolio

Ecological Forecasting Projects

Spring

- ***Rocky Mountain Ecological Forecasting II [USGS Colorado State University]—*** *Regional Short- and Long-term Climate Impacts on Northern Rocky Mountain's and Great Plain's Ecosystems*
- ***Florida Ecological Forecasting II [Goddard Space Flight Center]—*** *Radar and Hyperspectral Characterization of Florida's Indian River Lagoon Mangrove Extent with ALOS/PALSAR and Hyperion Data for Improved Climate Change Oriented Mangrove Management Practices*
- ***Gulf of Mexico Ecological Forecasting [Jet Propulsion Laboratory]—*** *Assessing the Detection of Sargassum with Synthetic Aperture Radar Imagery to Assist with Atlantic Blue Fin Tuna Population Assessment and Management and Possible Impact from the Deepwater Horizon oil spill*
- ***Kansas Ecological Forecasting [Langley Research Center]—*** *Utilizing NASA EOS to Assess Drought Extent and Conduct Risk Mapping for the Wetlands of the Cheyenne Bottoms Wildlife Area*
- ***Rwanda Ecological Forecasting II [Langley Research Center]—*** *NASA EOS Monitoring of Long-Term Deforestation and Reforestation Dynamics and Linkages to Agricultural Practices across the Republic of Rwanda for Enhanced Management Tracking*
- ***South Carolina Ecological Forecasting [NSSTC at Marshall Space Flight Center]—*** *Monitoring Wetland Extent in South Carolina using Terra ASTER and HICO data*

Summer

- ***Klamath Ecological Forecasting [Ames Research Center]—*** *Investigating Changing Habitats in the Upper Klamath Lake and the Greater Klamath Basin in California*
- ***Rocky Mountain Ecological Forecasting III [USGS Colorado State University]—*** *Testing Integrative Geospatial Modeling Strategies for Remote Sensing of Coniferous Forests in the Northern Rocky Mountains*
- ***West Africa Ecological Forecasting [Goddard Space Flight Center]—*** *African Forest Disturbance and Agricultural Fire Assessment Web GIS Application using Landsat, MODIS, and AIRS Products in Partnership with the Forestry Research Institute of Ghana, World Resources Institute, and World Bank*
- ***Bangladesh Ecological Forecasting [International Centre for Integrated Mountain Development / NSSTC at Marshall Space Flight Center]—*** *Earth Observation for Natural Resource Assessment and Sustainable Community Based Ecosystem Management for Protected Areas in Bangladesh*
- ***Great Dismal Swamp Ecological Forecasting [Langley Research Center]—*** *Utilizing NASA EOS to Aid the Fish and Wildlife Service in Predicting and Managing the Effects of the Invasive Species Phragmites Australis into the Great Dismal Swamp National Wildlife Refuge*
- ***Myanmar Ecological Forecasting [Langley Research Center]—*** *Utilizing NASA Earth Observations to Monitor, Map and Forecast Mangrove Extent and Deforestation in Myanmar for Enhanced Conservation*
- ***Brazil Ecological Forecasting [University of Georgia]—*** *Utilizing NASA EOS for Conservation Management of the Bearded Capuchin Monkey (Cebus libidinosus) in Northeastern Brazil*
- ***Tennessee-North Carolina Ecological Forecasting [University of Georgia]—*** *Remote Sensing of Air Quality Impacts on Eastern Hemlock Decline by Exotic Hemlock Woolly Adelgid Infestation in Great Smoky Mountains National Park*
- ***Georgia Ecological Forecasting [University of Georgia / NSSTC at Marshall Space Flight Center]—*** *Remote Estimation of Salt Marsh Biophysical Parameters in the Georgia Coast: Model Cal/Val using NASA Sensors to Improve Monitoring and Restoration Efforts by the Georgia Department of Natural Resources*

Fall

- ***Sierra Nevada Ecological Forecasting [Ames Research Center]—*** *Sierra Nevada Decision Support System for Monitoring, Reporting, and Forecasting Ecological Conditions*
- ***Rocky Mountain Ecological Forecasting [USGS Colorado State University]—*** *Mapping post-infestation tree mortality in the Arapaho-Roosevelt National Forest, Colorado for enhanced landscape-scale*
- ***Myanmar Ecological Forecasting II [Goddard Space Flight Center]—*** *Utilizing NASA Earth Observations to Monitor, Map and Analyze Mangrove Forests in Myanmar for Enhanced Conservation*
- ***Cumberland Ecological Forecasting [NSSTC at Marshall Space Flight Center]—*** *Using NASA Earth Observations to Model Representative Species Dispersion in the Cumberland Plateau for Corridor*
- ***Costa Rica Ecological Forecasting [University of Georgia]—*** *Utilizing NASA Earth Observations to prioritize reforestation efforts in the Bellbird Biological Corridor in Costa Rica*
- ***Georgia Ecological Forecasting [University of Georgia]—*** *Remote Estimation of Salt Marsh Biophysical Parameters in the Georgia Coast: Model Cal/Val using NASA Sensors to Improve Monitoring and Restoration Efforts by the Georgia Department of Natural Resources*

Health & Air Quality Projects

Spring

- ***Ethiopia Health and Air Quality [International Research Institute for Climate and Society]—*** *Using MODIS, LANDSAT and DEM to understand better the dynamics of malaria parasite species In Oromia, Ethiopia*
- ***Oregon Health and Air Quality [Langley Research Center]—*** *Utilizing NASA EOS to Assess Effects on Air Quality Caused by Western United States Wildfires*
- ***Appalachian Health and Air Quality II [Stennis Space Center]—*** *Comparison of NASA OMI and MLS Ozone Products with USDA Forest Service Ground-Based Ozone Monitoring Data for USDA Forest Service Air Quality / Forest Management Decision Support*
- ***Virginia Health and Air Quality II [Wise County and City of Norton Clerk of Court's Office]—*** *Monitoring Air Quality in Wise and Russell Counties for Comparison of Coal Burning Technologies and Relating Environmental Impacts*

Summer

- ***Sahel Health and Air Quality [International Research Institute for Climate and Society]—*** *Utilizing New Dust Aerosol Cycle Models to Compute Spatio-Temporal Distribution of Environmental Factors for the World Health Organization to Combate Meningitis in the Sahel*
- ***Sudan Health and Air Quality [International Research Institute for Climate and Society]—*** *Using MODIS, Landsat and TRMM to Evaluate Feasibility of Early Warning Tools for Monitoring Leishmaniasis (Kala Azar) Dynamics in Sudan for Improved Control Strategies*
- ***Southeast Health and Air Quality [University of Georgia / NSSTC at Marshall Space Flight Center]—*** *Infusing NASA Data into U.S. Forest Service and State Decision Support Systems in the Southeast for Assessment of Air Quality by Human and Naturally-Ignited Burns*
- ***Virginia Health and Air Quality III [Wise County and City of Norton Clerk of Court's Office]—*** *Monitoring Air Quality in Wise and Russell Counties for Comparison of Coal Burning Technologies and Relating Environmental Impacts*

Fall

- ***Sudan Health and Air Quality III [International Research Institute for Climate and Society]—*** *Using ALOS-PALSAR, Aqua-AMSR-E, QuikSCAT-SeaWinds, Aqua and Terra-MODIS, and LANDSAT data to understand the dynamics of water bodies in relation to Leishmaniasis (Kala Azar) in Sudan*
- ***Brazil-California Health and Air Quality [Jet Propulsion Laboratory]—*** *Utilizing NASA Earth Observations for Forecasting Dengue Vector-Borne Disease Outbreaks*
- ***Gulf Coast Health and Air Quality [Mobile County Health Department]—*** *Utilizing NASA Earth Observing Resources to initialize a Habitat Suitability Model in order to ascertain Transmission Risk of Chagas Disease along the Gulf Coast*
- ***US Health and Air Quality [Stennis Space Center]—*** *Using NASA Earth Observation Data to Identify Ozone Anomalies Related to Wildfires and Prescribed Burns*

Water Resources Projects

Spring

- ***Yosemite Water Resources [Ames Research Center]—*** *Coupling the NASA-CASA ecosystem model with a hydrologic routing algorithm for improved water management decision-making*
- ***Colorado Water Resources [USGS Colorado State University]—*** *Regional Short- and Long-term Climate Impacts on Northern Rocky Mountains' and Great Plains' Ecosystems*
- ***Great Dismal Swamp Water Resources II [Langley Research Center]—*** *Utilizing NASA Earth Observations to Aid the Fish and Wildlife Service in Managing Hydrology in the Great Dismal Swamp*
- ***Mobile County Water Resources II [Mobile County Health Department]—*** *Characterization of Potential Impact of Road Network Development on Big Creek Watershed and Big Creek Reservoir Water Quality*
- ***Alabama Water Resources II [NSSTC at Marshall Space Flight Center]—*** *Multispectral remote sensing to monitor and assess Alabama fresh water resources*

Water Resources Projects (continued)

Summer

- ***Sierra Nevada Water Resources [Ames Research Center]—*** *Mapping Forest Disturbance Patterns and Water Availability in the Sierra Nevada for United States Forest Service Applications*
- ***Yosemite Water Resources II [Ames Research Center]—*** *Coupling the NASA-CASA Ecosystem Model for Improved Water Management Decision Making*
- ***Colorado Water Resources II [USGS Colorado State University]—*** *Mapping Head Waters and Riparian Ecosystems of the Northern Rocky Mountains*
- ***New England Water Resources [Langley Research Center]—*** *Multispectral Monitoring of New England Freshwater Resources to Assess Turbidity, Algal Blooms and Water Quality for Enhanced Natural Resource Management*

Fall

- ***Colorado Water Resources III [USGS Colorado State University]—*** *Utilizing Landsat and statistical models to map land cover change and vulnerability of critical headwaters of the Northern Rocky Mountains*
- ***Kenya Water Resources [Goddard Space Flight Center]—*** *Utilizing NASA Earth Observations to Understand Phenological Responses to Land Use and Hydrology in the Southern Region of Kenya*
- ***Chile Water Resources [Langley Research Center]—*** *Application of NASA Earth Observations for Assessing Potential Water Availability from Andean Snowpack for Use in Agricultural Water Allocation Planning in the Coquimbo Region of Chile*

Disaster Projects

Spring

- ***Great Lakes Disasters [Great Lakes and St. Lawrence Cities Initiative]—*** *Utilizing NASA EOS to Assess the Onshore Flood Damage from Extreme Rainfall Events in the Duluth and Thunder Bay Cities along the Great Lakes*
- ***West Africa Disasters [Goddard Space Flight Center]—*** *West African Forest Disturbance and Agricultural Fire Assessment Web GIS Application using Landsat-based Algorithms and MODIS Active Fire*
- ***Sacramento Disasters II [Jet Propulsion Laboratory]—*** *NASA Radar Remote Sensing for Levee Health Assessment in Partnership with the US Army Corps of Engineers and the California Department of Water Resources*
- ***Wabash Valley Disasters [Saint Louis University]—*** *Use of DInSAR to monitor zones of stress accumulation deficit over Wabash Valley Seismic Zone for potential geologic hazards through Integrated use of NASA EOS*
- ***Coahuila Disasters [Wise County and City of Norton Clerk of Court's Office]—*** *Employment of NASA EOS for Fire Management and Assessment of Affected Ecosystems in Coahuila, Mexico*

Summer

- ***California Disasters [Jet Propulsion Laboratory]—*** *Utilizing UAVSAR Derived Interferograms to Delineate Fault Boundaries for Improved Earthquake Risk Assessment in California*
- ***California-Mississippi Disasters [Jet Propulsion Laboratory]—*** *Utilizing Spaceborne and Airborne SAR Sensors to Assess Aqueduct, Levee and Road Conditions After Earthquake and Flood Events*
- ***Mexico Disasters II [Wise County and City of Norton Clerk of Court's Office / Tecnológico de Monterrey Campus Saltillo]—*** *Employment of NASA EOS for Fire Management and Assessment of Affected Ecosystems in Coahuila, Mexico*

Fall

- ***US Disasters [Jet Propulsion Laboratory]—*** *Bridging the Gap Between Remote Sensing and GIS for Natural Disaster Damage Assessment: Applications to Hurricane Sandy and L'Aquila Earthquake*

Agriculture Projects

Spring

- ***Uruguay Agriculture [International Research Institute for Climate and Society]—*** *Using NASA Hyperion, LANDSAT and MODIS to Identify Crops in Uruguay for Improving Yield Forecast*

Summer

- ***Uruguay Agriculture II [International Research Institute for Climate and Society]—*** *Using NASA Hyperion, Landsat and MODIS to Identify Crops in Uruguay to Improve Yield Forecast*
- ***Great Plains Agriculture [Langley Research Center]—*** *Monitoring Rangeland Loss due to Changing Precipitation Regimes for Enhanced Range Management in the Great Plains*
- ***Virginia Agriculture [Langley Research Center / The Patrick Henry Building]—*** *Identifying Suitable Growing Conditions with NASA Earth Observations and Model Output for Expansion of Viticulture and Introduction of New Crops in Southside Region of Virginia*
- ***Rwanda Agriculture & Ecological Forecasting [Langley Research Center / Wise County and City of Norton Clerk of Court's Office—*** *Quantifying Population Dynamics and Risk of Soil Degradation in Rwanda by Novel Use of NASA EOS for Resettlement Efforts by the Republic*
- ***Alabama Agriculture [Mobile County Health Department]—*** *An Application of the VIIRS Sensor to Forest Management and Wildfire Mapping*

Fall

- ***Bhutan Agriculture [International Centre for Integrated Mountain Development / NSSTC at Marshall Space Flight Center—*** *Utilizing NASA Earth observations for improved conservation in Bhutan*
- ***Uruguay Agriculture [International Research Institute for Climate and Society]—*** *Using Terra MODIS Land Surface Reflectance, MODIS-Vegetation products and Tropical Rainfall Measuring Mission - Precipitation to Assess Local Scale Drought in Uruguay*
- ***Great Plains Agriculture [Langley Research Center]—*** *Utilizing NASA Earth Observations to Monitor Drought Conditions for Enhancement of Rangeland Management*
- ***Virginia Agriculture [Langley Research Center]—*** *Identifying Suitable Growing Conditions with NASA Earth Observations and Model Output for Expansion of Viticulture*
- ***Alabama Agriculture [NSSTC at Marshall Space Flight Center]—*** *Improving Input Data and Model Evaluation for a NASA data driven Real-Time Coupled Crop-Hydrology Model to Monitor & Manage Agro-Ecosystem Integrity Due to Irrigation Water Withdrawals*
- ***Coahuila Agriculture [Wise County and City of Norton Clerk of Court's Office]—*** *Using Earth Observing Satellites to Characterize Drought Scenarios in Coahuila, Mexico*

Climate Projects

Spring

- ***Nepal Climate II [International Centre for Integrated Mountain Development]—*** *Developing a Climate change vulnerability index for Nepal using NASA EOS data*
- ***Central US Climate [Stennis Space Center]—*** *Determining the Feasibility of Using VIIRS Global Combustion Source Detection Products to Estimate the Regional Contributions of Natural Gas Flaring to U.S. Greenhouse Gas Emissions*

Summer

- ***American Climate II [Stennis Space Center]—*** *Using NASA EOS Data to Estimate National Contributions of Natural Gas Flaring to U.S. Greenhouse Gas Emissions and Ozone Concentrations*

Energy Projects

Summer

- ***Mid-Atlantic Energy [Langley Research Center]—*** *Deriving Solar Energy Production Suitability for the Mid-Atlantic Region from NASA Earth Observations*
- ***Rwanda Energy [Langley Research Center / Wise County and City of Norton Clerk of Court's Office]—*** *Utilizing NASA Earth Observations to Determine Site Suitability for Green Energy Resources in Rwanda*

Fall

- ***Rwanda Energy [Wise County and City of Norton Clerk of Court's Office]—*** *Utilizing NASA Earth Observations to assess the benefits of Green Energy Resources in Rwanda*

Ocean Projects

Summer

- ***South Pacific Oceans [Langley Research Center]—*** *Monitoring and Forecasting the Movement of Floating Volcanic Debris in the Pacific Ocean for Enhanced Maritime Transportation*
- ***Gulf of Mexico Oceans [Stennis Space Center]—*** *Combining Aquarius and MODIS Measurements to Assess Near Shore Salinity Levels in the Northern Gulf of Mexico*

Fall

- ***Texas Oceans [Stennis Space Center]—*** *Enhancing Remote Sensing Capabilities of the Sargassum Early Advisory System (SEAS) Through the Use of NASA EOS and Open Source GIS*

Weather Projects

Spring

- ***New England Weather III [Saint Louis University]—*** *Improved Small-Scale Wind Forecasting Capability: Provide new products that will provide regional-scale and hurricane-scale forecasters new decision support tools*

Cross-Cutting Projects

Summer

- ***Tech Team (VIEW) [Langley Research Center]—*** *Visually Integrated Earth-observation Wall*

Fall

- ***Tech Team (DEVELOPedia) [Langley Research Center]—*** *Creating a Framework Facilitating Meaningful Inter-Team Collaboration*

Attendees of the DEVELOP 2013 Strategic Planning and Leadership Retreat (January 7-11), where many of the ideas for the year began.

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