# NASA DEVELOP 2015 Summer Overview

## Project Overview

**1. Colorado Agriculture II**: Mapping Forest Harvest History Using Landsat Imagery (Fort Collins)
*Objective: Continue and complete the delineation of the location and age of forest harvests occurring between 1987 and 2012 in Landsat scenes covering northern Colorado and southern Wyoming.*

**2. Northwest US Agriculture III**: Assessing Current and Future Plant Hardiness Zones for Apple Production in Washington State using Climate Models and NASA Earth Observations (Langley)
*Objective: Build on the growing degree day maps and chill hour accumulation maps generated by Northwest US Agriculture I and II teams from the fall 2014 and spring 2015 terms. This project will determine plant hardiness zones for apple orchards in Washington State, using similar procedures as the United State Agriculture project from the spring 2014 term.*

**3. Thailand Agriculture**: Monitoring Food Crop Health and Stress Due to Changing Climate for Enriched Agricultural Land Management (Marshall & Wise County)
*Objective: Assess changing climate patterns to improve understanding of environmental variables such as precipitation and temperature, to understand risks and impacts of floods, storms, drought, invasive species, and sea level rise on the agricultural lands.*

**4. Navajo Nation Climate II:** Assessing Climate Change Impacts on Ground Water Availability and Drought Vulnerability in the Navajo Nation Using NASA Earth Observations (Ames)
*Objective: Assess impacts on water resource availability on the Navajo Nation (NN) with climate change using Earth observations (EO) and hydrological modeling techniques. A NN Standard Precipitation Index (SPI), a ground station placement suitability index, and modeled stream flow measurements will be created using various NASA EO water resource related products. Products created by this project will enhance drought monitoring, water infrastructure allocations, and enhance policy decisions regarding water quality.*

**5. Himalaya Disasters II**: Expanding Upon Landslide Identification Product and Hazard Assessment Model Capabilities for Enhanced Landslide Detection in the Koshi River Basin (Goddard)
*Objective: Three complementary activities to better characterize landslide hazards within the Koshi River Basin: 1) Improving global and regional landslide catalogs using a sudden landslide identification product, 2) integrating a dynamic soil moisture or antecedent rainfall product into a landslide hazard assessment model, and 3) develop a regional relationship with ICIMOD to maintain and visualize landslide data and hazard products.*

**6. East Africa Disasters**: Assessing Landslide Characteristics and Developing a Landslide Potential Hazard Map in Rwanda and Uganda Using NASA Earth Observations (Marshall)
*Objective: Assess the characteristics of landslide-prone regions of Rwanda and Uganda by using TRMM, GPM, CHIRPS, SRTM2, and other geospatial datasets such as topography, hydrology, land cover, and soils.*

**7. Georgia Disasters**: Utilizing NASA Earth Observations to Monitor Sinkhole Development and Identify Risk Areas (UGA)
*Objective: Develop a sinkhole inventory map to determine environmental risk to human health, infrastructure, and water supply. Specifically, this project will identify and map sinkholes, analyze the factors influencing the development of sinkholes, and produce an accurate hazard map and a groundwater risk map for Dougherty County, Georgia.*

**8. Alaska Disasters**: Utilizing NASA Earth Observations to Identify Oil Seeps Off the Northern Shore of Alaska (Langley)
*Objective: Create a procedure to identify oil spills in the Arctic and to identify current oil seeps in Northern Alaska.*

**9. Texas Disasters**: Utilizing NASA Earth Observations to Assist the Texas Forest Service in Mapping and Analyzing Fuel Loads and Phenology in Texas Grasslands (Stennis)
*Objective: Use and produce regional geospatial mapping products from MODIS data to depict locations of potential wildfire fuel types, fuel loads, and vegetation phenology for Texas' vegetation types vulnerable to wildfire, especially during drought years.*

**10. Indonesia Disasters**: Creating an Enhanced Methodology for Mapping Burn Scars in Indonesian Forests Using Landsat (IRI)
*Objective: Create a methodology for effectively mapping burn scars in the forests of Indonesia using Landsat by testing a technique of converting Red Green Blue (RGB) colors from Landsat scenes into Hue Saturation Value (HSV) in order to see if it is a more effective procedure for identifying burn scars and to assess carbon emissions and map deforestation in Indonesia.*

**11. California Disasters II**: A New Method for Providing Near-Real-Time Active-Fire and Post-Burn Support to Fire Responders Using Data Products Derived from NASA's Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) (JPL)
*Objective: Explore the viability of UAVSAR-derived polarimetric imagery to provide near-real-time map products to active fire responses as well as post-burn imagery to support fire severity assessments.*

**12. US Disasters II**: Using GRACE-Derived Water and Moisture Products as a Predictive Tool for Fire Response in the Western United States (JPL)
*Objective: Analyze correlations between GRACE Data Assimilated Products (GDAPs) surface soil moisture, root zone soil moisture, and groundwater with NDVI values, fuel moisture data, and MODIS-based fire-severity data to establish the potential predictive capability of GDAPs for directing ground-response efforts during fire seasons and fire outbreaks.*

**13. Southern California Disasters II**: Assessing the Effectiveness of Simulated HyspIRI Data for Use in USDA Forest Service Post-Fire Vegetation Assessment and Decision Support (Stennis)
*Objective: Utilize simulated HyspIRI data (produced from co-located AVIRIS and MASTER imagery) to produce wildfire burn severity and vegetation monitoring products comparable to existing operational USDA Forest Service products, and quantitatively evaluate simulated HyspIRI derived products to investigate if and how HyspIRI will provide improved capabilities beyond current Landsat-derived products.*

**14. Idaho Disasters III**: Using Landsat Earth Observations to Identify Heightened Fire Susceptible Areas Due to Cheatgrass Invasion (BLM-ISU)
*Objective: Explore heightened fire susceptibility by identifying areas of cheatgrass infestation. The results of this study will benefit the broader fire community and extend the data products and technical capabilities of the RECOVER decision support system for use by the Bureau of Land Management and Idaho Department of Lands in southern Idaho.*

**15. Thailand Disasters**: Monitoring Risk and Extent of Flood and Drought for Enhanced Decision Making and Resource Allocation (Goddard)
*Objective: Improve near real-time flood inundation and drought monitoring techniques for Thailand by leveraging a previously created online flood dashboard and incorporating*

*additional land and weather products into an enhanced agricultural drought severity index for Thailand.*

**16. Peru Disasters II**: Identifying and Mapping Flood Prone Regions in the La Libertad Region of Peru using NASA's Earth Observations (Wise)
*Objective: Utilize NASA Earth Observations and mathematical models to produce historic and predictive flood maps for the La Libertad Region in Peru.*

**17. Malawi Disasters II**: Applications of Flood Definitions and NASA Earth Observations to Create a Flood Forecasting Tool Targeting Region-Specific Flood Types (IRI)
*Objective: Create an early warning flood detection and prediction product that will target specifically defined flood types using previously developed flood definitions to assess effectiveness and utility to assist in the prediction of the flood events.*

**18. Southwest US Disasters**: Incorporating Atmospheric Teleconnections and CDRs to Create a Predictive Model of Post-Burnout Flood Risk (NCDC)
*Objective: Incorporate atmospheric teleconnections to create a statistical model which utilize PERSIANN and NDVI Climate Data Records (CDRs) to predict the risk of post-burnout flooding.*

**19. Ethiopia Ecological Forecasting**: Mapping Fire History for Habitat Conservation in Ethiopia's Galama Mountains, using a Time Series of Landsat Data (Fort Collins)
*Objective: Quantify fire occurrence and distribution in the unique, high-altitude shrublands of Ethiopia's Galama Mountains by mapping and modeling burned areas and vegetation health from 1985-2014.*

**20. Maryland Ecological Forecasting**: Utilizing NASA Earth Observations to Monitor and Strengthen the Survivorship of Maryland's Sea Turtles (Goddard)
*Objective: Map water surface temperatures, near shore temperatures, and algal bloom conditions along Maryland's coasts to complete a historical analysis correlating these biophysical parameters to geo-referenced turtle mortality data.*

**21. North Carolina Ecological Forecasting**: Evaluating the Application of NASA Earth Observations to Rapidly Detect Change in Wetland Types at a Regional Scale (Langley)
*Objective: Evaluate how open-source imagery from Landsat 8 and other remote sensing platforms can be applied in a multi-resolution strategy to more rapidly detect and evaluate changes in wetland types at regional (broad landscape) scales.*

**22. Texas-Arizona Ecological Forecasting**: Utilizing NASA Earth Observations to Monitor and Manage Ocelot Habitat Loss (Marshall)
*Objective: Track the change in ocelot habitat from 1980 to the present throughout southeast Texas and south Arizona and determine how urbanization, road development, habitat loss, habitat fragmentation, and other barriers have had an impact.*

**23. Mississippi Ecological Forecasting**: Using NASA Earth Observations to Locate Potential Habitat for the Dusky Gopher Frog (Stennis)
*Objective: Use NASA Earth observation data to locate potential breeding sites suitable for the endangered dusky gopher frog (Lithobates sevosus), a species currently only found in two small ponds within the DeSoto National Forest of Harrison County, Mississippi.*

**24. Ocmulgee Ecological Forecasting**: Utilizing NASA's Earth Observations for Forecasting Land Use Change and Wildlife Disturbances along the Ocmulgee River Corridor (UGA)

*Objective: Analyze the effects of changing conditions on the wildlife and fisheries in the Ocmulgee River corridor with a focus on endangered native species.*

**25. Southeast US Ecological Forecasting**: Utilizing NASA Earth Observations and Proximal Remote Sensing for Mapping the Spatio-temporal Distribution of *Hydrilla* (UGA)
*Objective: Develop a multi-platform approach for mapping the spatial and temporal distribution patterns of Hydrilla sp. sp. in several water bodies in Georgia and Florida.*

**26. Los Angeles Health & Air Quality:** Identifying Urban Emission Patterns in Los Angeles Using *In Situ* Observations from JPL's Megacities Carbon Project, NASA's OCO-2 and Terra satellite, and JAXA's GOSAT (JPL)
*Objective: Provide the California Air Resources Board (CARB) with a survey of emissions data in the Los Angeles Megacity (LAM) region from both top-down and bottom-up approaches. The results from the JPL and Earth Networks in situ observational network will be analyzed alongside remotely sensed data, including NASA's OCO-2 satellite, MOPITT (Terra satellite) and CLARS (Mt. Wilson Observatory), to test the hypothesis of whether fossil fuel greenhouse gas (GHG) emissions can be observed from space.*

**27. Arizona Health & Air Quality**: Enhancing Extreme Heat Intervention and Preparedness Activities in Maricopa County, Arizona with NASA Earth Observations (Langley)
*Objective: Investigate how information regarding spatial variability in heat exposure in Maricopa County, Arizona, can improve extreme heat adaptation strategies. The public health benefits of the regional heat warning system and network of cooling centers could be improved with a more targeted approach toward identifying the most at-risk areas and populations.*

**28. Brazil-Venezuela Health & Air Quality**: Earth Observation Identification of Rural Village Sites along the Brazil and Venezuela Border for Targeted River Blindness Disease Eradication (Goddard, Marshall & Wise County)
*Objective: Assist the Carter Center in its mission to eradicate onchocerciasis (river blindness disease) in the Americas by the end of 2015. Through NASA and commercial remote sensing imagery, this project would create a methodology for identifying remote villages of the Yanomami people to support targeted eradication efforts.*

**29. Mexico Water Resources**: A Geospatial Evaluation of Drivers, Occurrences, and Distribution of Hypoxic Events within the Grijalva-Usumancita River Delta System and the Southern Coast of the Gulf of Mexico (Ames)
*Objective: Use NASA Earth observations to assess the drivers leading to hypoxic events in the Grijalva-Usumacinta delta system and detect hypoxia occurrences and distribution off the southern coast of the Gulf of Mexico.*

**30. Sierra Nevada Water Resources**: Understanding the Effects of Wildfire Severity in Relation to Snowpack in the Sierra Nevada (Ames)
*Objective: Investigate changes in snowpack in specific areas where wildfire is managed for resource benefit and areas where wildfire has been suppressed and subjected to large high-severity burns. Quantifying these changes will enable the USDA Forest Service and other forest managers to better understand the effects of wildfire to snowmelt timing during spring and summer months.*

**31. New Mexico Water Resources**: Investigating Rangeland Conditions in New Mexico Using MODIS-Derived Evapotranspiration Products (JPL)
*Objective: Automate MODIS data acquisition for, and to streamline evapotranspiration product generation and delivery to, the New Mexico Office of the State Engineer. These products will*

*then be disseminated to decision-makers in the ranching, drought assessment and fire-response communities in the Eastern Plains Region of New Mexico through an easily accessed online interface.*

**32. Colorado Water Resources II**: Utilizing NASA Earth Observations to Identify Changes in Contaminate Sources after the Colorado Floods of September 2013 (Langley)
*Objective: Identify any changes in contaminant sources, such as organic carbons, nitrates, phosphates, and uranium, as a result of the 2013 Colorado flood event.*

**33. Texas Water Resources**: Utilizing NASA Earth Observations to Monitor Drought Severity in Texas for Wildfire Mitigation Support (Langley)
*Objective: Monitor drought severity in Texas and support the Texas Forest Service to use the previously developed Drought Severity Index. This project will be conducted in parallel with the Stennis DEVELOP Texas Disasters project which will focus on fuel type and loading monitoring.*

**34. Coastal Texas Water Resources**: Utilizing NASA Earth Observations to Assess Estuary Health and Enhance Management of Water Resources in Coastal Texas through Land Cover and Precipitation Mapping (Mobile)
*Objective: Conduct a land cover classification and precipitation analysis of Laguna Madre in Padre Island National Seashore to analyze the suspected correlation between the increase in mesquite trees in the area and the increase in salinity of the lagoon.*

**35. Pacific Water Resources**: Using NOAA CDRs and Satellite Data to Connect Atmospheric Teleconnections with Precipitation across Hawaii and the U.S. Affiliated Pacific Islands (USAPI) (NCDC)
*Objective: Examine the influence of specific phases of the El Niño Southern Oscillation (ENSO) on long-term precipitation averages for the Exclusive Economic Zones (EEZ's) encompassing American Samoa, Guam, the Republic of the Marshall Islands (RMI), the Federated States of Micronesia (FSM), the Commonwealth of the Northern Mariana Islands (CNMI), the Republic of Palau, and Hawaii. The goal is to identify long-term rainfall patterns during specific phases of ENSO for each of the USAPI.*

**36. Costa Rica Water Resources II**: Utilizing NASA Earth Observations to Develop a Comprehensive Water Budget for the Arenal-Tempisque Irrigation District of Costa Rica (UGA)
*Objective: Provide Costa Rica's National Service of Underground Water, Irrigation, and Drainage with datasets and tools derived from NASA Earth observations to help guide their decision-making process throughout their water resource management plan in the Arenal-Tempisque Irrigation District.*

**37. Virginia Water Resources**: Monitoring Harmful Algal Blooms through NASA Earth Observations in the James River for Improved Water Management (PHB)
*Objective: Explore the use of Floating Algal Index (FAI) and Normalized Difference Turbidity Index (NDTI) to augment current water quality monitoring practices in the James River.*

**38. CALIPSO Cross-Cutting**: Improving CALIPSO Air Parcel Modeling and Database to Improve Smoke Plume Characteristic and Source Identification (Langley)
*Objective: Construct a database and joined with an air parcel trajectory model to help improve current and future research efforts in identifying smoke plume.*

## Partner Overview (84)
### Local Partners (5)
- Albemarle-Pamlico National Estuary Partnership (APNEP; Partner and Boundary Organization, POC: Jim Hawhee, Policy and Engagement Manager, Dean Carpenter, Program Scientist)
- City of Albany and Dougherty County Planning and Development Services (End-User/Partner, POC: Randy Weathersby, GIS Manager for the City of Albany and member of the Southwest Georgia Water Resources Task Force)
- Denver Water (Partner/End-User, POC: Linda Rosales (Water Quality Specialist), Diego Portillo (GIS Specialist), and Sheila Pelczarksi (Remote Sensing Specialist))
- Henry County Water Authority (End-user/Partner, POC: Ken Presley, Assistant Reservoir Manager)
- Southwest Georgia Water Resources Task Force (End-User, POC: Randy Weathersby, GIS Manager for the City of Albany and member of the Southwest Georgia Water Resources Task Force)

### State Partners (13)
- Arizona Department of Health Services (ADHS) (End-user/Partner/Boundary Organization, POC: Matthew Roach, Climate and Health Program Manager)
- California Air Resources Board (End-User/Collaborator, POC: Abhilash Vijayan, Manager, Greenhouse Gas Technology & Field Testing Section)
- California Department of Forestry and Fire Protection (CAL FIRE) (End-User, POC: Jana Luis, Division Chief, Predictive Services)
- Colorado State Forest Service (End-User, POC: John Twitchell, Steamboat District Forester)
- Georgia Department of Natural Resources (Partner/End-User, POC: Dan Forster, Director of Wildlife Resources Division; Thomas Litts, Special Project Operations Manager)
- Idaho Department of Lands, Boise Field Office (End-User, POCs: Dixie Booker-Lair, GIS Analyst and Robin Dunn, GIS Specialist)
- Maryland Department of Natural Resources (MDDNR): Marine Mammal and Sea Turtle Stranding Program (End User/Partner, POCs: Amanda Johnson, Program Coordinator; Dr. Cindy Driscoll, Director of the Fish & Wildlife Health Program at the MDDNR)
- New Mexico Office of the State Engineer (NMOSE) (End-User/Boundary Organization, POC: John W. Longworth, P.E., Chief of Water Use and Conservation Bureau)
- Texas Department of Transportation (Collaborator/End-User, POC: Dr. John Young, Jr., Environmental Specialist)
- Texas Forest Service (Boundary Organization and End-User, POC: Curt Stripling, GIS Systems Coordinator; Tom Spencer, Department Head – Predictive Services)
- Texas Forest Service (TFS) (End-User, POC: Tom Spencer, Department Head, Predictive Services & Curt Stripling, Geospatial Systems Coordinator, Predictive Services)
- Virginia Department of Environmental Quality (VDH) (End-User, POC: Arthur Butt, Office of Water Monitoring and Assessment)
- Virginia HAB Task Force

### Regional Partner (1)
- Bioenergy Alliance Network of the Rockies (BANR) (End-User, Partner, and Boundary Organization, POC: Anthony Vorster, Feedstock Supply Team Task Manager)

### Federal Partners (23)
- Bureau of Land Management, Idaho State Office and Cooperating District Offices (End-User, POCs: Mike Kuyper, Natural Resource Specialist)
- NASA Goddard Space Flight Center (POC: Dr. Jim Tucker, Physical Scientist)
- NASA HyspIRI Science Team, JPL (Partner, POC: Dr. Robert Green, Science Lead)

- NASA RECOVER Project (Partner, NASA Goddard POCs: John Schnase, Mark Carroll; Partner/ Boundary Organization, Idaho State University POC: Keith Weber)
- NASA SERVIR Coordination Office at MSFC (Collaborator/Boundary Organization/End-user, POC: Eric Anderson, Research Associate)
- NASA Terrestrial Hydrology Program at Goddard Space Flight Center (Collaborator, POC: Dr. Matt Rodell, Laboratory Chief of Hydrological Sciences)
- National Park Service, Padre Island (End-user & Collaborator, POC: Joe Meiman, Hydrologist)
- National Park Service, Yosemite National Park (End-User, POC: Jim Roche, Yosemite National Park Hydrologist)
- NOAA Regional Climate Services Director (RCSD) (Partner, POC: John Marra, Pacific Regional Director)
- NWS Pacific ENSO Application Center (PEAC) (Boundary Organization, POC: Carl Noblitt, NOAA Corp Communication Officer)
- NASA SERVIR Applied Sciences Team at NASA GSFC (Collaborator/End-user, POC: Dr. Dalia Kirschbaum, GPM Applications Scientist)
- Tactical Fire Remote Sensing Advisory Committee (TFRSAC) (Collaborator/Boundary Organization, POC: Everett Hinkley, National Remote Sensing Program Manager)
- United States Coast Guard (End user, POC: MST1 Justin Hoffer, CG-MER-1)
- United States Coast Guard, Auxiliary University Programs (USCG AUP) (Collaborator/Boundary Organication, POC: Dr. David Kellogg, Internship Coordinator)
- US Army Corps of Engineers (Boundary Organization, POC: Danny Hartley, Wildlife Biologist)
- US Fish and Wildlife Service (Collaborator/End-User, POC: Linda LaClaire, Wildlife Biologist)
- USDA Agriculture Research Service (Partner, POC: Dr. Michael Glenn)
- USDA Forest Service (End-User, POC: Dr. Marc Meyer, USDA Forest Service Southern Sierra Nevada Province Ecologist)
- USDA Forest Service, Eastern Forest Environmental Threat Assessment Center [EFETAC] (End-User, POC: Dr. Steve Norman, Research Ecologist)
- USDA Forest Service, ForWarn (Collaborator, POC: William "Bill" Hargrove, Research Ecologist)
- USDA Forest Service, Remote Sensing Applications Center (RSAC) (Collaborator/End-User, POC: Brad Quayle, RS/GIS Specialist & Tony Guay, Remote Sensing Specialist)
- USDA Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Partner/Boundary Organization, POC: Dr. Robert Keane, Research Ecologist)
- USDA Forest Service: DeSoto Ranger District (Boundary Organization, POC: Ed Moody, Wildlife Biologist)

**International Partner (23)**
- Asian Disaster Preparedness Center / SERVIR Mekong (Collaborator/Boundary Organization, POCs: Pete Cutter, Science & Data Co-Lead & Bill Crosson, Hub Science Coordinator)
- Bogor Agricultural University (IPB) (Partner, POC: Rizaldi Boer, Research Scientist)
- Center for International Forestry Research (CIFOR) (Boundary Organization, POC: Louis Verchot, Research Director, Senior Scientist)
- Centro del Cambio Global y la Sustentabilidad en el Sureste (CCGSS) (End-User, POC: Dr. Mariana Elvira Callejas Jiménez, Research Scientist )
- Centro Nacional de Datos Oceanograficos (CENDO) (End-User, POC: Dr. Carlos Torres, Director)
- Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) (Collaborator, End-User, POCs: Dr. Rainer Ressl, General Director of Geomathics and Dr. Sergio Cerdeira,Marine Monitoring Coordinator)

- Consorcio de Instituciones de Investigación Marina del Golfo de México y del Caribe (CiiMar-GoMC) (End-User, POCs: Dr. Porfirio Alvarez Torres, Executive Secretary and Dr. José Manuel Piña Gutiérrez, President of CiiMar-GoMC and Rector of the University Juarez Tabasco)
- Costa Rican Embassy to the United States (Partner, POC: HE Ambassador Roman Macaya and Alejandra Solano, Minister Counselor)
- Instituto Nacional de Defensa Civil del Peru (INDECI) (End-User, POC: Miguel Angel Saldarriaga Jiron , Direccion Desconcentrada de INDECI La Libertad)
- International Centre for Integrated Mountain Development [ICIMOD] (Collaborator, End-user, Boundary Organization. POCs: Basanta Shrestha (Director Strategic Cooperation), Birendra Bajracharya (Regional Programme Manager), Manchiraju Sri Ramachandra Murthy (Theme Leader for <u>Geospatial Solutions)</u>, Deo Raj Gurung (Remote Sensing Specialist), Sebastian Wesselman (Senior Geospatial Capacity Building Specialist)
- National Safety Council of Thailand (End-User, POC: TBD)
- Red Cross / Red Crescent Climate Centre (RCRCCC) (Boundary Organization, POC: Erin Coughlan, Senior Climate Specialist)
- Red Cross: Malawi and Regional Office for southern Africa (End-Users, POC: Hastings Kandaya, Director of Programmes and Development)
- Regional Centre for Mapping of Resources for Development (RCMRD) (Collaborator/End-User, POC: Denis Macharia, SERVIR-Eastern & Southern Africa Disaster Lead)
- Royal Thai Embassy (Collaborator/Boundary Organization, POC: Bunyakiat Raksaphaeng, Office of Science & Technology)
- Secretaría de Marina (SEMAR) (Collaborator, POC: Captain Joel Pensamiento, Data Management Subdirector)
- Secretaria de Medio Ambiente y Recusos Naturales (SEMARNAT) (Collaborator/Boundary Organization/End-User, POC: Dr. Arturo Caso, Area Director)
- SENARA (End-User/Boundary Organization, POC: Javier Artiñano Guzmán, Agronomist for the Arenal-Tempisque Irrigation District)
- Thai Department of Disaster Prevention and Mitigation (End-User, POC: TBD)
- Thailand's Ministry of Agriculture and Cooperatives, Rice Department – Bureau of Rice Research and Development (End-User, POC: TBD)
- Universidad Autónoma de Baja California (UABC) (Collaborator, POC: Dr. Eduardo Santamaria del Angel, Professor and Researcher)
- Universidad Juarez Autonoma De Tabasco (UJAT) (Collaborator, POC: Rosa Martha Padron) Biological Sciences Director)
- University of Georgia Costa Rica (Partner, POC: Dr. Quint Newcomer, Director of the University of Georgia Costa Rica Campus)

**Private Company Partners (3)**
- Ben Delatour Scout Ranch (End-User, POC: Robert Sturtevant, Conservation Committee Chair)
- ERT, Inc. (Partner, POC: Michael Kruk, Pacific Water Resources Product Development Lead)
- Georgia Power (End-user/Partner, POC: Anthony Dodd, Environmental Specialist)

**Tribal Partners (2)**
- Navajo Nation Department of Water Resources (NNDWR), Water Management Branch (End-user, POC: Jason John, Branch Director, Robert Kirk and Teresa Showa, Principal Hydrologists, and Maurice Upshaw, Geographic Information System Supervisor)
- Navajo Technical University (End-user, POC: Ramsey Seweingyawwa, Geospatial Engineering Technology Lab Lead)

**NGO Partners (9)**
- Carter Center (End-User, POC: Dr. Frank Richards, Director, River Blindness Elimination Program)
- J.W. Jones Ecological Research Center (Partner, POC: Dr. Stephen W. Golladay, Associate Scientist)
- National Parks Conservation Association (Potential End-User, POC: Dr. Chris Watson, Senior Program Manager)
- Pittsburgh Zoo & PPG Aquarium (Collaborator/Boundary Organization, POC: Ken Kaemmerer, Ocelot SSP Chair & Dr. Josh Gaspard, Director of Science and Conservation)
- South Texas Refuge Complex (Collaborator/End-User, POC: Mitch Sternberg, Zone Biologist-South Texas Gulf Coast)
- The Denver Zoo (Collaborator/End-User, POC: Nanette Bragin, GIS Conservation Biologist)
- The Murulle Foundation (TMF) (End-User, Partner, and Boundary Organization, POC: Nicholas Young, Secretary)
- The Nature Conservancy (Collaborator/End-User, POC: Jim Lee, Biologist)
- Water for People (Boundary Organization, End-User, POC: Mark Duey, Head of Program Quality, and Francisco Soto, Director for Peru)

**Academic Partners (5)**
- Arizona State University, Center for Policy Informatics (CPI) (Partner POC: Erik W. Johnston, Associate Professor)
- Arizona State University, Environmental Remote Sensing and Informatics Lab (ERSL) (Partner, POC: Billie L. Turner II, Professor)
- Colorado State University, Natural Resource Ecology Laboratory (NREL) (End-User, Partner), POC: Nicholas Young, Research Associate)
- Texas A&M University-Kingsville, Caesar Klegerg Wildlife Research Institute (Collaborator/End-User/Boundary Organization, POC: Michael Tewes, Frank D. Yturria Endowed Chair in Wild Cat Studies and Regents Professor)
- Virginia Institute of Marine Science (VIMS) (Collaborator, POC: Dr. Juliette Smith, Aquatic Health Science Lab)

**Study Area Overview**

<u>Domestic</u> *(50 states + American Samoa)*

- All 48 contiguous states
- Alaska
- Arizona (4)
- California (5)
- Colorado (2)
- Florida
- Georgia (3)
- Hawaii
- Idaho
- Louisiana
- Maryland
- Mississippi
- New Mexico (3)
- North Carolina
- Texas (5)
- Utah
- Virginia
- Washington
- Wyoming
- American Samoa

<u>International</u> *(15 countries + USA + Artic)*

- Arctic
- Brazil
- Commonwealth of the Northern Mariana Islands
- Costa Rica
- Ethiopia
- Federated States of Micronesia
- Indonesia
- Malawi
- Mexico
- Nepal
- Peru
- Republic of the Marshall Islands
- Rwanda
- Thailand (2)
- Uganda
- Venezuela