DEVELOP Research Meeting

NASA RECOVER
2014 Science Team Meeting
October 20-24, 2014
Idaho State University, Pocatello, ID
Agenda
(times approximate)

- 1:30 pm Opening remarks
  - Introductions
  - What is RECOVER?
  - What is DEVELOP
  - How does DEVELOP relate to RECOVER
- 2:15 pm Overview of current DEVELOP research
Agenda (cont’d)

- 2:30 pm Discussion:
  - Current research direction
  - Ideas for future research that can aid in your management efforts
- 3:45 pm Other items
Introductions
What is RECOVER?

- RECOVER: Rehabilitation Capability Convergence for Ecosystem Recovery
- NASA Applied Sciences Program sponsored project
What is RECOVER?

- Customer-driven, Customer-centric*
- Decision Support System (DSS)
  - Rapid assembly of site-specific data
  - Delivered in customized GIS analysis environment
  - Wildfire focus

* Our “customer” is the USDI BLM, Idaho Dept. of Lands, and other wildfire management agencies (National Park Service, USFS, etc.)
RECOVER Products

RECOVER client web map

RECOVER real-time app
RECOVER

- Is not a research project
- Instead, RECOVER brings together the best available data as web services within a single browser-based site
DEVELOP
NATIONAL PROGRAM

Science Serving Society
October 23rd, 2014
The Applied Sciences Program (ASP) serves as a bridge between the data and knowledge generated by NASA Earth Science and the information and decision-making needs of public and private organizations. The goal of the program is to discover and demonstrate innovative uses and practical benefits of NASA Earth science data, scientific knowledge, and technology.

ASP is organized thematically around 9 application areas and 4 capacity building programs that aim to improve domestic and international skills and capabilities in the use of NASA Earth science.

Applied Sciences Program Website: www.nasa.gov/applied-sciences
Applied Sciences’ Capacity Building

Participating in Interagency & Global Capacity Building Activities

**SERVIR Coordination Office (MSFC):** Building international capacity with hubs in East Africa, Hindu Kush-Himalaya, Mesoamerica

**Gulf of Mexico Initiative, GOMI (SSC):** Building Gulf region’s capacity for local issues

**Applied Remote Sensing Training, ARSET (GSFC):** Online and hands-on basic/advanced training to build domestic skills

**DEVELOP (LaRC National Office):** Dual workforce/local government capacity building using collaborative feasibility projects
DEVELOP is part of NASA’s Applied Sciences Program, addresses environmental and public policy issues by conducting interdisciplinary feasibility 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. With the competitive nature and growing societal role of science and technology in today’s global workplace, DEVELOP is fostering an adept corps of tomorrow’s scientists and leaders.
DEVELOP’s Mission, Vision & Core Values

**MISSION**

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

**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.

**INNOVATION**

Generate new and creative Earth science applications to meet societal needs by utilizing existing technologies

**SERVICE**

Devote ourselves to the success of our people and the communities we serve

**INTEGRITY**

Define ourselves by truth, honor, character, and ethical conduct

**PASSION**

Pursue all endeavors with energy, excitement, and enthusiasm

**PROFESSIONALISM**

Maintain a high level of excellence and respect in work, actions, and appearance

**STEWARDSHIP**

Utilize resources and talents to benefit society and the environment

**SCHOLARSHIP**

Foster an organizational culture where continued learning is a priority

**COLLABORATION**

Promote teamwork, open communication, and shared resources
DEVELOP Locations

Federal Locations
- NASA Ames Research Center – Moffett Field, CA
- NASA Goddard Space Flight Center – Greenbelt, MD
- NASA Jet Propulsion Laboratory – Pasadena, CA
- NASA Langley Research Center – Hampton, VA
- NASA Marshall Space Flight Center at NSSTC – Huntsville, AL
- NASA Stennis Space Center – Stennis, MS
- USGS at Colorado State University – Fort Collins, CO
- NOAA National Climatic Data Center – Asheville, NC

Regional Locations
- International Research Institute – Palisades, NY
- Mobile County Health Department – Mobile, AL
- Patrick Henry Building – Richmond, VA
- University of Georgia – Athens, GA
- Wise County Clerk of Court’s Office – Wise, VA

Additional Project Activity
- ICIMOD – Kathmandu, Nepal
- GIS TReC – Pocatello, ID
Dual-Capacity Building

Participants
Young Professionals, Students & Transitioning Professionals

Scientific/Professional Development:
• Experience using NASA Earth observations
• GIS and remote sensing
• Working in a group environment
• Management and leadership skills

Personal Development:
• Presentation and communication skills
• Personality typing and working with diverse groups (How NASA Builds Teams)

Professional Networking:
• NASA scientists and managers
• Partner organizations
• Peers – teams, center, and national

End-User Organizations
Local, State, Regional, Federal, Academic, International, and NGOs

• Introduction to new methods to augment current practices: cost-saving & time-saving
• Enhanced decision support through use of NASA Earth observations
• Increased exposure to NASA Earth Science technologies and capabilities
• Introduction to NASA’s Applied Sciences Program and its contributions to society
• Opportunities for networking with the NASA community
Participant Eligibility

- Age 18+ with a minimum GPA of 3.0 GPA
- Current students, recent graduates, early career professionals, transitioning career professionals, US Military service members & veterans
- Interdisciplinary backgrounds (majority from STEM fields), no experience is required but a strong interest in GIS, remote sensing, and science is important
- US Citizens & Foreign Nationals*

* US citizenship required to apply to DEVELOP locations at NASA Centers. Foreign nationals must be currently enrolled or recently graduated an accredited U.S. school. Acceptances are conditional upon proof of a visa or approved CPT/OPT that will allow them to legally work within the U.S.

Three 10-week terms per year
Spring, Summer, and Fall
Participants must reapply each term
Focus on the utilization of **NASA Earth observations**

Highlight the **capabilities** of NASA satellite and airborne Earth remote sensing science

Address **community concerns** relating to real-world environmental issues

Align with at least one of the nine NASA Applied Sciences Program’s **National Application Areas**

Partner with organizations who can **benefit** from using NASA Earth observations to **enhance decision making**

Meet partner needs by **providing decision support tools**

Research is conducted by teams with **diverse backgrounds**

Science advisors and mentors from NASA and partner organizations provide **scientific guidance**
Environmental Forecasting
- Arizona Eco Forecasting
- Coastal Colombia Eco Forecasting II
- Colombia Eco Forecasting II
- Cumberland Eco Forecasting

Disasters
- Andes Mountains Disasters II
- Idaho Disasters
- Pakistan Disasters
- Southeast Asia Disasters III
- Southern US Disasters

Water Resources
- Coastal Mid-Atlantic Water Resources II
- Georgia Water Resources II
- Mississippi Water Resources (two projects)
- Peru Water Resources II
- Western US Water Resources

Health and Air Quality
- East Africa Health & Air Quality III
- Zanzibar Health & Air Quality

Energy
- Appalachia Energy II

Climate
- California Climate II
- Great Basin Climate II
- Great Lakes Climate

Agriculture
- Northwest US Agriculture
- Virginia Agriculture

Tech Teams
- DEVELOPedia
- DEVELOP Website
- GEO AIP-7 App Development
## Common Majors
- Geography
- Environmental Science
- Computer Science
- Remote Sensing
- GIS
- Biology
- Engineering
- Chemistry
- Meteorology
- Physics
- Accounting
- Economics
- Mathematics
- Public Policy
- Communications

## Commonly Used Software & Programming Languages
- Esri ArcGIS
- ERDAS IMAGINE
- ENVI/IDL
- Python
- MATLAB
- R
- Microsoft Office Suite

### Spring Term 2015
- January 26th – April 3rd
- Apply Online:
- September 29th – November 7th

### Summer Term 2015
- June 1st – August 7th
- Apply Online:
- January 19th – February 27th
Thank You

DEVELOP National Program

http://develop.larc.nasa.gov/
http://apply-develop.larc.nasa.gov/
How does DEVELOP relate to RECOVER?

- You may have already guessed it…
  - We are hoping DEVELOP research will produce data that can be included* in RECOVER to improve the DSS

* DEVELOP research results will be broadly available and not restricted to use by RECOVER only
Idaho Disasters

Using NASA Earth Observations to Create a Database and Determine Regional and Temporal Wildfire Susceptibility in Idaho Savannahs

- Kiersten Newtoff (University of North Carolina Wilmington)
- Katy Bradford (Montgomery College)
- Jeff May (Idaho State University)
- Eric Smith (Idaho State University)
How can we aid in combating wildfires?

Fire susceptibility
Can we predict a “bad fire year” months in advance?
Objectives

1. To investigate relationships between remote sensing parameters and the total number of fires in a year.

2. To create a database and map set of fires and remote sensing parameters to be integrated into RECOVER.
Study Area

**Scrub/Shrubland** | **> 13 mil acres**

**Herbaceous/Grassland** | **> 3 mil acres**
Regional Analyses

- Fine-scale

Can we identify specific areas as being more susceptible to fire?
Methodology – Remote Sensing Parameters

Used the **Normalized Difference Vegetation Index.**
- 250m resolution, 16-day composites
Methodology – Regional Analysis

- Median precipitation year 2013
- Identified fires >5000 acres and in savannas
- NDVI averaged across polygon between Mar - Aug
Results – Regional Analysis

![Graph showing NDVI values over time for different locations and conditions.](image)

- **NDVI** values from March 21 to August 18, with lines indicating average control (AVG Control) and average burn (AVG Burn).
- Locations and dates represented include 4100C, 4194C, 4313C, 4100, 4194, 4313, 4161C, 4210C, and 4161, 4210.

Note: The graph visualizes the impact of burning on NDVI values, with a peak before the burn and a gradual decrease post-burn.
Regional Analyses

- **No difference** between smaller regions
- Could be due to similar vegetation
- Maybe control areas susceptible too, but no ignition
Temporal Analyses

- Broad-scale

- Can we identify if ecosystems are more susceptible to fire?
TERRA MODIS-16 day composite NDVI (MOD13Q1) products were obtained for 2001 – 2013. Images were analyzed across the hydrologic water year (Apr. 6 – Sept. 29). Zonal statistics calculated using ArcMap Spatial Analyst. Phenology Metrics were calculated. Metrics quantitatively describe fire and correlations investigated to determine relationship with annual number of fires.
Results – MODIS NDVI

- Annual NDVI values across hydrologic water year (April 6\textsuperscript{st} – Sept. 29)

![Annual NDVI Trends](image)

*2013 Sept. NDVI not included
Surface Temperature

- 8-day composites
- 1 km resolution
Methodology - Surface Temperature

Surface Temperature in Grasslands

- C

2000 - 2014
Results - Surface Temperature

$R^2 = 0.1191$

$R^2 = 0.0505$

$R^2 = 0.0042$

Number of Grassland Fires vs. Surface Temp
Methodology - Precipitation

- U.S.B.R – AgriMet
  - Excellent data availability
  - Limited network (relatively few in study area)
  - Discrete data (continuous is ideal)
  - Interpolation Not an Option (Precip. Is not continuous)
Methodology - Precipitation

- PRISM
- The National Center of Atmospheric Research (National Science Foundation) - Boulder CO.
Results – Precipitation

PRISM Historic Precipitation
During Hydrologic Water Year (mm)
Questions?
Questions?
Other Items?