



# DEVELOP Research Meeting

NASA RECOVER  
2014 Science Team Meeting  
October 20-24, 2014  
Idaho State University, Pocatello, ID

# Agenda

(times approximate)

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- 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)

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



# Introductions

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# What is RECOVER?

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



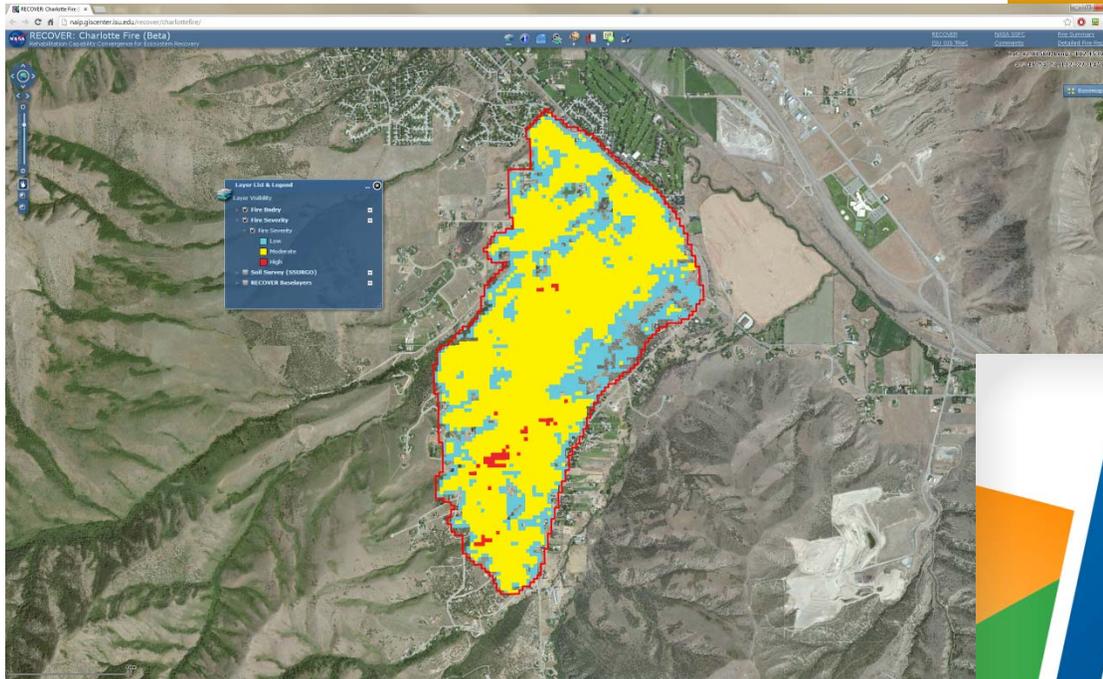
# What is RECOVER?

- 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

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

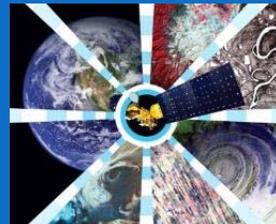
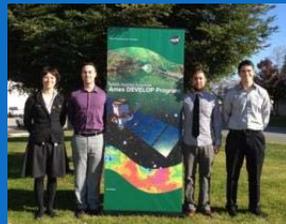


# DEVELOP

## NATIONAL PROGRAM

*Science Serving Society*

*October 23<sup>rd</sup>, 2014*



# NASA Applied Sciences Program



## “Discovering Innovative & Practical Applications of NASA Earth Science”

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](http://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



# What is DEVELOP?



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

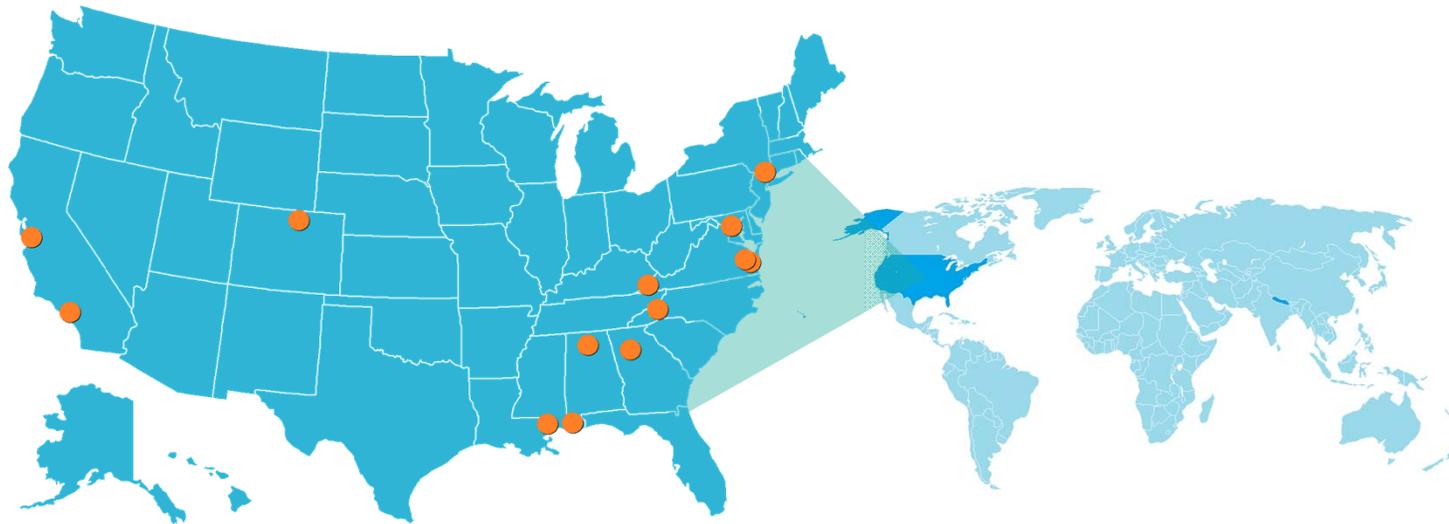
### SCHOLARSHIP

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 TRc – 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

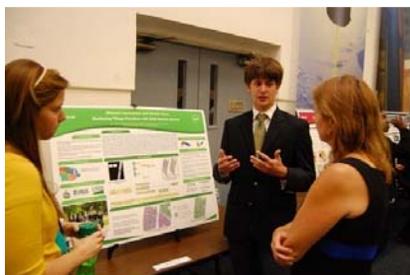
*Local, State, Regional, Federal, Academic, International, and NGOs*

- 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*



# Project Characteristics

- ▶ 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**





# Fall 2014 Portfolio

## Ecological 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

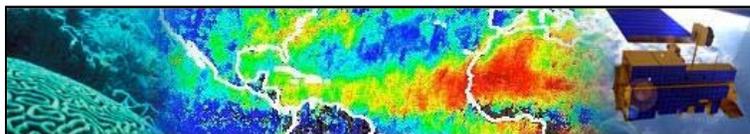
DEVELOPedia  
DEVELOP Website  
GEO AIP-7 App Development



# Participant Opportunities

## Common Majors

- ▶ Geography
- ▶ Environmental Science
- ▶ Computer Science
- ▶ Remote Sensing
- ▶ GIS
- ▶ Biology
- ▶ Engineering
- ▶ Chemistry
- ▶ Meteorology
- ▶ Physics
- ▶ Accounting
- ▶ Economics
- ▶ Mathematics
- ▶ Public Policy
- ▶ Communications



## Spring Term 2015

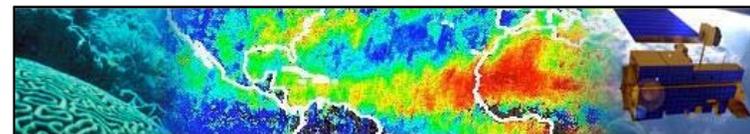
January 26<sup>th</sup> – April 3<sup>rd</sup>

**Apply Online:**

September 29<sup>th</sup> – November 7<sup>th</sup>

## Commonly Used Software & Programming Languages

- ▶ Esri ArcGIS
- ▶ ERDAS IMAGINE
- ▶ ENVI/IDL
- ▶ Python
- ▶ MATLAB
- ▶ R
- ▶ Microsoft Office Suite



## Summer Term 2015

June 1<sup>st</sup> – August 7<sup>th</sup>

**Apply Online:**

January 19<sup>th</sup> – February 27<sup>th</sup>



# THANK YOU

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**DEVELOP National Program**

<http://develop.larc.nasa.gov/>

<http://apply-develop.larc.nasa.gov/>

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# How does DEVELOP relate to RECOVER?

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- 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

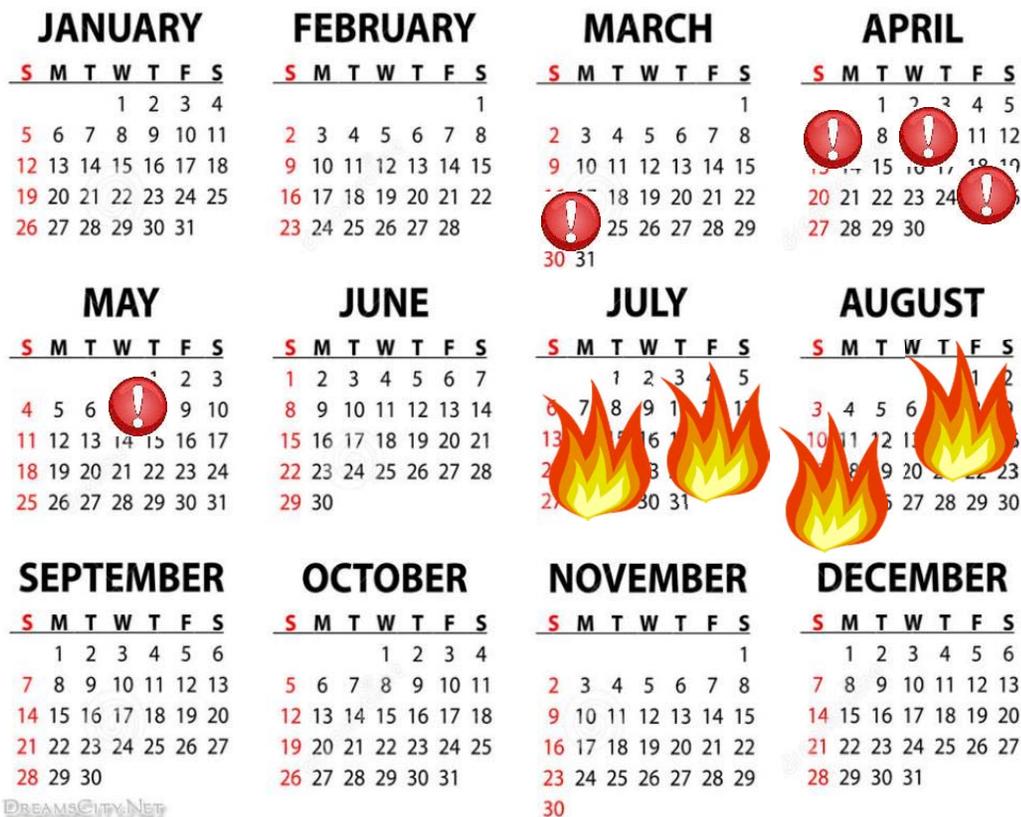
*Using NASA Earth Observations to Create a Database  
and Determine Regional and Temporal Wildfire  
Susceptibility in Idaho Savannahs*

- 
- ▶ 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.

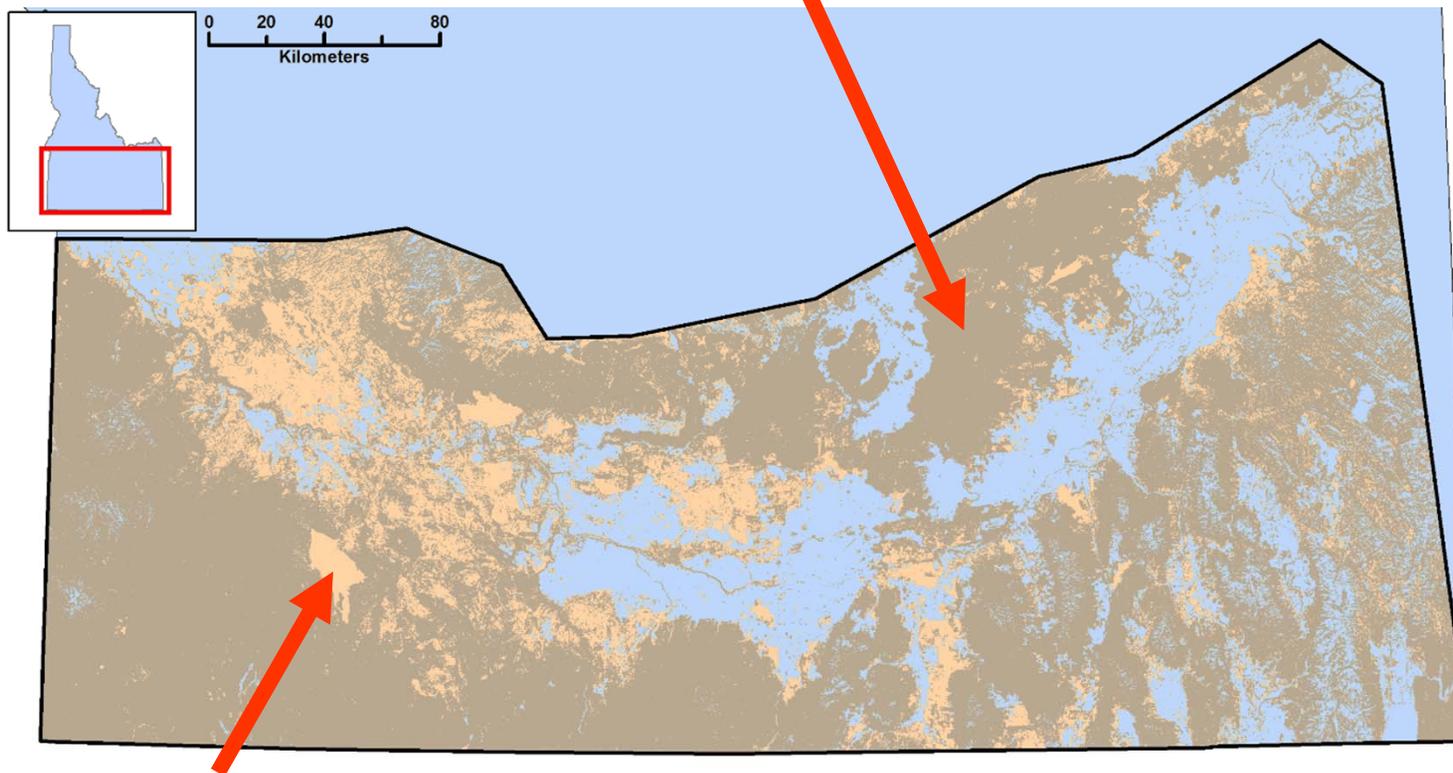


2. To create a **database** and **map set** of fires and remote sensing parameters to be integrated into RECOVER.



# Study Area

Scrub/Shrubland | > 13 mil acres



Herbaceous/Grassland | > 3 mil acres

# Project Overview



- ▶ Regional Analyses
  - ▶ Fine-scale
  - ▶ Can we identify **specific areas** as being more susceptible to fire?

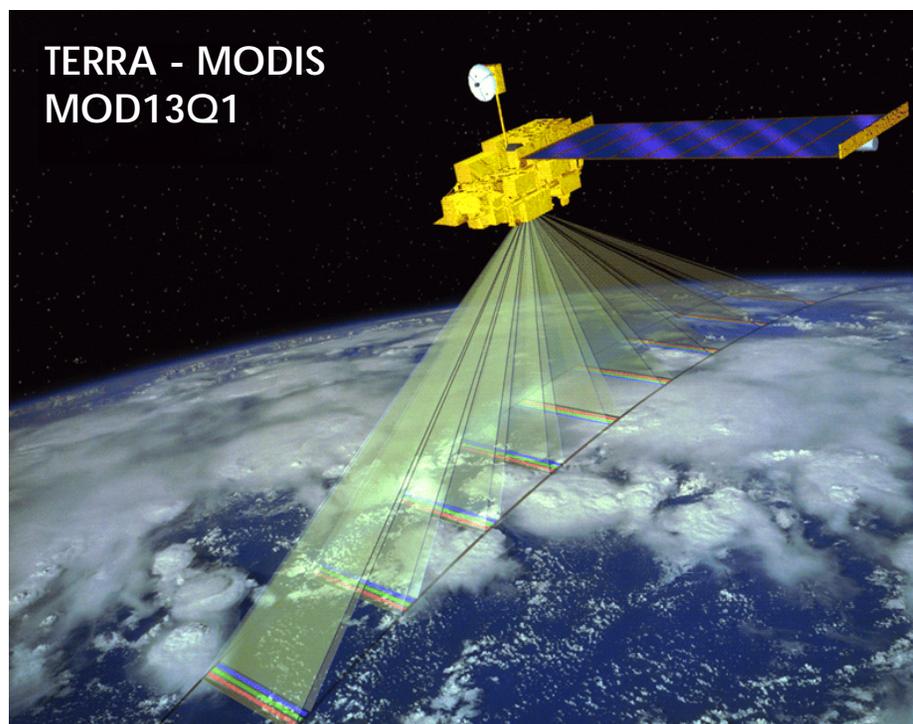




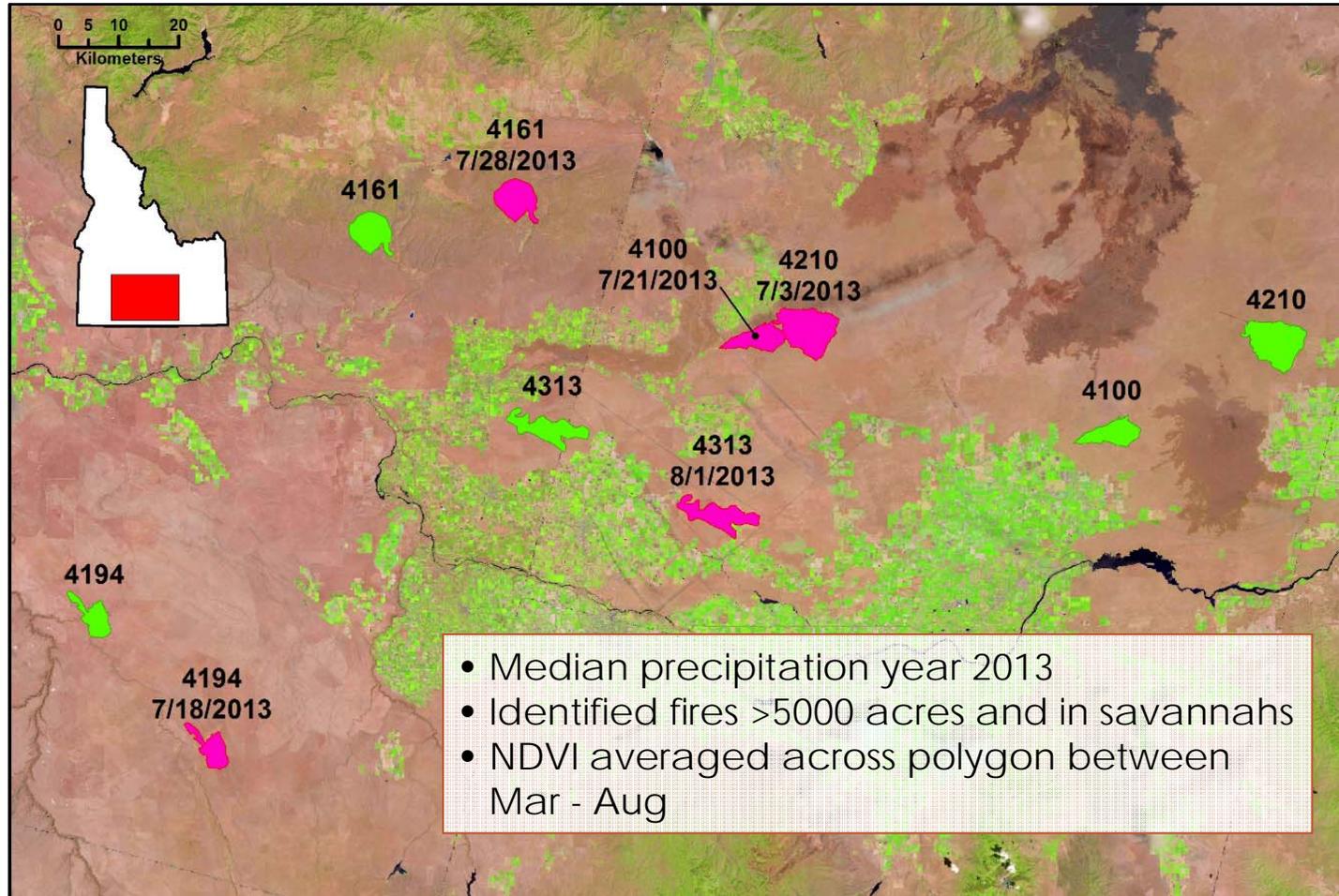
## Methodology – Remote Sensing Parameters

Used the **Normalized Difference Vegetation Index**.

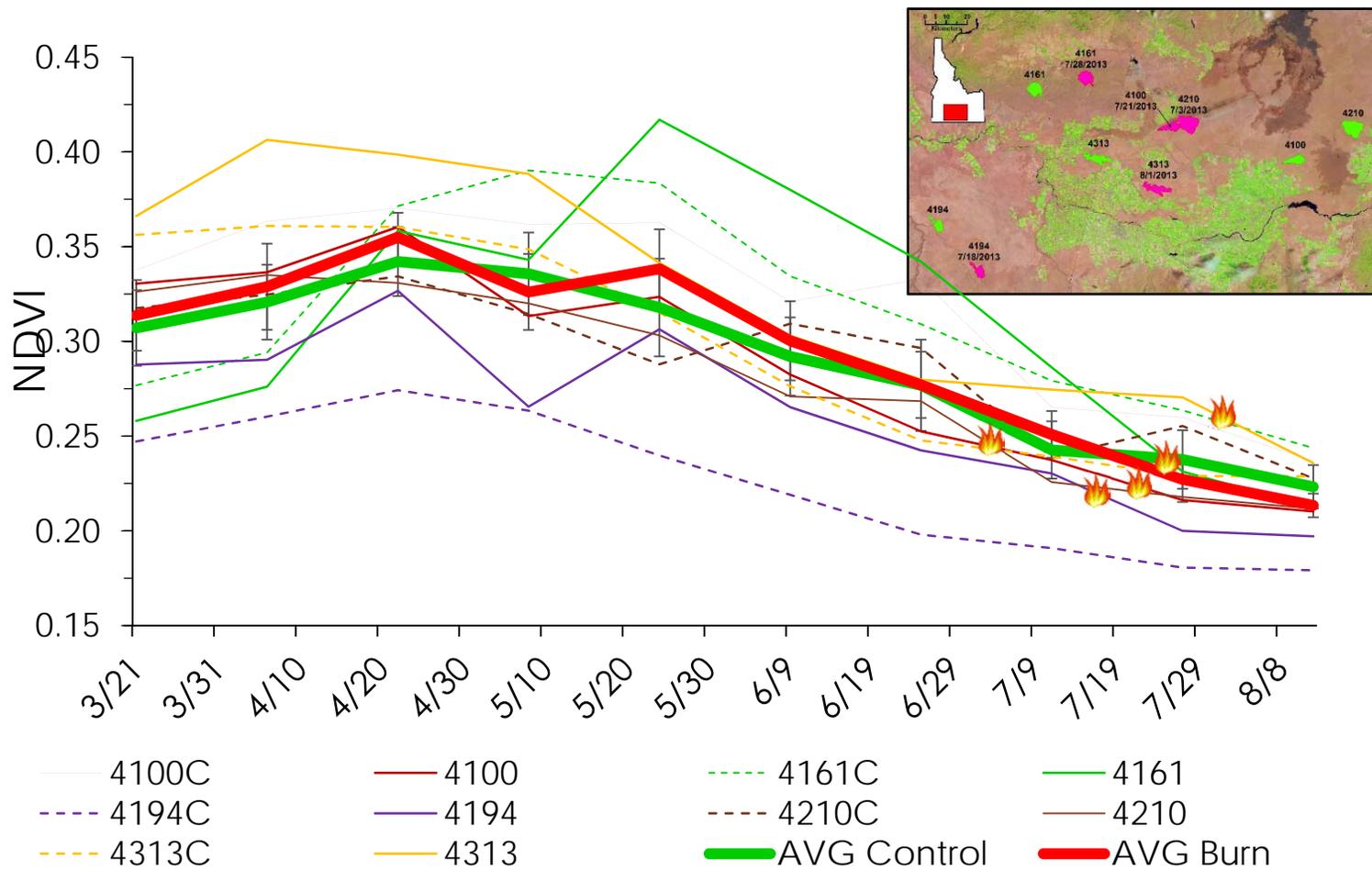
- ▶ 250m resolution, 16-day composites



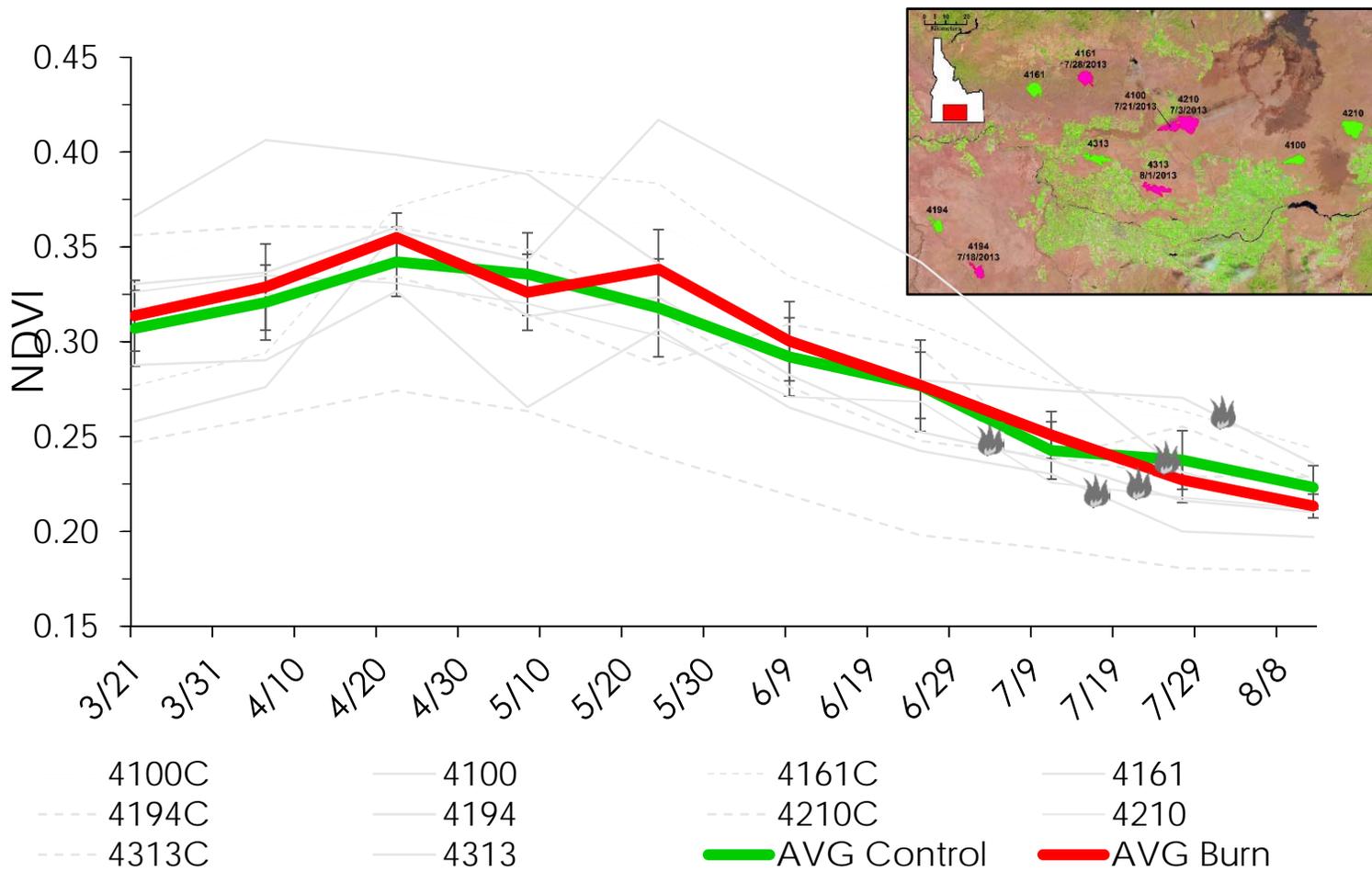
# Methodology – Regional Analysis



# Results – Regional Analysis



# Results – Regional Analysis



# Project Overview



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



# Project Overview



- ▶ Temporal Analyses
  - ▶ Broad-scale
  - ▶ Can we identify if **ecosystems** are more susceptible to fire?





## Methodology – MODIS NDVI

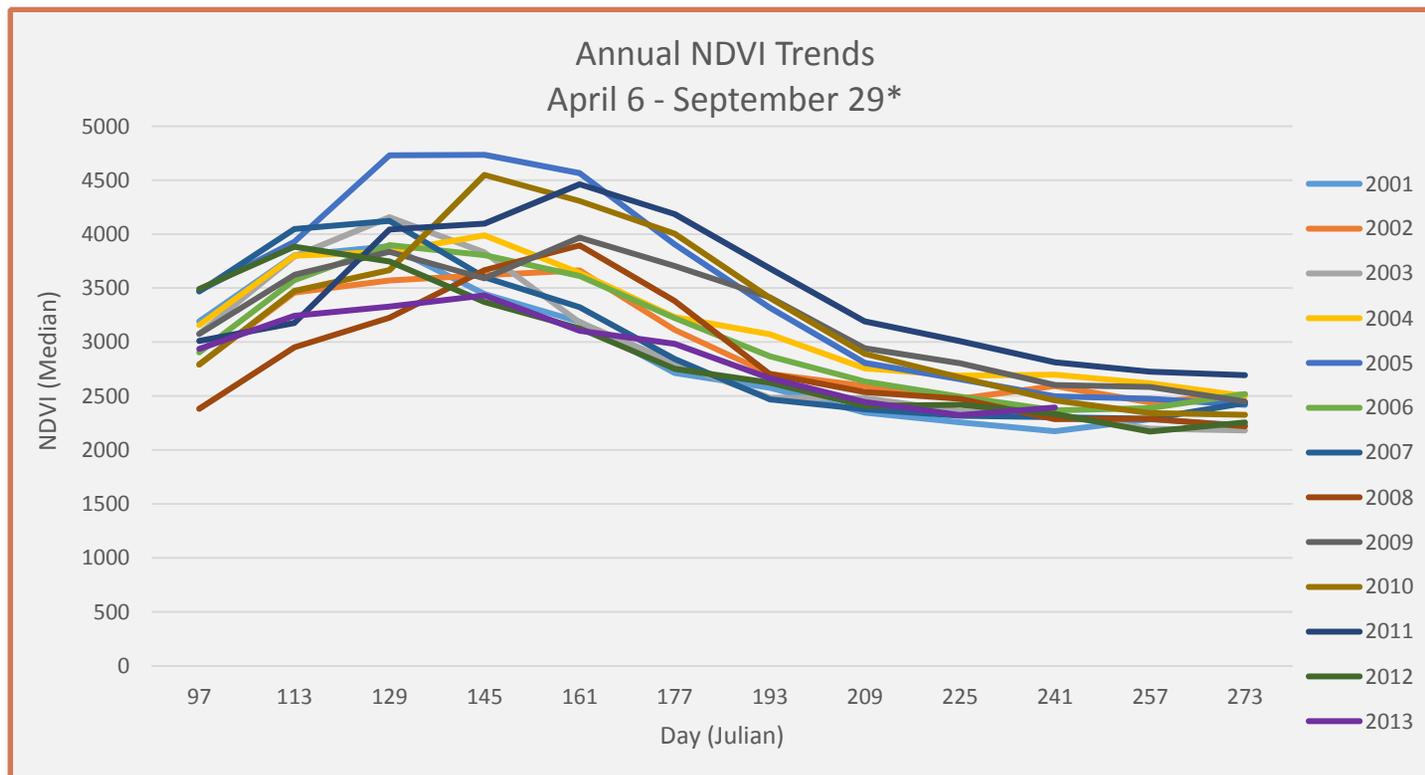
- ▶ TERRA MODIS-16 day composite NDVI (MOD13Q1) products were obtained for 2001 – 2013
- ▶ Images were analyzed across the hydrologic water year (Apr. 6 – Sept. 29)
- ▶ Zonal statistics calculated using ArcMap Spatial Analyst
- ▶ Phenology Metrics were calculated
- ▶ Metrics quantitatively describe fire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



# Results – MODIS NDVI



- ▶ Annual NDVI values across hydrologic water year (April 6<sup>st</sup> – Sept. 29)



\*2013 Sept. NDVI not included

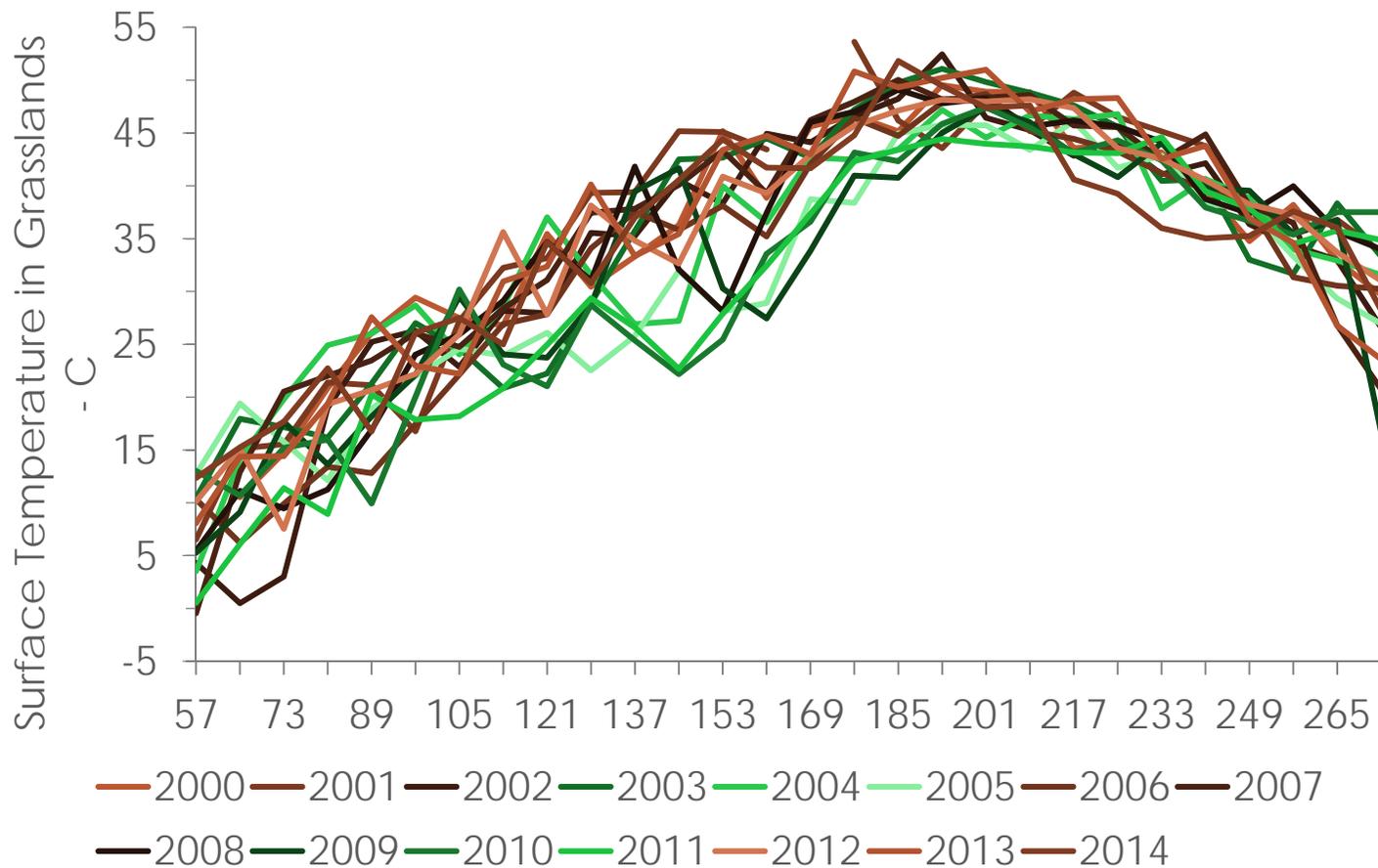


## Surface Temperature

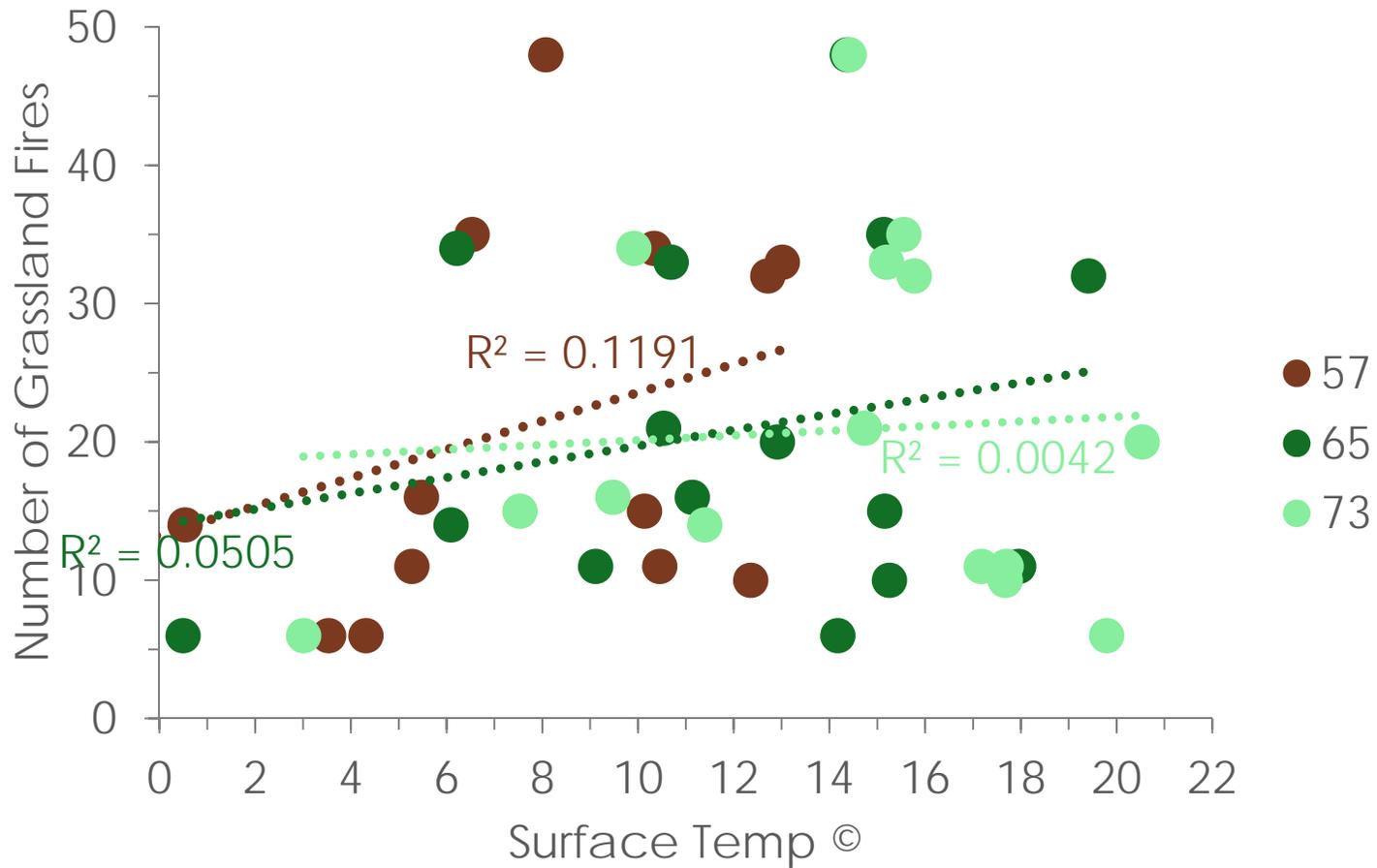
- ▶ 8-day composites
- ▶ 1 km resolution



# Methodology – Surface Temperature



# Results – Surface Temperature

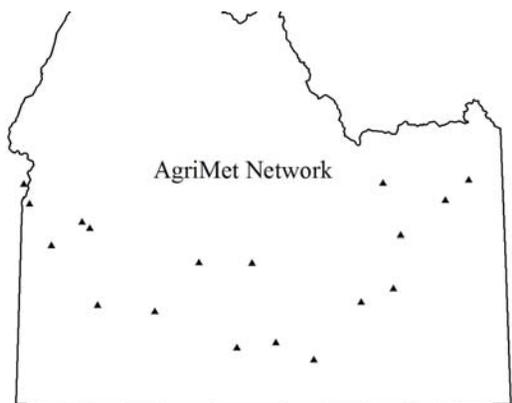


# Methodology – Precipitation



## ▶ 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)

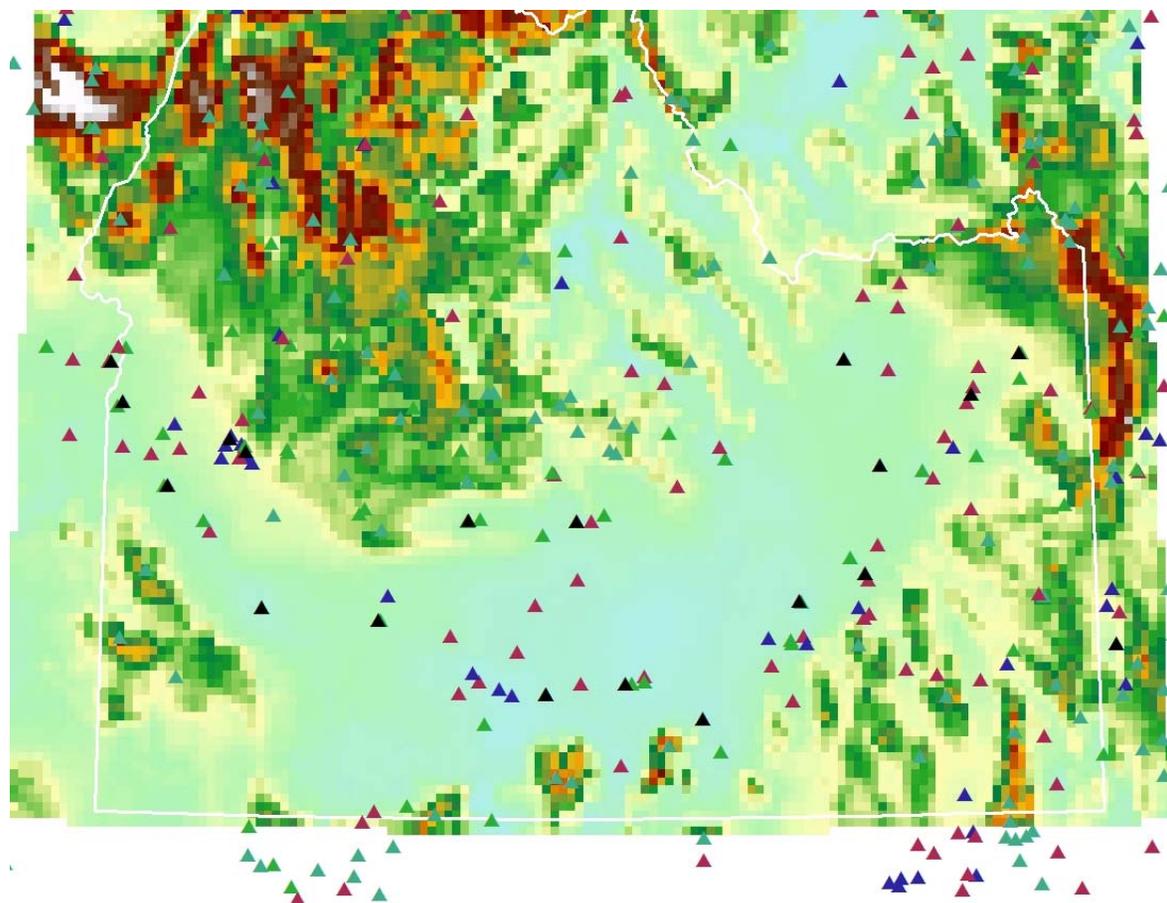


The screenshot shows the AgriMet website interface. The main content area is titled "AgriMet Historical Archive Weather Data Access". It features a "STATION:" dropdown menu set to "ABEI - Weather data for Aberdeen, ID (1991-Current)". Below this are "BEGIN DATE" and "END DATE" fields, each with "Year", "Month", and "Day" dropdown menus, all set to "2014", "January", and "1". A "PARAMETERS:" section lists various weather parameters with checkboxes, including ET, ETrs, ETos, MN, MX, MM, PC, PP, PU, SR, TA, TG, YM, UA, UD, WG, and WR. The left sidebar contains navigation links such as "Pacific Northwest Region Home", "Grand Coulee Dam", "About Us", "Contracting Opportunities", "Programs & Activities", "Environmental Documents", "Water Operations", "AgriMet", "Program Information", "Weather Data", "Crop Water Use", "Graphs", "Maps", "News", "Contact AgriMet", "Links", "Other Information", "Hydromet", and "Recreation".

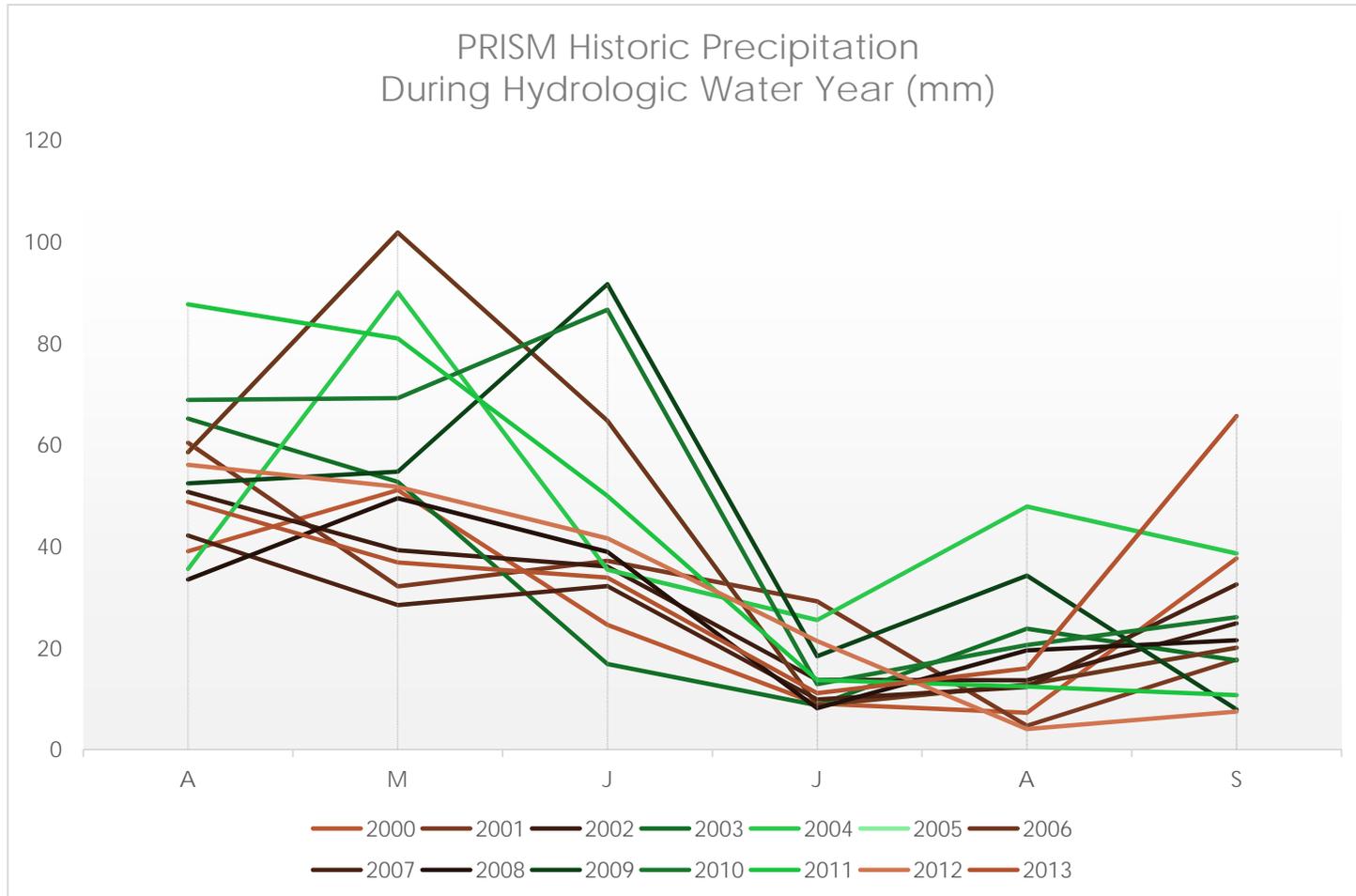


# Methodology – Precipitation

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



# Results – Precipitation



Questions?

# Questions?



# Other Items?

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