

# Using the BARC for BAER Support

## We will begin shortly after 10:00 MDT



Please introduce yourself in the chat with **your name**, **unit**, and **job title** along with your **typical role(s)** and **years of experience** in the BAER program



United States Department of Agriculture  
**Forest Service**

# Using the BARC for BAER Support

Annual BARC Training  
April 02, 2024

**Mark Nigrelli**  
**Geospatial Specialist**  
**Disturbance Assessment and Services Program**

Geospatial Technology and Applications Center | GTAC  
USDA Forest Service



Mapping Our Future Together



# Using the BARC for BAER Support

## Webinar Housekeeping

- **Video and Audio**

- Available through MS Teams only
- All participants' microphones will be muted
  - Questions are encouraged
    - Raise your 'Teams' hand, or submit a question in the chat

- **Webinar/Instructor Evaluation**

- Survey link will be sent via email following the training session

- **Recording**

- The training will be recorded, a link will be distributed after the training is complete

- **Data Bundle**

- <https://usfs-public.box.com/s/gqr8tipm0ewt8lv9ikbniwz8gptbtjy1>

Please introduce yourself in the chat with **your name**, **unit**, and **job title** along with your **typical role(s)** and **years of experience** in the BAER program



# Using the BARC for BAER Support

## Webinar Agenda

- **Overview Presentation** ~ 1 hour
- **Break** – 10 minutes
- **Exercise 2** - Editing The BARC/Creating the Soil Burn Severity dataset ~30 minutes (demo)
- **Exercise 3** - Analyzing the SBS ~15 minutes (demo)
- **(Optional) Exercise 4** – Exploring the BARC (demo)
- **Work on exercises at your own pace** – until 1:00 MDT





# Using the BARC for BAER Support

## Webinar Objectives

- Learn more about the BAER Imagery Support program and other post-fire mapping programs
- Learn how to order BARC products
- Know where to get technical assistance and whom to contact for help (both USFS and DOI)
- Understand how the BARC products are made
- Know the difference between the BARC4, BARC256, and SBS
- Learn how to create the SBS by modifying the BARC256
- Learn how to analyze the SBS against other GIS layers



# Fire Support Programs



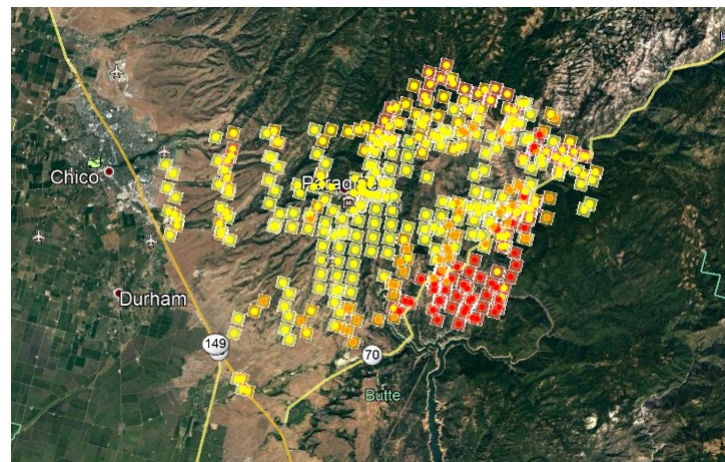
# Fire Support Programs

## USFS and USGS

### Active fire:

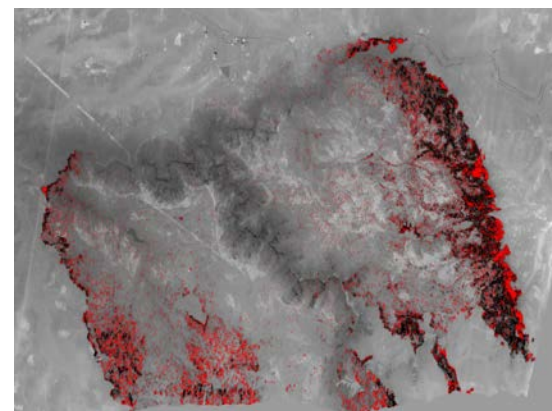
Fire Information for Resource Management System (FIRMS)

<https://firms.modaps.eosdis.nasa.gov/usfs/>



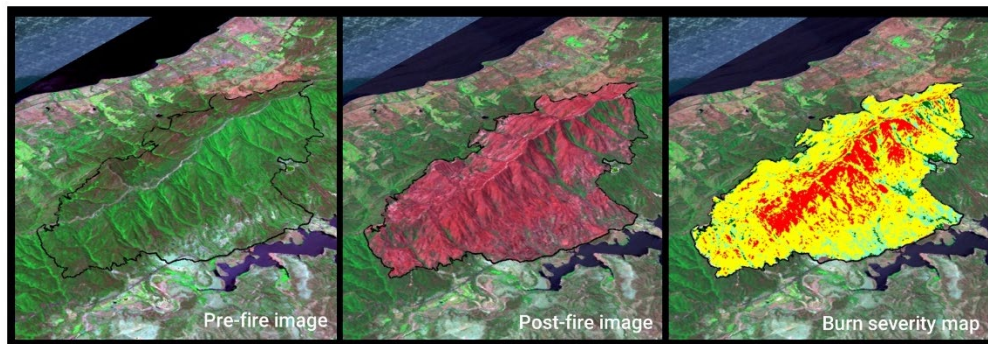
### Tactical fire:

## NIROPS



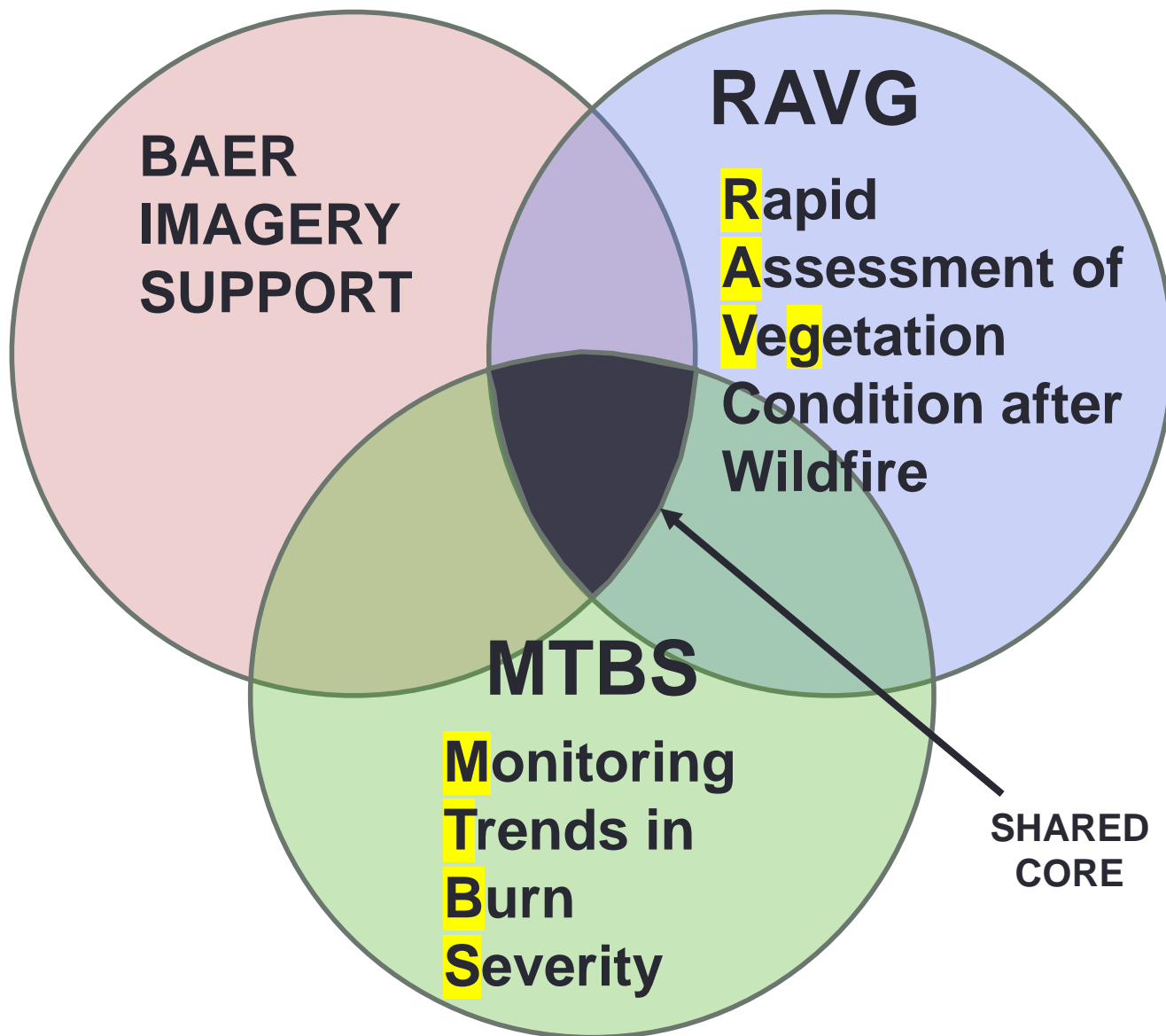
### Post-fire:

## Burn severity mapping



# Post-Fire Mapping Programs

SIMILAR BUT DIFFERENT







**BAER  
IMAGERY  
SUPPORT**

**RAVG**

**MTBS**

# Fires Mapped per Year	Temporal Extent	Scope	Timing	Availability
Map ~ 100 fires/year	Started in 2001	USFS BAER teams only. By request. USGS maps for all DOI agencies.	Near real-time (initial assessment)	BARC data available only to USFS, SBS made public
Map ~ 100 fires/year	Started in 2007	Forested areas on FS managed lands. Size criteria.	Within a few months of the fire (initial assessment)	Data available to public
Map ~ 1000 fires/year	Started in 2006. Maps fires back to 1984	All lands across CONUS, AK, HI and PR. Size criteria.	Mapped the following year (extended assessment)	Data available to public





**BAER  
IMAGERY  
SUPPORT**

**RAVG**

**MTBS**

USFS Contact	DOI Contact	Website
<a href="mailto:SM.FS.BAERImagery@usda.gov">SM.FS.BAERImagery@ usda.gov</a> or Mark Nigrelli <a href="mailto:mark.nigrelli@usda.gov">mark.nigrelli@usda.gov</a>	Kurtis Nelson <a href="mailto:knelson@usgs.gov">knelson@usgs.gov</a>	<a href="https://burnseverity.cr.usgs.gov/baer/">https://burnseverity. cr.usgs.gov/baer/</a>
<a href="mailto:SM.FS.PostFireRAVG@usda.gov">SM.FS.PostFireRAVG @usda.gov</a> or Craig Baker <a href="mailto:craig.baker@usda.gov">craig.baker@usda.gov</a>	Kurtis Nelson <a href="mailto:knelson@usgs.gov">knelson@usgs.gov</a>	<a href="https://burnseverity.cr.usgs.gov/ravg/">https://burnseverity. cr.usgs.gov/ravg/</a>
MTBS help desk <a href="mailto:SM.FS.mtbs@usda.gov">SM.FS.mtbs@usda.gov</a>	MTBS help desk <a href="mailto:SM.FS.mtbs@usda.gov">SM.FS.mtbs@usda.gov</a>	<a href="http://www.mtbs.gov">www.mtbs.gov</a>

# Burn Severity Portal

## Overview

<https://burnseverity.cr.usgs.gov>



### BAER

#### Burned Area Emergency Response

BAER teams rapidly assess the effects of fire on vegetation, soils and watershed function and develop a plan with actions to stabilize the fire affected landscape and mitigate...



### CBI

#### Composite Burn Index

The Composite Burn Index was developed by Key and Benson (2006) to assess the on the ground fire effects on vegetation and soil (i.e. burn severity).



### NPS

#### National Park Service

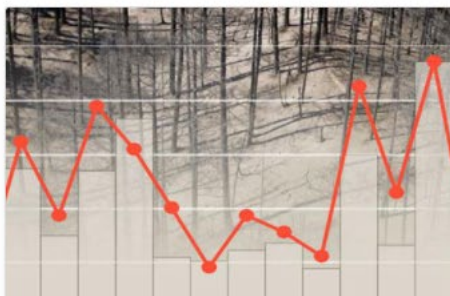
When requested by an NPS unit, or interagency partner program, USGS EROS has mapped wildland fires that are smaller than those mapped by the Monitoring Trends in Burn Severity...



### FWS Fire Atlas

#### U.S. Fish & Wildlife Service

Atlases of fire perimeters were created for fires occurring on U.S. National Wildlife Refuges from 1984 through 2013. Fire Atlas perimeter data provide information to refuge m...



### MTBS

#### Monitoring Trends in Burn Severity

MTBS consistently maps the location, extent and severity of all large fires occurring in the United States from 1984 to present. Temporally and spatially comprehensive data pr...



### RAVG

#### Rapid Assessment of Vegetation Condition After Wildfire

The Rapid Assessment of Vegetation Condition after Wildfire (RAVG) program produces data estimating post-fire vegetation conditions on National Forest System (NFS) lands, incl...



# Burn Severity Portal

## Overview

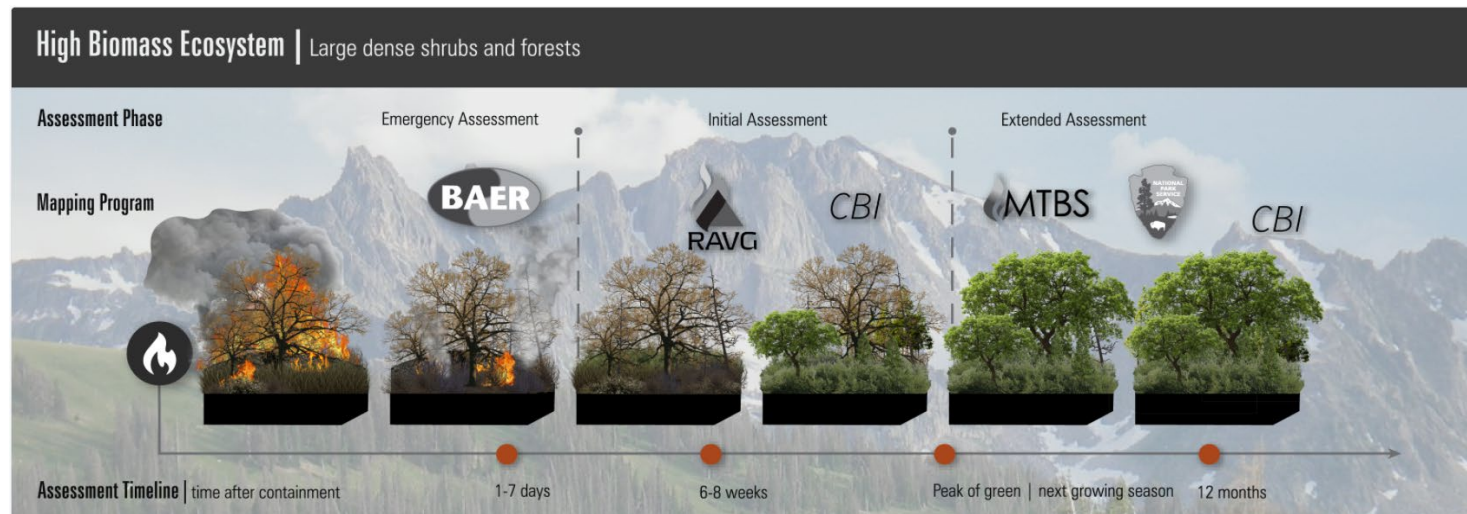
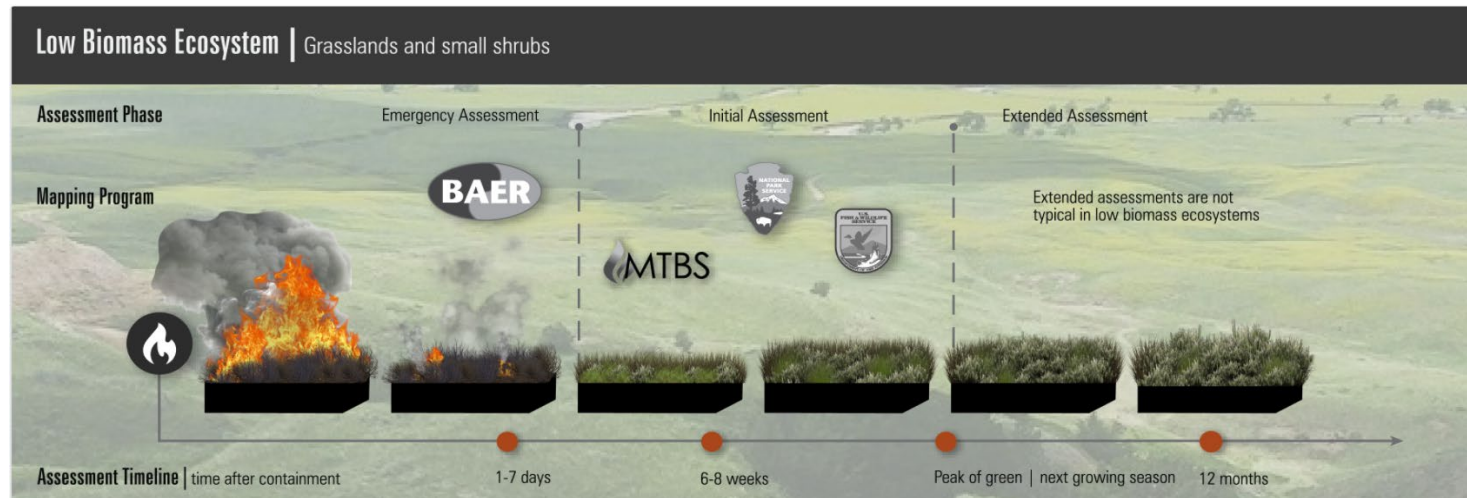
- Website: <https://burnseverity.cr.usgs.gov>
- Access to federal burn severity data
  - An interagency effort to provide comprehensive access to burn severity data
- Provides fire products for MTBS, BAER, RAVG, NPS, CBI, Prairie Fires, FWS Fire Atlas
  - Allows for users to directly compare burn severity products side by side and access burn severity field plot data
- Provides information about the methods/approach used for each of the different programs/products
- Interactive viewer lets users view, locate and then download any and all available products from a specific fire event
  - Ability to download and compare BAER, RAVG and MTBS mappings of the same fire, for example



# Burn Severity Portal

## Available Products

- Several Products available through the Burn Severity Portal
  - MTBS, BAER, RAVG, NPS, CBI, FWS Fire Atlas



# Burn Severity Portal

## Interactive Viewer

- Allows users to view, locate and download all fire/plot data over a given time period
  - Filter by program, region (continental US, AK, HI, PR), date and fire type
  - Filter by state or county, or with a user-drawn bounding box
  - Locate fire/plot and then double click on feature of interest to isolate it



Selected fire perimeter/plot point by double-click

Fire Bundle Downloads						
Download 1 Fires						
<input type="checkbox"/>	Fire Name	Acres	Ignition Date	Fire Type	Product	Fire Id ↑
<input type="checkbox"/>	POLE CREEK	3,395	2017-08-04	Wildfire	MTBS	WY4219011071520170804
<input type="checkbox"/>	SIMMONS	20,950	2016-07-11	Wildfire	MTBS	WY4231010419220160711
<input checked="" type="checkbox"/>	MARTEN CREEK	6,383	2018-09-16	Wildfire	MTBS	WY4270611067920180916
<input type="checkbox"/>	FAIRFIELD	1,457	2013-07-22	Wildfire	MTBS	WY4273810886420130722
<input type="checkbox"/>	STATION	9,845	2015-10-11	Wildfire	MTBS	WY4287610628620151011
<input type="checkbox"/>	SOUTH FORK 1	1,073	2015-09-26	Wildfire	MTBS	WY4302610888320150926

- Downloads .zip fire bundle to your computer for visualization and analysis with your preferred GIS software package



# Post-Fire Mapping Programs

## Post-fire Mapping Products: BAER, RAVG, and MTBS

The USDA Forest Service Geospatial Technology and Applications Center (GTAC) supports three major post-fire mapping programs

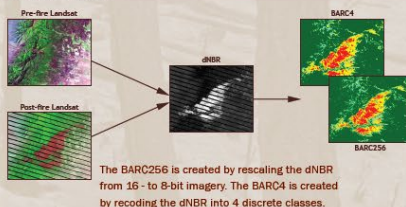
### BAER

(Burned Area Emergency Response)  
[burnseverity.cr.usgs.gov/baer](http://burnseverity.cr.usgs.gov/baer)

#### DESCRIPTION

The Burned Area Emergency Response (BAER) imagery support program at GTAC includes tracking fire progression and satellite overpasses, acquiring imagery, and creating the Burned Area Reflectance Classification (BARC). The BARC is a GIS layer used by BAER teams as they perform an agency assessment of the burned area. The BARC is a first approximation of soil burn severity on the burned land.

#### MAPPING METHOD



#### AUDIENCE

The BARC is delivered to BAER teams. These teams are dispatched to make an assessment of the burned area within seven calendar days from fire containment. One of their first tasks is to create a soil burn severity map. The BARC is used to create that map.

#### TIMELINE

1 - 7 days after fire containment

#### DELIVERABLES

- Pre- and post-fire satellite imagery
- BARC layers (thematic and continuous)
- Metadata
- 3D image drape

#### EXAMPLE

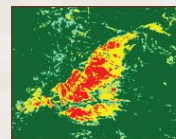
Trigo  
Ignition: 4/15/2008  
Contained: 5/11/2008



Perimeter Acres: N/A  
Assessment Type: Emergency



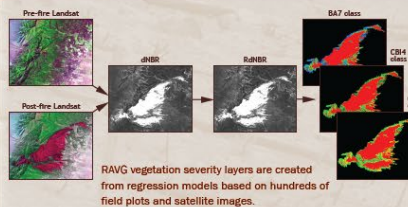
Pre-fire Image Date: 5/21/2007  
Post-fire Image Date: 5/15/2008



### RAVG

(Rapid Assessment of Vegetation Condition After Wildfire)  
[burnseverity.cr.usgs.gov/ravg](http://burnseverity.cr.usgs.gov/ravg)

The Rapid Assessment of Vegetation Condition after Wildfire (RAVG) program produces data describing post-fire vegetation conditions on National Forest System (NFS) lands. RAVG produces a suite of geospatial and tabular outputs that include standard vegetation mortality summary tables and maps. The tables and maps are produced by integrating existing vegetation layers and burn severity data.



The primary audience for RAVG data products is the Forest Service silviculture community, which is required to communicate yearly reforestation and restoration needs to the Washington Office and Congressional decision makers for funding requests.

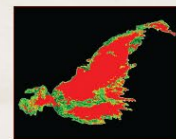
30 - 45 days after fire containment

- Pre- and post-fire satellite imagery
- Fire perimeter shapefile
- dNBR and RdNBR (continuous)
- Composite Burn Index (CBI) layer
- % change in basal area layer
- % change in canopy cover layer
- Summary table and map
- Metadata

Perimeter Acres: 14,297  
Assessment Type: Initial



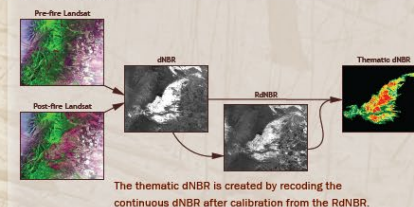
Pre-fire Image Date: 5/21/2007  
Post-fire Image Date: 5/7/2008



### MTBS

(Monitoring Trends in Burn Severity)  
[www.mtbs.gov](http://www.mtbs.gov)

Monitoring Trends in Burn Severity (MTBS) is a multi-year program designed to consistently map the burn severity and burn area boundaries of fires across all lands of the United States for the period spanning 1984 through 2020. The data generated by MTBS will be used to identify national trends in burn severity, providing information necessary to monitor the effectiveness and effects of the National Fire Plan and Healthy Forests Restoration Act.



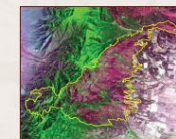
The MTBS project serves four primary user groups:

1. National policies and policy makers
2. Field management units
3. Existing databases from other comparably scaled programs
4. Research and academic entities interested in fire severity.

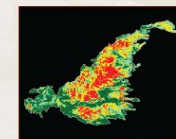
12 - 18 months after fire containment

- Pre- and post-fire satellite imagery
- dNBR and RdNBR (continuous)
- 5-class thematic thresholded dNBR
- Burn area boundaries
- Data summaries
- Metadata
- 3D image drape

Perimeter Acres: 13,855  
Assessment Type: Extended



Pre-fire Image Date: 7/8/2007  
Post-fire Image Date: 7/29/2009



Note: MTBS is a joint project between GTAC and USGS ES&S

■ CONTACT: For more information about any of these programs, see the contact page on their respective websites



# BAER Imagery Support

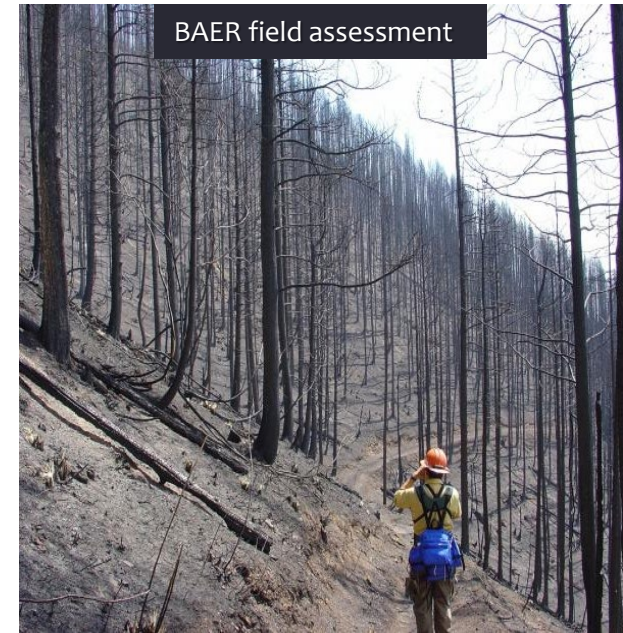




# Burned Area Emergency Response (BAER)

## Overview

- **Forest Service/DOI fast track emergency assessment**
  - Teams comprised of soil scientists, hydrologists, recreation specialists, engineers, GIS Specialists and others
- **Assess fire effects on the soil and watershed hydrologic function (erosion and flood potential)**
- **Prescribe and implement emergency stabilization measures to mitigate potential hazards to:**
  - Life
  - Property
  - Long-term soil productivity
  - Water quality
  - Natural resources
- **BAER response plan is required within 7 days of fire containment**



# BAER Imagery Support Program

## Remote Sensing in Support of the BAER Process

- **GTAC/EROS** create a Burned Area Reflectance Classification (**BARC**) showing which areas have the highest burn severity and are therefore most likely to suffer negative impacts.
- BARC maps are used by BAER teams to **focus field verification and analysis to areas of concern**
  - Minimizes field time
  - provides data for areas with limited access
  - Increases BAER team safety
- **Facilitates rapid development of a geospatial soil burn severity product by BAER team**
  - Improved product compared to previous methods such as hand-drawn maps
  - Used in analysis/modeling to determine necessary BAER treatments
- **GTAC provides support to USFS BAER teams; EROS supports DOI BAER teams**
  - Consistent products for all agencies
  - Support provided since 2001

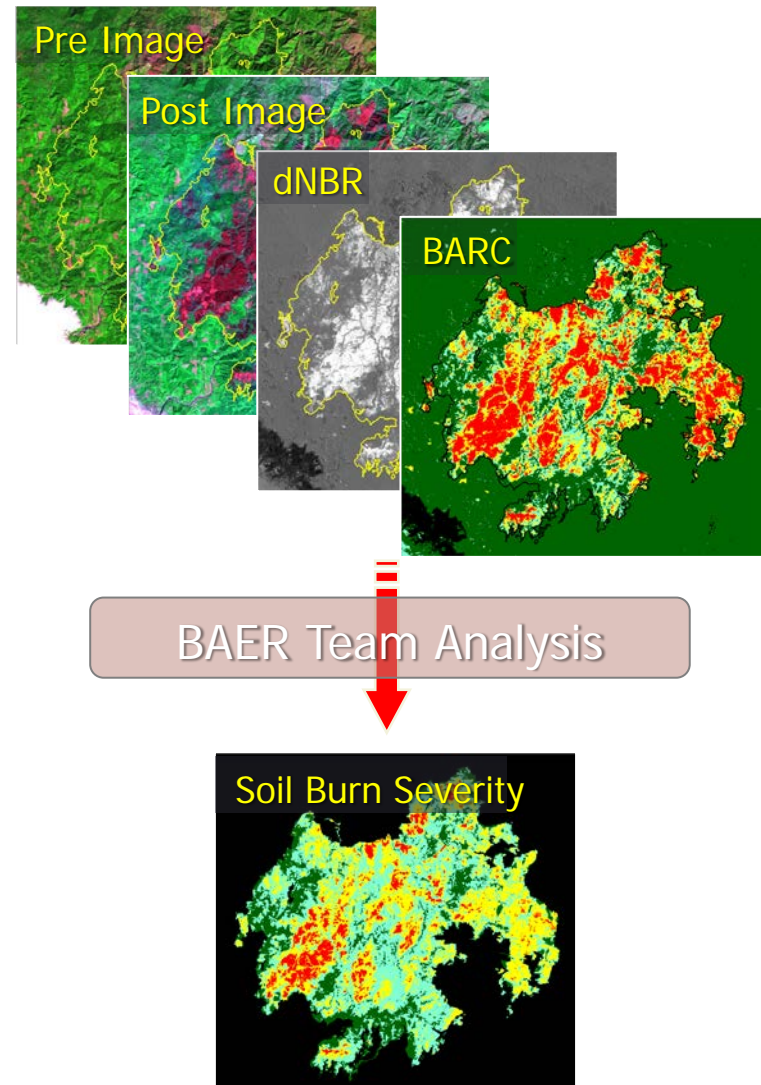




# BAER Imagery Support Program

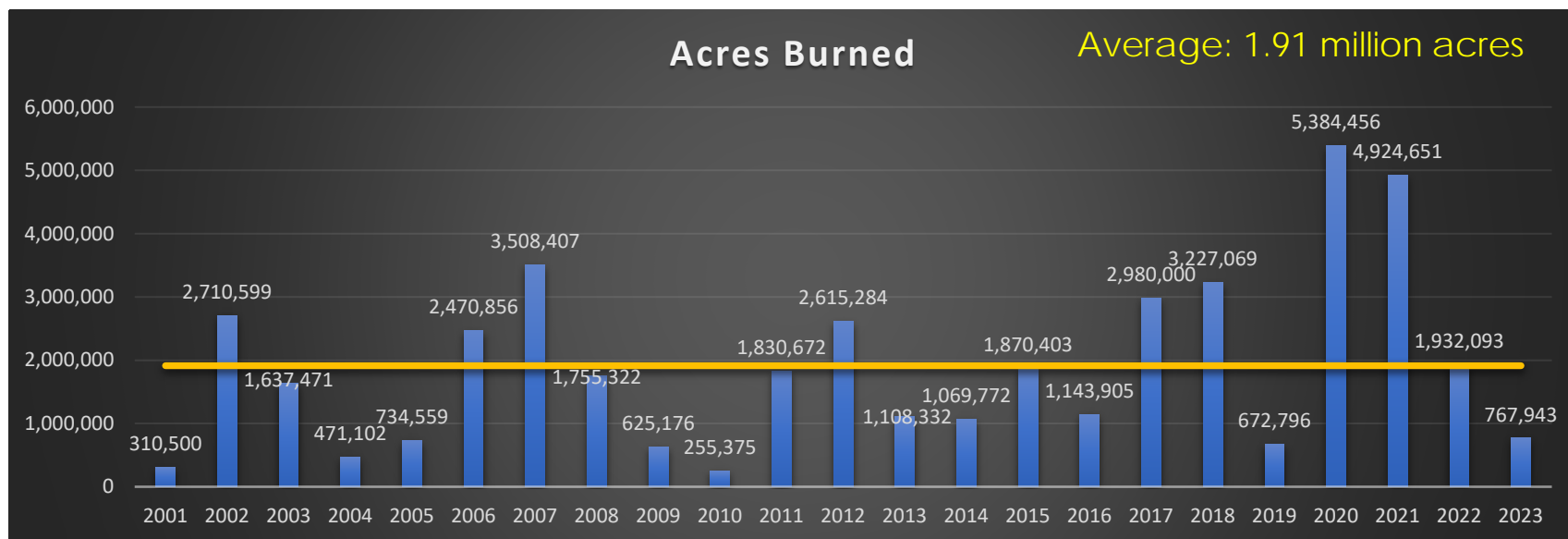
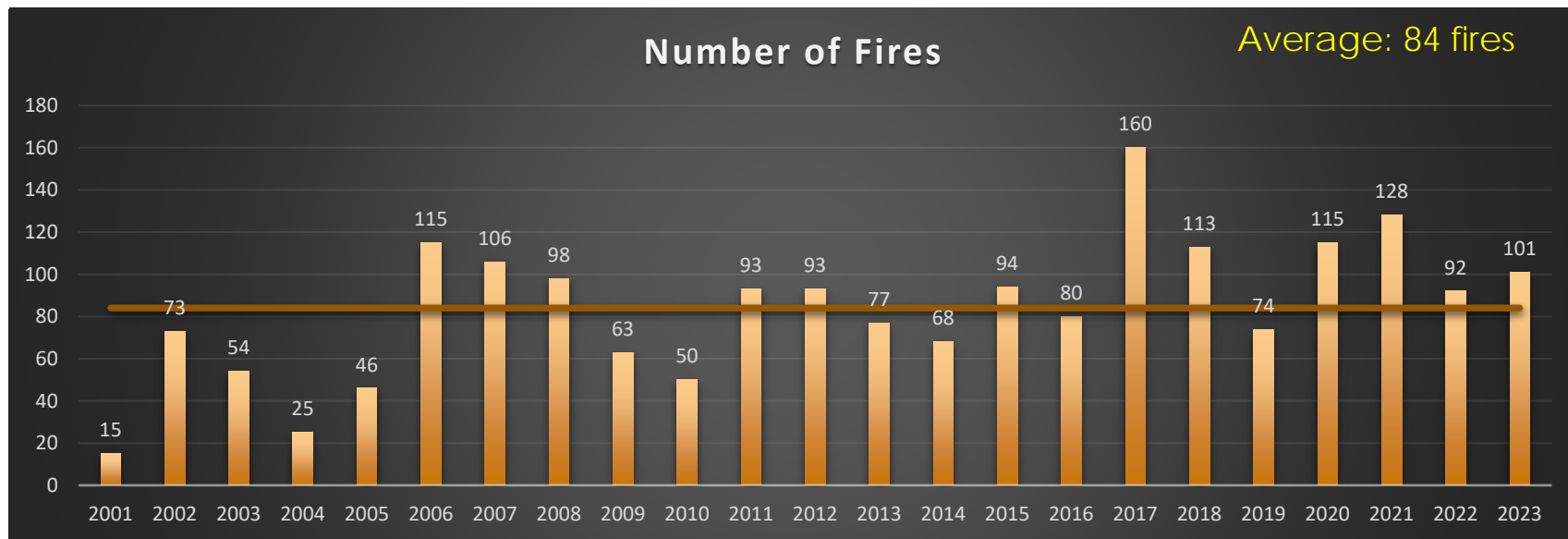
## Remote Sensing in Support of the BAER Process

1. Satellite imagery-based assessment
  - Pre-fire Imagery
  - Post-fire Imagery
2. Changed detection based on difference in the calculated normalized burn ratio index
3. Analyst interpretation of burn severity classes
4. Data delivered to BAER team
  - Field data collected
  - Initial burn severity data is reclassified (if necessary)
5. Final soil burn severity data is developed and used to inform the recommendations for BAER treatments

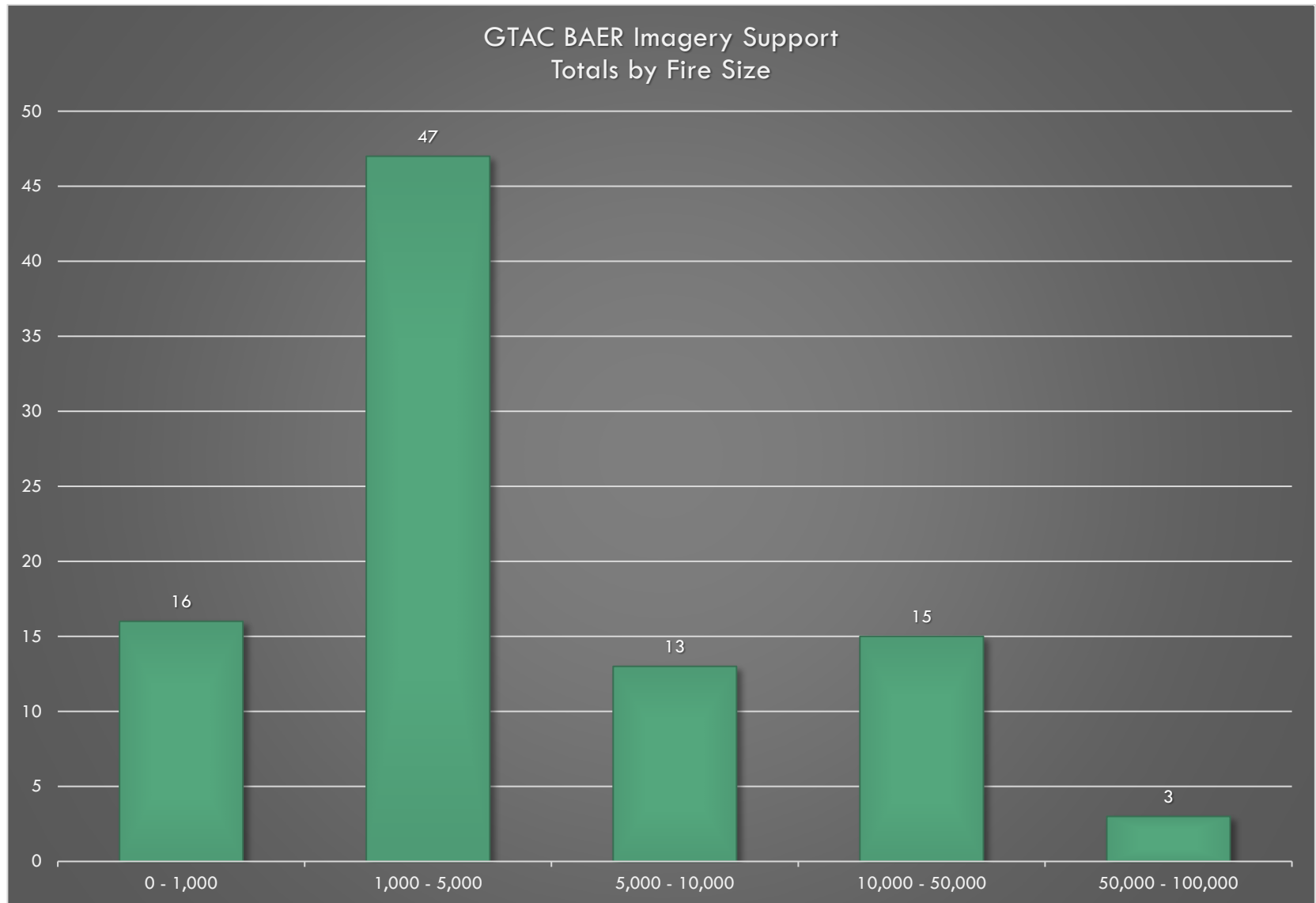




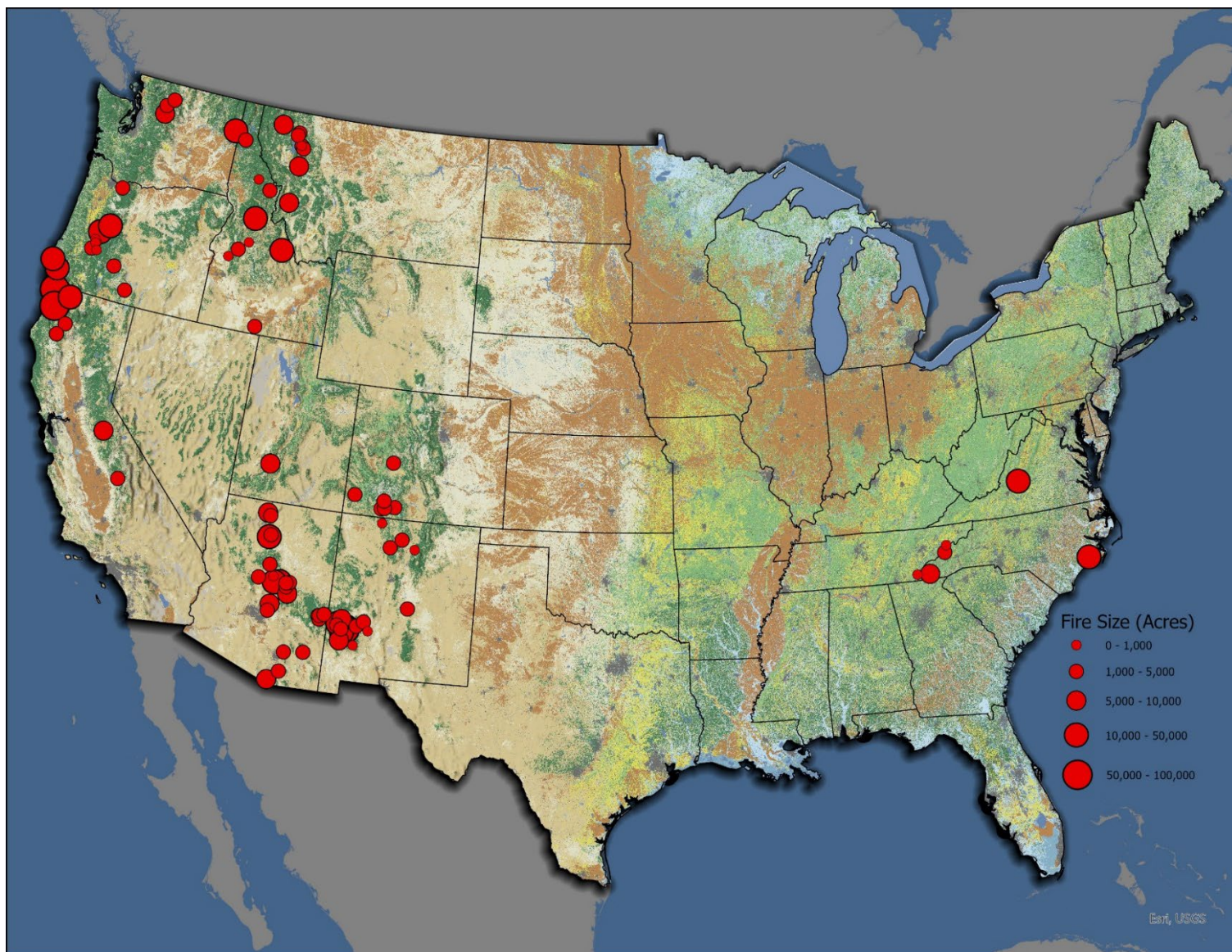
# 2023 USFS BAER Team Support from GTAC



# Mappings by Size



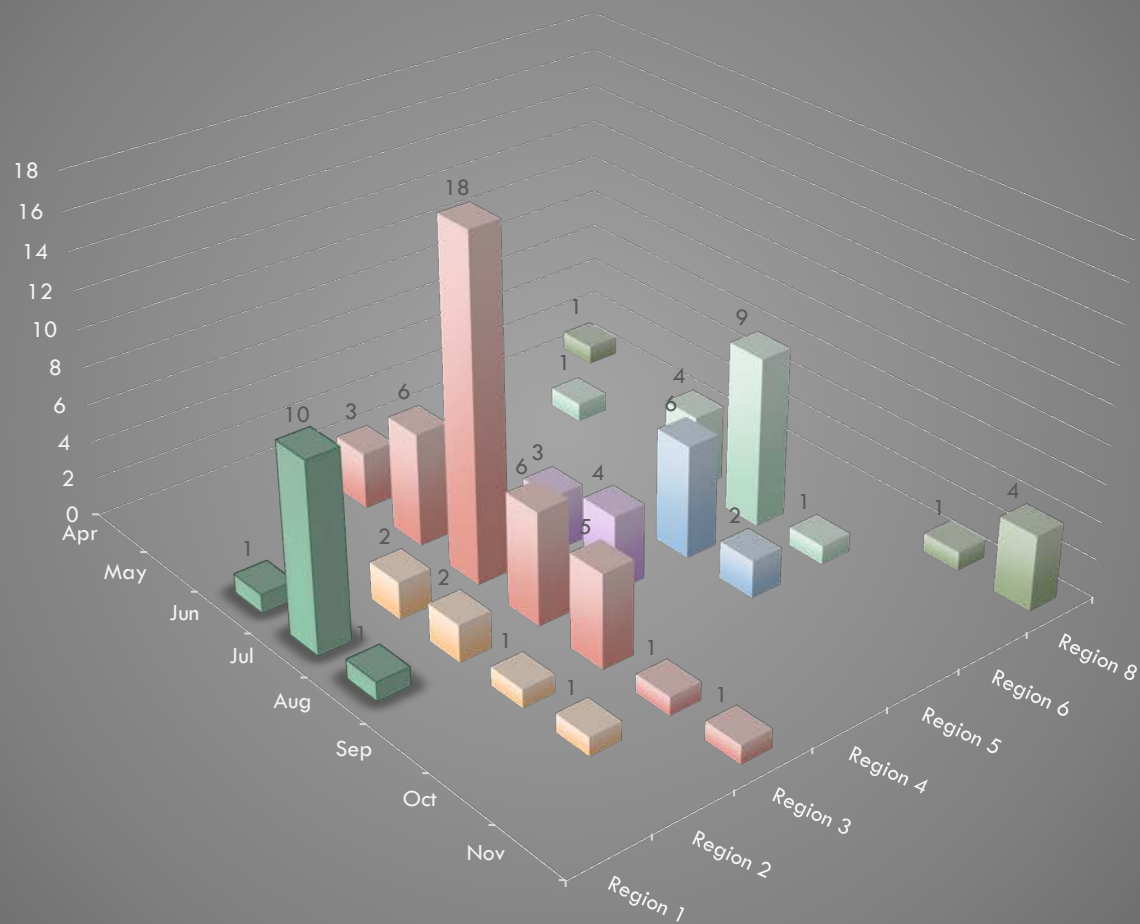
# Mappings by Size



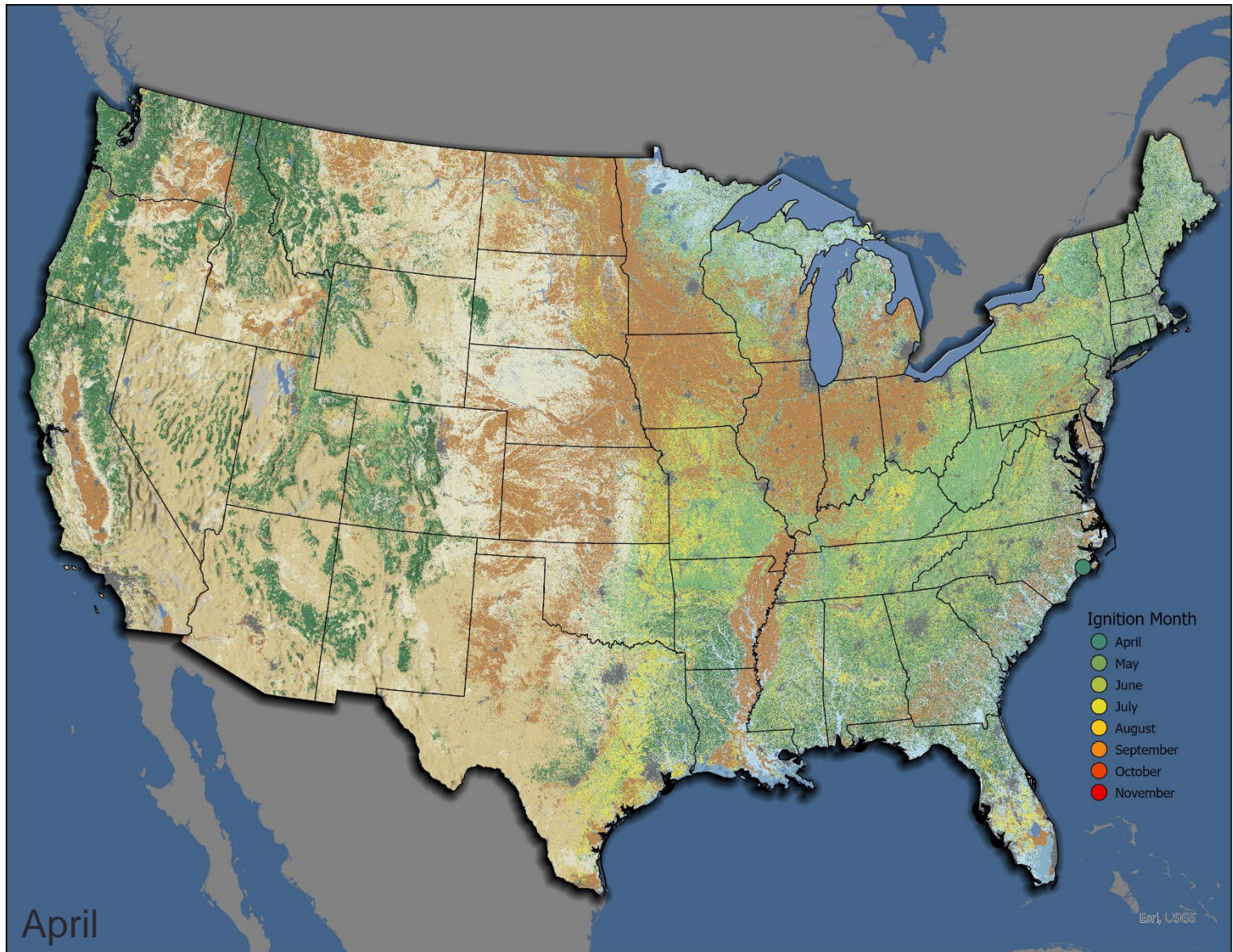


# Mappings by Month by Region

GTAC BAER Imagery Support  
Totals by Ignition Month

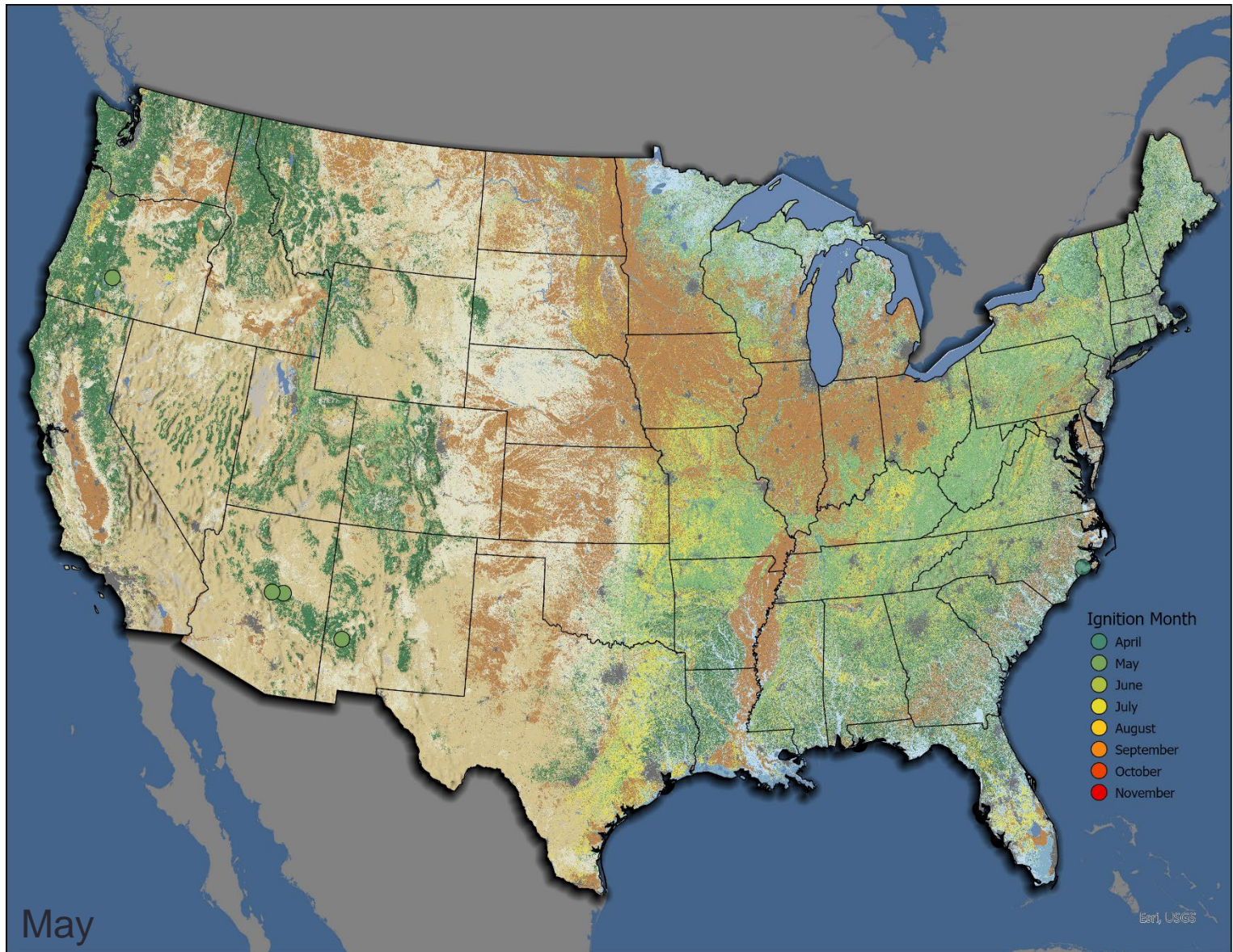


# Mappings by Ignition Month



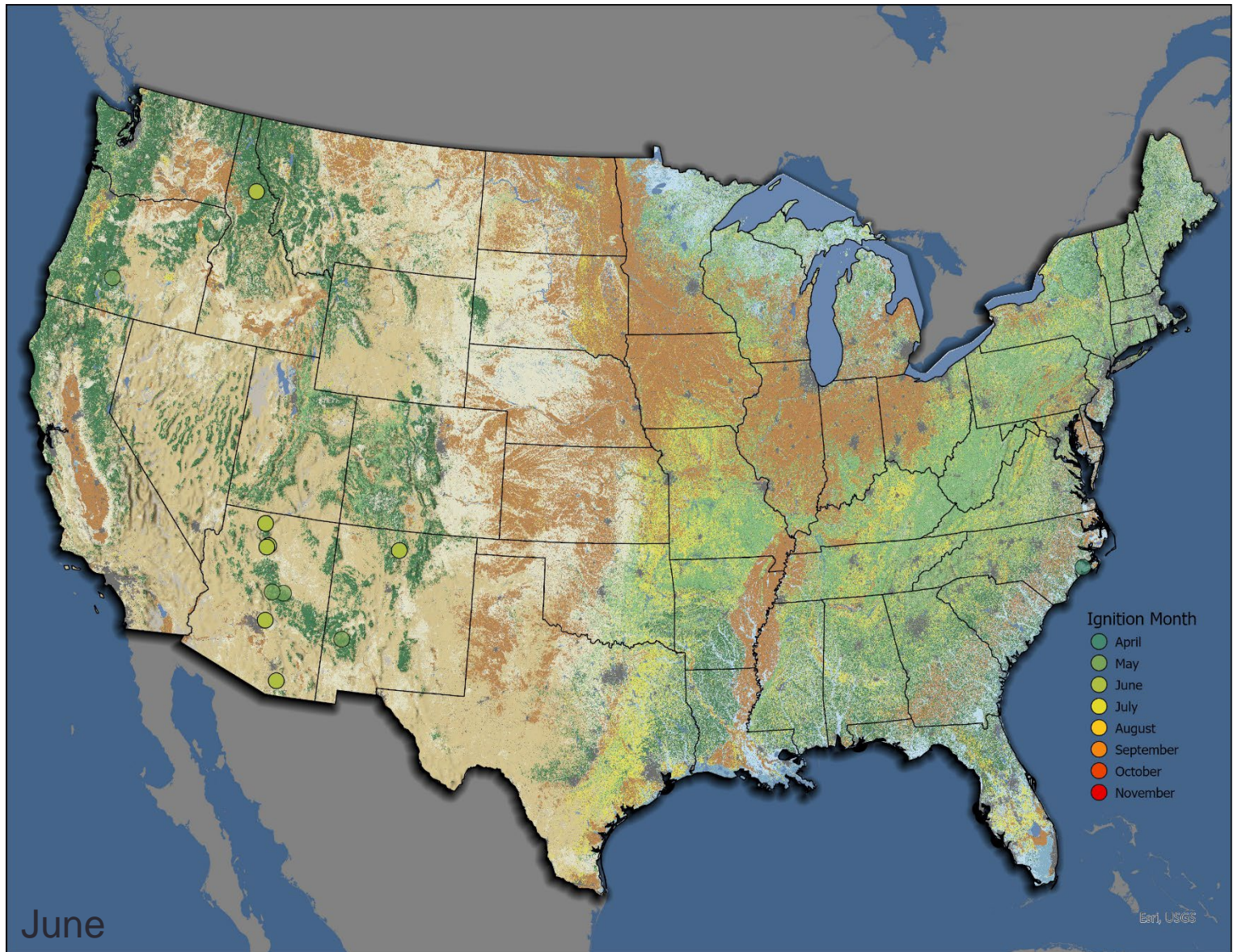


# Mappings by Ignition Month



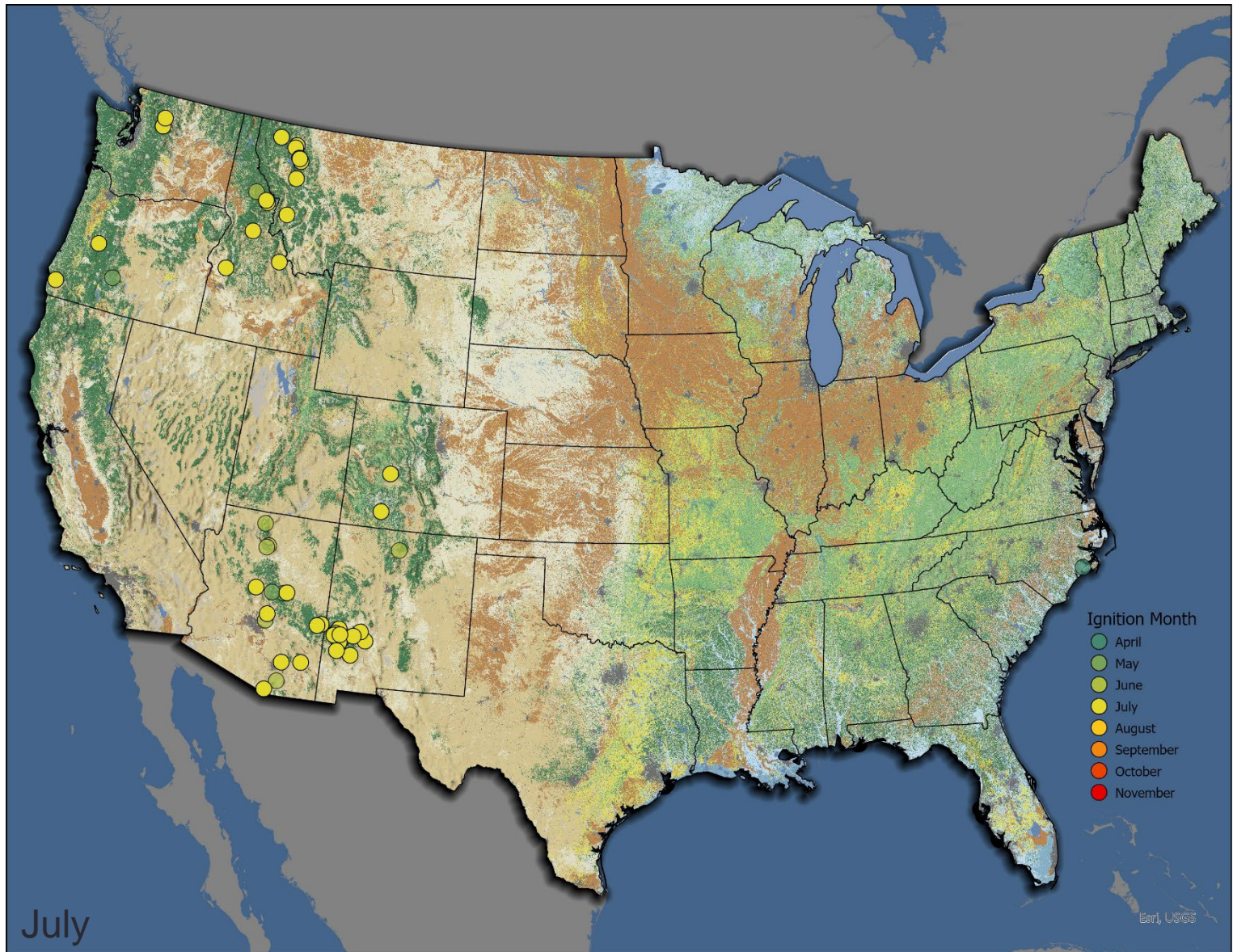


# Mappings by Ignition Month



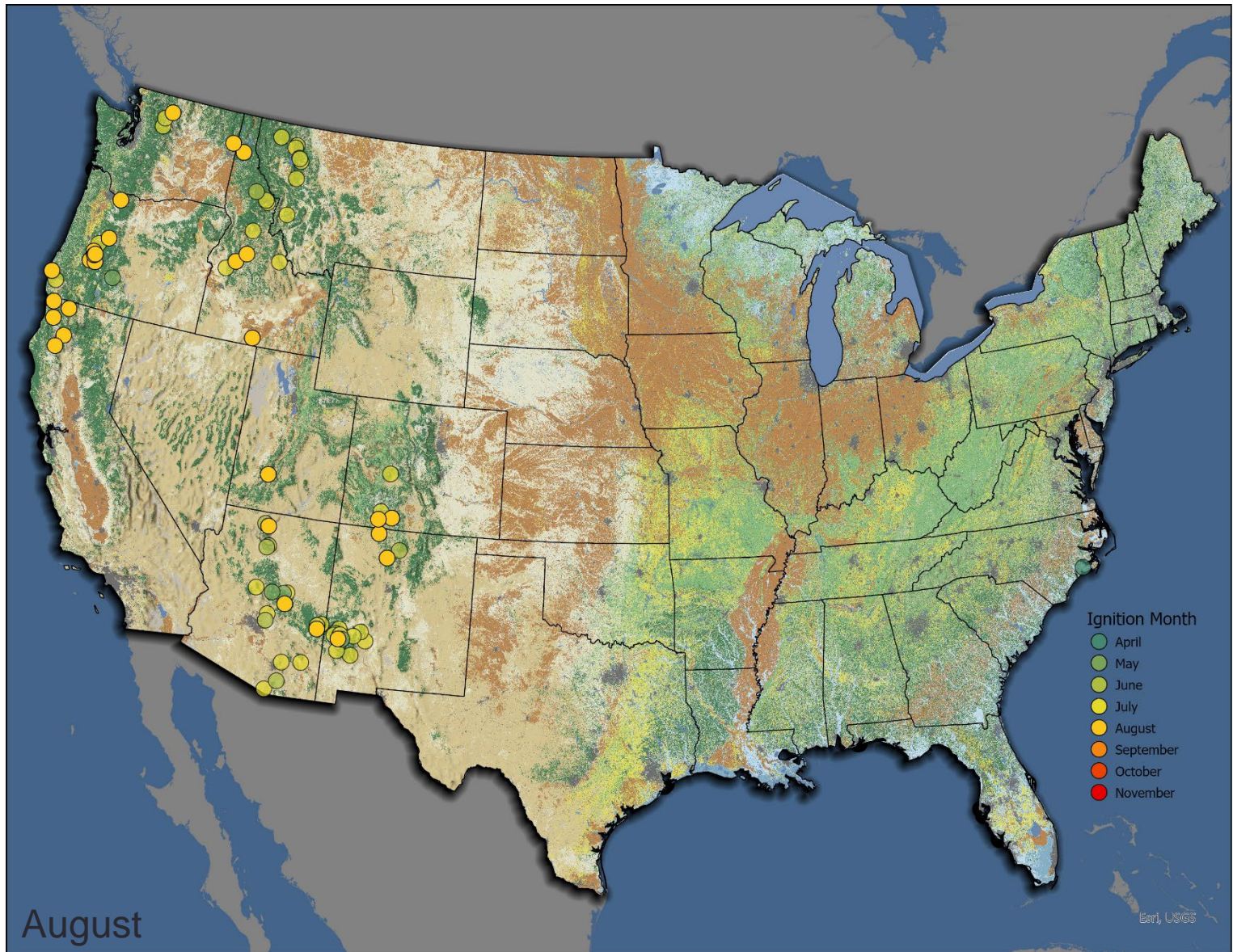


# Mappings by Ignition Month



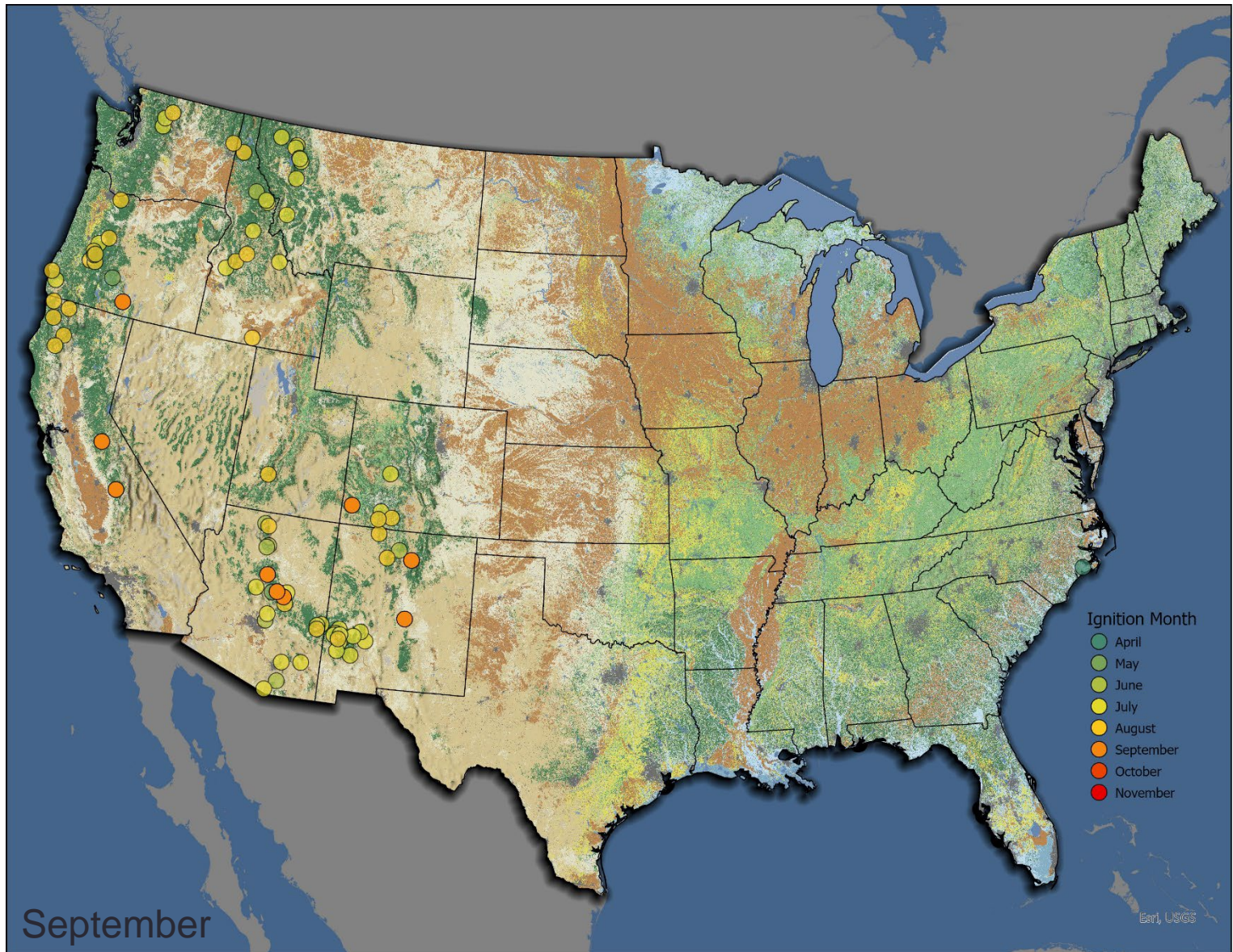


# Mappings by Ignition Month



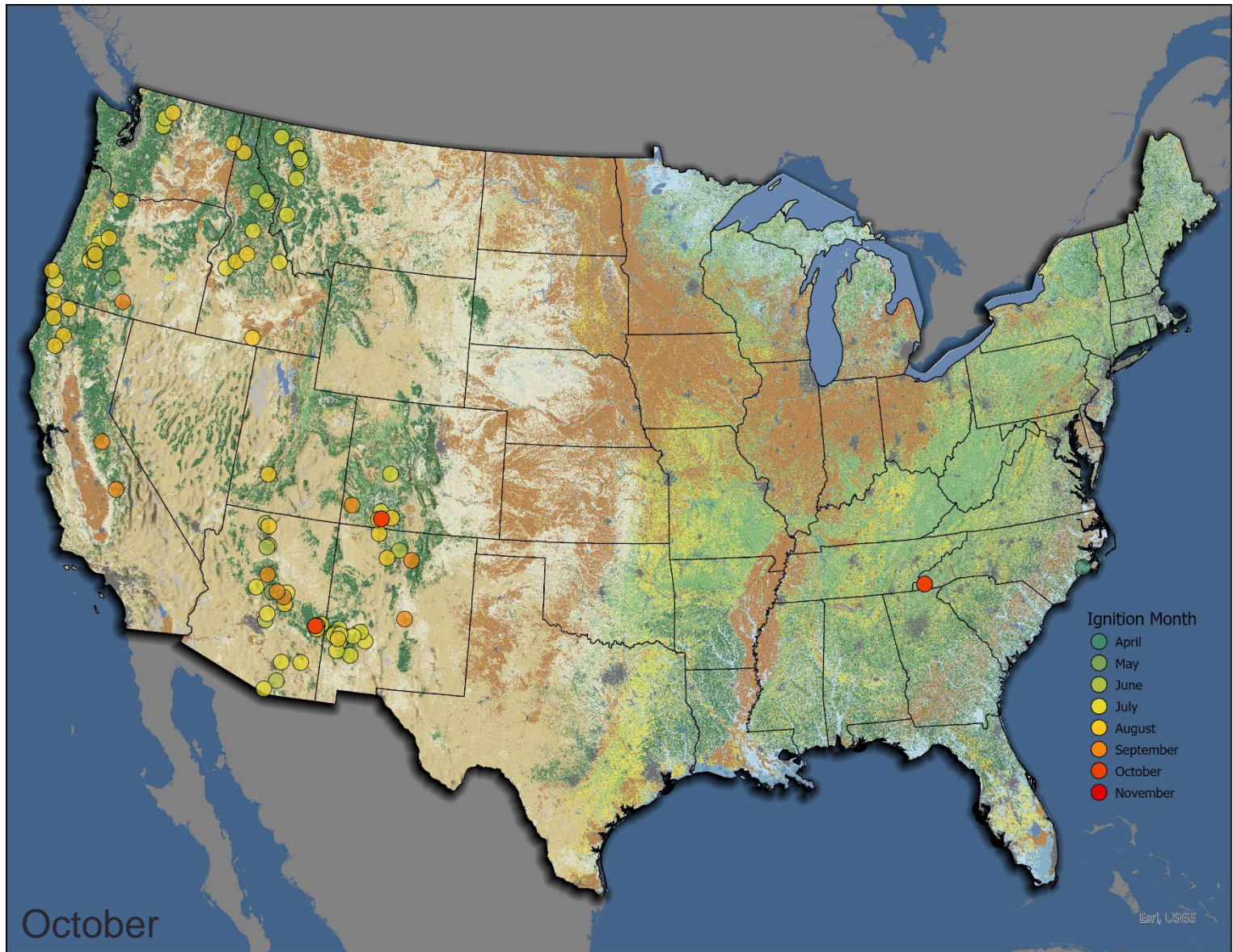


# Mappings by Ignition Month



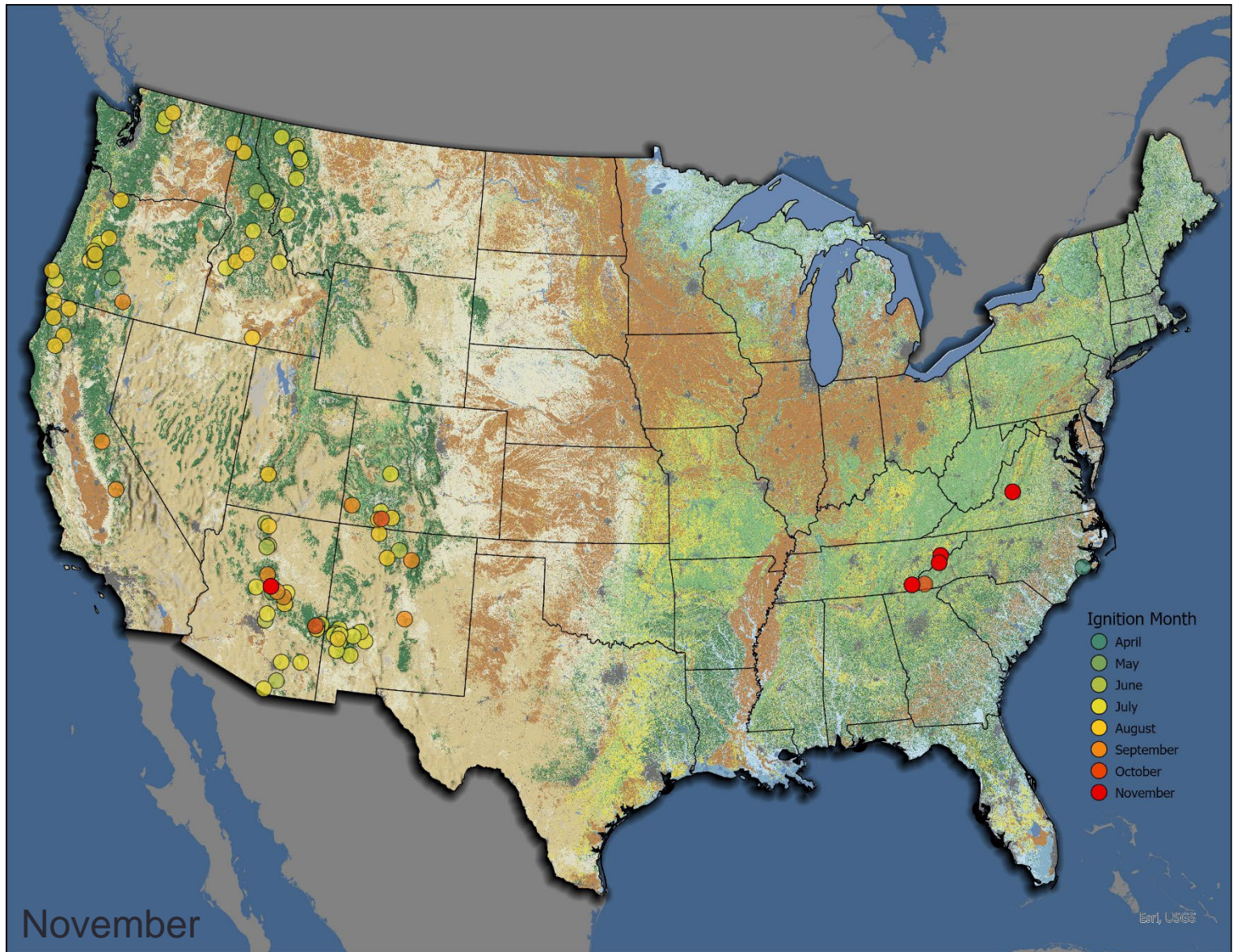


# Mappings by Ignition Month



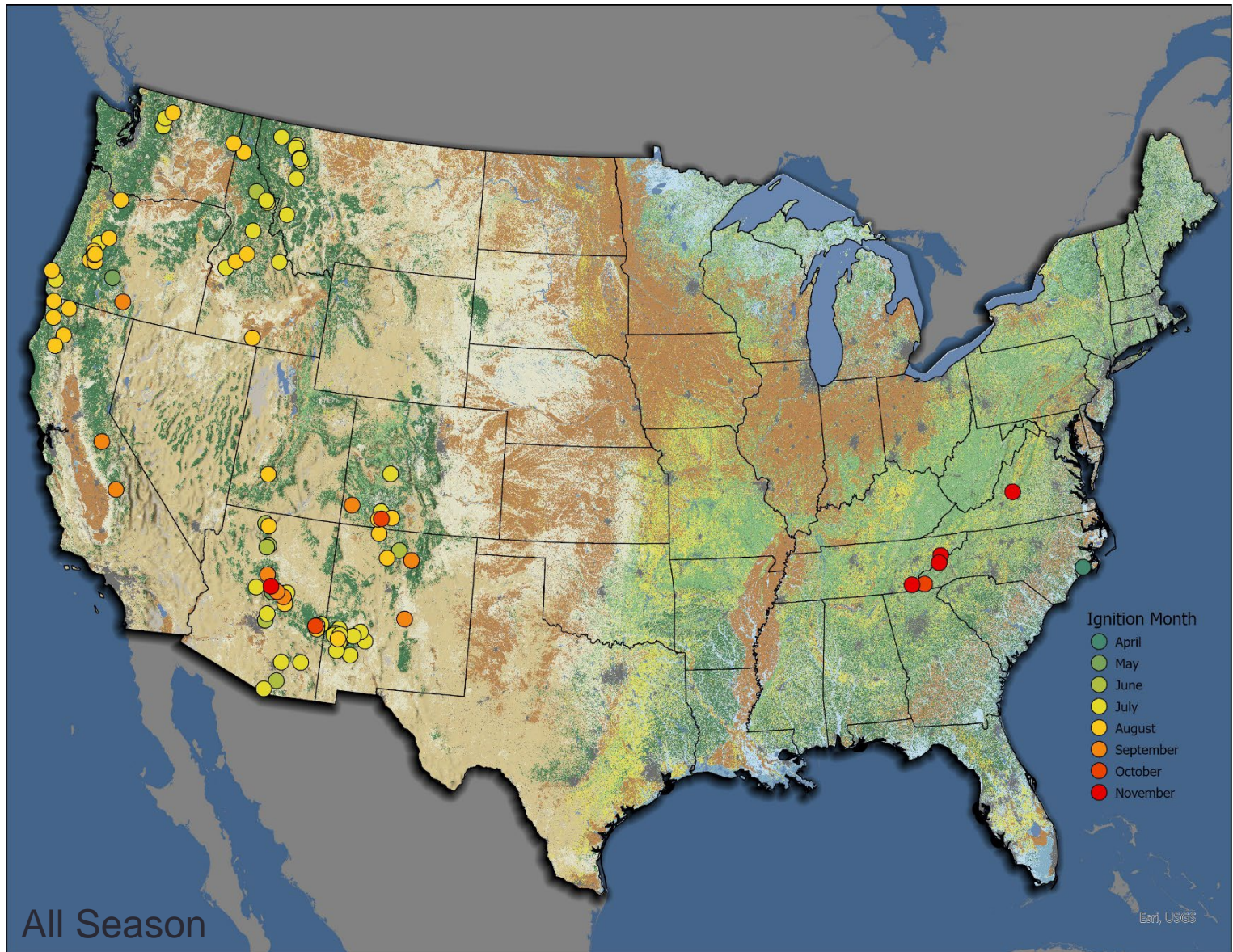


# Mappings by Ignition Month





# Mappings by Ignition Month



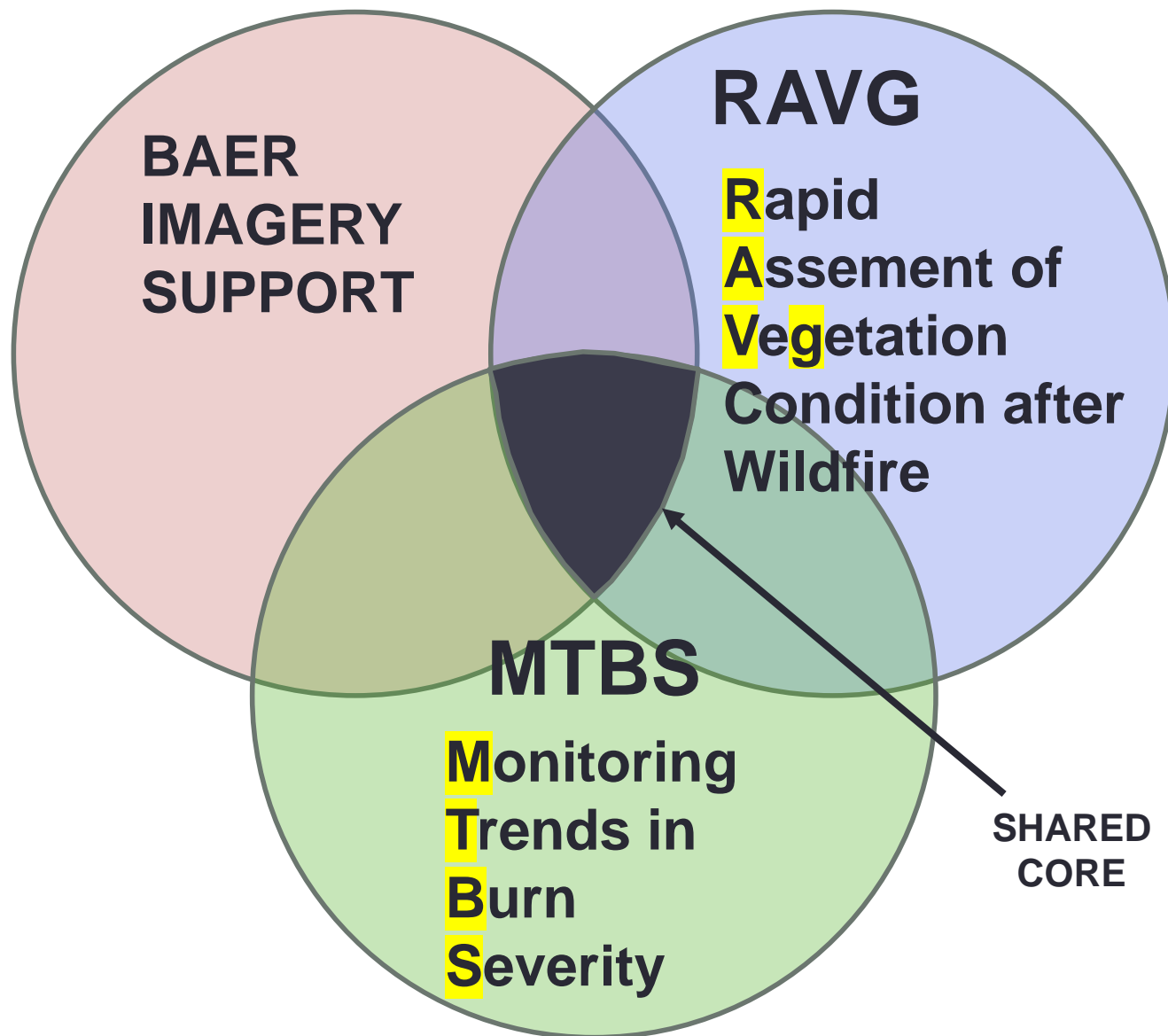
# How the BARC is Created



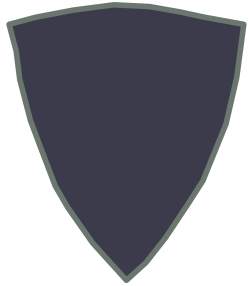


# Post-Fire Mapping Programs

SIMILAR BUT DIFFERENT



SHARED  
CORE



- All 3 programs based on same **remote sensing** principles
- Behind the scenes, shared **infrastructure** for mapping
  - Database
  - Scripts
  - Software



ArcGIS



Google Earth Engine





# Satellite Constellations & Sensors

## 2024 BAER Imagery Support Program

Sensor	Spatial Resolution	Temporal Resolution (days)	Analysis	Source	Use with BAER
Landsat 8/9 OLI	30m	16 (8)	dNBR*	USGS EROS	Frequent
Sentinel-2 (A/B) MSI	20m	10 (5)	dNBR*	ESA Copernicus	Frequent

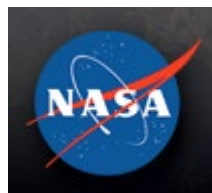
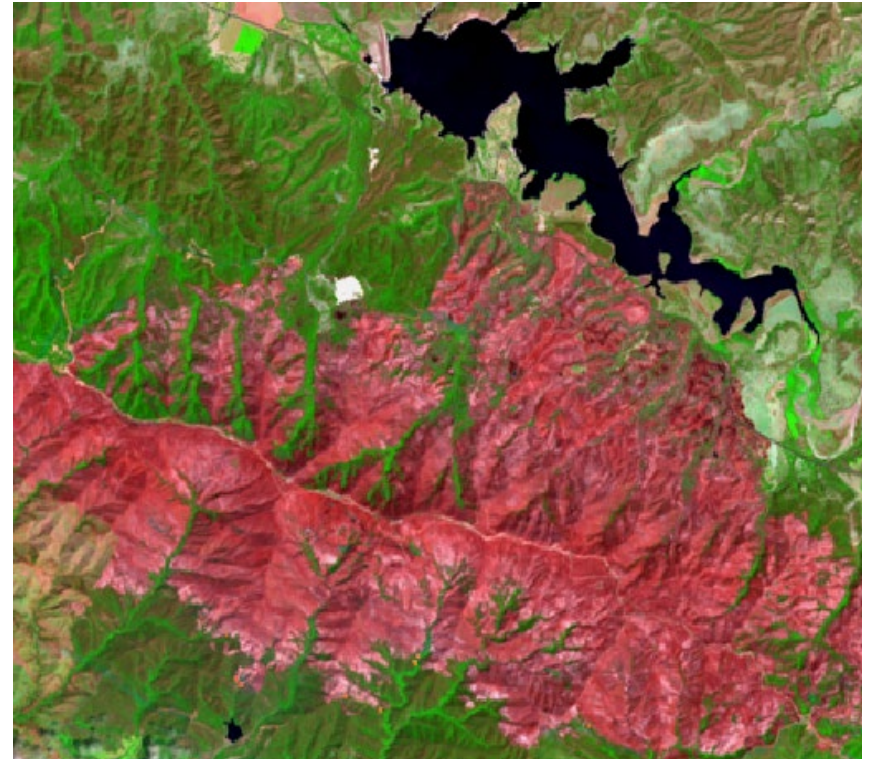
\*dNDVI products are available by request



# Satellite Constellations

## Landsat

- Engineered by NASA; Data managed by USGS
- Tried and true – well tested and documented
- Revisit time: 16 days independently
  - 8 days alternating (8&9)
- Resolution : 30 meters
- Delivery time: 3+ hours
- Currently using L8/9

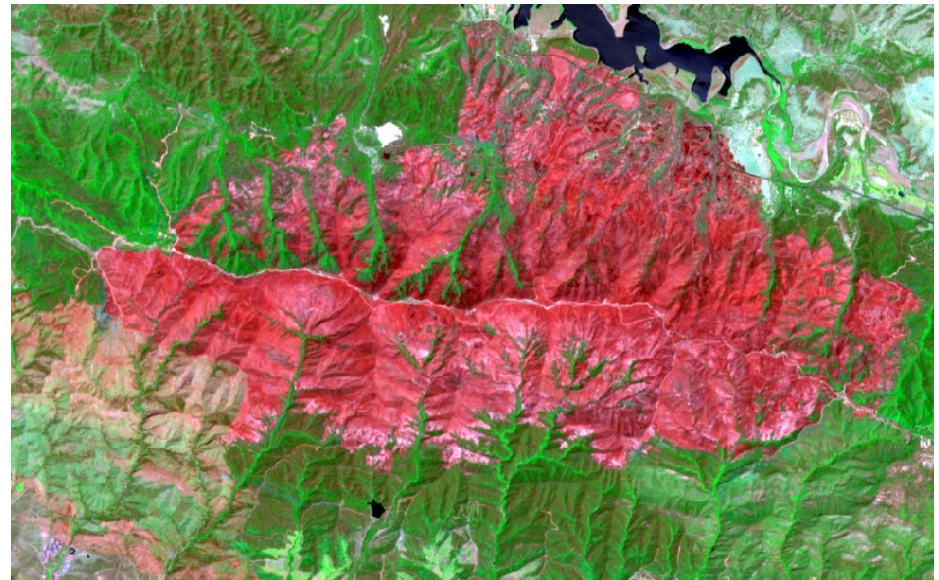


# Satellite Constellations

## Sentinel-2



- European Space Agency
- Revisit time: 10 days but 2 satellites = 5 days
- Resolution : 20 meters
- Delivery time: 1-2 days
- Have tested and compared to L8 products
  - Highly compatible with Landsat and creates comparable products

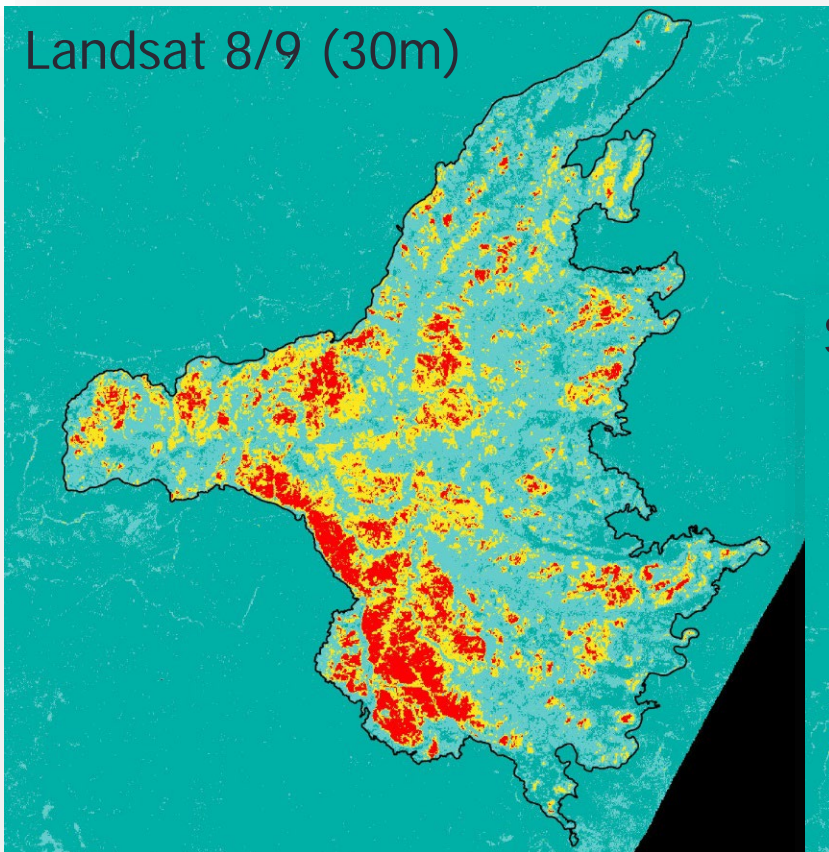




# Satellite Constellations

## Landsat / Sentinel-2 Comparison

Landsat 8/9 (30m)



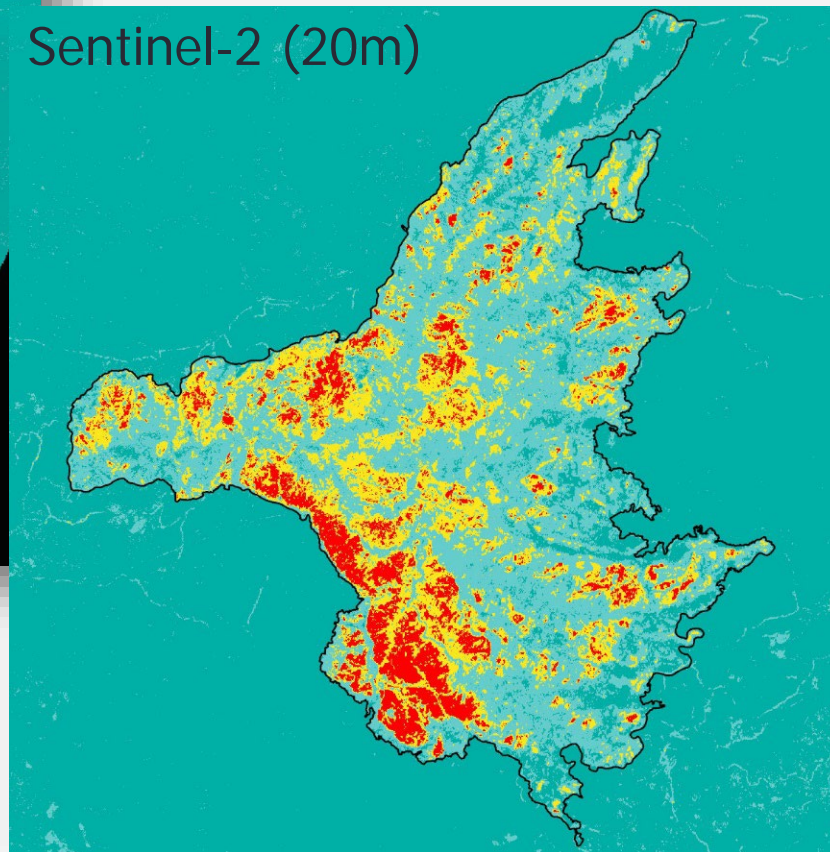
Example:

BARC4 Product

2022 Mosquito Fire

California

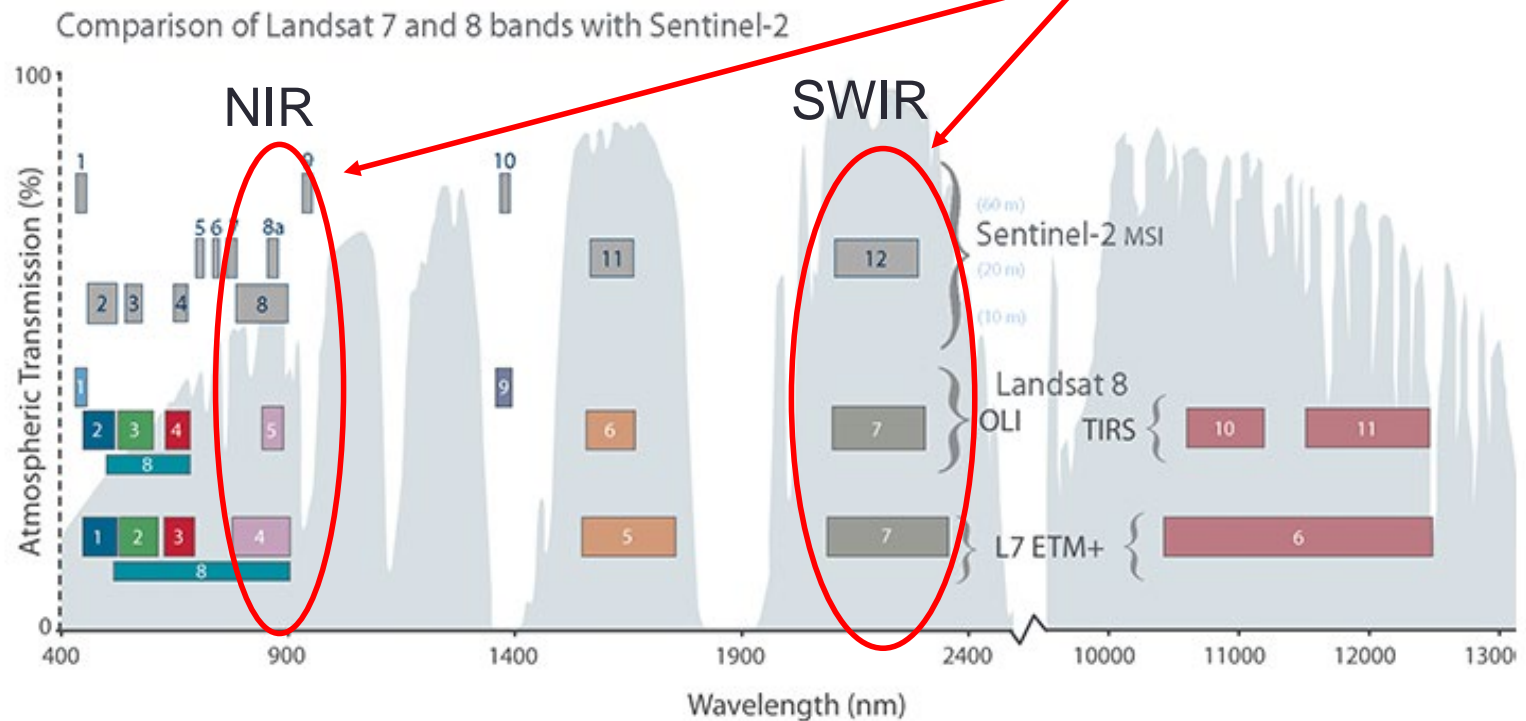
Sentinel-2 (20m)



# Satellite Constellations

## Landsat / Sentinel-2 Multispectral Bands

The BARC product utilizes the NIR and SWIR bands.



Source: <https://landsat.gsfc.nasa.gov/landsat-9/landsat-9-spectral-bands>



# Remote Sensing Principles

## Multispectral Imagery

True Color: Red, Green, Blue



Pre-fire Image



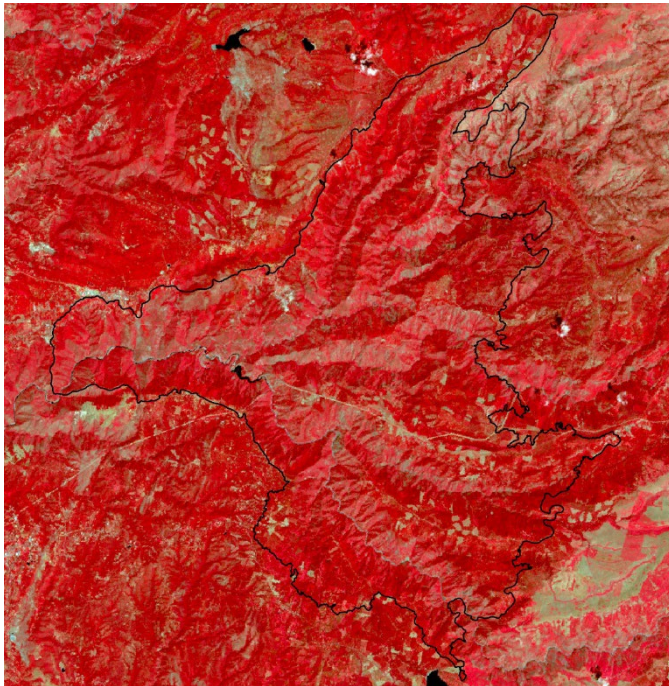
Post-fire Image



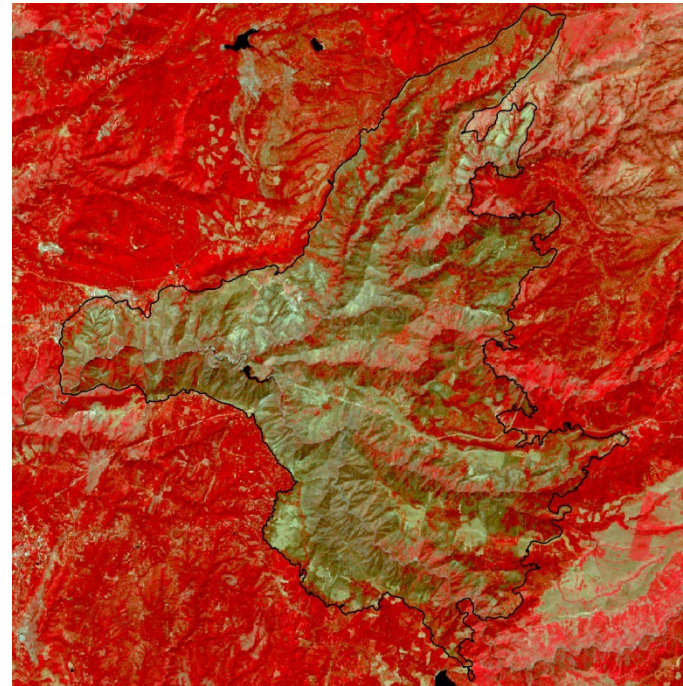
# Remote Sensing Principles

## Multispectral Imagery

False Color: Near Infrared, Red, Green



Pre-fire Image



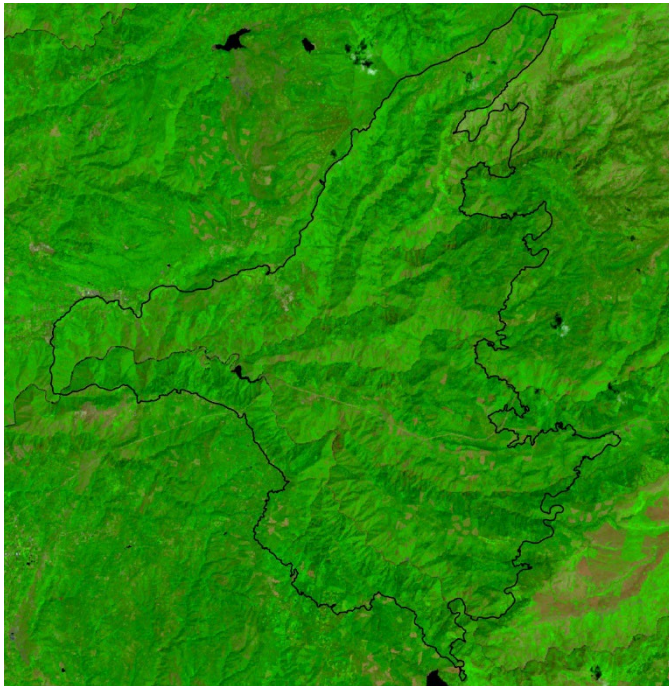
Post-fire Image



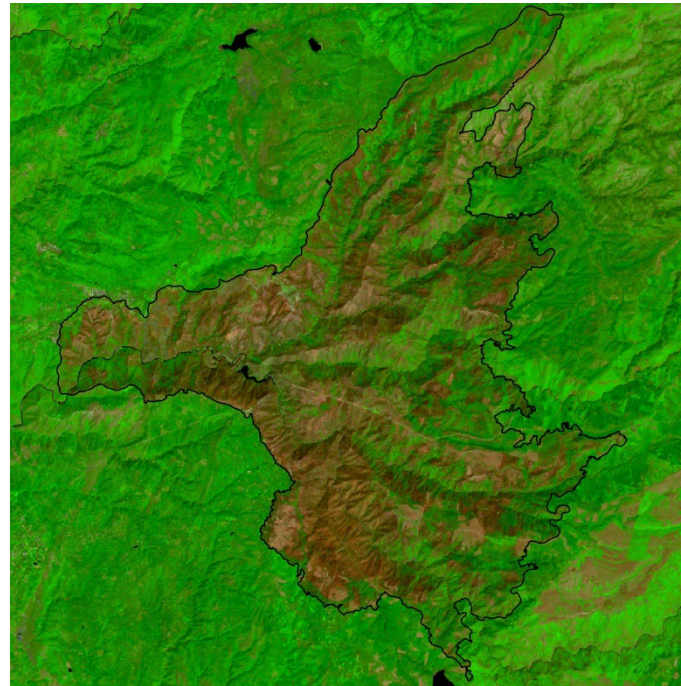
# Remote Sensing Principles

## Multispectral Imagery

False Color: Shortwave Infrared 2, Near Infrared, Red



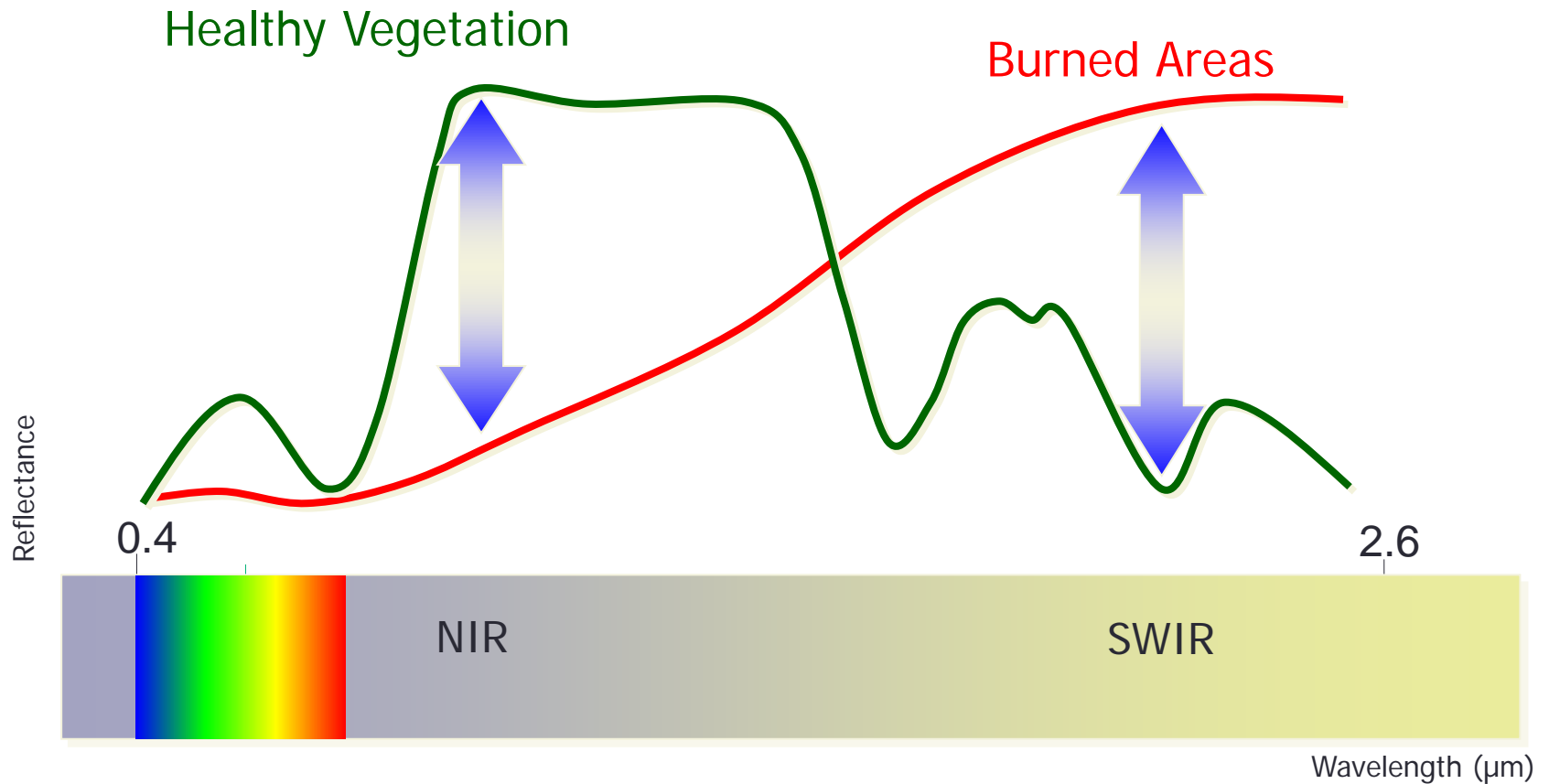
Pre-fire Image



Post-fire Image

# Remote Sensing Principles

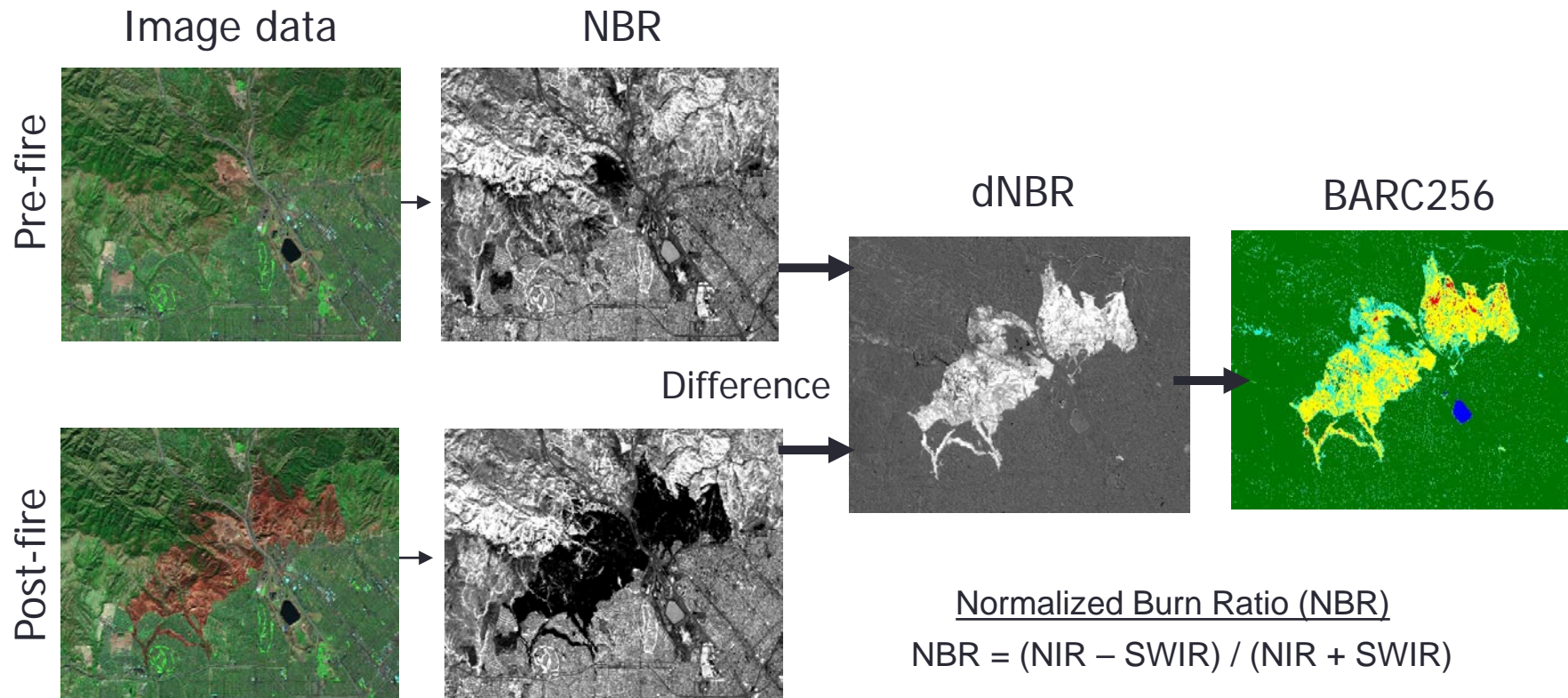
## Healthy Vegetation vs Burned Areas





# Remote Sensing Principles

## Creating Burn Severity Products



Normalized Burn Ratio (NBR)

$$\text{NBR} = (\text{NIR} - \text{SWIR}) / (\text{NIR} + \text{SWIR})$$

Differenced Normalized Burn Ratio (dNBR)

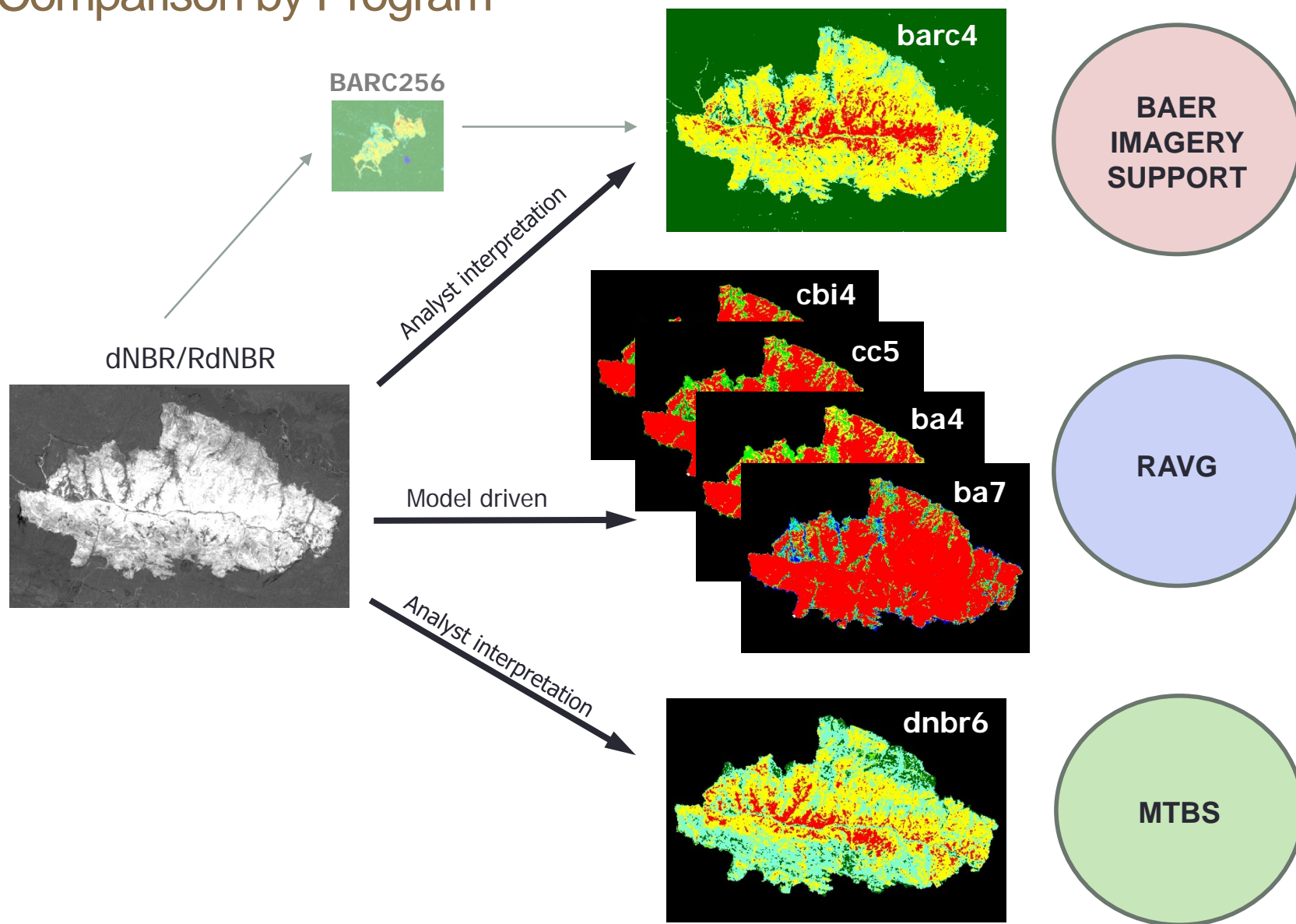
$$\text{dNBR} = \text{Pre NBR} - \text{Post NBR}$$

NIR = near infrared

SWIR = shortwave infrared

# Burn Severity Final Products

## Comparison by Program





# How to Order a BARC





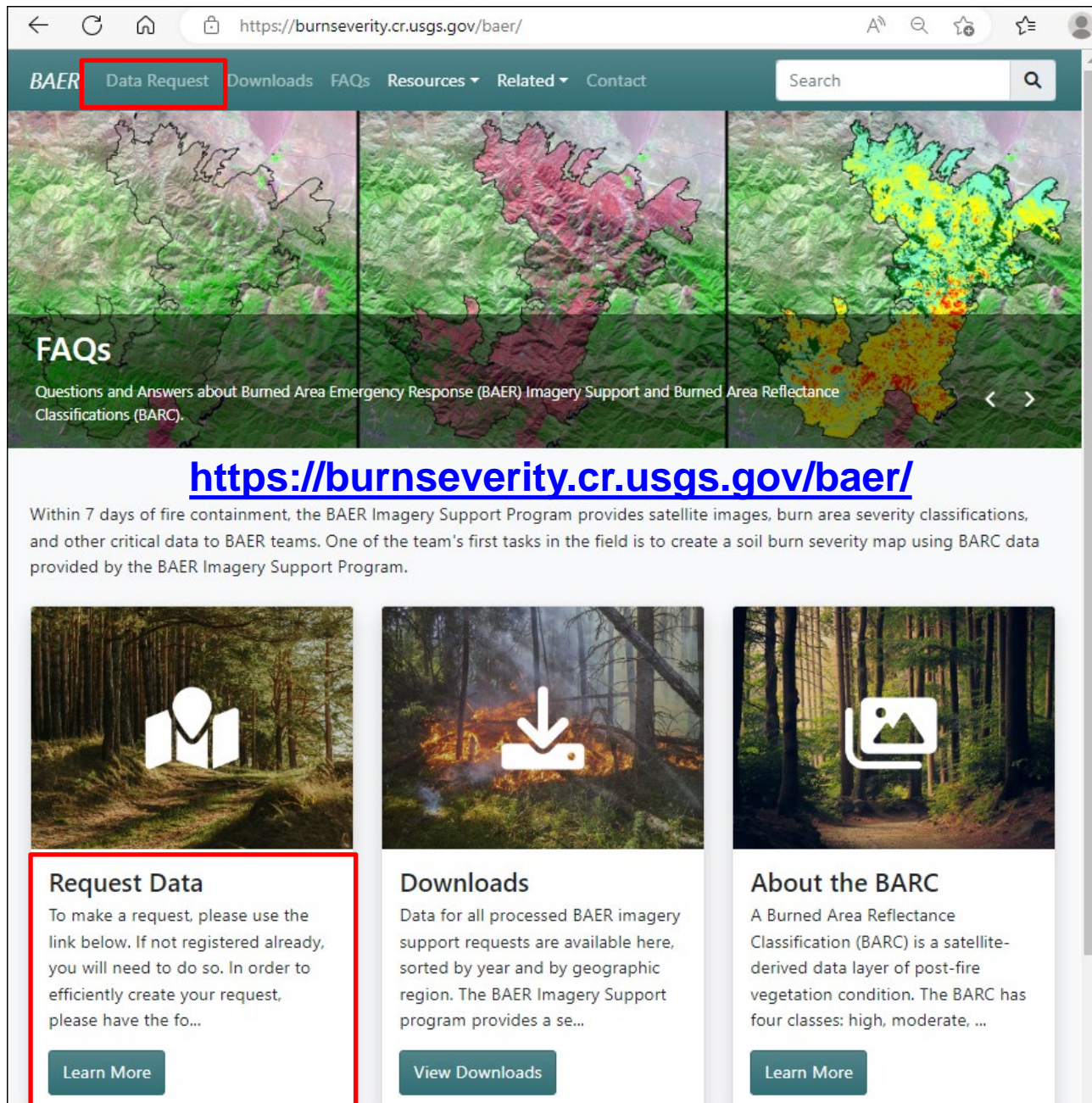
# BAER Imagery Support Program

## BARC Product Ordering Limitations

- BARC mapping by request only
- Priority is for **official BAER assessments**
- GTAC will provide **1-2 BARC packages per incident** without charge
- **Exceptions** may be made for prolonged incidents
- **Non-BAER** related BARC maps may be ordered on a **cost-reimbursable** basis (USFS)
  - Prescribed fire
  - Habitat assessments and other non-BAER post-fire needs
  - Contact Kurtis Nelson for questions regarding DOI incidents



# BAER Imagery Support Website



The screenshot shows the BAER Imagery Support Website. The browser address bar displays <https://burnseverity.cr.usgs.gov/baer/>. The navigation menu includes **BAER**, **Data Request** (highlighted with a red box), **Downloads**, **FAQs**, **Resources**, **Related**, and **Contact**. A search bar is located on the right. The main content area features a large banner with three maps of a forested region, each showing different data layers. Below the banner, the text reads: "FAQs Questions and Answers about Burned Area Emergency Response (BAER) Imagery Support and Burned Area Reflectance Classifications (BARC)." A blue link <https://burnseverity.cr.usgs.gov/baer/> is displayed. Below this, a paragraph states: "Within 7 days of fire containment, the BAER Imagery Support Program provides satellite images, burn area severity classifications, and other critical data to BAER teams. One of the team's first tasks in the field is to create a soil burn severity map using BARC data provided by the BAER Imagery Support Program." Three cards are shown: "Request Data" (with a map icon), "Downloads" (with a download icon), and "About the BARC" (with a camera icon). Each card has a "Learn More" button. The "Request Data" card is highlighted with a red box.

<https://burnseverity.cr.usgs.gov/baer/>

Within 7 days of fire containment, the BAER Imagery Support Program provides satellite images, burn area severity classifications, and other critical data to BAER teams. One of the team's first tasks in the field is to create a soil burn severity map using BARC data provided by the BAER Imagery Support Program.

**Request Data**

To make a request, please use the link below. If not registered already, you will need to do so. In order to efficiently create your request, please have the fo...

[Learn More](#)

**Downloads**

Data for all processed BAER imagery support requests are available here, sorted by year and by geographic region. The BAER Imagery Support program provides a se...

[View Downloads](#)

**About the BARC**

A Burned Area Reflectance Classification (BARC) is a satellite-derived data layer of post-fire vegetation condition. The BARC has four classes: high, moderate, ...

[Learn More](#)



# BARC Request Application (RFMapp)

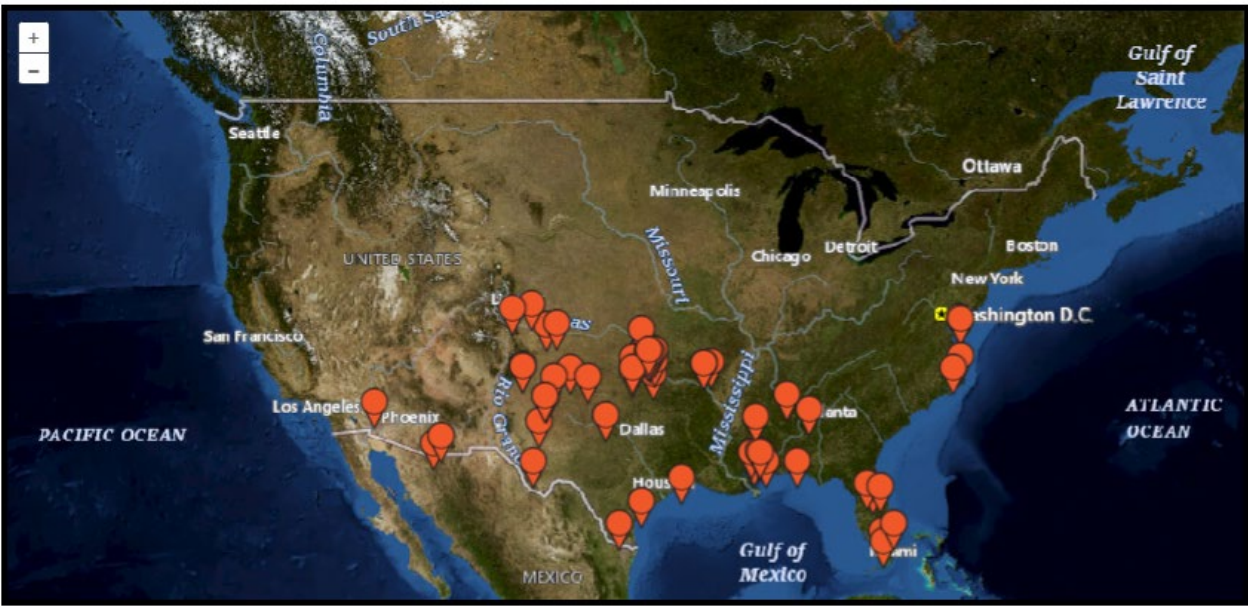
← ↻ 🏠 [https://burnseverity.cr.usgs.gov/rfmapp/baer#error=login\\_required&state=5a50d...](https://burnseverity.cr.usgs.gov/rfmapp/baer#error=login_required&state=5a50d...) 🔍 ⭐ 👤

**RFMapp** Incident Map Request Queue Login

To submit a BAER support request you must login first. For user that doesn't have .gov email, please reach out to

- For DOI BAER contact: [knelson@usgs.gov](mailto:knelson@usgs.gov)
- For USFS BAER contact: [sm.fs.baerimagery@usda.gov](mailto:sm.fs.baerimagery@usda.gov)

Choose Fire ▾



Having trouble? If your request is related to a Dept. of Interior fire, contact Kurtis Nelson at [knelson@usgs.gov](mailto:knelson@usgs.gov). If your request is related to a US Forest Service fire, or if your request is not related to an active BAER incident, please send an email to [sm.fs.baerimagery@usda.gov](mailto:sm.fs.baerimagery@usda.gov)

- Map interface populated with current large incidents
- If fire not listed, user can add manually
- Account required (very simple, instantaneous)
- Exercise 1 walks through the ordering process

<https://burnseverity.cr.usgs.gov/rfmapp/baer>



# BAER Imagery Support Program

## BARC Request Application Form

Create BAER Request

Email Address*	Name*	Phone*
<input type="text" value="smokey.bear@usda.gov"/>	<input type="text" value="Smokey Bear"/>	<input type="text" value="1234567890"/>
Fire Id	Latitude (in DD xx.xxx)*	Longitude (in DD -xxx.xxx)*
<input type="text" value="2023-AZCRA-000044"/>	<input type="text" value="33.874"/>	<input type="text" value="-114.494"/>
Fire Name*	Agency	Ignition Date*
<input type="text" value="LEVEE"/>	<input type="text" value="BIA"/>	<input type="text" value="02/06/2023"/>
Burned Acres	Expected Containment Date	
<input type="text" value="509"/>	<input type="text" value="02/15/2023"/>	
Assessment Start Date*	Assessment Team Leader*	
<input type="text" value="mm/dd/yyyy"/>	<input type="text" value=""/>	
Comments		
<input type="text"/>		
<input type="button" value="Submit"/>		

# BAER Imagery Support Program

## BARC Request Application

Request queue: status of requests including which Center responding

RFMapp Incident Map Request Queue Login					
BAER Request Page					
			Request Year	2024	Status
Incident Name	Burned area	Supporting Agency	BEAR assessment start date	Requested Date	Status
WINDY DEUCE	144206	USGS EROS	2024-03-05	2024-03-06	Complete
SMOKEHOUSE CREEK	1059570	USFS GTAC	2024-03-18	2024-03-11	Complete
NORTH ZONE COMPLEX	14504	USFS GTAC	2024-04-03	2024-03-29	Processing





# What's Included in a BARC Data Package



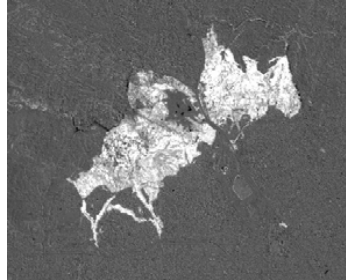
# BARC Data Package

## Products

Pre-Fire Image



dNBR



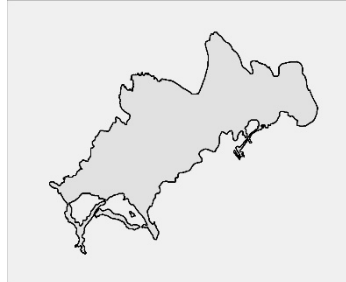
BARC256



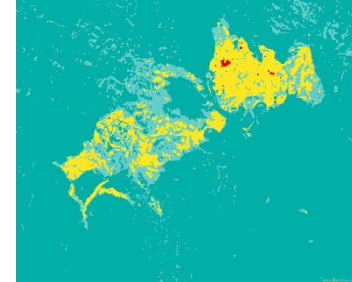
Post-Fire Image



Burn Boundary



BARC4



- Google Earth KMZ of BARC4
- Metadata
- PNG Thumbnails





# BARC Data Package

Side note: BARC256 vs BARC4 vs SBS

- **BARC256**

- 8-bit burn severity derived from 16-bit dNBR
  - Continuous (255 values)
  - $\text{BARC256} = (\text{dNBR} + 275) / 5$
- Preliminary data—used as input to the SBS

- **BARC4**

- Classified (4 or 5 classes)
- Derived from the thresholds applied to the BARC256
- Useful for visualizations

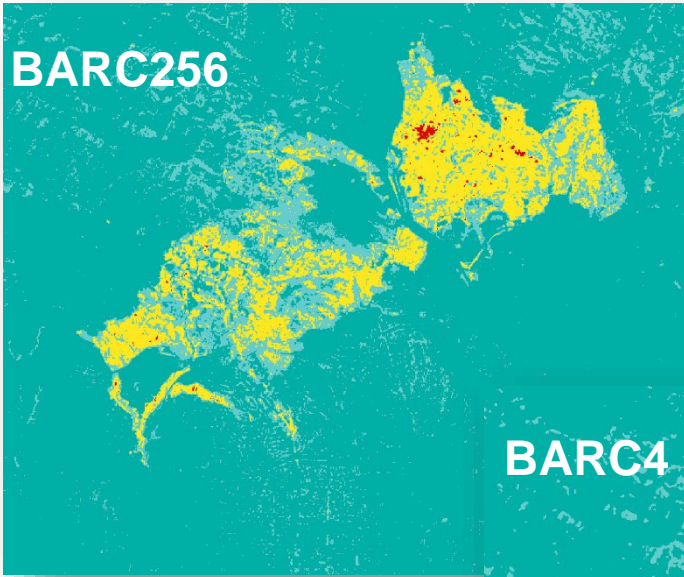
- **SBS (Soil Burn Severity)**

- Final (official) burn severity product
- Field-validated by BAER team based on field sampling, flight reconnaissance, etc.

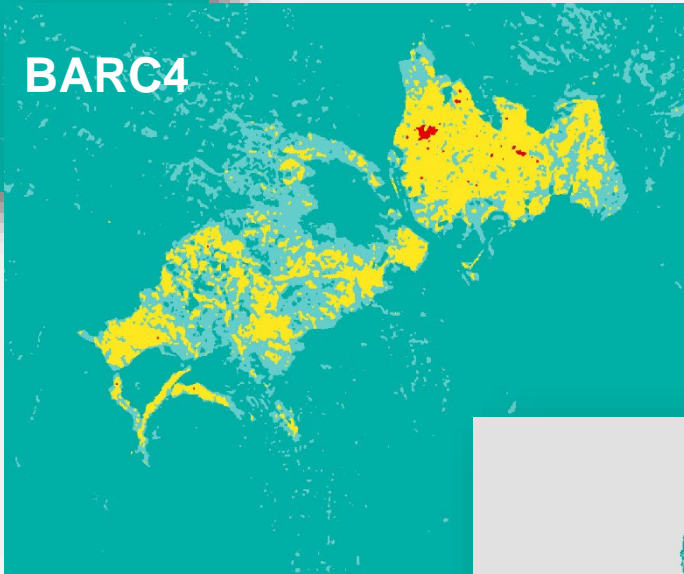


## Saddleridge fire (CA), 2019

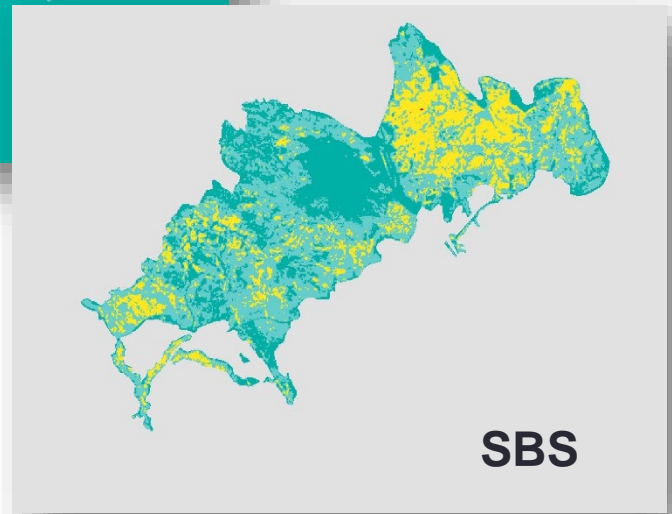
**BARC256**



**BARC4**



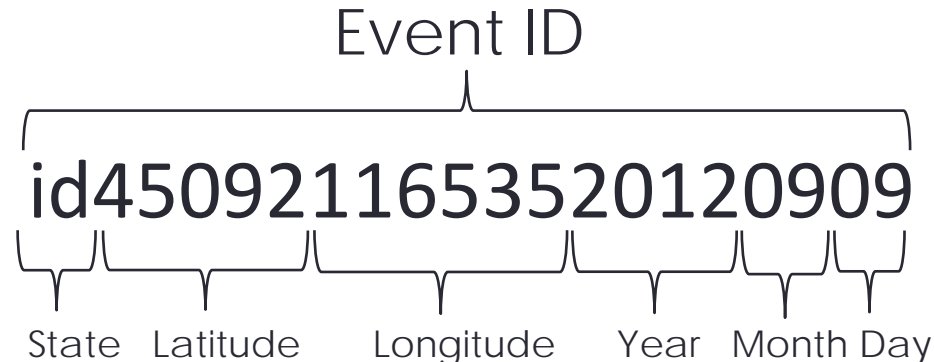
**SBS**





# BARC Data Package

## File Naming Conventions



### File Type

Perimeter  
dNBR/dNDVI  
BARC4  
BARC4 cm\*  
BARC256  
BARC256 cm\*  
ba7\_prelim\*\*  
Metadata  
SBS Metadata  
Pre-fire Image  
Post-fire Image

### File Name

id4509211653520120909\_20110920\_20120930\_burn\_bndy\_utm.shp  
id4509211653520120909\_20110920\_20120930\_dnbr\_utm.tif  
id4509211653520120909\_20110920\_20120930\_dnbr\_barcode\_utm.tif  
id4509211653520120909\_20110920\_20120930\_dnbr\_barcode\_cm\_utm.tif  
id4509211653520120909\_20110920\_20120930\_dnbr\_barcode256\_utm.tif  
id4509211653520120909\_20110920\_20120930\_dnbr\_barcode256\_cm\_utm.tif  
id4509211653520120909\_20110920\_20120930\_rdnbr\_ba7\_prelim\_utm.tif  
id4509211653520120909\_20110920\_20120930\_metadata\_utm.xml  
id4509211653520120909\_20110920\_20120930\_SBS\_metadata.txt  
id4509211653520120909\_20110920\_l5\_refl\_utm.tif  
id4509211653520120909\_20120930\_l7\_refl\_utm.tif

Imagery date

Plus KMZ, thumbnails, and 4 PDF documents

\*cm products are masked and clipped to the burned area boundary

\*\*New this year – Preliminary vegetation mortality 7-class basal area loss product (based on RAVG models)

# BARC Data Package

## Another side note: SBS vs Preliminary Vegetation Mortality



### Soil Burn Severity - Smith River Complex

#### Burned Area Emergency Response (BAER)

#### Six Rivers National Forest and Rouge River Siskiyou National Forest

##### Soil Burn Severity

Soil Burn Severity is a measure of the fire's effects on the ground surface and soil condition. This map identifies the fire-induced changes in soil and ground surface properties that may affect infiltration, runoff, and erosion potential. The BAER Team uses this map to identify areas of unacceptable risk to a critical value and where mitigating treatments may be most effective.

##### Severity Indicators

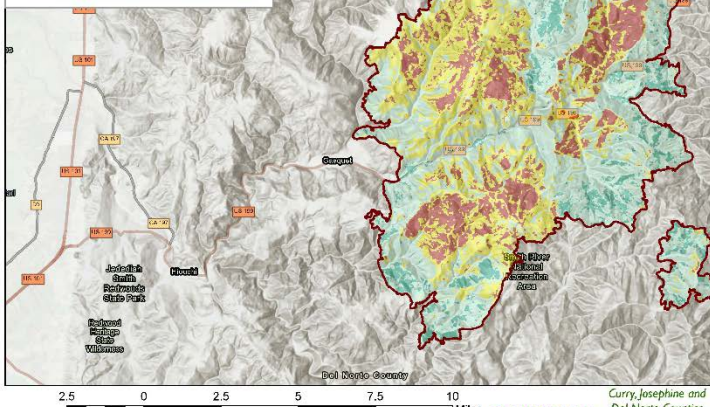
**High soil burn severity:** Most or all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed, and charring may be visible on larger roots. Soil is often gray, orange, or reddish at the ground surface where large or dense fuels were concentrated and consumed. Soil structure is often altered and less stable at the surface.

**Moderate soil burn severity:** Up to 80 percent of the pre-fire ground cover may be consumed but generally not all of it. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. Soil structure is generally unchanged.

**Low soil burn severity:** The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred), and surface organic layers are not completely consumed. The canopy and understory vegetation will likely appear "green."

**Very Low or Unburned:** Little to no burn expected within these areas except in small patches, or where fuels were sparse. Canopy and ground litter almost completely intact. Little to no vegetation mortality expected.

For additional information including photo examples of soil burn severity see the Field Guide for Mapping Post-Fire Soil Burn Severity at: [https://www.fs.usda.gov/rm/pubs/rmrs\\_gtr243.pdf](https://www.fs.usda.gov/rm/pubs/rmrs_gtr243.pdf)



##### Disclaimer

This product is a product of BAER rapid assessment. Further information concerning the accuracy and appropriate uses of this data may be obtained from the USDA Forest Service. The Forest Service, makes no warranty, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, nor assumes any legal liability or responsibility for the accuracy, reliability, completeness or utility of these geospatial data, or for the improper or incorrect use of these geospatial data. These geospatial data and related maps or graphics are not legal documents and are not intended to be used as such. The data and maps may not be used to determine title, ownership, legal descriptions, boundaries, legal jurisdiction, or restrictions that may be in place on either public or private land. Natural hazards may or may not be depicted on the data and maps, and land users should exercise due caution. The data is dynamic and may change over time. The user is responsible to verify the limitations of the geospatial data and to use the data accordingly.

CALIFORNIA & OREGON



Date: 9/28/2023



### Preliminary Vegetation Mortality - Smith River Complex

#### Burned Area Emergency Response (BAER)

#### Six Rivers National Forest and Rouge River Siskiyou National Forest

##### Preliminary Vegetation Mortality - Basal Area Loss

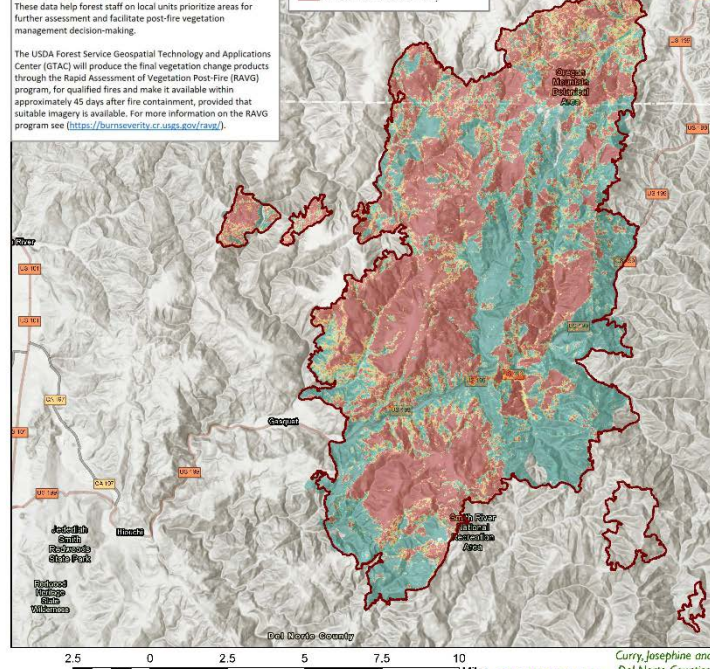
This is a post-fire preliminary vegetation mortality product that focuses on the current wildfire effects to the vegetation and is reported in percent of live basal area (BA) loss. Basal area is the estimated cross-sectional area of tree stems within a unit area, often expressed as square feet per acre. This product helps BAER team scientists understand the scope and scale of vegetation mortality in assessing emergency response strategies.

This post-fire product is shared with the local forest and agency partners for use in assessing fire-related reforestation needs. These data help forest staff on local units prioritize areas for further assessment and facilitate post-fire vegetation management decision-making.

The USDA Forest Service Geospatial Technology and Applications Center (GTAC) will produce the final vegetation change products through the Rapid Assessment of Vegetation Post-Fire (RAVG) program, for qualified fires and make it available within approximately 45 days after fire containment, provided that suitable imagery is available. For more information on the RAVG program see (<https://burnseverity.usgs.gov/ravg/>).

##### Preliminary Vegetation Mortality

0% BA mortality  
1-10% BA mortality  
11-25% BA mortality  
25-50% BA mortality  
50-75% BA mortality  
75-90% BA mortality  
90% or more BA mortality



##### Disclaimer

This product is a product of BAER rapid assessment. Further information concerning the accuracy and appropriate uses of this data may be obtained from the USDA Forest Service. The Forest Service, makes no warranty, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, nor assumes any legal liability or responsibility for the accuracy, reliability, completeness or utility of these geospatial data, or for the improper or incorrect use of these geospatial data. These geospatial data and related maps or graphics are not legal documents and are not intended to be used as such. The data and maps may not be used to determine title, ownership, legal descriptions, boundaries, legal jurisdiction, or restrictions that may be in place on either public or private land. Natural hazards may or may not be depicted on the data and maps, and land users should exercise due caution. The data is dynamic and may change over time. The user is responsible to verify the limitations of the geospatial data and to use the data accordingly.

CALIFORNIA & OREGON



Date: 9/28/2023





# BARC Data Package

## Data Delivery

- **BARC data will be staged on Box (Pinyon)**
  - Link emailed to requestor
  - Intended for USFS BAER teams only



# **Color Vision Deficit (CVD)-friendly BARC for 508 Compliance**

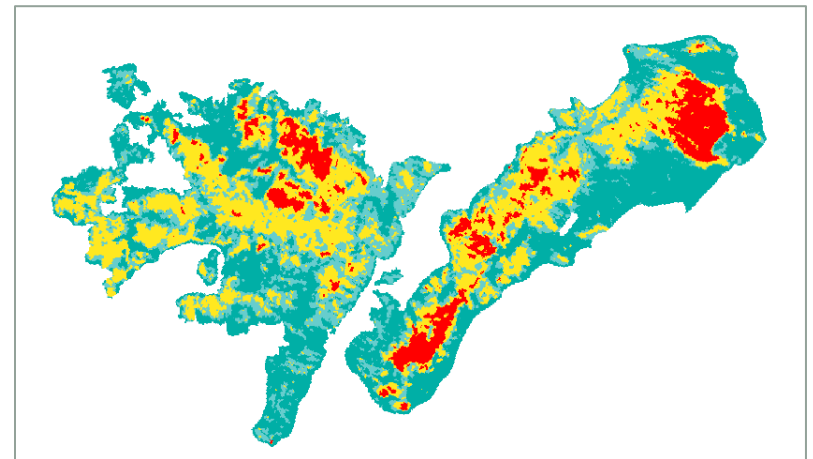
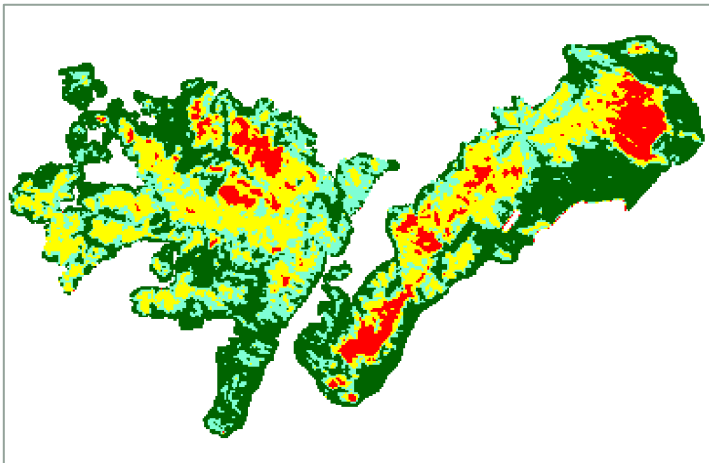




# BARC Data Products

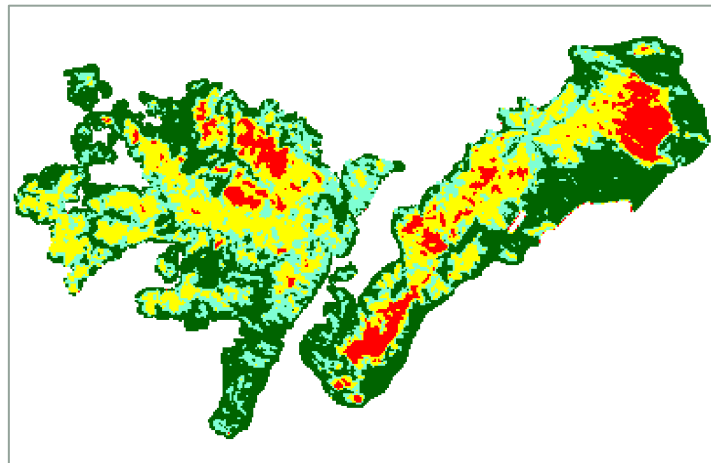
## Increasing Accessibility

- “Classic” color scheme problematic for some with color-vision deficiency (“colorblind”)
- Updated color scheme tested during 2022; default as of the 2023 fire season

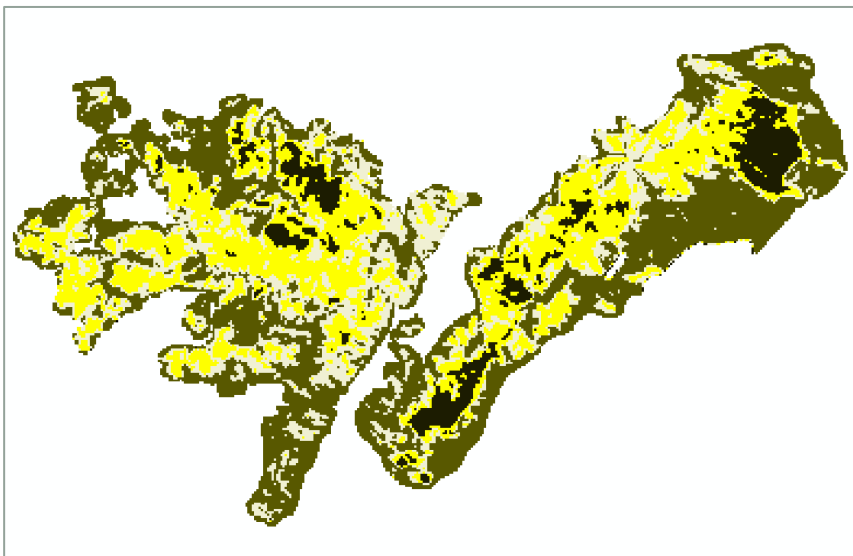


# BARC Data Products

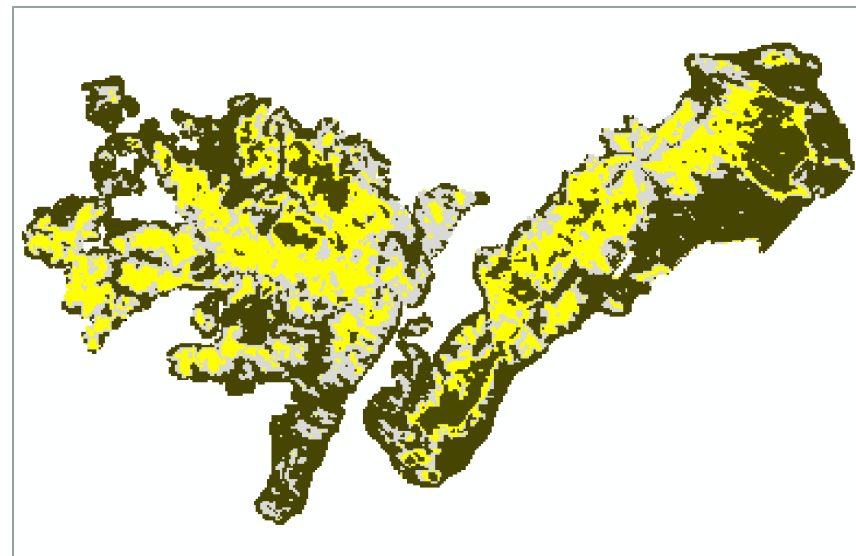
## “Classic” BARC



**Protanopia:**



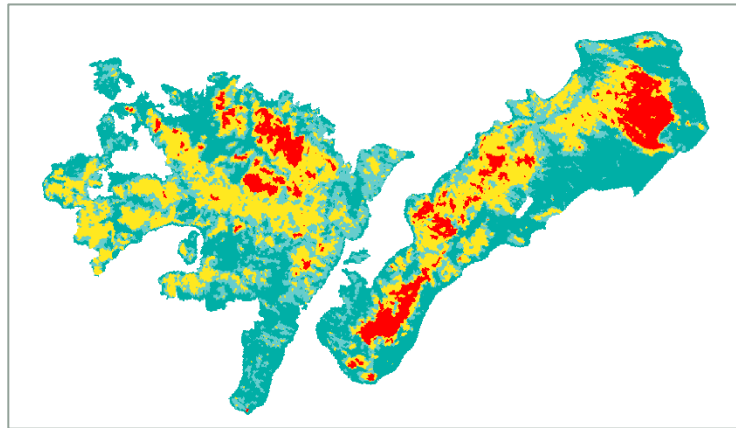
**Deuteranopia:**



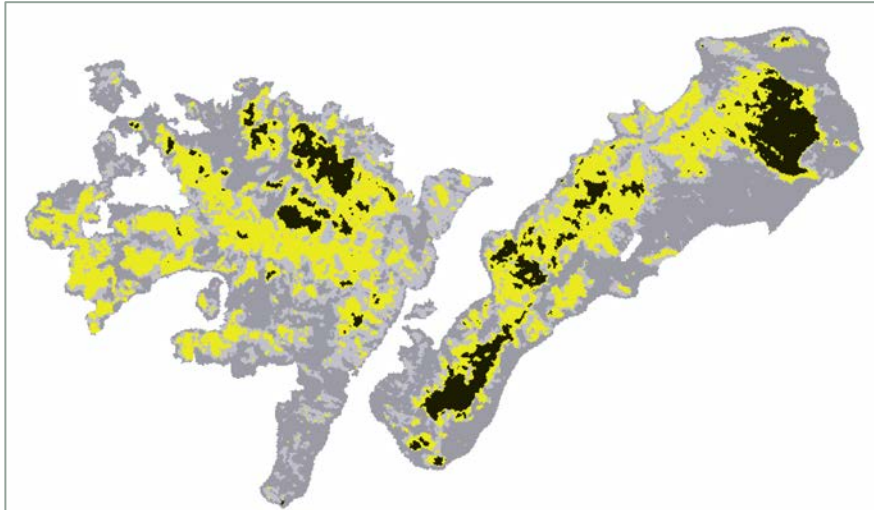


# BARC Data Products

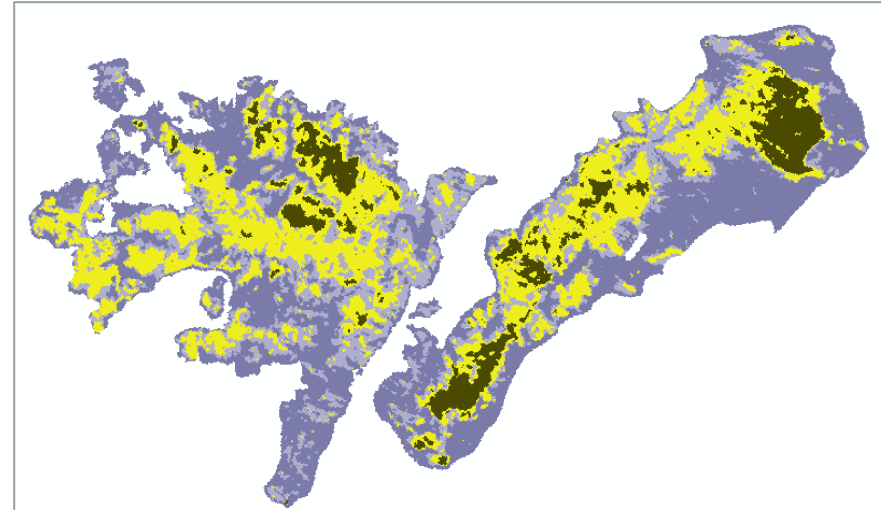
508 Compliant BARC (2023 Version)



Protanopia:

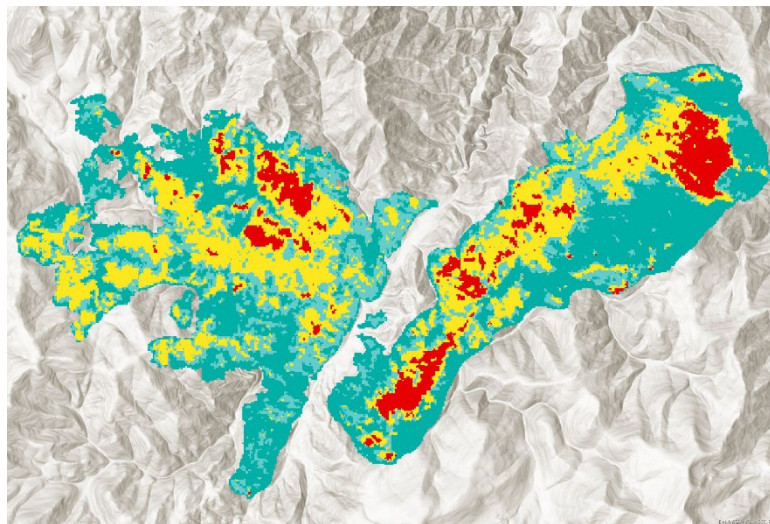


Deuteranopia:

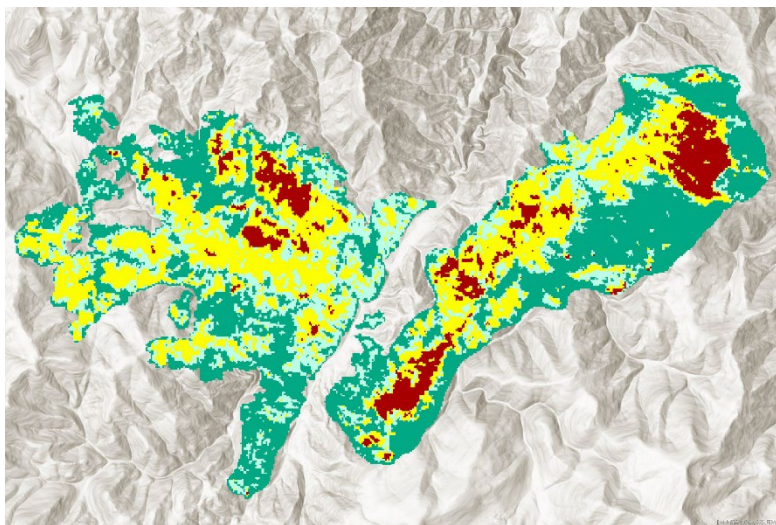


# BARC Data Products

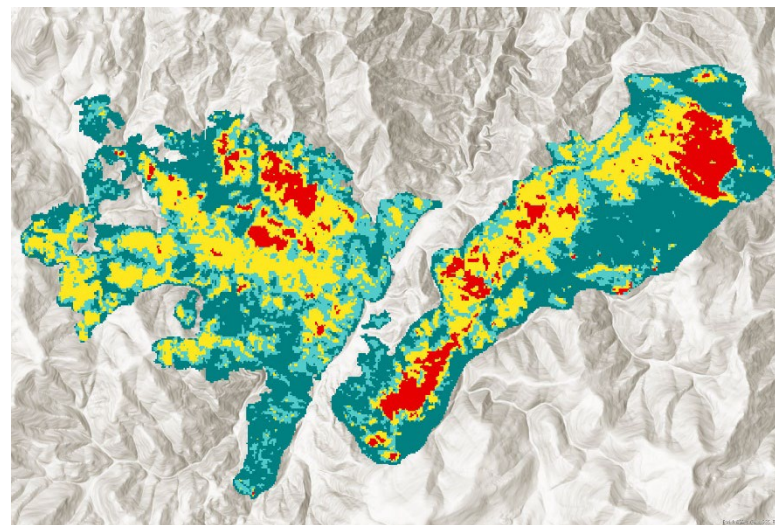
## Updates to 508 Compliant BARC



Version 1:



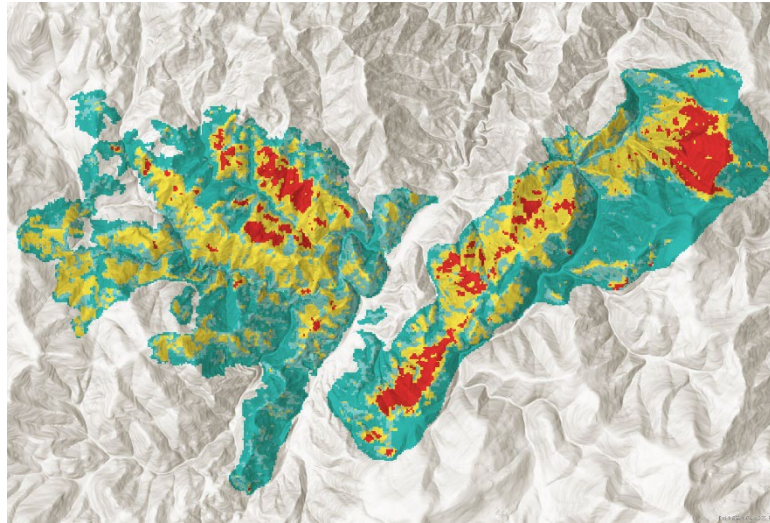
Version 2:



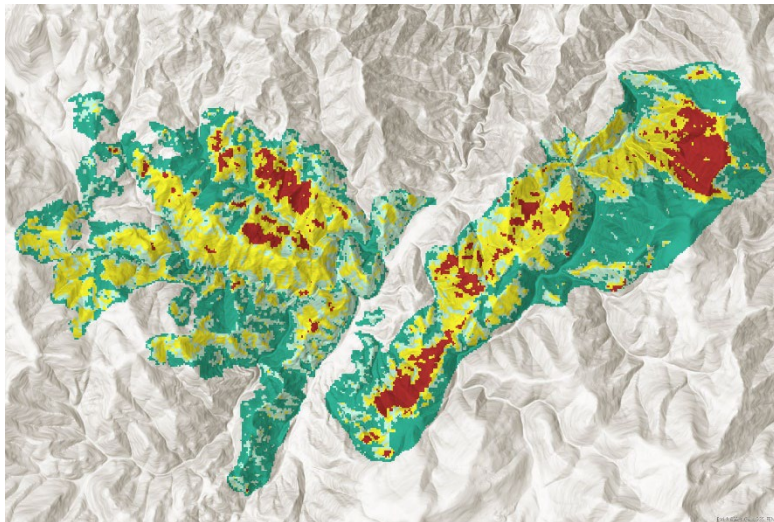


# BARC Data Products

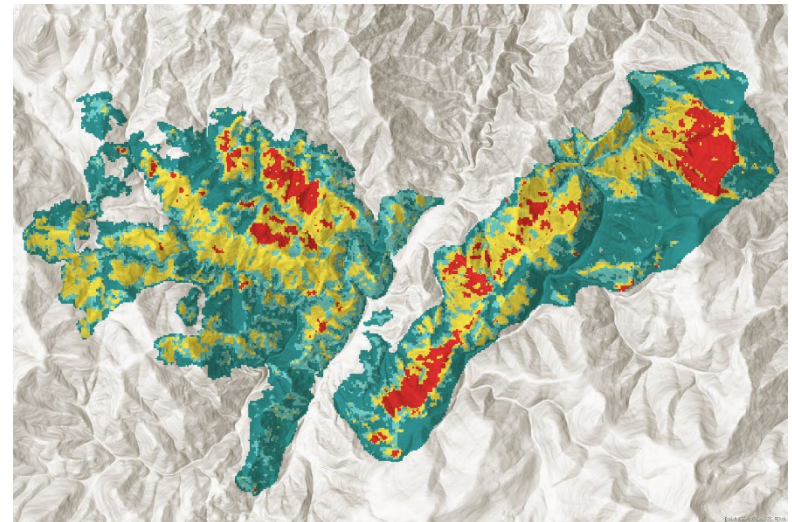
## Updates to 508 Compliant BARC



**Version 1:**



**Version 2:**



# Soil Burn Severity





# Soil Burn Severity

## What is SBS?

1. SBS is the field-validated final burn severity dataset
2. It is necessary for all BAER related mitigation measures
3. Also necessary for debris flow hazard modeling
4. It is the only dataset that we make publicly available

### *Field Guide for Mapping Post-Fire Soil Burn Severity*

Helps BAER teams to consistently interpret, field validate and map soil burn severity

Available for download (PDF):  
<http://treesearch.fs.fed.us/pubs/36236>

Also included in training data bundle



United States  
Department  
of Agriculture

Forest Service

Rocky Mountain  
Research Station

General Technical Report  
RMRS-GTR-243

October 2010



## Field Guide for Mapping Post-Fire Soil Burn Severity

Annette Parsons, Peter R. Robichaud, Sarah A. Lewis,  
Carolyn Napper, and Jess T. Clark







# Soil Burn Severity

## GTAC's Current Role & Responsibilities

- GTAC has provided a repository for SBS data
- GTAC distributes SBS data for fire research, management, decision making, etc.
- 85% - 95% of teams returned SBS in recent years
- After field assessment, post final soil burn severity data to T-drive:

**T:\FS\NFS\WOEngineering\GMO-  
RSAC\RDAS\BAER\_FINAL\_SoilBurnSeverity**

**\*\*\* NOTE: USFS National BAER Application in development \*\*\***

# Soil Burn Severity

## Current Data Archiving Guidance

- **Raster dataset**
  - GeoTIFF
  - 4 class thematic
- **Metadata**
  - Follow template provided with the data bundle
- **Ancillary data**
  - Geolocated photos
  - Include vector format (shapefile) if desired
  - PDF of BAER team map
- **Posted to T-drive**

### Instructions for Archiving the Soil Burn Severity Data

The Soil Burn Severity (SBS) dataset should be submitted to GTAC where it will be archived and made available to the public. These datasets are also used to assess the accuracy of the BARC products and to maintain high quality standards. **It is therefore critical that they are submitted.**

Upon completion of an SBS map, the BAER Team Leader should approve the map and authorize the BAER GIS specialist to transmit a copy of the SBS data to GTAC for archiving and distribution. The SBS data should follow the guidelines below. **If you need help with converting or submitting data, please contact Carl Albury at [carl.albury@usda.gov](mailto:carl.albury@usda.gov).**

#### 1) SBS dataset format

- A. GeoTIFF raster format (.tif extension), classified into four categories: Unburned / Undetectable, Low, Moderate, and High.

#### 2) Metadata

- A. Open the metadata text file included in the SBS data bundle and complete the empty section found at the bottom of the document. The original BARC256 threshold values can be found in this section as a reference.
- B. Document the steps taken to convert the BARC256 to the SBS dataset. For example:
  - Step 1 - Adjusted the threshold between High and Moderate severity from 200 to 210 based on 10 field observations in those classes*
  - Step 2 - Used a vegetation cover map to reclassify grasslands to Low burn severity,*
  - Step 3 - Used a vegetation cover map to reclassify chaparral from High to Moderate burn severity.*

Note: If you investigated the fire and found the BARC to be accurate, thus requiring no changes, please state that clearly.

#### 3) Additional datasets

- A. If you have additional datasets such as geotagged photos, ground points or polygons that were drawn to help delineate the burned areas, please include those along with your SBS data. These data are very useful for interpretation and for understanding how the BARC was validated and the SBS created.

#### 4) Delivery of SBS data

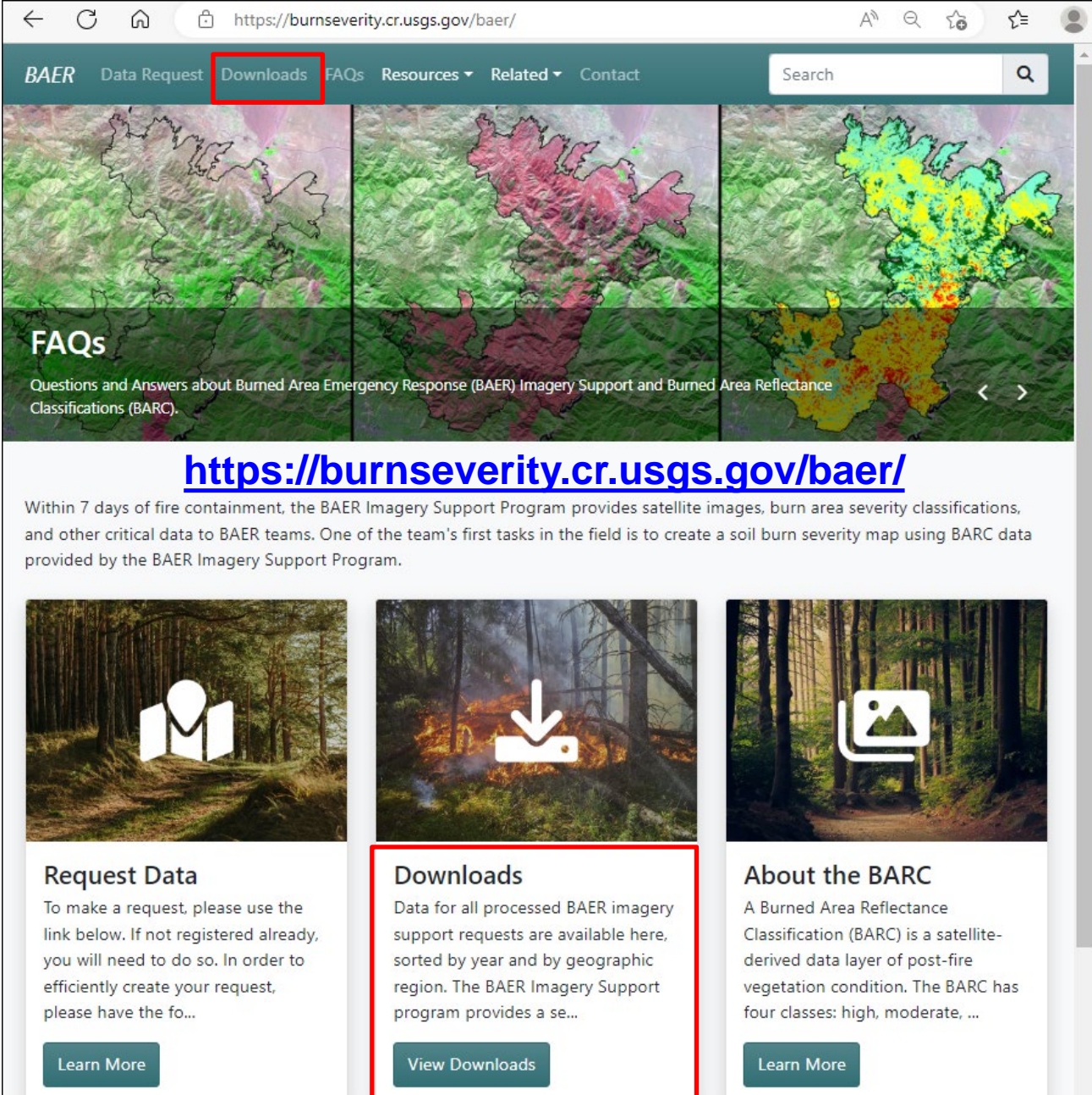
- A. Zip the SBS data, metadata and additional datasets together, name it with the format:  
*Firename\_Region.zip*
- B. Post the zip file to this location:  
`T:\FS\NFS\WOEngineering\GMO-RSAC\RDAS\BAER_FINAL_SoilBurnSeverity`
- C. Send an email to [sm.fs.baerimagery@usda.gov](mailto:sm.fs.baerimagery@usda.gov) to alert GTAC that new SBS data is available for posting to the BAER Imagery Support website.

#### 5) Archive Site

- A. SBS maps will be posted to <https://burnseverity.cr.usgs.gov/baer/baer-imagery-support-data-download>, a link to the data will be included in the "Soil Burn Severity" column.

\*\*\* NOTE: USFS National BAER Application in development \*\*\*

# BAER Imagery Support Website – Data Access



The screenshot shows the BAER Imagery Support Website. The navigation bar includes links for BAER, Data Request, Downloads (highlighted with a red box), FAQs, Resources, Related, and Contact. A search bar is also present. Below the navigation bar, there are three maps showing different burn severity classifications. The first map is labeled 'FAQs' and has a description: 'Questions and Answers about Burned Area Emergency Response (BAER) Imagery Support and Burned Area Reflectance Classifications (BARC)'. Below the maps, the URL <https://burnseverity.cr.usgs.gov/baer/> is displayed in blue. A paragraph explains that within 7 days of fire containment, the BAER Imagery Support Program provides satellite images, burn area severity classifications, and other critical data to BAER teams. Below this, there are three columns of content: 'Request Data' with a map icon, 'Downloads' with a download icon (highlighted with a red box), and 'About the BARC' with a camera icon. Each column has a 'Learn More' button.

<https://burnseverity.cr.usgs.gov/baer/>

Within 7 days of fire containment, the BAER Imagery Support Program provides satellite images, burn area severity classifications, and other critical data to BAER teams. One of the team's first tasks in the field is to create a soil burn severity map using BARC data provided by the BAER Imagery Support Program.

**Request Data**  
To make a request, please use the link below. If not registered already, you will need to do so. In order to efficiently create your request, please have the fo...

**Downloads**  
Data for all processed BAER imagery support requests are available here, sorted by year and by geographic region. The BAER Imagery Support program provides a se...

**About the BARC**  
A Burned Area Reflectance Classification (BARC) is a satellite-derived data layer of post-fire vegetation condition. The BARC has four classes: high, moderate, ...



















































# BAER Imagery Support Website

## Public Data Distribution

1. Preliminary data bundle made available on the BAER Imagery Support website
  - Pre- and post-fire imagery subsets
  - dNBR
  - Metadata
  - **BARC is not included in the bundle (available only to BAER team)**
2. Soil Burn Severity data bundle made available once received

### Region 05 (Pacific Southwest)

Fire Name	Fire ID	Ignition Date	Administrative Unit	State	Preliminary Data		Soil Burn Data	
Camp	ca3982012144020181108	11/08/2018	Plumas National Forest	California				
Charlie	ca3449011860020180922	09/22/2018	Angeles National Forest	California				
Cranston	ca3372011680020180725	07/25/2018	San Bernardino National Forest	California				
Delta	ca4094312242720180905	09/05/2018	Shasta-Trinity National Forest	California				
Donnell	ca3834911992920180801	08/01/2018	Stanislaus National Forest	California				
Ferguson	ca3765211988120180713	07/13/2018	Sierra National Forest	California				
Georges	ca3664611822120180708	07/08/2018	Inyo National Forest	Nevada				
Hirz	ca4089112222820180809	08/09/2018	Shasta-Trinity National Forest	California				
Holy	ca3367611751620180806	08/06/2018	Cleveland National Forest	California				
Kerlin	ca4061612352420180904	09/04/2018	Shasta-Trinity National Forest	California				
Lions	ca3756511912720180611	07/06/2018	Sierra National Forest	California				
Mendocino Complex	ca3924012311020180727	07/27/2018	Mendocino National Forest	California				
Stone	ca3490011851020180604	06/04/2018	Angeles National Forest	California				
Stone MDF	ca4139512105720180815	08/15/2018	Modoc National Forest	California				
Valley	ca3409611695820180706	07/06/2018	San Bernardino National Forest	California				
Whaleback	ca4063012088020180727	07/27/2018	Lassen National Forest	California				



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**Time for a break**



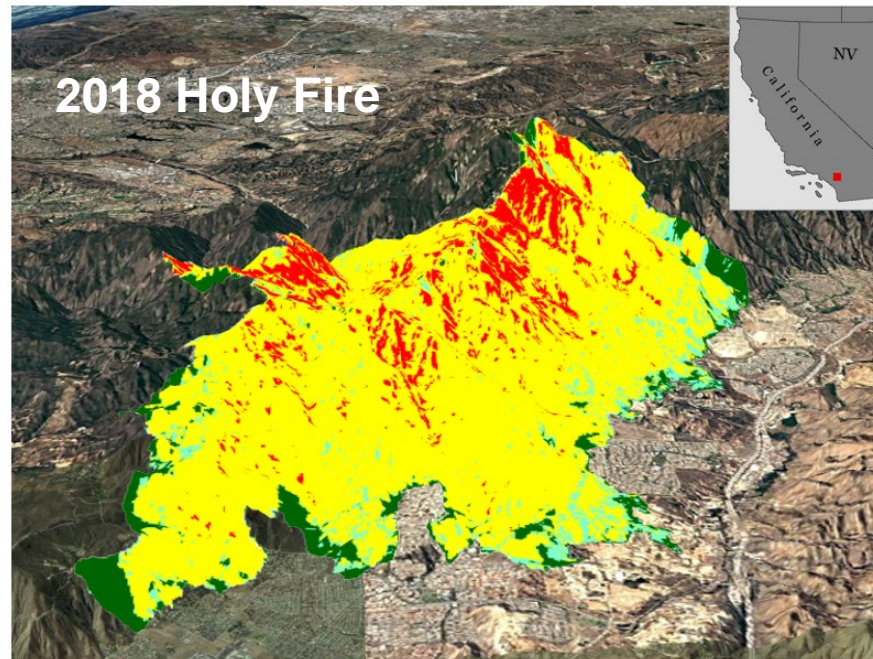
**Next up: Exercises - Preview**



# Using the BARC for BAER Support

## GIS Exercises Preview

- **Exercise 1** – How to Order a BARC
- **Exercise 2** – Editing The BARC
- **Exercise 3** – GIS Analysis
- **Exercise 4** – Exploring the BARC



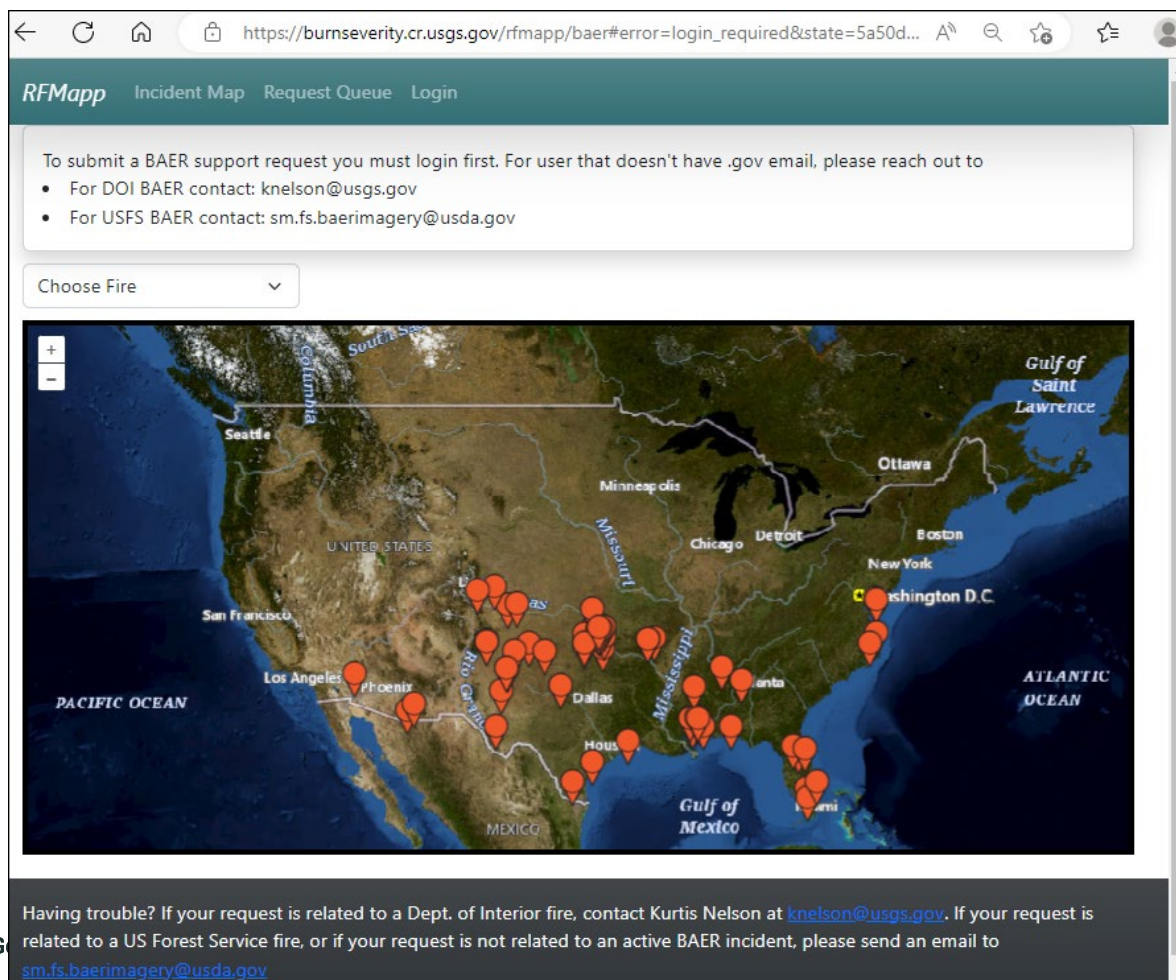
# Using the BARC for BAER Support

## Exercise 1 – How to Order a BARC

***Problem:** You've been asked to request a BARC map for an upcoming BAER team assessment.*

### Topics covered:

1. Account creation
2. Steps to request a BARC for a fire shown on the map
3. Steps to request a BARC for a fire not shown on the map



The screenshot shows the RFMapp web application. The browser address bar displays the URL: [https://burnseverity.cr.usgs.gov/rfmapp/baer#error=login\\_required&state=5a50d...](https://burnseverity.cr.usgs.gov/rfmapp/baer#error=login_required&state=5a50d...). The application header includes links for RFMapp, Incident Map, Request Queue, and Login. A message box states: "To submit a BAER support request you must login first. For user that doesn't have .gov email, please reach out to" followed by two bullet points: "For DOI BAER contact: knelson@usgs.gov" and "For USFS BAER contact: sm.fs.baerimagery@usda.gov". Below this is a "Choose Fire" dropdown menu. The main map area shows a map of the United States with numerous orange location pins indicating fire incidents. Major cities like Seattle, San Francisco, Los Angeles, Phoenix, Dallas, Houston, Chicago, Detroit, Minneapolis, St. Louis, New York, and Washington D.C. are labeled. The map also shows the Pacific Ocean, Gulf of Mexico, and Atlantic Ocean. At the bottom, a footer provides contact information: "Having trouble? If your request is related to a Dept. of Interior fire, contact Kurtis Nelson at [knelson@usgs.gov](mailto:knelson@usgs.gov). If your request is related to a US Forest Service fire, or if your request is not related to an active BAER incident, please send an email to [sm.fs.baerimagery@usda.gov](mailto:sm.fs.baerimagery@usda.gov)".



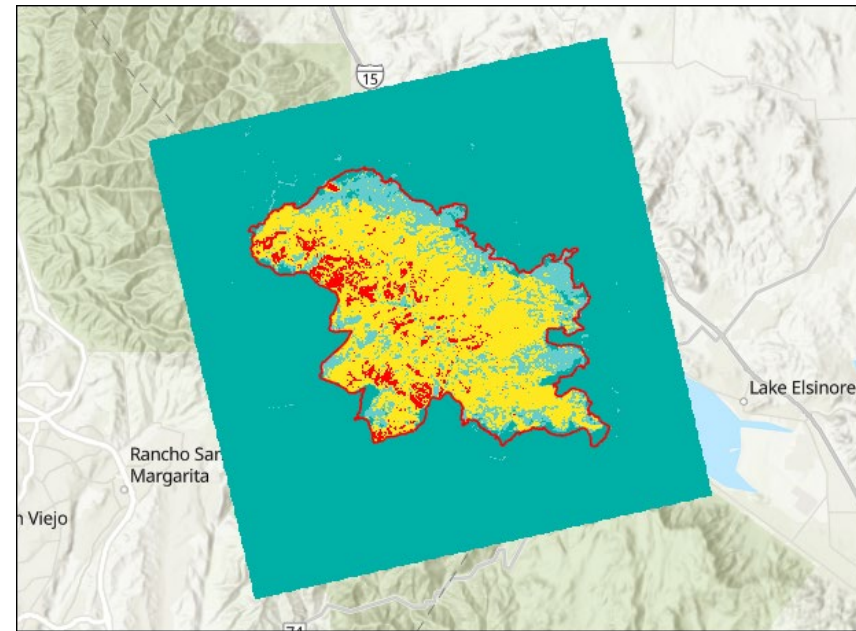
# Using the BARC for BAER Support

## Exercise 2 – Editing the BARC

**Problem:** *The BARC received from GTAC does not match the field observations and needs to be adjusted.*

### Topics covered:

1. Symbolize and visualize BARC package data
2. Compare field data to the BARC
3. Edit the BARC256 based on field data
4. Create the Soil Burn Severity dataset
5. Complete metadata and return SBS to GTAC



2018 Holy Fire, California



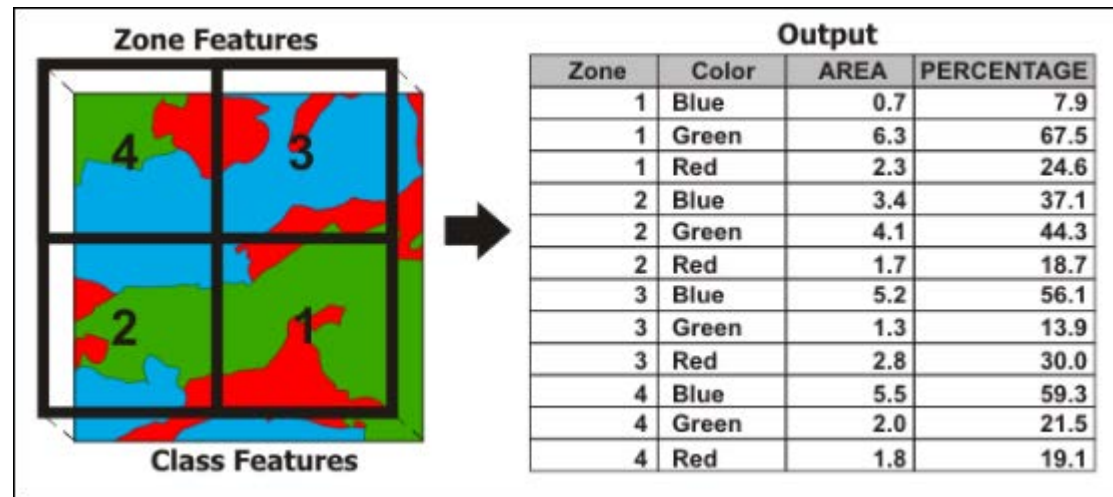
# Using the BARC for BAER Support

## Exercise 3 – GIS Analysis

**Problem:** For the reporting phase of your burn severity mapping you need to summarize the burn severity acres by land management.

### Topics covered:

1. Create a new attribute and calculate a field
2. Summarize a field based on categorical data
3. Summarize the intersection of two layers



ArcGIS Pro illustration of Tabulate Intersection tool

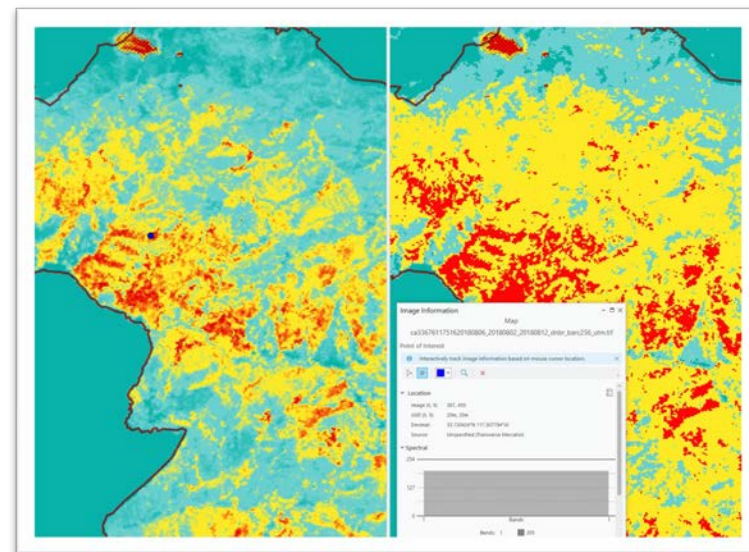
# Using the BARC for BAER Support

## Exercise 4 – Exploring the BARC (Optional)

**Problem:** Visualizing and interpreting the spatial pattern represented in the BARC256 products can be complicated.

### Topics covered:

1. Using classified symbology to represent the BARC256
2. Exploring different ways to display values in the BARC256
3. Exploring severity patterns through advanced symbology





# BAER Imagery Support Program

## Contacts and Tech Support

### Ordering a BARC:

<https://burnseverity.cr.usgs.gov/rfmapp/baer/>

### General information and data for download:

<https://burnseverity.cr.usgs.gov/baer/>

### Contacts:

- **USDA Forest Service:** [SM.FS.BAERImagery@usda.gov](mailto:SM.FS.BAERImagery@usda.gov)  
or Mark Nigrelli ([mark.nigrelli@usda.gov](mailto:mark.nigrelli@usda.gov))
- **Department of the Interior:** Kurtis Nelson ([knelson@usgs.gov](mailto:knelson@usgs.gov))

**Training is available for all interagency BARC users**





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**Work on exercises  
at own pace**

**Feel free to ask  
questions**

