



Using Earth Observations for Pre- and Post-Fire Monitoring

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Jan 20, 2022

Course Information

- Two, 3-hour sessions on January 18 and January 20 at **12:00-15:00 EST (UTC-5)**
 - Each session will feature lecture, hands-on guided exercises, a Q&A session, and “lab time” where instructors will be online to answer questions.
- Webinar recordings, PowerPoint presentations, and the homework assignment can be found after each session at:
 - <https://appliedsciences.nasa.gov/join-mission/training/english/arset-using-earth-observations-pre-and-post-fire-monitoring>
- Prerequisites:
 - [Fundamentals of Remote Sensing](#)
 - [Satellite Observations and Tools for Fire Risk, Detection, and Analysis](#) or have equivalent experience
- For additional questions please email:
 - amberjean.mccullum@nasa.gov or
 - juan.l.torresperez@nasa.gov



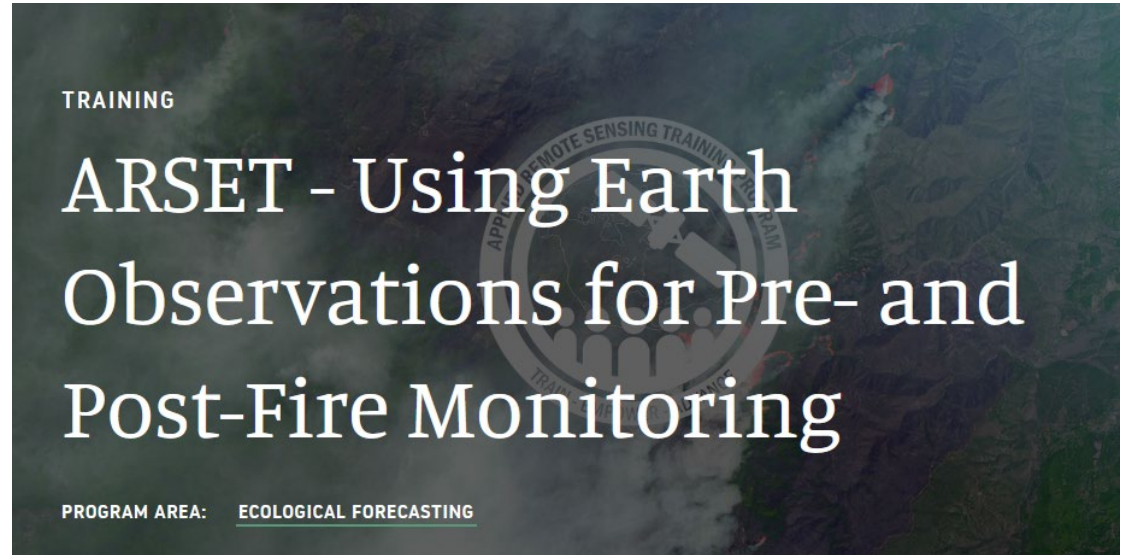
Homework and Certificates

- **Homework:**

- One homework assignment
- Answers must be submitted via Google Forms
- **HW Deadline: Tuesday February 3**

- **Certificate of Completion:**

- Attend both live webinars
- Complete the homework assignment by the deadline (access from ARSET website)
- You will receive certificates approximately three months after the completion of the course from: marines.martins@ssaihq.com



Course Outline



Learning Objectives

By the end of the training attendees will be able to:

- Identify land cover and climate variables related to wildfire risk
- Access and display geospatial wildfire risk data layers
- Create a burn severity map using satellite imagery
- Calculate burned area using satellite imagery

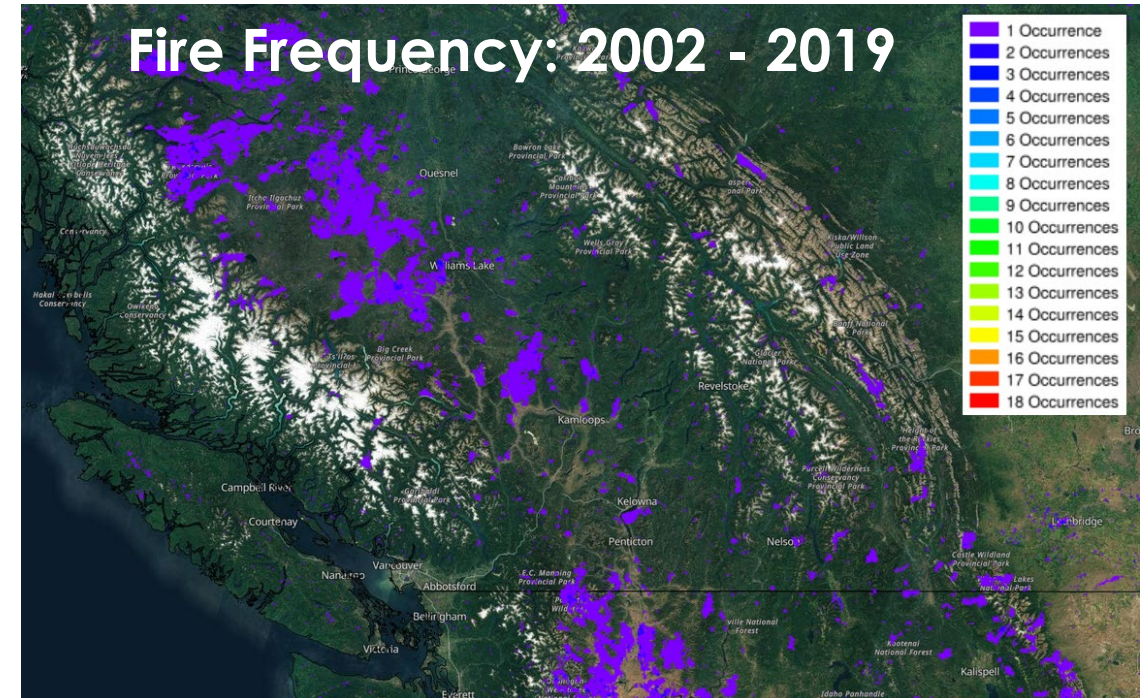
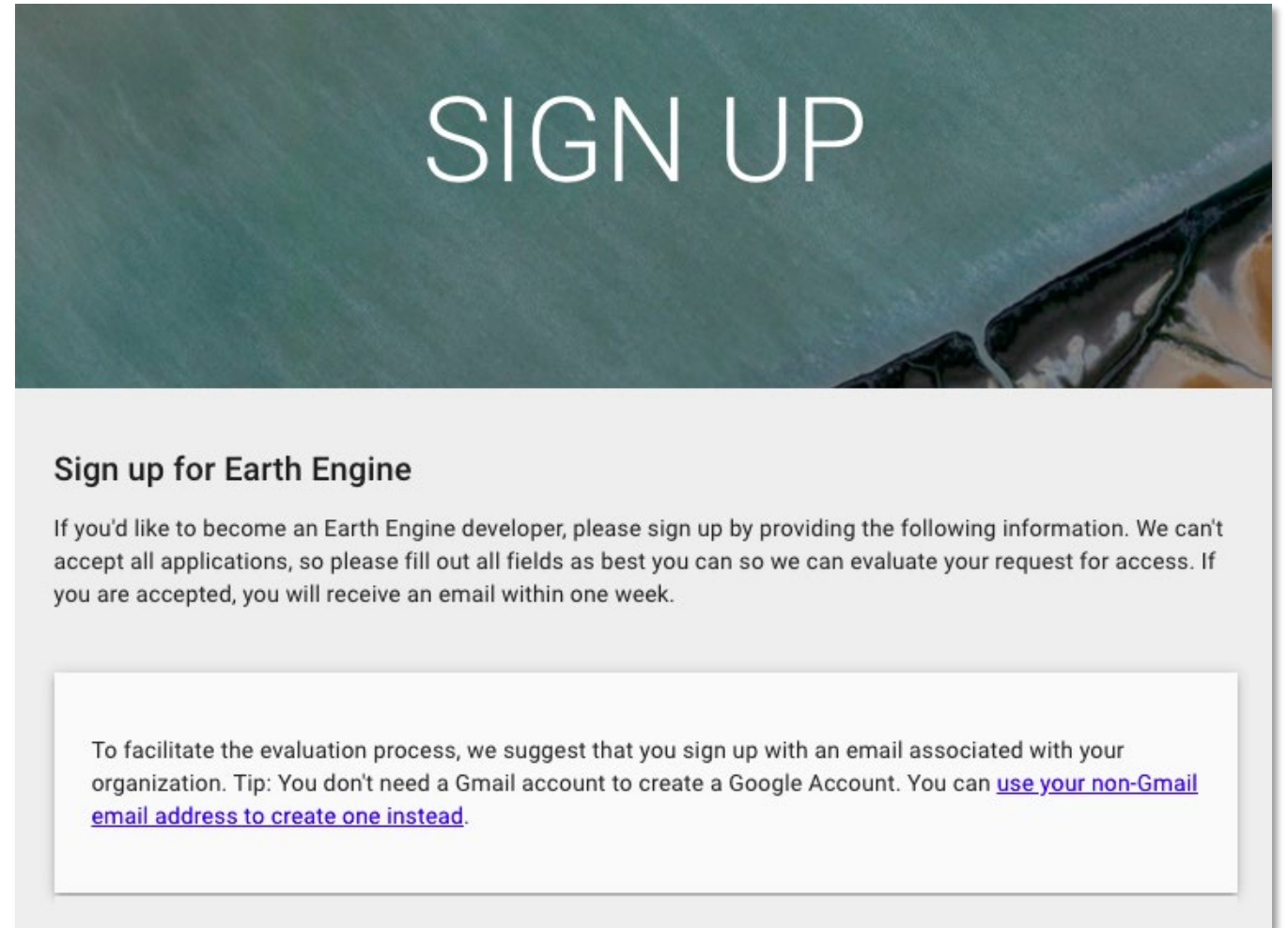


Image Credit: [GWIS](#)



Google Earth Engine Account Reminder

- Make sure you sign up for a Google Earth Engine account as soon as possible, if you haven't already, using the link below:
 - <https://signup.earthengine.google.com/#!/>
 - A Gmail address is not required. It is recommended that you use your work/institutional email.



SIGN UP

Sign up for Earth Engine

If you'd like to become an Earth Engine developer, please sign up by providing the following information. We can't accept all applications, so please fill out all fields as best you can so we can evaluate your request for access. If you are accepted, you will receive an email within one week.

To facilitate the evaluation process, we suggest that you sign up with an email associated with your organization. Tip: You don't need a Gmail account to create a Google Account. You can [use your non-Gmail email address to create one instead](#).



Case Studies

Lytton, Canada Wildfires Jul-Aug 2021

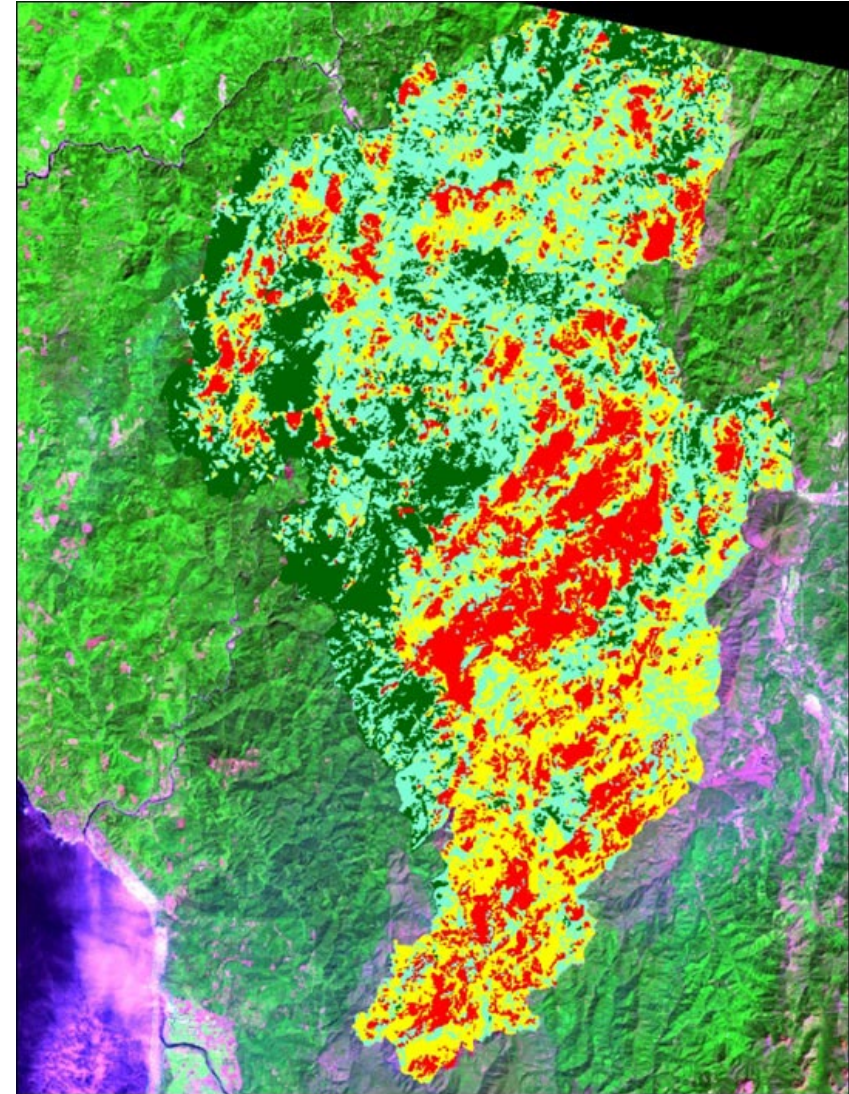


Eastern Bolivia Wildfires Oct 2020



Part 2 Agenda

- Review of post-fire assessments
- Burned area and burned severity mapping
- Tools for post-fire mapping
- Google Earth Engine (GEE) for post-fire mapping
- Case-study overview
- Hands-On Exercise: Post-Fire Mapping with GEE
- Q&A
- Lab Time



Preliminary Burn Severity
■ unburned ■ low ■ moderate ■ high

Image Credit: [Keith Lannom, USDA](#)





Post-Fire Assessments

Post-Fire Impacts

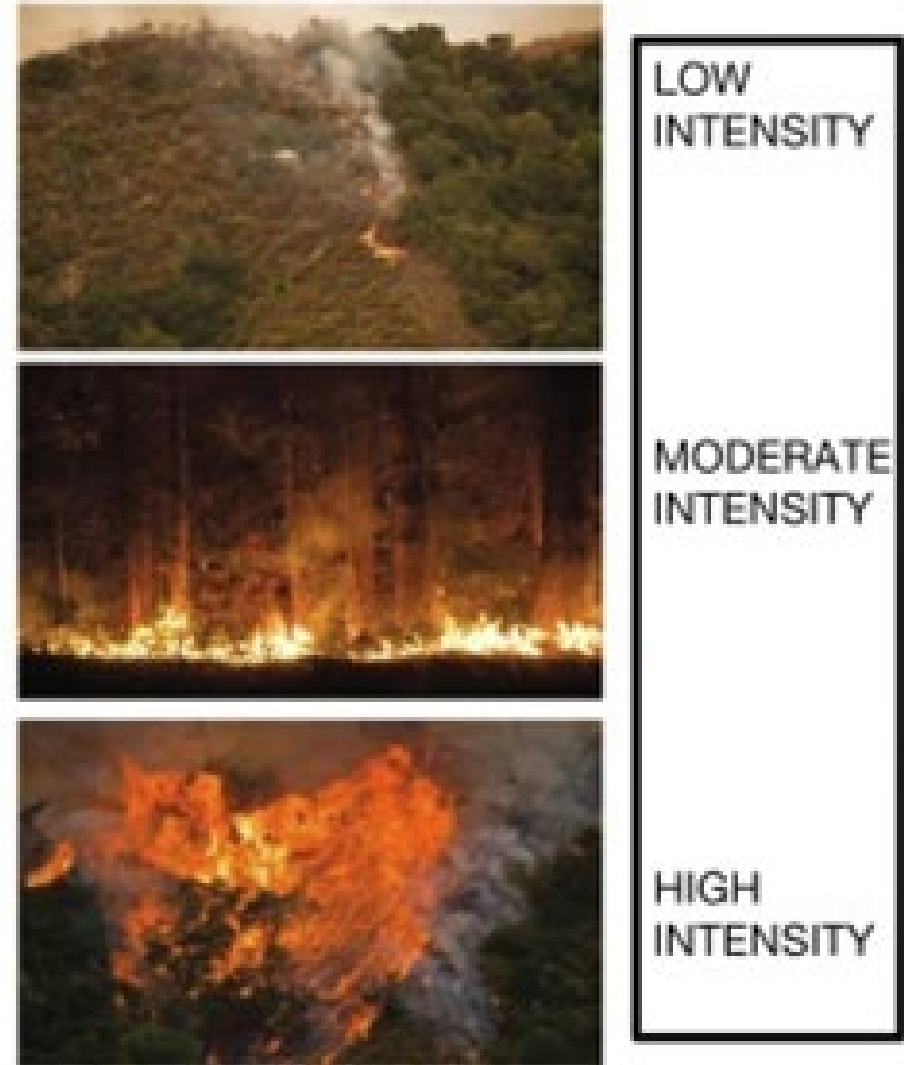
- Fires are a part of the natural forest, grassland, and tundra environment.
- Fires have long-lasting impacts to surrounding human lives and infrastructure.
- Some of the major post-fire impacts on environment are:
 - Release of carbon dioxide and soot particles in the atmosphere, thereby influencing climate
 - Change in soil chemistry and reduction in soil fertility
 - Destruction of vegetation leading to increased runoff and soil erosion
 - Influence on nutrient cycling and flow
 - Destruction of ecosystems and wildlife

<http://www.geog.leeds.ac.uk/courses/level3/geog3320/studentwork/groupd/positiveandnegative.html>



Fire Intensity

- The **amount of energy or heat release per unit time or area** and encompasses several specific types of fire intensity measures.
- Byram (1959): “The rate of energy or heat release per unit time, per unit length of fire front, regardless of its depth.”
- Fire intensity dictates burn severity.



Example scale of fire intensity.

Image Credit: [NPS.gov](https://www.nps.gov/), [NIFC.gov](https://www.nifc.gov/), K. Crocker, D. A. DellaSala



Burn Severity

- The **effect of a fire on ecosystem properties**, often defined by the degree of mortality of vegetation
- Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time



Example of high severity burned area.
Image Credit: USDA Forest Service Gen. Tech. Rep. RMRS-GTR-243. 2010



Soil Burn Severity

- The **fire-induced changes** in physical, chemical, and biological **soil properties** that impact hydrological and biological soil functions



Image Credit: Stefan Doerr



Low



Moderate



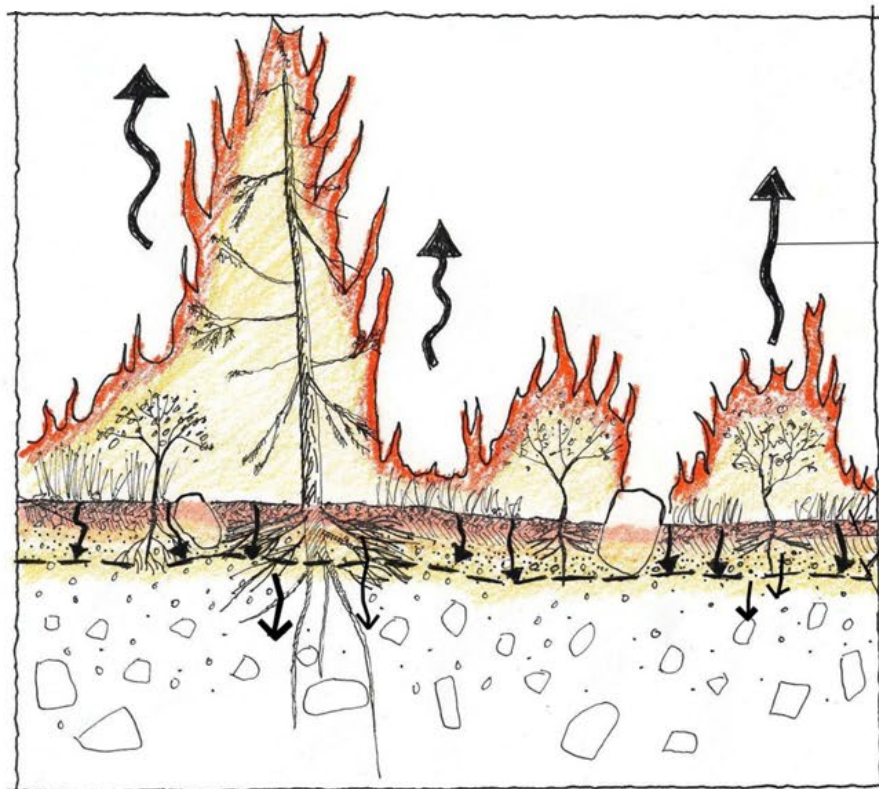
High

Image Credit: co-co.org



Effects of Fire on Land Surface

Fire Intensity



Convective Heat

Organic Litter

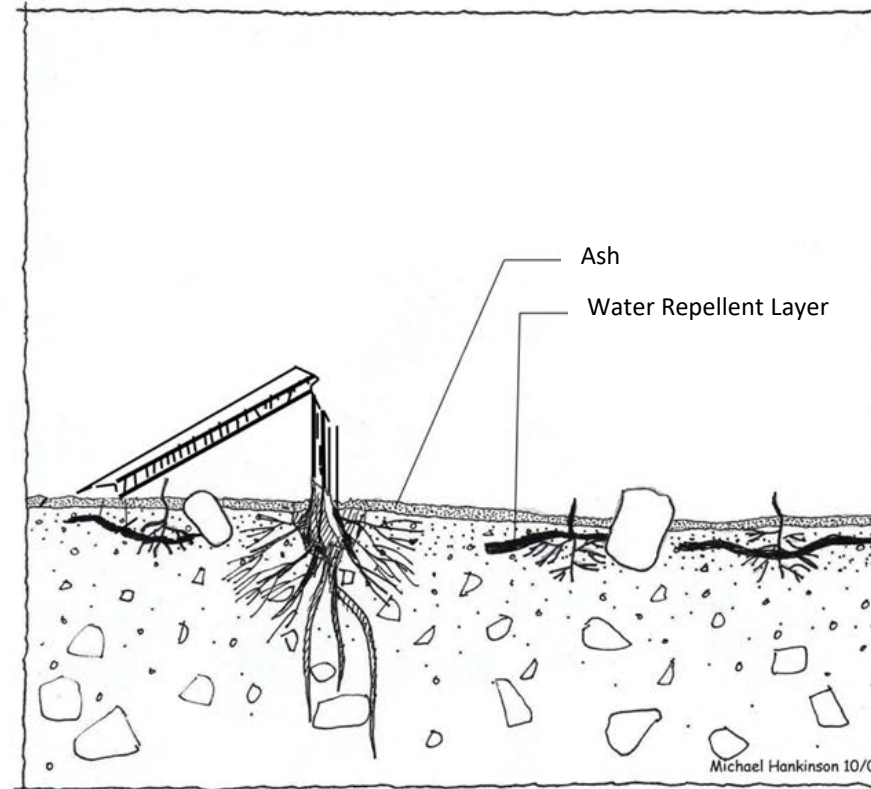
Conductive and Radiant Heat

A Horizon

Soil Heating

During Fire

Burn Severity



Ash

Water Repellent Layer

Michael Hankinson 10/02

After Fire

Soil Burn Severity

Image Credit: USDA Forest Service Gen. Tech. Rep. RMRS-GTR-243. 2010



Field Perspective

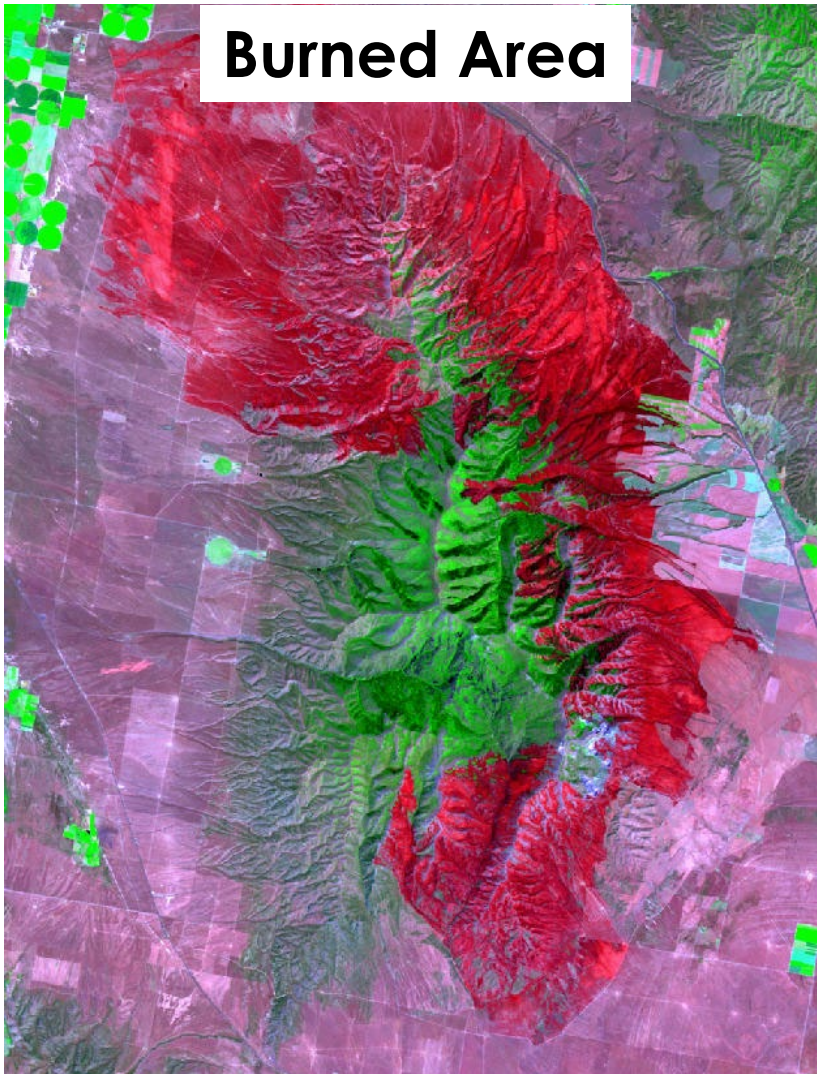
- Ground-based severity assessments post-fire:
 - Composite Burn Index (CBI)
 - Field observing of the burn scar mosaic
 - Water repellency tests
- Ground-based regrowth assessments post-fire:
 - Tree injury assessment
 - Determination of tree mortality
 - Field monitoring of vegetation regeneration



Images: USDA Forest Service Gen. Tech. Rep. RMRS-GTR-243. 2010



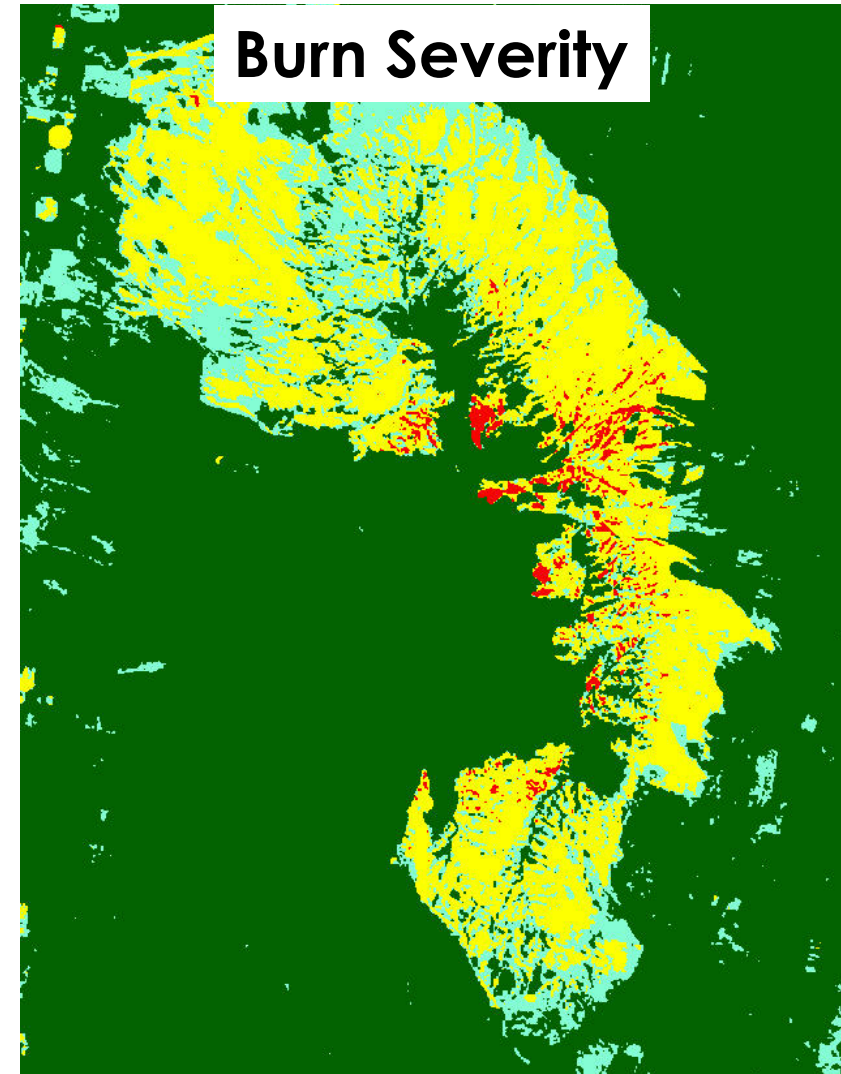
Remote Sensing Perspective: Burned Area and Burn Severity



- Burned area uses imagery to assess the extent of impacts on vegetation for a particular fire event.

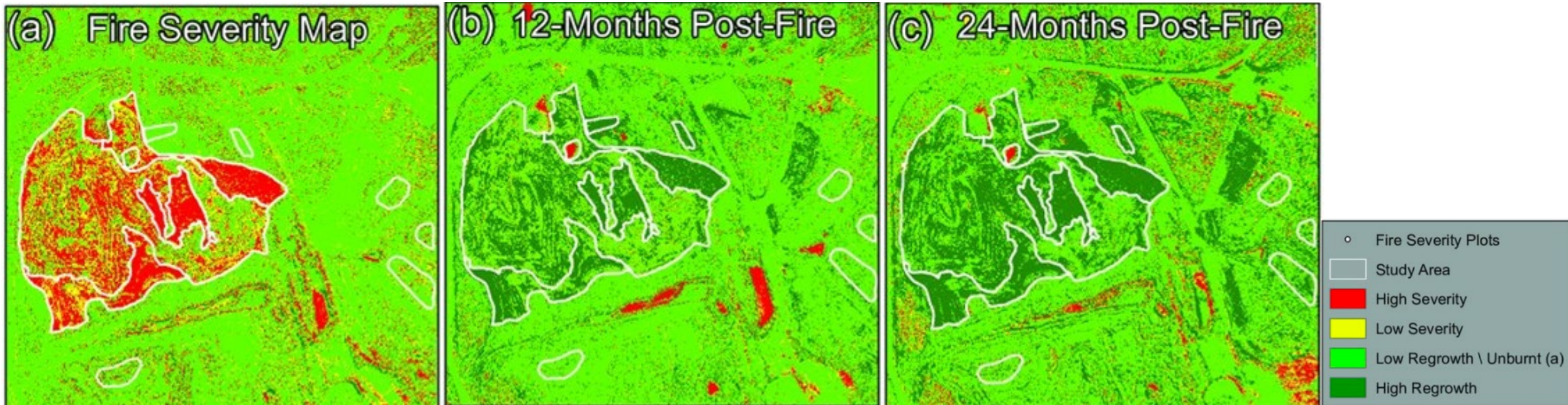


- Burn severity compares burned area information to pre-fire imagery to assess relative magnitude of burn impacts.



Remote Sensing Perspective: Vegetation Regrowth

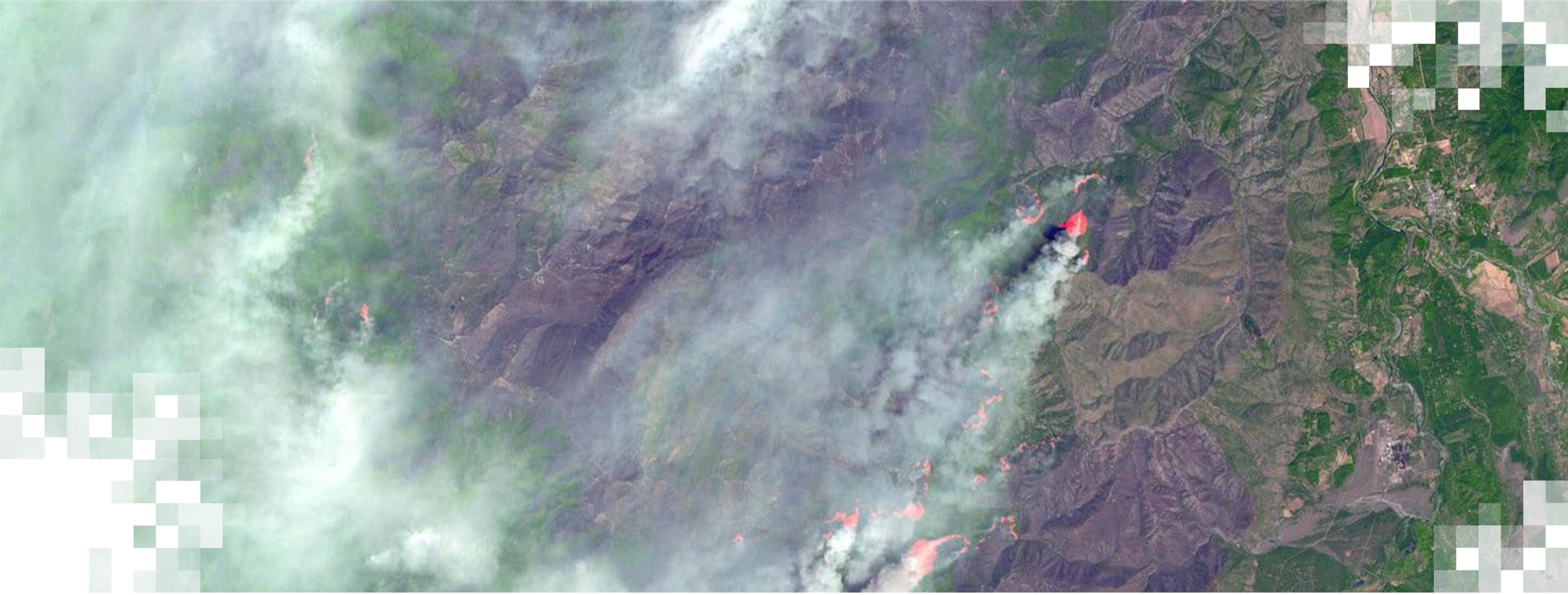
- Vegetation indices and land classifications use imagery to assess vegetation regeneration and condition at various post-fire intervals.



Differenced Normalized Difference Vegetation Index (dNDVI) analysis of WorldView-3 images showing: (a) fire severity map; (b) fire recovery 12-months post-fire; and (c) fire recovery 24-months post-fire at a coal mine rehabilitation in semi-arid Central Queensland, Australia.

Credit: McKenna, Phinn, & Erskine, 2018

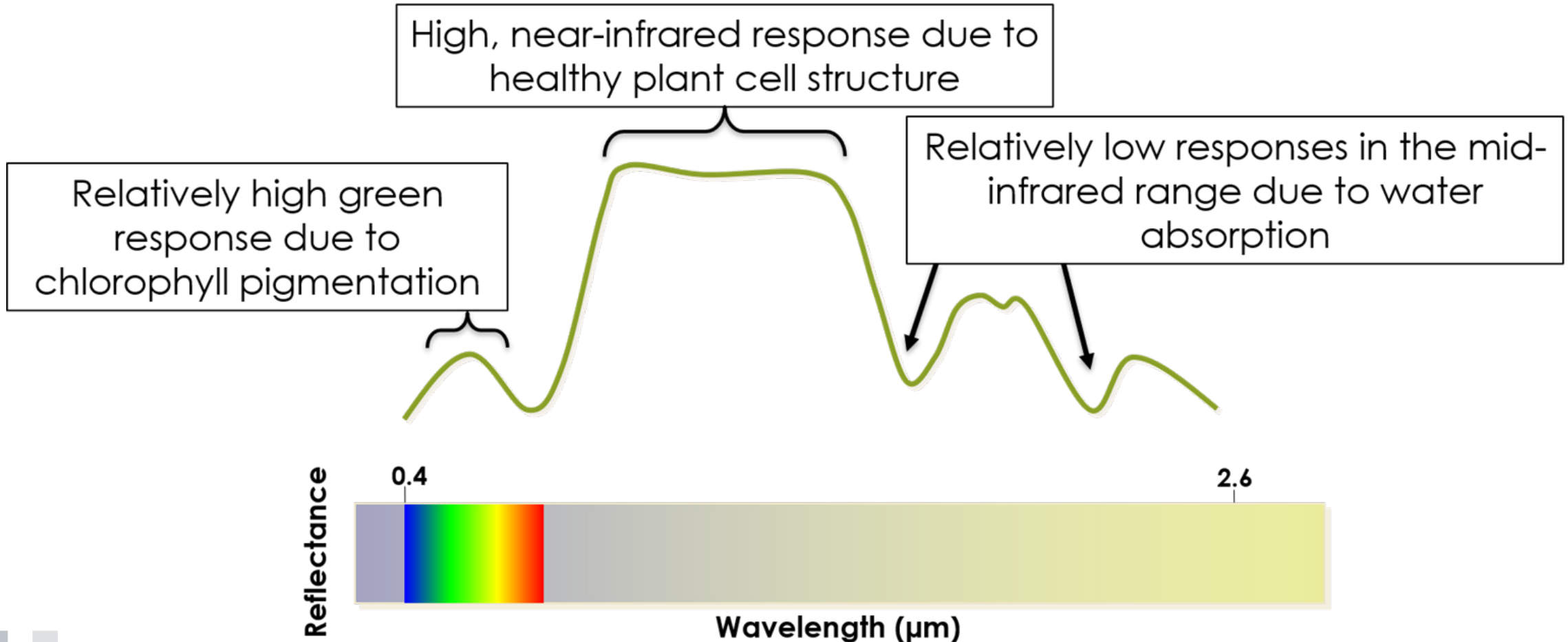




Burned Area and Burn Severity Mapping

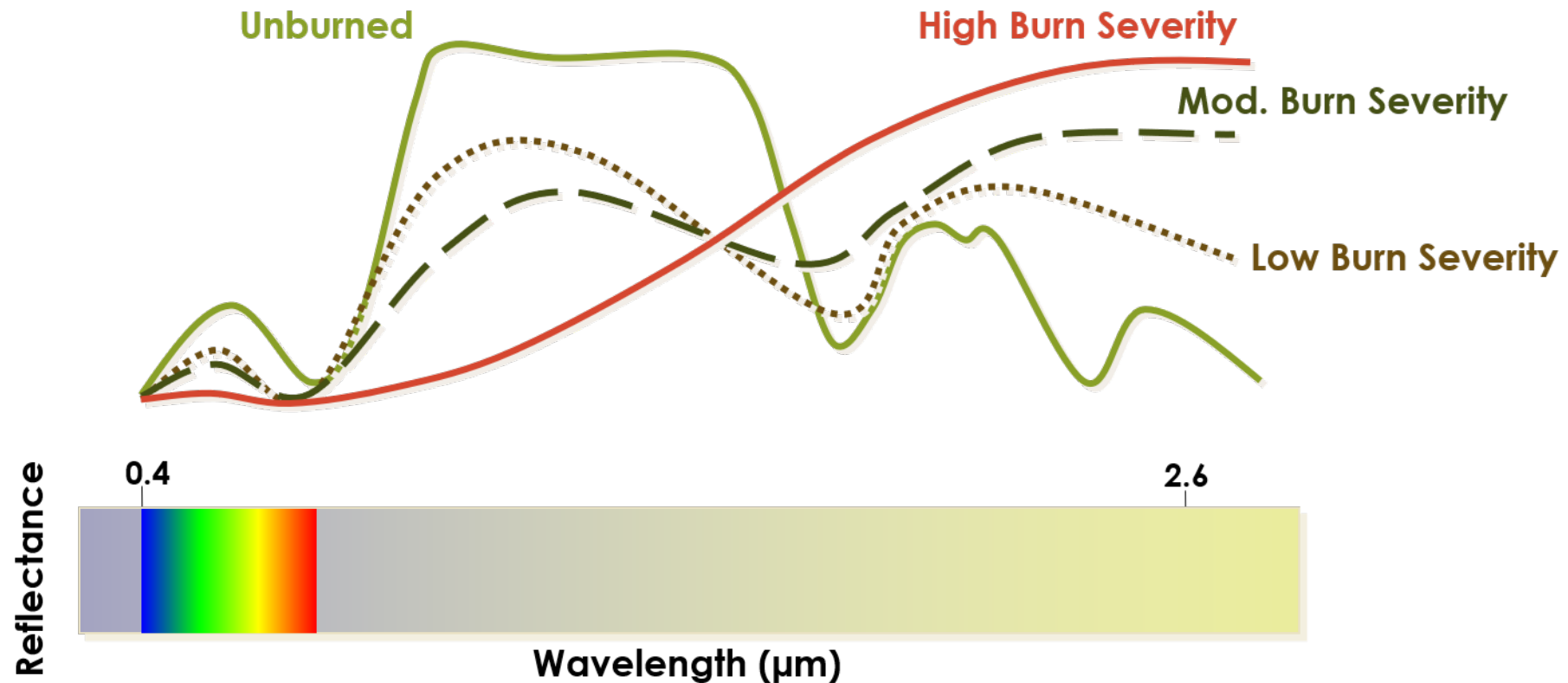
Typical Vegetation Spectral Response

Spectral Response Curve of Typical Vegetation from 0.4 to 2.6 μm



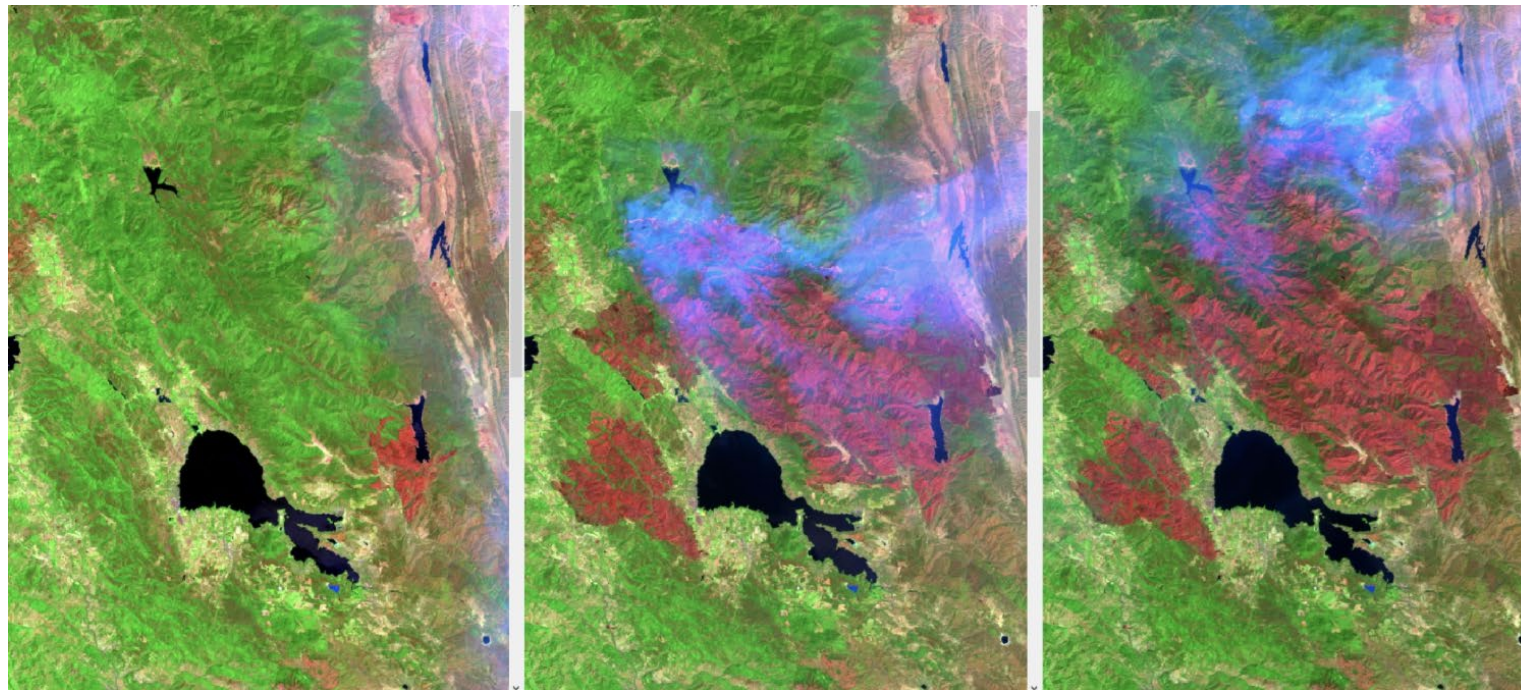
Healthy Vegetation vs. Burned Areas

Exploiting Spectral Response Curves



Burned Area: Normalized Burn Ratio (NBR)

- Used to identify burned areas
- Compare pre- and post-burn to identify burn extent and severity



July 26

Aug 11

Aug 27

Mendocino Complex Fires, 2018

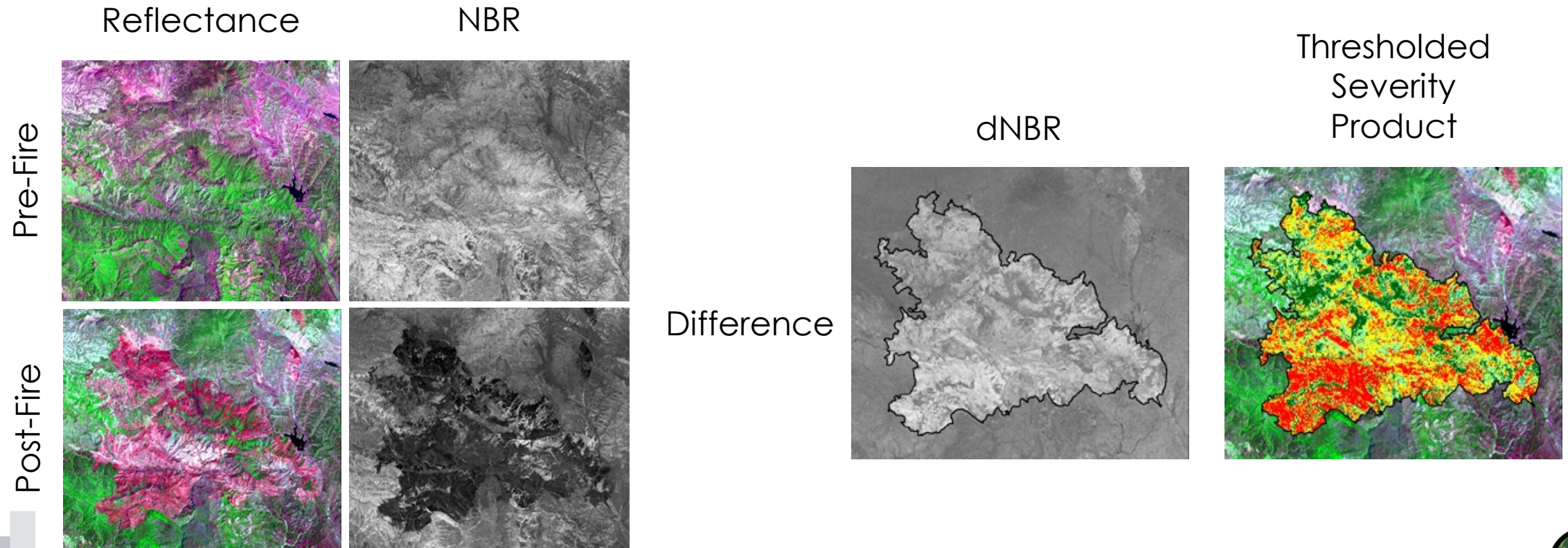
$$NBR = \frac{(NIR - SWIR)}{NIR + SWIR}$$



Burn Severity: Differenced Normalized Burn Ratio (dNBR)

- **Normalized Burn Ratio (NBR)**
- Establishes extent of burned area before and after fire event

- **Differenced Normalized Burn Ratio (dNBR)**
- Provides a comparison of pre- and post-fire conditions to determine severity
- $dNBR = \text{Pre-Fire NBR} - \text{Post-Fire NBR}$



Burn Severity: Relativized Differenced Normalized Burn Ratio (RdNBR)

- Variant of dNBR; removes bias associated with pre-fire vegetation condition
 - Developed by [Miller and Thode, 2007](#)
 - Example: Low density vegetation in pre-fire image experiences complete burn
 - i.e., a stand-replacing fire
 - RdNBR measures relative change of vegetation within the pixel:
 - 100% change in vegetation: RdNBR is high

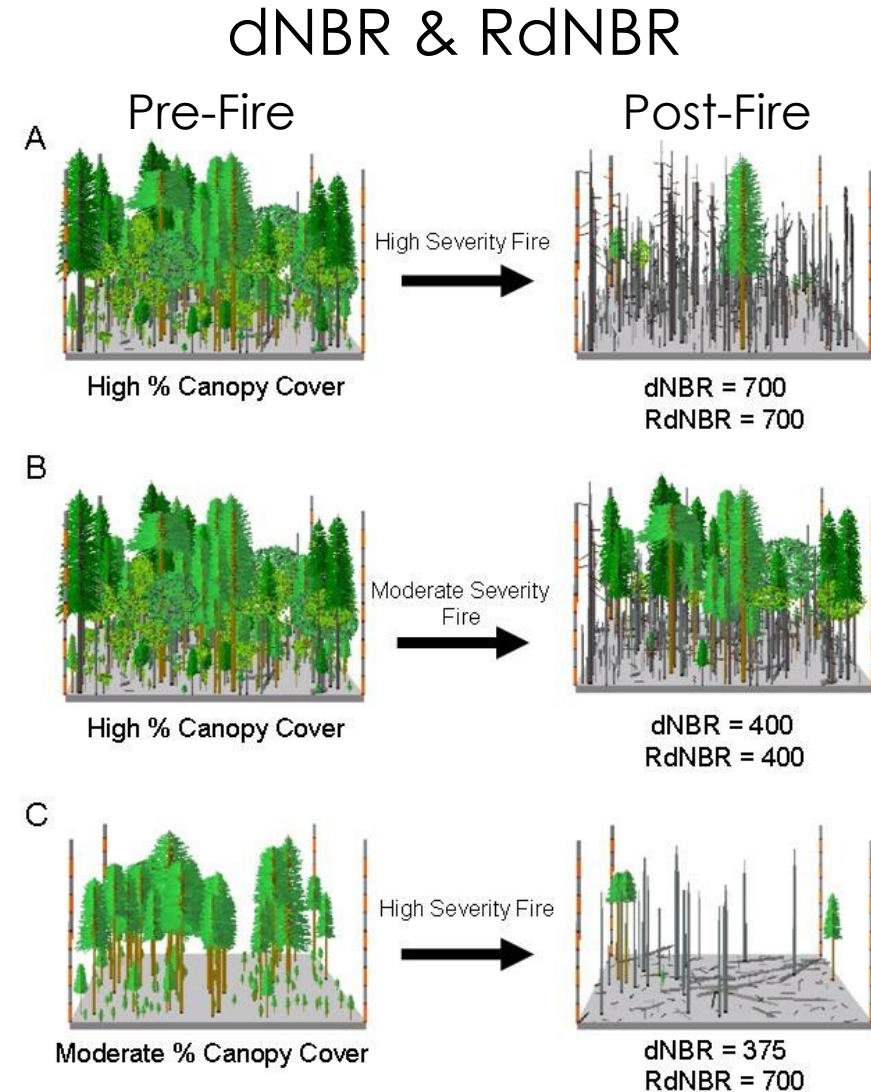


Image Credit: Remote Sensing of the Environment; 109, 66-80 (July 12, 2007)

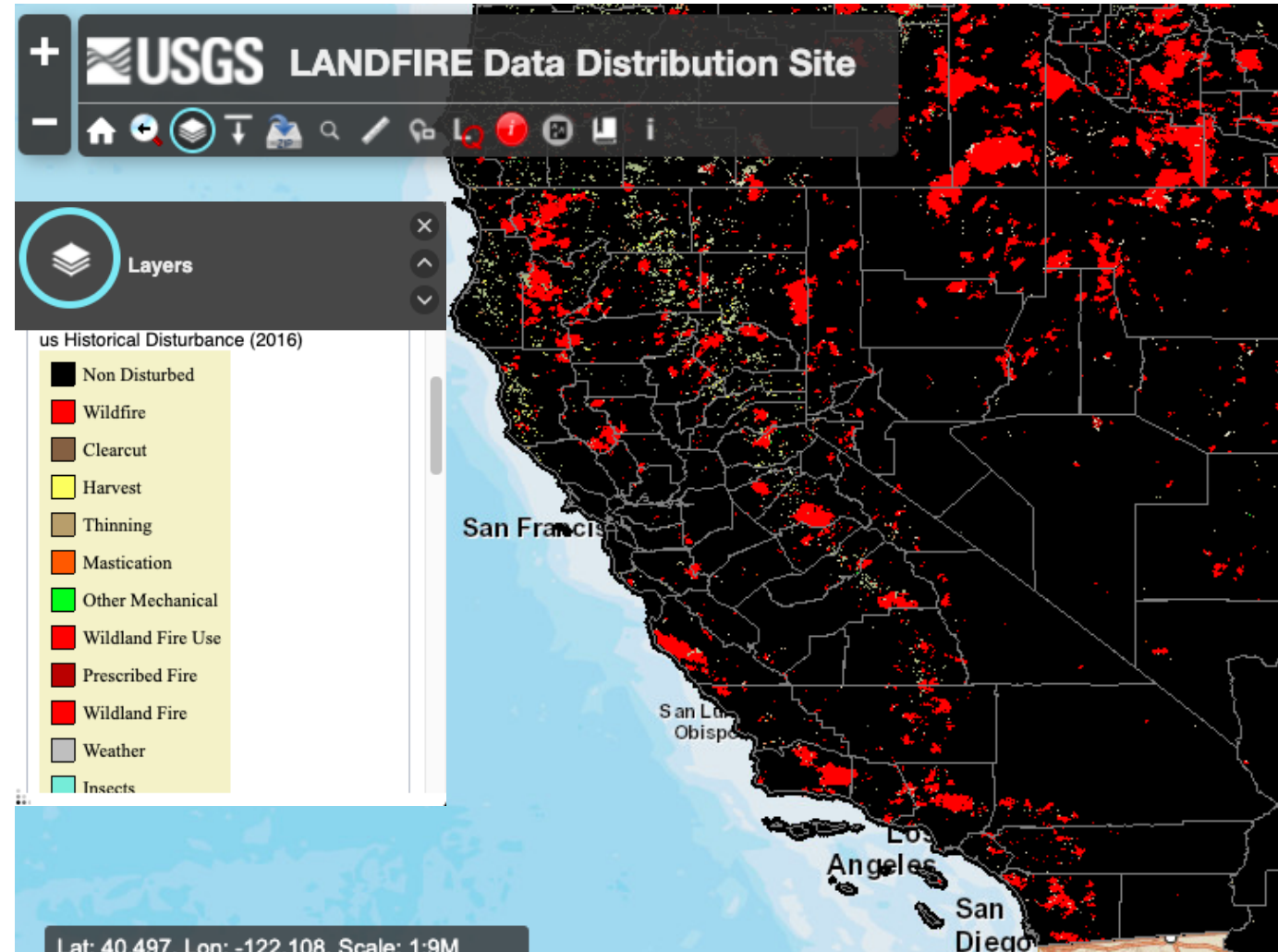




Tools for Post-Fire Mapping

LANDFIRE: Disturbance Data

- For the U.S. via LANDFIRE:
 - <https://landfire.gov/viewer/viewer.html>
- Disturbance Data:
 - Annual
 - Vegetation
 - Fuel
 - Historical
- Vegetation Disturbance:
 - Transition magnitude
 - Forest vegetation transitions
 - Non-forest vegetation transitions
 - Forest vegetation simulator
- Data Specifications for All Layers:
 - <https://landfire.gov/index.php>

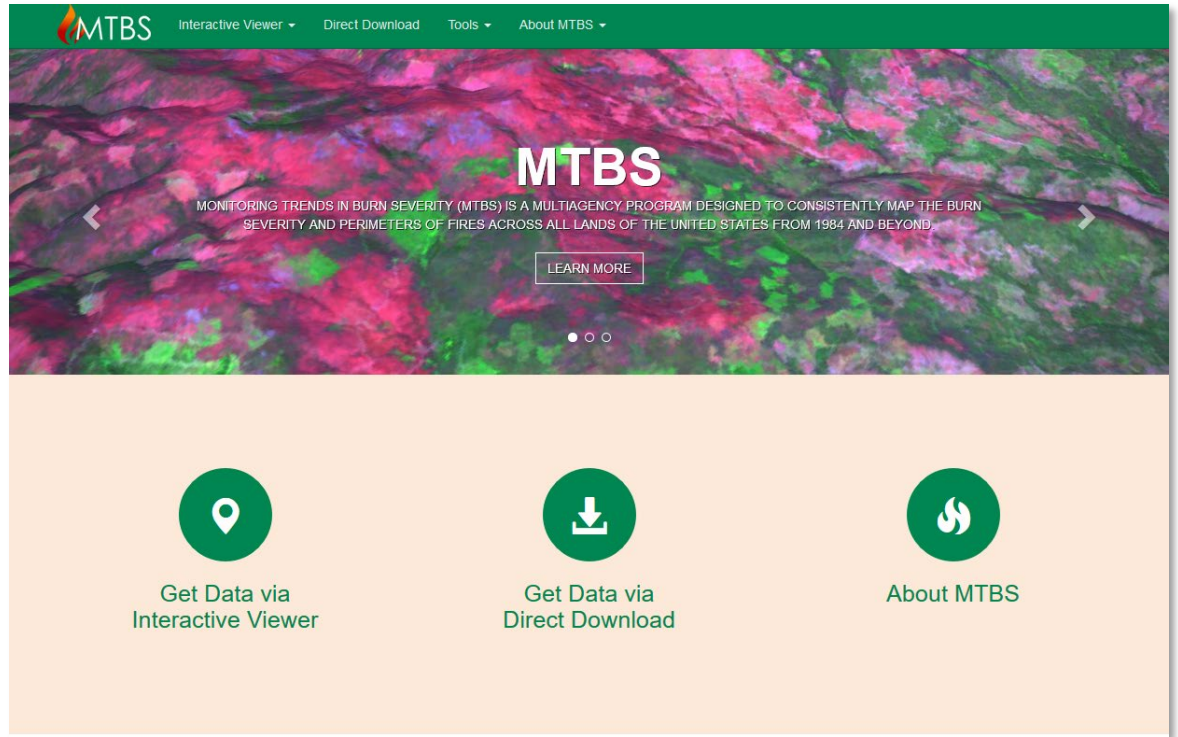


LANDFIRE historical disturbance data for California.
Image Credit: [LANDFIRE](https://landfire.gov/)



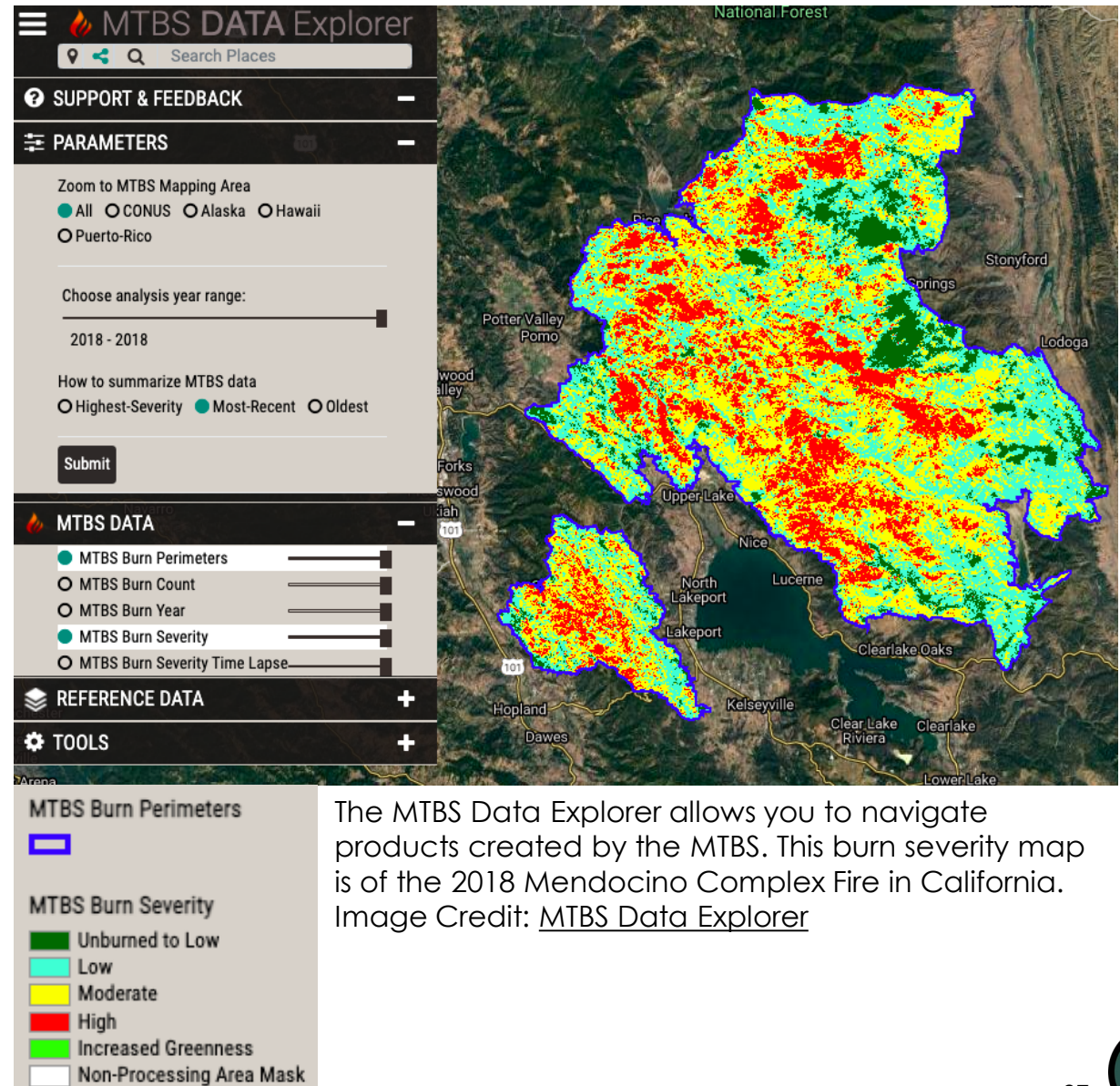
Monitoring Trends in Burn Severity (MTBS)

- MTBS Link:
 - <http://www.mtbs.gov/>
- Project designed to consistently map burn severity and fire perimeters across the U.S.
 - Partnership between USGS & USDA Forest Service
 - For the U.S. only
- Remote sensing and ground-based assessments
- Outputs:
 - NBR from Landsat (pre- and post-fire)
 - Differenced NBR (dNBR)
 - Classification of Burn Severity
 - Based on pre- and post-fire imagery, plot data, & analyst's experience with fire behavior
 - Fire Perimeter
 - Geospatial Metadata



MTBS Data Explorer

- Data Explorer Link:
 - <https://www.mtbs.gov/data-explorer>
- Developed within Google Earth Engine
- Explore the entire MTBS burn severity archive
- Calculate statistical summaries over a user-defined area of interest
- Analyze single point (30 x 30m) data
- Download data as CSV and PNG

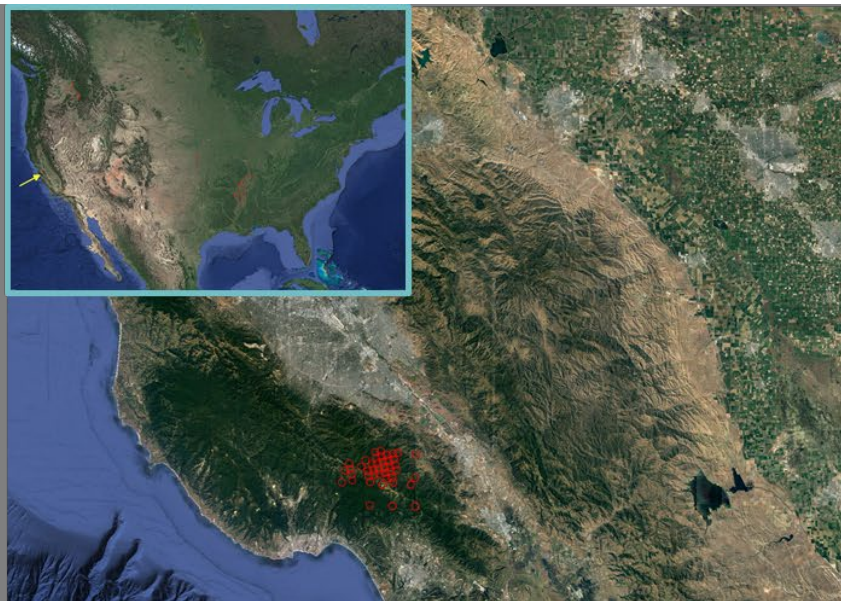


Fire Mapping Tool (FMT)

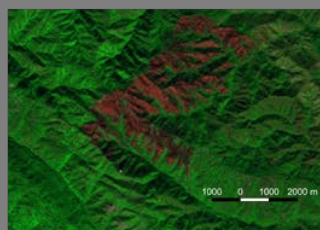
- The QGIS-based FMT was developed to address the needs of users who either need to determine the effects of small fires that are below the MTBS burned area threshold, or who cannot wait for an MTBS assessment to be published.
- Resources:
 - Tool and Instructions: <https://mtbs.gov/qgis-fire-mapping-tool>
 - ARSET Techniques for Wildfire Detection and Monitoring: <https://appliedsciences.nasa.gov/join-mission/training/english/arset-techniques-wildfire-detection-and-monitoring>
- FMT Process:
 - Landsat Imagery ordered from <https://espa.cr.usgs.gov/>
 - Creates dNBR images
 - Builds fire perimeter and masking vector files (i.e., shapefiles)
 - Calculates RdNBR offset and subsequently outputs a RdNBR image
 - Suggests potential low, moderate, and high burn severity thresholds
 - Creates thresholded burn severity product
 - Outputs metadata



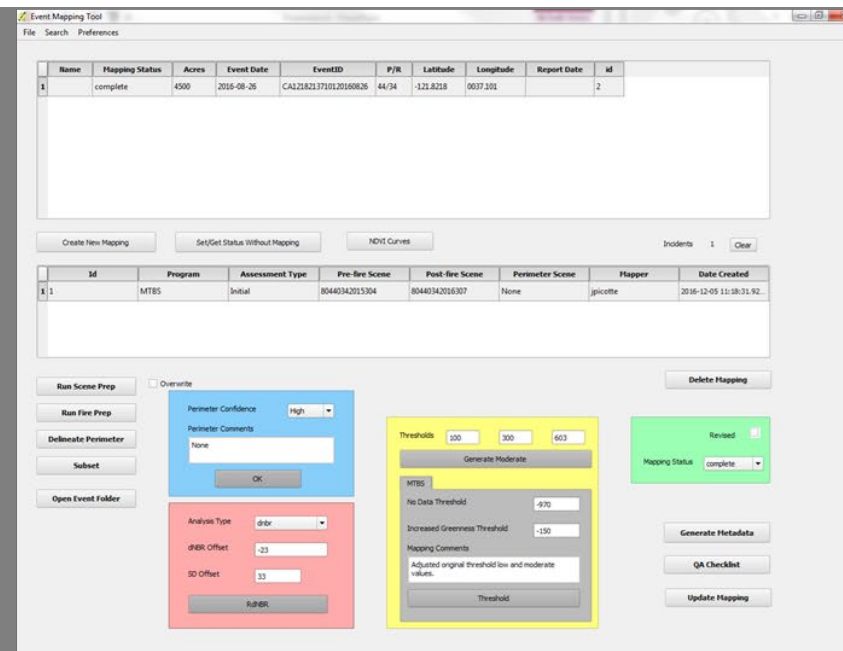
FMT Process for Fire Perimeter and Burn Severity Assessment



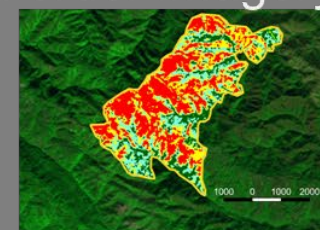
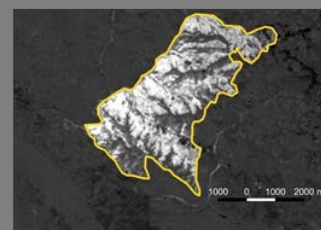
Step 1: Identify a fire using sensor detections or another data source



Step 3: Identify pre- (left) and post- (right) fire Landsat Scenes



Step 2: Use QGIS tool to enter fire information and order imagery



Step 4: Map fire perimeter and burn severity



Fire Information for Resource Management System (FIRMS)

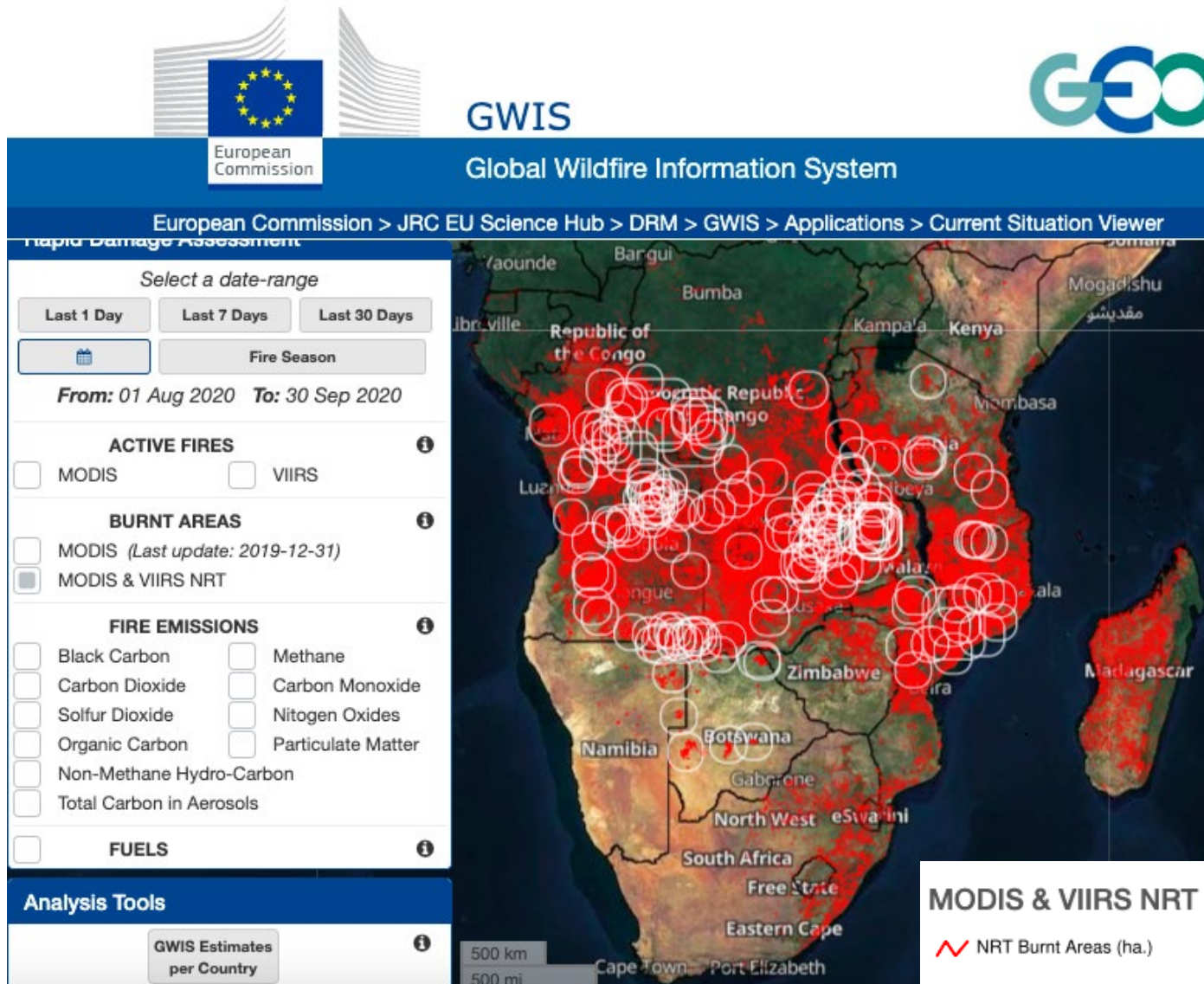
- NASA FIRMS:
 - <https://firms2.modaps.eosdis.nasa.gov/>
- Data available globally
- MODIS Burned Area Product
- Also includes VIIRS and MODIS fire detection and active fire data
- Near Real-Time (NRT) data replaced with standard science-quality data as they become available (usually with a 2-3-month lag)
- Data Download:
 - <https://firms2.modaps.eosdis.nasa.gov/download/>



MODIS burned area displayed for Northern California displaying burned areas in August and September 2020. Image Credit: [FIRMS](#)



Global Wildfire Information System (GWIS): Burnt Area



- GWIS has a variety of fire metrics available, including MODIS burnt area products and the MODIS & VIIRS Near Real-Time burnt area product (shown here)
- GWIS: https://gwis.jrc.ec.europa.eu/apps/gwis_current_situation/index.html



A zoomed view over Zambia displaying MODIS & VIIRS NRT Burned Area.

Image Credits: [GWIS](#)

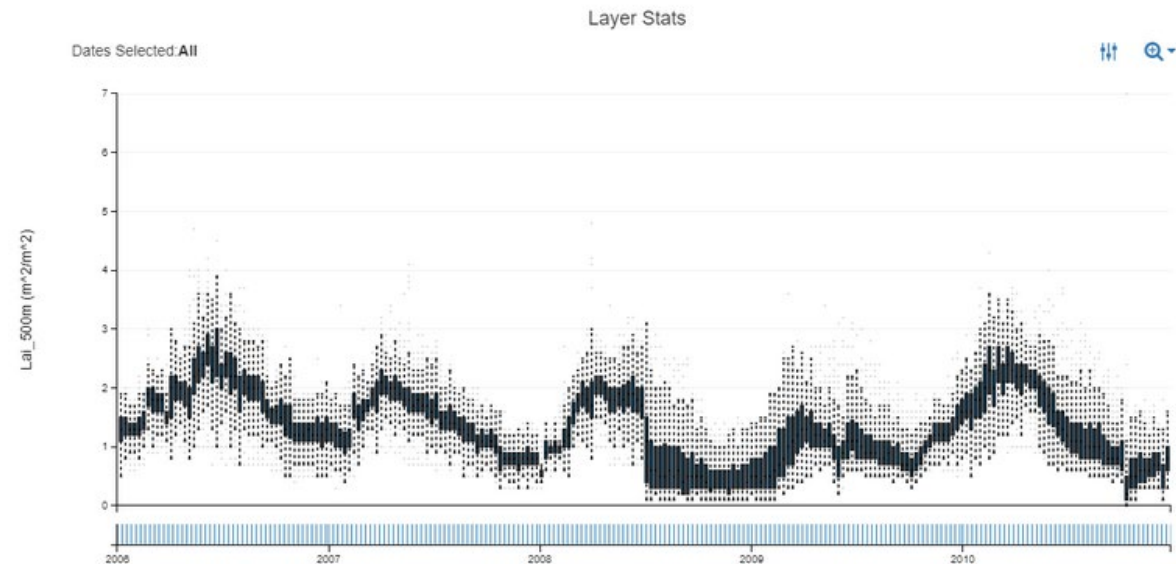
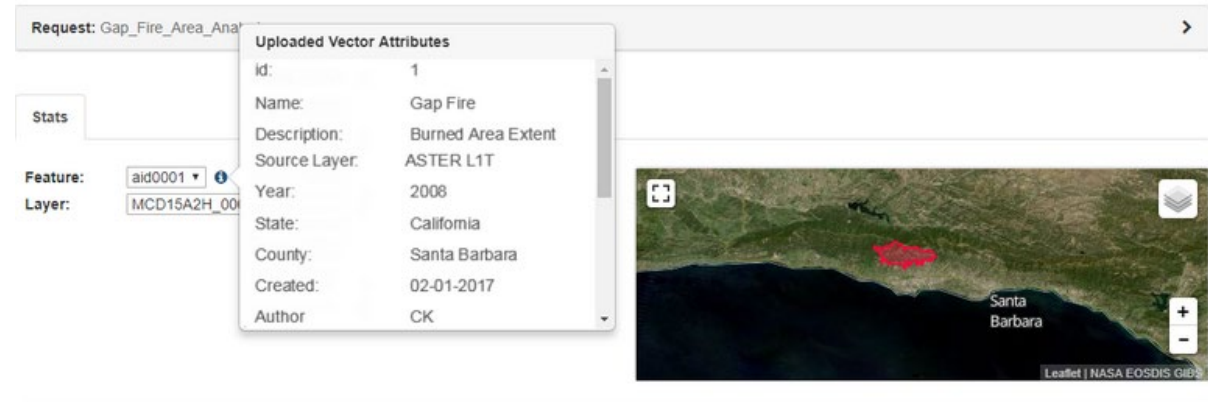
NASA's Applied Remote Sensing Training Program



Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)

- Simple and efficient method for extracting data and conducting on-the-fly quality assurance test from points or areas globally
- View data prior to download
- Interactive visualizations and summary statistics
- Data available for wildfires include:
 - Monthly MODIS and VIIRS Burned Area products (500 m)
 - NRT MODIS and VIIRS Thermal Anomalies (500 m, 750 m, and 1 km)

<https://lpdaacsvc.cr.usgs.gov/appeears/>



Example of interactive viewer analyzing burned area extent for a wildfire near Santa Barbara, California via APPEEARS.

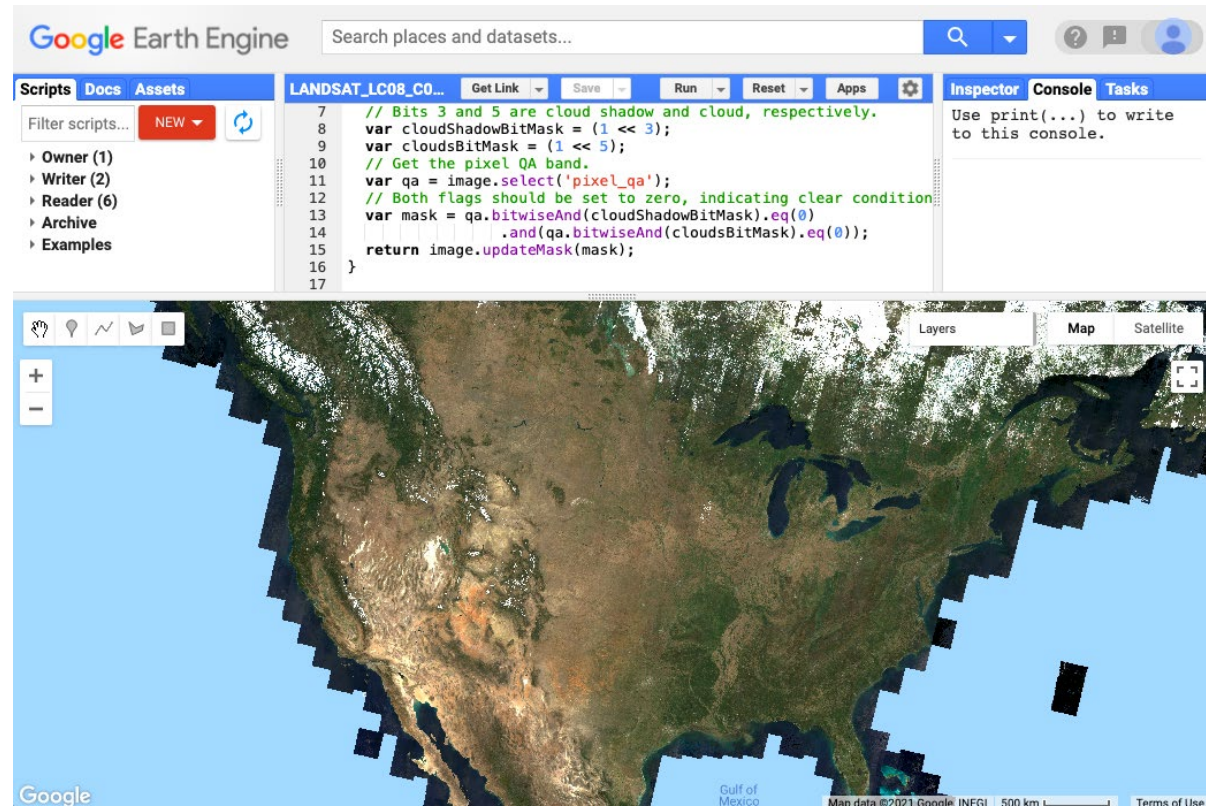




Google Earth Engine for Post-Fire Mapping

Cloud-Based Raster Computing for Remote Sensing Analysis

- Cloud-based raster computing removes barriers and limitations related to...
 - Data hosting and storage
 - Imagery access and availability
 - Personal computing capabilities
- GEE is also free for scientists, researchers, and developers.



Google Earth Engine code editor interface using the JavaScript API, displaying Landsat 8 surface reflectance true color imagery for the U.S.
Credit: [Google Earth Engine Developers](#)



The Google Earth Engine Platform

- Google Earth Engine (GEE) takes advantage of cloud computing capabilities to provide users with a single place for **accessing satellite data, applying remote sensing methodologies, and displaying analysis results.**
- GEE's application programming interface (API) allows users to easily apply land cover monitoring algorithms and classifications with coded commands.

☰ Google Earth Engine

Meet Earth Engine

Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface.

Satellite Imagery + Your Algorithms + Real World Applications

[Learn More](#)

Image Credit: [Google Earth Engine](#)

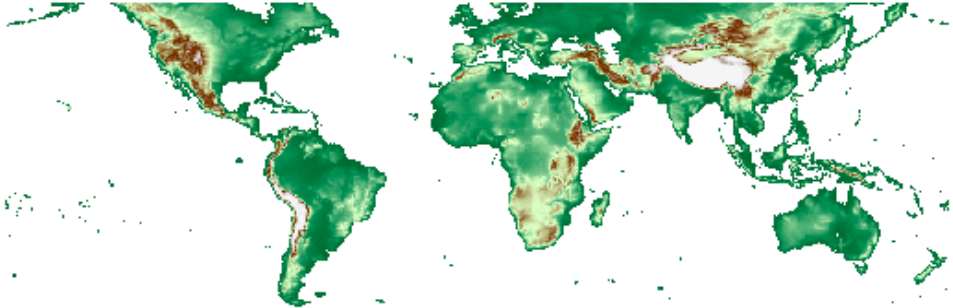


Application Programming Interface (API)

- The Earth Engine JavaScript API is currently the most widely used method of working with GEE.
- A Python API through Google Colaboratory (Colab) is also available for those interested in using Python.
 - This is a bit more complicated than working directly in the GEE code editor with JavaScript.

```
# Import the Image function from the IPython.display module.
from IPython.display import Image

# Display a thumbnail of global elevation.
Image(url = dem.updateMask(dem.gt(0))
      .getThumbURL({'min': 0, 'max': 4000, 'dimensions': 512,
                    'palette': ['006633', 'E5FFCC', '662A00', 'D8D8D8', 'F5F5F5']}))
```

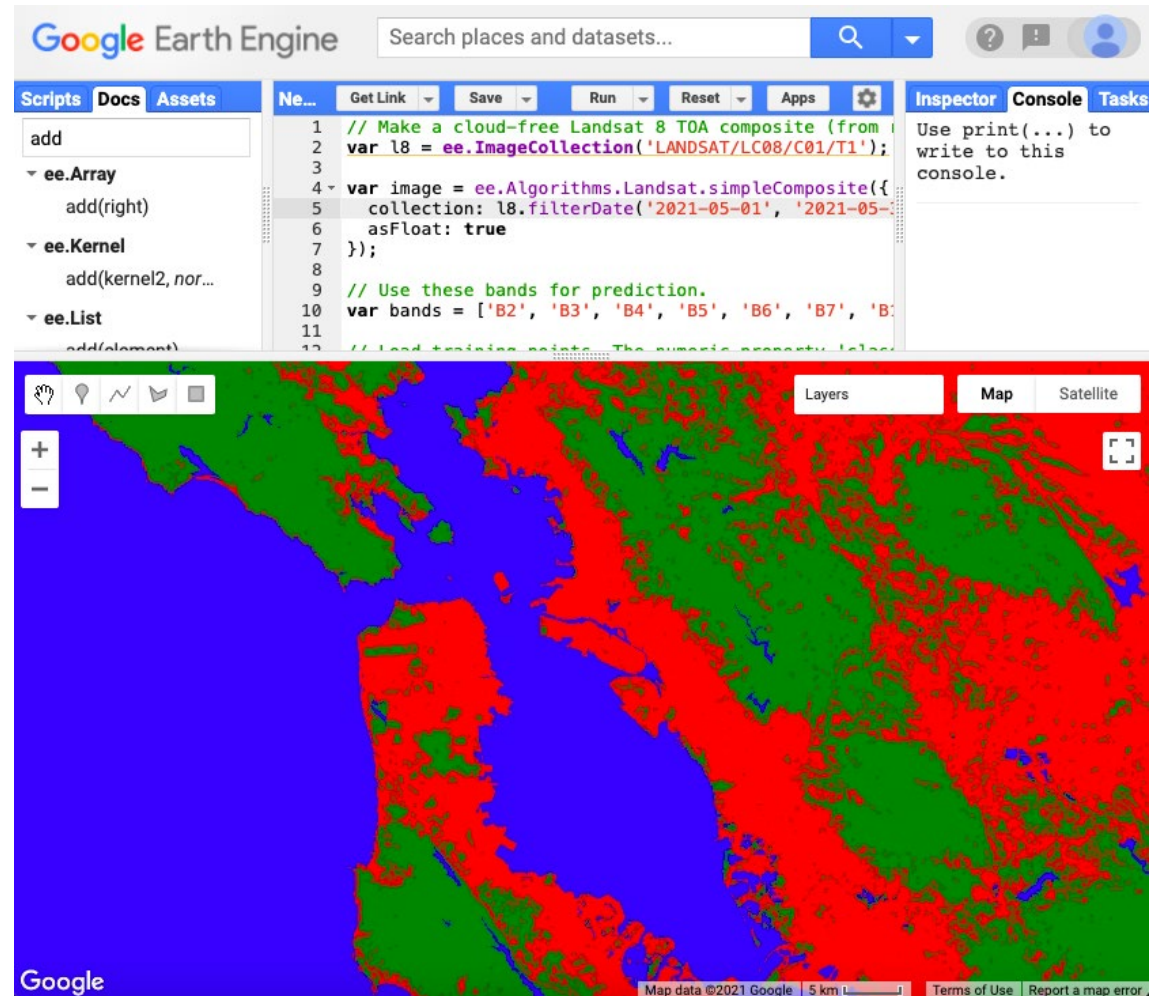


Google Colab notebook using a coded section to display elevation in an output cell. Credit: [Google Colab](#)



Google Earth Engine Functionality

- Uses of GEE for satellite imagery analysis include:
 - Automation of data processing and display
 - Near real-time monitoring (limited by the availability of data in the catalog)
 - Machine learning algorithm application
 - Graphical User Interface implementation



Simple Classification and Regression Trees (CART) classifier implemented in the GEE API to identify three classes urban, forest, and water in the San Francisco Bay Area for May 2021 using Landsat 8 imagery. Credit: [Google Earth Engine Developers](#)



GEE Land Applications

- Long-term monitoring of landscape change and land cover type
- Computation of indices relevant to land management such as normalized difference indices for vegetation, water, snow, soil, and urban areas
- Landscape time series analysis and change detection
- Summary statistics
- Validation and accuracy assessment methods
- Visualization and presentation of results



Time series of MODIS NDVI displayed using Google Earth Engine.
Image Credit: [Google Earth Engine Developers](#)



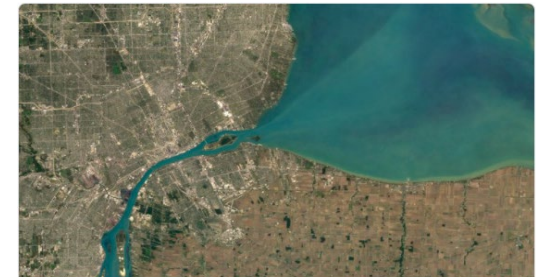
Available Satellite Sensor Data in GEE: Landsat Series

- Data from the entire Landsat series is available for use in GEE, including:
 - **Landsat 1-5**
 - Multispectral Sensor Radiance
 - **Landsat 4-8**
 - Raw Images
 - Top of Atmosphere
 - Surface Reflectance
- The full archive includes data from 1972 to present day, with data from 1982 onward at 30m resolution (Landsat 4-8).
- GEE Data Catalog Link:
 - <https://developers.google.com/earth-engine/datasets/catalog/landsat>



Landsat 8

2013 - Present



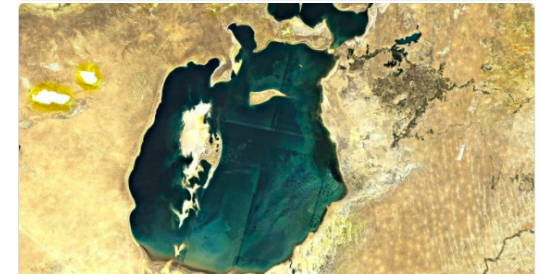
Landsat 7

1999 - Present



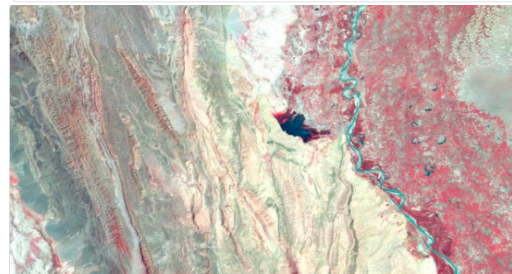
Landsat 5

1984 - 2012



Landsat 4

1982 - 1993



Landsat 1-5 MSS

1972 - 1999

Available Landsat series collections in the GEE data catalog. Image Credit: [Earth Engine Data Catalog](#)



Available Satellite Sensor Data in GEE: Sentinel-2

- Available Sentinel-2 data includes:
 - Top of Atmosphere
 - Surface Reflectance
- Sentinel-2 land applications are very similar to those of Landsat, but differences include:
 - 10-20m spatial resolution
 - 5-day revisit
 - Less temporal coverage
- GEE Data Catalog Link:
 - <https://developers.google.com/earth-engine/datasets/catalog/sentinel-2>



Surface Reflectance

Level-2A orthorectified atmospherically corrected surface reflectance.

Dataset availability: 2017-03-28 – Present



Top-of-Atmosphere Reflectance

Level-1C orthorectified top-of-atmosphere reflectance.

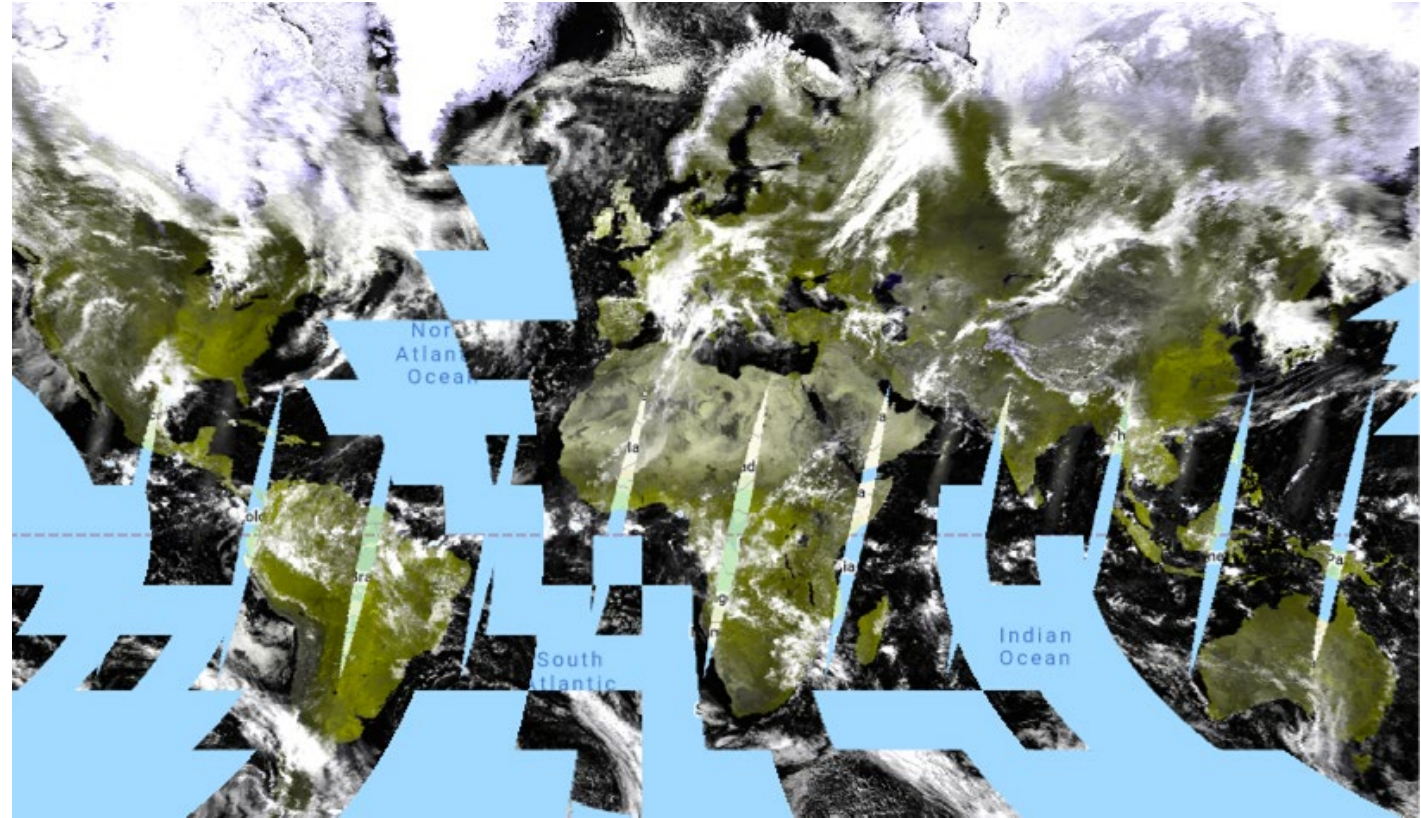
Dataset availability: 2015-06-23 – Present

Available Sentinel-2 data products in GEE. Note the temporal coverage starts in 2015 and 2017. Image Credit: [Earth Engine Data Catalog](#)



Available Satellite Sensor Data in GEE: MODIS

- MODIS reflectance data products include:
 - Daily, 500m Nadir BRDF-Adjusted Reflectance
 - Daily, Global, 250m Surface Reflectance
 - 8-Day, Global, 250m Surface Reflectance
- Pre-processed products include:
 - Daily, Global, 500m Snow Cover
 - 16-Day, Global, 250m Vegetation Indices
 - Yearly, Global, 500m Land Cover Type



False color image of the Terra Surface Reflectance Daily Global 250m projected in the GEE JavaScript API. Credit: [Google Earth Engine Developers](#)

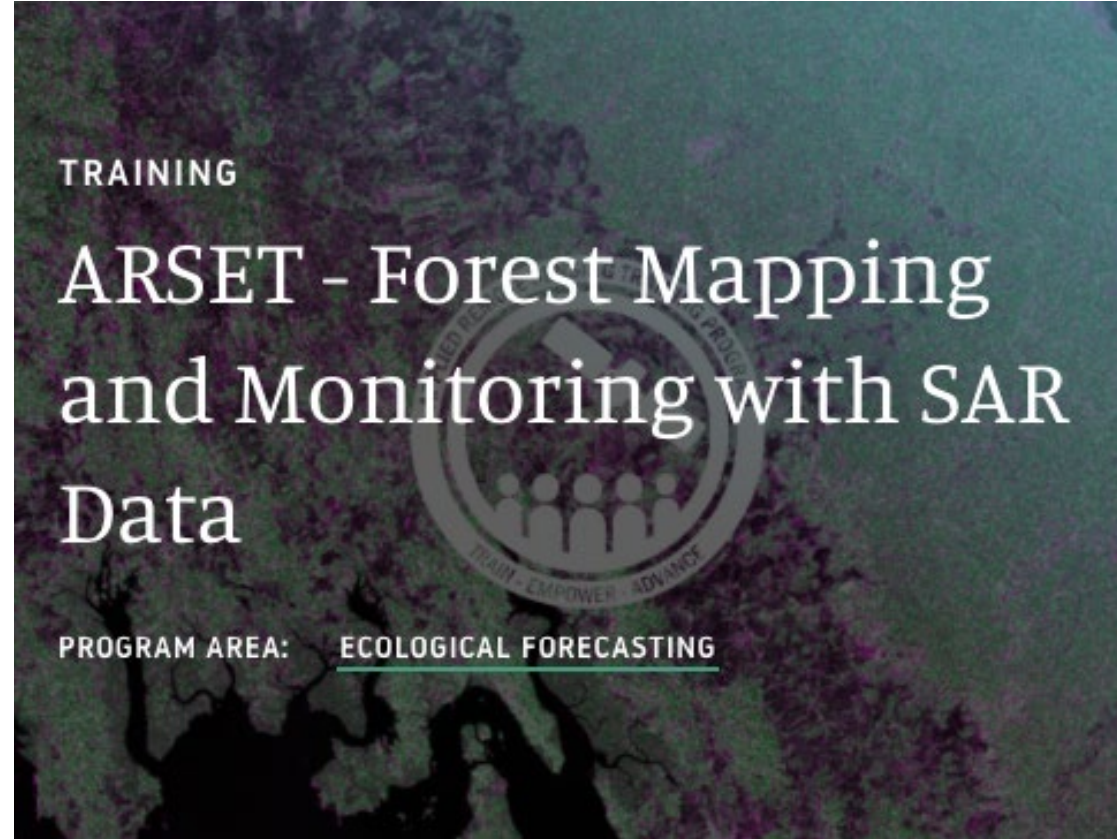
MODIS GEE Catalog Link:

<https://developers.google.com/earth-engine/datasets/catalog/modis>



Available Satellite Sensor Data in GEE: Sentinel-1 SAR

- Pre-processed SAR data from Sentinel-1 is available to work with in GEE.
- Previous ARSET training:
 - [Forest Mapping and Monitoring with SAR Data](#)
- GEE Data Catalog:
 - https://developers.google.com/earth-engine/datasets/catalog/COPERNICUS_S1_GRD

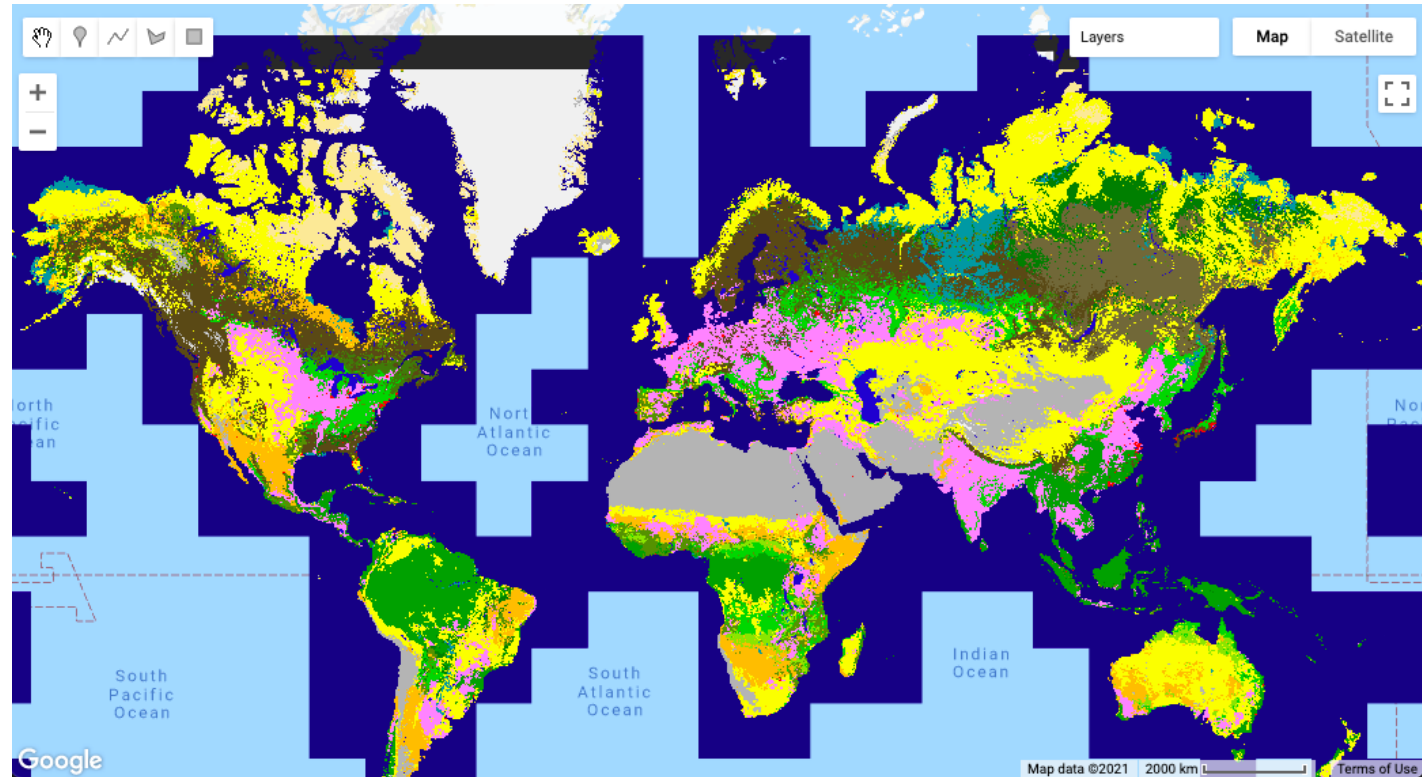


A previous ARSET training details the use of SAR data for land management, particularly in vegetated ecosystems.
Link: [ARSET](#)



Available Satellite Sensor Data in GEE: Land Cover Products

- A variety of land cover data products are available in GEE, including:
 - Copernicus Global Land Cover Layers
 - MODIS Land Cover Type Yearly Global 500m
 - Global PALSAR-2/PALSAR Forest/Non-Forest Map
 - USGS National Land Cover Database
- GEE Data Catalog:
 - <https://developers.google.com/earth-engine/datasets/tags/landcover>

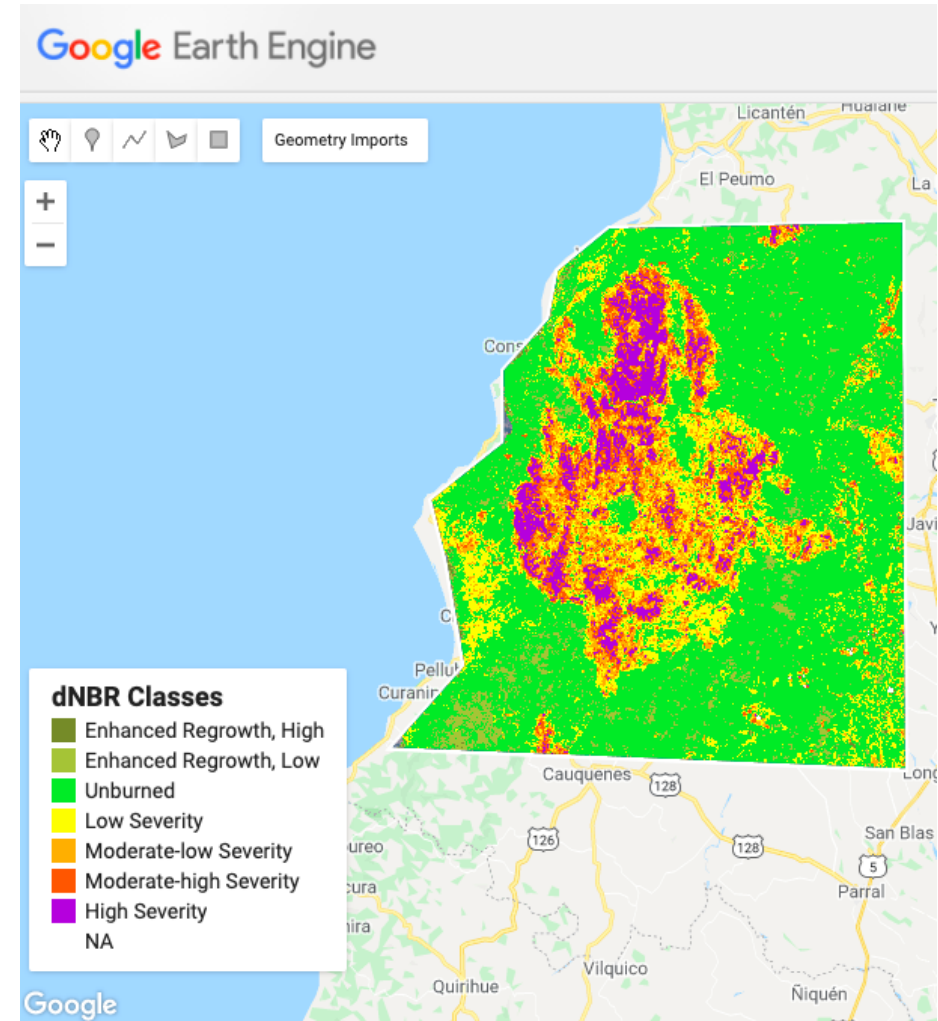


Copernicus Global Land Cover Layers: CGLS-LC100 collection 3 displayed globally in GEE. Credit: [Earth Engine Data Catalog](#)



Applications of GEE for Land Management: Burn Severity

- Burn severity mapping completed in GEE manipulates pre-loaded Sentinel-2 or Landsat 8 data and uses the GEE platform as a means to quality control and filter data.
- Normalized Burn Ratio (NBR) and differenced NBR (dNBR) are calculated.
- Thresholding rates the severity of wildfire burning to complete a full burn severity assessment.
- Refer to the step-by-step [UN-SPIDER burn severity in GEE training](#)



Example of burn severity mapping using Sentinel-2 data in Emedrado, Chile in February 2017. This map was produced using the UN-SPIDER Burn Severity with GEE script. Credit: [UN-SPIDER](#)



Advantages and Disadvantages of GEE

Advantages

- Allows processing of remote sensing data directly on Google's servers (cloud-computing)
- Free for non-commercial use
- Access and integration of many geospatial datasets at multiple scales
 - Ability to monitor global phenomena
- Built in functions for quick processing
- Flexible access through APIs (Climate Engine built in this manner)

Disadvantages

- Processing and storage limits
 - Inability to perform “batch jobs” without cost
- Only free for non-commercial user
- Complex operations can be challenging
 - Restricted programming framework
 - Aggregate layers make it difficult to determine the date of specific pixels





Google Earth Engine Case Study Analysis

Lytton Creek Fire

- Began on June 30th, 2021
- Destroyed much of Lytton, Canada and killed two people
- Many First Nations communities affected
- One of multiple fires that occurred in British Columbia as a result of the 2021 Western North America heat wave
- More information via an ArcGIS Storymap created by Susie Saliola, Sativa Cruz, and Jonatan Van Dusen:

<https://storymaps.arcgis.com/stories/5873123f76cf4cad9c10f72a8989093c>

Temperatures in Canada and north-west US reached record highs on 29 June

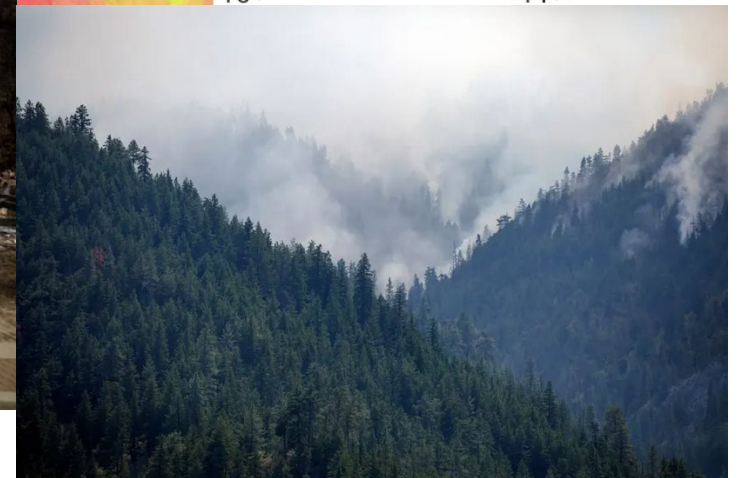
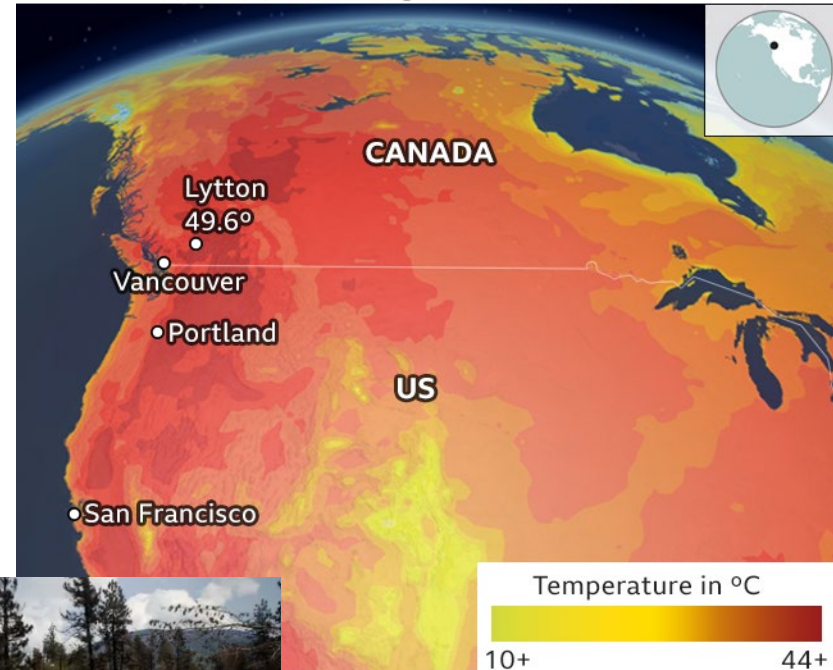


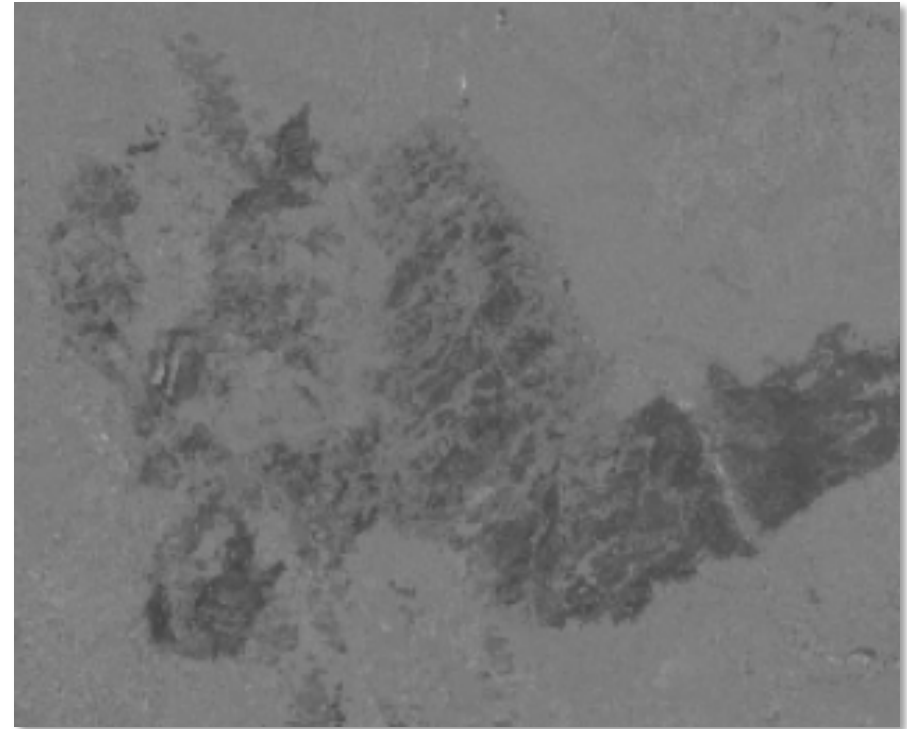
Image Credit: [The Guardian](#)



Lytton Creek Fire In GEE

For this exercise, we will:

1. Load the pre- and post-fire Landsat images
2. Calculate the Normalized Burn Ratio (NBR) for the pre- and post-fire images
3. Calculate the differenced NBR (dNBR) for the pre- and post-fire images
4. Classify the burn severity and add a legend
5. Calculate the burned area
6. Export the burned area statistics as a .csv



LYTTON CREEK FIRE CODE LINK:

<https://code.earthengine.google.com/bf0e7325fd0c23ff828815adada8f9eb0>



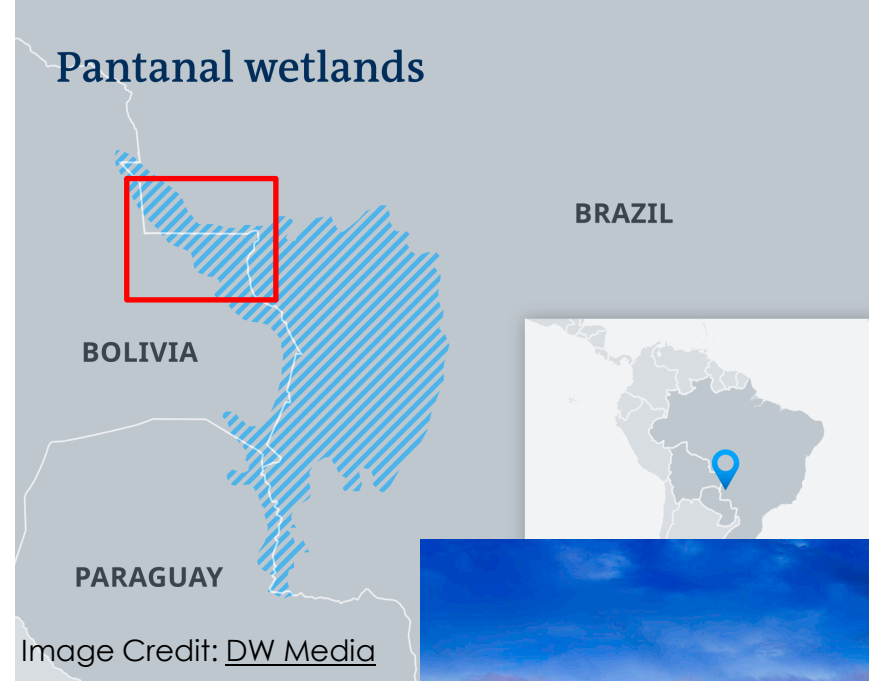
Bolivian Fires of 2020

- Multiple fires burning throughout August, September, and October 2020
- High temperatures and dry conditions
 - Prolonged regional drought due to climate variability (warm phase of the Atlantic Multidecadal Oscillation, AMO)
- State of emergency declared in October 2020
- Fires burning in Pantanal wetlands, in the Chiquitano forest, in the Beni savannas, and the Amazon rainforest
- More than 1.3 million acres burned
- Crops and livestock affected



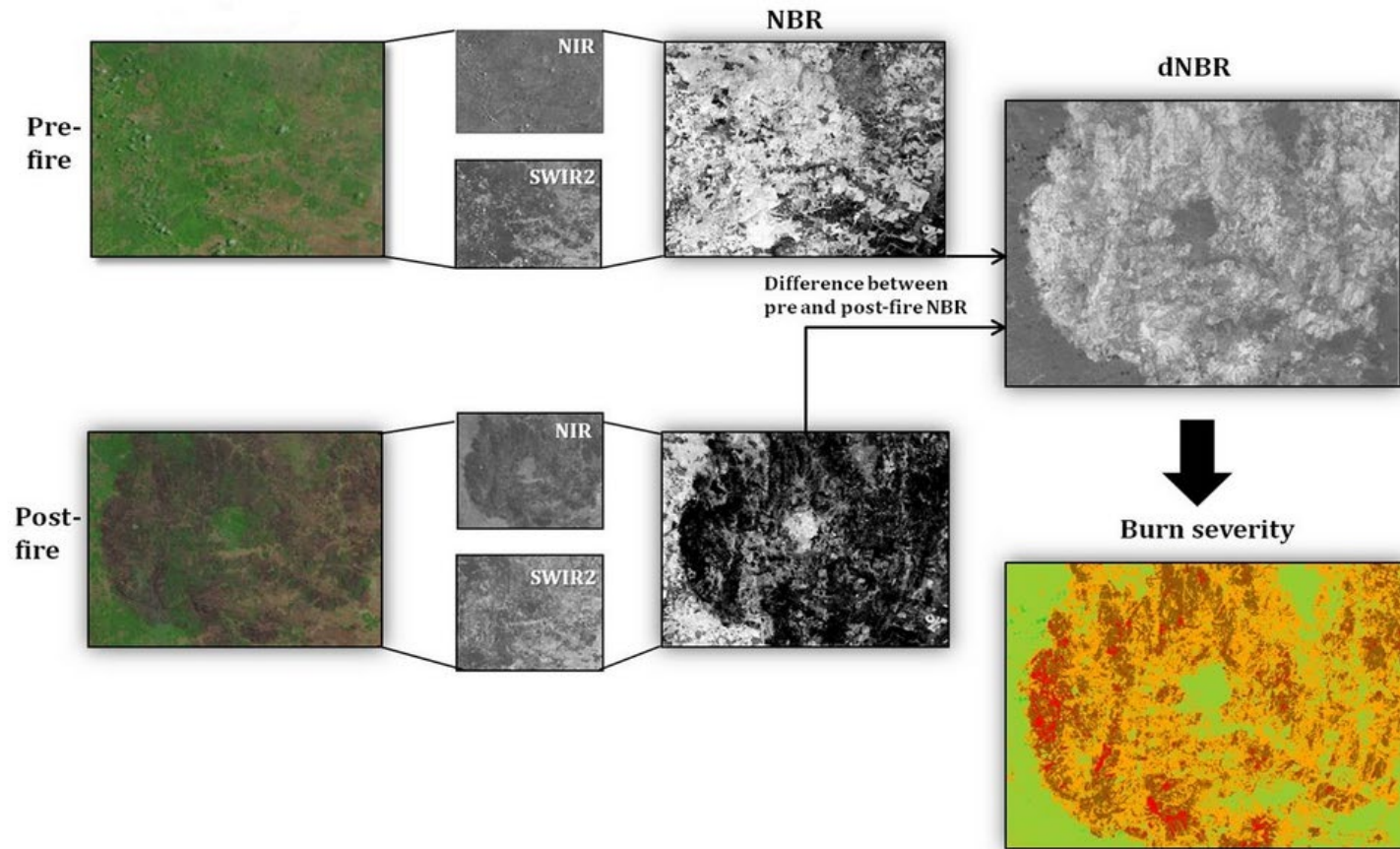
Bolivian Fires of 2020: Pantanal Wetlands

- Pantanal wetlands of Brazil, Paraguay, and Bolivia
 - Largest tropical wetland in the world – biologically diverse
- Less than 5% protected
- Over 8,000 fires in 2020
- Over 22% - 3.2 million hectares burned
- Worst drought in 47 years
- More Information via an ArcGIS Storymap by Lainet Garcia Rivera:
<https://storymaps.arcgis.com/stories/a042c49f05654437ae1e846af87c3159>



Bolivian Fires of 2020 In GEE

- Most of this code was generated via the United Nations Office for Outer Space Affairs, UN-SPIDER Knowledge Portal.
- Please refer to this website for more information: <https://un-spider.org/advisory-support/recommended-practices/recommended-practice-burn-severity>



Bolivian Fires of 2020 In GEE

For this exercise we will:

1. Select the study area
2. Select the date range
3. Select the satellite platform (Landsat 8 or Sentinel 2)
4. Identify what the user selected in steps 1-3
5. Apply a cloud and snow mask
6. Mosaic and clip images to the study area
7. Calculate the NBR for the pre- and post-fire images
8. Calculate the dNBR
9. Add all the image layers to the map
10. Calculate burned area
11. Add a legend to the map
12. Export the dNBR image
13. Export the burned area statistics as a .csv



BOLIVIAN FIRES CODE LINK:

<https://code.earthengine.google.com/25ade354b78d713f37ec8aa1b9c66952>



Summary

- Fire impacts soil chemistry, watershed dynamics, vegetation extent and type, and many other features of the landscape.
- Remote sensing can be used to assess the burned area extent, burn severity, and vegetation regrowth.
- There are multiple tools for assessing post-fire landscapes, including:
 - LANDFIRE
 - FIRMS
 - MTBS
 - GWIS
 - AppEEARS
 - And GEE, which we have featured in this session



Resources

- Google Earth Engine Beginners Cookbook: <https://developers.google.com/earth-engine/tutorials/community/beginners-cookbook>
- LANDFIRE: <https://landfire.gov/>
- Fire Information Resources Management System (FIRMS): <https://firms2.modaps.eosdis.nasa.gov/>
- Monitoring Trends in Burn Severity (MTBS): <http://www.mtbs.gov/>
- MTBS Fire Mapping Tool: <https://www.mtbs.gov/qgis-fire-mapping-tool>
- Global Wildfire Information System (GWIS): <https://gwis.jrc.ec.europa.eu/>
- Canada's Record-Breaking Heatwave: <https://airs.jpl.nasa.gov/resources/228/nasas-airs-tracks-record-breaking-heat-wave-in-pacific-northwest/>
- CNN Article about the Lytton Fire: <https://www.cnn.com/2021/07/08/americas/canada-lytton-wildfire-climate-change-indigenous-intl-cmd/index.html>
- Earth Observatory Article about the Bolivian Fire outbreak: <https://earthobservatory.nasa.gov/images/147408/fierce-fires-in-bolivia>

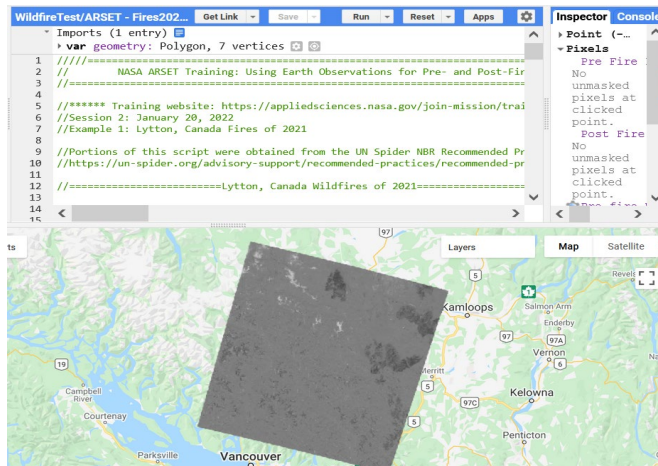


Interactive Training Portion

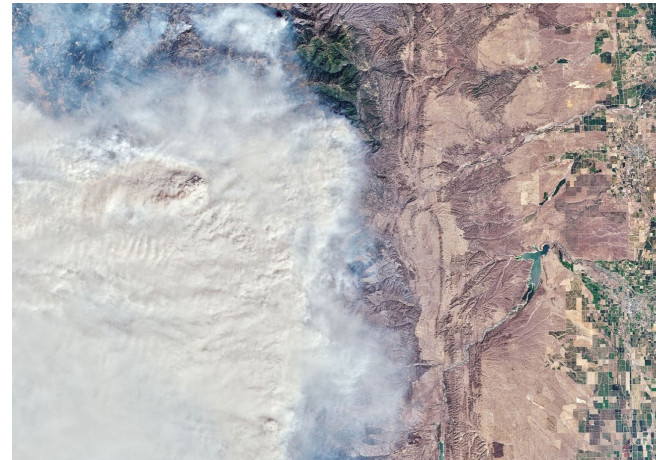
Exercise

Questions

Lab Time

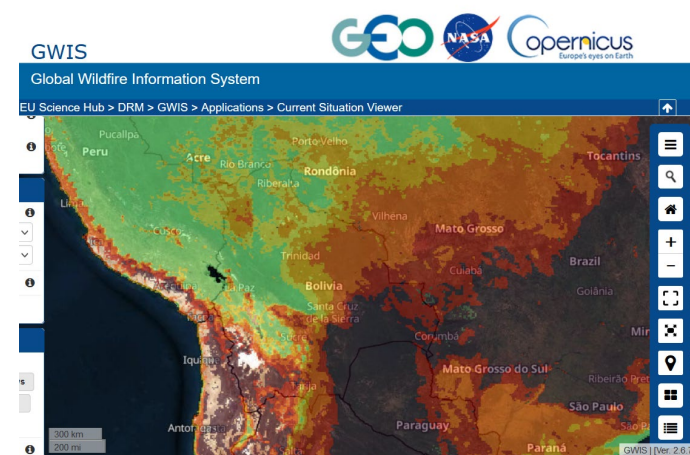


We will step through one of the hands-on exercises together



Please enter your questions in the Q&A box.

We will post the Q&A to the training website following the conclusion of the webinar.



The trainers will remain online as you work through the exercises.

We will answer questions related to the exercise and/or share our screen to talk through common issues.



Contacts

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 - Juan Torres-Pérez: juan.l.torresperez@nasa.gov
- Training Webpage:
 - <https://appliedsciences.nasa.gov/join-mission/training/english/arset-using-earth-observations-pre-and-post-fire-monitoring>
- ARSET Webpage:
 - <https://appliedsciences.nasa.gov/what-we-do/capacity-building/arset>





Hands-On Exercise: Post-Fire Mapping with GEE



Thank You!

