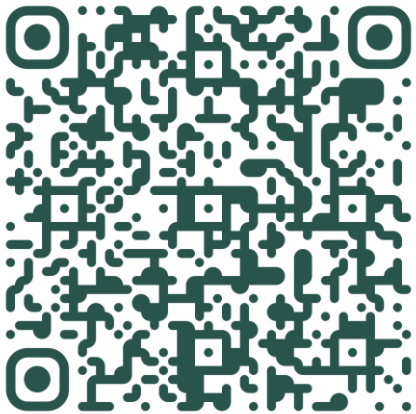
Welcome to NASA Applied Remote Sensing Training (ARSET) Program

- We will begin shortly.
- Please ensure you have created your Earthdata account.
- All training materials for this workshop can be found on the training webpage:
  - https://www.earthdata.nasa.gov/learn/trainings/nasa-satellite-observations-tools-conservation-management-workshop-series





NASA Satellite Observations and Tools for Conservation Management Workshop Series

Session 2: From Water Quality to Vegetation Health: Implementing NASA Earth Observations into Conservation Workflows

Kait Lemon (Lead Agriculture Trainer)

December 2nd, 2026

Today's Agenda

- Introduction
- Section 1. Water Quality and Quantity Monitoring
- Section 2. NASA's Satellite Needs Working Group and Data Products
- Section 3. Hands on Exercise: Mapping surface Water Extent in Worldview & Discussion
- Break
- Section 4. HLS Vegetation Indices and NDVI Calculation
- Section 5. NASA AppEEARS & HLS Vegetation Demo, Exercise, & Discussion
- Section 6. Hands on Exercise: NDVI Anomaly Calculation in QGIS
- Training Conclusion

Learning Objectives

- Explore relevant NASA Level-3 data products (HLS & OPERA), and web tools for a variety of conservation applications, such as water, vegetation monitoring, and agricultural management.
- Calculate different vegetation indices appropriate for water and vegetation monitoring.
- Interpret downloadable HLS Vegetation Index data in AppEEARS.
- Conduct raster-based change detection analysis in QGIS to assess vegetation decline in a forest impacted by spruce budworm.

Satellite Characteristic Questions – Recall from Session 1!

What parts of the Earth can the sensor see?	**Orbits:** Polar/Non-Polar Orbit vs. Geostationary
Can the sensor make observations at night? Can it see through clouds?	**Energy Source:** Passive vs. Active
Can the sensor make observations at night? Can it see through clouds?	**Spectral Range:** Visible, UV, IR, Microwave…
What features will I be able to see? How often are observations made over my location of interest?	**Resolution Type and Quality:** Spatial, Temporal, Spectral, Radiometric
Is the data product I want available from this sensor?	**Application:** Weather, Ocean Color, Land Mapping, Air Quality, Radiation Budget, etc.



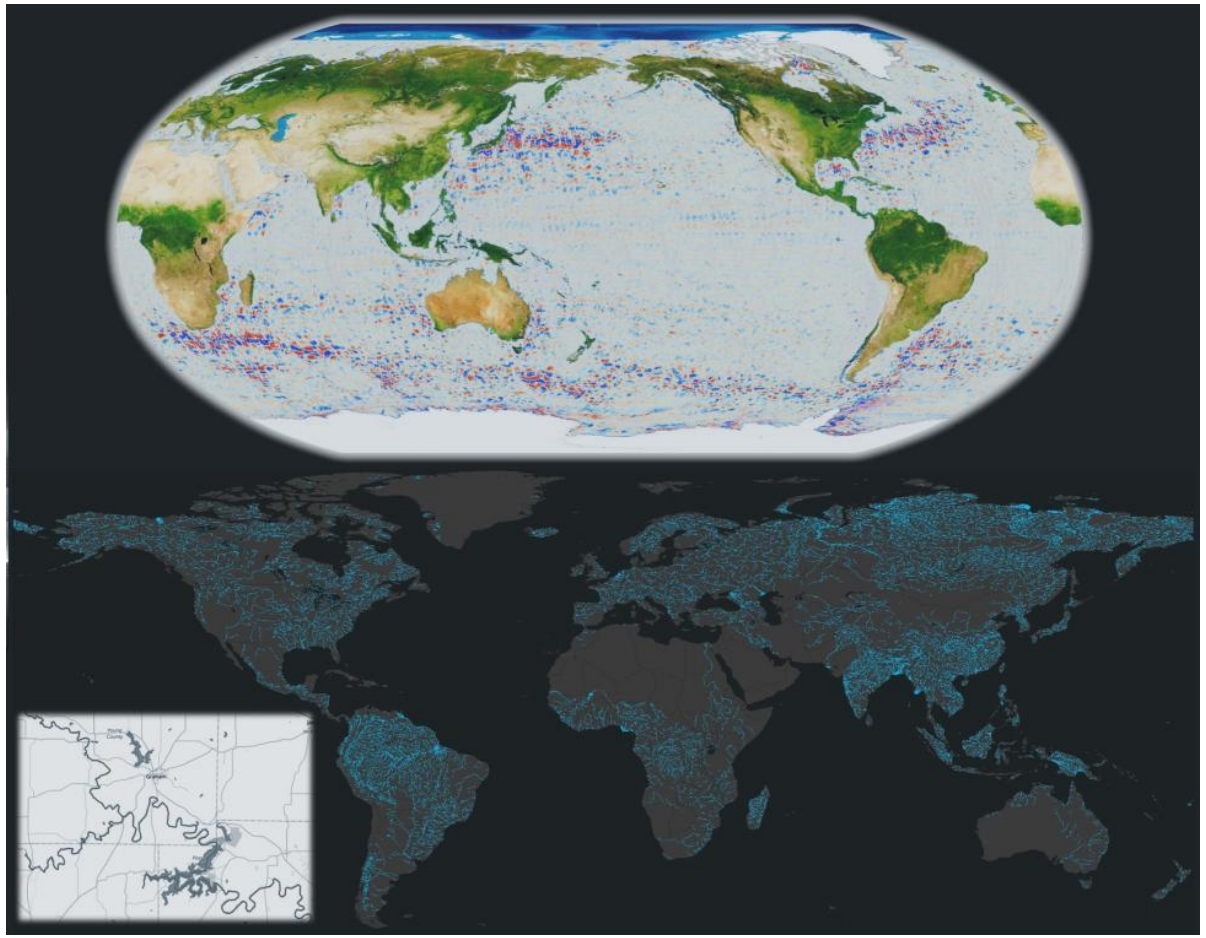
Section 1.
Water Quality and Quantity Monitoring with NASA Earth Observations

Remote Sensing for Water Management



- Satellite remote sensing can observe inaccessible areas like remote lakes, polar regions, and conflict zones where ground measurements are impossible.
- Multiple NASA missions focus on various water components.
- Consistent, timely observations
- Calibrated and validated data
- Reduced Field Work: Minimizes expensive and time-consuming ground-based monitoring

Water Quantity



Credit: Accessing Data for the World's Water with SWOT

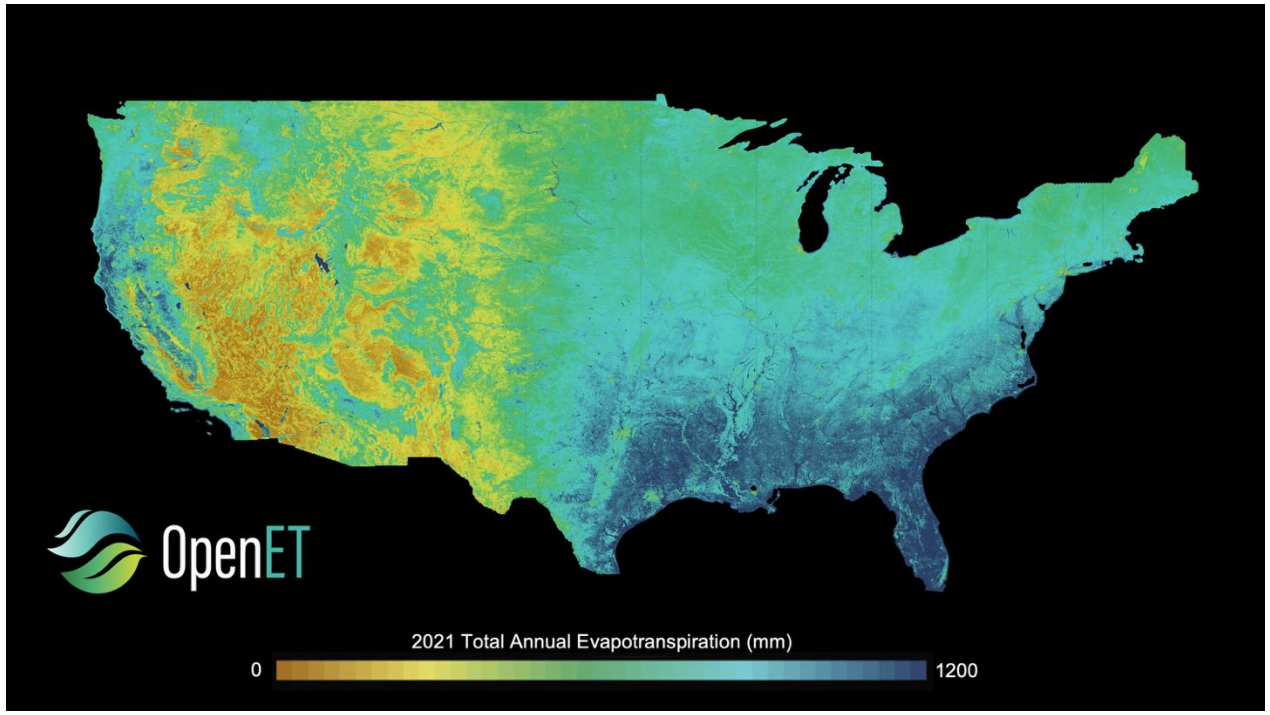
Water is measured in terms of mass per volume or in terms or depth or height per unit area.

Water amount measured is referred to as water budget and includes:

- Precipitation
- Soil Moisture
- Evapotranspiration (ET)
- Groundwater
- Water Runoff
- Atmospheric Humidity and Clouds
- Reservoirs and Lakes

Water Quantity Monitoring – Evapotranspiration with OpenET

- 2016 – Present
- Spatial Resolution: 30 m
- Latency: Variable
- Evapotranspiration data from OpenET do not represent direct measurements of ET; rather they are estimates based on satellite, meteorological, soil, and vegetation datasets that are used within state-of-the-art ET models.
- Access: OpenET



OPENET

Filling the Biggest Data Gap in Water Management

What is ET? | How to use Data | Methodologies | Known Issues | API | FAQ | Newsroom | About | Contact | Sign Out

Home | Explore Data | Use Cases | Accuracy

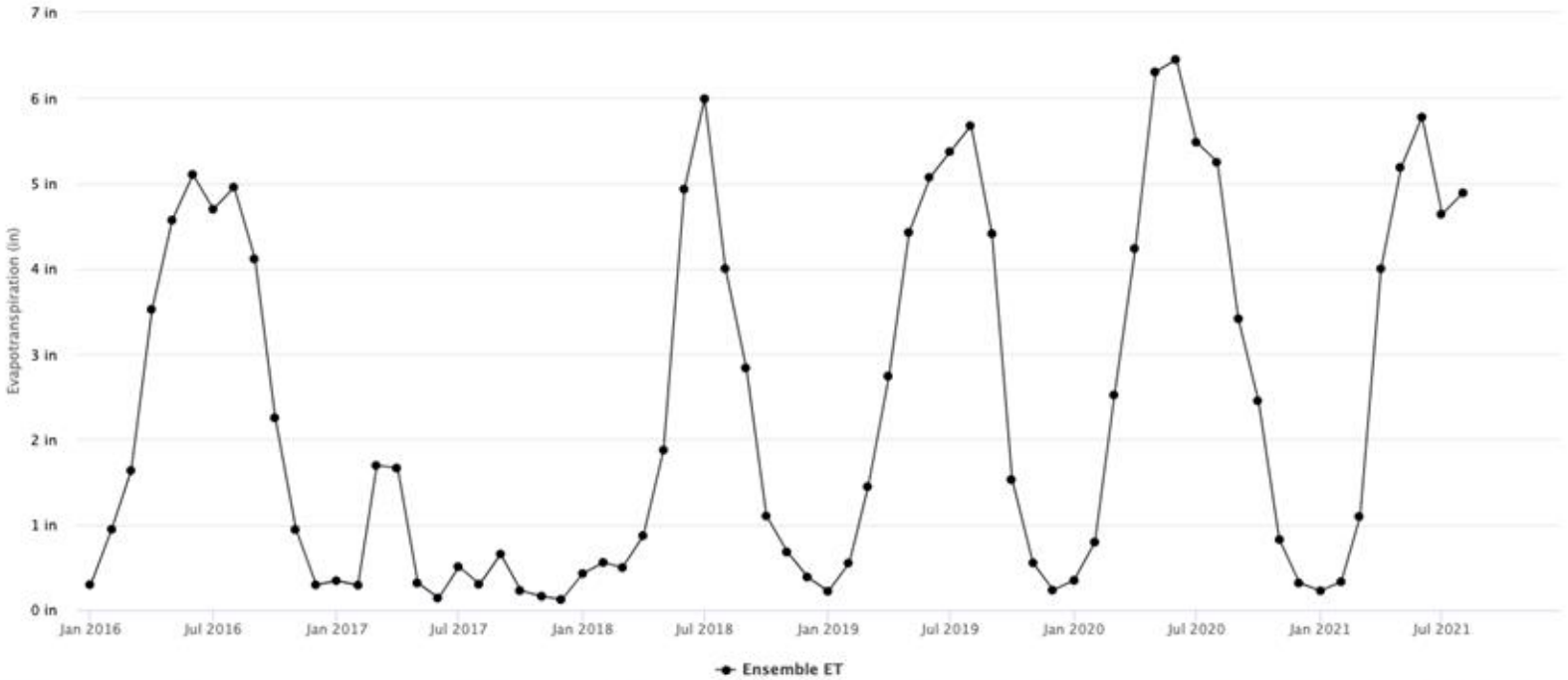
Grand Valley, CO, USA | 2020 | ET | Raster View | Field View | New Here? Take a Tour!

USDA/CDWR Crop Type: Alfalfa | Area: 100 Acres | Field ID: 084171

Monthly | Cumulative

Evapotranspiration

Download Data



Data Options

ET

- Ensemble
- Range
- eeMETRIC
- SSEBop
- SIMS
- PT-JPL
- DisALEXI
- geeSEBAL

ET Fraction

Additional Variables

Cumulative Ensemble Evapotranspiration (in)

About Crop Type and Field Boundaries

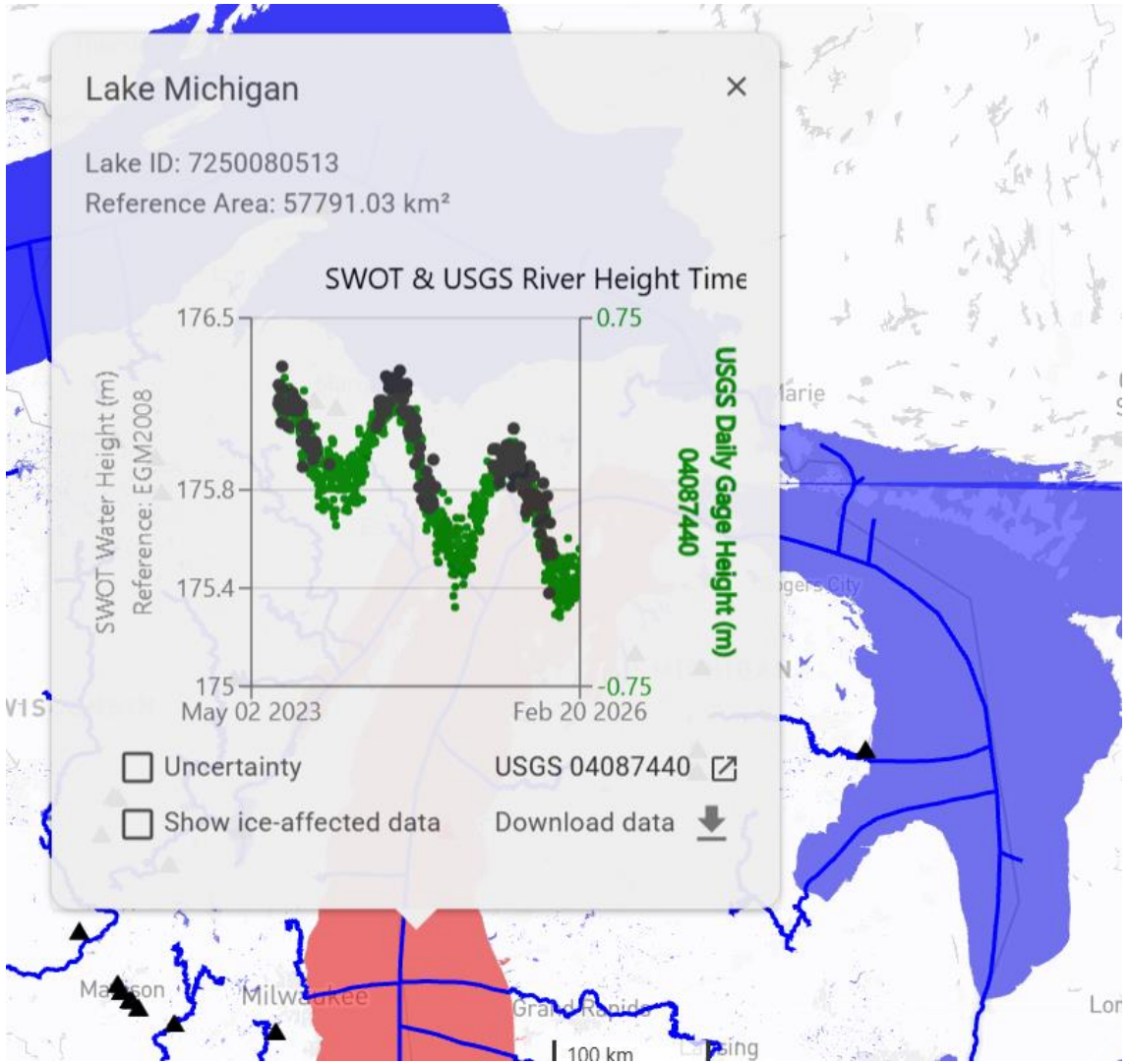
Opacity

Draw Custom Area

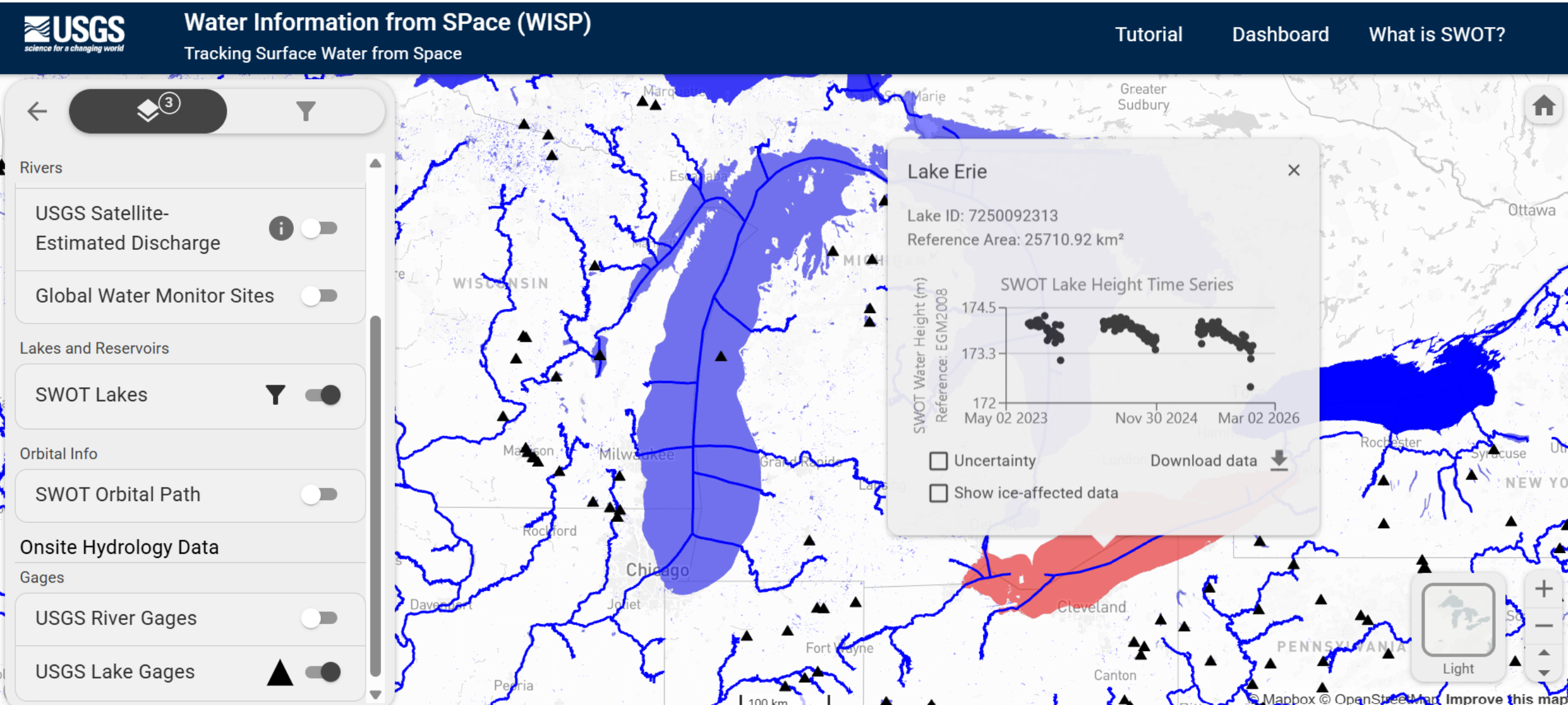
Google

Water Quantity Monitoring – Surface Water Height

- WISP is a USGS online platform for tracking surface water from space.
- 2023 – Present
- Derived from Surface Water and Ocean Topography (SWOT)
- Spatial Resolution:
  - Swaths: 120 km
  - Oceans: 14-15 km
  - Coastal Zones: 10 km
  - Land: ~100 m
- Temporal Resolution: 21-Day Revisit
- Access: WISP



Water Quantity – WISP Lake Data



Water Quantity – WISP Stream Data



Water Quality

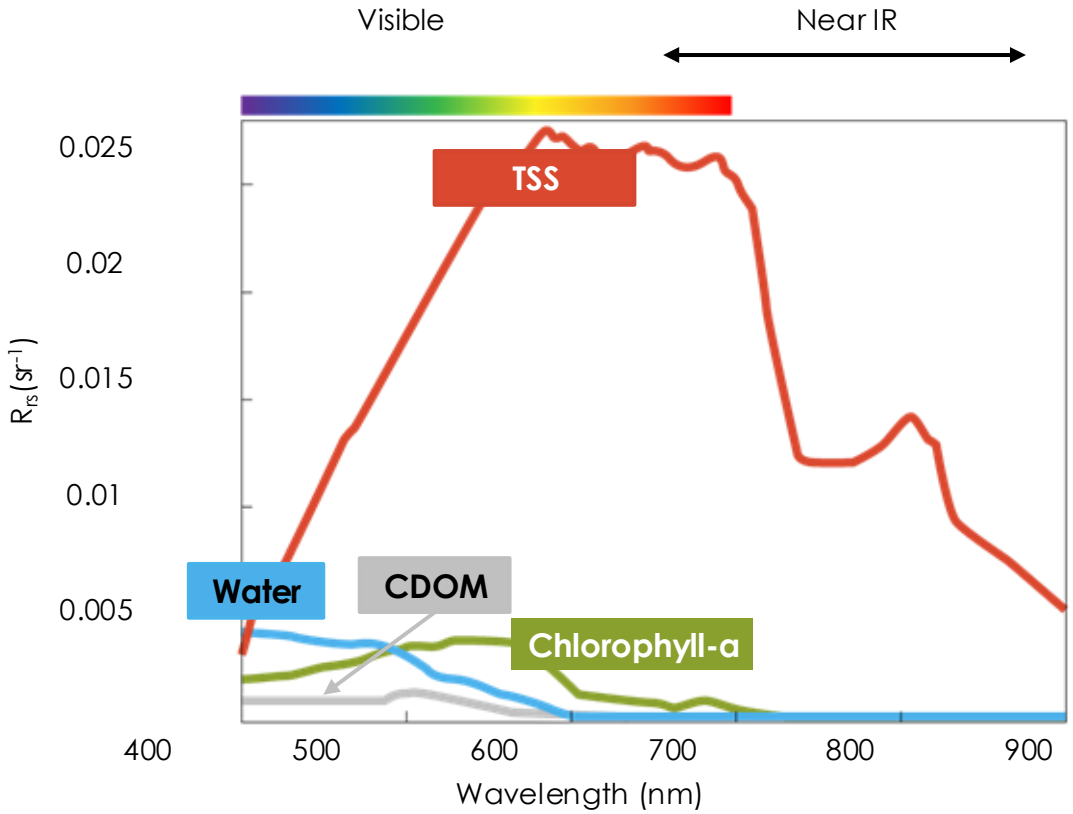
- **Water Quality Characteristics:** Water contains visible and invisible physical, chemical, biological, and microbiological components that determine its quality and suitability for different uses.
- **Factors Affecting Water Quality:** Nutrient levels, pollution, temperature, food web changes, invasive species, and changes in water flow caused by hurricanes, droughts, and floods.
- **NASA Water Quality Data:** Satellite and underwater sensors collect global data to monitor water quality and environmental changes.



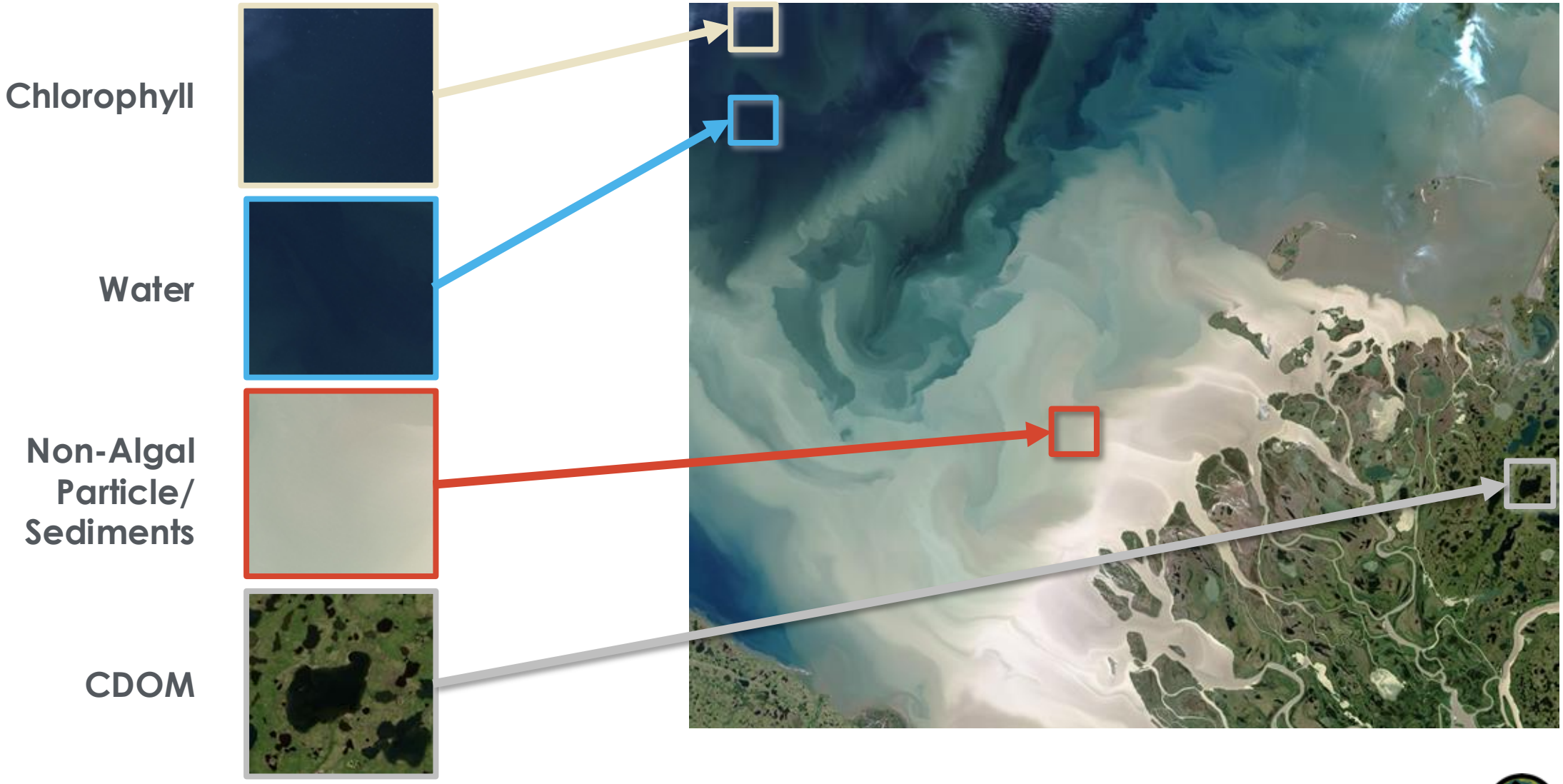
Credit: Lake Erie Blooms – NASA Science

Common Earth Observation Water Quality Parameters

- **Chlorophyll-a (Phytoplankton):** Primary green pigment in algae (harmful & non harmful)
- **Colored Dissolved Organic Matter (CDOM):** Impacts light penetration, nutrient cycles, aquatic ecosystem health, and carbon cycle
- **Total Suspended Solids (TSS):** Include pollutants, heavy metals, and nutrients. Affect light penetration and aquatic ecosystem. Sediment loads are critical for protecting the integrity of sediment-maintained geomorphic features such as river deltas and marsh and mangrove wetland platforms.



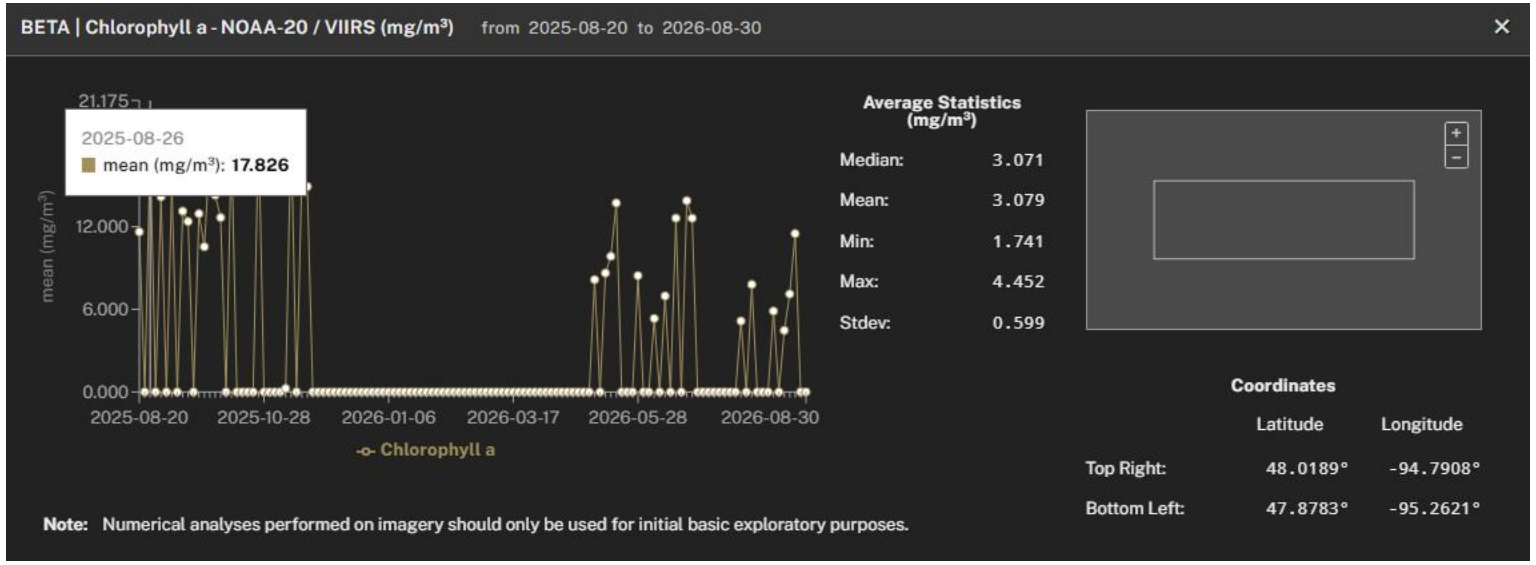
Inherent Optical Properties (IOPs) decide the 'color' of water.



Water Quality Ranges for Lakes

Credit: EPA

Chlorophyll-a Range	Trophic State	Water Quality Condition
< 5 mg/m3	Oligotrophic	Clear water, high oxygen, excellent drinking water quality
5 – 10 mg/m3	Mesotrophic	Intermediate productivity, moderate plant/algae growth
10 – 20 mg/m3	Eutrophic	High biological productivity, prone to occasional algal blooms
> 20 mg/m3	Hypereutrophic	Highly productive, dense algal mats, poor water clarity, potential for toxic blooms



Chlorophyll-a Products in Worldview

MODIS (Terra/Aqua)

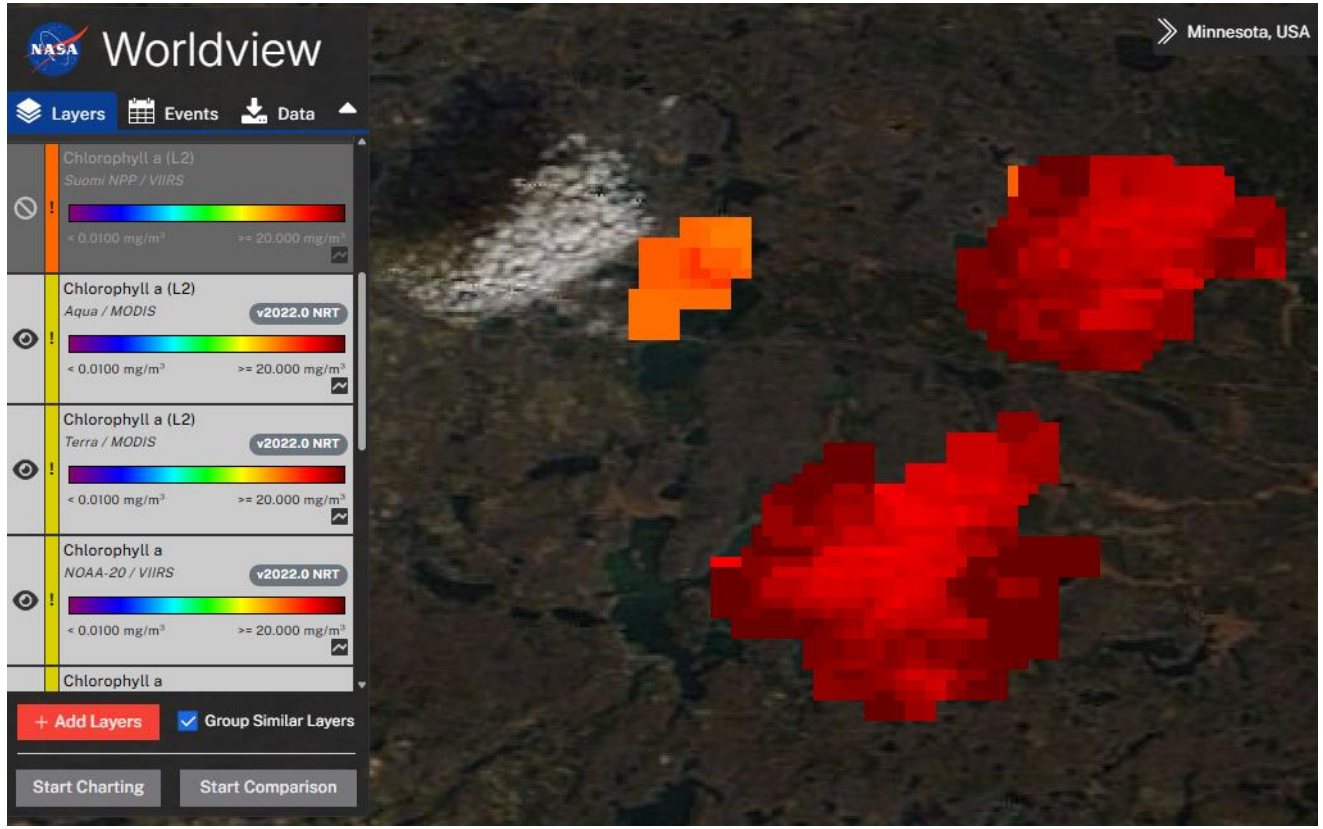
- Temporal Coverage: 2002 – Present
- The sensor and imagery resolution is 1 km, and the temporal resolution is daily.

VIIRS (NOAA-20/NOAA-21)

- Temporal Coverage: 2017/2002 – Present
- The sensor and imagery resolution is 1 km, and the temporal resolution is daily.

Sentinel-3A/B OLCI

- Temporal Coverage: 2016/2018 – Present
- The sensor and imagery resolution is 1 km, and the temporal resolution is daily.





Section 2.
NASA's Satellite Needs Working Group (SNWG) and Overview of Data Products

Satellite Needs Working Group (SNWG)

- An interagency, coordinated approach to identify and communicate federal satellite Earth observation needs through a biannual survey and develop solutions to help federal agencies use Earth-observing satellite data products in their decision-making.
- Tasked with surveying the satellite needs of civil agencies every two years, as approved by the U.S. Group on Earth Observations (USGEO).
- There have been five biennial cycles with over 500 surveys submitted!
- Over 30 solutions have been developed as a result, addressing the needs of over 30 agencies and increasing NASA data usability, functionality, and accessibility.

A Selection of SNWG Solutions

Biosphere

- Harmonized Landsat Sentinel-2 (HLS) & Vegetation Indices, *Low-Latency Products*
- OPERA Dynamic Surface Water Extent
- OPERA Surface Disturbance

Cryosphere

- Low Latency ICESat-2/ATLAS Products
- Sea Ice Mask

Geosphere

- OPERA Surface Displacement

Coming Soon:

- *OPERA Vertical Land Motion*

Hydrosphere

- Ocean Color Data Product

Coming Soon:

- *Global Algal Blooms Assessment Network (GABAN)*

Atmosphere

- Historical Airborne Data Catalog
- Global Cloud Composites
- TEMPO Near Real-Time Air Quality Products (NO_2, HCHO, O_2-O_2, SO_2, aerosols)



Section 2.1
Harmonized Landsat Sentinel-2 (HLS) & Vegetation Indices

Landsat & Sentinel-2 for Vegetation Applications

Landsat 8 & 9

- Launched in 2013 and 2021
- Sensor: Operational Land Imager (OLI) & Thermal Infrared Sensor (TIRS)
- Multispectral: 30- and 100-meter pixel bands, 15-meter panchromatic band, 8-day revisit

Sentinel-2A/B/C

- Launched in 2015, 2017, 2024
- Sensor: Multispectral Instrument (MSI)
- Multispectral: 10, 20, and 60-meter pixel bands, 2–5-day revisit

Vegetation-Based Applications:

- Vegetation Extent and Type
- Vegetation Stage and Health: Variety of vegetation indices, including NDVI, EVI, SAVI
- Vegetation Moisture: NDWI

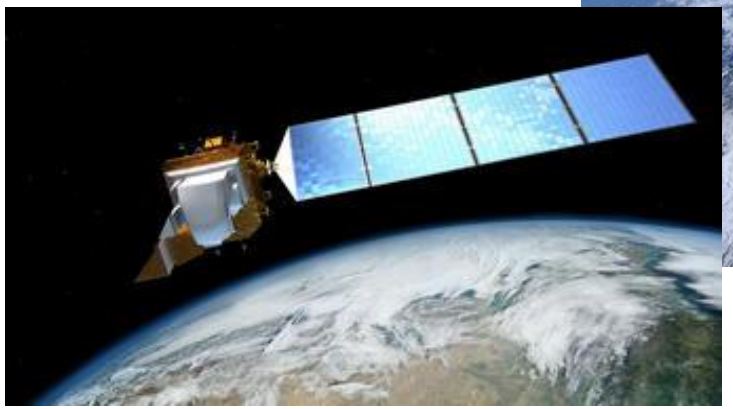




Image Credits: USGS, ESA

Harmonized Landsat & Sentinel-2 (HLS)

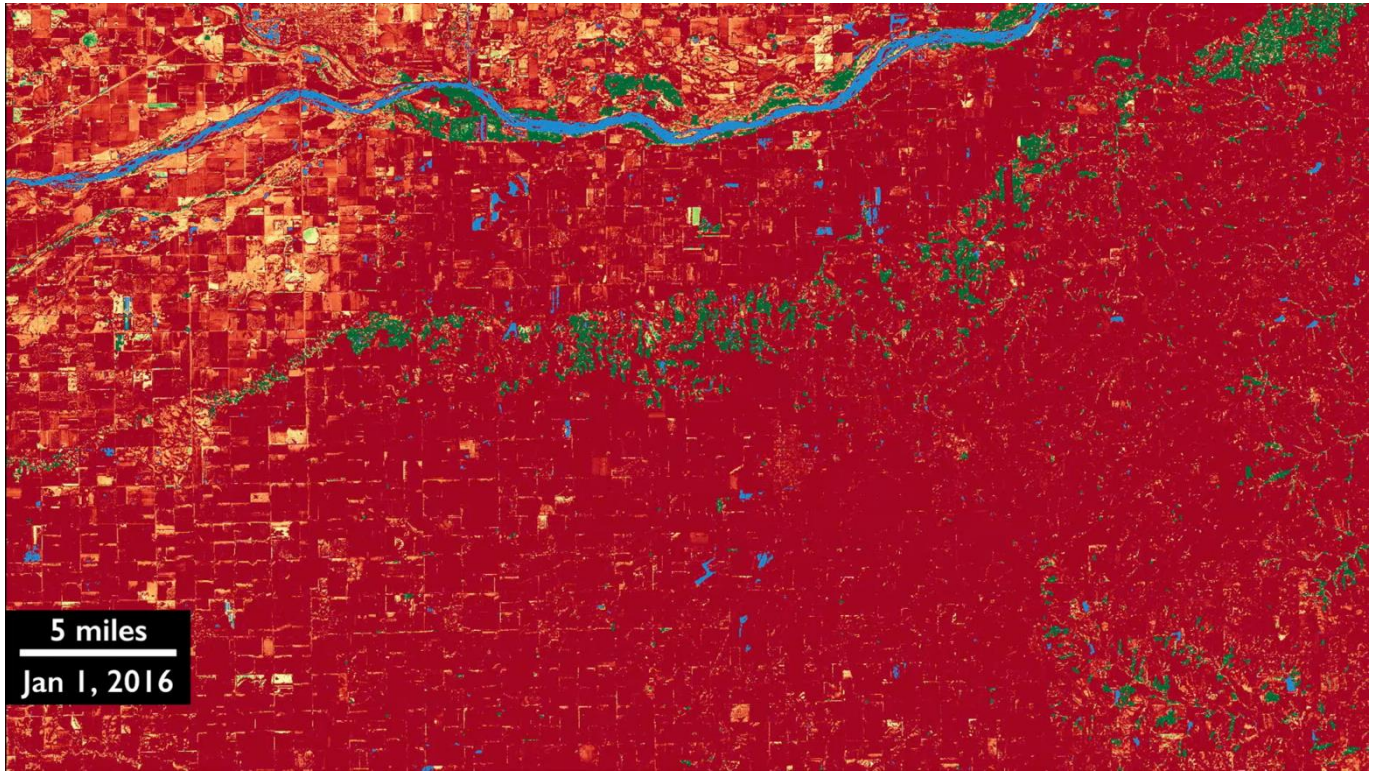
- Harmonized Landsat and Sentinel-2 (HLS)
- Active: 2013 – Present
- Spatial Resolution: 30 m
- Temporal Resolution: 2–3 days
- Integrates Landsat 8/9 (NASA/USGS) and Sentinel-2A/B/C (ESA) data
- Harmonized for seamless joint use
- Reflectance Layer offers "true color imagery"
  - Reflectance (NADIR BRDF-Adjusted)
- Access: Earthdata Search, Worldview, & AppEEARS



HLS Reflectance Layer used as a background layer in Worldview. Credit: Worldview

Vegetation Index

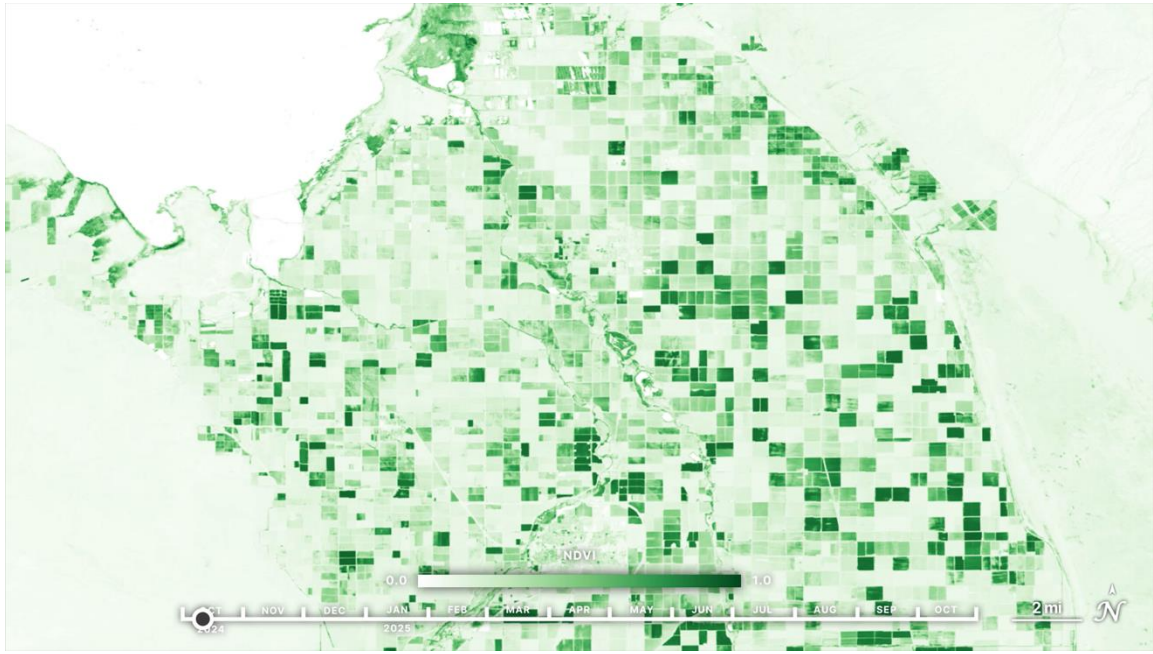
- A mathematical **calculation performed on each pixel** using values from multiple spectral bands of an image.
- Typically normalized **between -1 and +1**.
- **Transforms** complex multispectral data **into meaningful, interpretable information** about Earth's surface conditions and processes.



Annual NDVI data (2016) of farmland south of Columbus, Nebraska, with the Platte River across the top. Red shows bare soil; green indicates healthy vegetation.
Image Credit: NASA GSFC – SVS

HLS Vegetation Indices

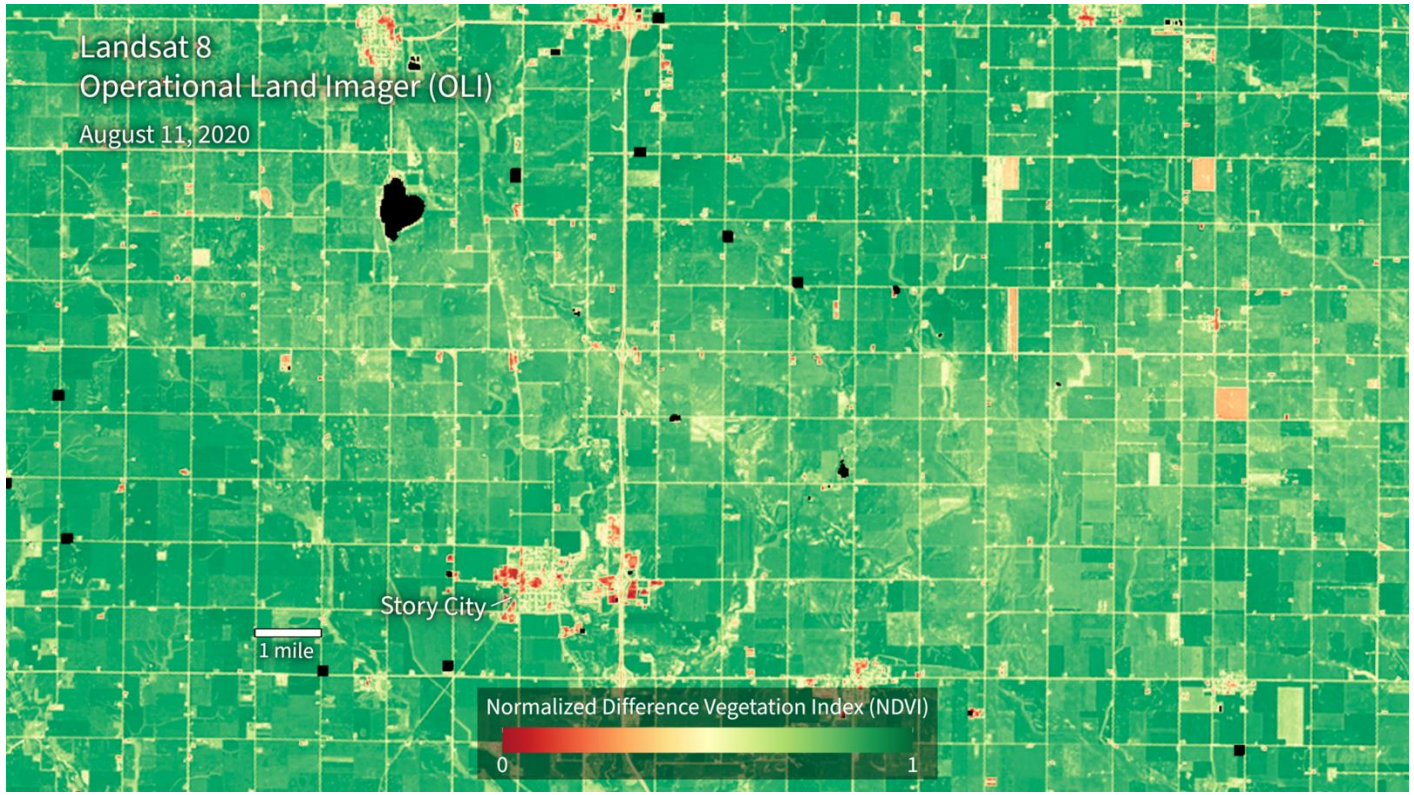
- Harmonized Landsat and Sentinel-2 (HLS) Project
- Combines data from NASA's Landsat 8/9 and ESA's Sentinel-2A/B/C satellites to create a unified, analysis-ready dataset.
- Increased Temporal Frequency: 2–3-day revisit globally
- Analysis-Ready Data: Pre-processed surface reflectance
- Two vegetation index products:
  - Landsat 30-meter Vegetation Index (HLSL30VI)
  - Sentinel-2 30-meter Vegetation Index (HLSSS30VI)
- Each product contains a suite of nine vegetation indices including greenness, vegetative moisture content, burned area, and vegetation change.



Credit: NASA HLS NDVI

Common Vegetation Indices Available with HLS

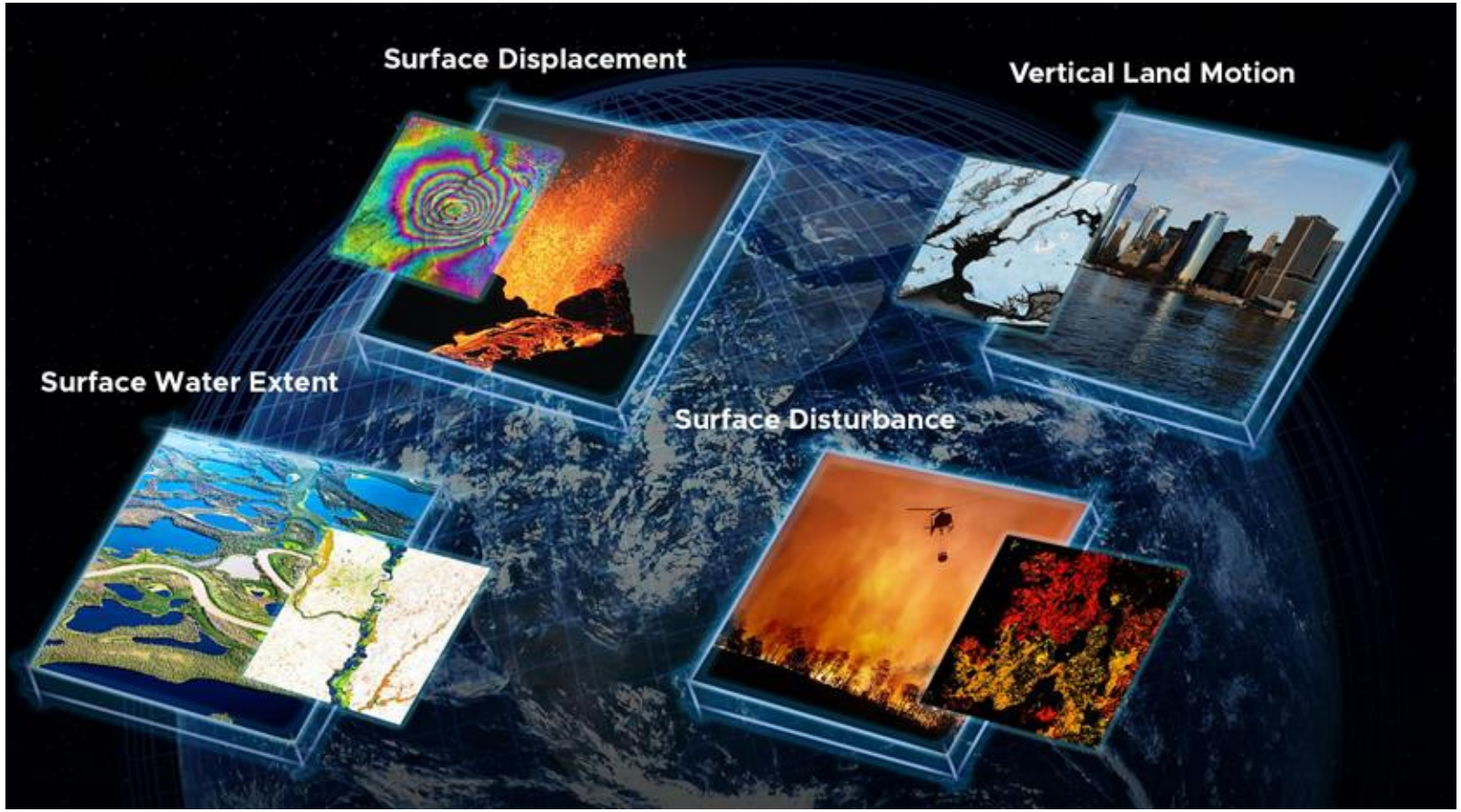
- **NDVI** – Normalized Difference Vegetation Index
- **EVI** – Enhanced Vegetation Index
- **SAVI** – Soil Adjusted Vegetation Index
- **NDMI** – Normalized Difference Moisture Index
- **NDWI** – Normalized Difference Water Index





Section 2.2
Observational Products for End-Users from Remote Sensing Analysis (OPERA)

Observational Products for End-Users from Remote Sensing Analysis (OPERA)



OPERA Datasets:

- Funded by the Satellite Needs Working Group, responding to well-defined end-user needs
- Free and open, low-latency, ready-to-use data to support disaster response, recovery, damage assessments, and others
- Multi-layer design allows users to choose from simple to use layers to more advanced, diagnostic layers

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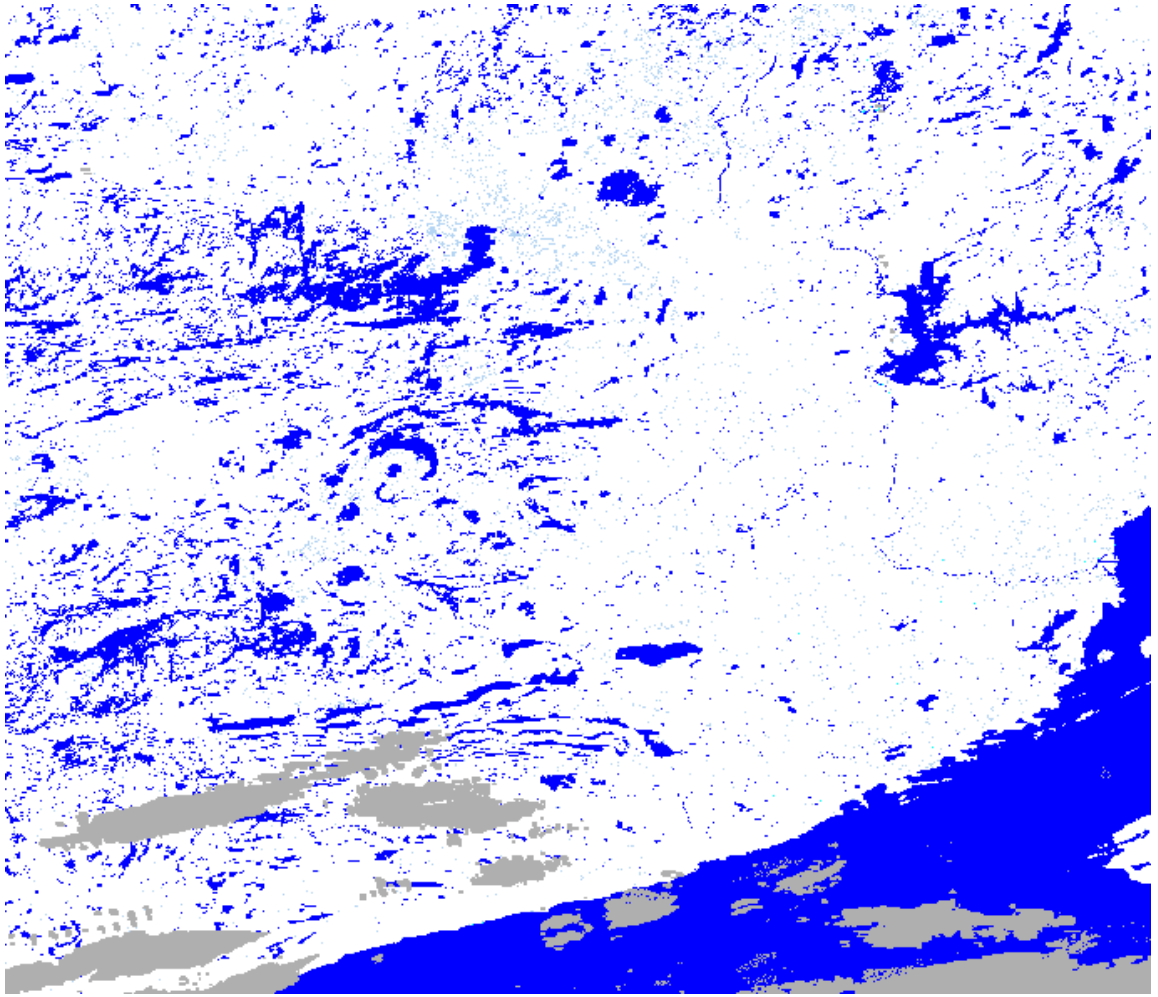
OPERA Dynamic Surface Water Extent Harmonized Landsat/Sentinel-2 HLS

- Maps surface water using optical HLS Imagery
- April 2023 – Present
- Spatial Resolution: 30m
- Near-Global Coverage
- Maps surface water every 6–12 days
- Offers 5 Classifications:
  - Blue: Open Water
  - Sky Blue: Partial Surface Water
  - Cyan: HLS Snow/Ice (High-Confidence Water)
  - Gray: HLS Cloud/Cloud Shadow
  - White: Non-Water



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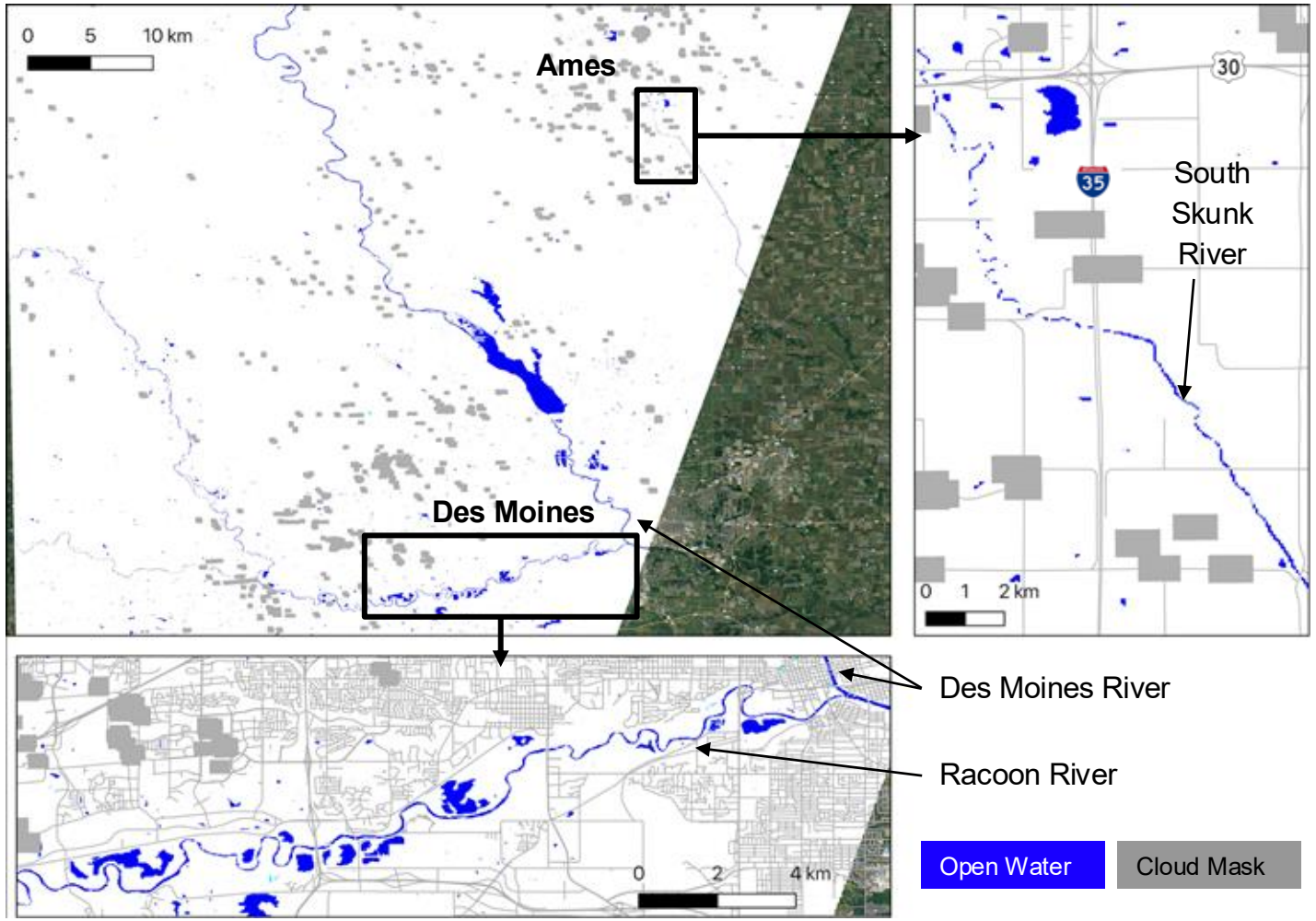
Dynamic Surface Water Extent – DSWx-HLS Example



Dynamic Surface Water Extent Harmonized Landsat/Sentinel

- Acquisition Date: 13 April 2024
- Image Source: Sentinel-2A
- Right Panel: South Skunk River is near the detection limit.
- Bottom Panel: Des Moines and Racoon Rivers are well observed.
- Bottom Panel: Lakes surrounding the Racoon River are well observed. The product's resolution is fine enough to show that the surrounding lakes are not connected to the Racoon River.

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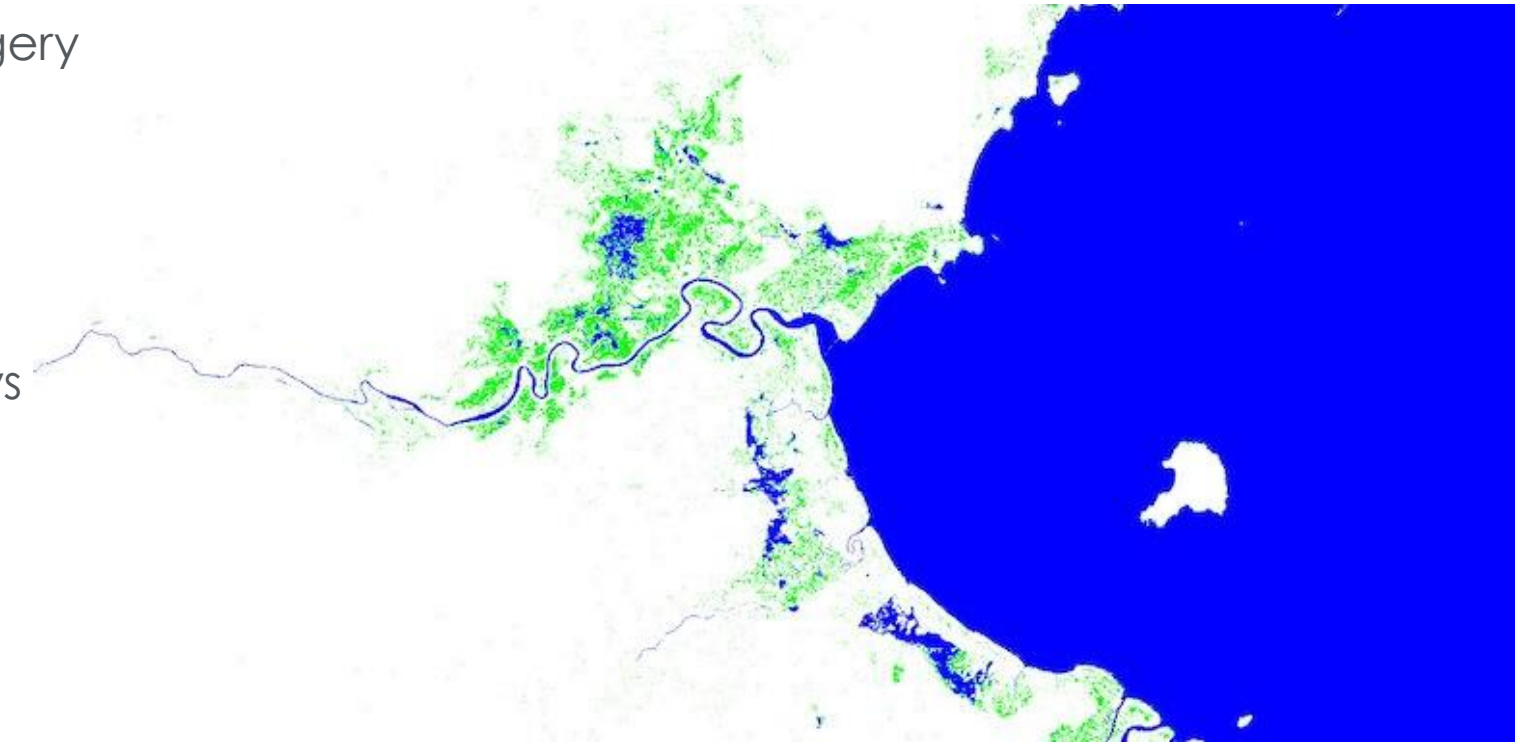
OPERA Dynamic Surface Water Extent DSW-S1

- Maps surface water using SAR imagery
- Sept 2024 – Present
- Spatial Resolution: 30 m
- Near-Global Coverage
- Maps surface water every 6–12 days
- Offers 5 Classifications:
  - Blue: Open Water
  - Green: Inundated Vegetation
  - Gray: Layover/Shadow
  - White: Non-Water
  - — Height Above Nearest Drainage (HAND)



Credit: Worldview

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Dynamic Surface Water Extent – DSWx-S1 Example

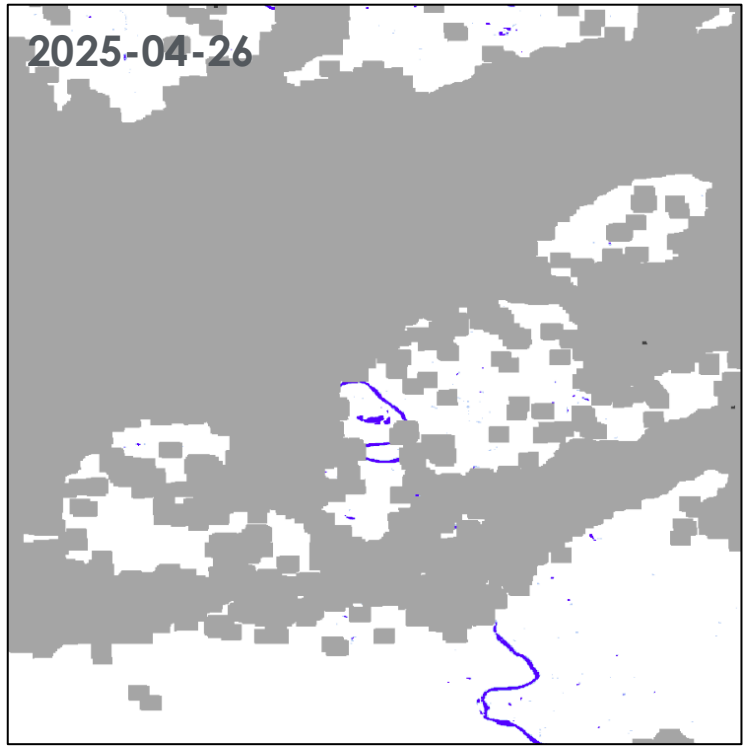
SAR provides a complementary view to optical:

- Provides retrievals under cloudy conditions
- Can partially penetrate through vegetation

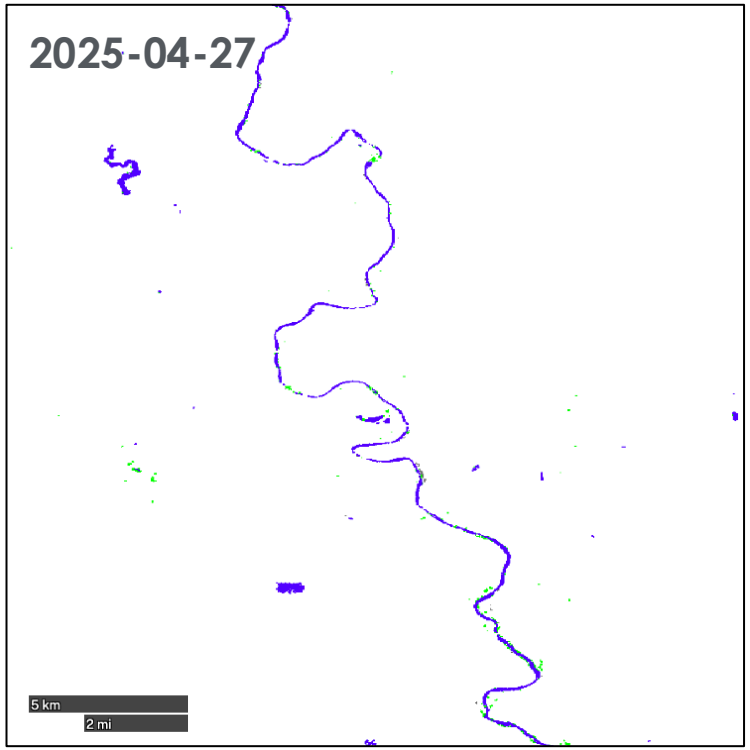
A Note on Inundated Vegetation:

- DSWx-S1 C-band data will detect inundated vegetation in herbaceous wetlands.
- DSWx-NISAR L-band data will provide key information in **all wetlands**.

Optical: DSWx-HLS



SAR: DSWx-S1



Open Water | **Cloud Mask** | **Open Water** | **Inundated Vegetation**

Click on the DSWx-S1 example Worldview link to see the complete scene.

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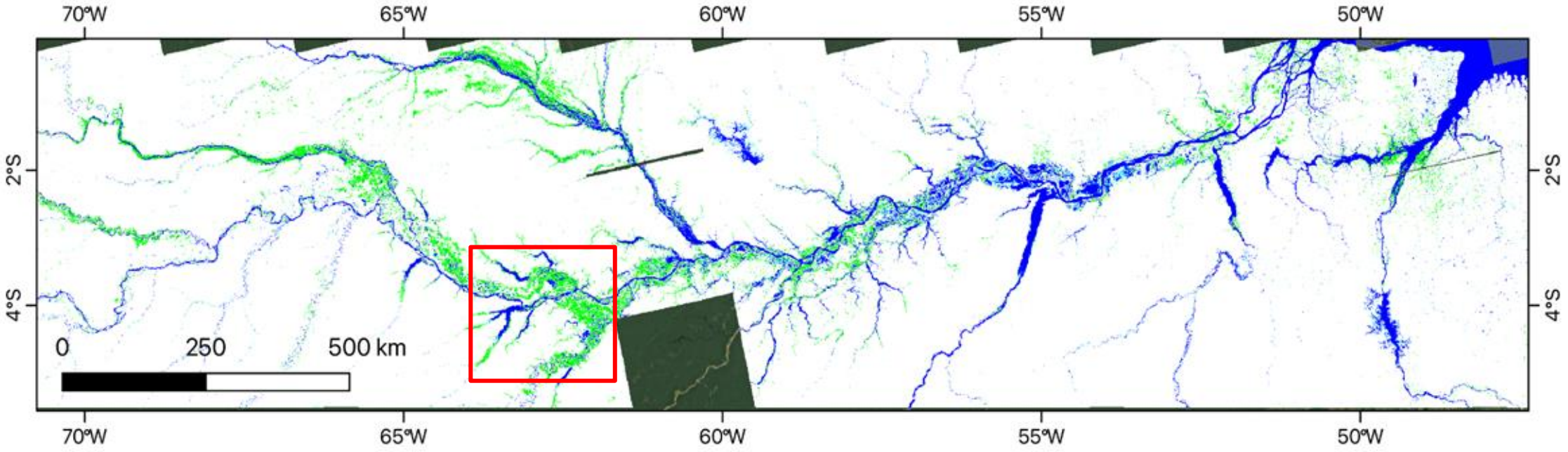
OPERA Dynamic Surface Water Extent DSW-NI

- Maps surface water using NISAR imagery
- Soon in 2026 – Present
- Spatial Resolution: 30 m
- Near-Global Coverage
- Maps surface water every few days

- Offers 5 Classifications:
  - Blue: Open Water
  - Green: Inundated Vegetation
  - Gray: Layover/Shadow
  - White: Non-Water
  - — Height Above Nearest Drainage (HAND)



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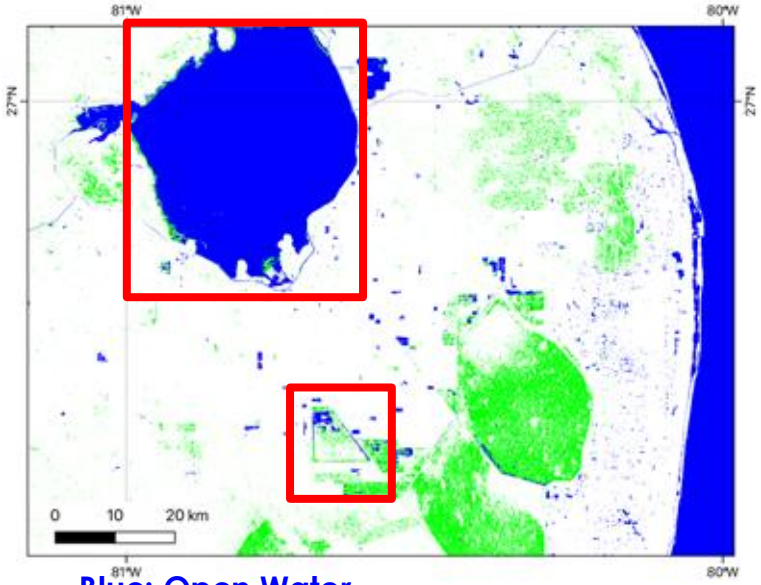
DSWx-NI Enhances Mapping of Inundated Vegetation

- DSWx-S1, DSWx-HLS, and DSWx-NI generally agree.

DSWx-S1 (05/14/2026)

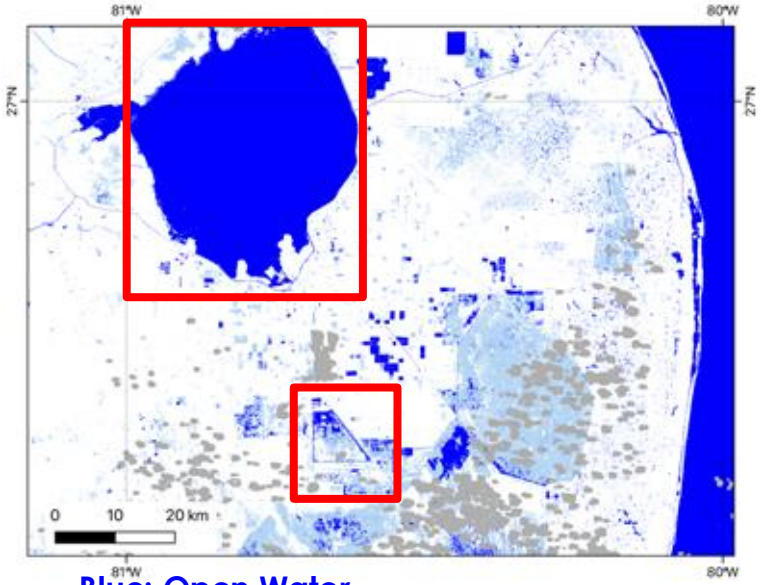
Successfully maps herbaceous wetlands



Blue: Open Water
Green: Inundated Vegetation
Gray: Layover/Shadow
White: Non-Water

DSWx-HLS (07/23/2026)

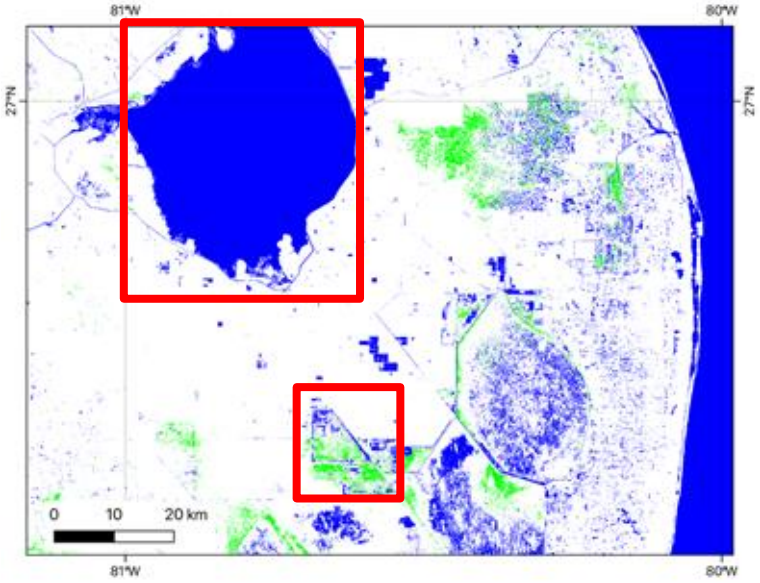
Is limited in vegetation, maps as partial surface water



Blue: Open Water
Sky Blue: Partial Surface Water
Cyan: HLS Snow/ice (High-Confidence Water)
Gray: HLS Cloud/Cloud Shadow
White: Non-Water

DSWx-NI (07/20/2026)

Has better performance in denser vegetation



Blue: Open Water
Green: Inundated Vegetation
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White: Non-Water

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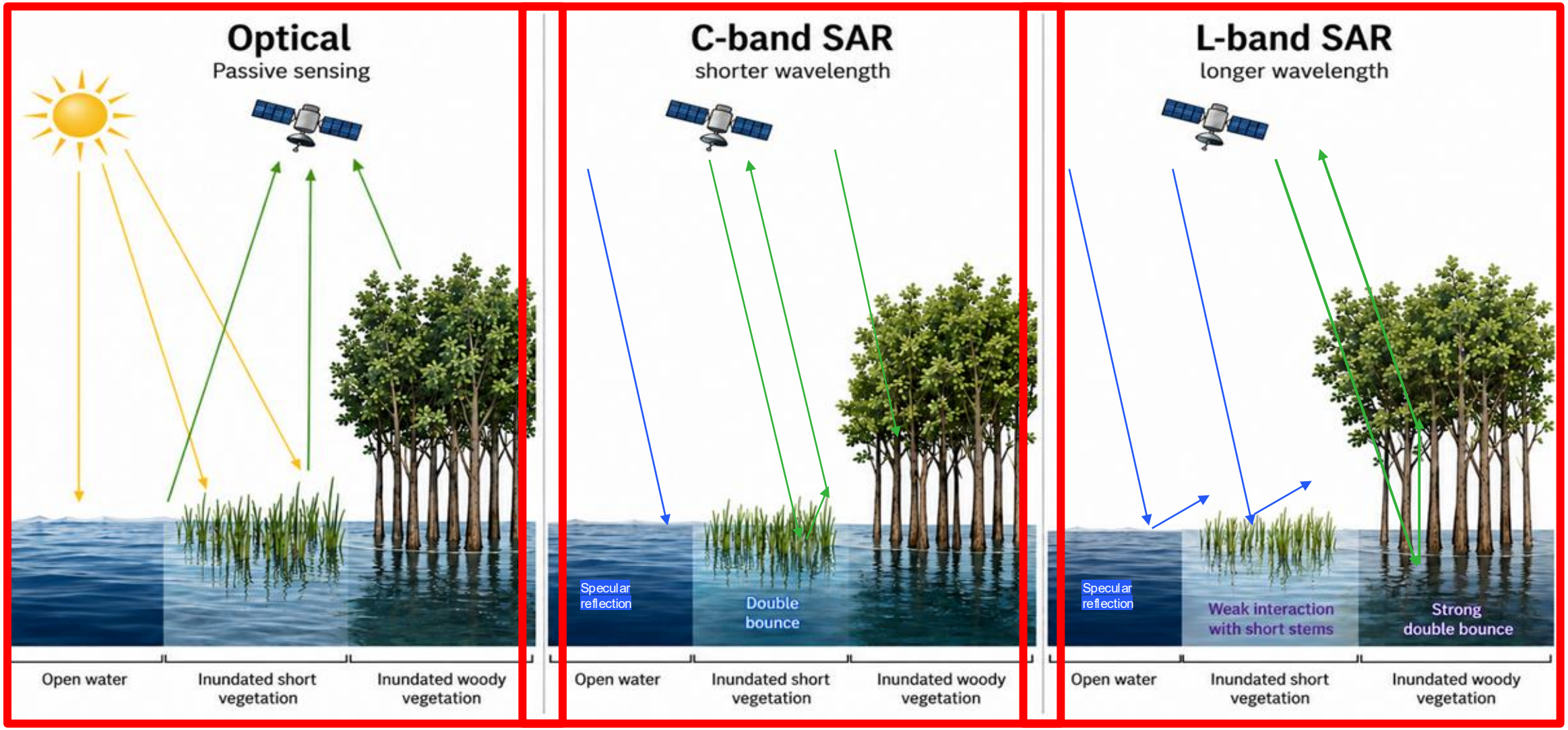
Measurement Principle



Courtesy of Jungkyo Jung, JPL, OPERA Algorithm Definition Team

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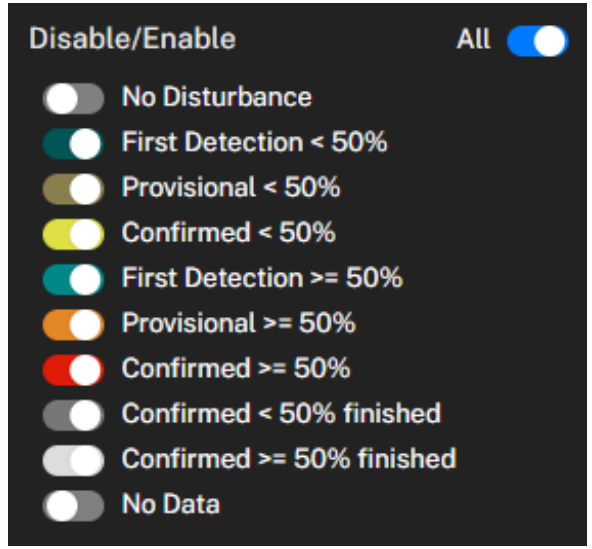
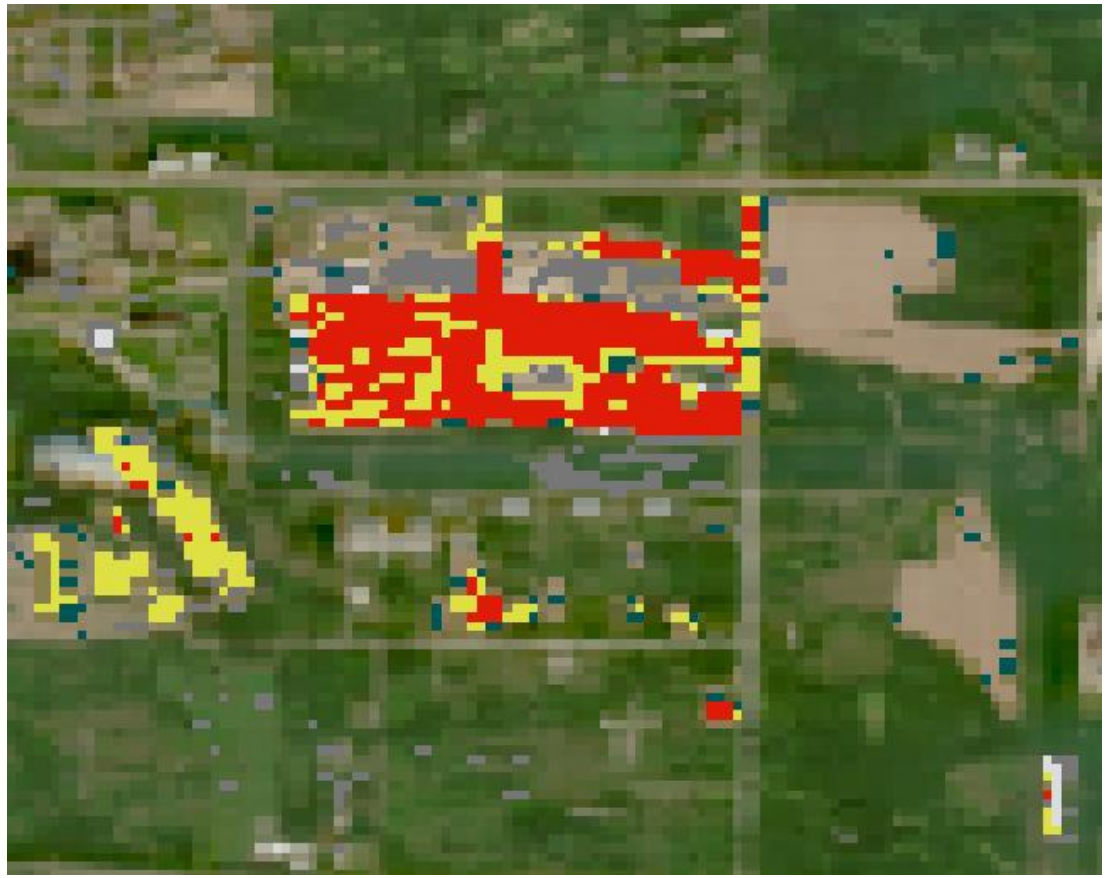
OPERA Vegetation Disturbance Status DIST-ALERT

- Maps vegetation disturbance detected outside a historical norm using optical imagers.
- Every 2-3 Days
- Jan 2023 – Present
- Spatial Resolution: 30 m
- The input dataset for generating each product is the Harmonized Landsat Sentinel-2 (HLS) dataset.
- **10 Different Classifications:**







Section 3.
Hands on Exercise Mapping Surface Water Extent in Worldview

Exercise Location – Badger Lakes Wildlife Management Area

- Ducks Unlimited Prairie Pothole Restoration Projects
  - Acquires and restores drained cropland back to wetlands and native prairies
  - Murray County, Minnesota is located in the Prairie Pothole Region, where wetlands and native prairie vegetation once provided important habitat for thousands of migrating waterfowl.
  - Migrating birds used these wetlands each spring and fall to rest, feed, and refuel during their journeys.
  - More than 90% of Minnesota's prairie potholes have been lost to drainage and agricultural conversion, along with more than 99% of its native prairies.

- Badger Lakes Wildlife Management Area
  - Acquisition and restoration of 137 acres of cropland on Badger Lakes Wildlife Management Area
  - 131 Acres of prairie
  - 6 acres of small wetlands

Hands on Exercise – Prairie Pothole Mapping in Minnesota

Navigate to https://worldview.earthdata.nasa.gov/

1. Search Location In the search bar copy or type the coordinates Badger Lake State Wildlife Management Area (43.92668418086818, -95.72954388236592).

2. Select Timeframe Using the 'Date Selector' navigate to 2026 OCT 13.

3. Add Data Layers We will add three data products (4 data layers) to observe water on farmland.

A. Reflectance (Nadir BRDF-Adjusted) HLS Landsat 8 & 9 OLI **and** HLS Sentinel-2 MSI

B. OPERA Dynamic Surface Water Extent DSWx-HLS

C. OPERA Dynamic Surface Water Extent DSWx-S1

4. Set Zoom Level Center the coordinates in the middle of the screen, zoom out until the zoom level reads 1000m/5000ft.

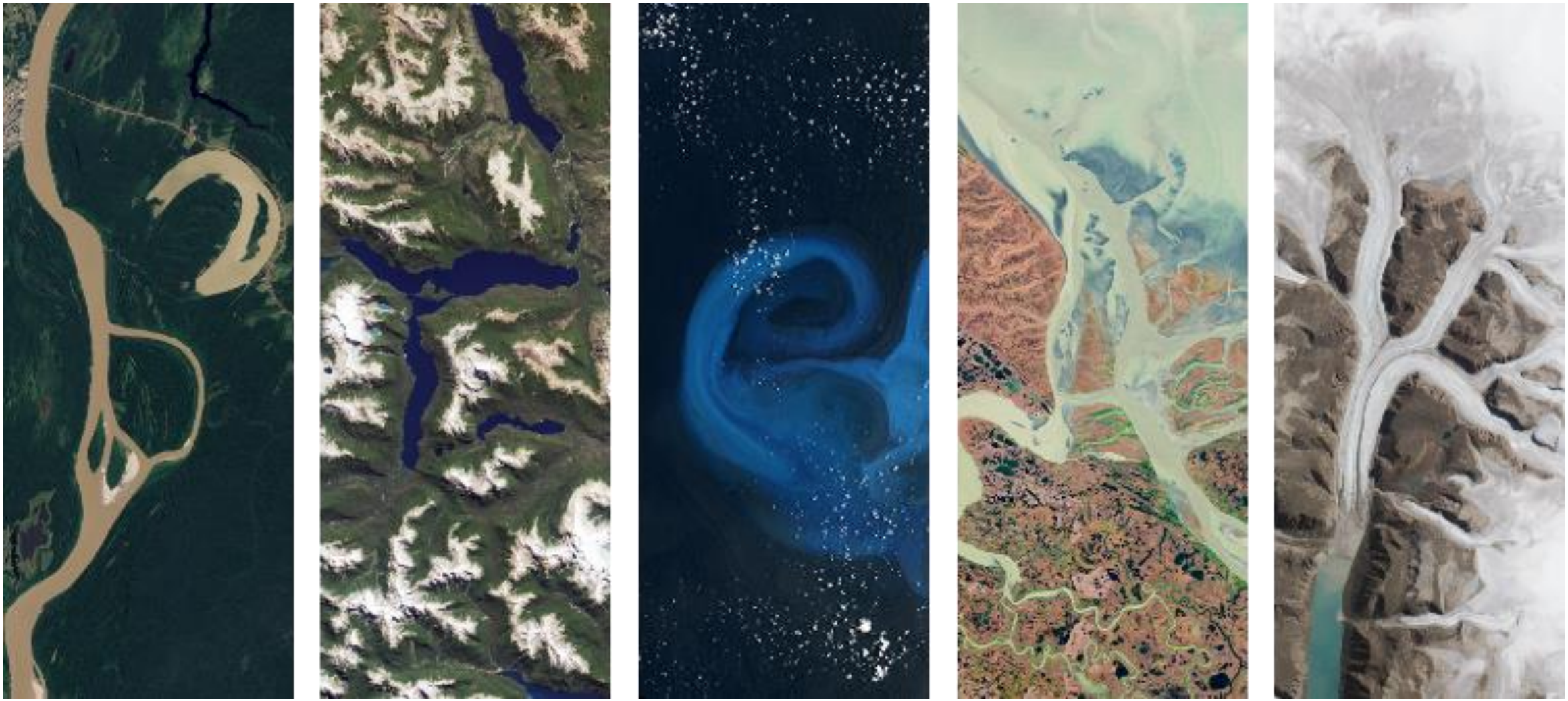
5. Compare Surface Water Layers Using the eye icon, toggle on and off DSWx-HLS layer to view the DSWx-S1 layer.

6. Using the layers panel Select the view options (3 lines) Disable the "not water" feature.

Discussion & QA

- Discussion
  - Where across the landscape are you most likely to see the vegetation classification "Partial Surface Water" with the DSWx-HLS?
  - Where are you most likely to see the vegetation classification "Inundated Vegetation" with DSWx-S1?
  - What value is there in having both HLS and S-1 datasets available?
  - Did you find any of the Worldview features confusing to interpret?
  - How could these dynamic surface water products apply to your work?
- Q&A

15-Minute Break





Section 4.
Calculating HLS Vegetation Indices and Exploring their Applications

Interaction with Earth's Surface: Vegetation

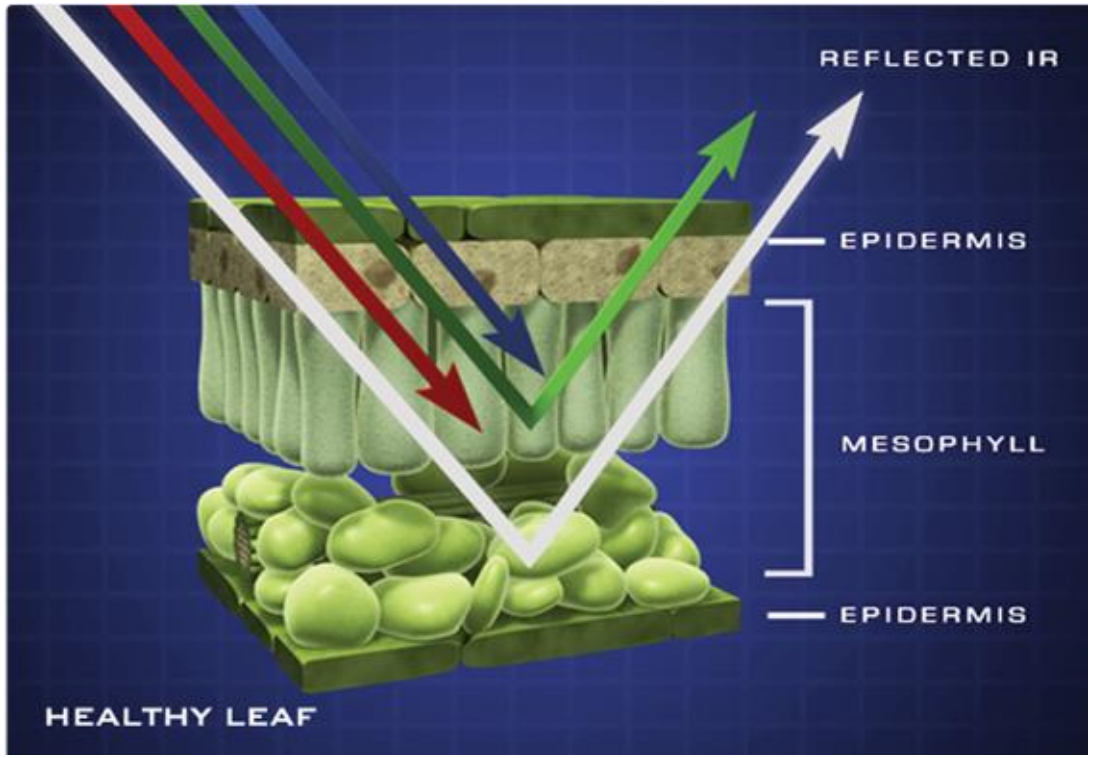
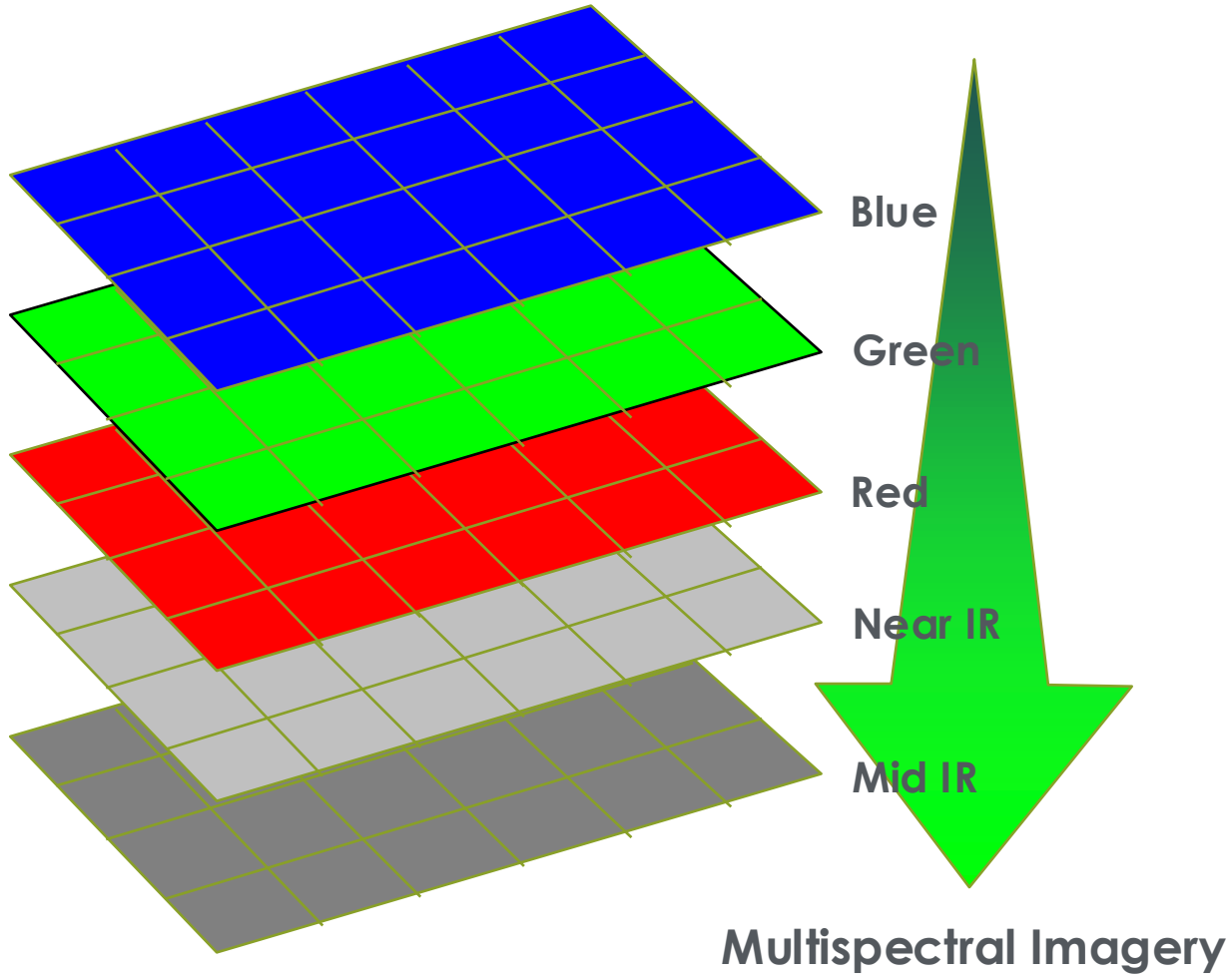


Image Credits: NASA/Jeff Carns & Ginger Butcher

- Healthy, green vegetation:
  - **Absorbs Blue** and **Red** wavelengths (photosynthesis), and…
  - **Reflects Green** and **Infrared**.
- Due to reflection of green wavelength and since we cannot see infrared radiation, we see healthy vegetation as green.
- The amount of reflected energy is dependent on the health of the vegetation, water content, and phenological stage.

Spectral Resolution – Image Bands

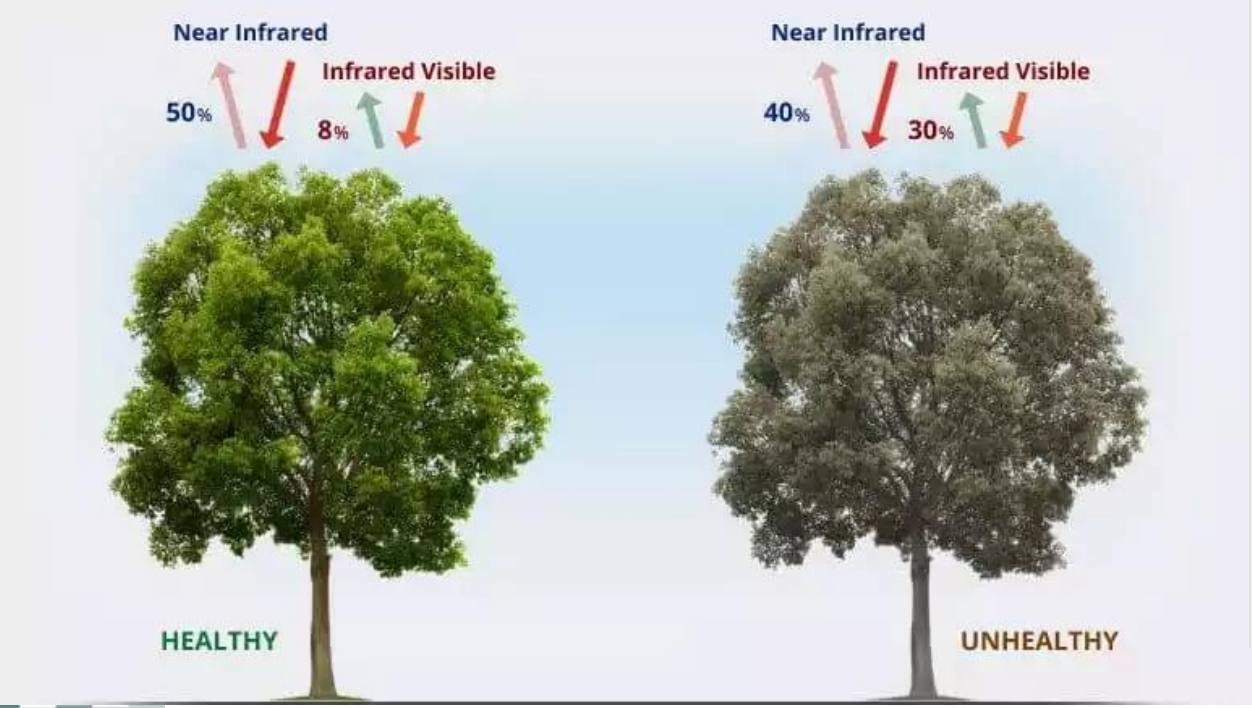
Each image band is a different layer in an image.

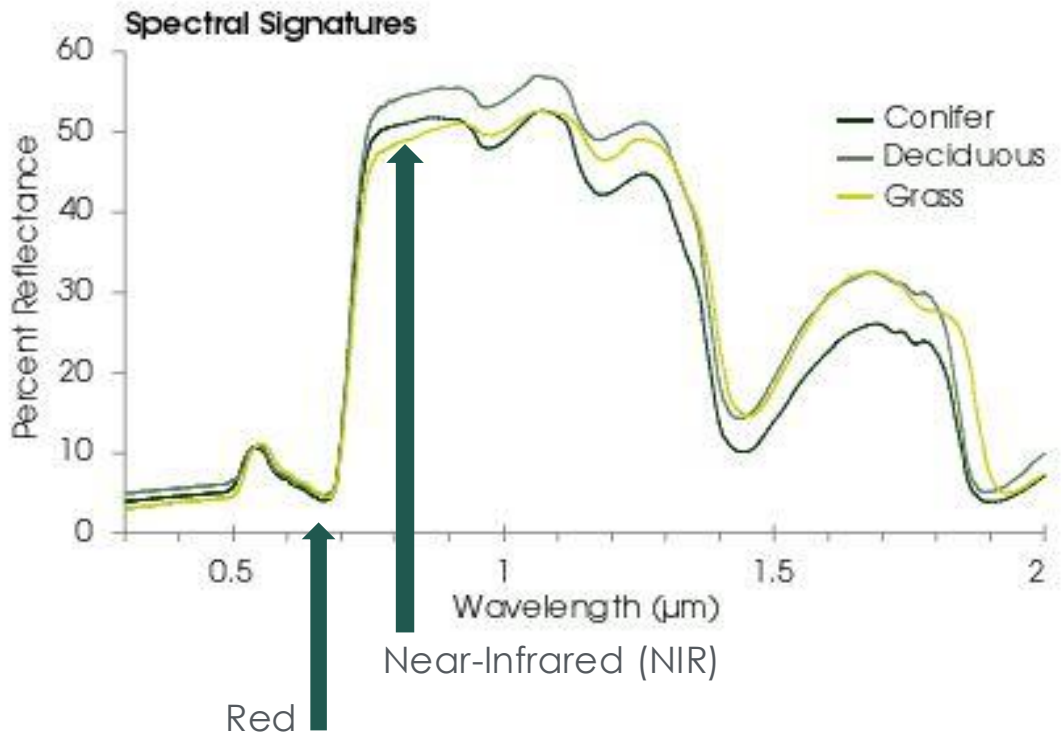


Normalized Difference Vegetation Index (NDVI)

- NDVI evaluates vegetation condition and chlorophyll content.
- Chlorophyll strongly absorbs visible light, and the cellular structure of leaves strongly reflects near-infrared light.

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$



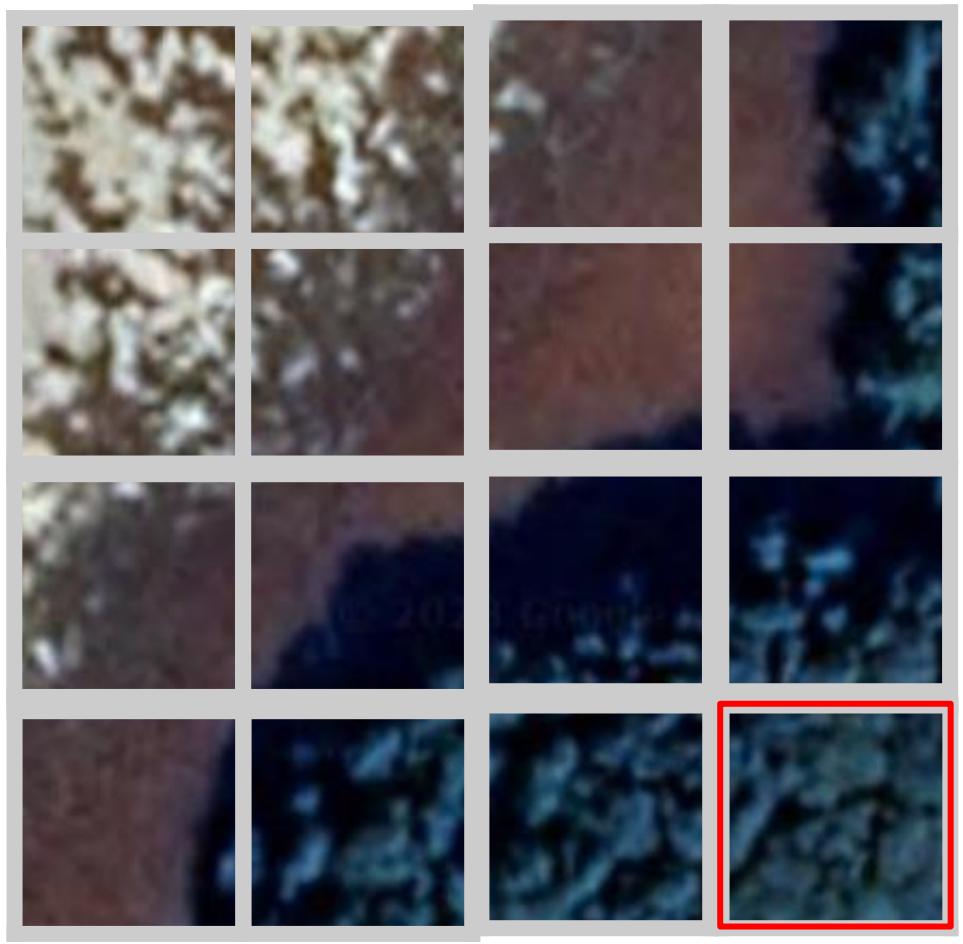


HLS Spectral Bands

Band Name	OLI band number	MSI band number	HLS band code name L8	HLS band code name S2	Wavelength (micrometers)
Blue	2	2	B02	B02	0.45-0.51*
Green	3	3	B03	B03	0.53-0.59*
Red	4	4	B04	B04	0.64-0.67*
NIR	5	8A	B05	B8A	0.78-0.88**
SWIR 1	6	11	B06	B11	1.57-1.65*
SWIR 2	7	12	B07	B12	2.11-2.29*

*from OLI specifications
*from MSI specifications

NDVI Sample Calculation



Near Infrared (Landsat 9 Band 5)

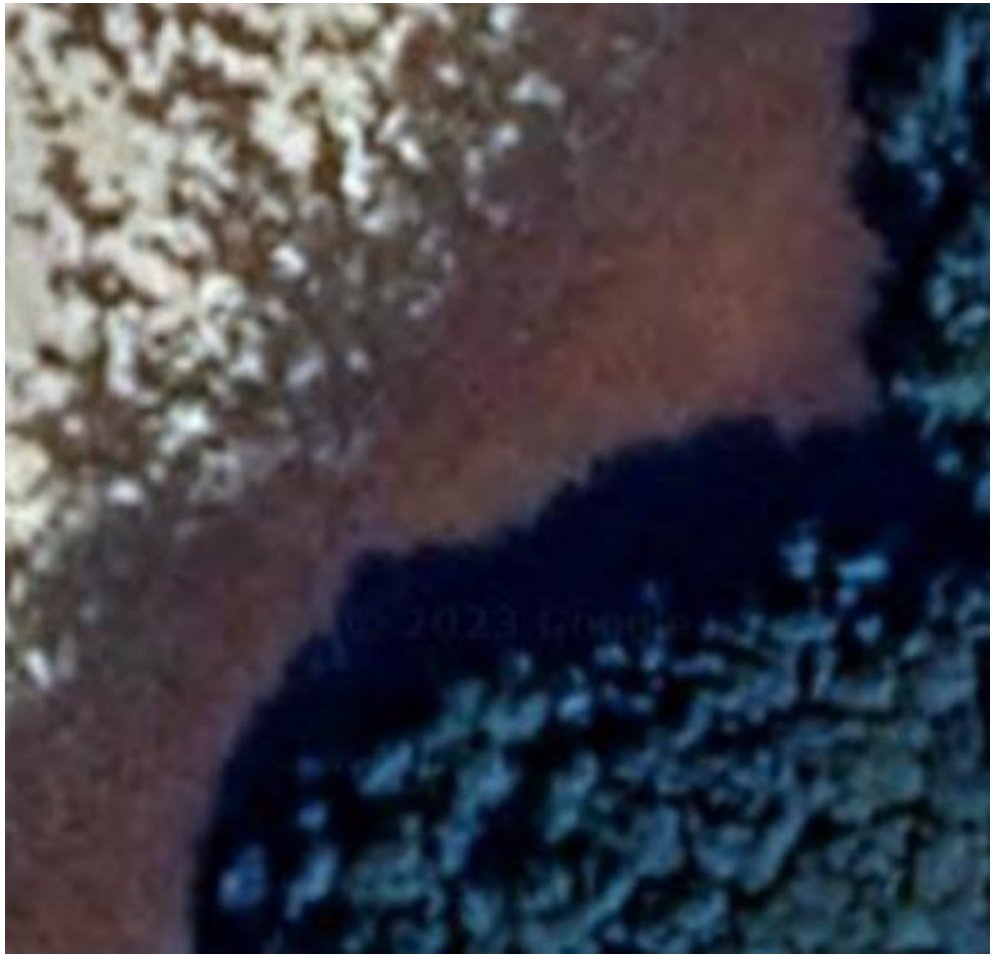
.1144

Red (Landsat 9 Band 4)

.0344

$$NDVI = \frac{(B05 - B04)}{(B05 + B04)}$$

NDVI Sample Calculation Continued



Near Infrared | Red

.1144 − .0344

.1144 + .0344

= .538

$$NDVI = \frac{(B05 - B04)}{(B05 + B04)}$$

Near Infrared	
.0214	.0313
.0031	.1144

−

Red	
.0473	.0444
.0415	.0344

+

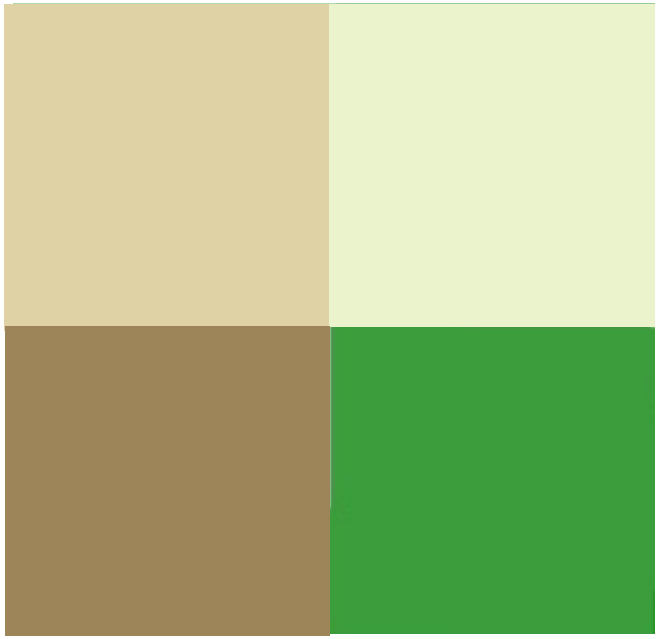
.0214	.0313
.0031	.1144

.0473	.0444
.0415	.0344

=

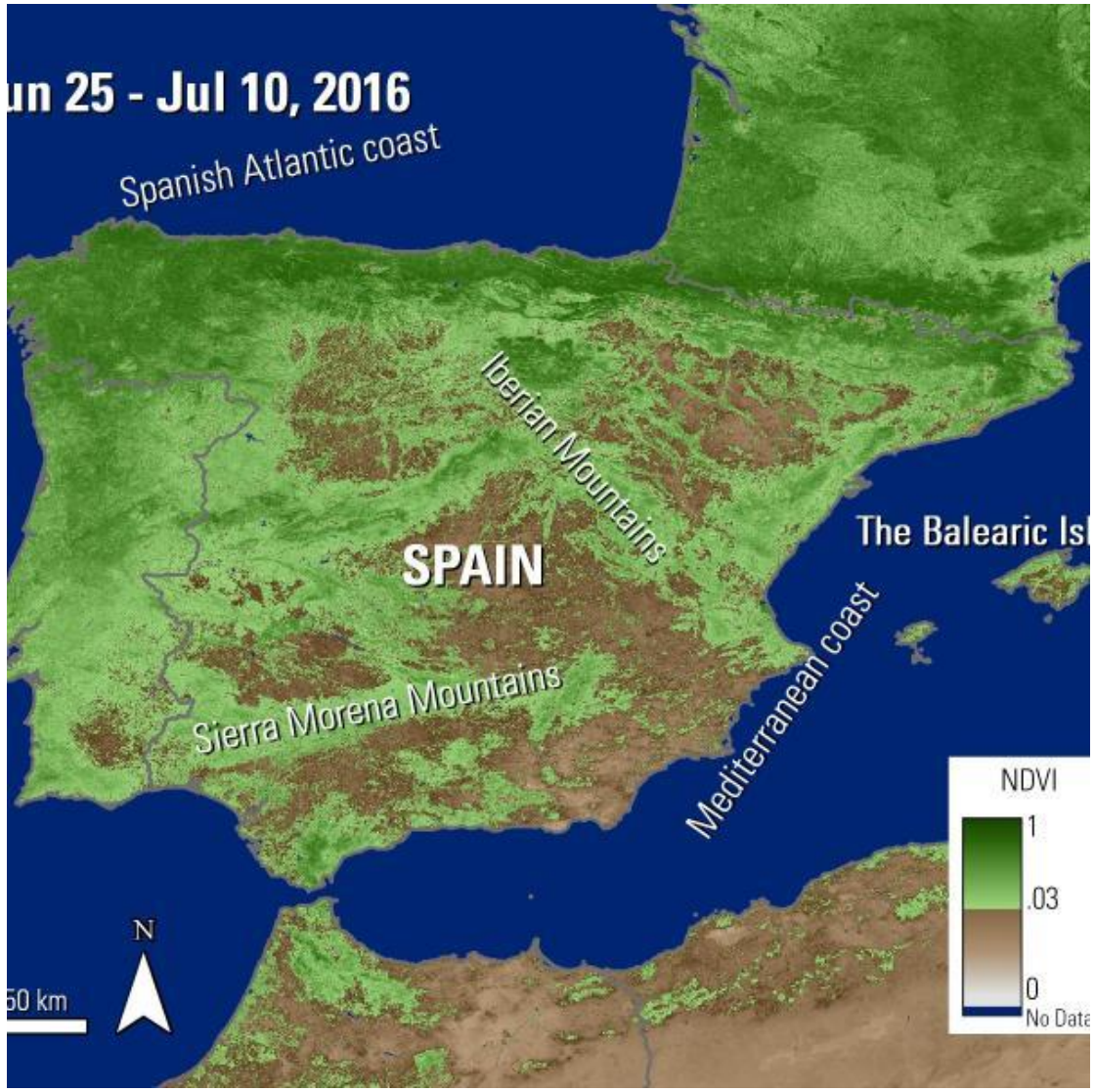
NDVI

-.377	-.174
-.862	.538



NDVI Value Classification

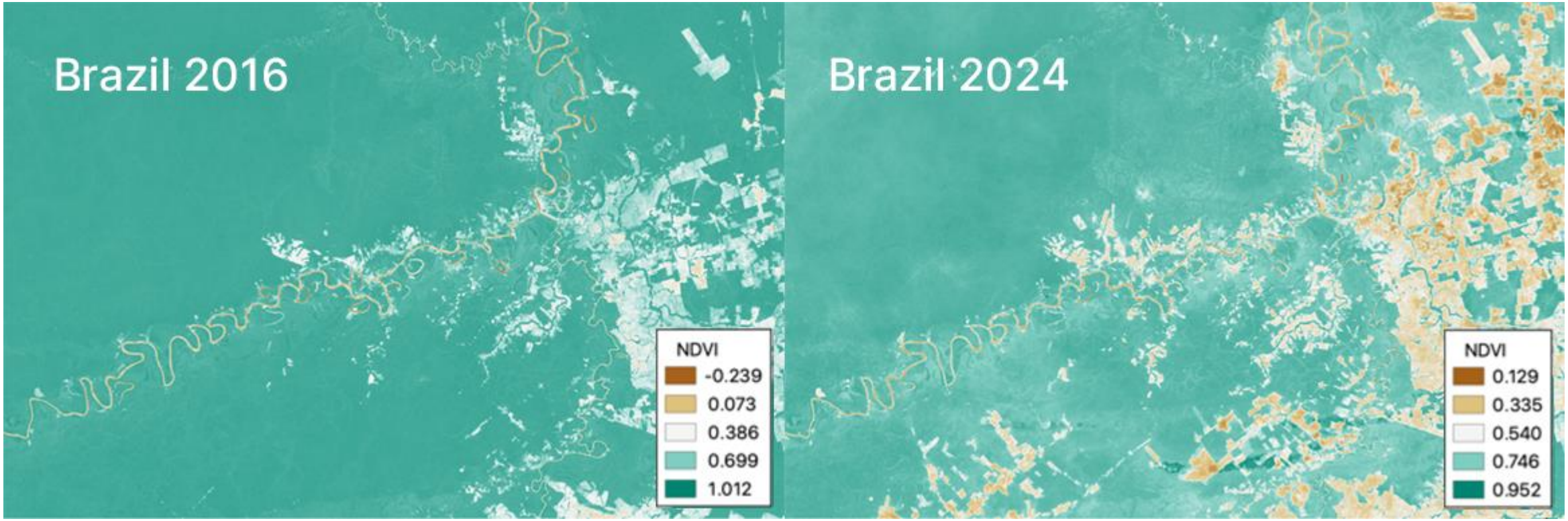
NDVI Values	Classification
-1.0 to 0.0	Non-vegetated surfaces like water, clouds, or snow
0.0 to 0.1	Bare soil, rock, concrete, or completely dead areas
0.1 to 0.3	Sparse vegetation, grasslands, or early cultivation stages
0.4 to 0.6	Moderate vegetation cover (e.g., Developing crops or shrubs)
0.7 to 1.0	Dense, healthy vegetation, (e.g., Forests, mature crops)



Credit: NASA

Calculating Change in NDVI

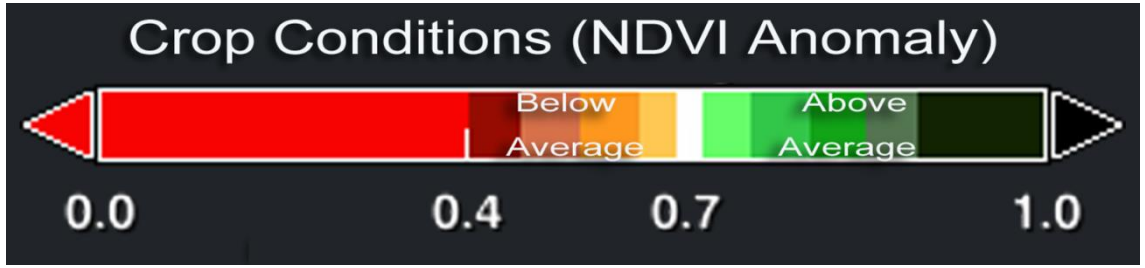
- Change between to NDVI dates can be used to detect crop stress, farmland productivity, or crop loss
- NDVI Change Calculation: $NDVI\ Change = Current\ NDVI - Historic\ NDVI$



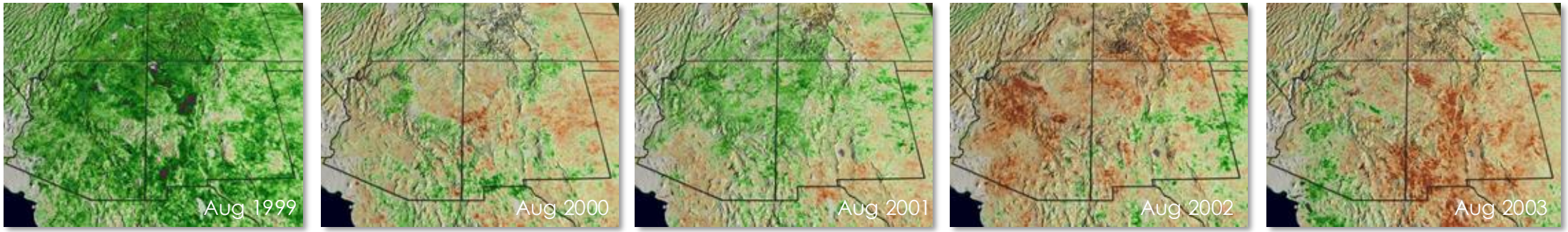
Credit: NASA

Calculating NDVI Anomaly

- Statistical measure comparing present vegetation health to long-term average
- Current measurement (day, month, year, etc.) minus reference period average
- $NDVI\ Anomaly = Current\ NDVI - Longterm\ Mean$

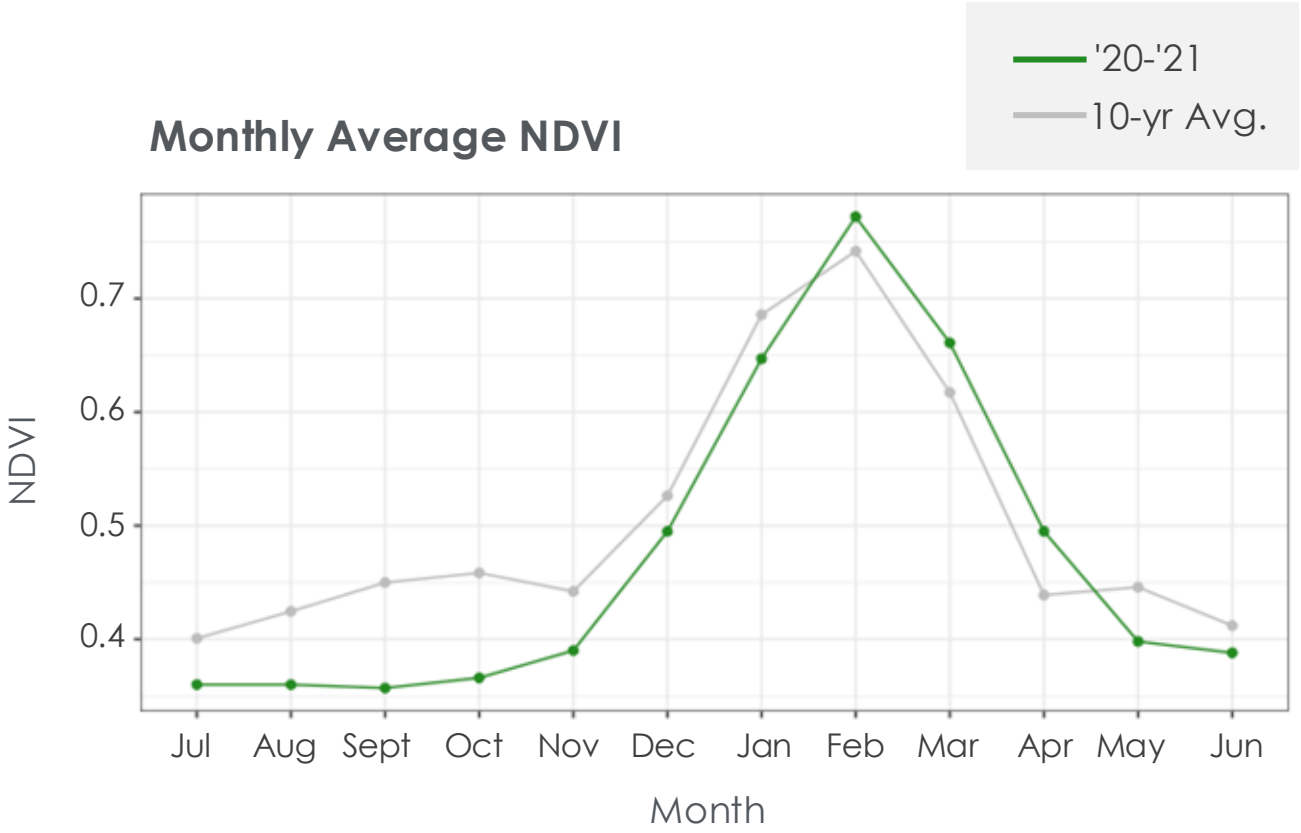


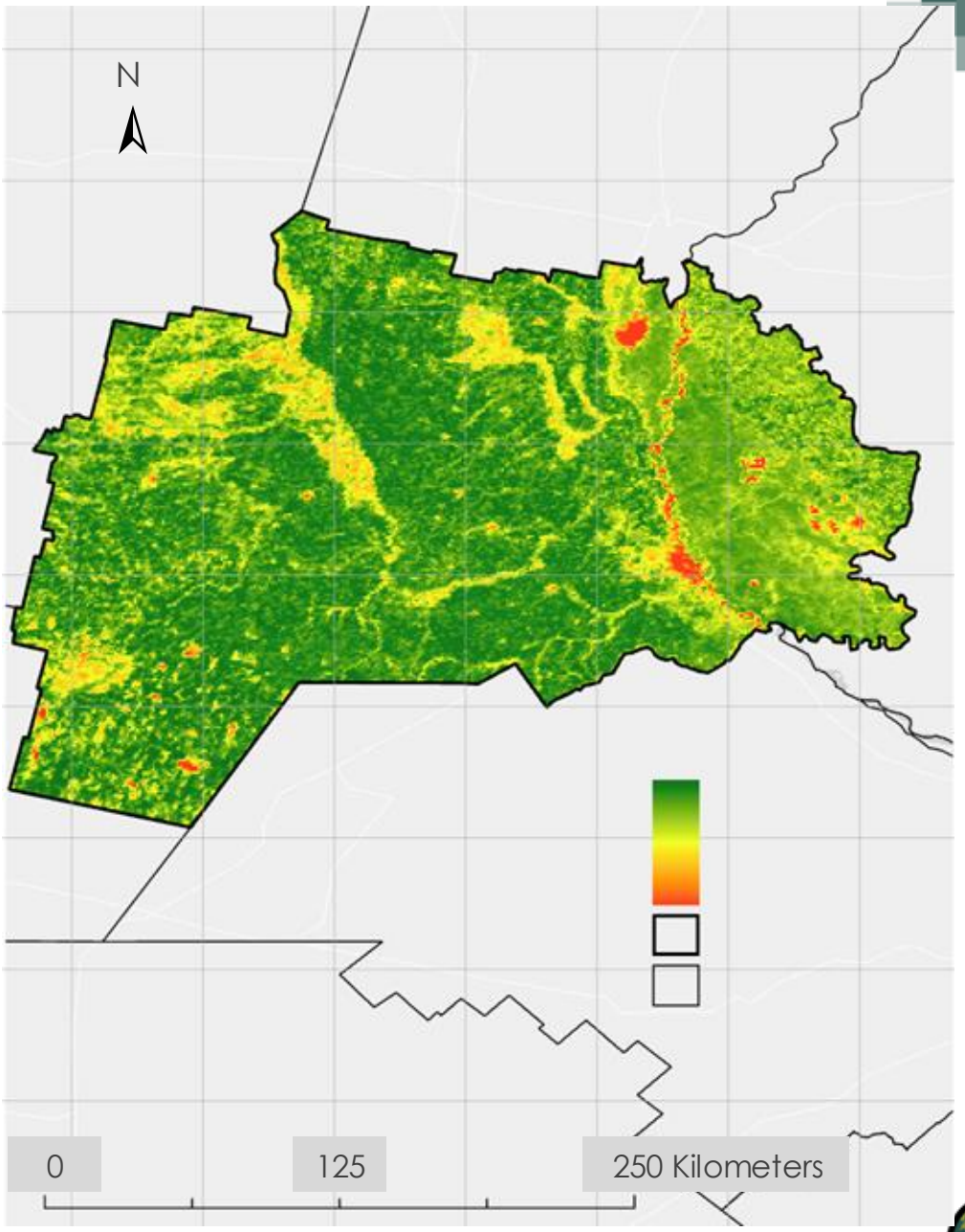
NDVI Anomalies in the Southwestern United States

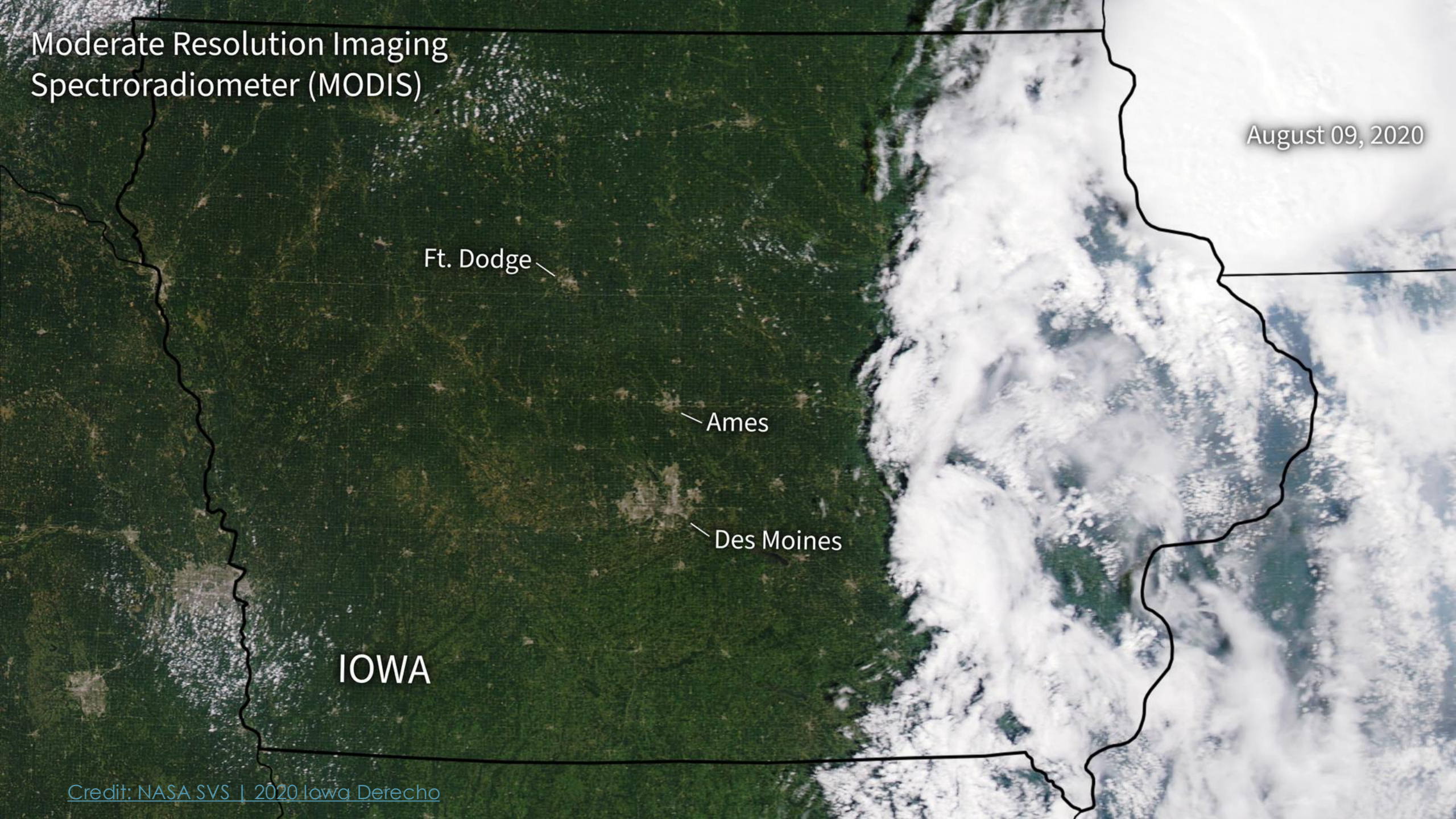


Credit: NASA

Example NDVI Analysis







Credit: NASA SVS | 2020 Iowa Derecho

Vegetation Indices – Vegetation Health

Enhanced Vegetation Index (EVI)

- Can be used in place of NDVI to examine vegetation greenness
- More sensitive in areas with dense vegetation, making it better for fuels assessment in dense forests

$$EVI = G * \left(\frac{(NIR - R)}{(NIR + C1 * R - C2 * B + L)} \right)$$

Constants
$G = 2.5$
$C1 = 6$
$C2 = 7.5$
$L = 1$

Soil Adjusted Vegetation Index (SAVI)

- Used to correct NDVI for the influence of soil brightness in areas where vegetative cover is low
- Better index for areas with sparse vegetation and high bare soil coverage
- Contains a soil brightness correction factor (L)

$$SAVI = \left(\frac{(NIR - R)}{(NIR + R + L)} \right) (1 + L)$$

Vegetation Indices – Water Management

Normalized Difference Moisture Index (NDMI)

- Measures vegetation water content
- Used to monitor agricultural drought and detect early plant water stress
- NDMI Values:
  - Below 0.2: Indicates drought conditions or stress
  - 0.2-0.4: Potentially under low to moderate water stress
  - Above 0.4: Healthy vegetation, no water stress

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

Normalized Difference Water Index (NDWI)

- Can identify open water features
- Allows water to stand out against vegetation and soil
- Can track seasonal flooding

$$NDWI = \frac{(Green - NIR)}{(Green + NIR)}$$



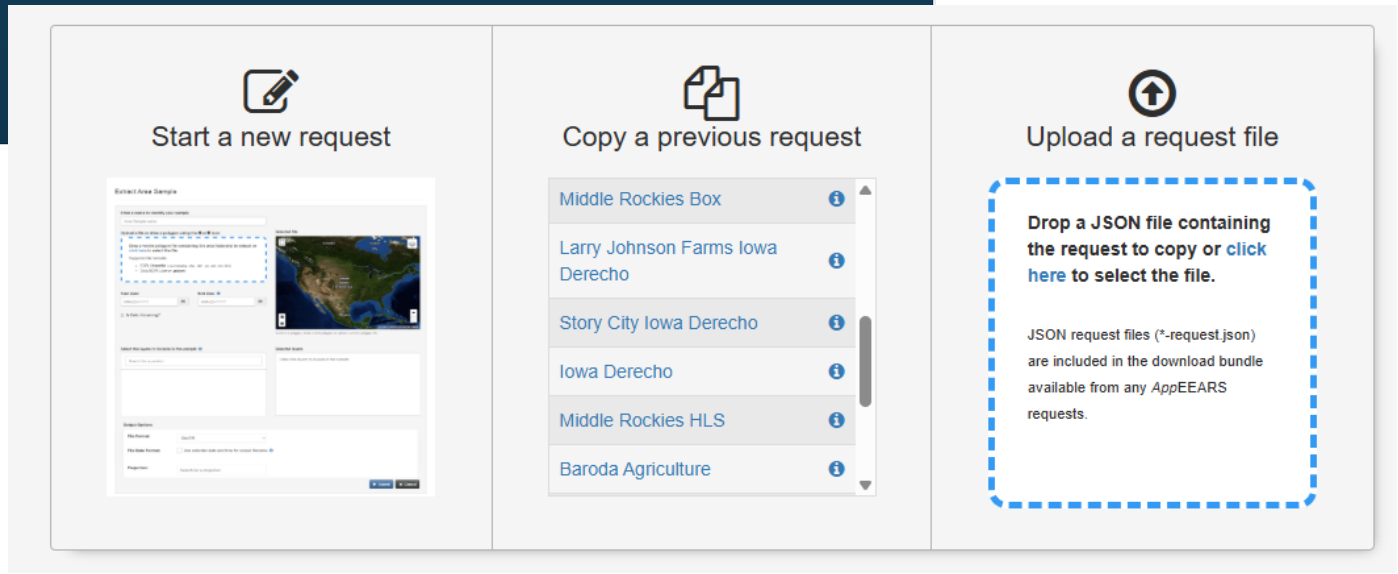
Section 5.
NASA AppEEARS & HLS Vegetation Demo, Exercise, & Discussion

*App*EEARS!

Welcome to *App*EEARS!

Application for **E**xtracting and **E**xploring **A**nalysis **R**eady **S**amples (***App*EEARS**)

The Application for Extracting and Exploring Analysis Ready Samples (***App*EEARS**) offers a simple and efficient way to access and transform geospatial data from a variety of federal data archives. *App*EEARS enables users to subset geospatial datasets using spatial, temporal, and band/layer parameters. Two types of sample requests are available: point samples for geographic coordinates and area samples for spatial areas via vector polygons. Sample requests submitted to *App*EEARS provide users not only with data values, but also associated quality data values. Interactive visualizations with summary statistics are provided for each sample within the application, which allow users to preview and interact with their samples before downloading their data. Get started with a sample request using the Extract option above, or visit the Help page to learn more.



*App*EEARS Interface

- Extract Area and Point Sample Data
  - Using shapefiles, drawn polygons, or coordinates
- Query data by date ranges
- Mosaicked and clipped for HLS data
- Can select projection and file format
- Provides summary statistics and visualization to extract with the results and do some exploratory analysis prior to the data download
- Reduces download volume significantly
- Reproducible and traceable data

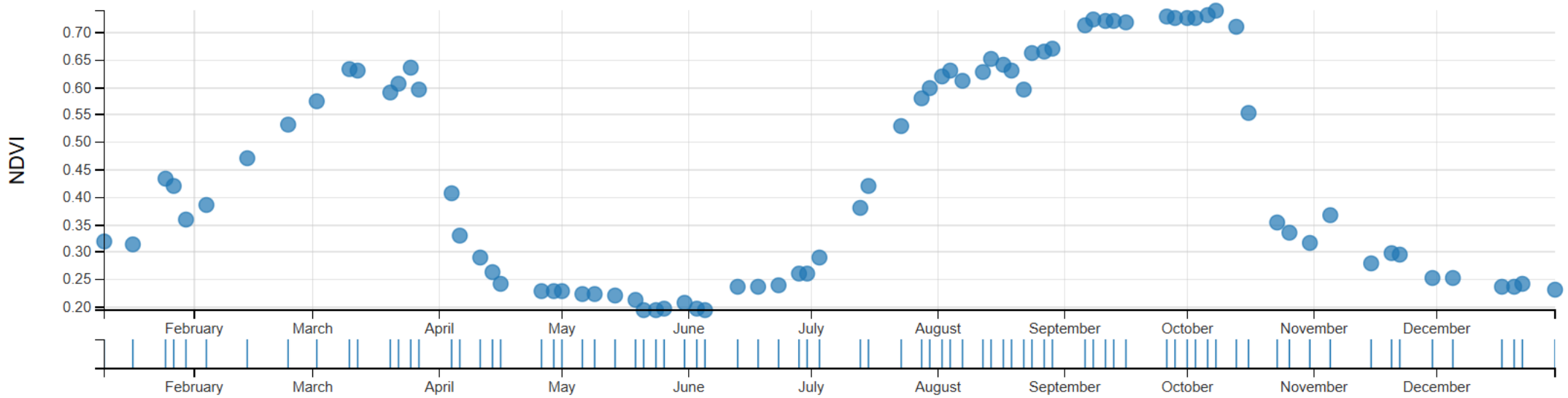
HLS Vegetation Indices in *App*EEARS

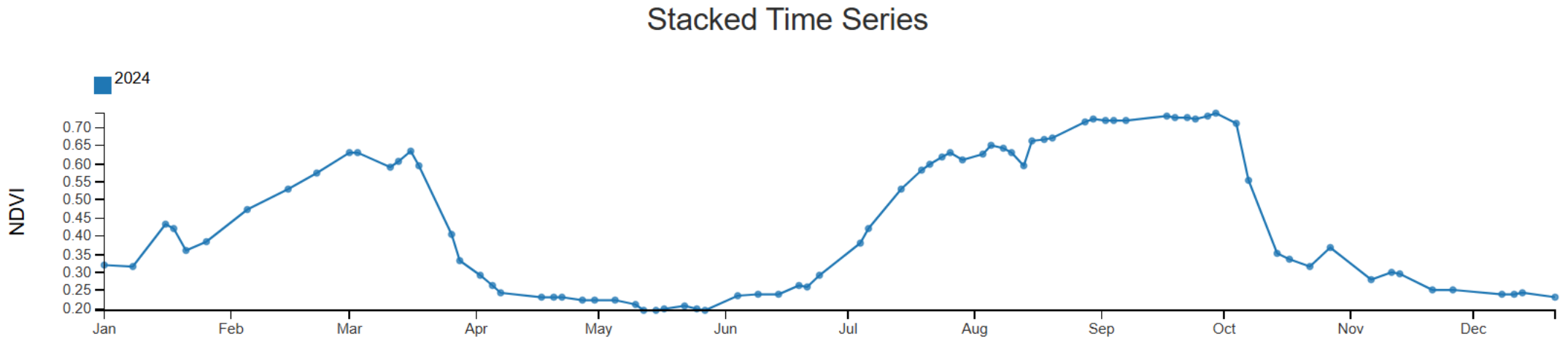
Allows for easy access and download of a suite of nine vegetation indices:

- Normalized Difference Vegetation Index
- Enhanced Vegetation Index
- Soil Adjusted Vegetation Index
- Normalized Difference Moisture Index
- Normalized Difference Water Index
- Normalized Burn Ratio
- Normalized Burn Ratio 2
- Triangular Vegetation Index

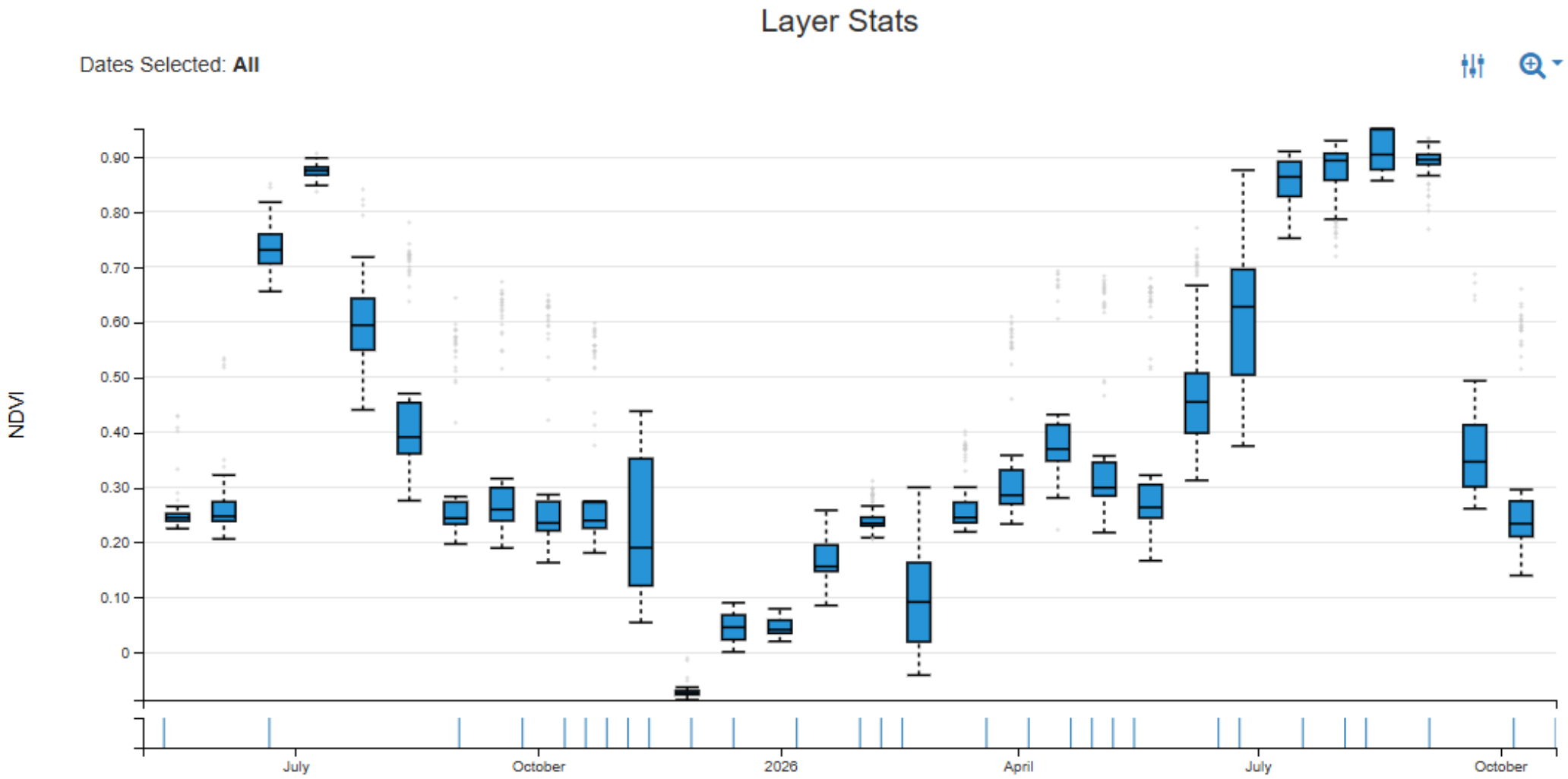
Provides Data Visualization without Download

Time Series Plots

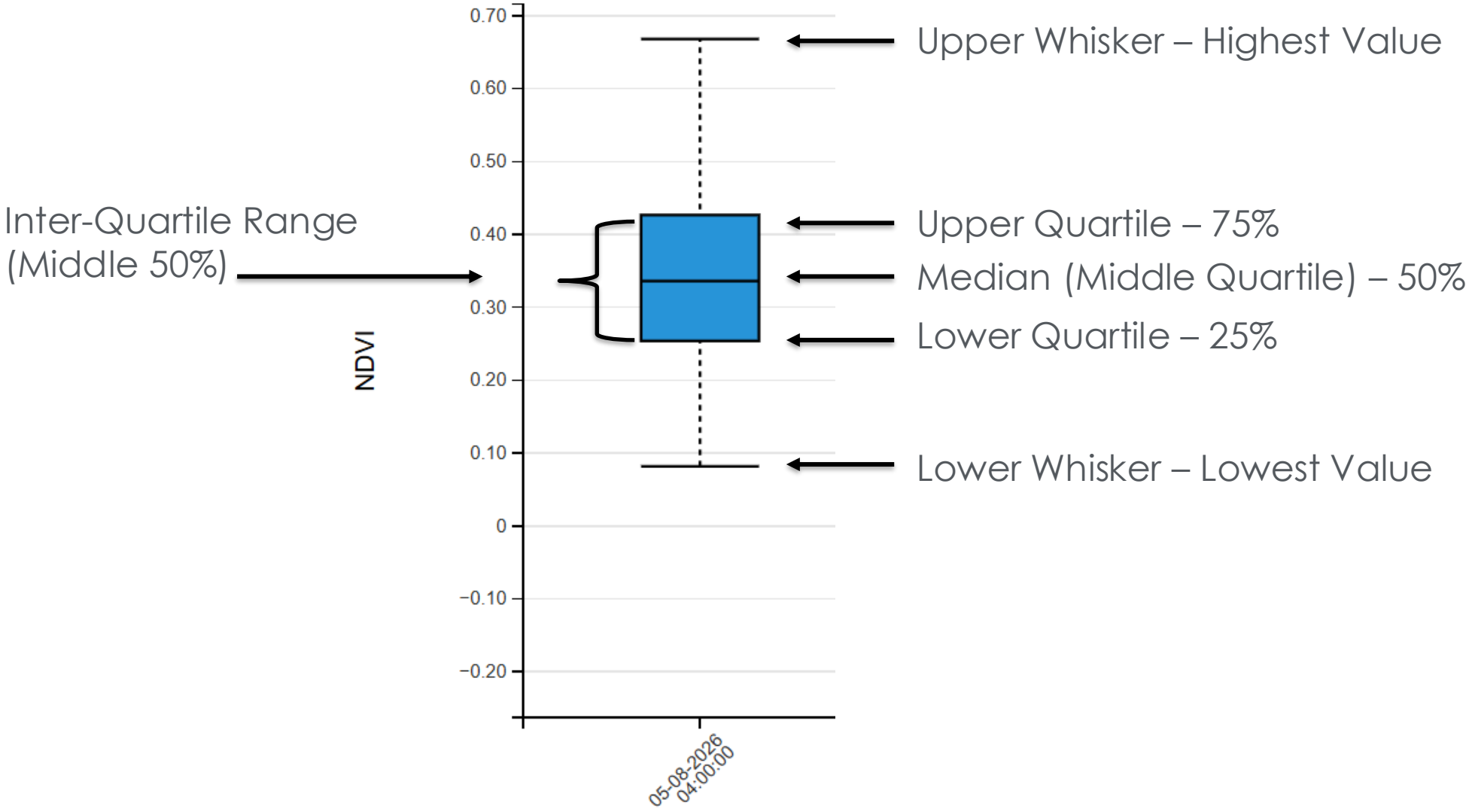




Provides Data Visualization without Download
Box Plots



Reading Box Plots





Section 6.
NDVI Anomaly Calculation in QGIS



Conclusion
Summary, Resources, and Q&A

Session 2 Summary

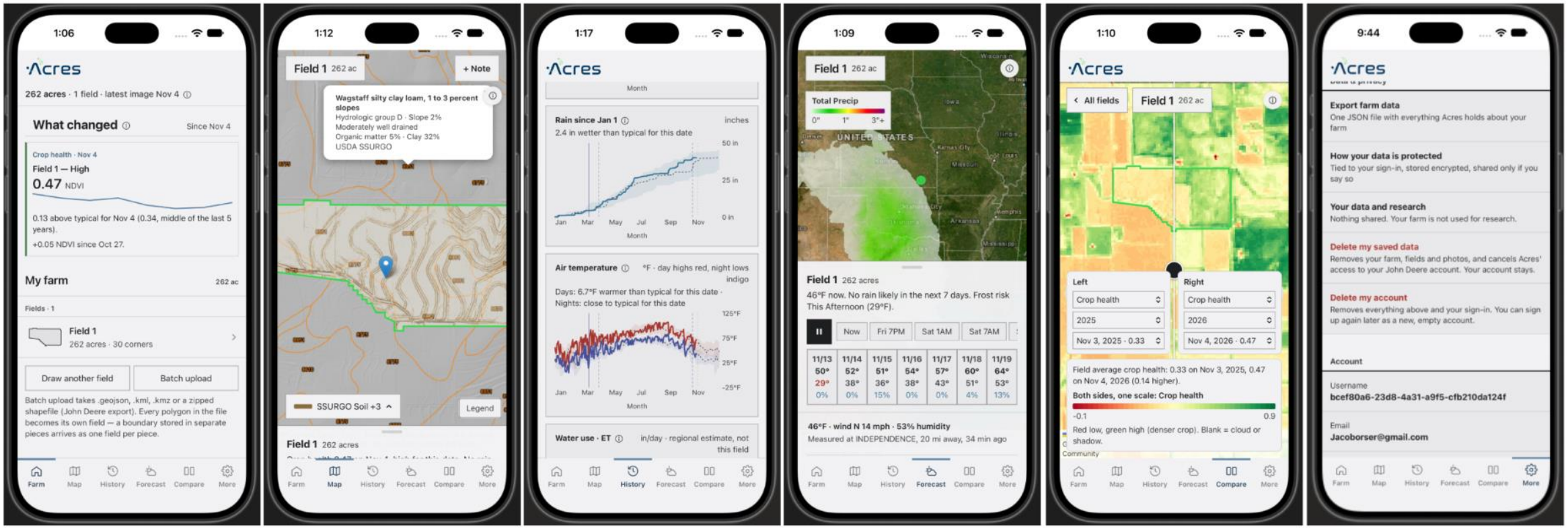
- **OPERA data products** offer low latency level-3 products to assess surface water and vegetation disturbance for analyzing land cover change, disaster response, and wetland monitoring.
- **Spectral indices are mathematical formulas** combining spectral bands to highlight surface features, reduce noise, and enable consistent cross-sensor monitoring using standard formats.
- **Key monitoring satellites/sensors include** MODIS & VIIRS for daily global coverage, Landsat 8/9 for 30m resolution, Sentinel-2 for 10–20m resolution, and HLS for combined 2–3-day revisit time.
- **Vegetation index anomalies are calculated** using 10+ year baselines to compute climatological means, then determining current departures via absolute, standardized, or percentage formulas.
- **Essential indices** include NDVI for vegetation health, NDMI for moisture content, NDWI for water detection, and EVI for dense vegetation analysis.

On-Farm Decision Support Tools – Every.Farm

- Every.Farm streams imagery from the world's open-data archives (NASA, ESA, USGS, and USDA)
- Open access Earth observations for specialty crop growers
- Filter and layer maps
- No GIS expertise required
- Free and openly available
- Powered by NASA Acres



On-Farm Decision Support Tools – NASA Acres App



Farm

Draw or import field boundaries, see what changed since the last clear pass.

Map

Satellite imagery of the field by date, crop health and surface temperature, standing water, soils, terrain.

History

This season against five-year typical range, for crop health, temperature, rain, soil moisture, growing degree days.

Forecast

The ten-day outlook and the nearest ground station for the field.

Compare

Seasons side by side; areas within one field; two dates with a swipe.

More

Research sharing choices, data sources cited.

Asynchronous Trainings Opportunities:

- Fundamentals of Remote Sensing
- Hyperspectral Data for Land and Coastal Systems
- Fundamentals of Remote Sensing for Air Quality
- Fundamentals of Remote Sensing for Land (2027)
- Fundamentals of Remote Sensing for Water (2027)

Fundamentals of Remote Sensing

Learn the underlying science behind how remote sensing works and the basic functional characteristics of satellites and sensors. Explore remote sensing data products, advantages and disadvantages of remote sensing, and use Worldview to visualize data. Fundamentals of Remote Sensing is often a prerequisite for other ARSET trainings.

Available in English and Spanish!

Access Fundamentals of Remote Sensing

go.nasa.gov/3EVfr9T

New Skills Launchpad: When Fields Flood
Identifying Standing Water and Inundated Vegetation from Space

- Learn how to use free NASA satellite data and tools to identify flooding
- Explore a real-world April 2025 flooding case study in Grubbs, Arkansas
- Develop skills to distinguish actual flooding from false detections, assess water duration and crop tolerance, and make informed decisions about field inspections
- Complete a self-paced StoryMap lesson and hands-on skills lab (coming soon)



ARSET Trainings for Advancing Skills from this Workshop Series



[Calculating Spectral Indices for Land and Aquatic Applications Using QGIS]
(Introductory)



[Worldview and Water Quality Applications in Coastal Regions]
(Introductory)



[Monitoring Surface Water with SAR for Water Resource Management]
(Intermediate)

Please Take Our Survey

This survey will only take a few minutes and will help us better understand how to meet your needs.

Thank You!