# Earth Remote Sensing Technologies

A driver for Efficient Development & Better Use of our Planet's Resources

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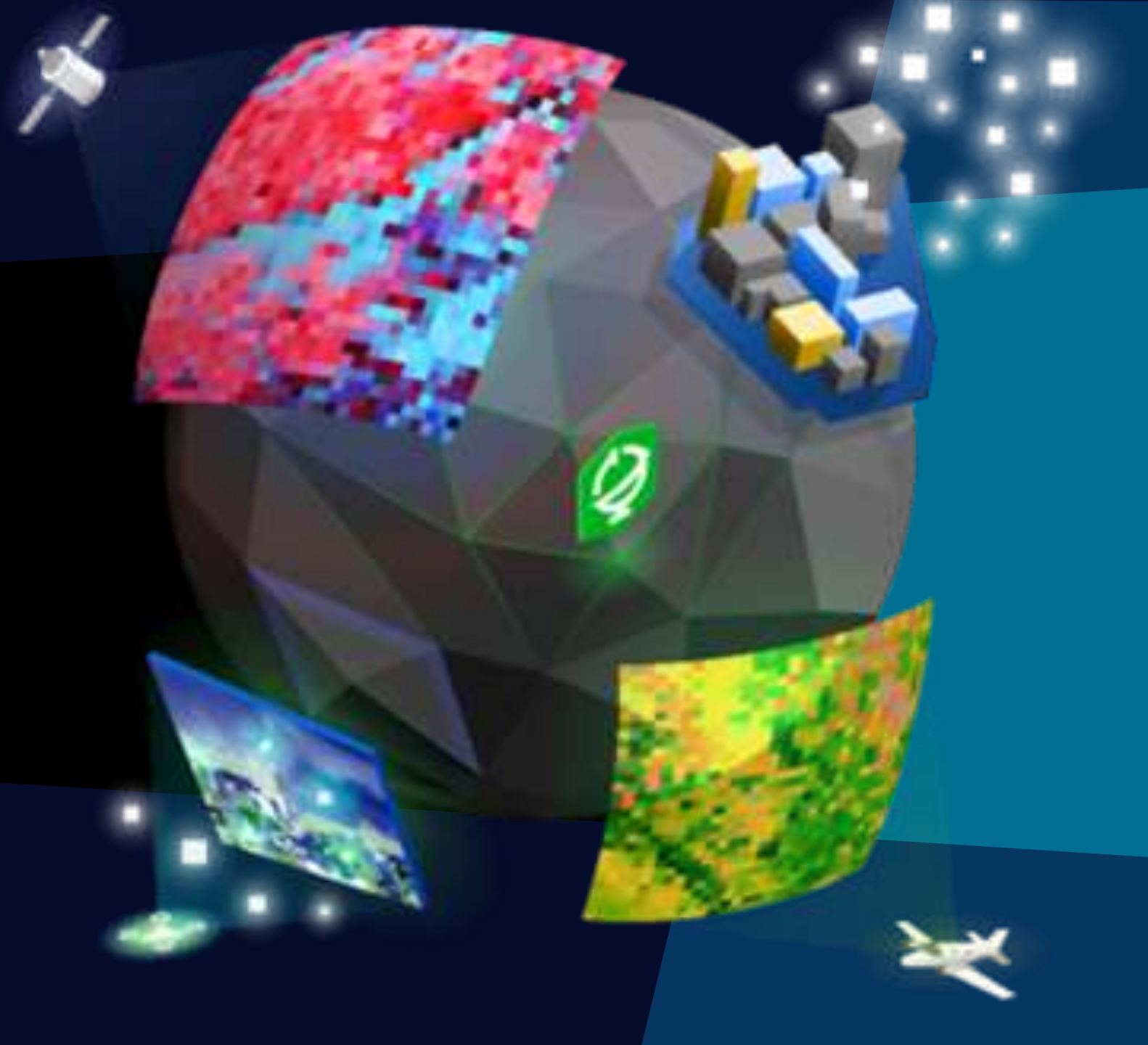
**Principal Consultant, Esri**

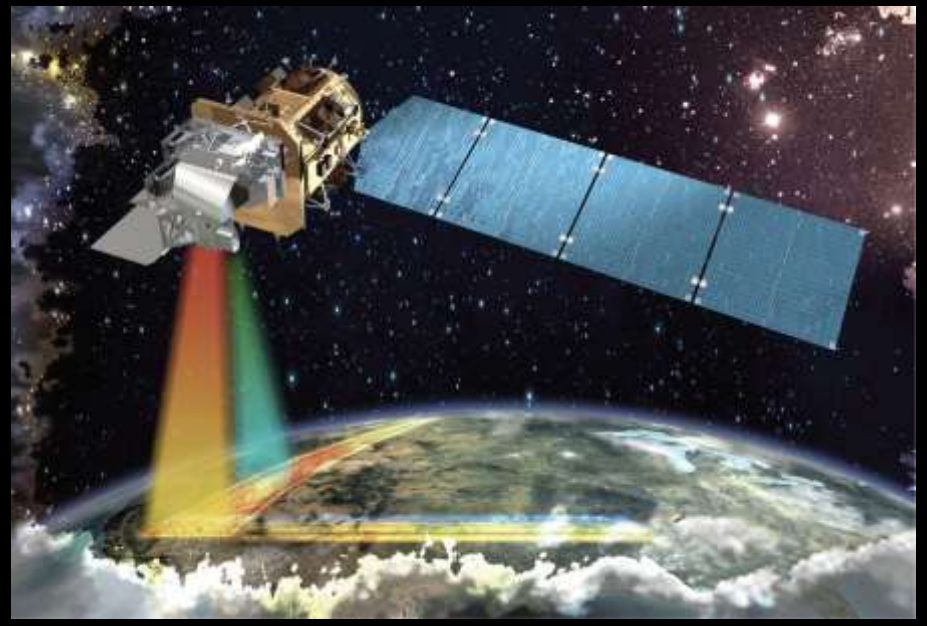
# Agenda

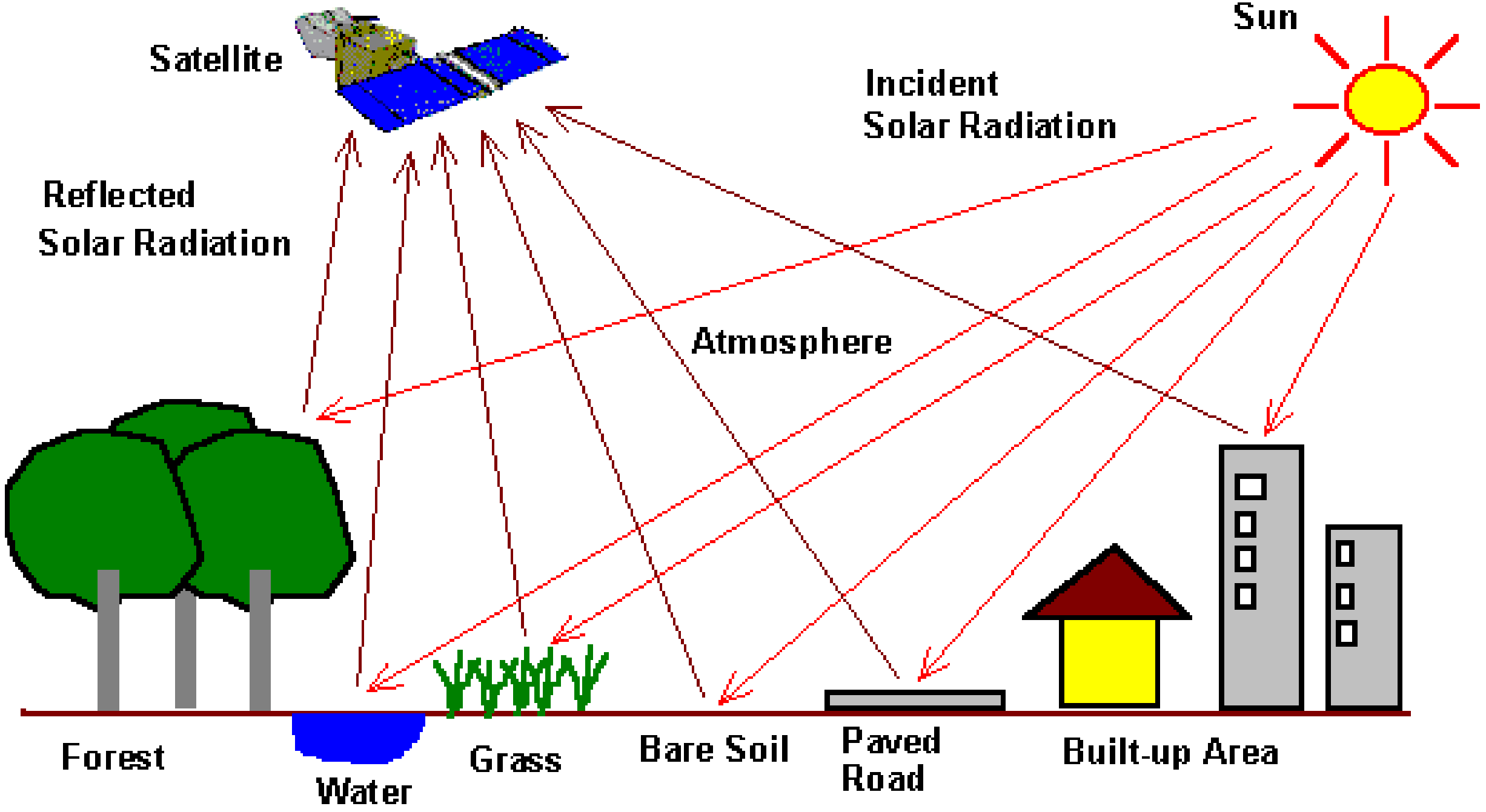
1. Intro
2. Imagery & Remote Sensing Essentials
3. Imagery Platform
4. Use Cases

# Imagery Essentials

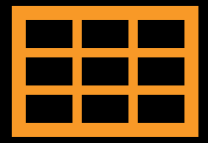


# What is remote sensing?




Satellite
Sun
Incident
Solar Radiation
Reflected
Solar Radiation
Atmosphere
Forest
Water
Grass
Bare Soil
Paved
Road
Built-up Area

# Imagery Resolutions



## Spatial

Measured in Pixels

Determines the minimum size an object must be to be detected

## Spectral

Refers to the ability of the sensor to define wavelengths of the electromagnetic spectrum

The key to image classification and segmentation

## Temporal

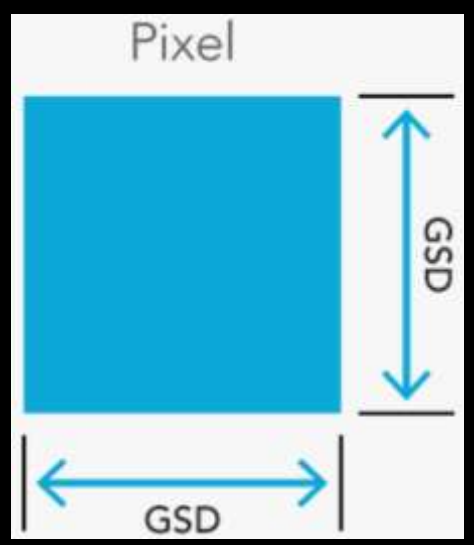
When the image was acquired

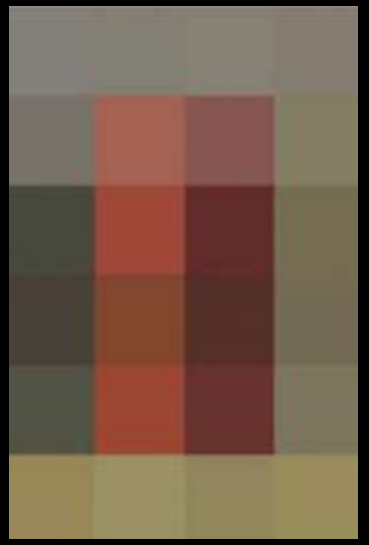
- Season, Time of Day, Weather, etc

When building a demo, make sure images make sense “temporally”.

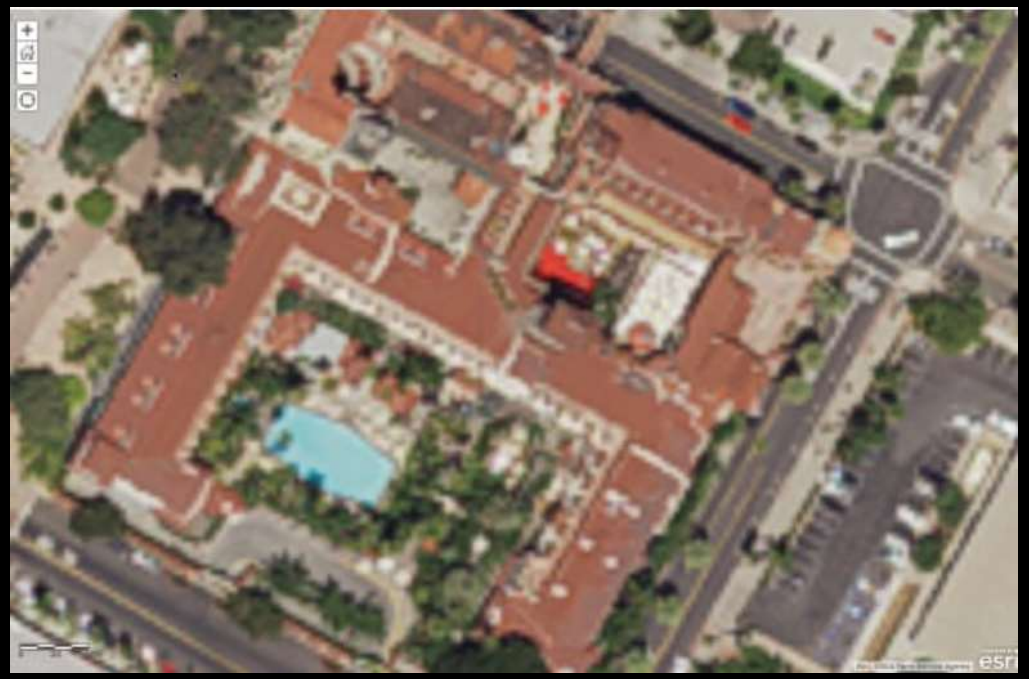
# What’s in a pixel?

Making sense of spatial resolution



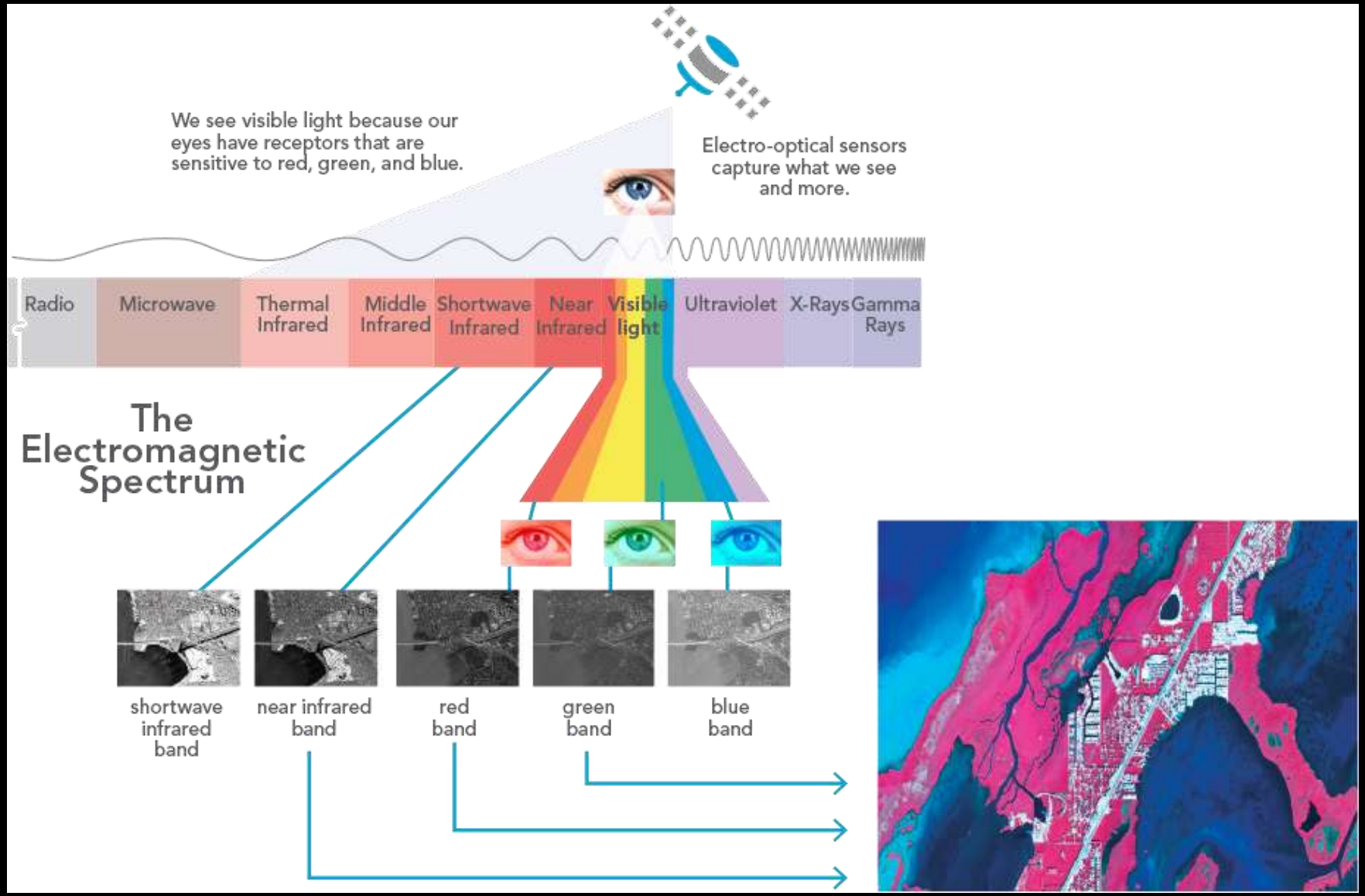


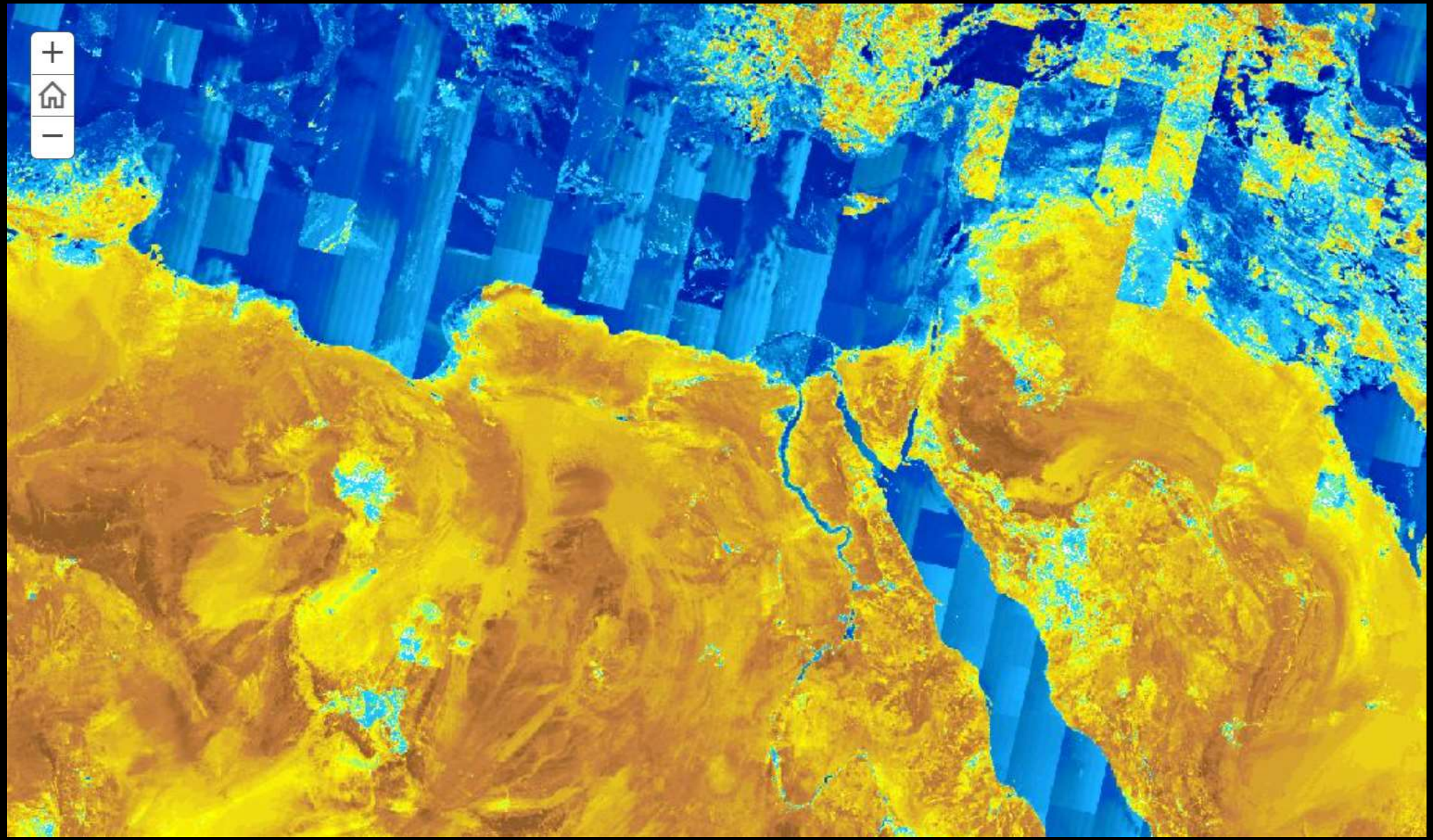
This image of the historic Mission Inn hotel in Riverside, California, is captured at approximately one-foot resolution. Click the image and zoom in as far as you can get. Each pixel represents about one foot on the ground. This type of imagery is appropriate for site-specific investigations and analysis.



This image of the same area is captured at one-meter resolution. The difference in resolution is significant. One-meter resolution data is appropriate for capturing and analyzing phenomena across larger areas of interest.

# Spectral Resolution





# Temporal Resolution

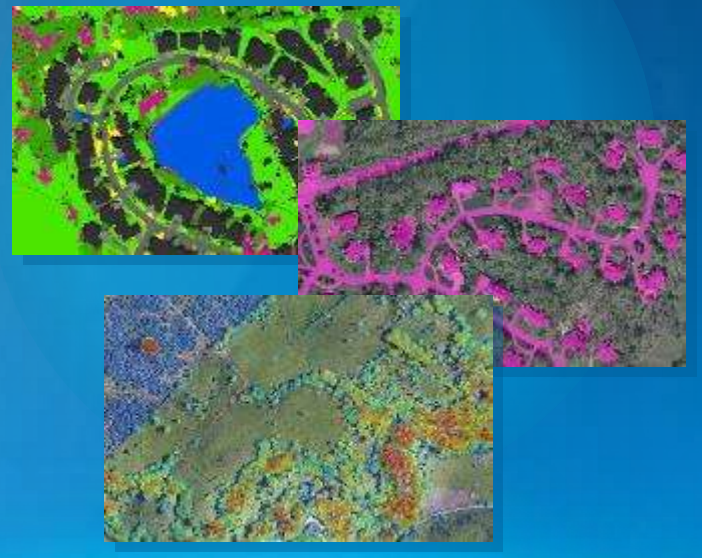
Imagery can represent time

# Imagery

Enables the
Geospatial Domain

## See the World

## Find the Patterns

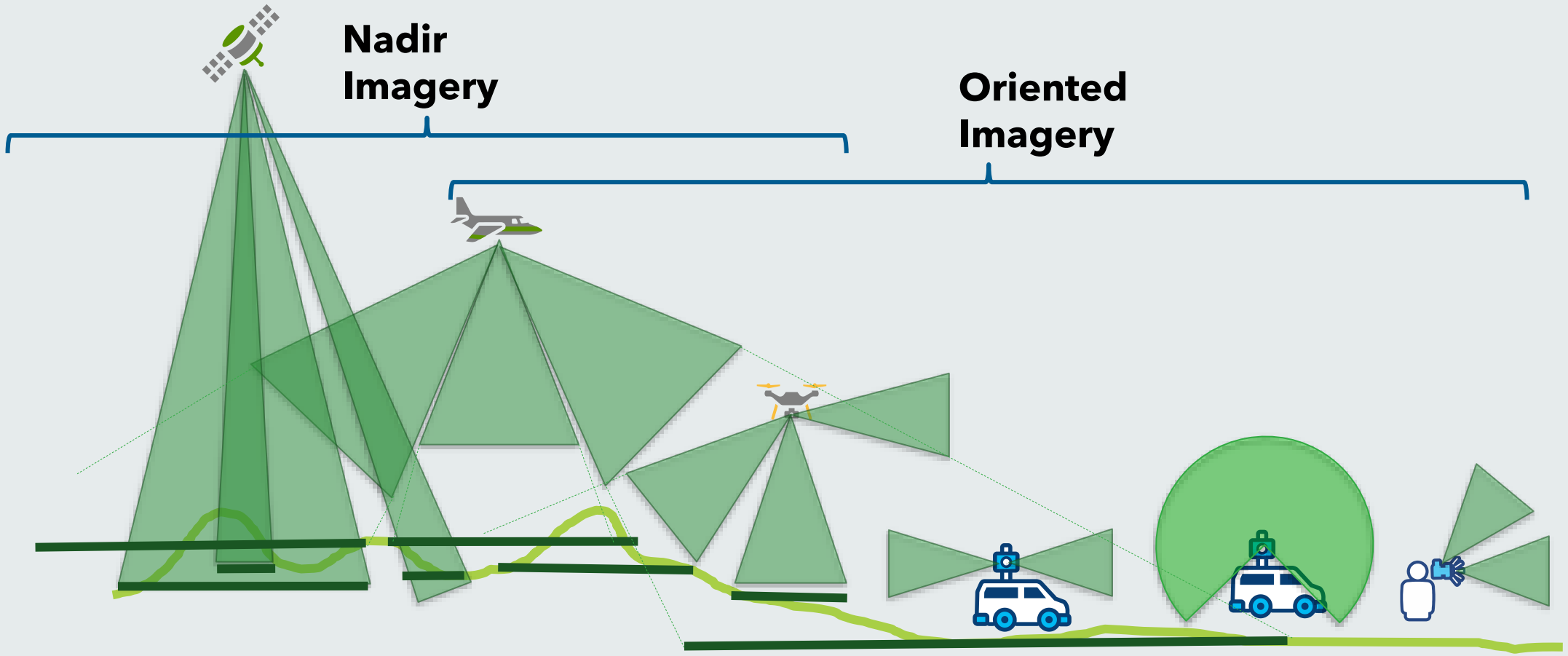


## Share with Others

*See, Find, Share…*

# Where does imagery come from?

**From Satellite to Ground Surveillance**

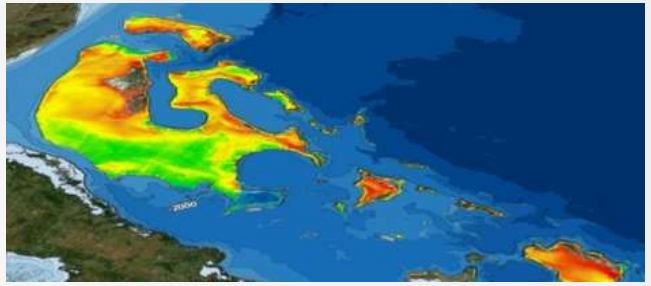


# Massive amounts of imagery data are being collected

*Challenge is to generate real-time information products from raw image data*

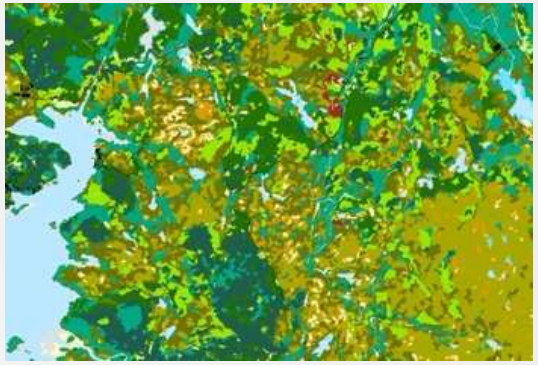
Satellite-Derived Bathymetry

TCarta Marine
Bahamas, Caribbean Sea



Rapid Situation Awareness

Planet Labs
Michigan

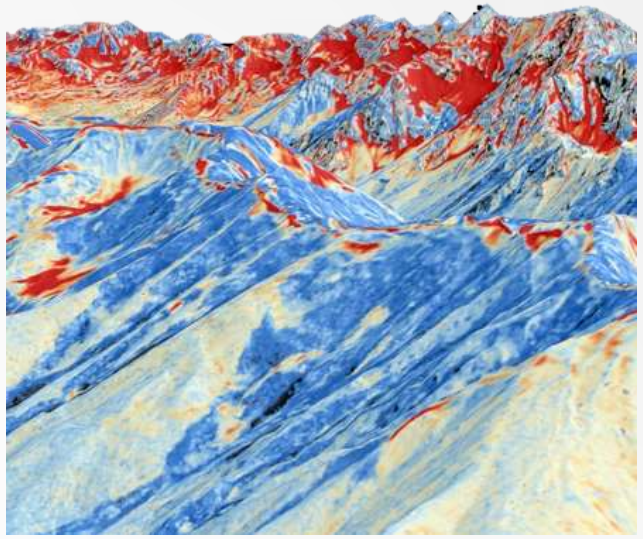


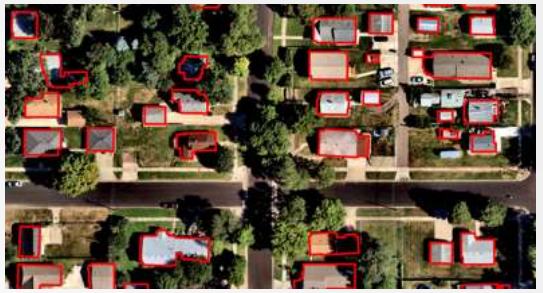
Forest Inventory (Satellite)

USFS
Tonga's National Forest, Alaska

Snow Depth

Airborne Snow Observatory
Colorado



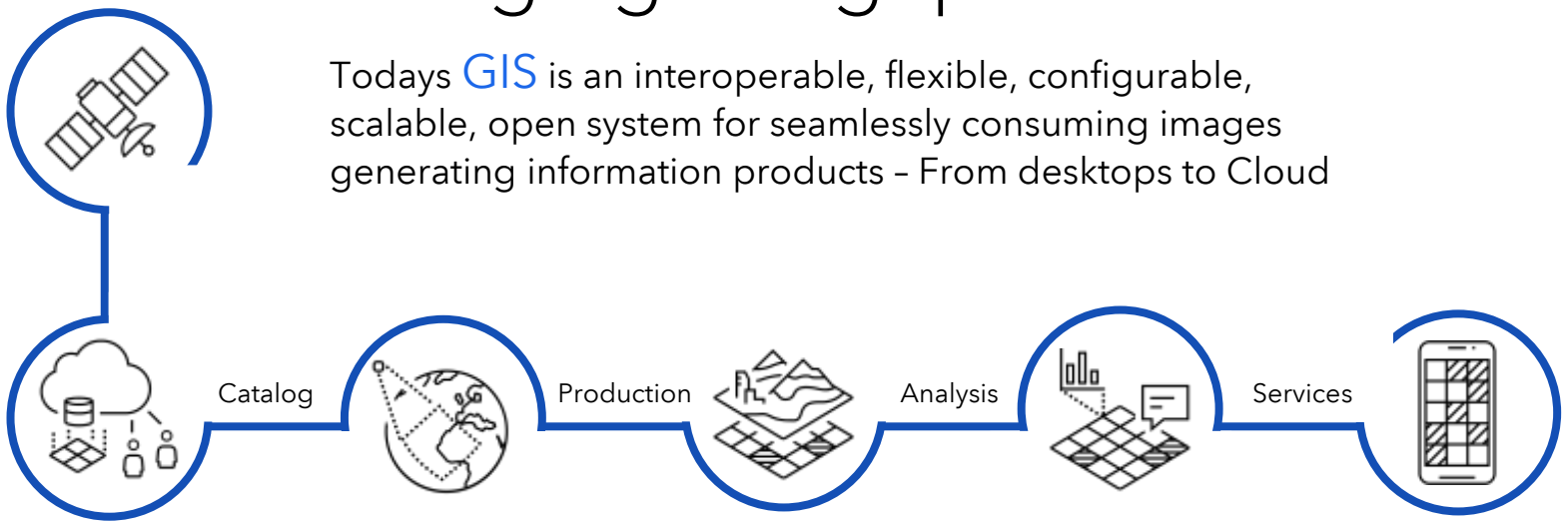


Building Feature Extraction (AI)

City of Sioux Falls
South Dakota

# Bridging the gap

Todays GIS is an interoperable, flexible, configurable, scalable, open system for seamlessly consuming images generating information products – From desktops to Cloud



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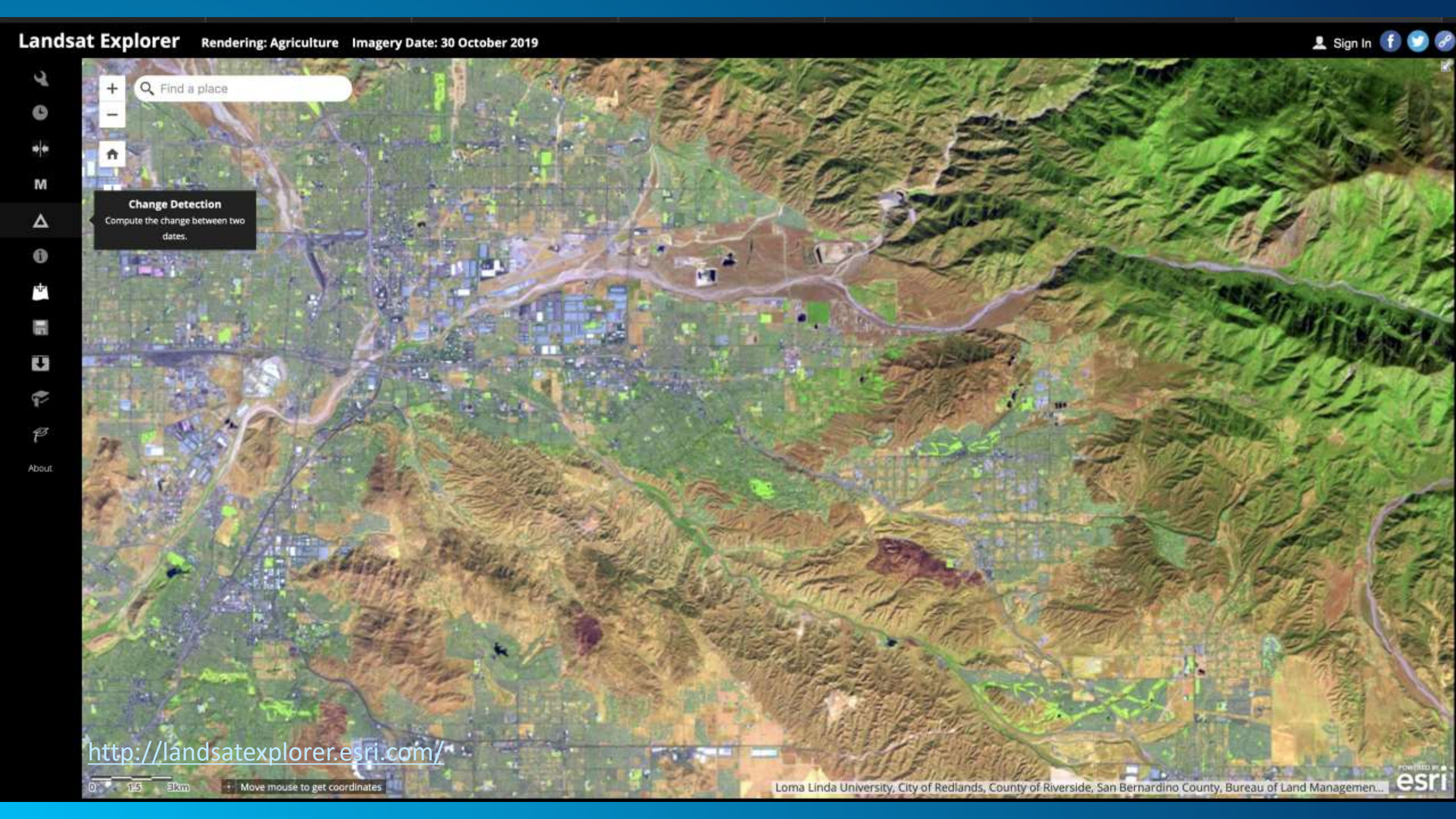
# Use cases & Applications


Landsat Explorer
Rendering: Agriculture
Imagery Date: 30 October 2019
Sign In
Find a place
Change Detection
Compute the change between two dates.
About
http://landsatexplorer.esri.com/
0 1.5 3km
Move mouse to get coordinates
Loma Linda University, City of Redlands, County of Riverside, San Bernardino County, Bureau of Land Managemen...
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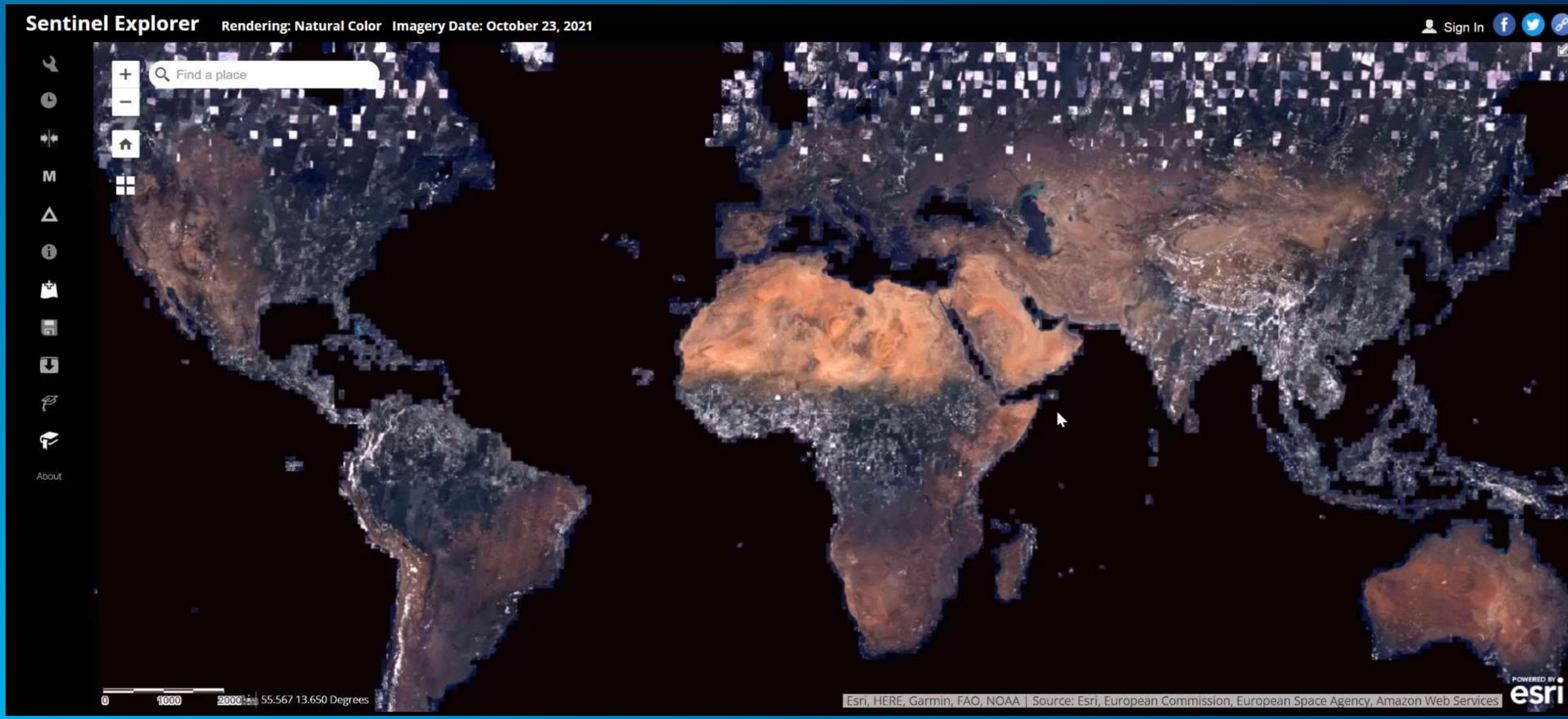
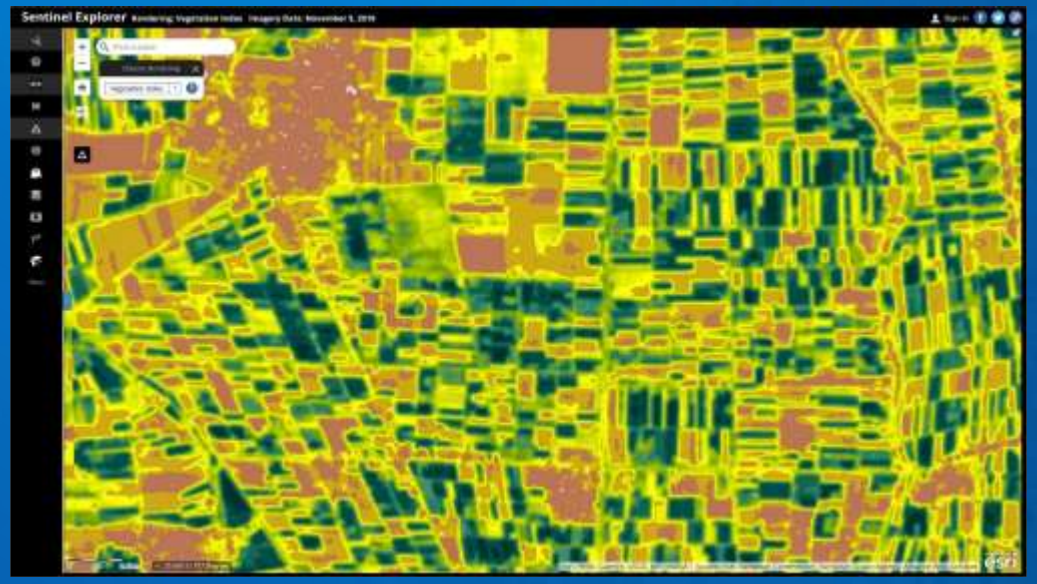

Sentinel Explorer
Rendering: Natural Color
Imagery Date: October 23, 2021
Sign In
Find a place
About
0
1000
2000 km
55.567 13.650 Degrees
Esri, HERE, Garmin, FAO, NOAA | Source: Esri, European Commission, European Space Agency, Amazon Web Services
POWERED BY esri

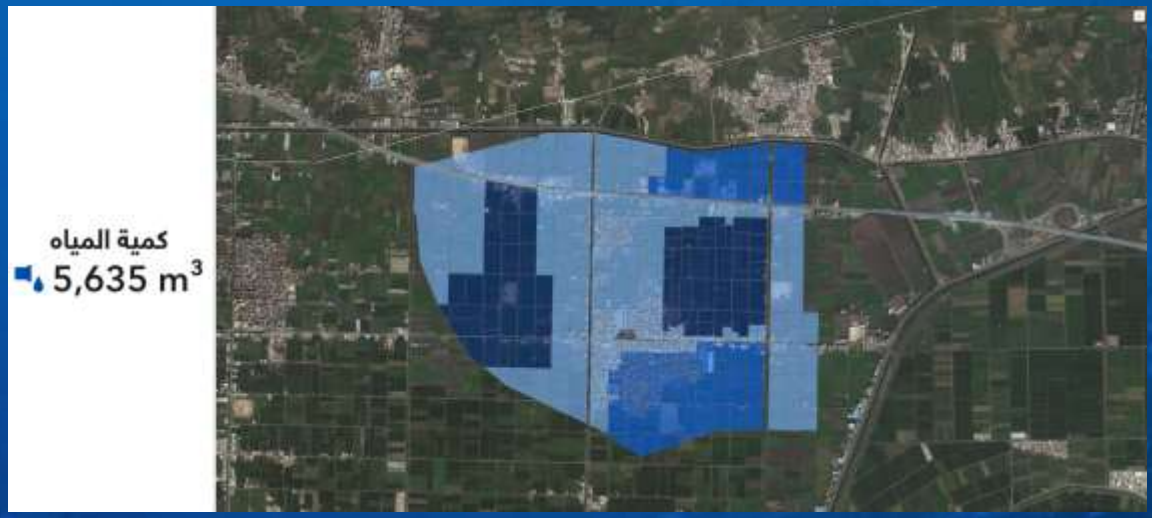
# Water Estimation for Agricultural Lands

- Agriculture pilot using artificial intelligence (AI) and remote-sensing spatial analysis technologies to establish a dynamic, seasonal digital inventory of crop patterns. It integrates satellite imagery, field observations, data feeds, and geospatial AI capabilities

Field Boundary Detection

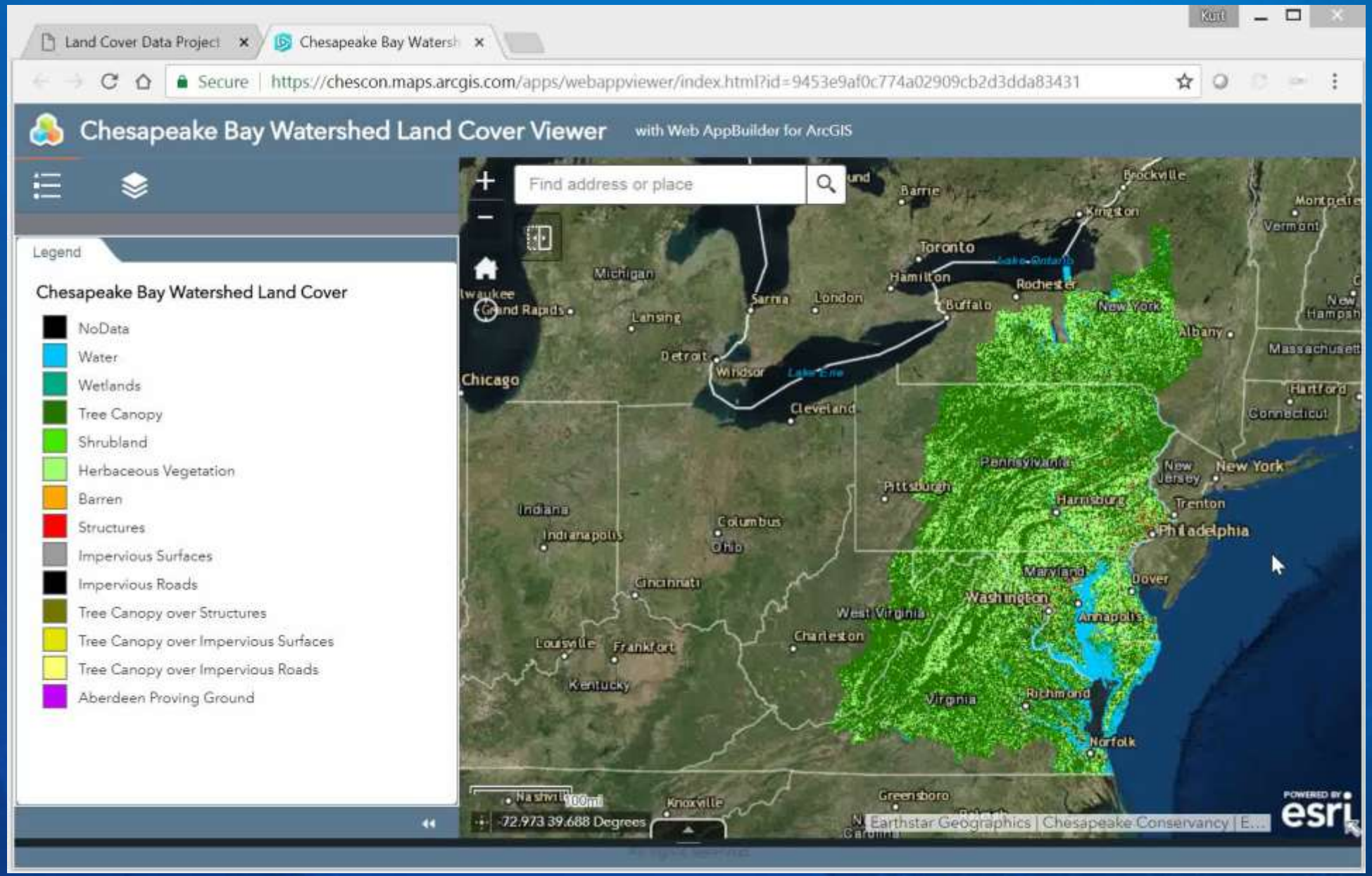



Estimate Health using Spectral Analysis




Estimate Water Needs

# Land Cover


Land Cover Data Project
Chesapeake Bay Watersh
Secure
https://chescon.maps.arcgis.com/apps/webappviewer/index.html?id=9453e9af0c774a02909cb2d3dda83431
Chesapeake Bay Watershed Land Cover Viewer
with Web AppBuilder for ArcGIS
Find address or place
Legend
Chesapeake Bay Watershed Land Cover
NoData
Water
Wetlands
Tree Canopy
Shrubland
Herbaceous Vegetation
Barren
Structures
Impervious Surfaces
Impervious Roads
Tree Canopy over Structures
Tree Canopy over Impervious Surfaces
Tree Canopy over Impervious Roads
Aberdeen Proving Ground
Toronto
Buffalo
Rochester
New York
Albany
Vermont
Massachusetts
Connecticut
Hartford
Chicago
Detroit
Cleveland
Pittsburgh
Harrisburg
Trenton
Philadelphia
Indianapolis
Columbus
Cincinnati
Washington
Maryland
Dover
Annapolis
Charleston
Louisville
Frankfort
Kentucky
Virginia
Richmond
Norfolk
Greensboro
Knoxville
72.973 39.688 Degrees
Earthstar Geographics | Chesapeake Conservancy | E...
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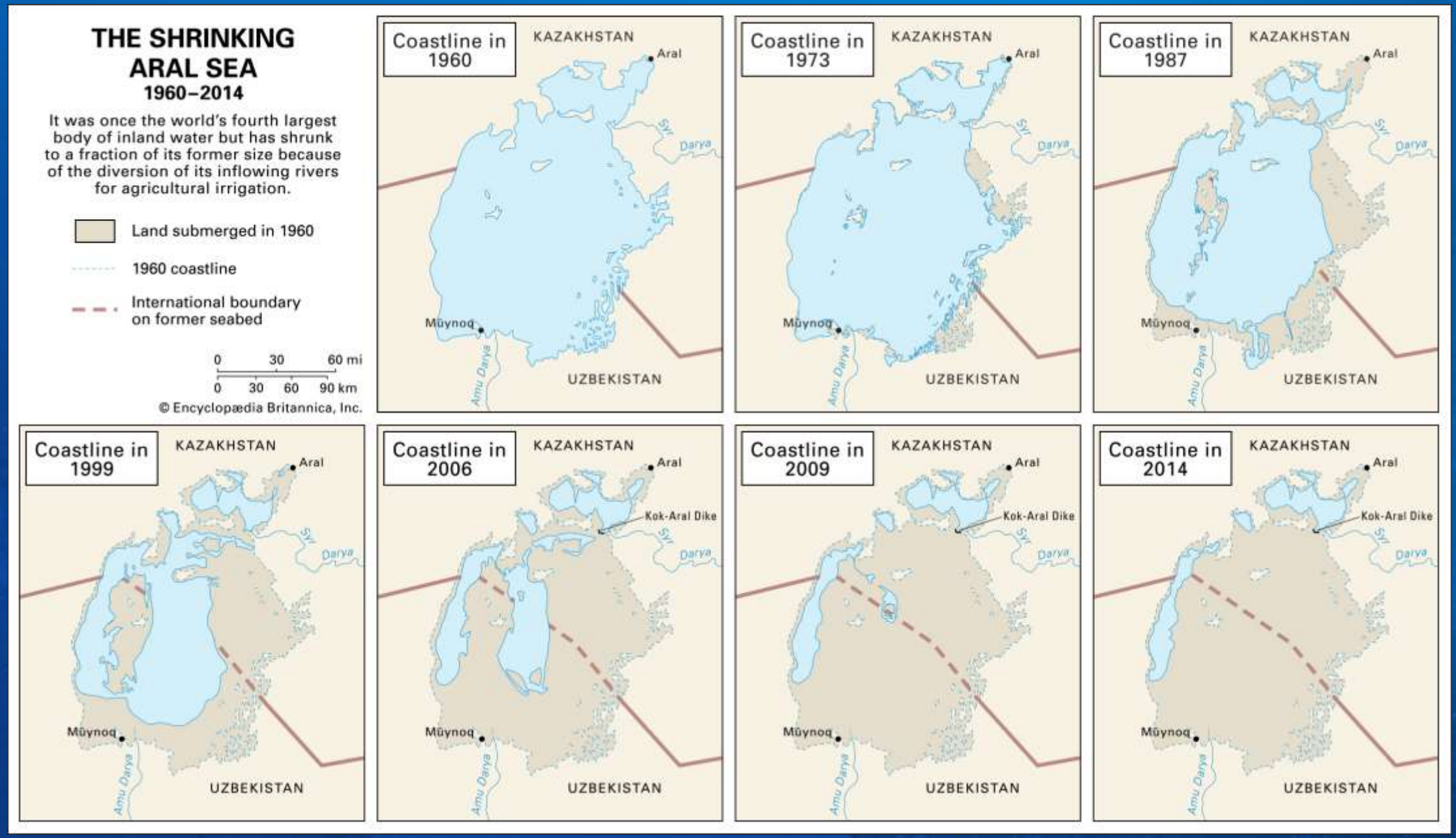
# Disappearing lake - The Aral Sea 1974 - 2015



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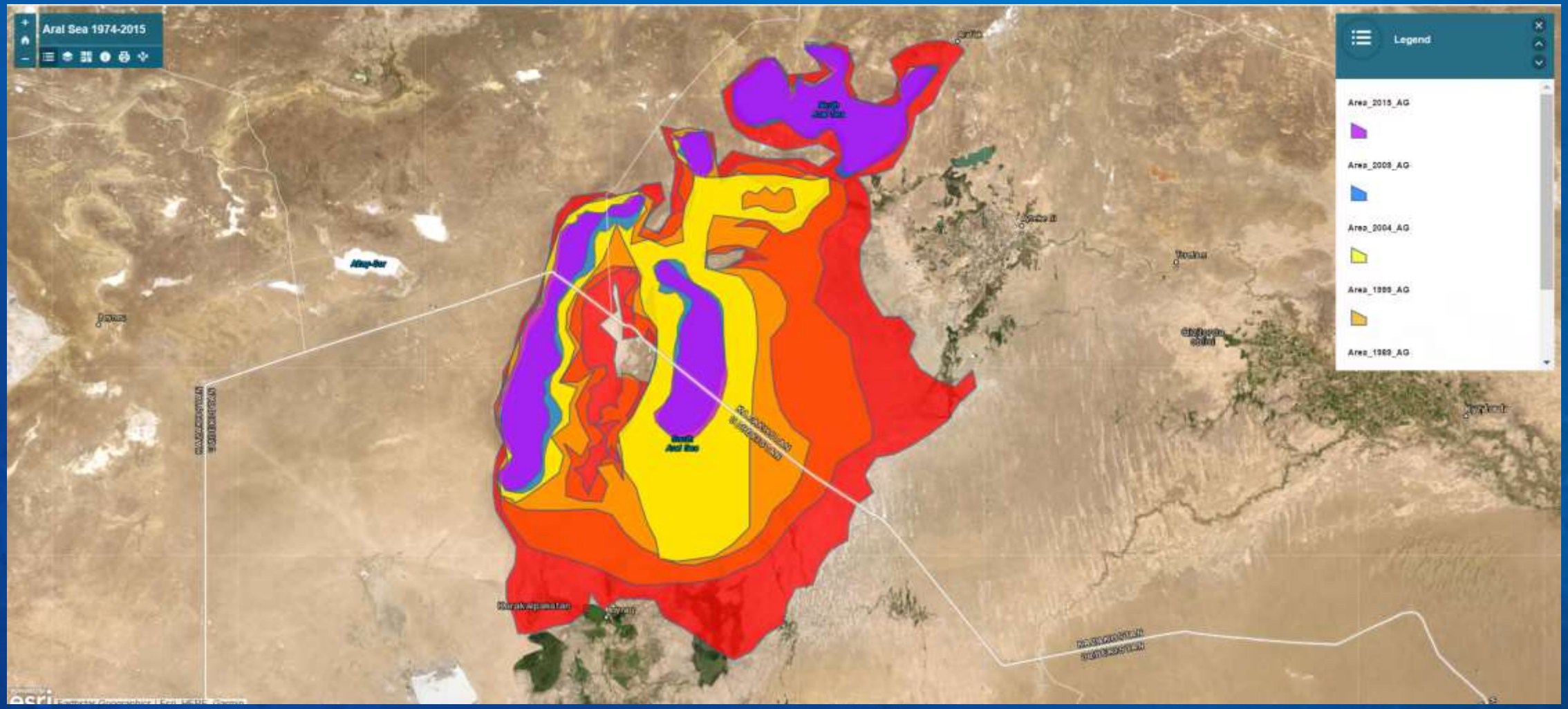

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