# Remote Vegetation Monitoring and Change Detection Using Landsat TM 7 + 8

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# Topics

- Washington State's Voluntary Stewardship Program (VSP) & Critical Area Identification

- Critical Area Change Detection using Landsat Imagery | Douglas County, Washington

- Lessons Learned

- Next Steps -> Migrating from Geoprocessing Toolboxes to Data Science Notebooks

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# Voluntary Stewardship Program

- VSP is a collaborative process that helps Washington communities ensure healthy landscapes and strong farms for the future.

- VSP was created in 2011 to give counties the option to use locally driven watershed plans and voluntary, incentive-based tools to protect critical areas.
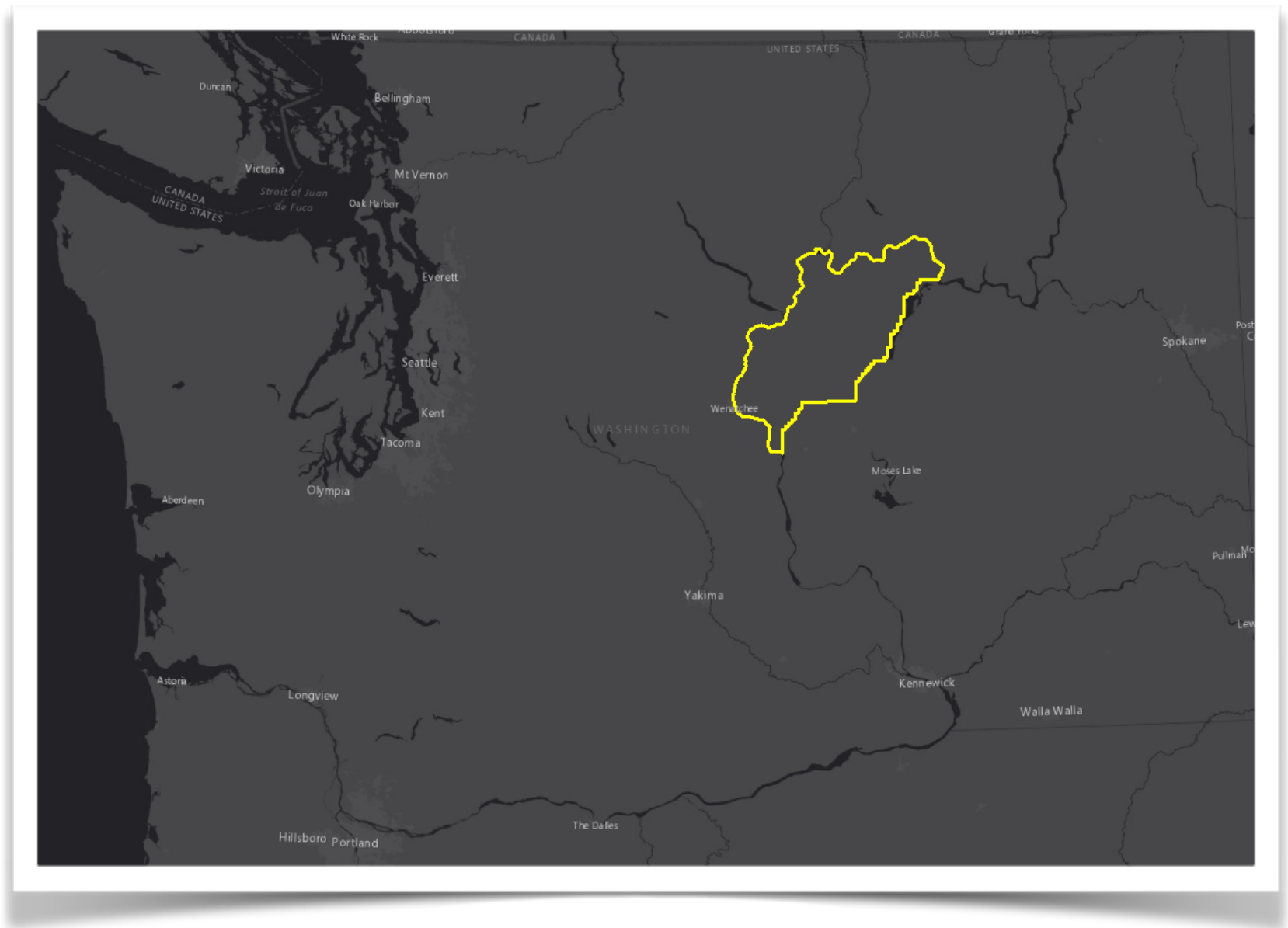


**Learn more: https://scc.wa.gov/vsp-background/**
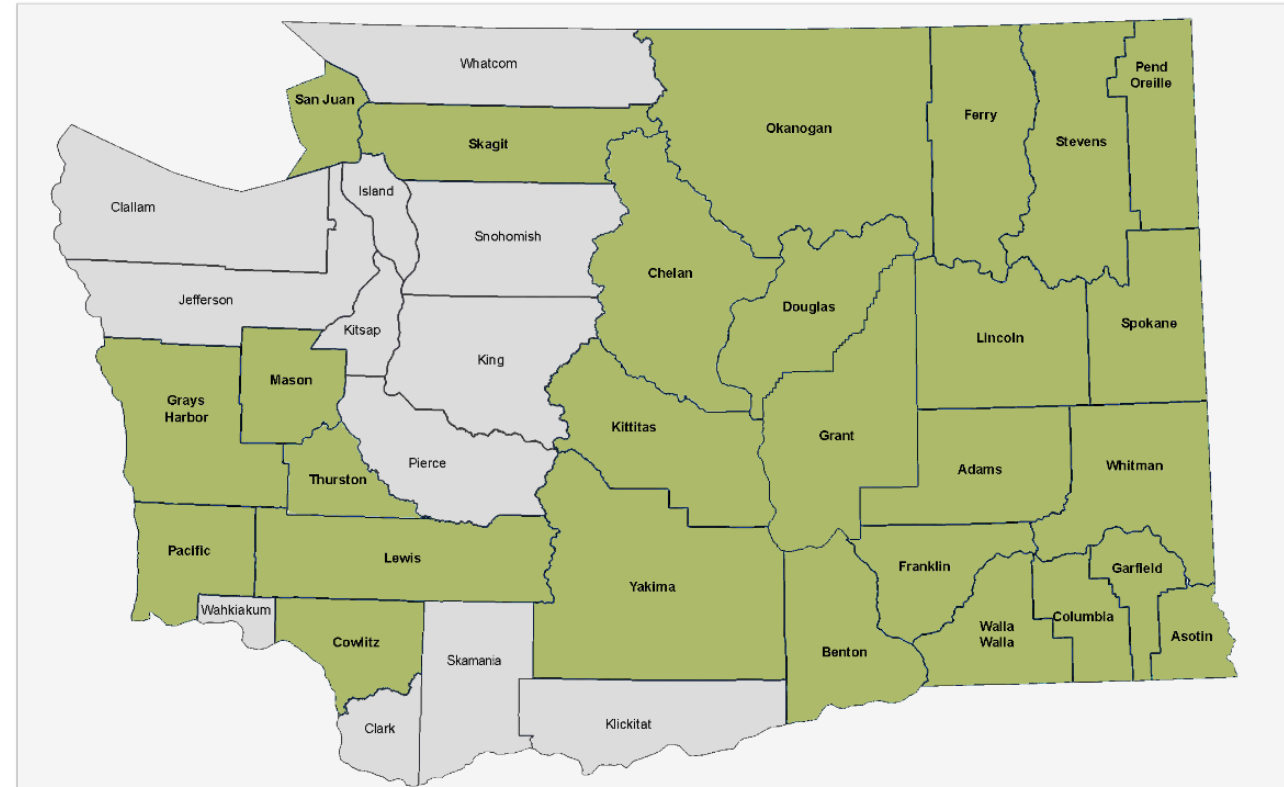
# Douglas County VSP
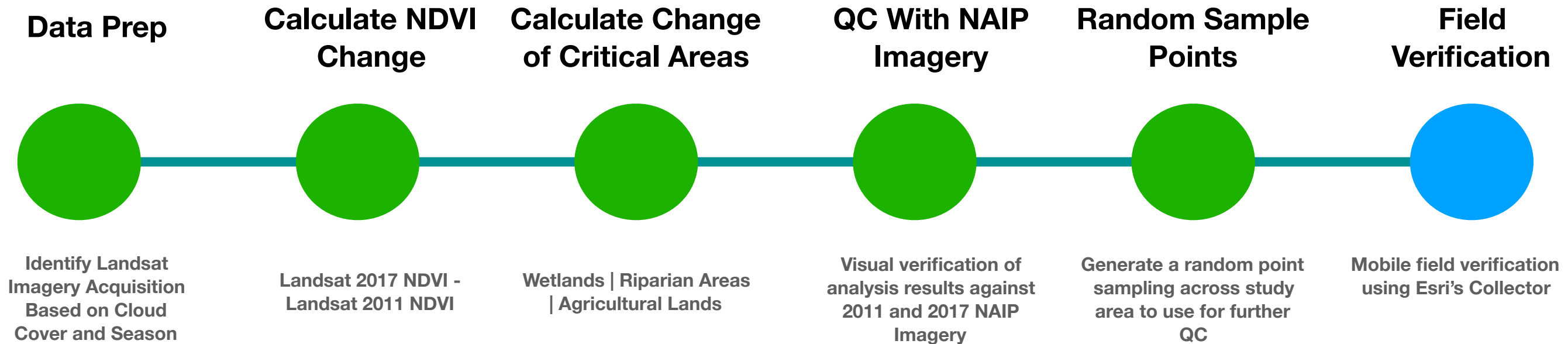
**Client:** Foster Creek Conservation District

**Project Objective:** Establish baseline for vegetation change of critical areas based on Landsat Imagery over a 10 year period for Douglas County, WA.

**Project Requirements:**
- Data analysis products
- Raw imagery inputs
- ArcGIS 10.X environment
- Field verification methodology



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# Project Work Plan

**Data Prep**

**Calculate NDVI Change**

**Calculate Change of Critical Areas**

**QC With NAIP Imagery**

**Random Sample Points**

**Field Verification**

Identify Landsat Imagery Acquisition Based on Cloud Cover and Season

Landsat 2017 NDVI - Landsat 2011 NDVI

Wetlands | Riparian Areas | Agricultural Lands

Visual verification of analysis results against 2011 and 2017 NAIP Imagery

Generate a random point sampling across study area to use for further QC

Mobile field verification using Esri's Collector

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| Input Data Sets | Comments |
|---|---|
| NHD Perennial Creeks | |
| Moskal Mapped Wetlands (2013) | |
| WSDA Cropland 2011 | |
| Landsat 8 Multispectral Imagery (30 meter) | July 2017 with less than 10% cloud coverage |
| Landsat 7 Multispectral Imagery (30 meter) | July 2011 with less than 10% cloud coverage |
| NAIP Aerial Imagery for both 2017 and 2011 | |

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# Initial Results
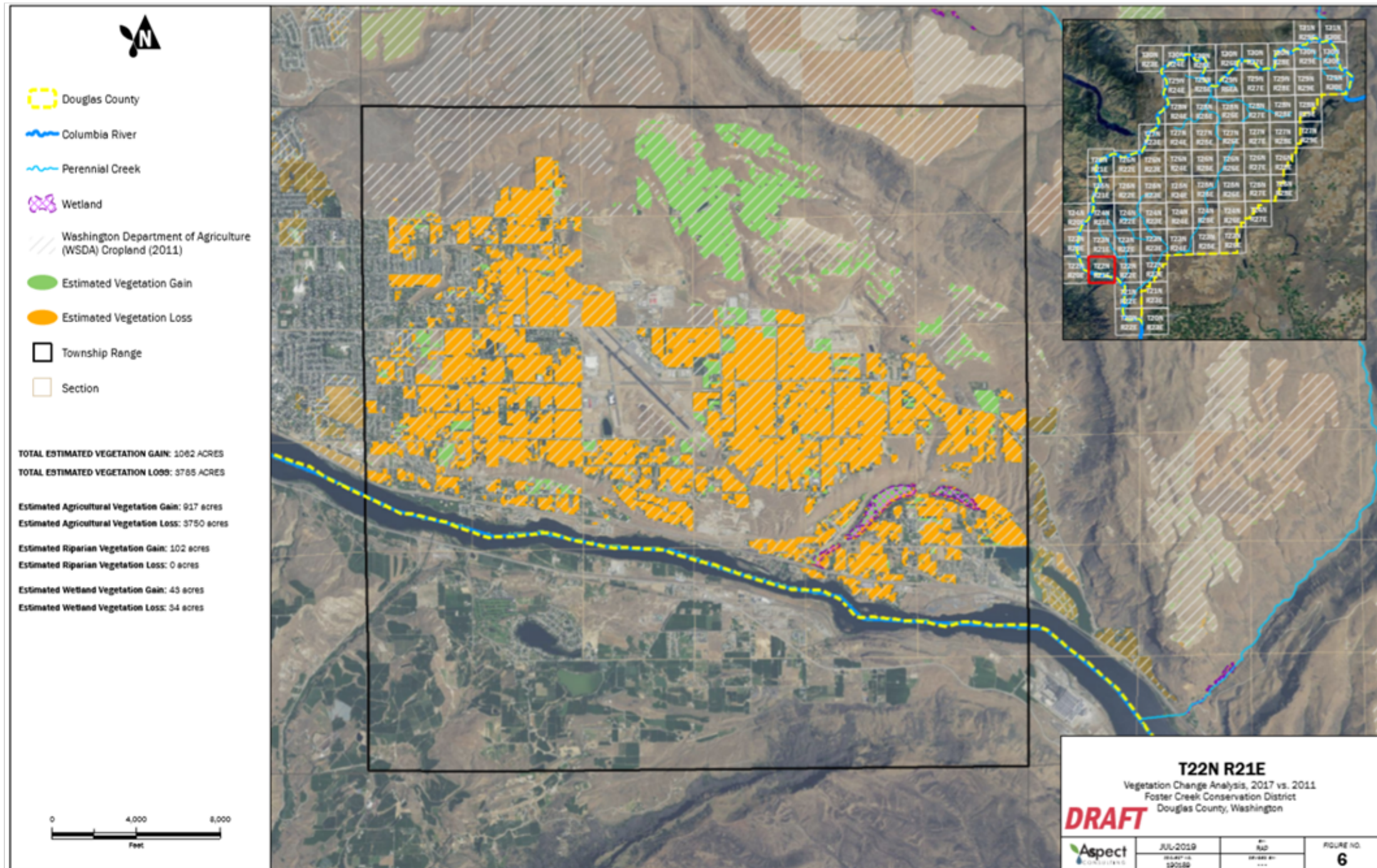
# Lessons Learned

- ArcGIS Online Landsat Explorer is a great tool to perform quick analysis and extract data.
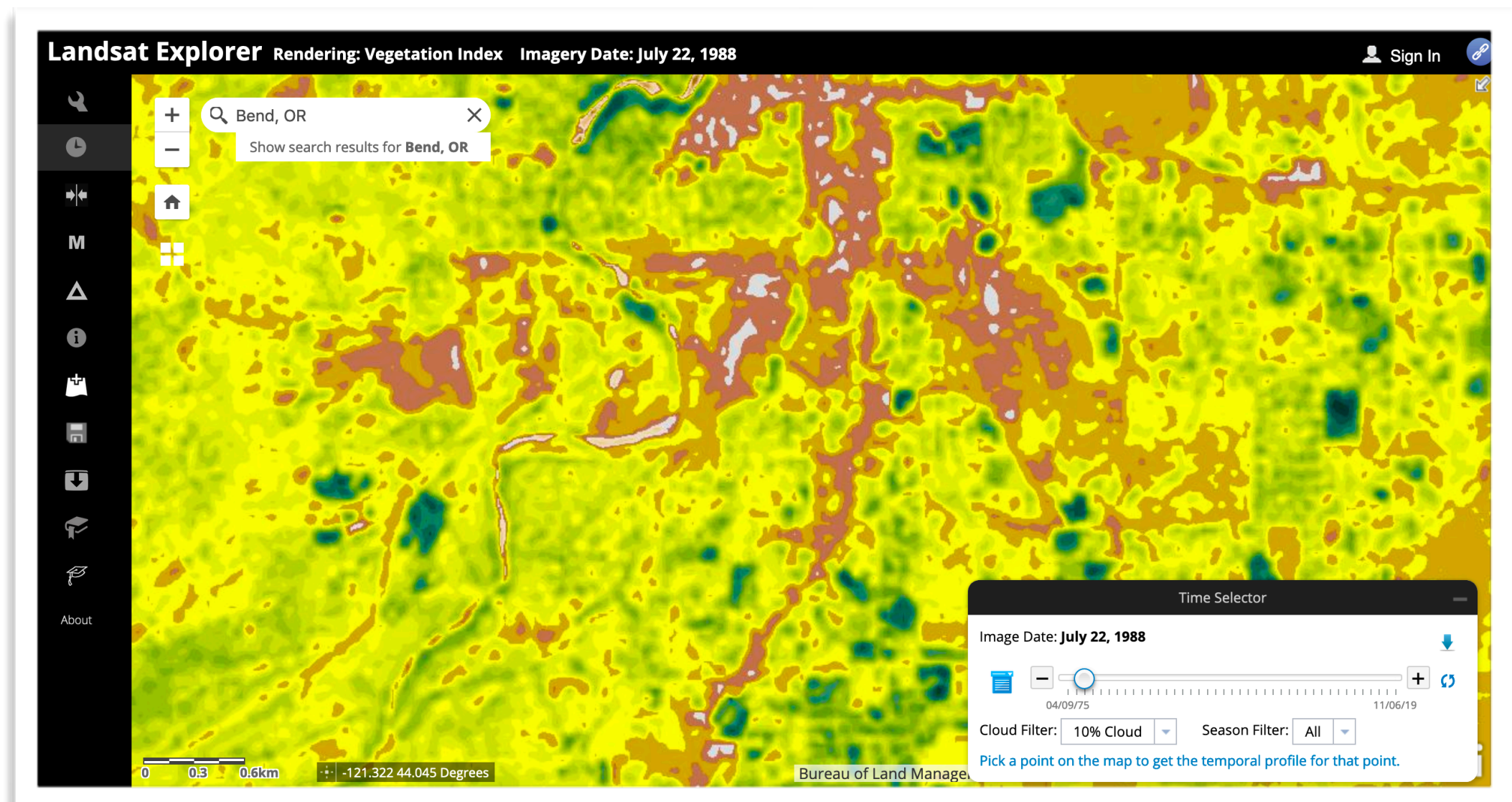
# Lessons Learned Continued

- Amazon's Public Data instead of USGS Earth Explorer
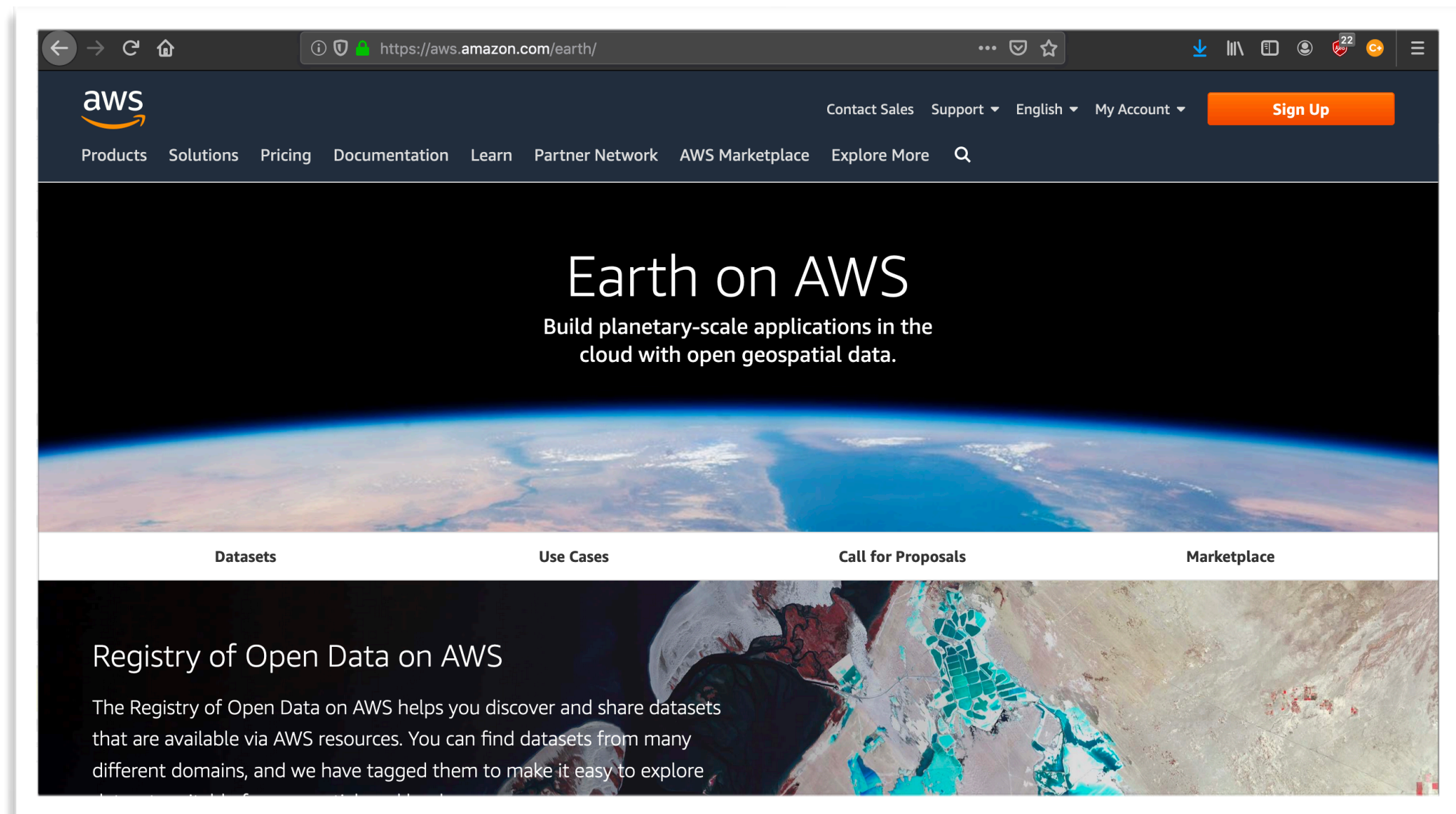


**NOTE**: If working with the raw data is not necessary then use hosted AGOL Landsat Map Services which read directly from AWS Public Data.

# Next Steps:
# Migrating to Python Notebooks

# Continual Improvement

- **Our Data and Mapping team have begun to migrate our workflow from a traditional Desktop environment to Jupyter Python notebooks.**

**Benefits**

- Repeatable and documented

- Run in the cloud (closer to data products)

- Closer fit with our science subject matter experts

**Tech Stack**

- Jupyter + Python 3

- Docker

- Rasterio

- Numpy

# Thank you!
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