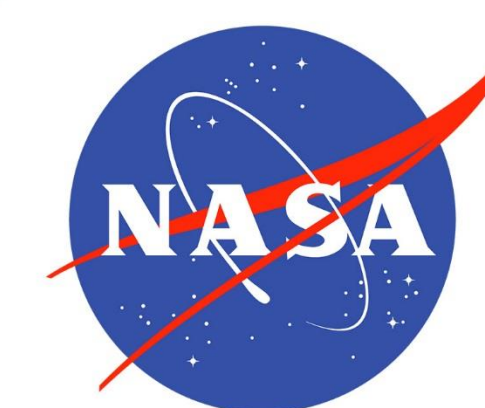# Identifying Early Season Invasives for Monitoring and Management in the Colorado National Monument
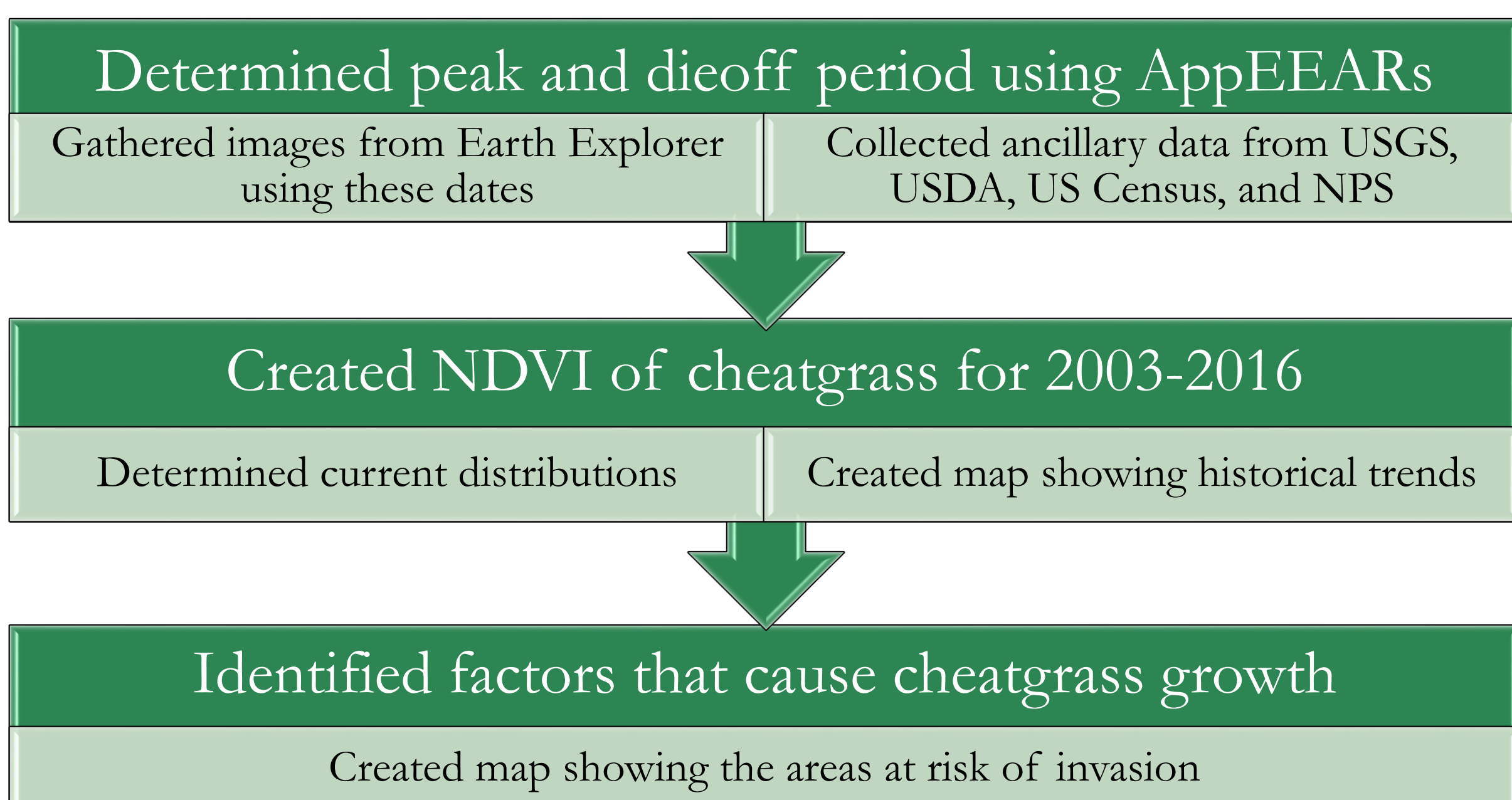
Abstract

Bromus tectorum, otherwise known as cheatgrass, is an invasive grass from Europe that has increased its presence all over the world by out-competing native grasses due to its adaptability and lifecycle. During the end of its life cycle, typically occurring in the summer, its flammable remains often create the conditions for forest fires to start early in the season. This alters native wildlife's previous response to wildfires and increases the overall frequency of fires. As a result, cheatgrass often disrupts the necessary recovery time for native wildlife after habitat destruction. This NASA DEVELOP project utilized Landsat 5 TM, Landsat 8 OLI and TIRS, Terra MODIS, and Sentinel-2 MSI data to study the spread of cheatgrass throughout the Colorado National Monument and the surrounding area to determine locations at risk of being invaded by cheatgrass. The results of the study included historical and current cheatgrass population maps, multi-criteria evaluation (MCE), MCE analysis, and forecasted cheatgrass spread. The MCE analysis assessed the factors and constraints that contribute to the vulnerability to cheatgrass invasion. The results from this project will assist the National Park Service in improving their monitoring and management efforts and help contribute to the prevention of cheatgrass in Colorado National Monument.
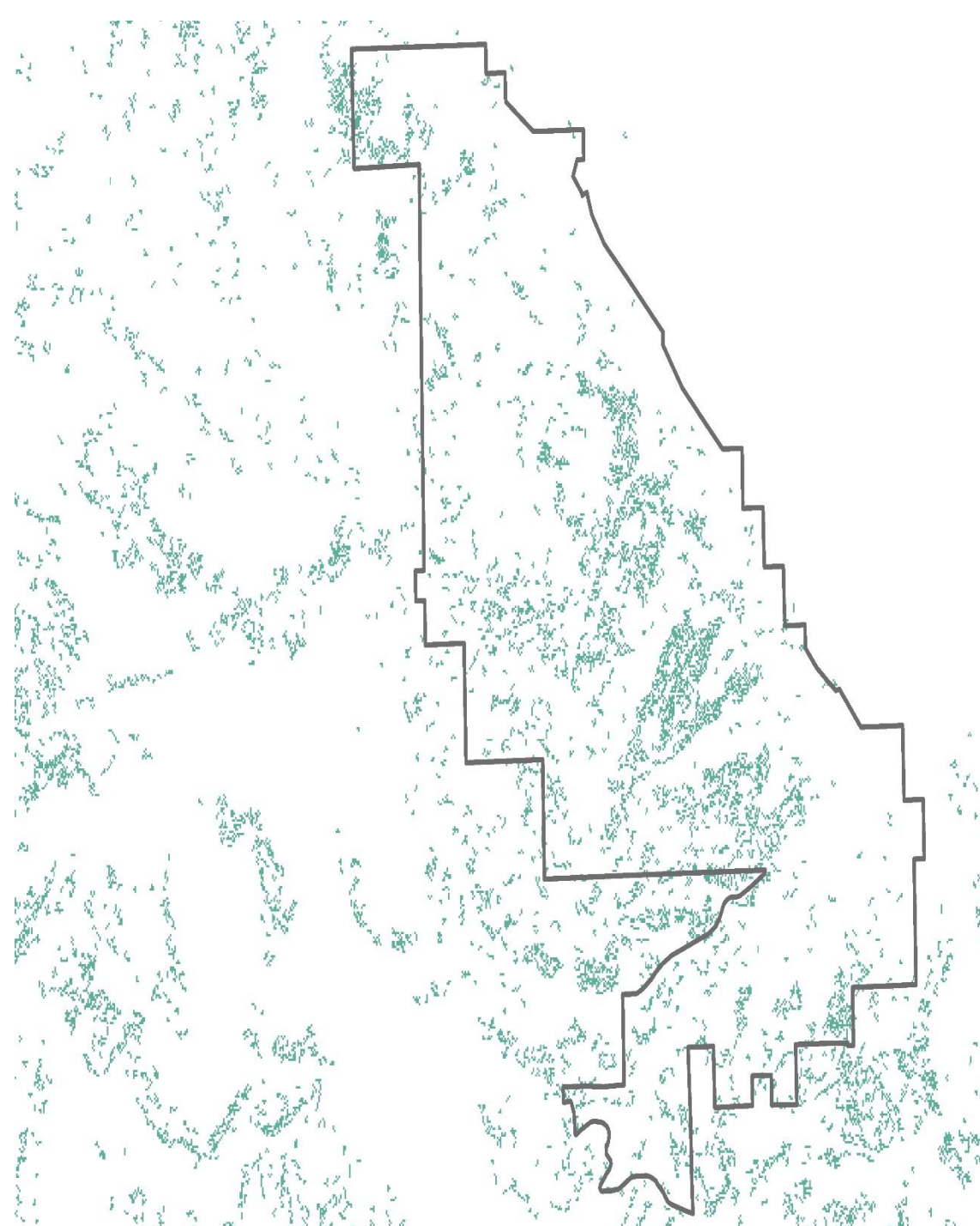
Objectives

▸ **Evaluate** the vulnerability of the landscape to cheatgrass invasion

▸ **Create** historic and current distribution maps of cheatgrass

▸ **Identify** cheatgrass movement during the study period and near future

▸ **Generate** a forecast map for cheatgrass distribution

Methodology

Determined peak and dieoff period using AppEEARs	
Gathered images from Earth Explorer using these dates	Collected ancillary data from USGS, USDA, US Census, and NPS

Created NDVI of cheatgrass for 2003-2016	
Determined current distributions	Created map showing historical trends

Identified factors that cause cheatgrass growth
Created map showing the areas at risk of invasion

Results

2017 Early Season NDVI Activity

☐ Colorado National Monument
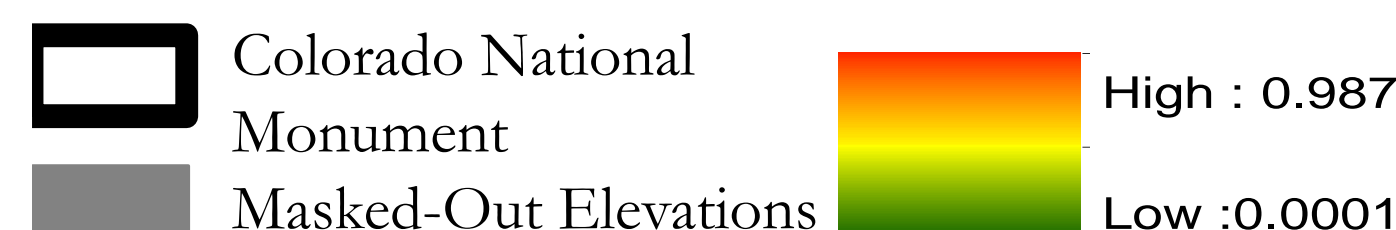▬ Peak Cheatgrass

Factors Used to Assess Cheatgrass Vulnerability
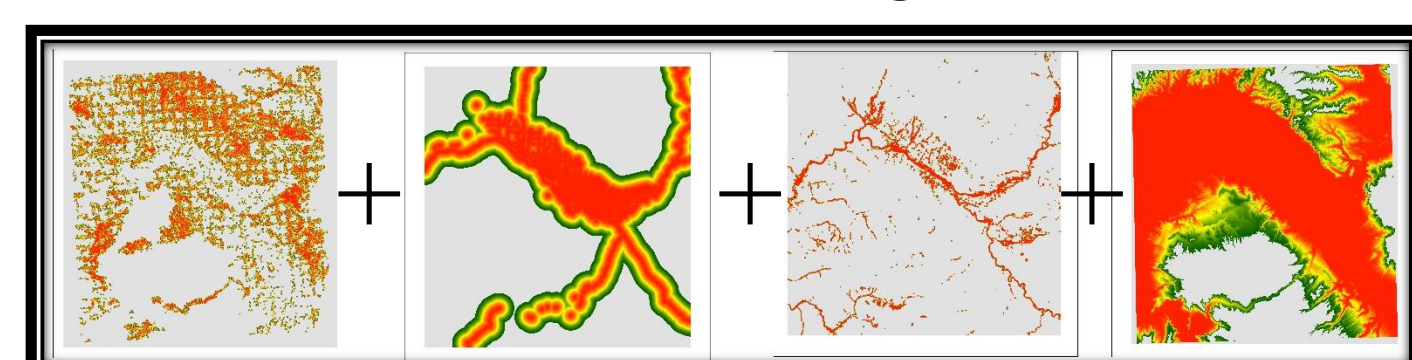
Early Season Activity + Developed Areas + Hydrographic Channels + Elevation
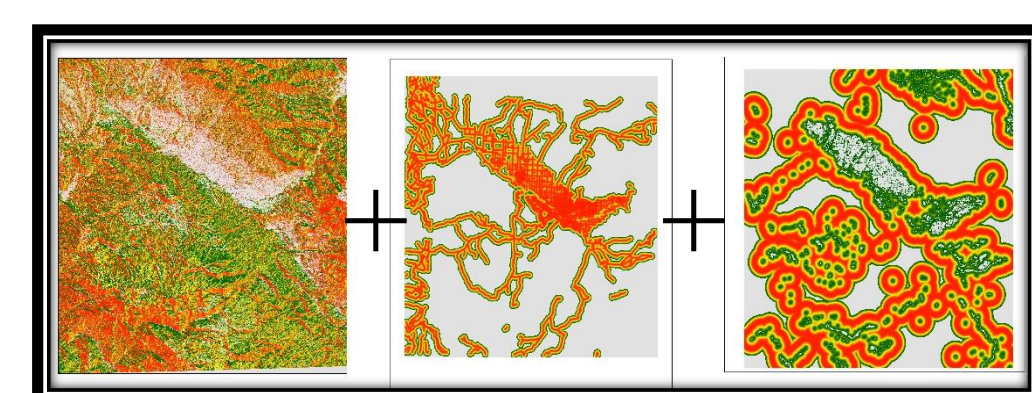
Aspect + Roads + Crops

Multi-Criteria Evaluation

☐ Colorado National Monument
▬ Masked-Out Elevations

High : 0.987
Low : 0.0001

Team Members

Zachary Peloquin (Project Lead)

James Ficklin

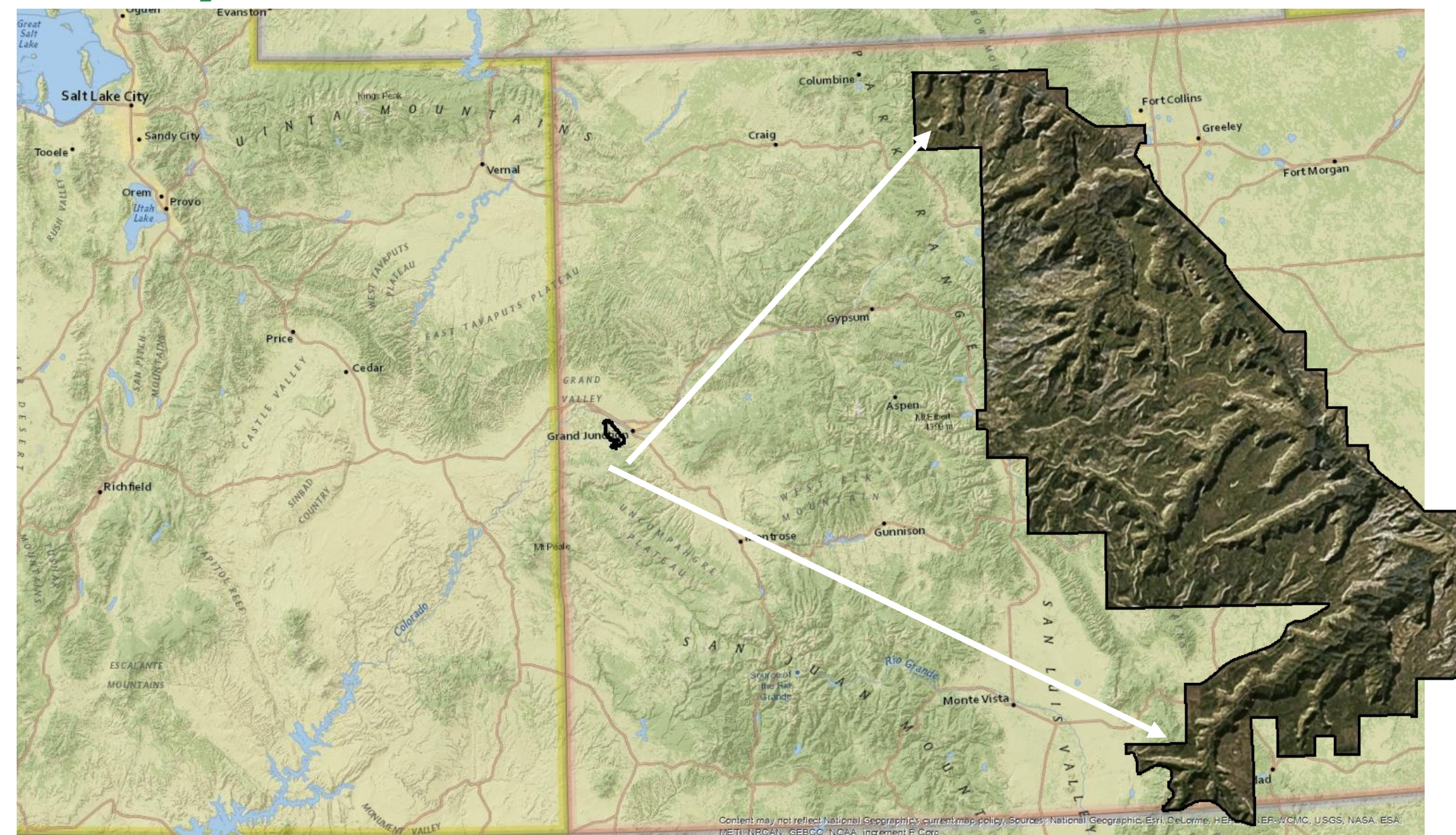Kayla Rini

Owen Cox

Study Area

Project Partners

NATIONAL PARK SERVICE

COLORADO MESA UNIVERSITY

Earth Observations

Aqua MODIS

Sentinel-2 MSI

Landsat 8 OLI & TIRS

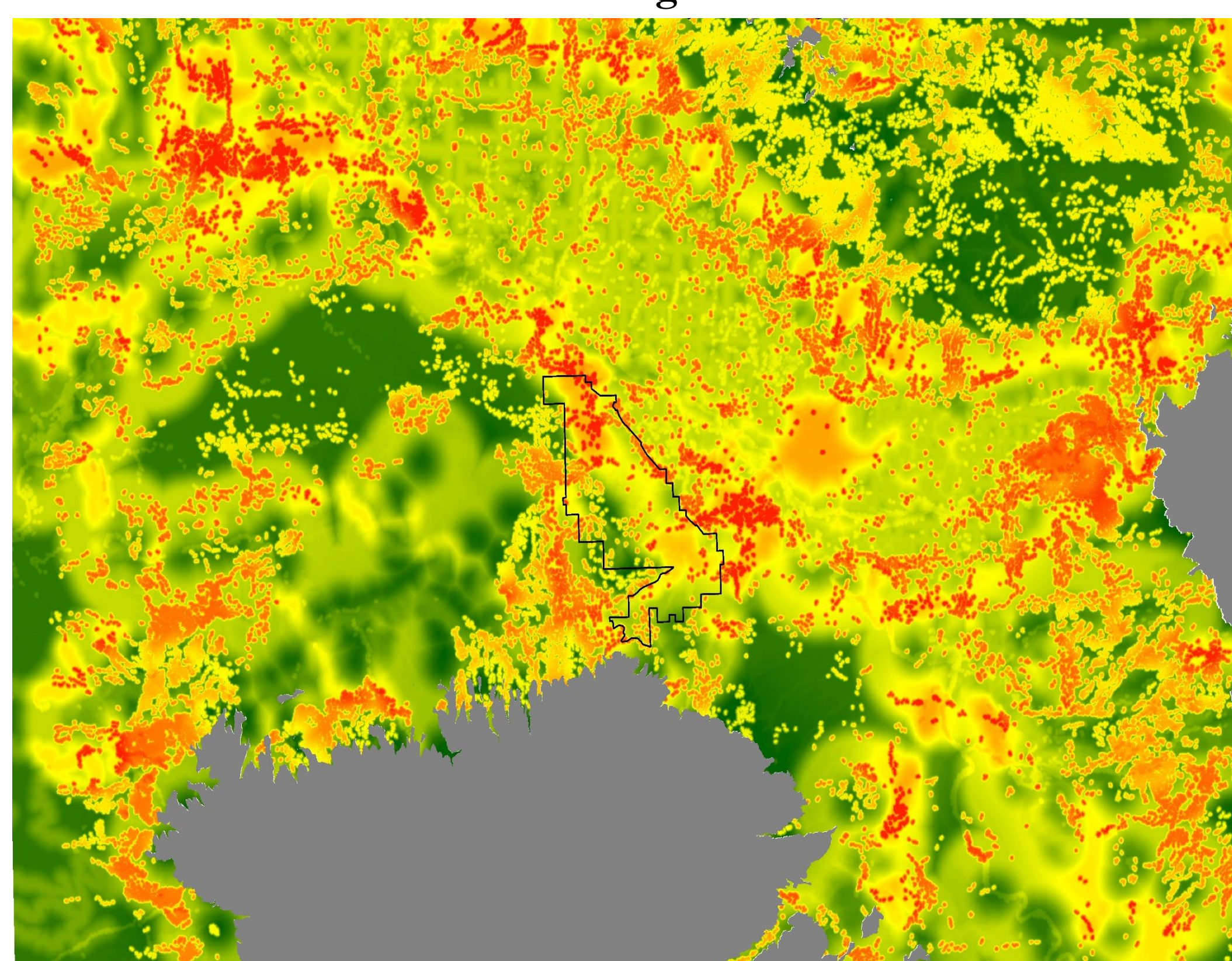**Landsat 5** TM
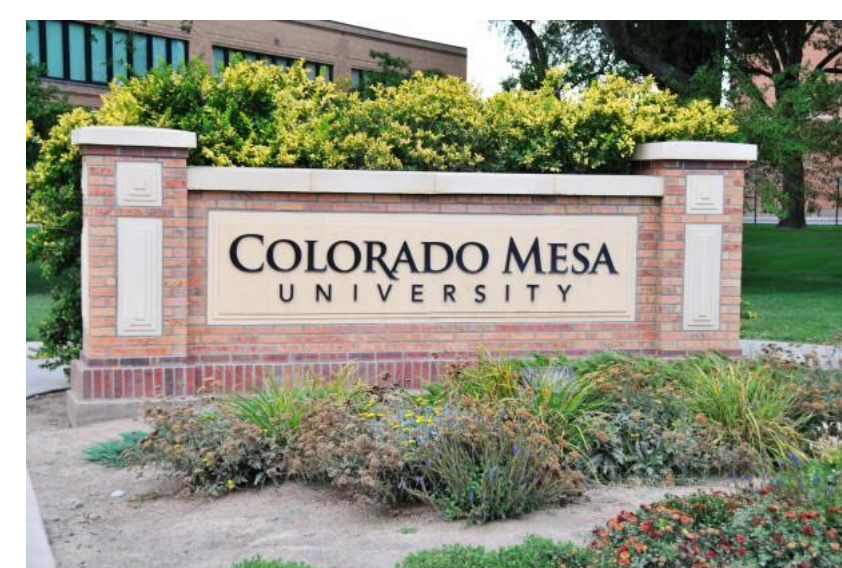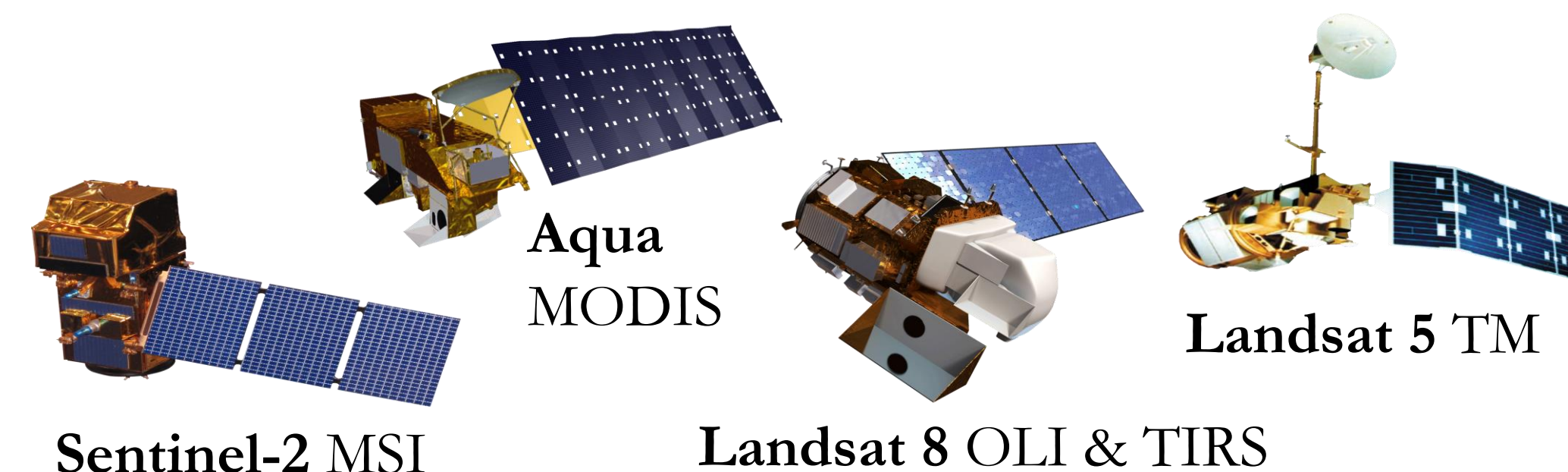
Multi-Criteria Evaluation to Cheatgrass Invasion

Conclusions

▸ There are several areas of concentrated early season activity to the southwest of the park.

▸ Not all early season activity detected by satellite imagery is cheatgrass. Ground truthing is needed to confirm that cheatgrass is present in that area.

▸ The MCE shows that the areas of greatest vulnerability to invasion are located slightly east and southwest of the park.

Acknowledgements

Colorado National Monument Ecological Forecasting

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