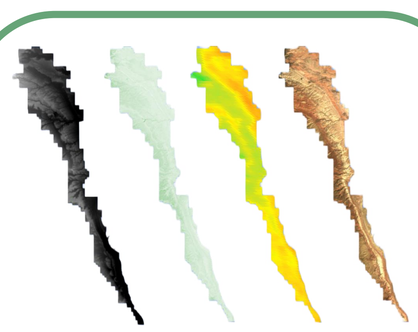
# Capitol Reef Ecological Conservation

## Mapping Vegetation Functional Groups to Inform Invasive Vegetation Management, Ecological Conservation, and Restoration in Capitol Reef National Park

## How do we study invasive exotic plants?

Invasive exotic plants are non-native plants that cause harm to an ecosystem. Many invasive plant species produce large quantities of seeds and spread quickly, have aggressive root systems that smother the root systems of native plants, and act as fuel for wildfires. Capitol Reef National Park has determined that intervention is needed in order to encourage native plant communities and to mitigate the harm of invasive plants. This is where remote sensing and satellite observations can help. Remote sensing gives scientists a way to study and monitor invasive plants over very large areas and develop plans for intervention.

## Earth Observations & Methods

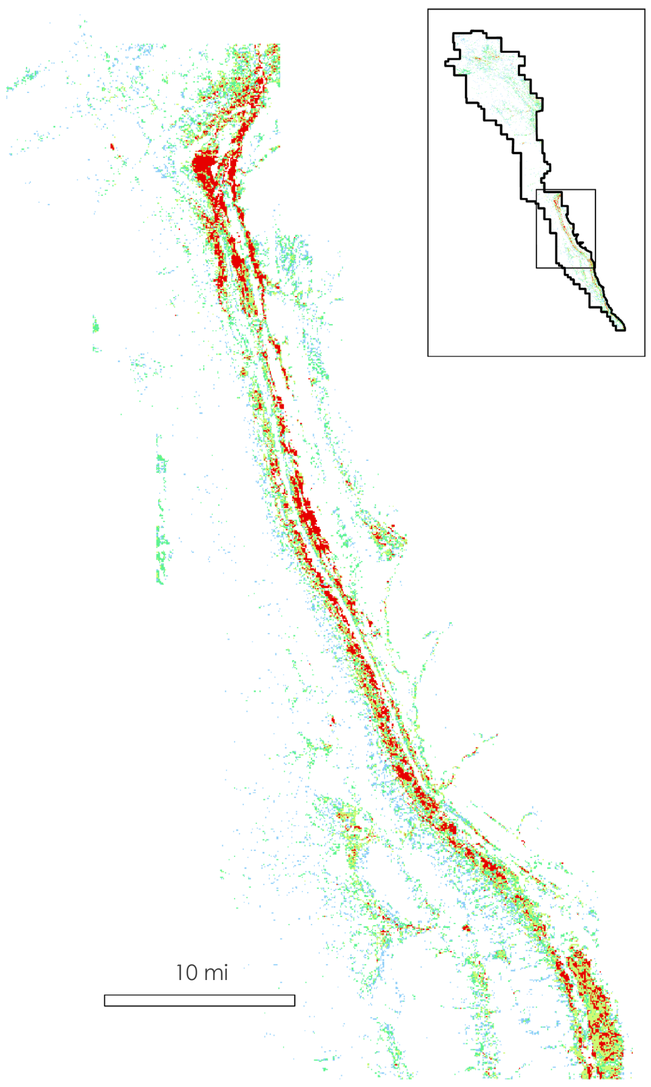



**Input Predictors:**

- Landsat 8 Imagery
- August NDVI – May NDVI
- August MSAVI2 – May MSAVI2
- May Indices: NDVI, MSAVI2, BSI, NDWI
- August Indices: NDVI, MSAVI2, BSI, NDWI
- LiDAR Height Above Ground
- SRTM Slope, Aspect, and Elevation

Random Forest Model

## Application

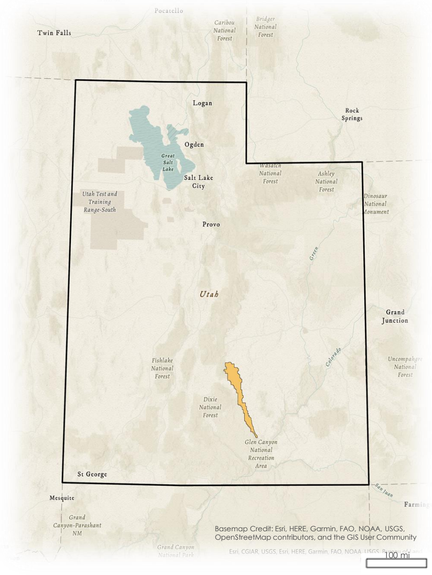



**Annual Grass Probability Map**
While detailed probability mapping of specific invasive species within CARE wasn't feasible due to project constraints, we successfully produced a 2022 grassland probability map. Leveraging the Random Forest model, this map estimates the likelihood of each pixel belonging to the grassland class, incorporating votes from decision trees. Regions with higher values or those shaded in red signify a stronger presence of annual grass. Notably, these areas are concentrated in the southeastern section of the national park.

## Results

**92%**

**Classification accuracy**
This means that when comparing the model's predictions to ground truth data, the model was accurate 92% of the time.




Rock

Grass

Shrubs

Trees

Bare Soil

**Functional Classes**
- Grass
- Bare Soil
- Rock
- Shrub
- Tree

Images (top to bottom: S. Clyde, NPS, pxful, Daniel Mayer, Albert Backer

10 mi

## Acknowledgements


The team would like to thank everyone who made this project possible:

**Partners:** Joseph Ceradini, Ecologist (CARE) Morgan Wehtje, Wildlife Biologist (CARE)

**Advisors:** Keith Weber, Joseph Spruce

**Fellow:** Ryan Healey


## Team Members


**Vanchy Li**
(Project Lead)
Clark University

**Zhenya Mazko**
University of Wisconsin-Madison

**Kyleigh Kowalski**
Idaho State University

**Drew Comin**
University of Utah


25TH DEVELOP ANNIVERSARY

Idaho – Pocatello | Summer 2023


*This material is based upon work supported by NASA through contract NNL16AA05C. Any mention of a commercial product, service, or activity in this material does not constitute NASA endorsement. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration and partner organizations.*