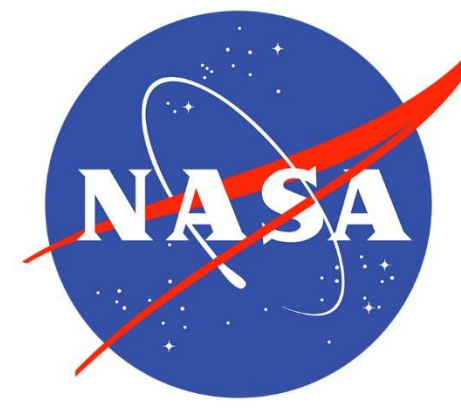


Utilizing NASA Earth Observations to Develop a Land Use Change Detection Tool for Habitat Conservation Plan Areas



Abstract

Habitat Conservation Plans (HCPs) were designed to protect and manage areas where desired economic development is in conflict with the needs of threatened and endangered species. Each plan is developed through collaboration between United States Fish and Wildlife Service (USFWS) and a landowner or other project proponent. Regulations restrict activities within HCP boundaries to minimize impacts to listed species while still allowing for land development. The USFWS does not have the capacity to closely monitor and assess the millions of acres of private- and publically-owned lands to ensure compliance with restrictions. In order to assist monitoring efforts by the USFWS, a methodology was constructed that uses remote sensing data and the Normalized Difference Vegetation Index (NDVI) to detect land use change. Past land use change from 1995 to 2017 in the Pacific Southwest HCPs was analyzed. This methodology used publically available satellite data from Landsat 5, Landsat 8, and Sentinel-2, and was implemented in the open source Google Earth Engine (GEE) API. The USFWS will be able to use this tool on the GEE platform to continue evaluating HCPs for disturbance, saving significant travel time and effort.

Objectives

- ▶ **Utilize** Landsat 5 and Landsat 8 imagery to derive interannual NDVI and relative greenness values for Habitat Conservation Plan areas in California
- ▶ **Identify** areas that have undergone significant land cover change between 1995 and 2017, and assess possible causation
- ▶ **Create** a tool to assist US Fish and Wildlife Service with monitoring Habitat Conservation Plan areas

Study Area

Habitat Conservation Plan areas in California

Legend

HCP Plan Areas

Other

Status

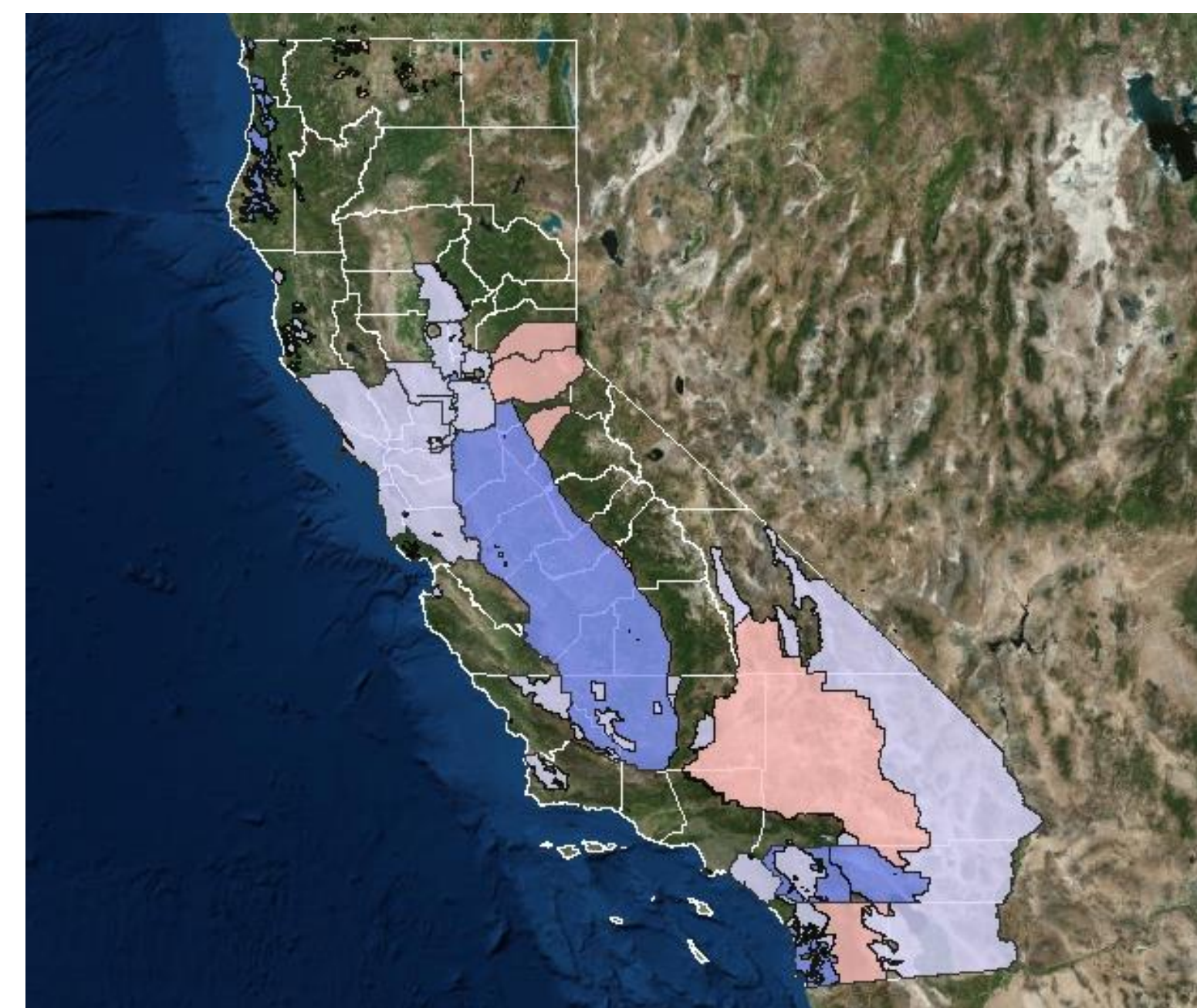
Implementation Phase

Inactive

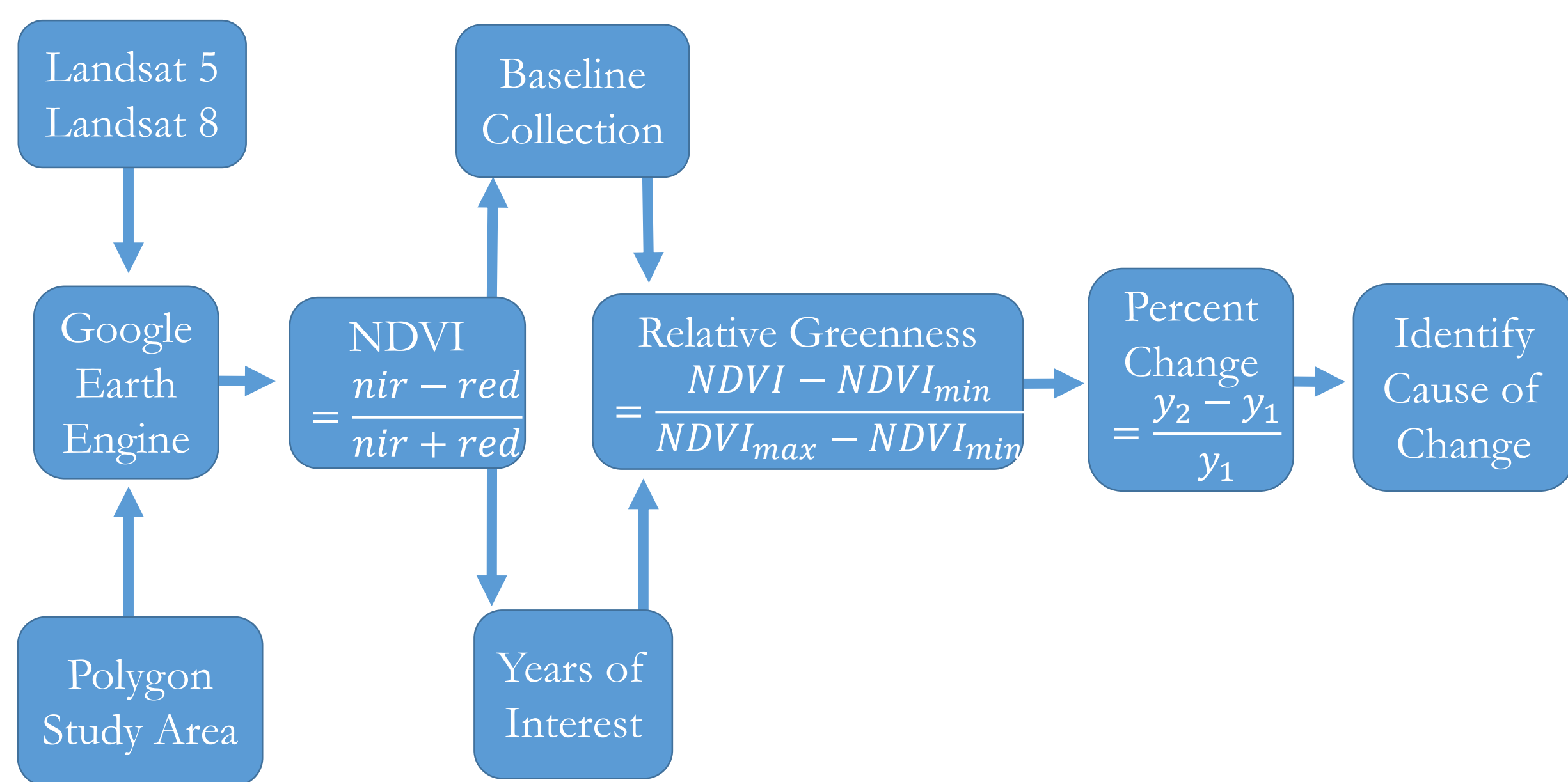
Plan Development Phase

Post Permit Phase

0 40 80 160 240 320 Miles



Methodology



Results

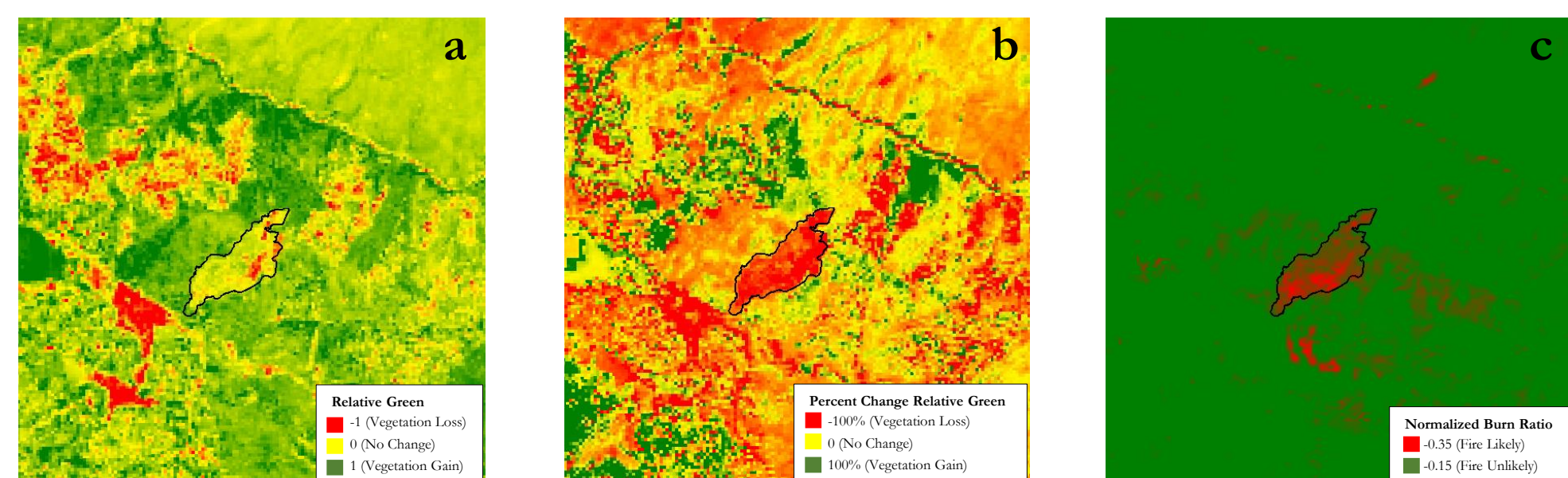


Figure 1 (a) Relative Green, (b) Percent Change in Relative Green, (c) Normalized Burn Ratio. These images show part of the Desert Renewable Energy Conservation Plan HCP and contain an outlined area where the Johnson Fire occurred in October 2016. These results were calculated from Landsat 8 images collected in November of 2016, shortly after the fire. Fig 1a and 1b display the vegetation loss that occurred in the area, and Figure 1c shows it was likely a fire that caused this loss of vegetation.

Earth Observations

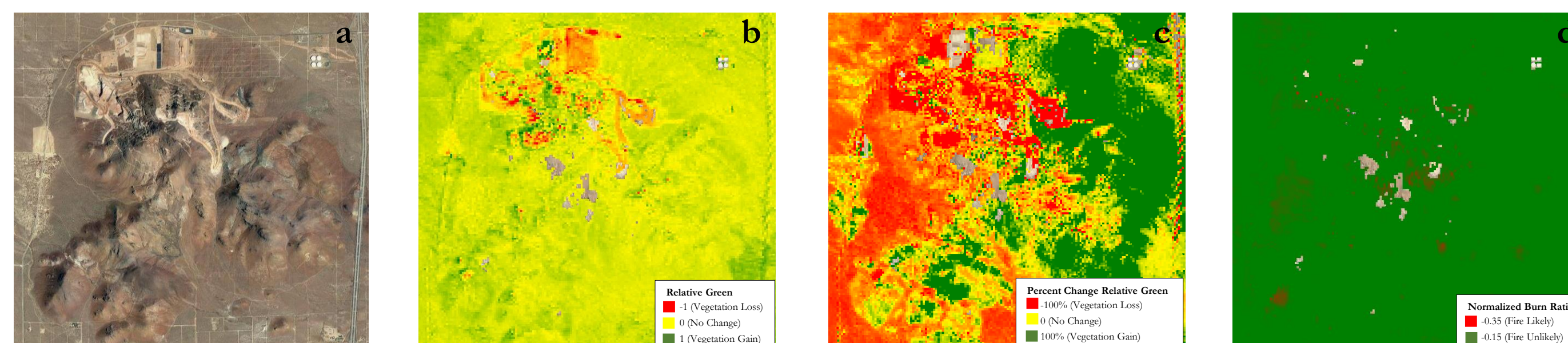


Figure 2 (a) Aerial Photo, (b) Relative Green, (c) Percent Change in Relative Green, (d) Normalized Burn Ratio. This is a Golden Queen Mine in California, also located within the Desert Renewable Energy Conservation Plan HCP. New development occurred in 2016 on the northern part of the mine. Figures 2b and 2c show the vegetation loss that occurred in this area. Fig 2d shows this change was likely not caused by a fire.

Project Partners



- ▶ Pacific Southwest Region
- ▶ Midwest Region

Team Members



Sean Robison
(Project Lead)



Elizabeth Dyer



Katie Thomas

Conclusions

- ▶ Recent appreciable land cover change can be detected using Landsat image collections.
- ▶ Normalized Burn Ratio can help indicate whether the vegetation loss was caused by a fire.
- ▶ The possible cause of change can be investigated by viewing aerial imagery, ancillary datasets, or conducting a ground survey.

Acknowledgements

Dr. Kenton Ross – DEVELOP National Science Advisor, NASA Langley Research Center

Pat Lineback – Regional GIS Coordinator; USFWS, Pacific Southwest Region

Dan Cox – Regional Habitat Conservation Coordinator; USFWS, Pacific Southwest Region

Brian Huberty – Regional NWI and Remote Sensing Coordinator; USFWS, Midwest Region

