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## Background

- Salton Sea: Drying inland lake in Southern California
- Diverted for agricultural and municipal use

### Bombay Beach

- Northeastern coast of Sea
- Water drains from fish farms, Coachella canal, Orocopia Mountains
- Water draining into sea fans out through washes and supports vegetation [1]



### Why is this important?

- Exposed shore contaminating air, danger to communities
- Aerosol dust and particulates becoming air pollutants [2]
- Not an issue individual to Salton Sea (Owens Lake)
- Wetland habitat important for migratory bird species [3]
- Contributing data to wetland conservation projects

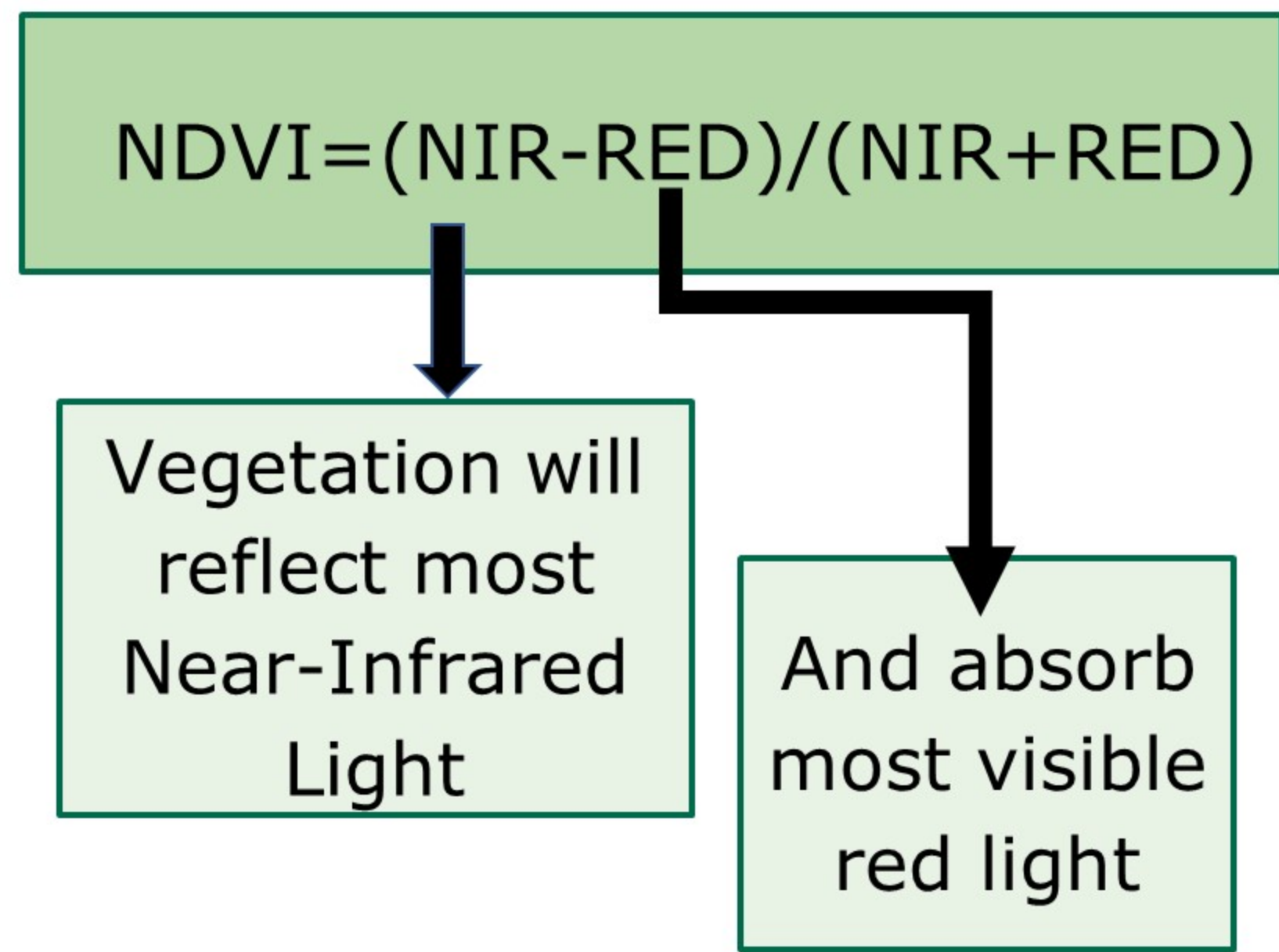
## Subquestion/Hypothesis:

*How has the distribution of vegetation and general biomass within the Bombay Beach washes changed over time?*

## Methods: 2009-2020 NAIP imagery NDVI

- Combination of aerial imagery from National Agriculture Imagery program (NAIP) and our own unmanned aerial system (UAS) flights
- Processed NAIP imagery from 2009, 2012, 2016, and 2020 using ArcGIS Pro

- Found Normalized Difference Vegetation Index (NDVI) for each year [4]
- Performed change detection analysis in ArcGIS to display biomass loss/gain each year



## Methods: 2022 Flight Data Vegetation Indices

- Flew UAS in Upper and Lower West Channel
- Used Pix4D to make 3d map of flight areas and ortho-mosaics
- Compared flight imagery to NAIP imagery with Normalized Green Red Difference Index (NGRDI) [5]

$$NGRDI = \frac{(b_G - b_R)}{(b_G + b_R)}$$



Figure 2: Laying UAS ground control points

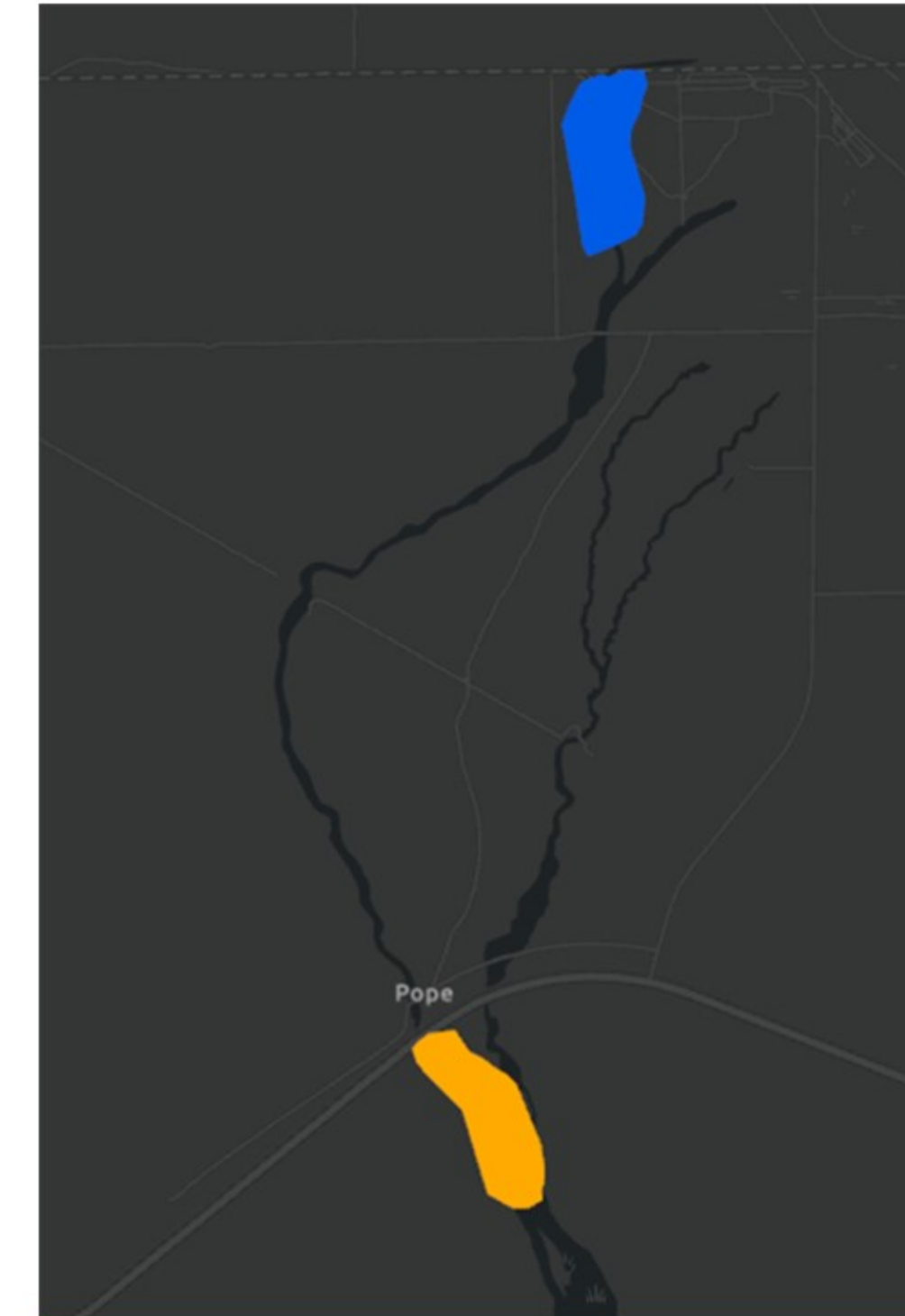
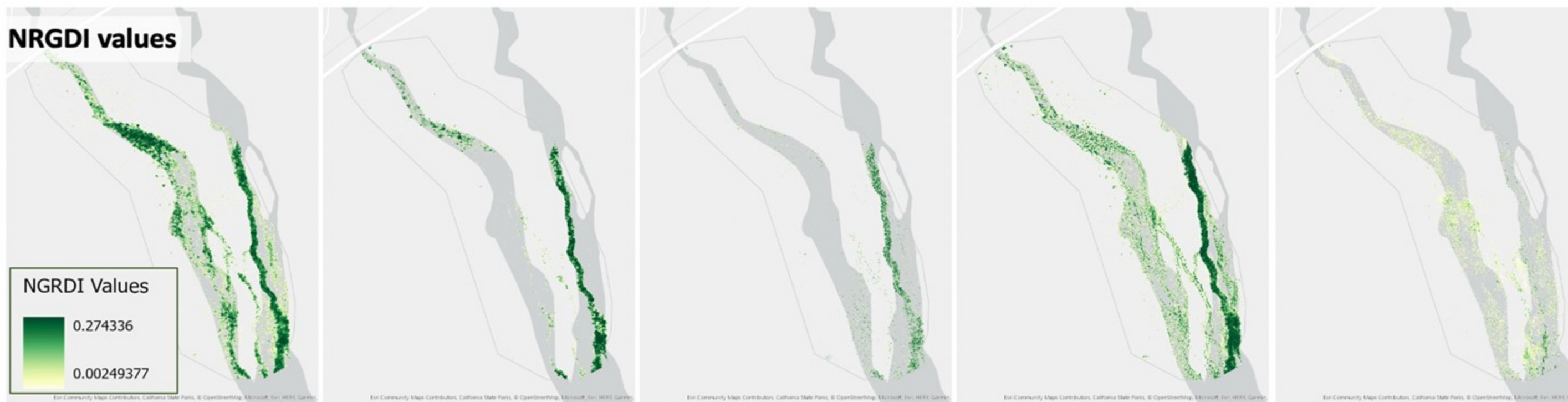
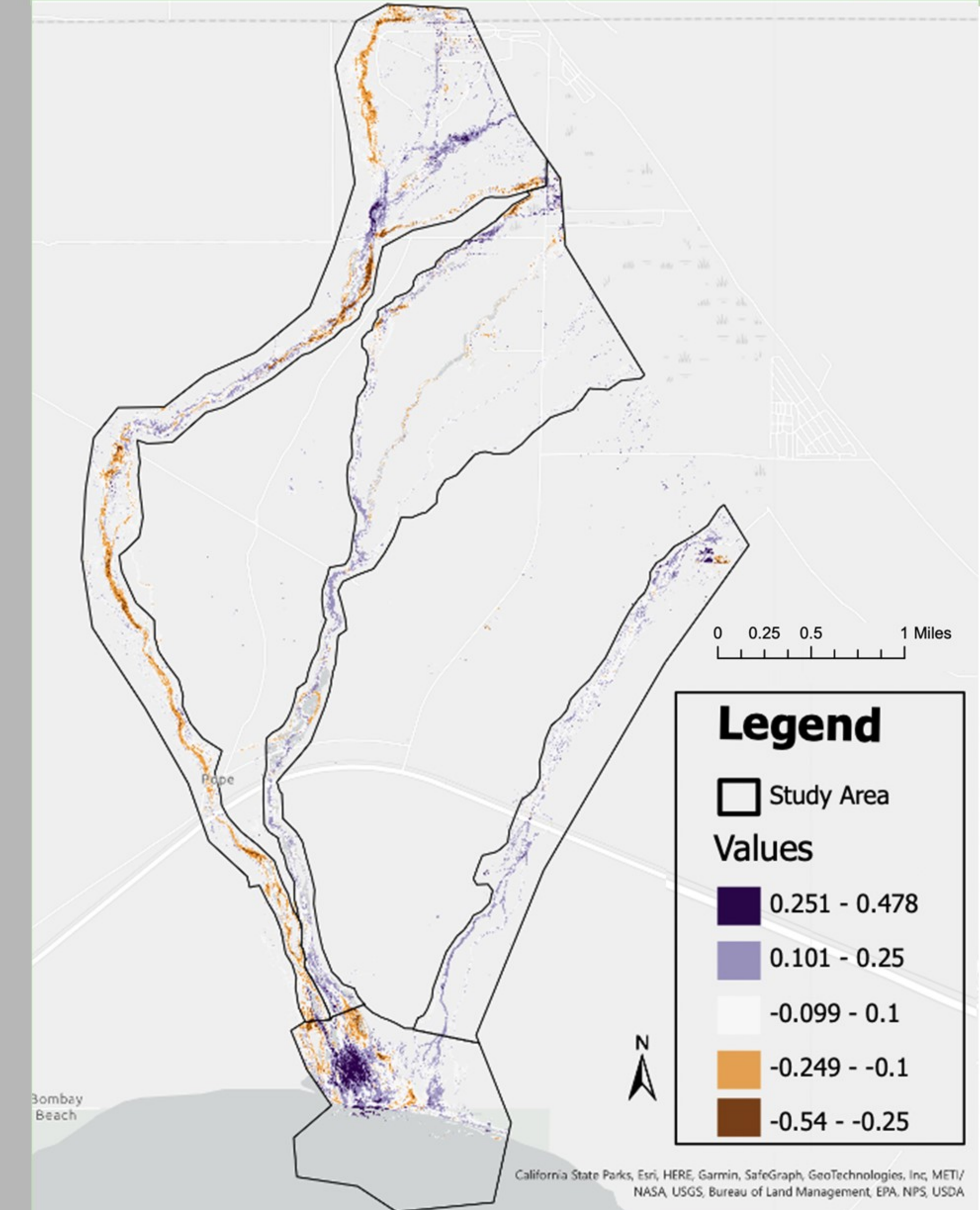


Figure 3: UAS flight locations

## Results: True Color Orthomosaics and NGRVI



## Results: 2009-2020 Vegetation Change



- Significant decrease in biomass from 2009-2022 throughout West Wash
- Recent biomass increase in East and Middle Wash and Wash convergence
- Emergent streams and changing water flow

Figure 4: Vegetation gain or loss from 2009-2022 through entire study area

## Discussion

- Conservation efforts for middle, east, and wash convergence should target berm reinforcement from storms and preserving existing vegetation
  - West wash optimal water use: dust suppression
- Will these patterns of diminishing and emerging wetlands continue?**



Figure 5: 3D west wash imagery

### Future Work

- Conduct drone flights over wider area of the washes at intervals throughout year
- Identify specific sources of water as causes of flow changes through hydrochemical studies

## References and Acknowledgements

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