

# **Climate Driven Shifts in Agricultural Land Suitability in California's Central Valley**

A GIS-BASED MULTI-CRITERIA EVALUATION UNDER CURRENT  
AND 2050 CLIMATE SCENARIOS

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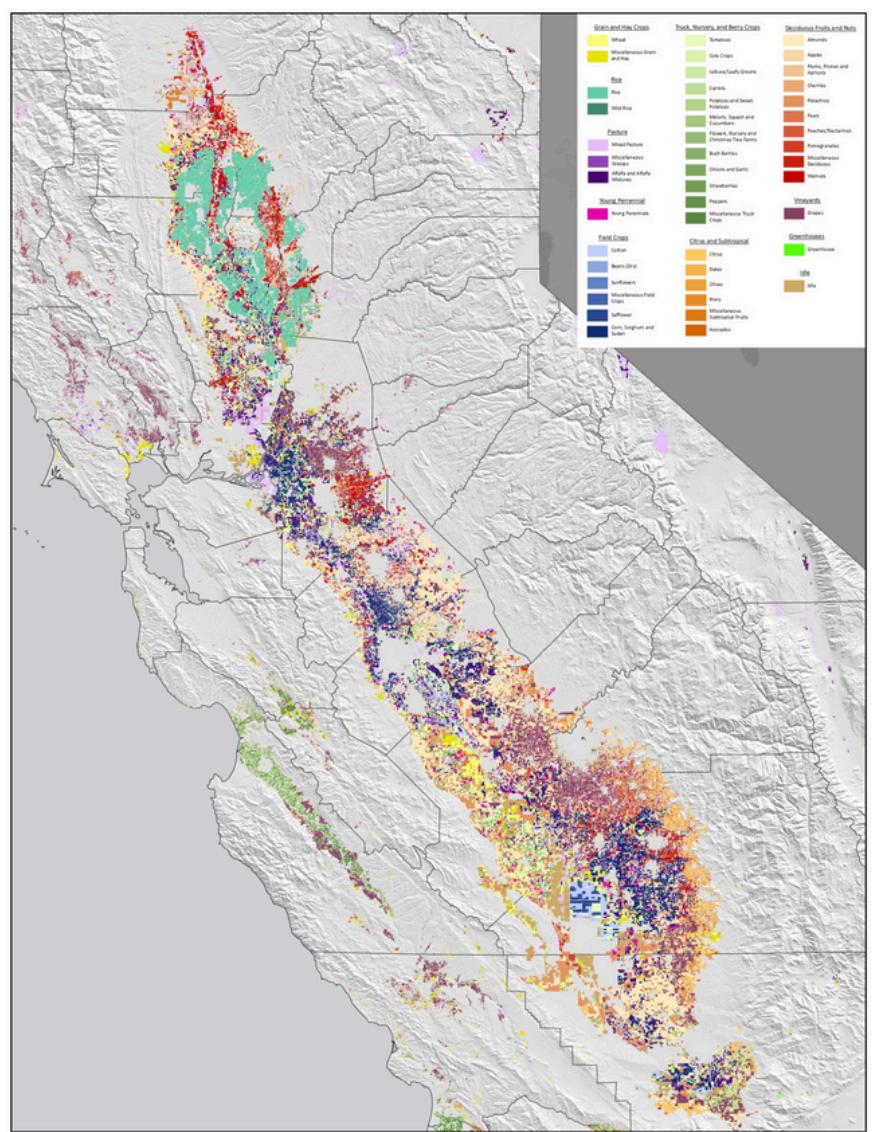
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**GEG693**

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# Background & Motivation

- California produces nearly 50% of U.S. vegetables and over 75% of U.S. fruits & nuts
  - ¾ of CA farmland in the Central Valley
- Climate vulnerabilities: droughts, groundwater depletion, salinization, extreme heat
- **Climate suitability mapping** allows for planning, resilience, and water management



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# Research Problem & Objectives

**Problem:** Climate change is altering temperature/precipitation  
→ affecting crop suitability

**Objective:** Evaluate spatial shifts in agricultural suitability using  
GIS-based MCE

## Specific goals:

- Map current suitability
- Model future suitability (2050 SSP245 & SSP585)
- Identify areas of gain/loss

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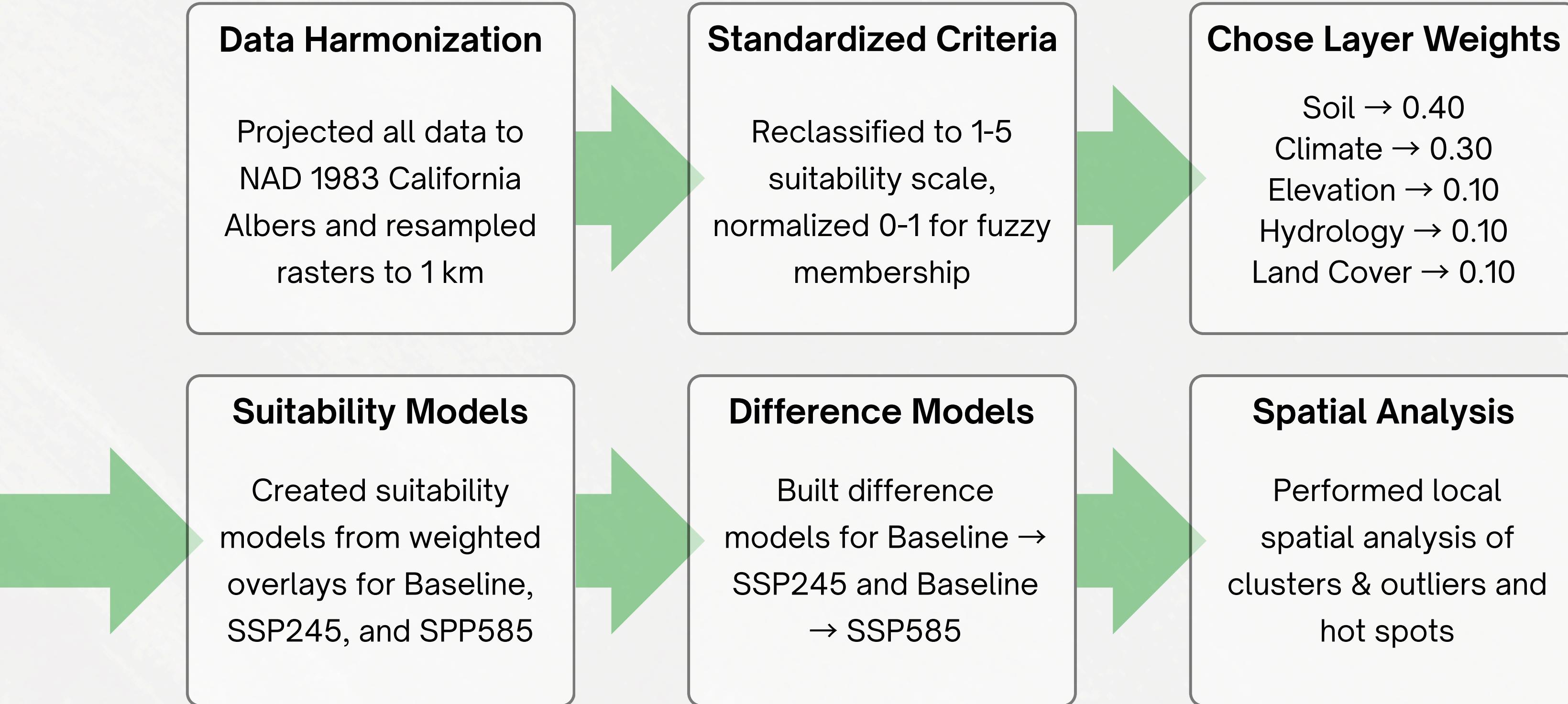
# Research Questions

- 1 What is the current spatial distribution of suitable agricultural land?
- 2 How will climate change alter suitability by 2050 (SSP245 vs. SSP585)?
- 3 Where are suitability gains, losses, or stable zones?
- 4 How can MCDA + GIS modeling produce an integrated suitability index?

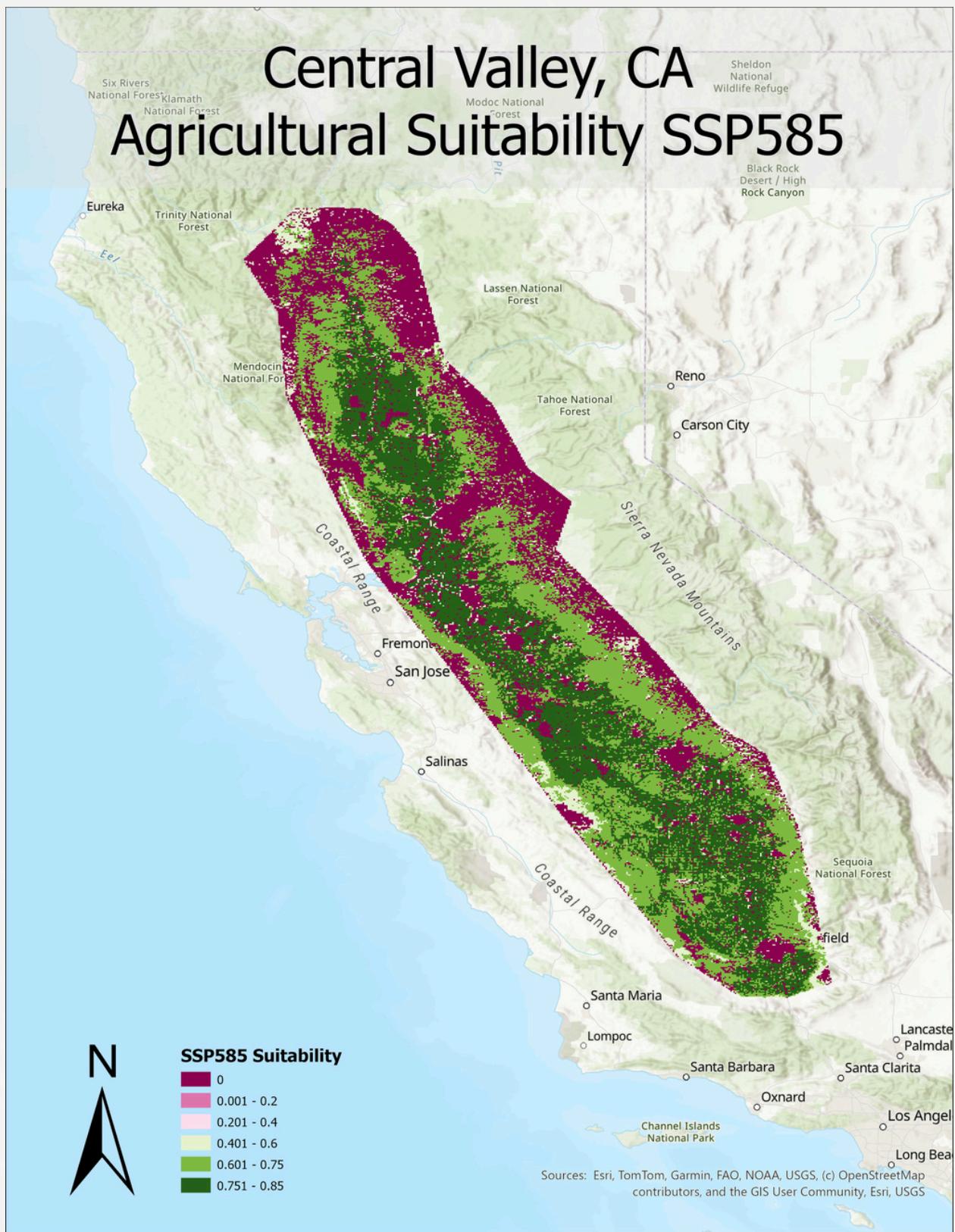
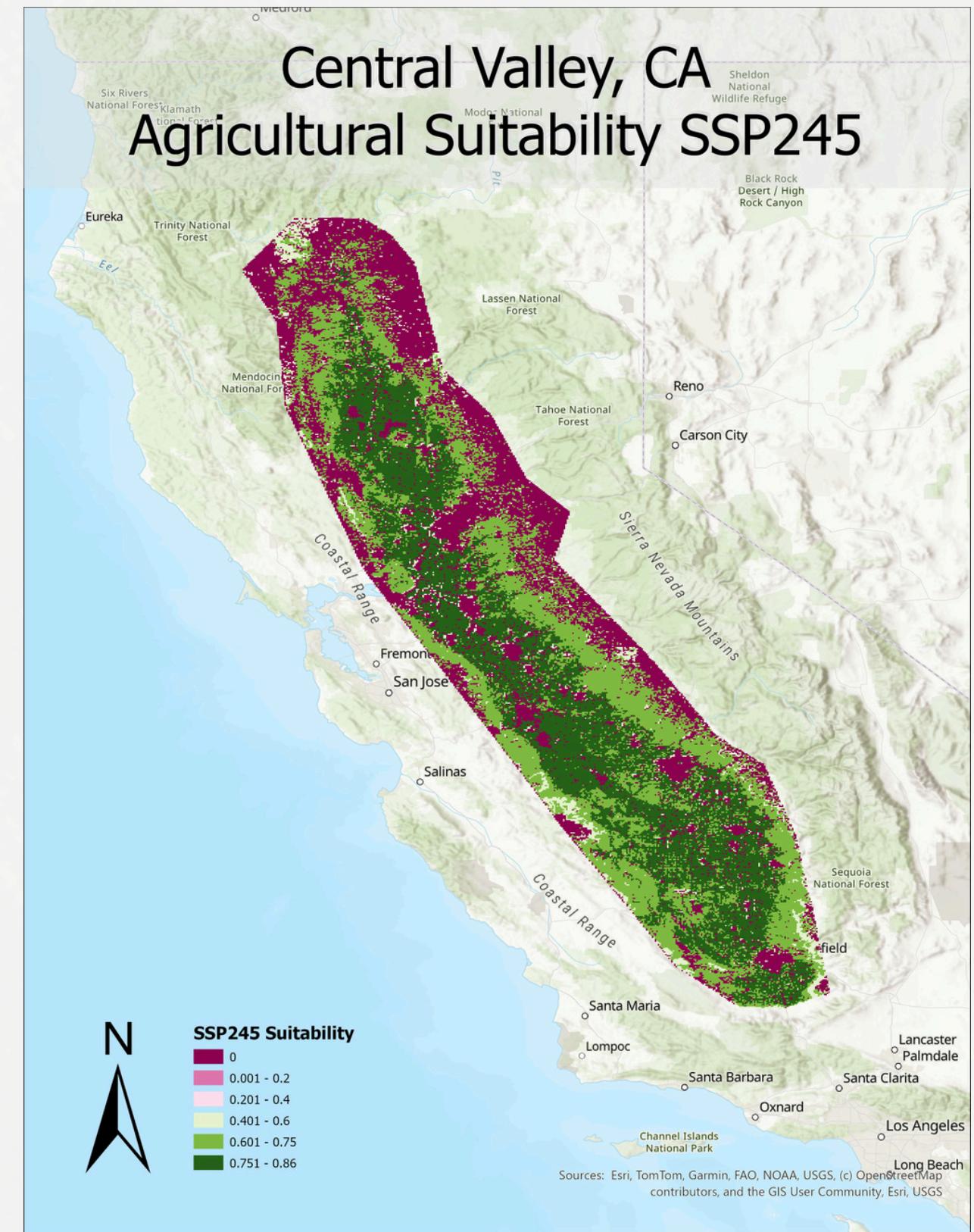
# Data Sources

| Topic      | Key Sources   | Features Used   |
|------------|---|---|
| Climate    | WorldClim v2.1 (baseline 2000-2020; CMIP6 SSP245/585) | Annual Mean Temp, Max Temp Warmest Month, Annual Precip, Precip Seasonality, Precip Warmest Month |
| Soils      | SoilGrids 2.0   | Bulk Density, Clay %, Sand %, Organic Carbon, pH  |
| Land Cover | USGS NLCD 2020  | Urban areas, Barren land  |
| Topography | USGS 3DEP DEM   | Elevation, Slope, Aspect  |
| Hydrology  | NHD 2020  | Flowlines, Waterbodies  |
| Boundaries | TIGER/Line  | Drew a polygon to represent Central Valley boundary   |

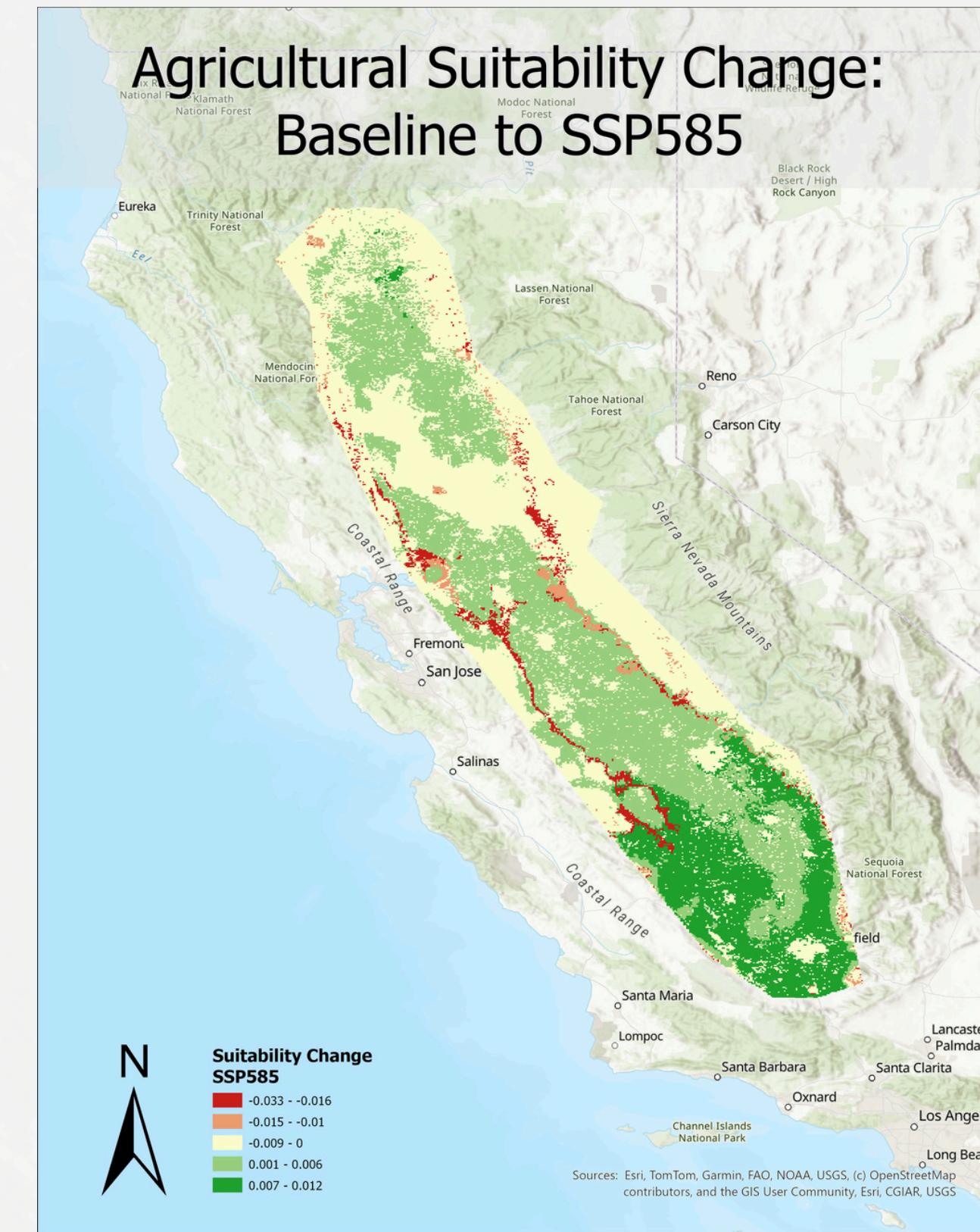
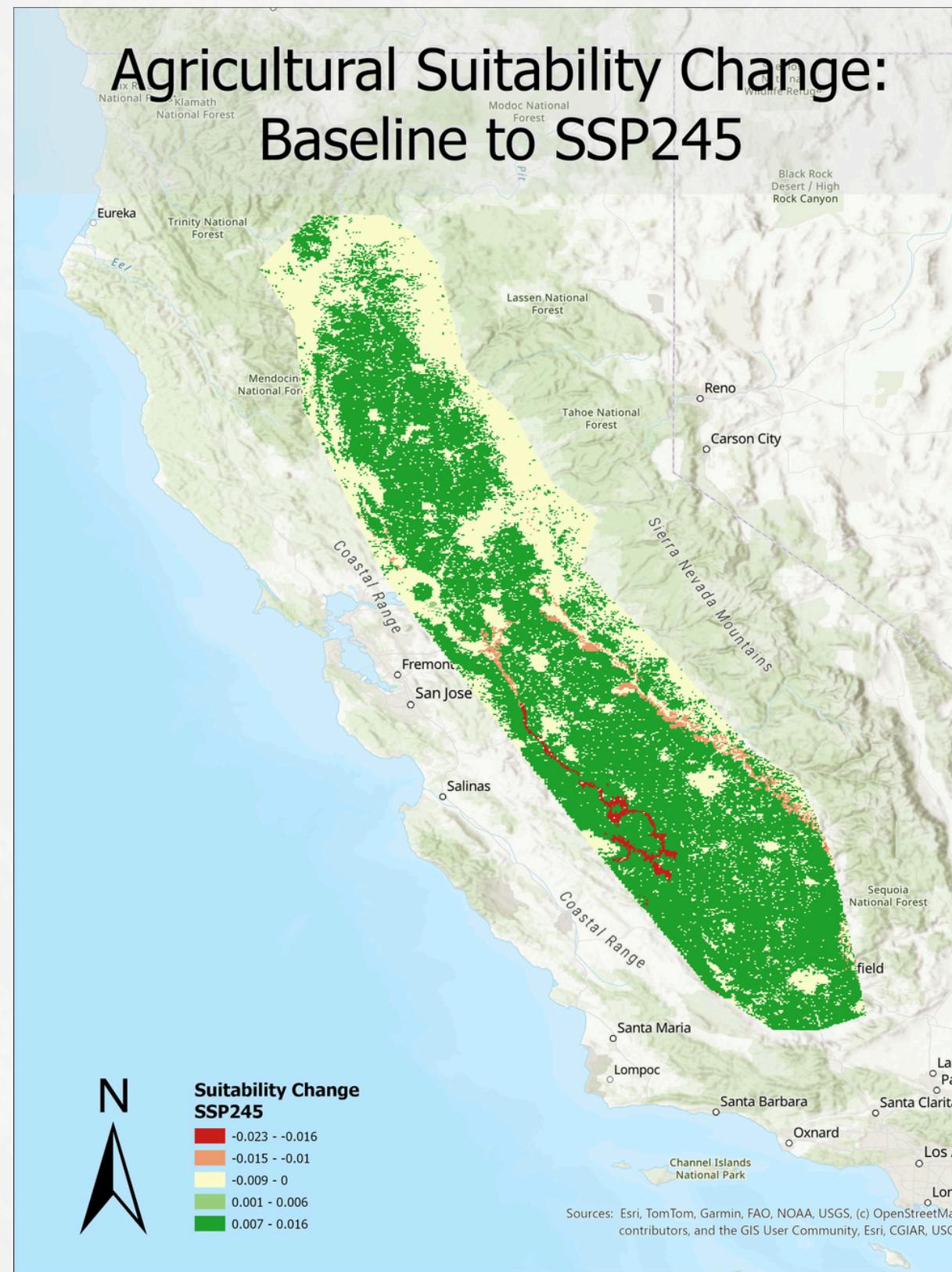
# Workflow



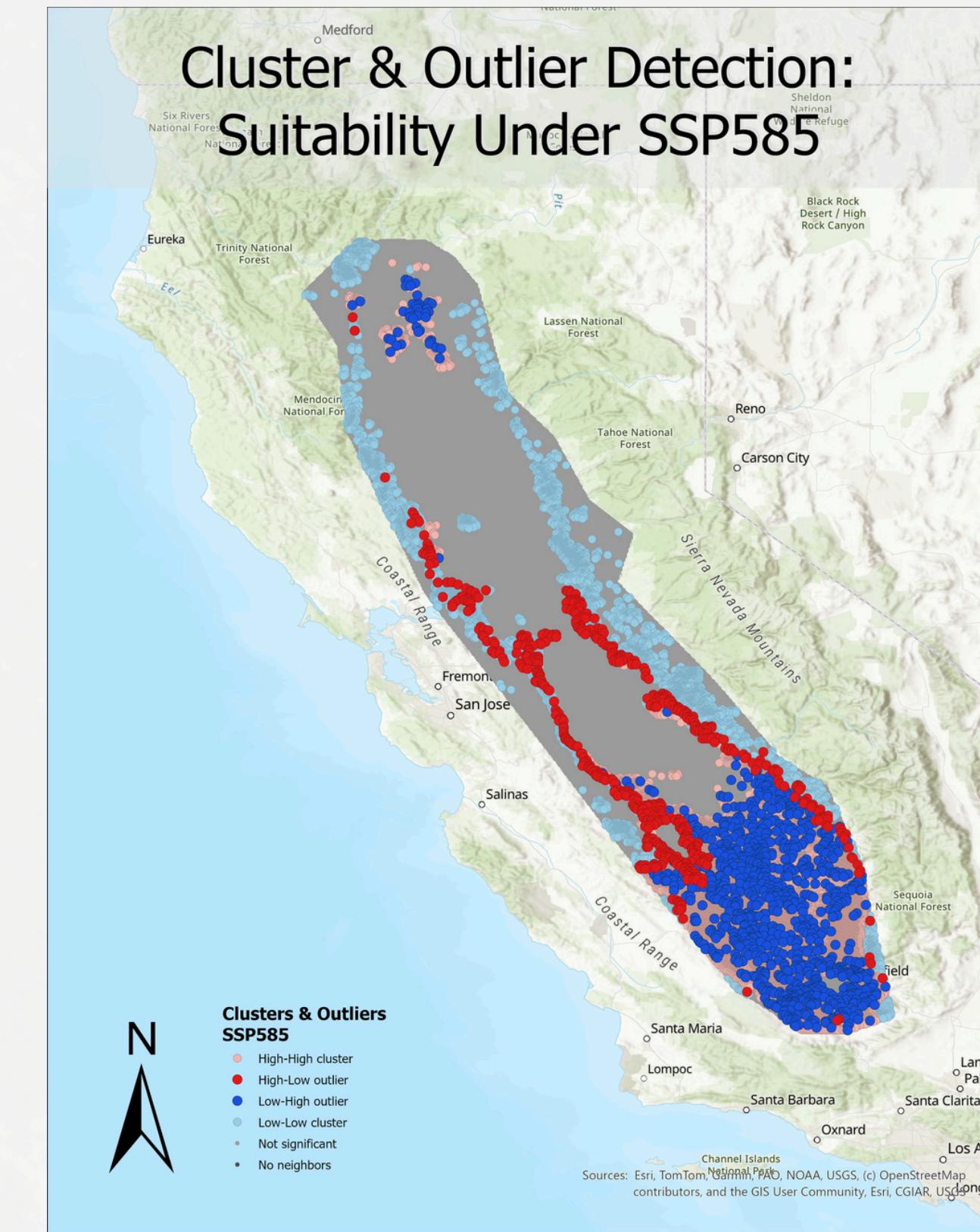
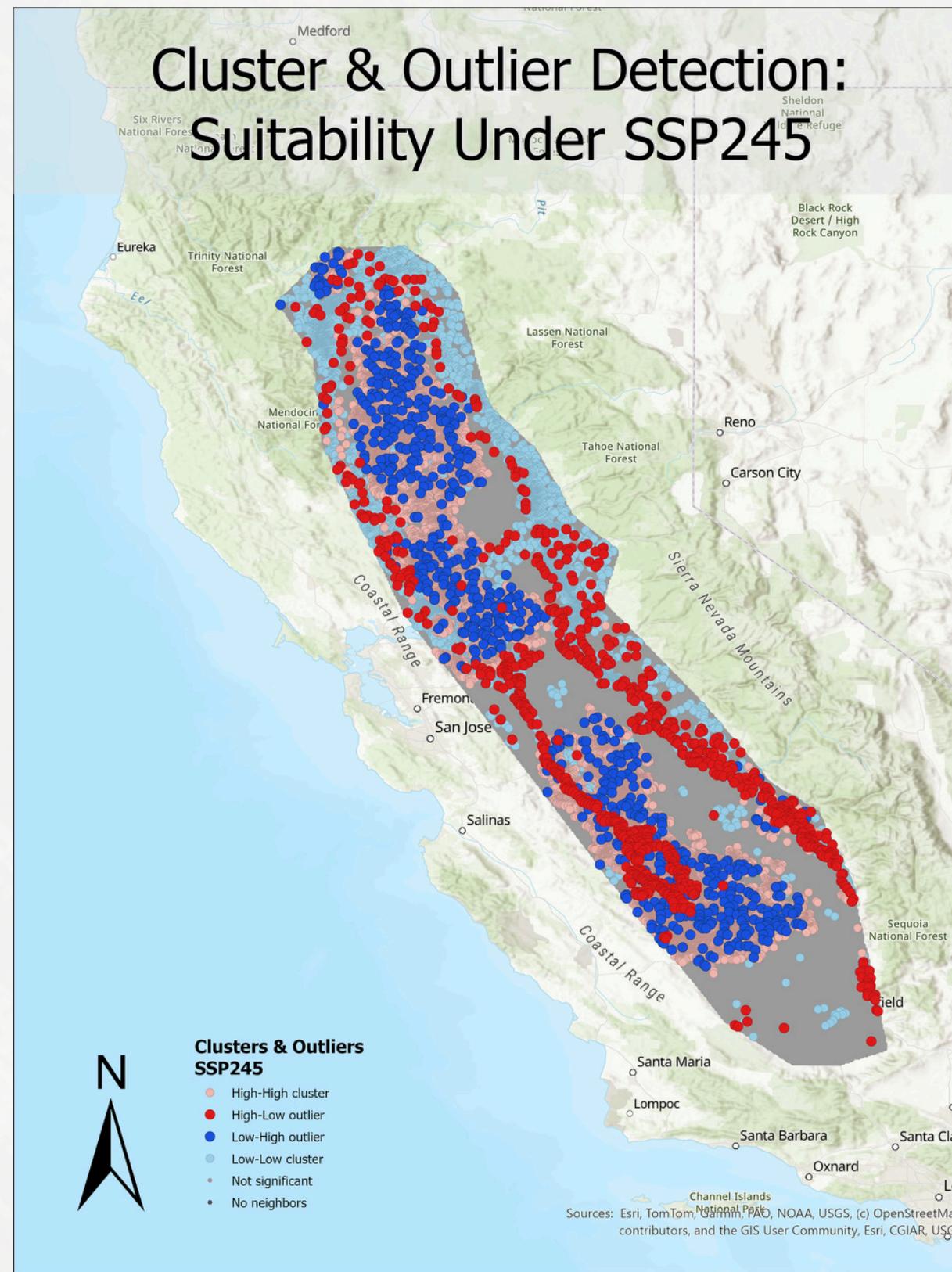
# Results & Interpretation: Sustainability Models



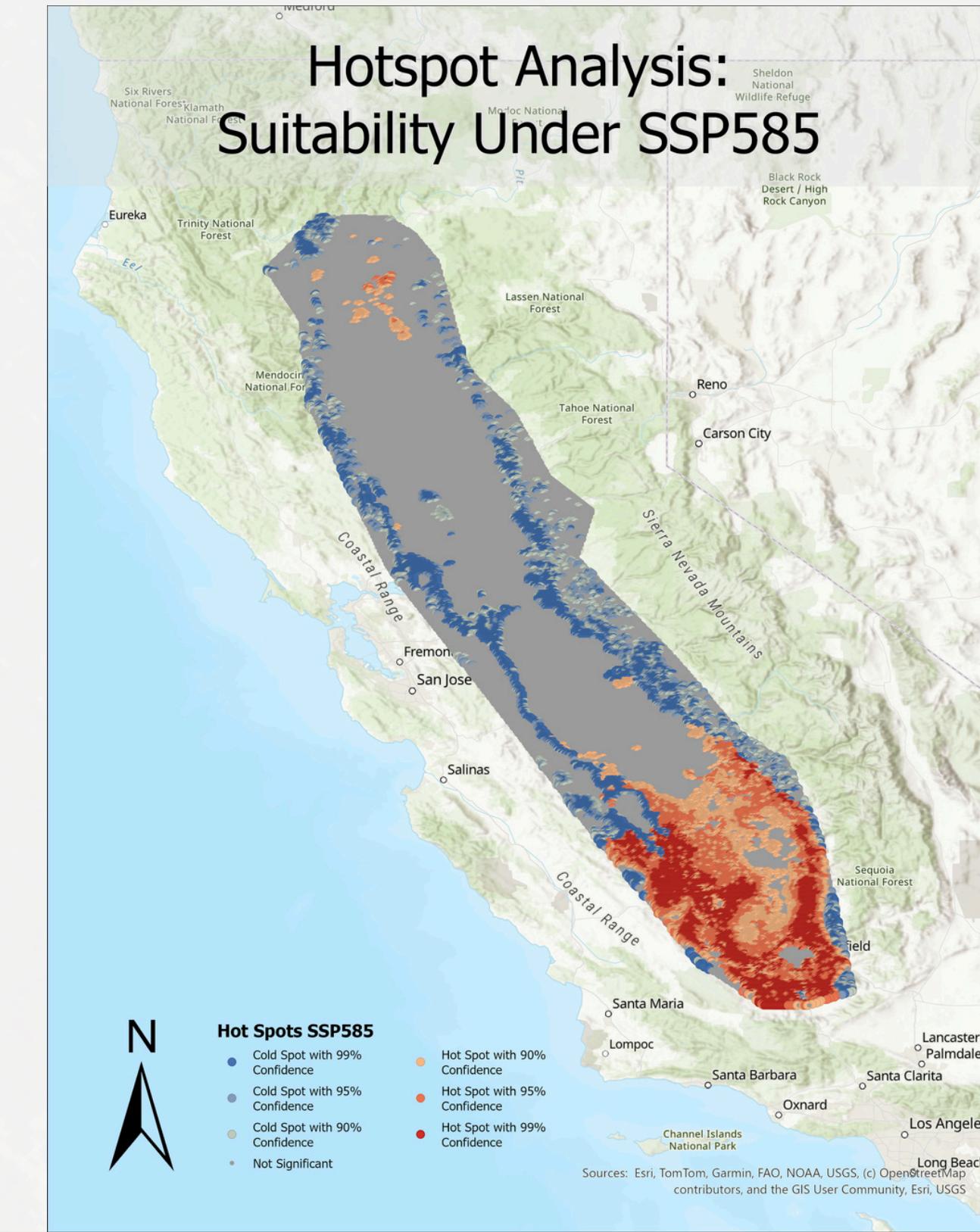
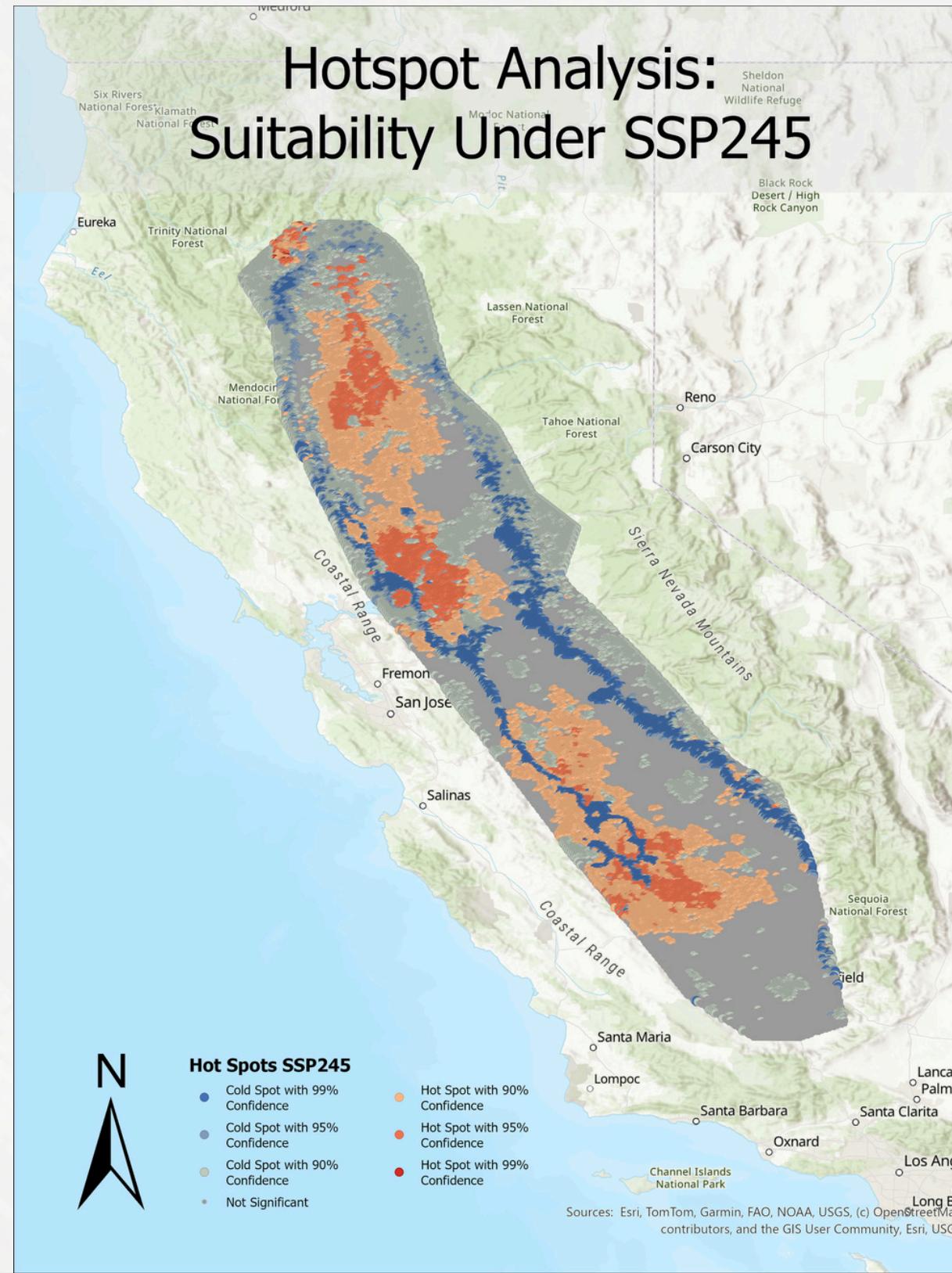
# Results & Interpretation: Suitability Change



# Results & Interpretation: Clusters & Outliers



# Results & Interpretation: Hotspot Analysis



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# Limitations, Challenges, & Future Work

## Challenges:

- Choosing coordinate system to project all data to / work in
- Deciding how to normalize variables for suitability model
- Weighting subjectivity in MCDA
- Data resolution differences

## Future Work:

- Crop-specific models
- Inclusion of groundwater trends
- Socioeconomic factors (costs, water rights, infrastructure)

# References

California Agricultural Production Statistics

Agricultural Land Use in California

A crop map for California's Central Valley

Central Valley, Britannica