

Marin County Wildland Fires II

Improving Fire Suppression Modeling to Inform Fire Prevention and
Suppression Decisions in Marin County, CA

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25TH DEVELOP
ANNIVERSARY

STUDY AREA & PERIOD

2018 - 2022



Sources: Esri, HERE, Garmin, Intermap, INCREMENTP, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, GIS User Community



PARTNERS

Fire Foundry

- Workforce Development Program
- Serves underrepresented communities



Source: FIRE Foundry/ Thomas Azwell

Marin County Fire Dept (MCFD)

- Responsible for all wildfires within Marin County



Source: Alan Dep/ Marin County Fire Department

COMMUNITY CONCERNS



Threat to **human life**



Potential for **infrastructure damage**



Destruction of natural areas



Source: California Highway Patrol



OBJECTIVES

1.

Create a **Suppression Difficulty Score** (SDS)

2.

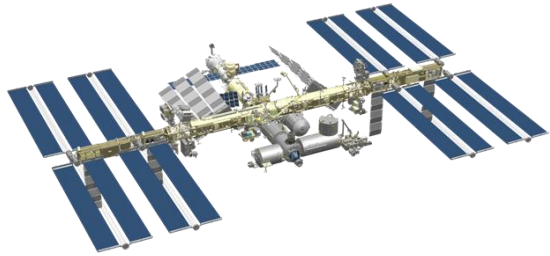
Classify and rank PODs with a localized **Suppression Difficulty Score**

3.

Develop **Enviromental Justice** indicators for at-risk communities



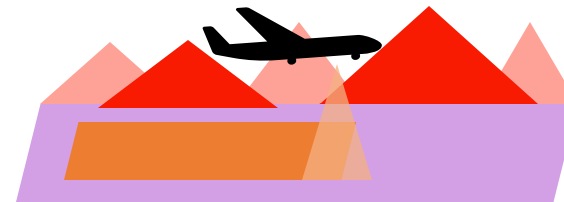
Earth Observation Platforms and Sensors



*International Space Station
(ISS)- ECOSTRESS*



Sentinel-2 MSI



LiDAR Aerial Survey

OBJECTIVES

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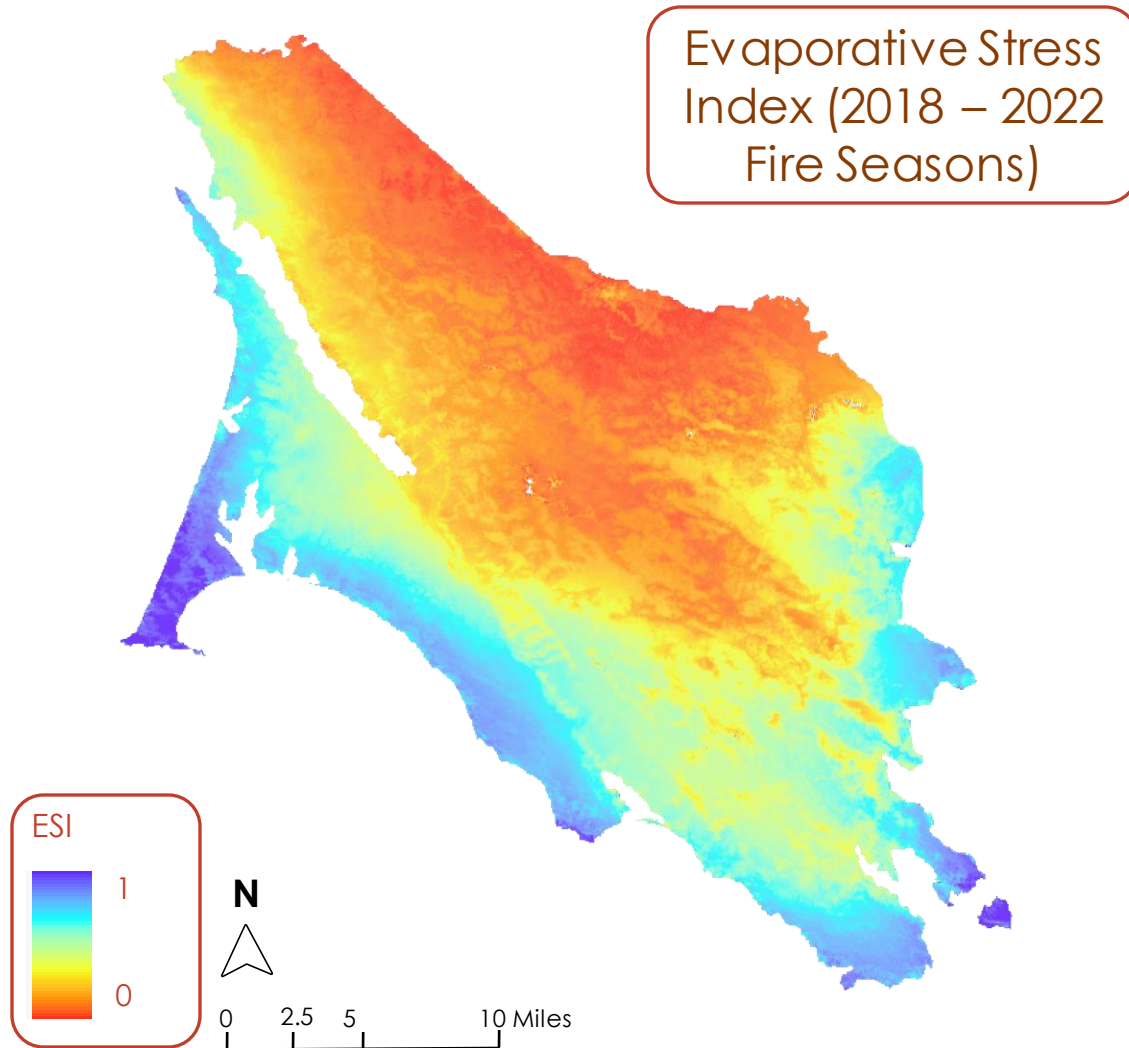
Identify and rank **Potential Operational Delineations** (PODs) using SDS

3.

Develop **Enviromental Justice** indicators for at-risk communities



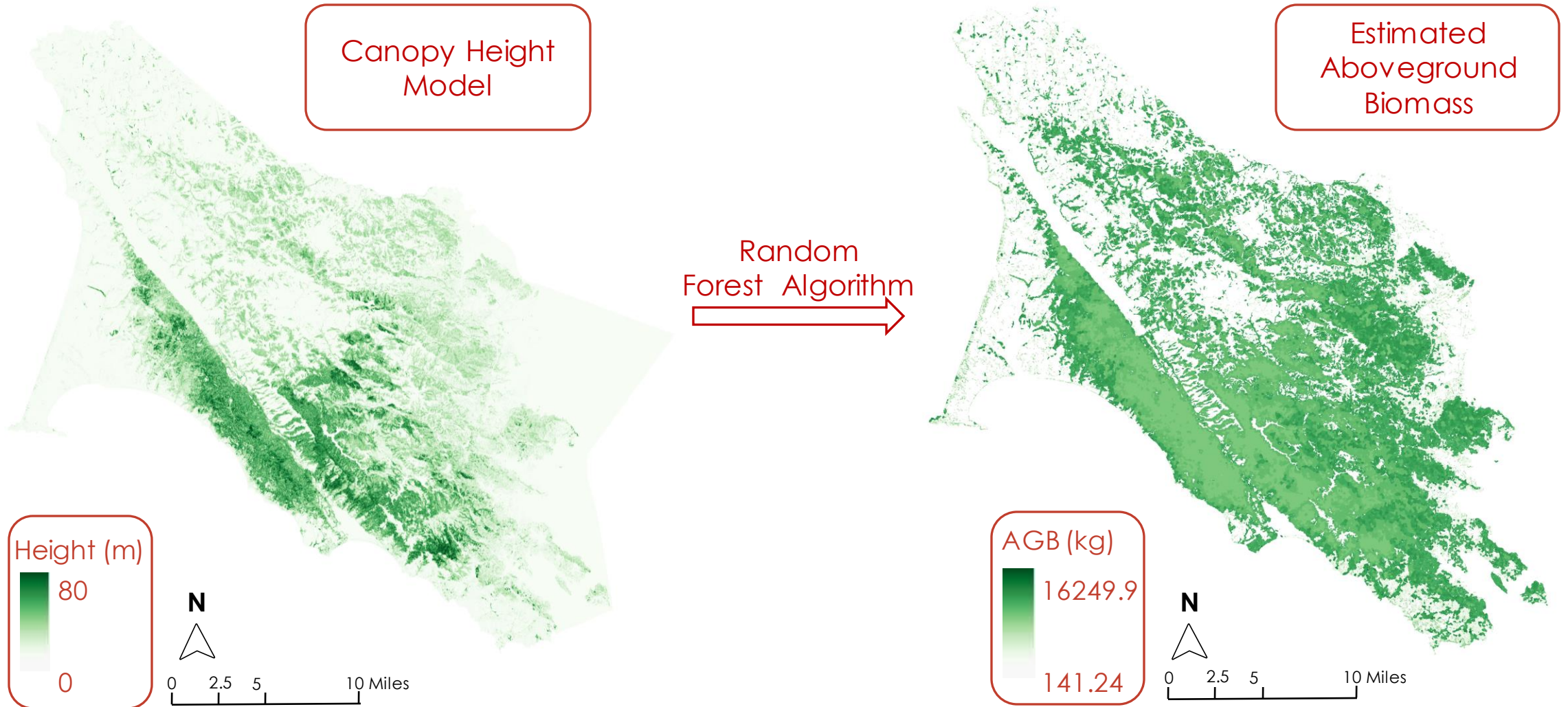
Data Processing: ECOSTRESS



- The ESI values indicate vegetation evapotranspiration potential
- Lower ESI values correspond to drought

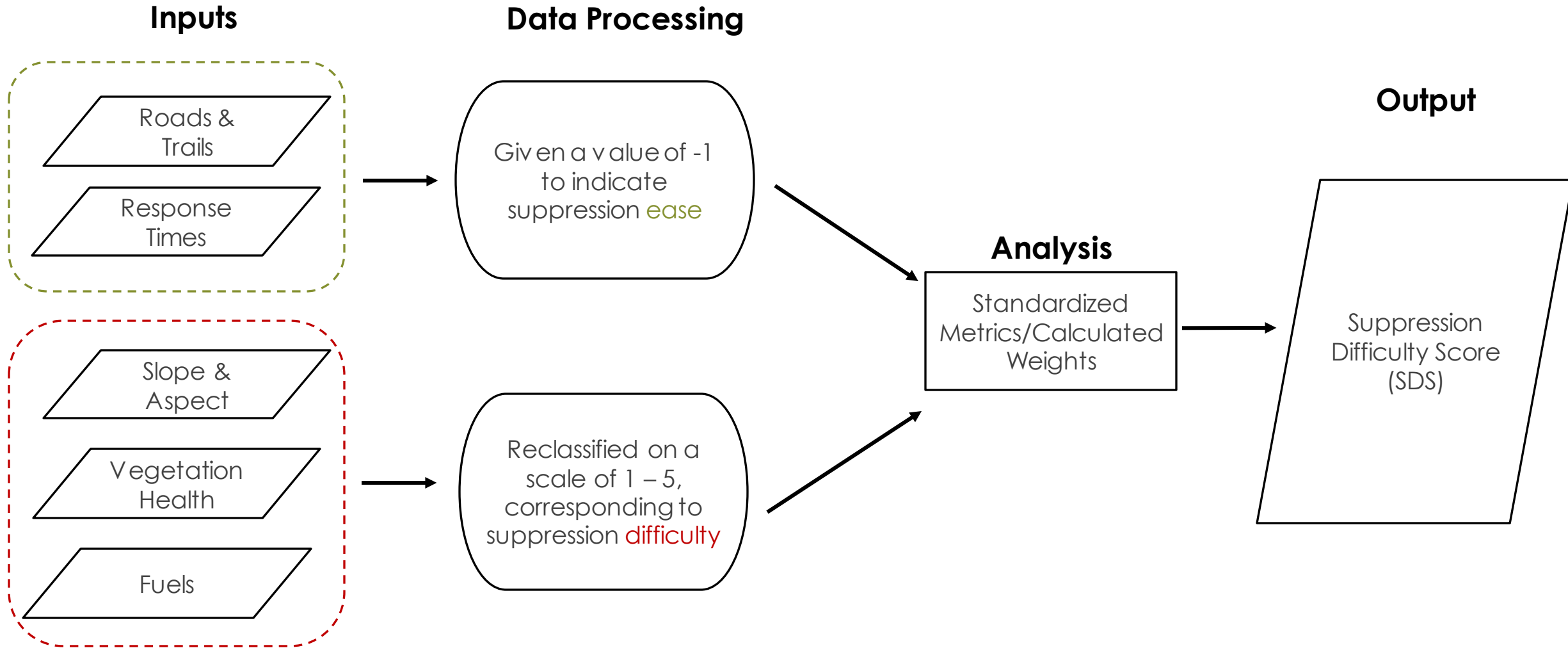
Sources: ECOSTRESS, AppEARS

Data Processing: Aboveground Biomass (AGB)

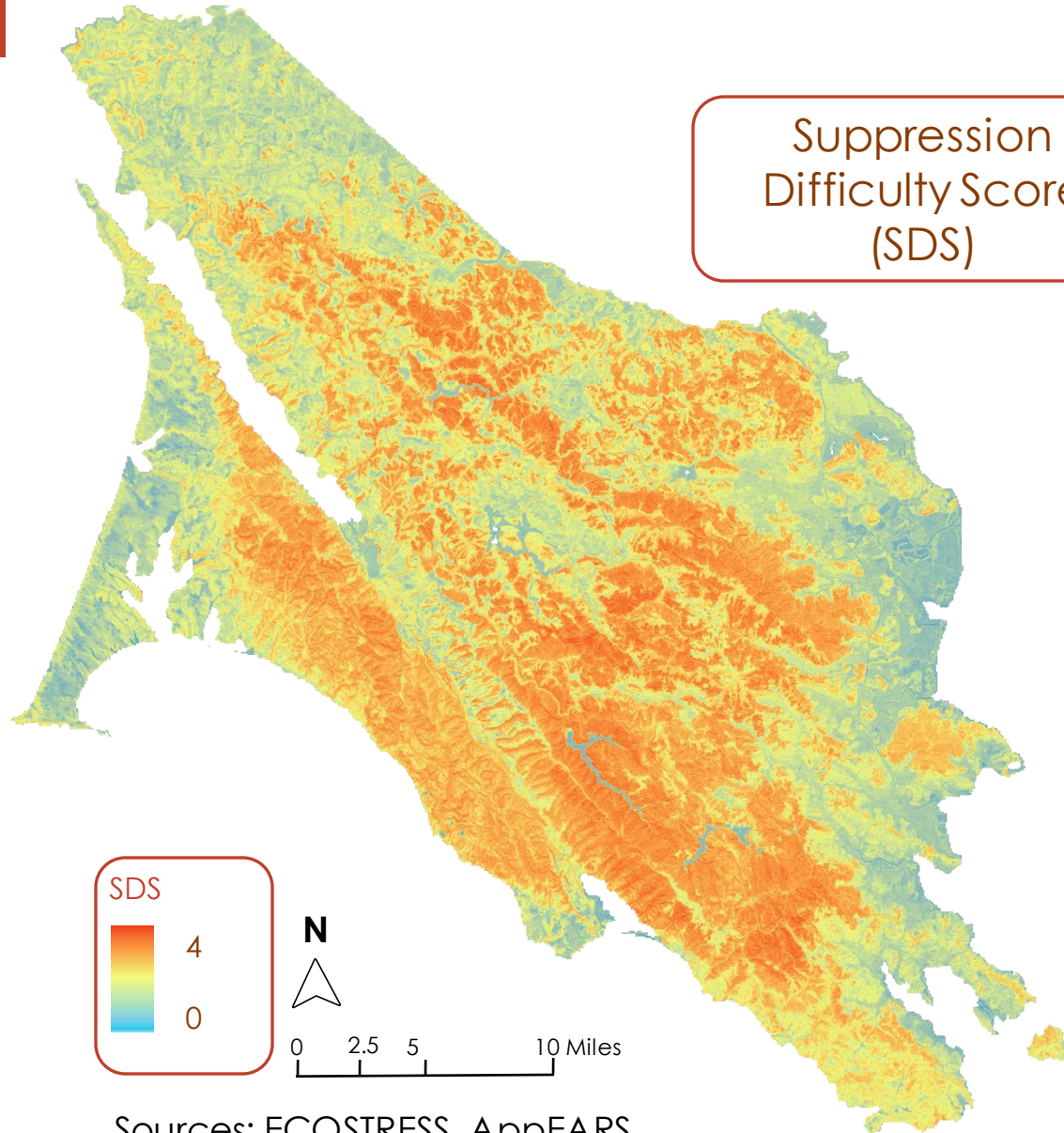


Source: Forest Observatory, NEON (National Ecological Observatory Network)

Data Analysis: Suppression Difficulty Score



Results: Suppression Difficulty Score



- Red/Orange areas indicate more difficult fire suppression
- Blue/Green areas indicate easier fire suppression

Sources: ECOSTRESS, AppEARS

OBJECTIVES

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Create a **Suppression Difficulty Score** (SDS)

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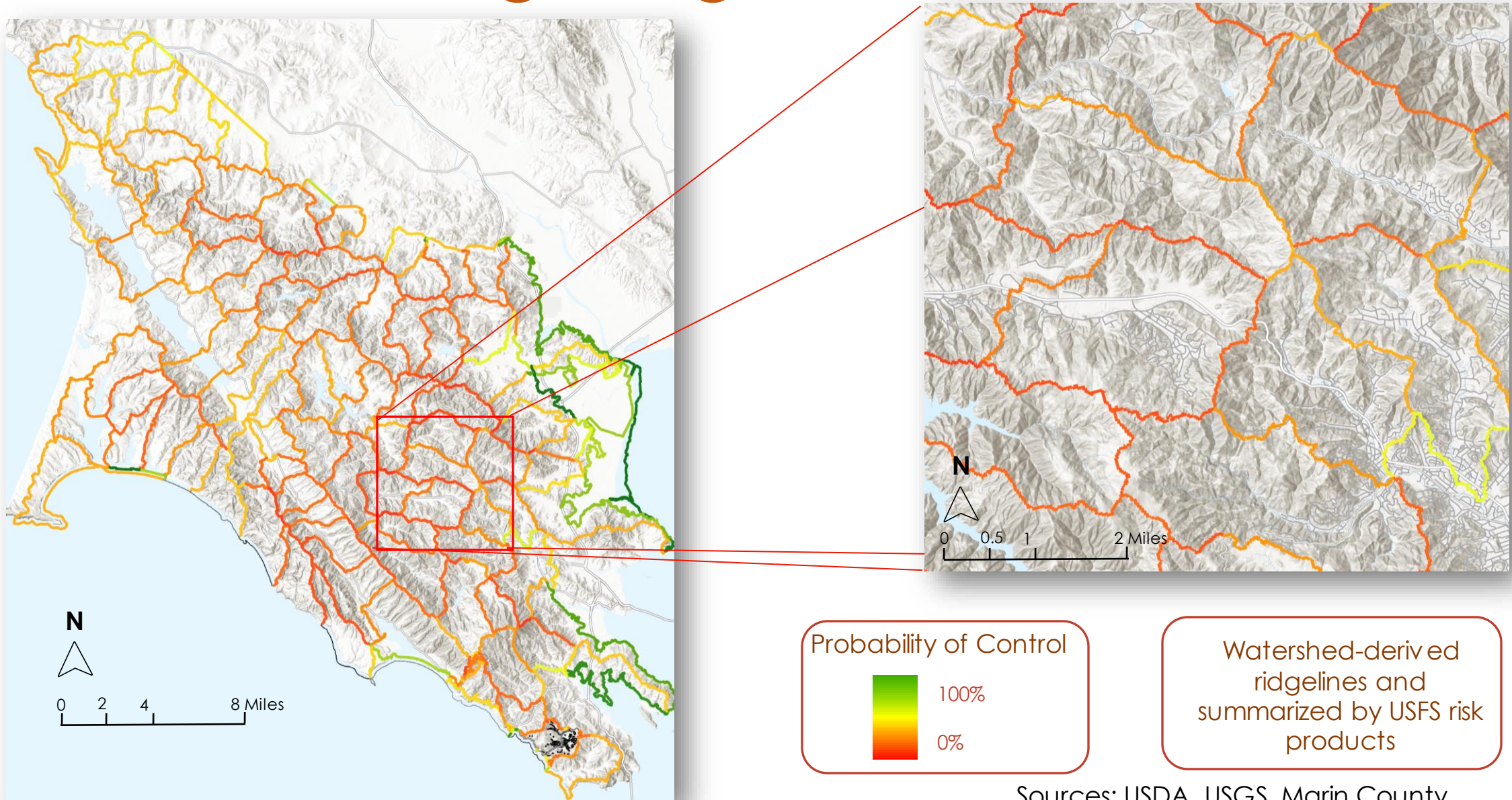
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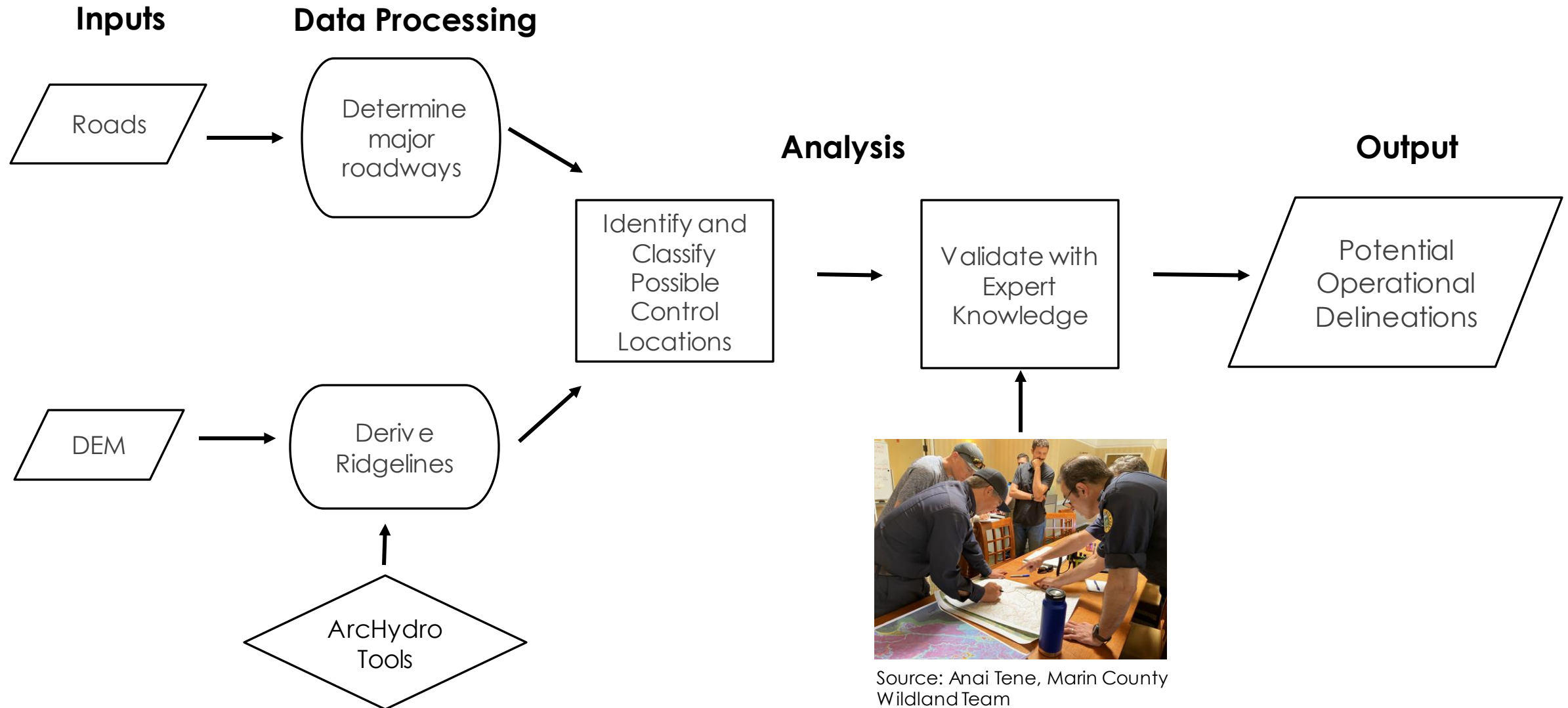
Develop **Enviromental Justice** indicators for at-risk communities



Data Processing: Ridgelines

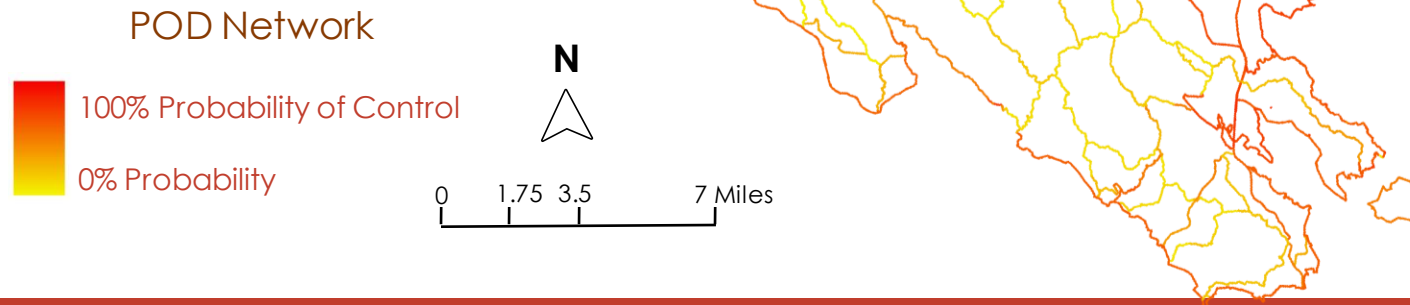


Data Analysis: Potential Operational Delineations

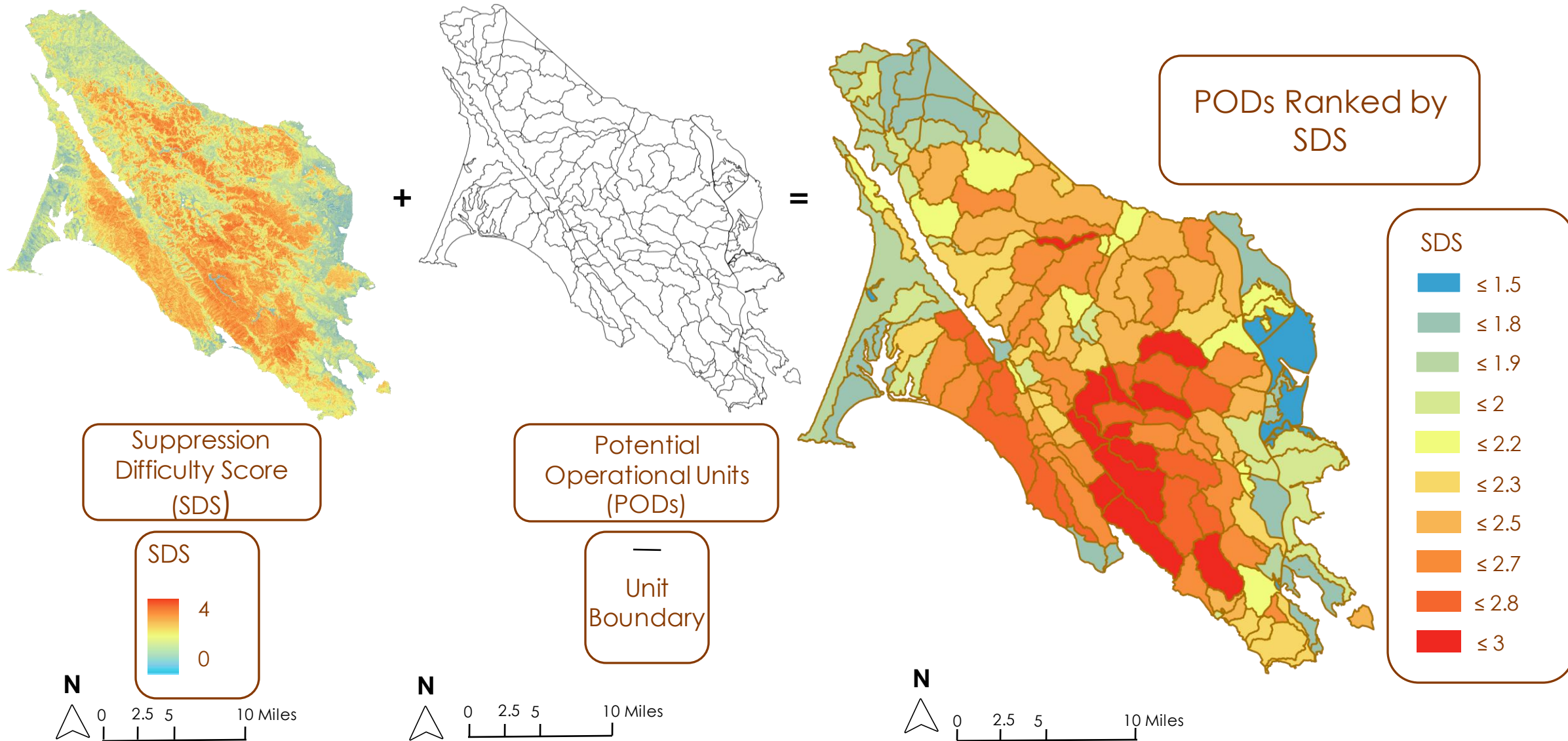


Results: Potential Operational Delineations (PODs)

78.5% of expertise-identified POD boundaries align with GIS-determined Potential Control Locations



Results: PODs Ranked by Suppression Difficulty



Sources: ECOSTRESS, AppEARS

Sources: One Tam, Marin County

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Identify and rank **Potential Operational Delineations** (PODs) using SDS

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Develop **Enviromental Justice** indicators for at-risk communities



Data Analysis: Evacuation Road Metrics



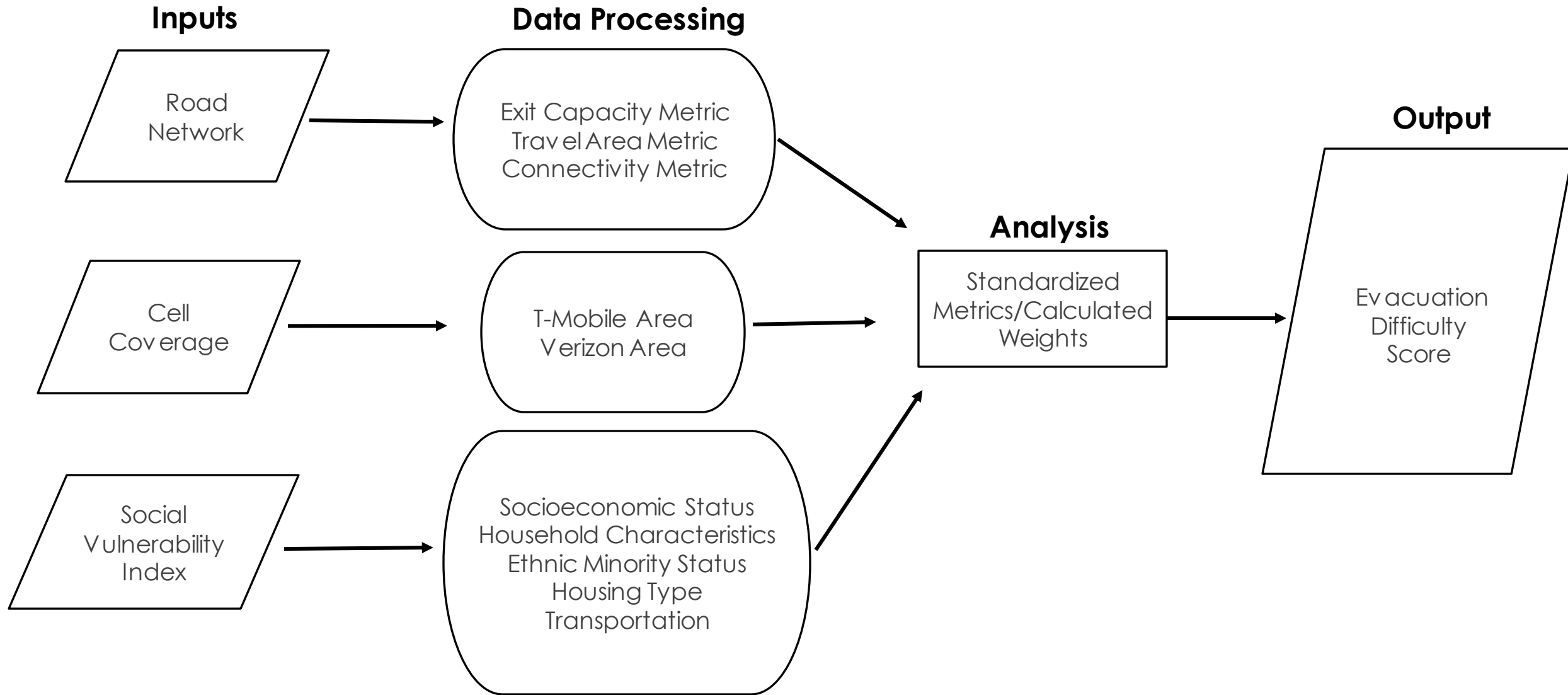
Town
Locations

Exit
Capacity

Travel Area

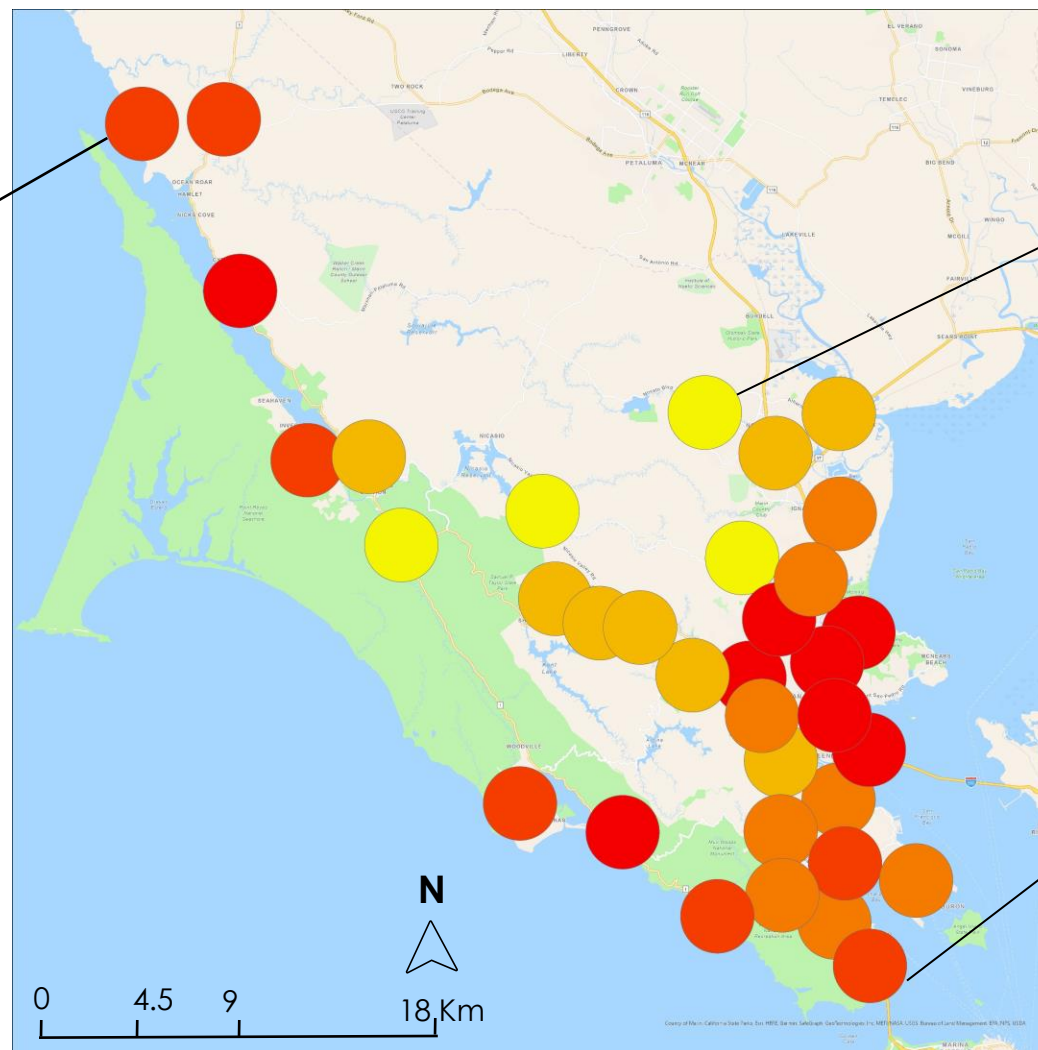
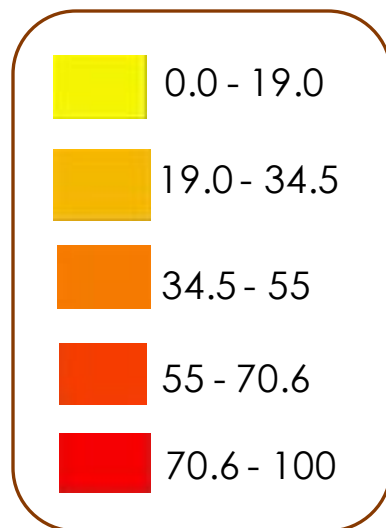
Connectivity

Data Analysis: Environmental Justice (EJ)



Results: Evacuation Difficulty Score

Dillion Beach
62.19

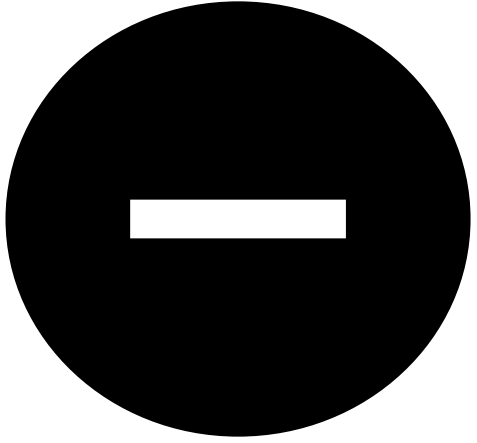


West Novato 18.90

Sausalito 67.24

Sources: Esri, HERE, Garmin, Intermap, INCREMENTP, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, GIS User Community, Marin GIS Open Data

Errors and Uncertainties



Data Limitations



Validity Concerns



Cloud Cover



Revisit Time



Future Work



Add community refuges as a parameter for the Evacuation Difficulty Score



Validate Suppression Difficulty Score using local knowledge and expertise



Assess POD Delineations by designing a workshop with MCFD



Incorporate additional parameters into the Suppression Difficulty Score



Conclusions

- A fusion of satellite and ground LiDAR data, focused on moisture, fuels, and topography, can be used to quantify fire severity in Marin's unique environment of microclimates
- PODs can be created in Marin County to identify strategic boundaries where fire could be contained and fought effectively
- Physical and social factors of evacuation difficulty can be effectively analyzed through an EJ framework



Image Credit : Fire Foundry



Acknowledgments

Partners

- **FIRE Foundry**
 - Joshua Dimon
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- Chandler Ross

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