TOOLS & RESOURCES

A review of various tools and resources that are available to support the development and management of mitigation projects.

INTRODUCTIONS

- **Presenters & Panelists:**
- Adam Drici, TNC
- Ankitha Doddanari, LCI
- Margot McDonald, Cal Poly San Luis Obispo
- Matt Malecha, Texas A&M University
- Michael Commons, FEMA Region 9
- James Kupihea, Cal OES

The Nature Conservancy

DECEMBER 5, 2024

Resources for Nature-Based Hazard Mitigation

2024 CalOES Mitigation Summit

ADAM DRICI

Agenda

- Background on TNC-FEMA partnership
- Why are nature-based solutions (NBS) for hazard mitigation important?
- Share existing and future resources

FEMA shift in policy to support nature-based solutions

2011 — FEMA issues Climate Change Adaptation Policy Statement

2013 — New policy allows **ecosystem service benefits** to be included in Benefit-Cost Analysis for acquisition projects

2016 — BCA policy updated to include use of ecosystem service benefits for **all mitigation projects**

2021 — BCA policy further updated to **remove .75 Benefit-Cost Ratio** threshold for ecosystem services

2021 — FEMA publishes ***Building Community Resilience with Nature-based Solutions:*** *A Guide for Local Communities.*

2022 — FEMA announces **$2.3 Billion in BRIC funding**; updates **ecosystem service values**; and releases alternative BCA policy with **3% discount rate**.

2023 — **64 of 125 BRIC projects selected with nature-based solutions**, FEMA publishes 2nd Guide on Nature-based Solutions – **Strategies for Success,** and new HMA Guidance emphasizing nature-based solutions

Source: Land Trust Alliance, Chelsea Welch

FEMA defines NBS

"Sustainable planning, design, environmental management, and engineering practices that weave **natural** features or processes into the built environment to build more resilient communities."

FEMA Hazard Mitigation Assistance Policy Guide

Hazard Mitigation Assistance Guidance

Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program

February 27, 2015

FEMA

Federal Emergency Management Agency
Department of Homeland Security
500 C Street, S.W.
Washington, DC 20472

2015

Hazard Mitigation Assistance Program and Policy Guide

Hazard Mitigation Grant Program, Hazard Mitigation Grant Program Post Fire, Building Resilient Infrastructure and Communities, and Flood Mitigation Assistance

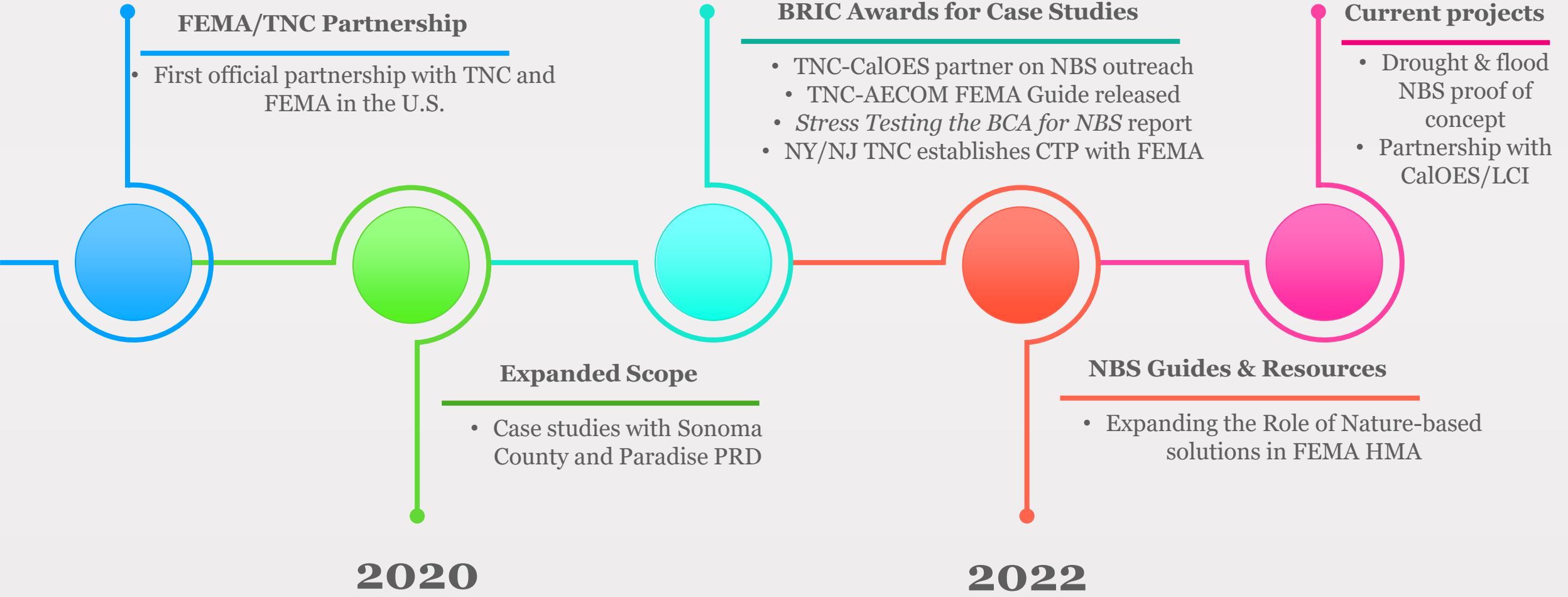
March 23, 2023

Federal Enterprise Architecture (FEA) Number: FP-206-21-0001

FEMA

2023

TNC-FEMA Partnership Timeline



Why is nature-based hazard mitigation important?

Environmental Benefits

Economic Benefits

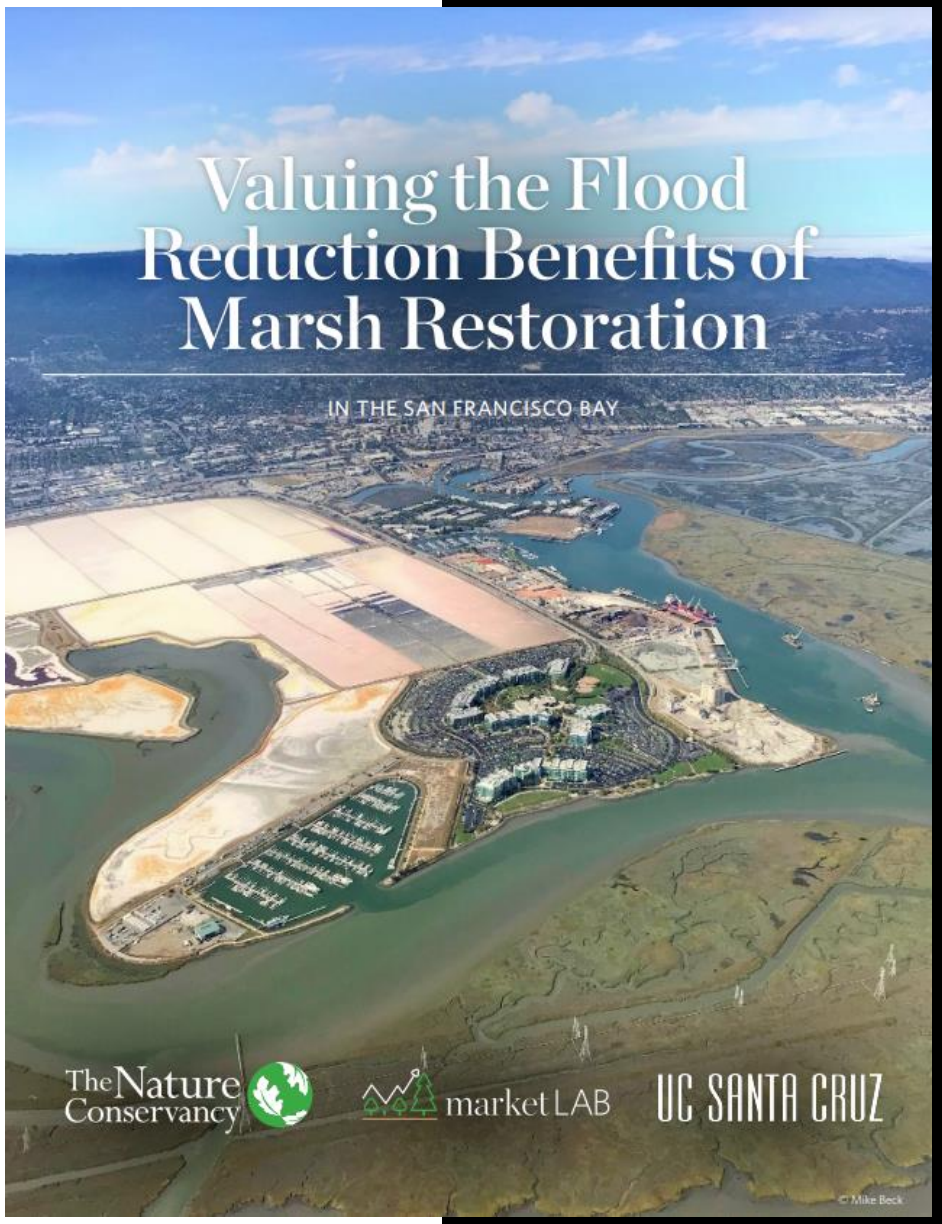
Social Benefits

Multiple benefits of marsh restoration

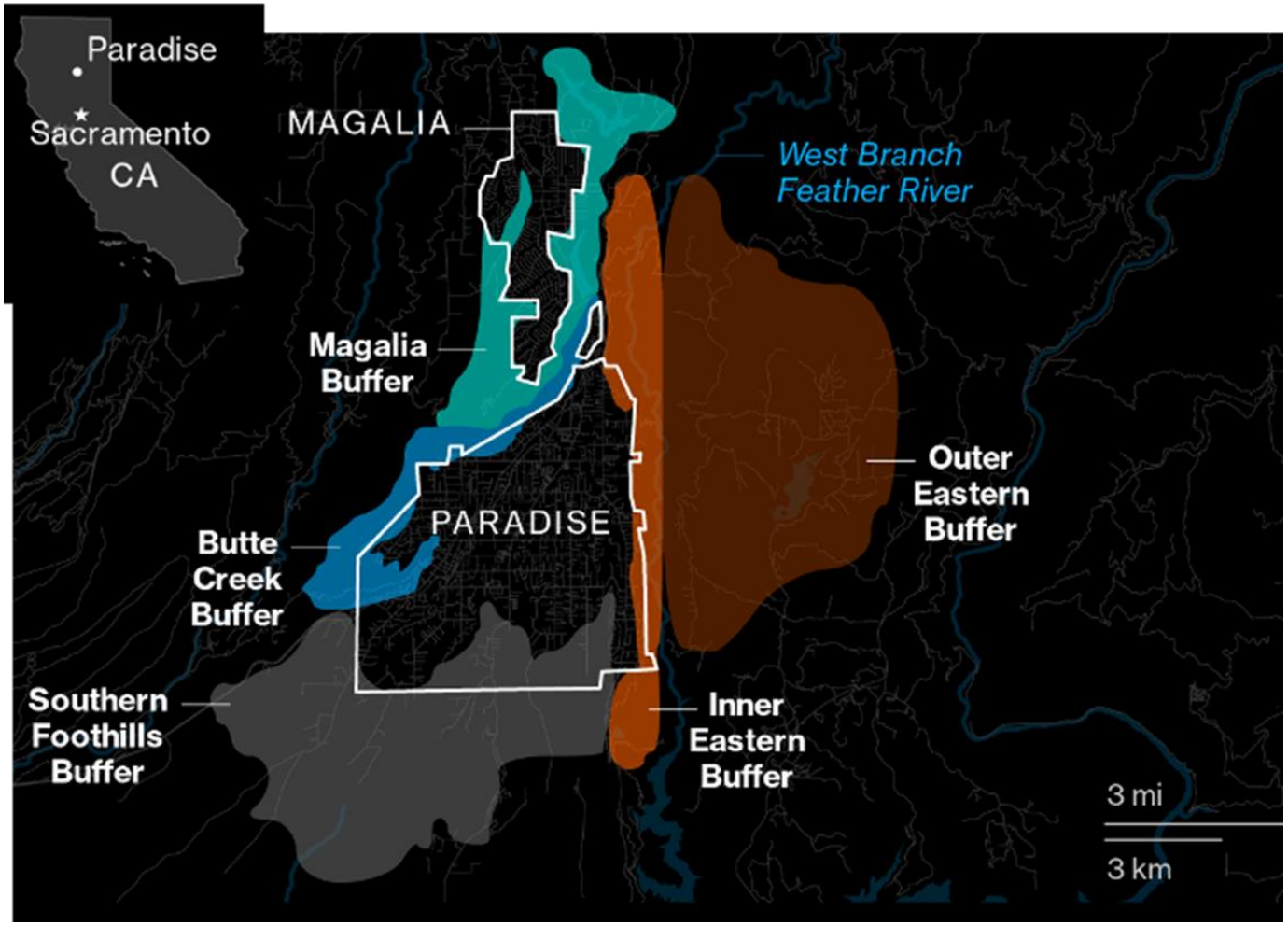
Risk reduction value:

$50 million
per year

Salt marshes also
- have some of the highest per-acre rates of carbon sequestration
- improve water quality
- provide fish and wildlife habitat
- offer recreation opportunities



Wildfire Buffers and Resilience Parks



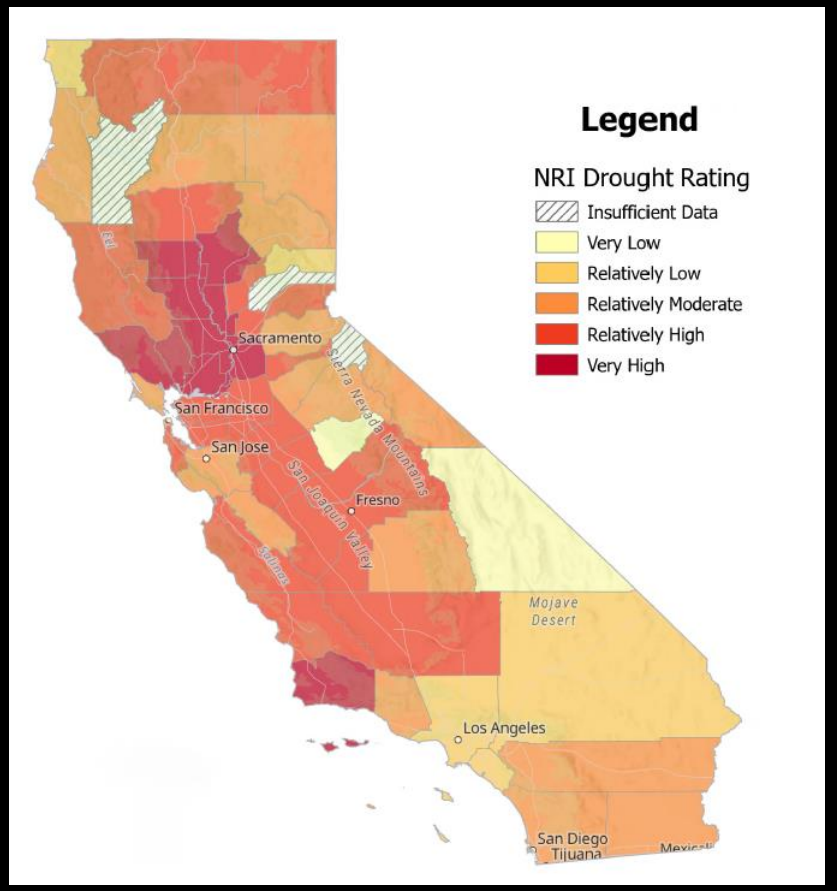
64% ignition risk reduction from Inner Eastern Buffer alone

- Community space
- Ingress/egress points
- Co-benefits of drought resilience, water quality improvement, biodiversity protection, recreation, etc.

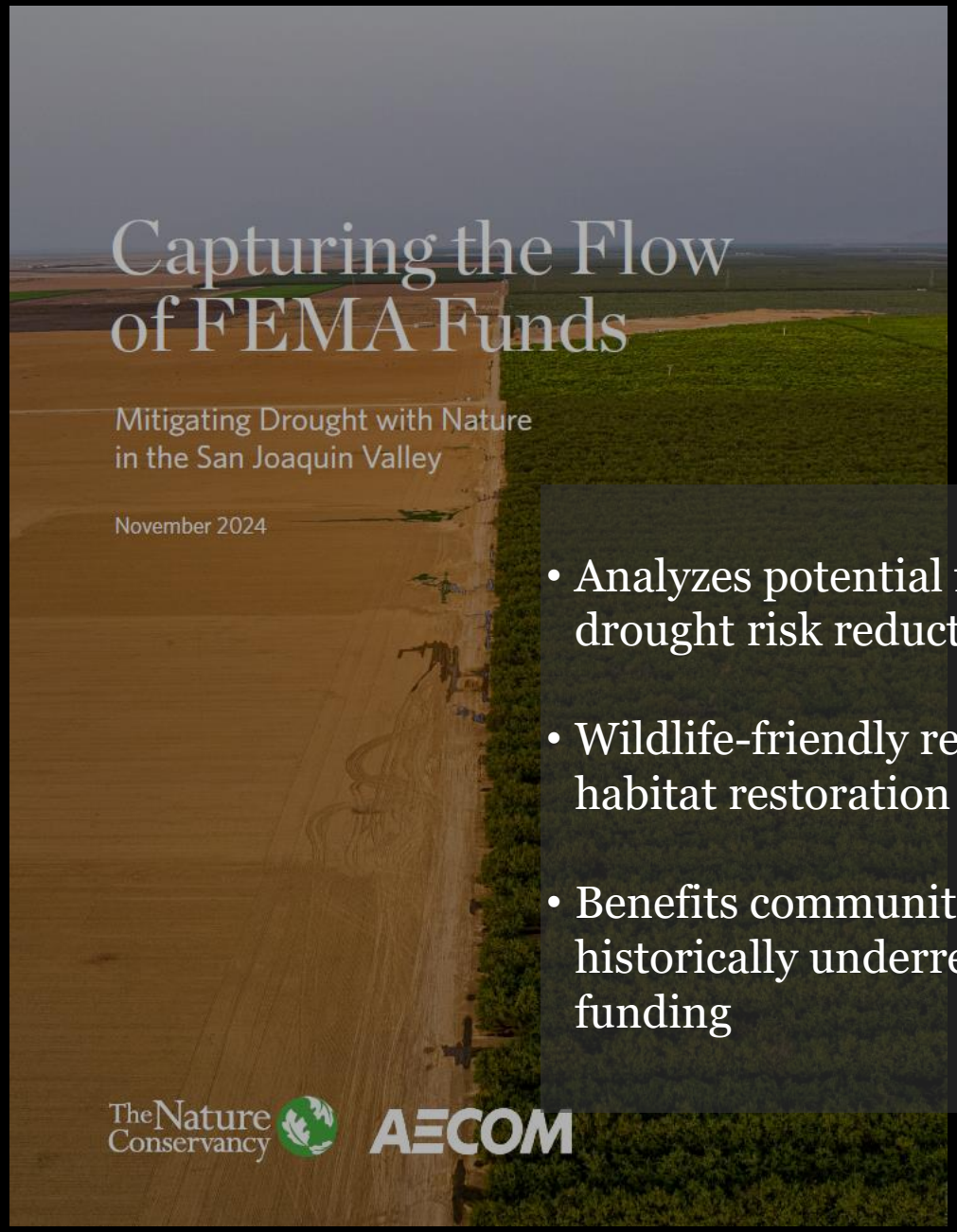
Drought

Carrizo Plain. Desert plants grow in the arid climate of the Carrizo Plain. © Lara Weatherly

- Few existing examples of drought risk mitigation projects
- TNC has collaborated with communities to find novel solutions

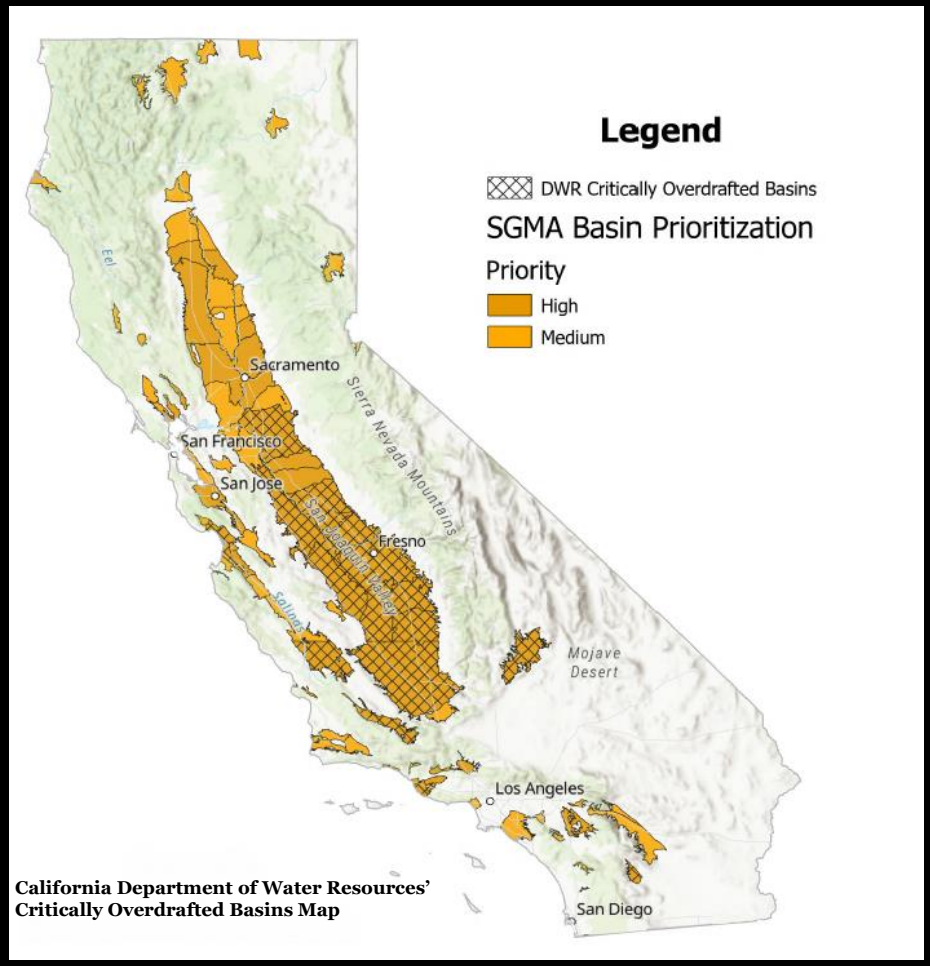


FEMA's National Risk Index Drought Risk

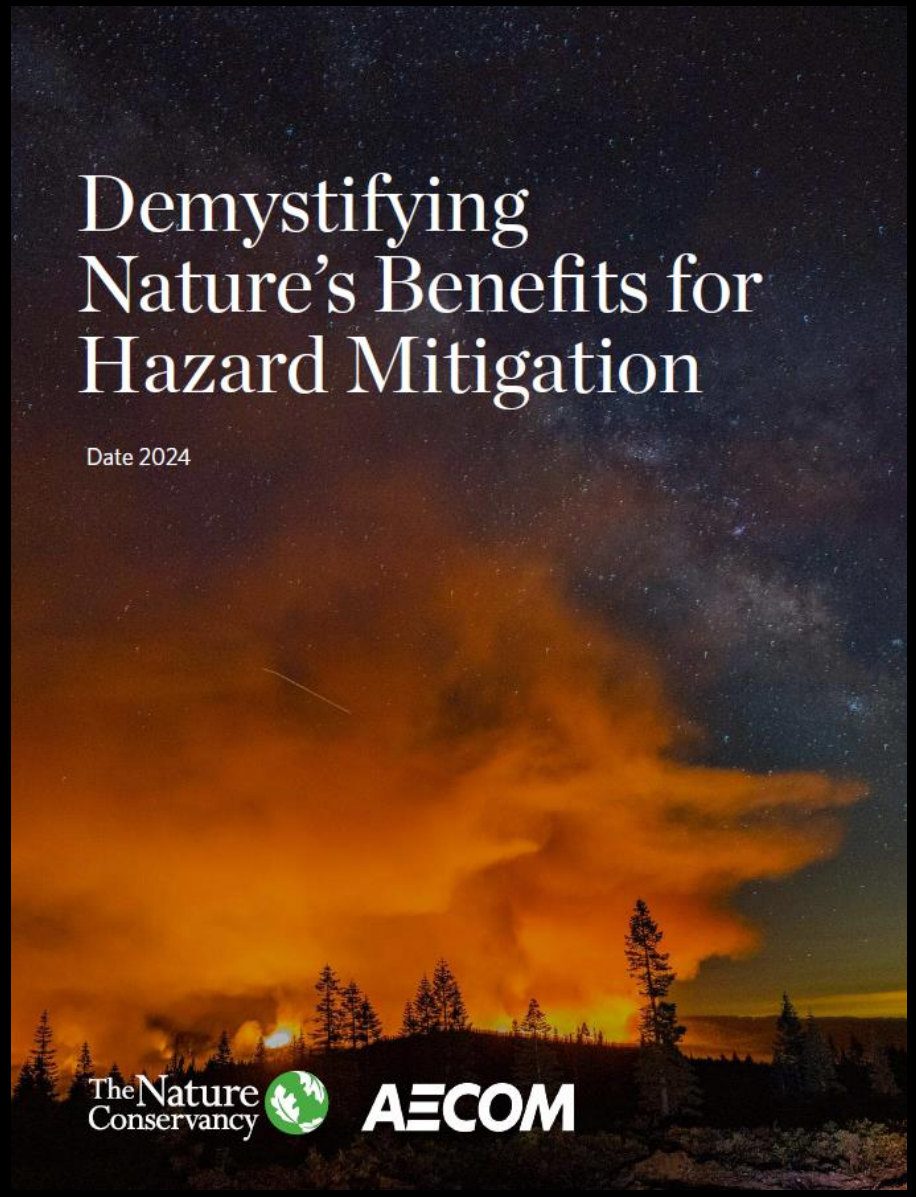


San Joaquin Valley Drought Case Study

- Analyzes potential for nature-based drought risk reduction in SJV
- Wildlife-friendly recharge basins and habitat restoration
- Benefits communities that have been historically underrepresented in FEMA funding



California Department of Water Resources' Critically Overdrafted Basins Map



Purpose of report

1. Demonstrate that nature-based solutions are a cost-effective means to hazard mitigation

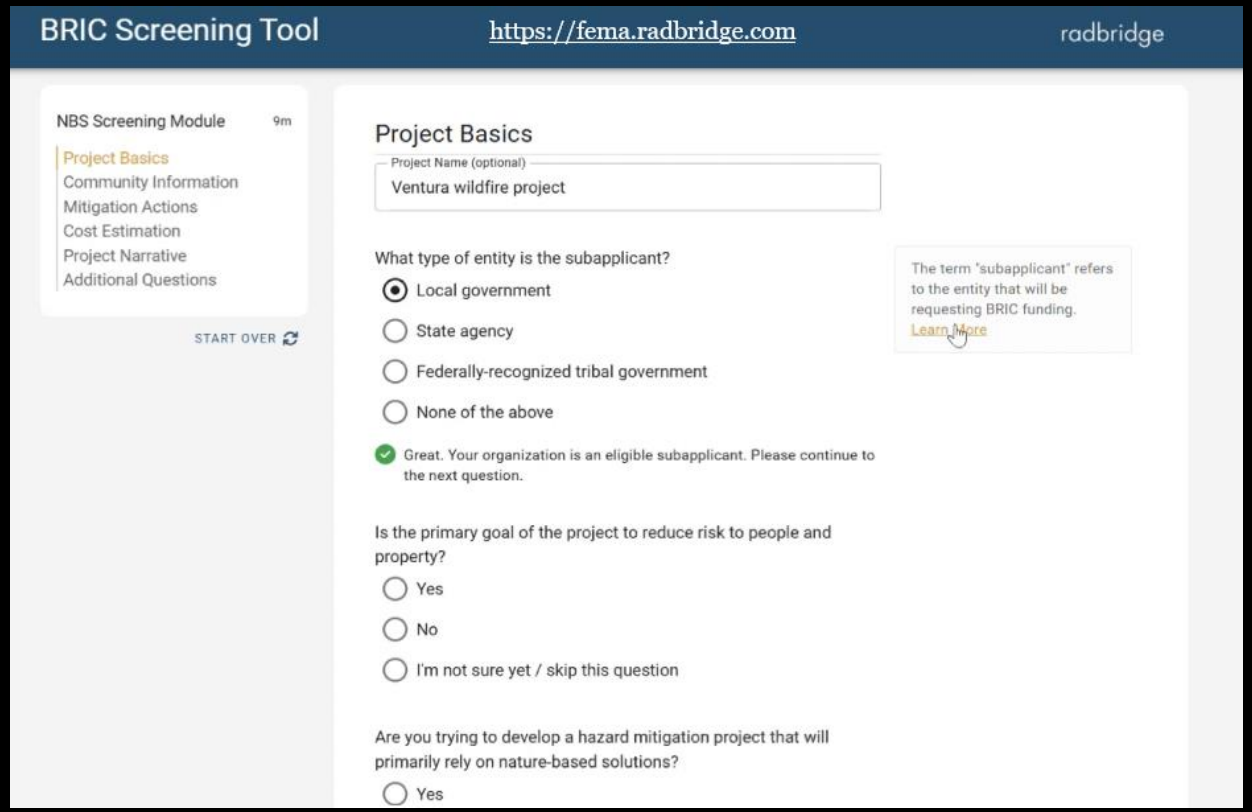
2. Outline eligible risk reduction actions addressing drought, flooding, and wildfire

3. Bring together resources for quantifying benefits for NBS

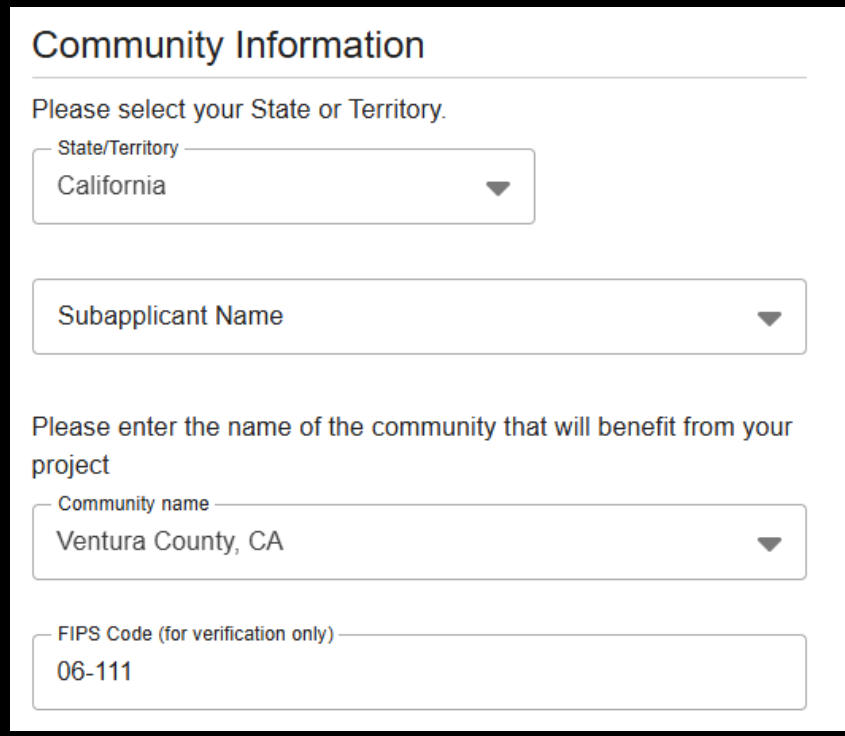
BRIC Screening Tool

https://fema.radbridge.com

Step 1: Project Basics



Step 2: Community Information

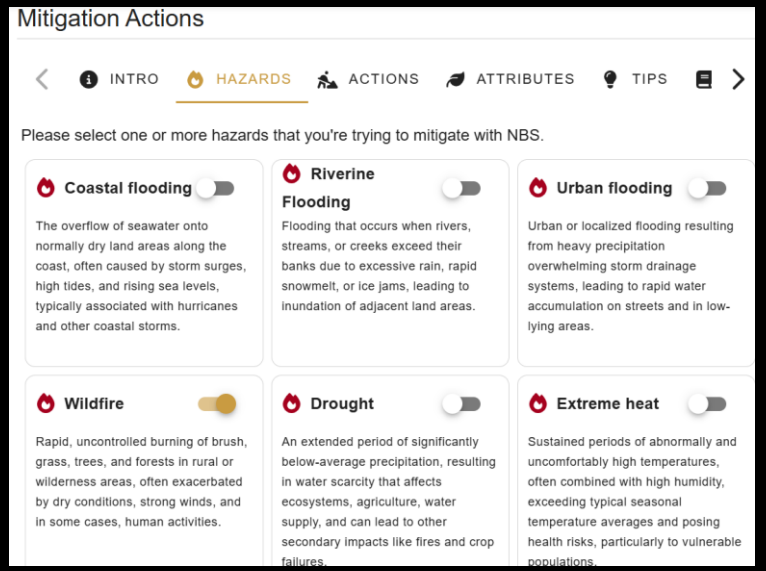


Contact rowan@radbridge.com for more information

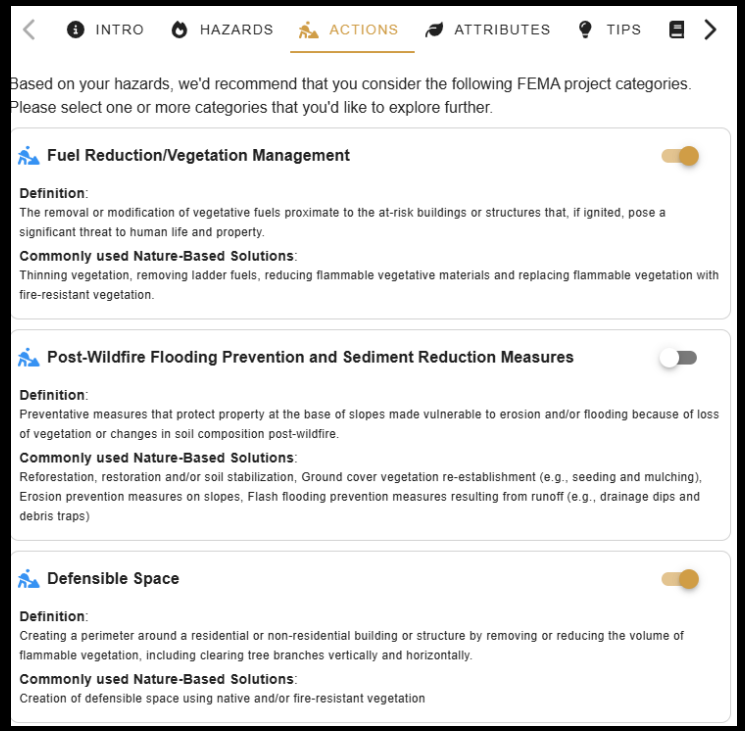
BRIC Screening Tool

https://fema.radbridge.com

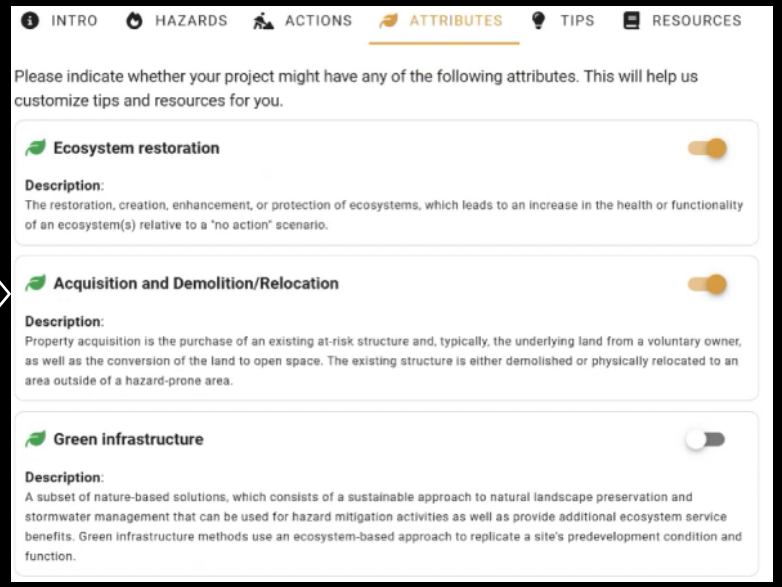
Step 3: Hazard Type



Step 4: FEMA Project Categories



Step 5: Nature-Based Actions



Contact rowan@radbridge.com for more information

BRIC Screening Tool

https://fema.radbridge.com

Step 6: Cost Estimation

Wildfire Mitigation

Project Complexity: Medium

Category	Amount	Unit	Unit Cost	Total Estimated Cost
Fuel Reduction/Vegetation Management	1000	acres	$2,813	$2,813,000
Defensible space	100	structures	$2,943	$294,300
Ignition resistant construction		structures	$7,064	$0
Total				**$3,107,300**

Acquisition & Demolition/Relocation

Land Type	# of properties	Unit Cost ($/property)	Total Estimated Cost
Residential	5	$458,468	$2,292,340

Cost Estimation

INTRO | CONSTRUCTION COST | LAND COST | COST SUMMARY

The table below provides a simple cost estimate for your project, based on the activities that you've indicated. FEMA defines a "cost estimate" as the line item(s) budget to support the scope of work for the execution and completion of the project. Some of the budget categories below represent a combination of several FEMA budget categories, so in a real FEMA budget you'll need to break out these estimates in more detail.

Budget Category	Cost Estimate
Construction	$3,107,300
Property Acquisition & Demolition/Relocation	$2,292,340
Architectural and Engineering	$932,190
Admin, Legal & Permitting	$466,095
Contingency	$1,087,555
TOTAL	**$7,885,480**

Additional Notes

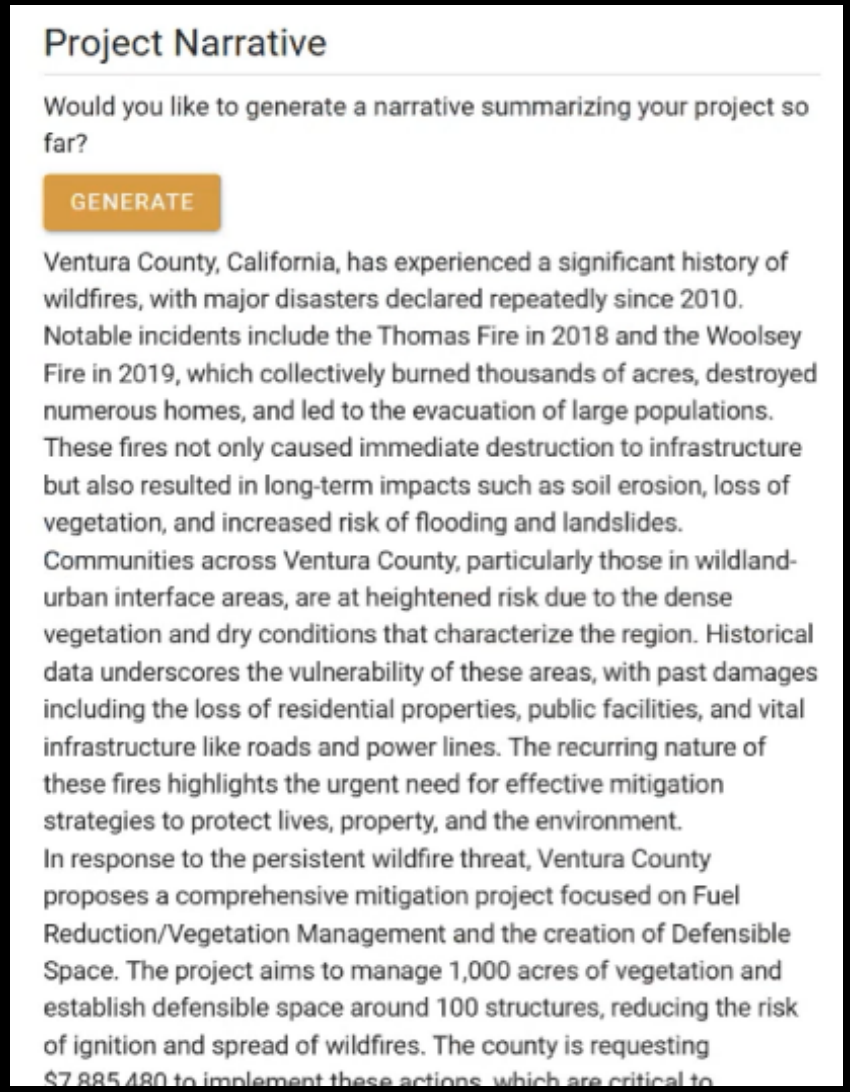
- Based on the budget above, you'll need to provide a non-federal cost share (local match) of approximately **$2,628,493** (25% of total project costs).
- In addition, you may be able to request grant management costs of up to **$525,699** (5% of the sum of non-federal and federal cost shares).

Contact rowan@radbridge.com for more information

BRIC Screening Tool

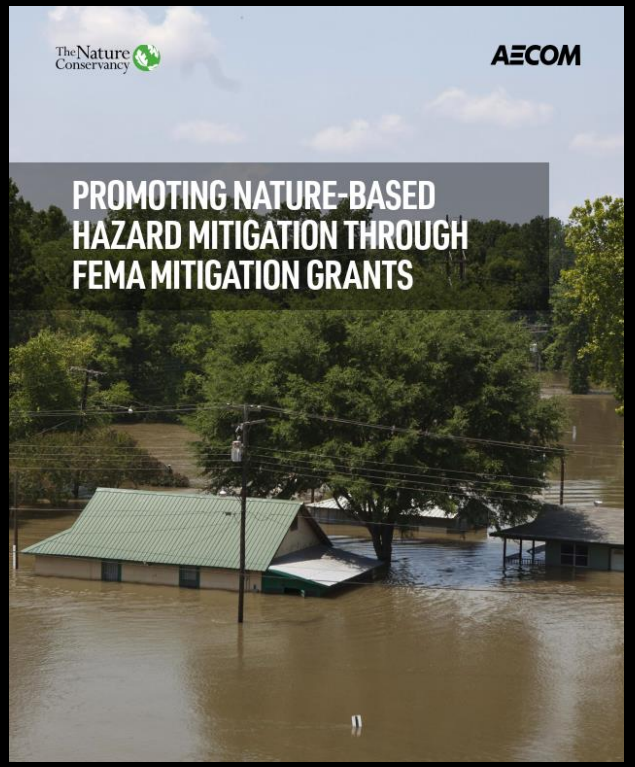
https://fema.radbridge.com

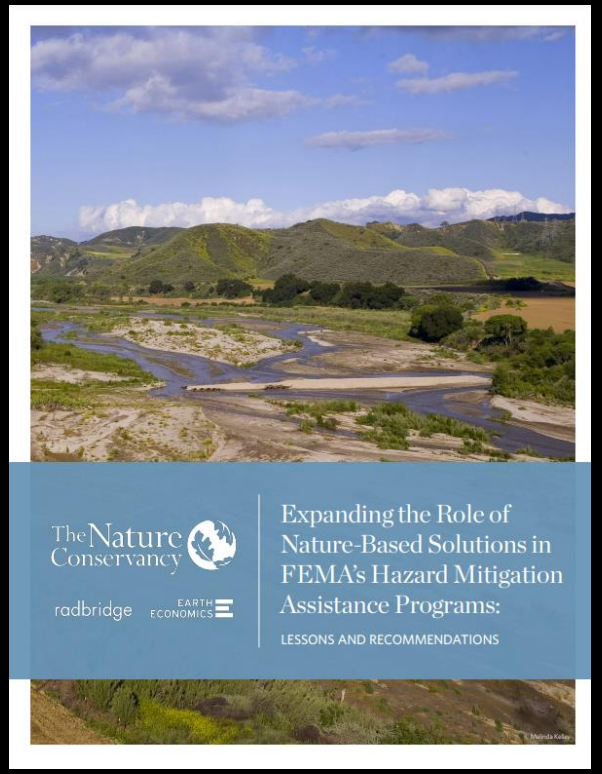
The tool creates a project narrative using information provided by the user

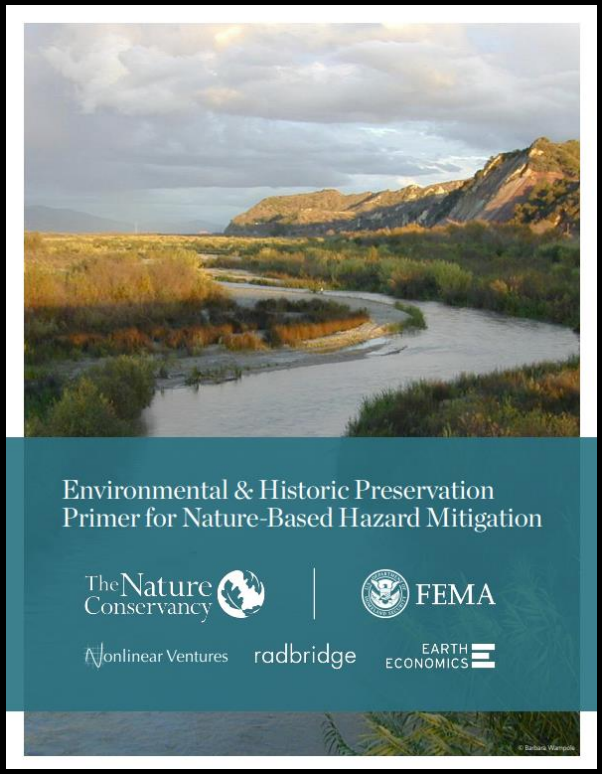


Contact rowan@radbridge.com for more information

Existing resources







These and many others can be found at:
https://www.scienceforconservation.org/science-in-action/tnc-and-fema

Image Credit © Max Whittaker

Vulnerable Communities Platform

Ankitha Doddanari

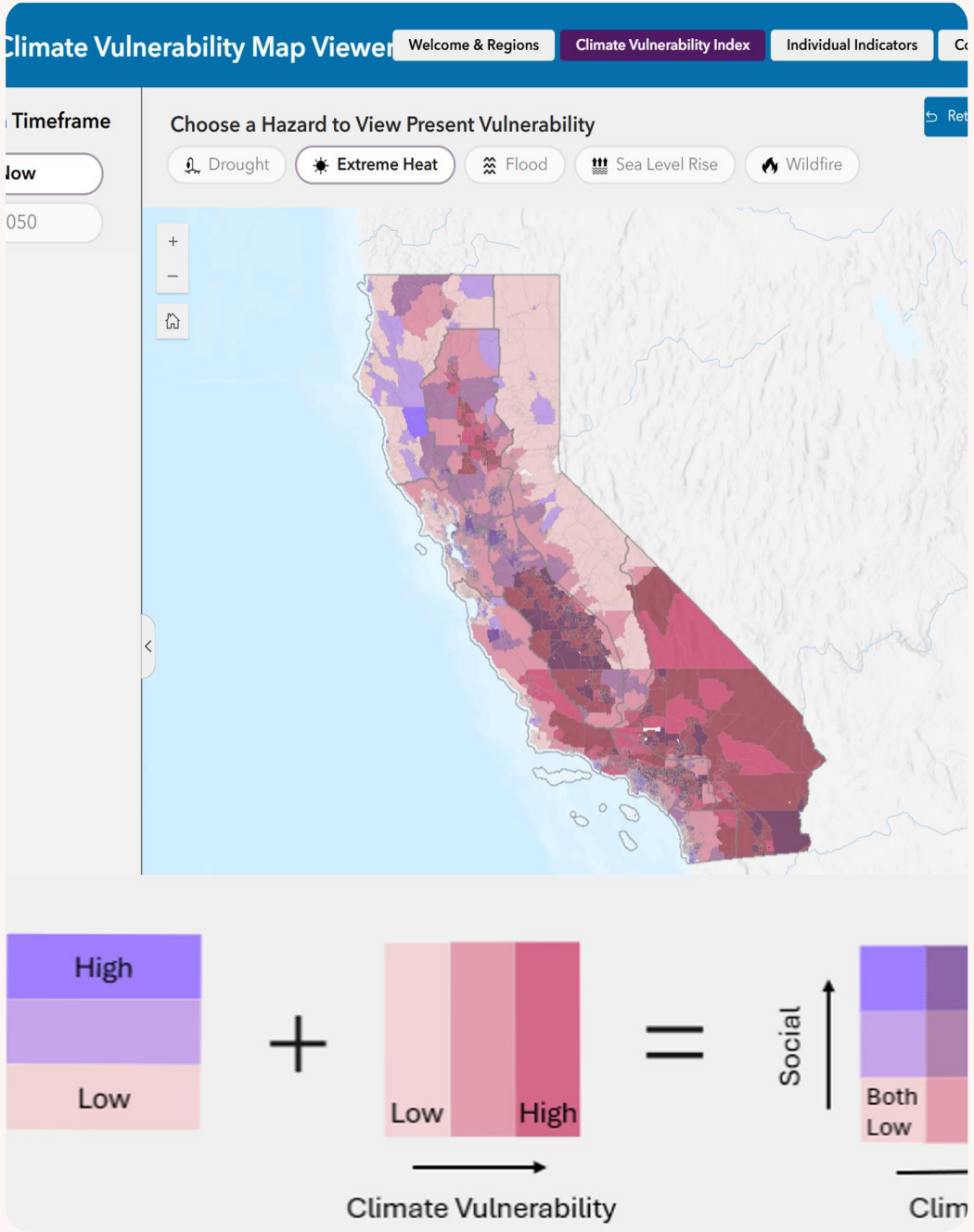
Staff Analyst, Climate Equity and Resilience Engagement

Governor's Office of
Land Use and
Climate Innovation

Vulnerable Communities Platform (VCP)

Web-hub with data and guidance to help identify populations across the state most vulnerable to the impacts of climate change

Map	climate hazard and social sensitivity data
Compare	existing vulnerability related tools
Find	resilience resources
Examples	of assessing community risk for local users



Climate Vulnerability Map Viewer

Welcome & Regions | Climate Vulnerability Index | Individual Indicators | Compare Tool

Return to VCP Home

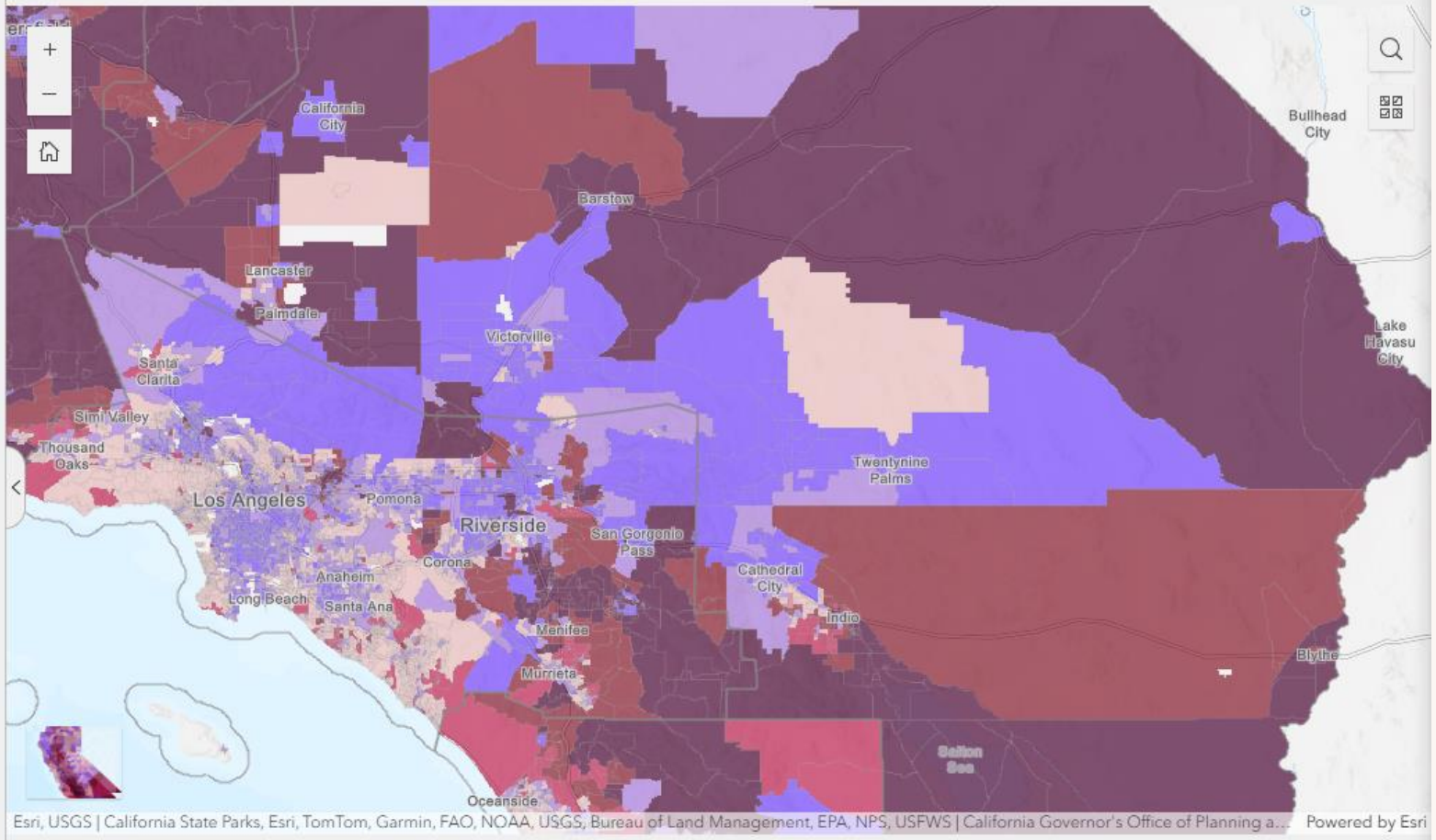
Choose a Timeframe

Now

2050

Choose a Hazard to View Present Vulnerability

Drought | Extreme Heat | Flood | Sea Level Rise | Wildfire



California Summary Information

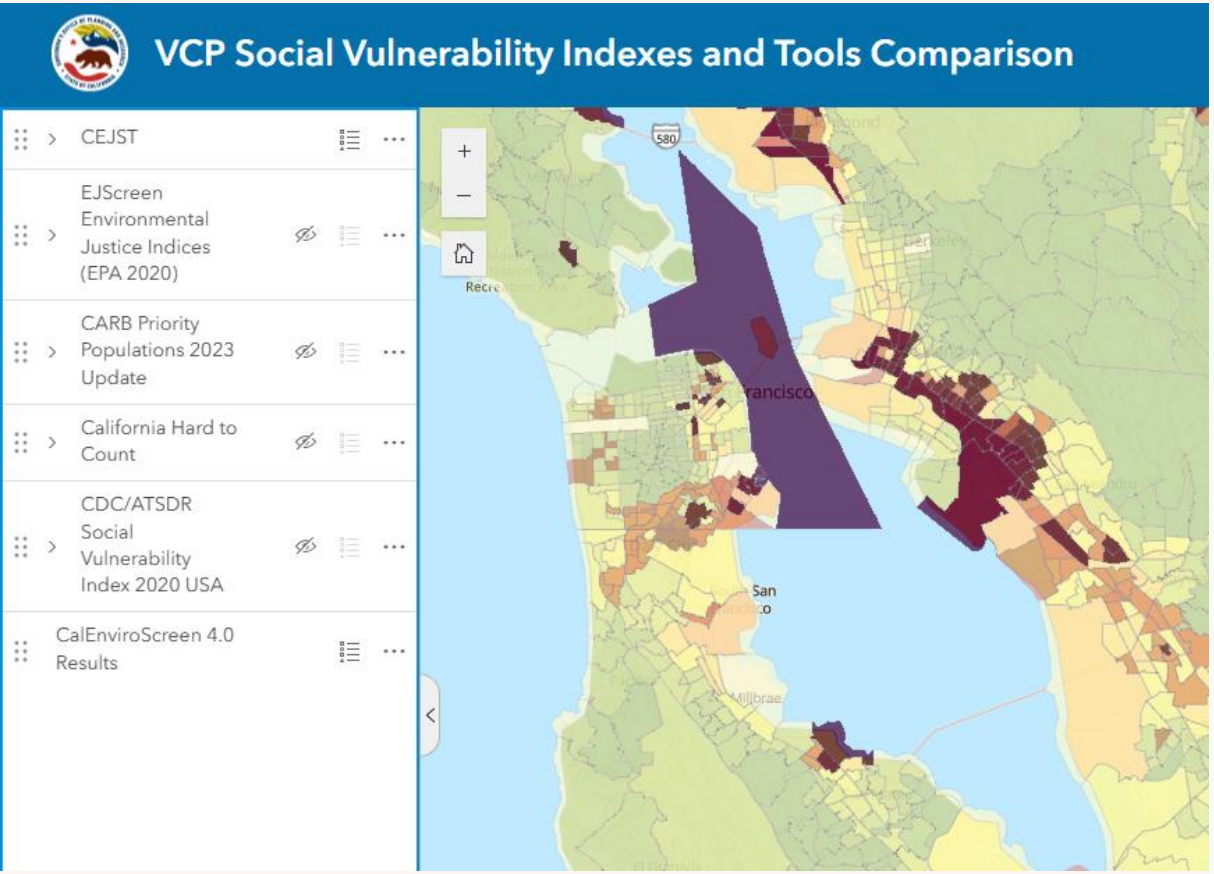
California is one of the most "climate-challenged" regions of North America; its historical climate is extremely variable, and climate change is making extreme conditions more frequent and severe. California's temperatures are already warming, heat waves are more frequent, and precipitation continues to be highly variable. Since its Third Climate Change Assessment in 2012, California has experienced several of the most extreme natural events in its recorded history: a severe drought from 2012-2016, an almost non-existent Sierra Nevada winter snowpack in 2014-2015, increasingly large and severe wildfires, and back-to-back years of the warmest average temperatures.

Information adapted from California's 4th Climate Change Assessment. Revision to information based on 5th Climate Change findings is forthcoming.

En Español

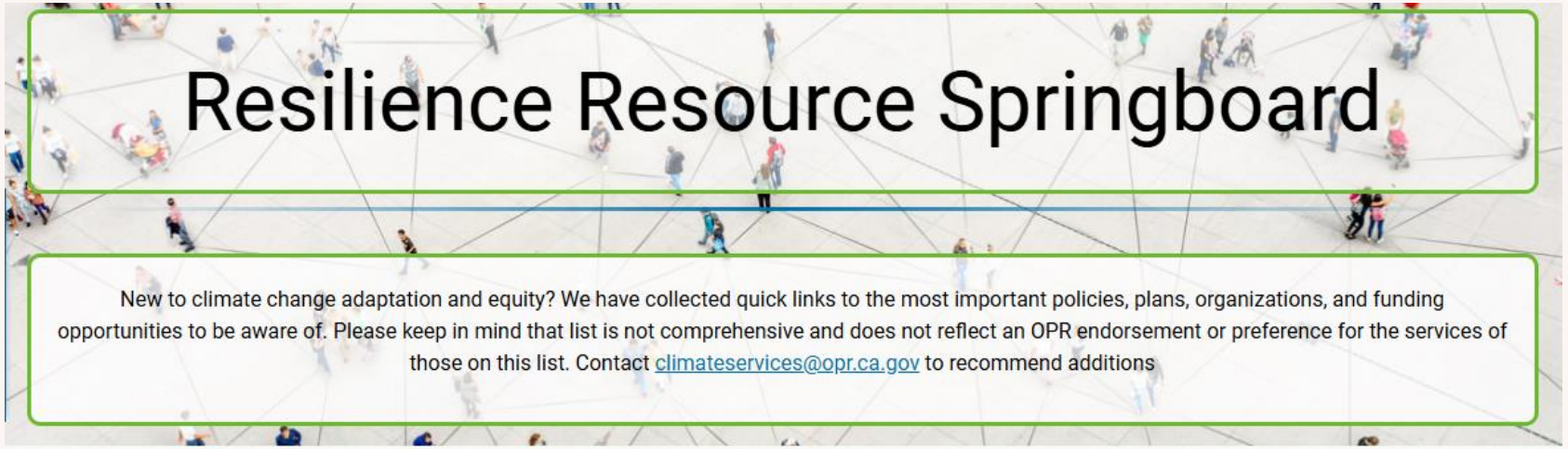
Index Methodology (coming soon)

Download Data (coming soon)



Tool Guide

Tool Name	Description	Climate Data	Publisher	Primary Features (key included below)	Additional Information	Data Granularity
California Healthy Places Index	Health equity focused data mapping platform that visualizes indicators of health related to race and historic underinvestment and underrepresentation.	None	Public Health Alliance of Southern California	Index, Individual Indicators	The Extreme Heat Edition of the HPI overlays the data in the HPI with extreme heat data and available resources	Census Tract, City, Zip Code, County
CalEnviroScreen	California's official pollution focused data mapping platform used to identify communities that are disproportionately burdened by multiple types of environmental pollution and are especially sensitive to pollution's effects, such as young children and people with asthma, and socioeconomic factors, such as poverty, race and ethnicity, and education.	None	California Office of Environmental Health Hazard Assessment	Index, Individual Indicators		Census Tract



Resilience Resource Springboard

New to climate change adaptation and equity? We have collected quick links to the most important policies, plans, organizations, and funding opportunities to be aware of. Please keep in mind that list is not comprehensive and does not reflect an OPR endorsement or preference for the services of those on this list. Contact climateservices@opr.ca.gov to recommend additions

Who is working on these issues?

Use the following resources to locate nonprofits and others working in the climate resiliency or related space

Climate Resiliency related Community Based Organizations

- Bay Area Climate Action Map: map of climate related nonprofits in the Bay Area
- Climate Adaptation Knowledge Exchange (CAKE-X): national database of climate adaptation related organizati

Regional groups

- Alliance of Regional Collaboratives for Climate Adaptation (ARCCA): network of regional collaboratives in the N Francisco Bay Area, Central Coast, Inland Southern California, Los Angeles County, and San Diego County

What's already being planned in my area?

Use the following resources to view existing planning documents related to climate resiliency

Existing City, County, and Regional Planning Documents

- **The Resilient CA Adaptation Planning Map** (RAP-Map): Inventory of local government climate risk, adaptation, a
- **CARB Climate Action Portal** (CAP-Map): Inventory of local government climate action and GHG reduction planni

Where can I get funding?

Use the following resources to view and learn about state, federal, and private portals to find sources of grant funding that

State

- ICARP Resilience Funding Summaries: Compilation of state climate resilience-related related funding programs com type (tribe, public sector, non-profits, private, and academia):
- California Grants Portal: searchable database of all funding programs offered by CA state agencies

Federal

- Federal Grant Guidebook: Compilation of federal funding programs complied by OPR broken down by category (clim community and regional development, food, nutrition, and agriculture, energy and transportation, housing and social

Where can I get help?

The organizations organized in the document below offer pro-bono technical assistance such as help finding, applying to, assessments and analyses, facilitating community engagement, training, and much more.

Vulnerability Map Purpose

This metric can help us understand:

1) **where** each climate hazard will be the most severe 2) **which communities** are the most vulnerable to each climate hazard, and 2) **what makes them vulnerable**

Ex. Where are the most heat-vulnerable communities?

Rural community near Coachella is heat vulnerable because they will experience 4x more heatwaves by 2050 there are many people who are elderly or are living in mobile homes

Community Pilot Workplan

1) Develop training curriculum on conducting community assessments of climate vulnerability

2) Select trainee cohort of 10-15 CBOs and local government organizations covering a wide variety of regions and community types (ex. urban, rural, tribal)

3) Facilitate training classes for cohort and enable peer-to-peer learning

4) Cohort members co-create assessments in partnership with their communities. Results and takeaways will be distilled into case studies for future VCP users to reference.

VCP Progress Tracker

Feature	Status	Projected Completion	Notes
Vulnerability Map	In Progress	February 2025	The climate and social data are undergoing interagency review and processing to generate maps and visualizations
Tool Comparison	Ready	Ongoing Updates	
Resilience Resources	Ready	Ongoing Updates	
Community Pilot	In Progress	April 2026	Curriculum development and cohort recruitment to begin in early 2025

Appendix

Social Data

Extreme Heat	Flooding	Sea Level Rise	Drought	Wildfire	Wildfire smoke
Received food stamps	Received food stamps	Received food stamps	Received food stamps	Received food stamps	Asthma
Food insecurity	Food insecurity	Food insecurity	Food insecurity	Food insecurity	Chronic obstructive pulmonary disease
Housing insecurity	Housing insecurity	Housing insecurity	Housing insecurity	Housing insecurity	Chronic kidney disease
Lack of reliable transportation	Lack of reliable transportation	Lack of reliable transportation	Lack of reliable transportation	Lack of reliable transportation	High blood pressure
Feeling socially isolated	Feeling socially isolated	Feeling socially isolated	Feeling socially isolated	Feeling socially isolated	diabetes
Children	Children	Children	Children	Children	Coronary heart disease
Disability	Disability	Disability	Disability	Disability	Obesity
Homelessness	Homelessness	Homelessness	Homelessness	Homelessness	Current cigarette smoking
Limited English Proficiency	Limited English Proficiency	Limited English Proficiency	Limited English Proficiency	Limited English Proficiency	Children
Low Income	Low Income	Low Income	Low Income	Low Income	Disablity
Mobile Homes	Mobile Homes	Mobile Homes	Mobile Homes	Mobile Homes	Homelessness
POC	POC	POC	POC	POC	Low Income
Seniors Living Alone	Seniors Living Alone	Seniors Living Alone	Seniors Living Alone	Seniors Living Alone	Mobile Homes
Internet Access	Internet Access	Internet Access	Internet Access	Internet Access	Seniors Living Alone
Chronic obstructive pulmonary disease	Flood Insurance	Flood Insurance	Agricultural Workers	Electricity Dependent	Indigenous Communities
Chronic kidney disease	Renters	Renters	Renters	Indigenous Communities	Outdoor Workers
High blood pressure	Toxic Facilities	Toxic Facilities		Limited Egress Routes	
Diagnosed diabetes		Projected Saltwater Intrusion in Coastal Groundwater		Fire Insurance	
Coronary heart disease				Renters	
Obesity					
Frequent mental distress					
Air Quality PM 2.5					
Outdoor Workers					
Urban Heat Island					

Climate Data

	Extreme Heat	Flooding	Sea Level Rise	Drought	Wildfire
Present	CalAdapt	DWR BAM Maps 100 year floodplain	CoSMoS current coast + 100 year storm	DWR Water shortage vulnerability tool	USDA Forest Service
2050	CalAdapt	FEMA 500 year floodplain	CoSMoS .8ft SLR + 100 year storm	DWR Water shortage vulnerability tool	CalAdapt

Strengthening Wildfire Resilience through Better Planning, Policy and GIS Spatial Analysis using the PIRS™ Methodology

Co-PI's: William Siembieda, Cal Poly SLO
Matthew Malecha, Texas A&M

Margot McDonald, Cal Poly SLO
Andrew Fricker, Cal Poly SLO
Chris Dicus, Cal Poly SLO
Dan Turner, SLO Fire Safe Council

Jaimie Masterson, Texas A&M
Siyu Yu, Texas A&M
Philip Berke, UNC-Chapel Hill

Research assistants: Heath Hooper
Jack Alexander, Kai Tran
Kolton Kladifko, Madeline Davies

CAL POLY | WUI Fire Institute | GORDON AND BETTY MOORE FOUNDATION | HAZARD REDUCTION & RECOVERY CENTER TEXAS A&M UNIVERSITY

Communities working toward resilience face significant challenges…

- **A ‘plethora of plans problem’** often exists in even small communities. Community plans are typically developed by various stakeholder groups that pursue a variety of goals. Larger cities typically have many more plans, making it that much harder to efficiently work toward resilience.

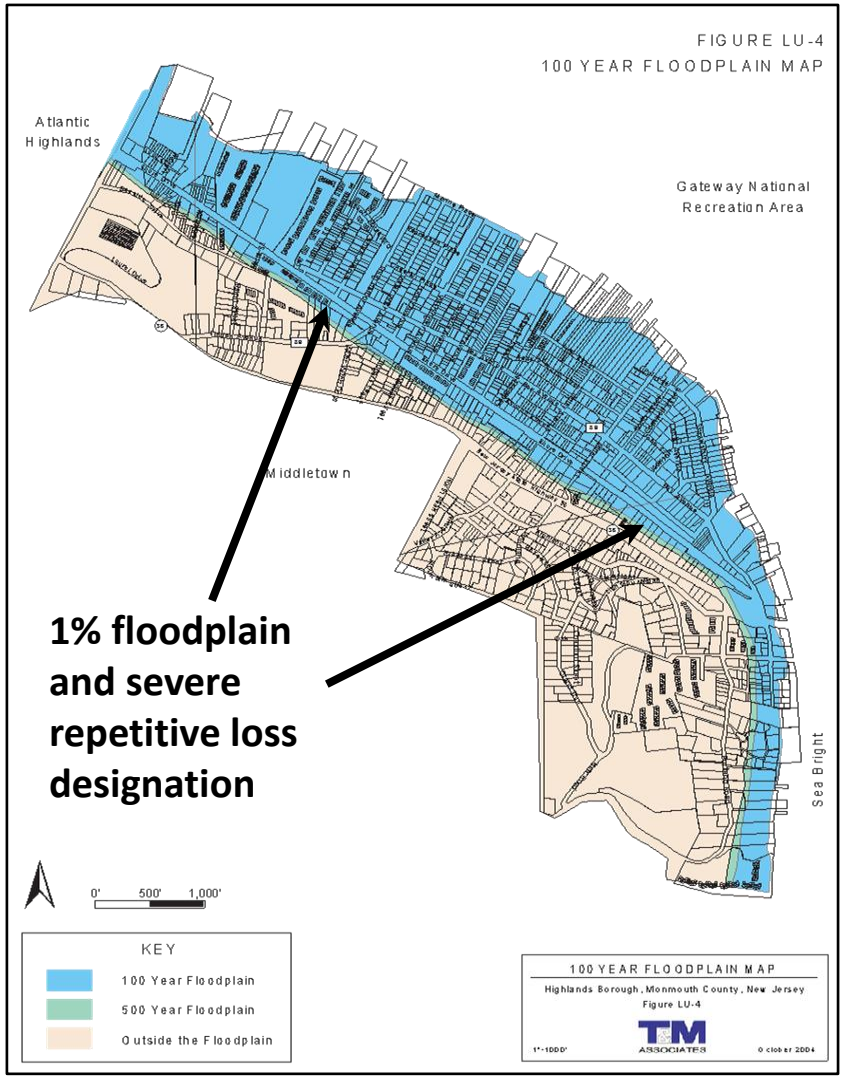
- **The absence of a collaborative process** to understand the many policies that exist in different plans results in an uncoordinated approach to risk reduction.

- **Little spatial understanding** of policies unknowingly influences hazard mitigation decisions and a community’s ability to reduce vulnerabilities.

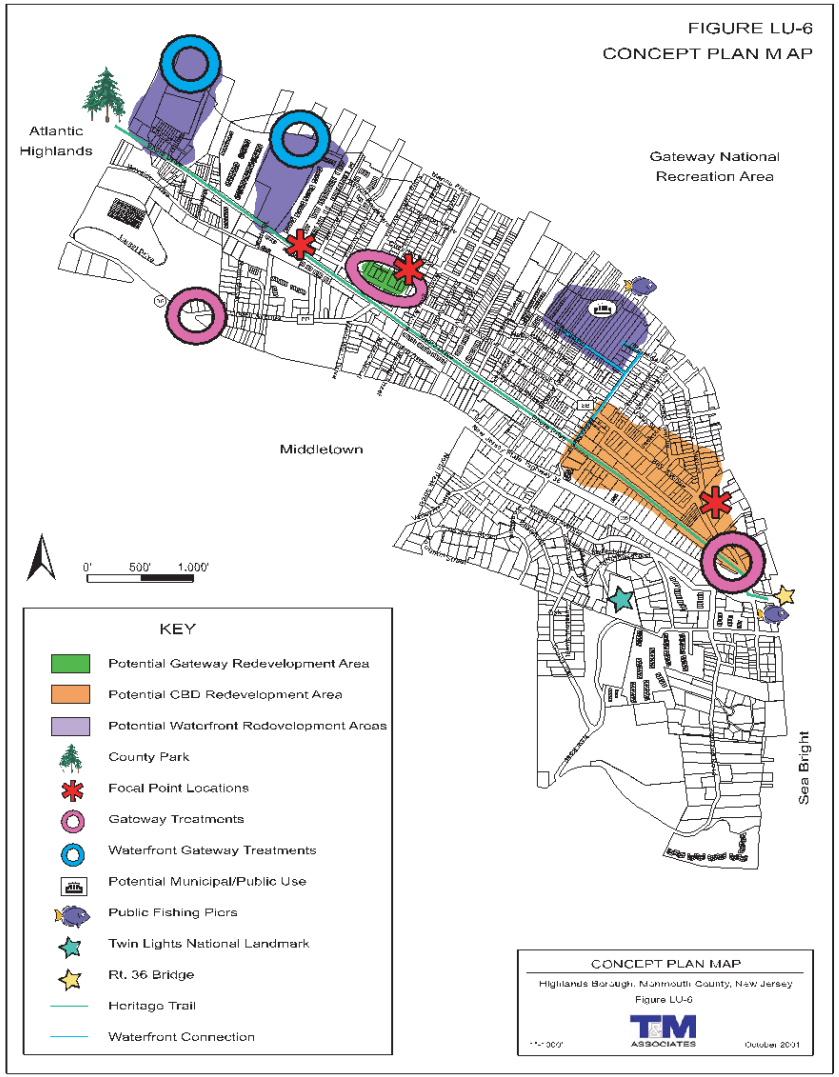
Scorecard Goals

1. Provide communities developing new plans or updating existing plans with a framework to **reduce future hazard risk** through **more consistent and spatially-informed** policies.
2. Integrate and strengthen local plans in ways that **reduce potential losses** from hazard events.
3. Identify and **address incongruities** within the networks of plans.
4. Provide **a validated tool** to **build collaboration and capacity**.

Example of plan conflict around hazards



Hazard Mitigation Plan



Comprehensive Plan

PLAN INTEGRATION FOR RESILIENCE SCORECARD™: PIRS™ for Wildfire ROADMAP

2. Identify Hazard Zones

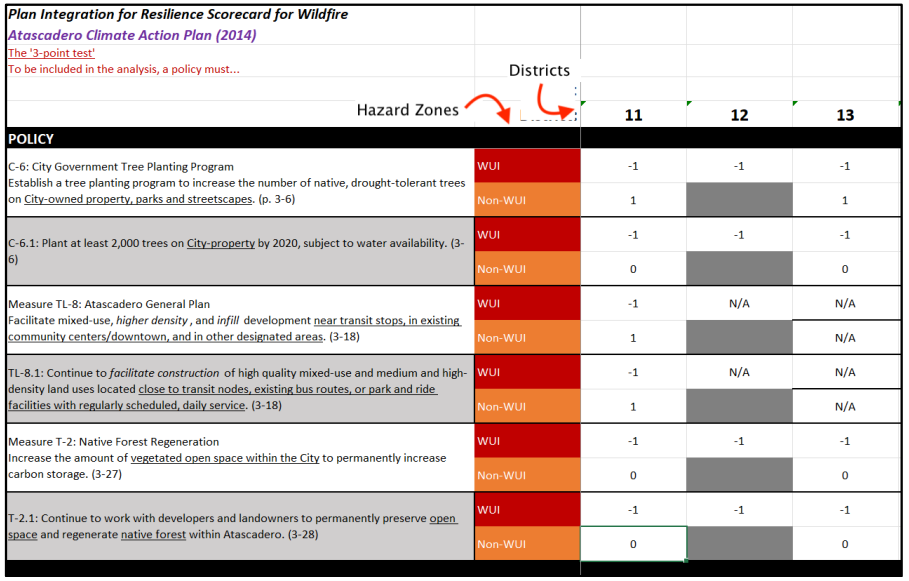
GIS-based maps illustrating the wildfire hazard in the community. CAL FIRE's Fire Hazard Severity Zone (FHSZ) maps may be used or locally derived maps.

1. Select policies from a "Network of Plans"

- General Plan:
  - Safety Element
  - Land Use Element
  - Open Space Element
  - Circulation Element
- Hazard Mitigation Plan
- CWPP
- Climate Action Plan
- Specific Area Plans

Policies selected must meet a 3-point test:

- have a spatial attribute
- have potential to reduce or increase wildfire resilience, and
- be actionable (i.e., a policy tool exists for recommending policy adjustments).



Plan Integration for Resilience Scorecard for Wildfire

Atascadero Climate Action Plan (2014)

The '3-point test'

To be included in the analysis, a policy must...

	Districts →		11	12	13
	Hazard Zones ↓				
POLICY					
C-6: City Government Tree Planting Program Establish a tree planting program to increase the number of native, drought-tolerant trees on City-owned property, parks and streetscapes. (p. 3-6)	WUI		-1	-1	-1
	Non-WUI		1		1
C-6.1: Plant at least 2,000 trees on City-property by 2020, subject to water availability. (3-6)	WUI		-1	-1	-1
	Non-WUI		0		0
Measure TL-8: Atascadero General Plan Facilitate mixed-use, *higher density* , and *infill* development near transit stops, in existing community centers/downtown, and in other designated areas. (3-18)	WUI		-1	N/A	N/A
	Non-WUI		1		N/A
TL-8.1: Continue to *facilitate construction* of high quality mixed-use and medium and high-density land uses located close to transit nodes, existing bus routes, or park and ride facilities with regularly scheduled, daily service. (3-18)	WUI		-1	N/A	N/A
	Non-WUI		1		N/A
Measure T-2: Native Forest Regeneration Increase the amount of vegetated open space within the City to permanently increase carbon storage. (3-27)	WUI		-1	-1	-1
	Non-WUI		0		0
T-2.1: Continue to work with developers and landowners to permanently preserve open space and regenerate native forest within Atascadero. (3-28)	WUI		-1	-1	-1
	Non-WUI		0		0

3. Choose Districts

Geographic regions that delineate contiguous zones used in community planning and development.

Combine districts and hazard zones above (steps 2 + 3) to create a DHZ layer used for scoring policies.

Create a web map with DHZ layers and additional GIS layers to score policies based on geospatial information (step 4).

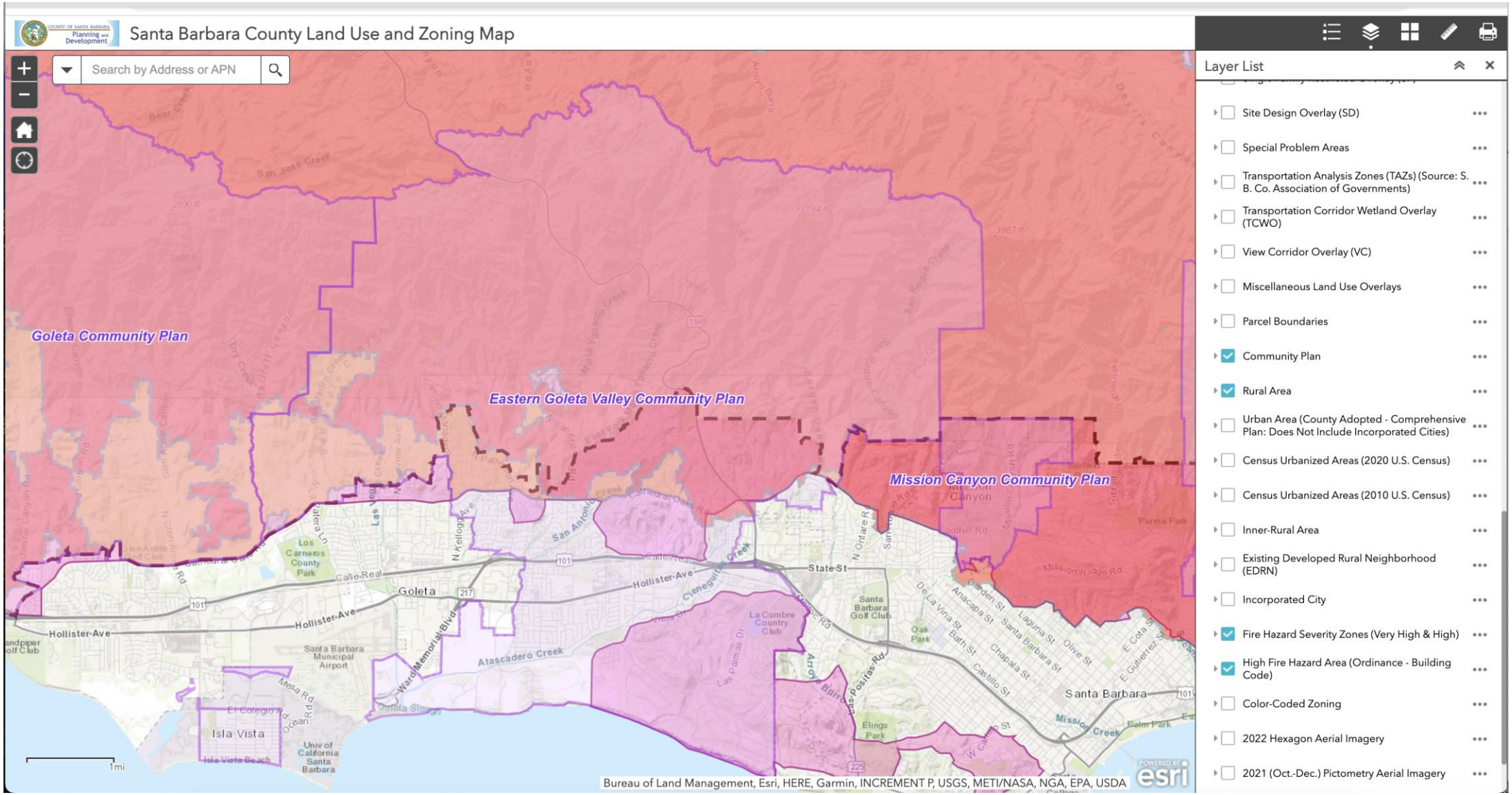
4. Score Policies Spatially

+1 Positively impacts wildfire resilience
-1 Negatively impacts wildfire resilience
0 Neutral/no impact on wildfire resilience

5. Map Composite Scores

Tally all scores for each district-hazard zone to create a composite map.

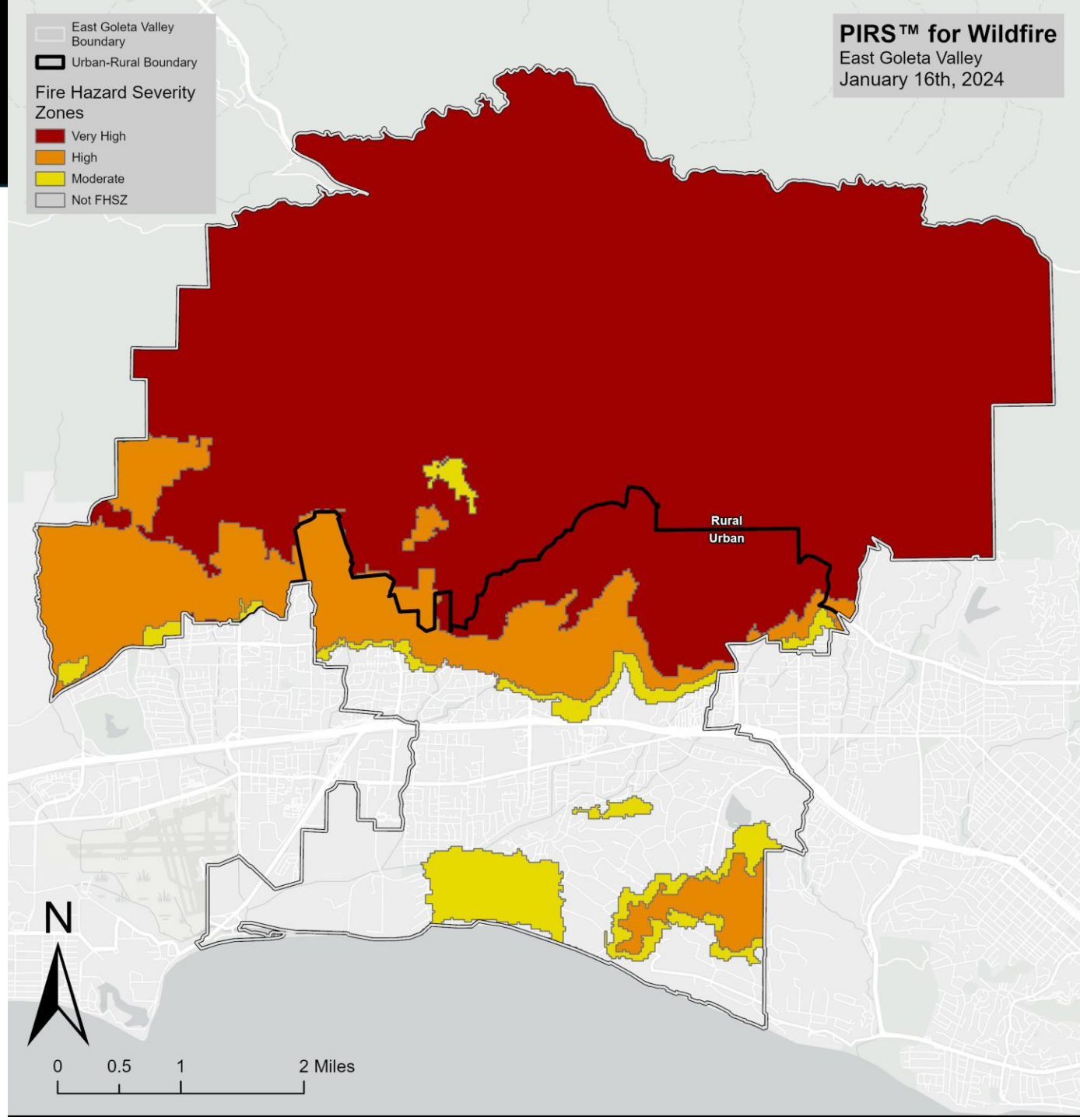
Public-facing GIS data for spatial analysis



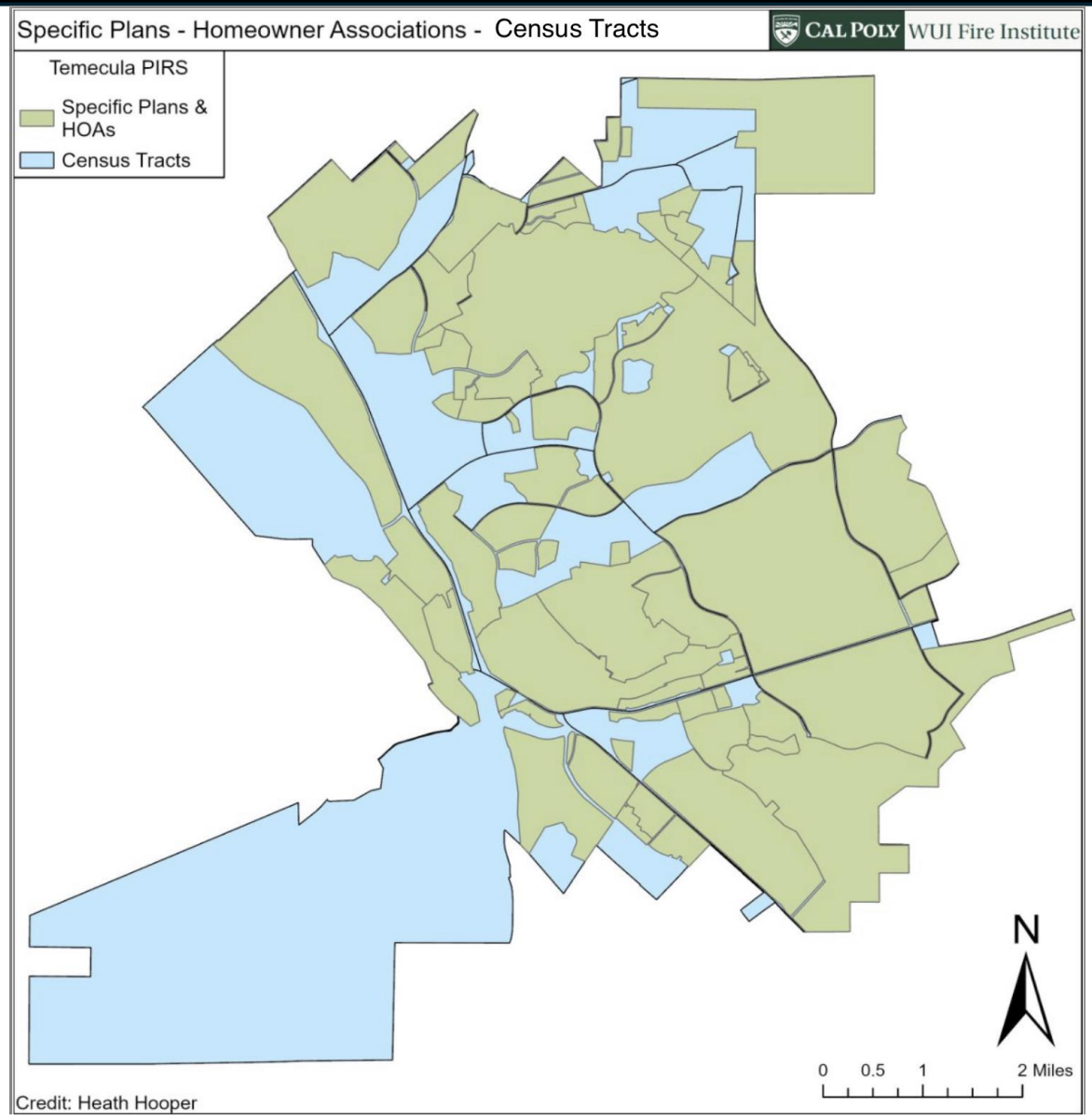
Geography of Choice

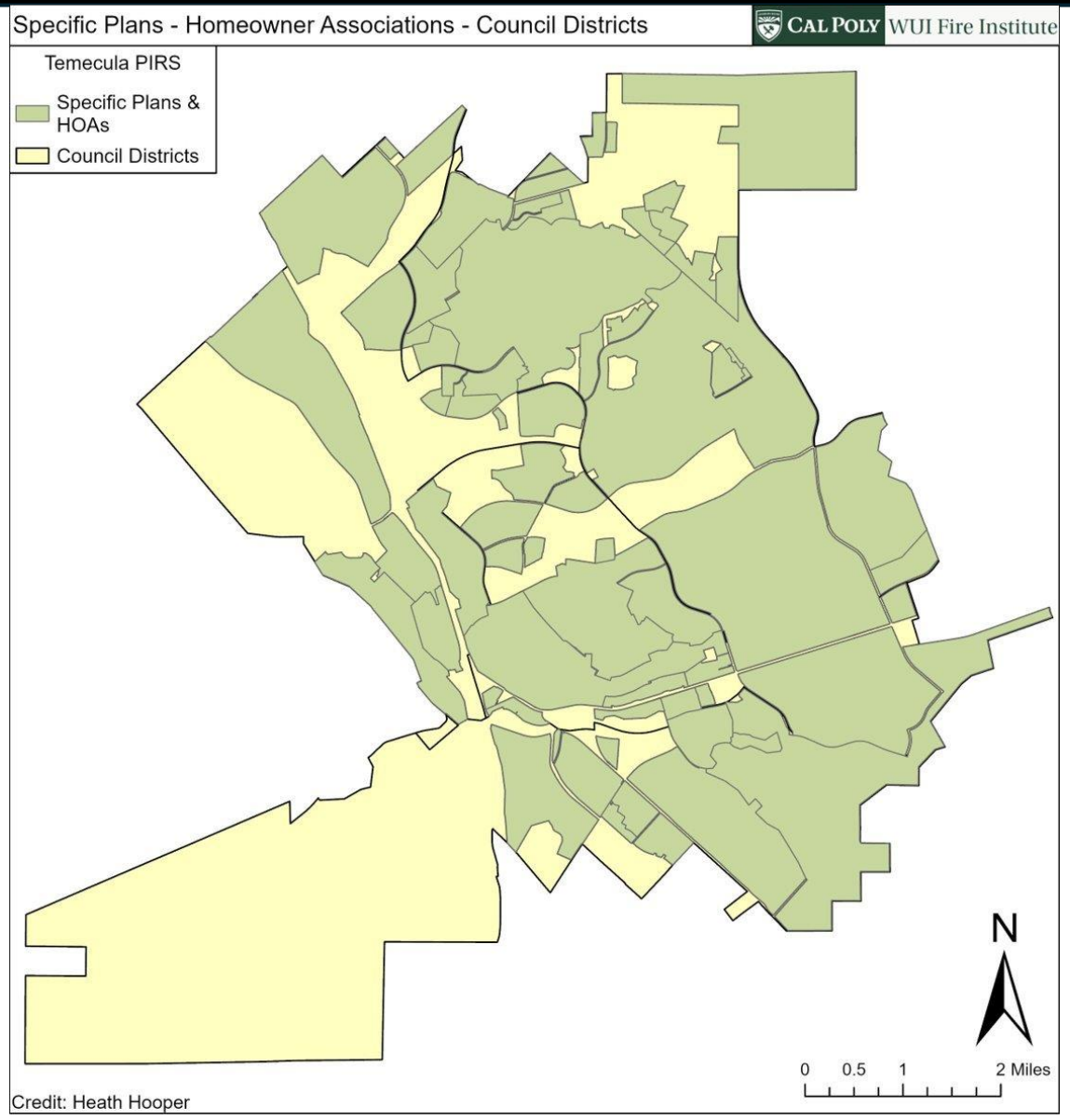
Rural-Urban boundary as Spatial Unit of Analysis for planning districts

Community plans within the county provide nested scales

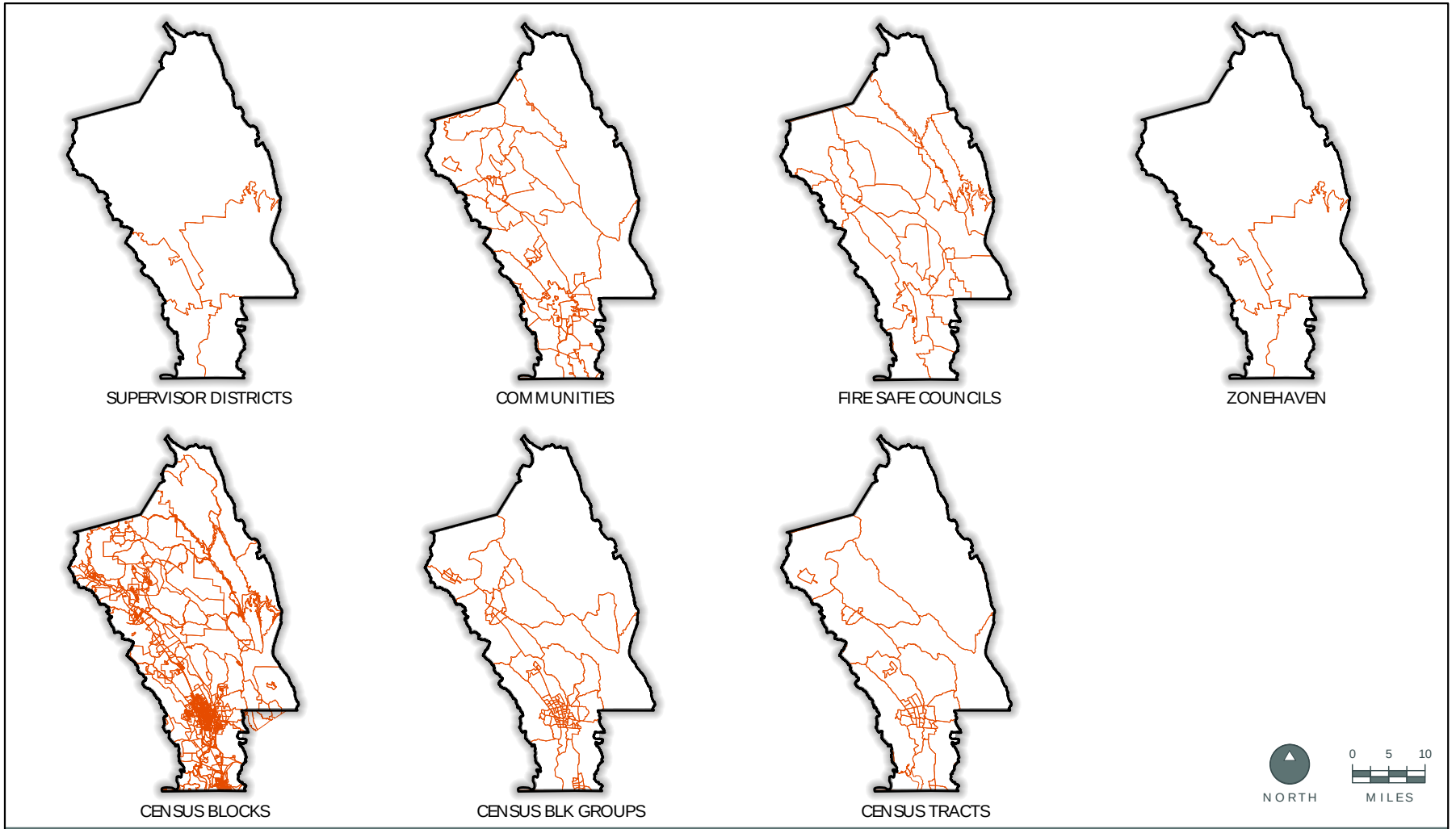


Geography of Choice: Planning Districts





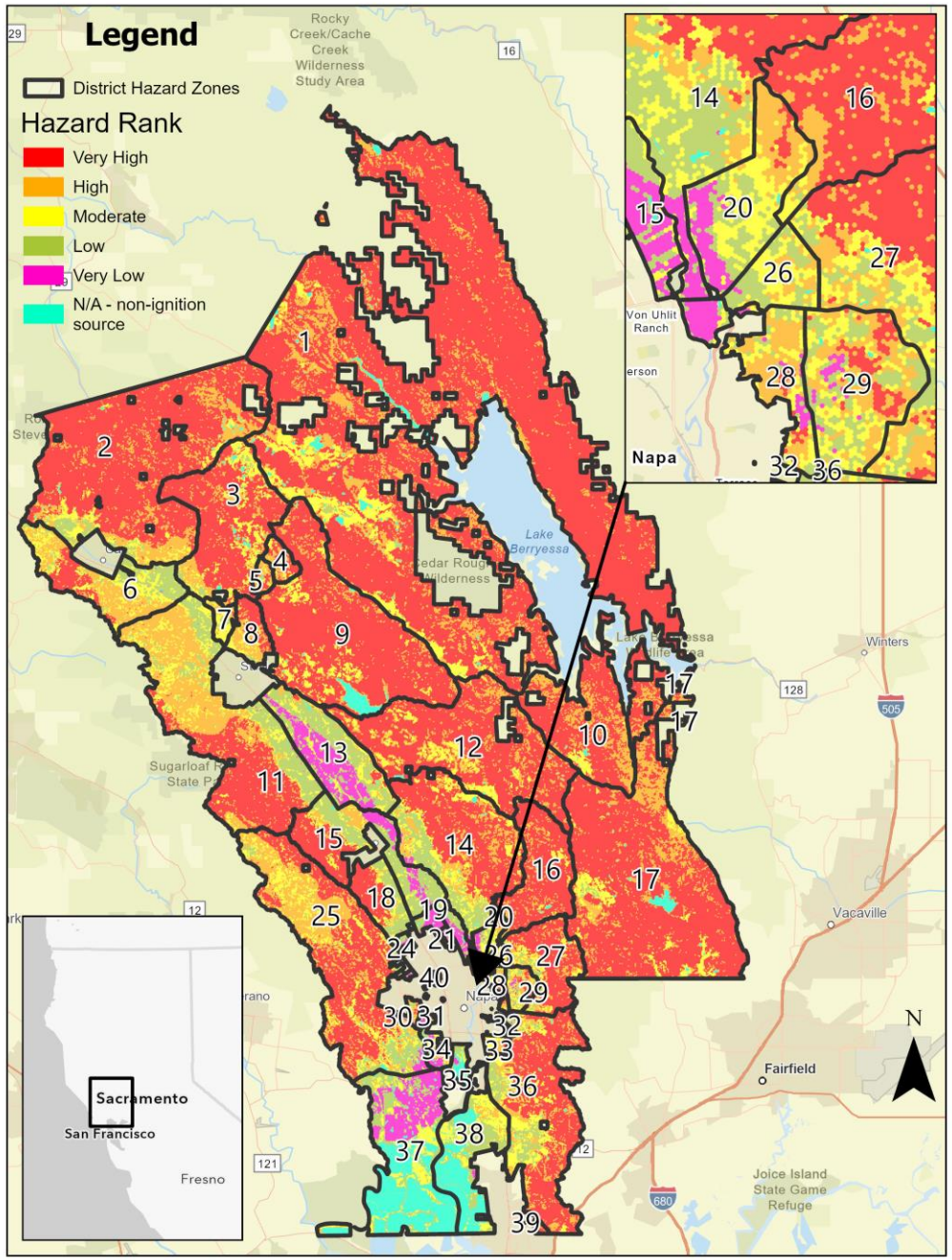
Geography of Choice: Planning Districts



District Hazard Zones

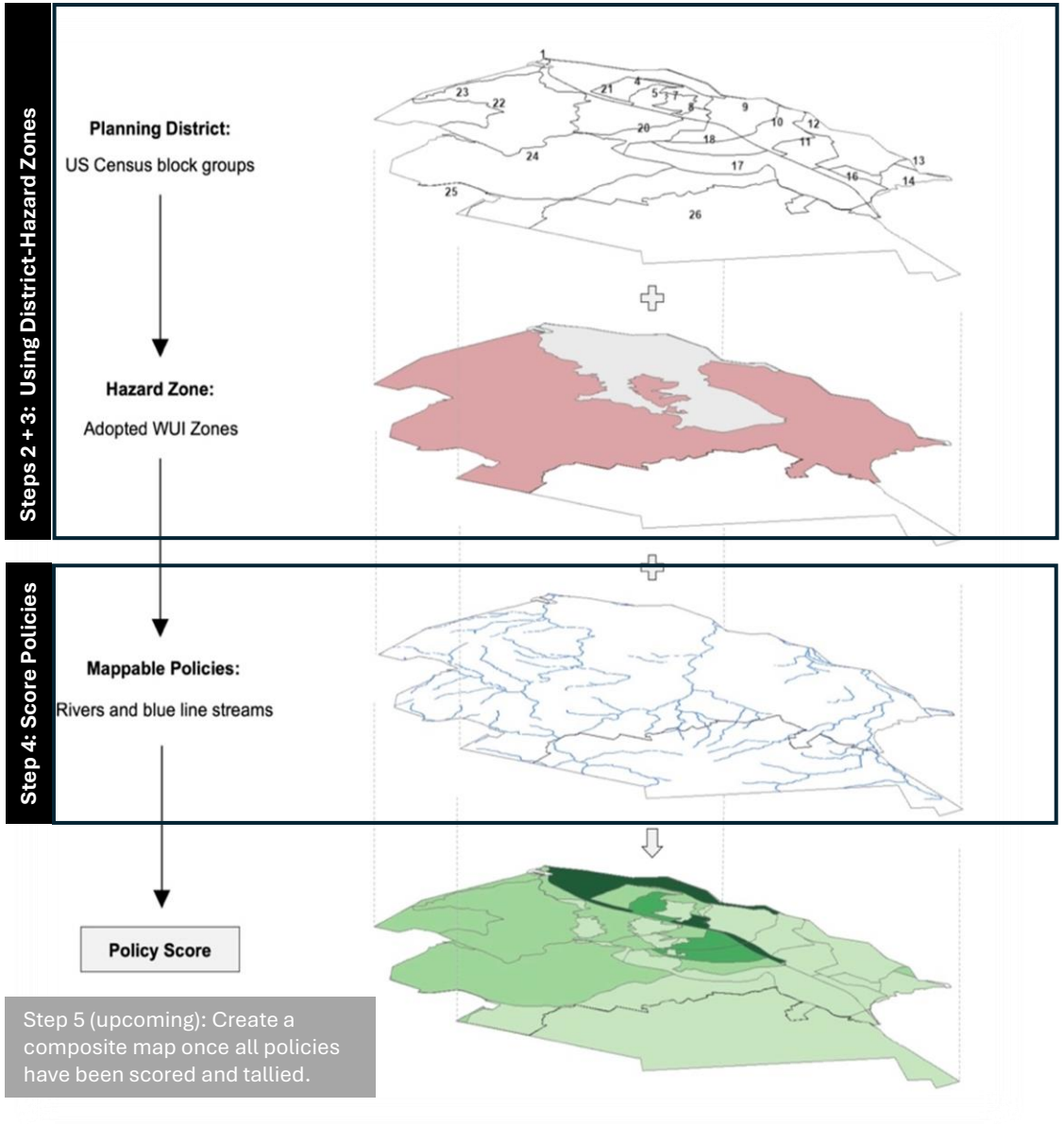
District Hazard Map for PIRS analysis:

1 - Slope
2 - Aspect
3 - Vegetation type (life form)
4 - Fire history
5 - Wind speeds
6 - Waterbody locations
7 - Vineyard locations



Credit: Napa County Planning, Building, and Environmental Services.

PIRS™ Concept and Method



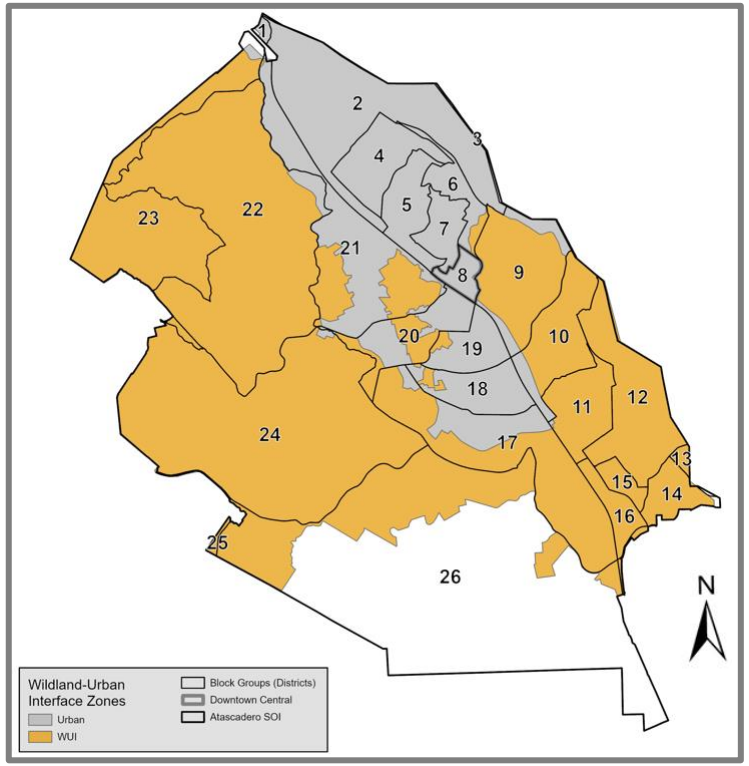
Step 5 (upcoming): Create a composite map once all policies have been scored and tallied.

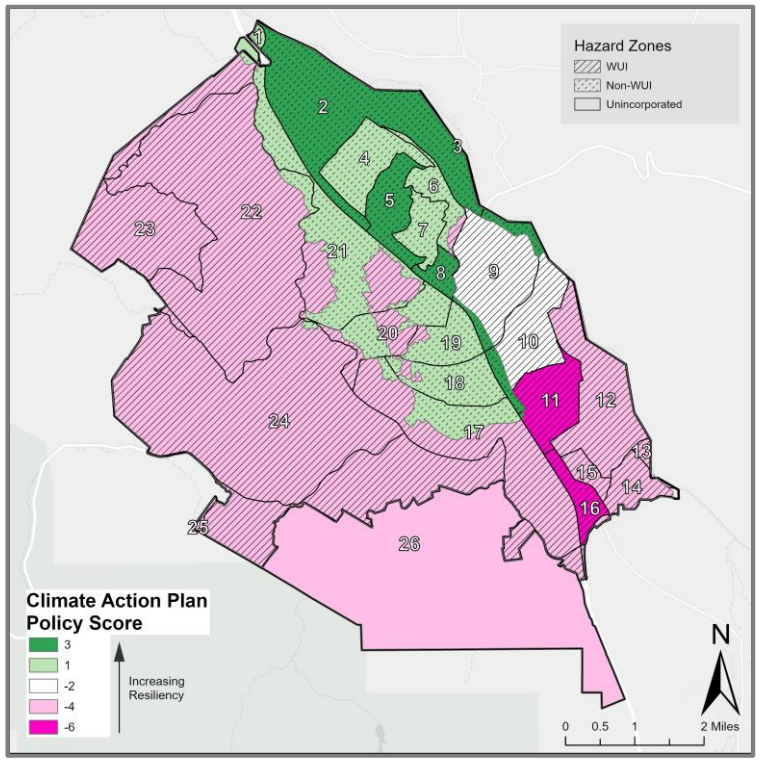
Example of PIRS™ spatially-informed policy analysis and scoring process (Atascadero, CA)

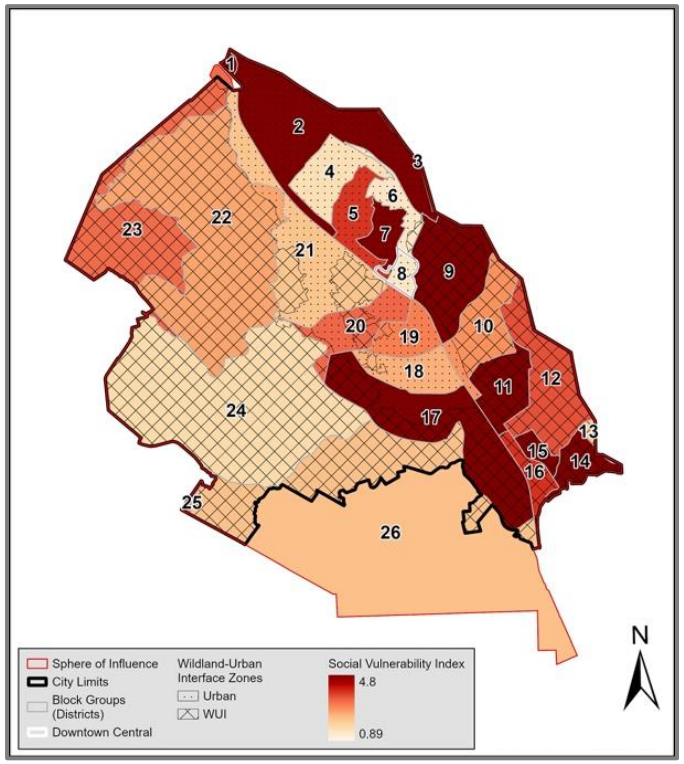
POLICY	Hazard zones	Districts: 07	Downtown [08]	09
[8.2.]1. Adopt and maintain a creek setback ordinance that will establish building setbacks and development standards along the banks of Atascadero Creek, Graves Creek, blue line creeks and the Salinas River to ensure the uninterrupted natural flow of the streams and protection of the riparian ecosystem with flexible standards for the downtown area.	WUI			1
	Non-WUI	1	-1	1

Reviewer comments on Policy 8.2.1 (above): *Where policy applies in the downtown area DHZ, open-ended "flexible standards" may impede wildfire resilience.*

Plan Integration for Resilience Scorecard (PIRS™)







Step 1:
Delineate “District-Hazard Zones”

Step 2:
Spatially evaluate plans

Step 3:
Compare to vulnerabilities

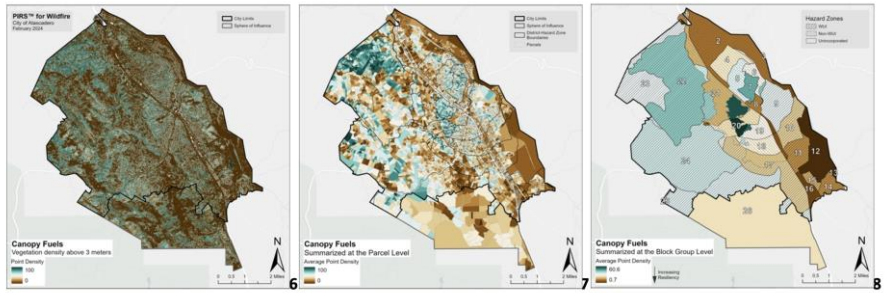
Future Work

Apply AI
Machine Language processing of policies in the Network of Plans.

Use of LiDAR and other spatial data for analysis
Canopy fuel density summarized by parcels (Atascadero, CA example below)

Add CA cities and counties
Increase impact beyond the pilot

Expand to multi-hazard analysis
Wildfire, flooding, extreme heat, etc.



Credit: Andrew Fricker and Heath Hooper.

Strengthen engagement from collaborative teams
Planning, Fire, Emergency Management, and other key stakeholders

CONTACTS + RESOURCES

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Plan Integration for Resilience Scorecard™

CSU Geospatial Review
GEOGRAPHIC INFORMATION SCIENCE IN THE CALIFORNIA STATE UNIVERSITY SYSTEM
csugis.sfsu.edu

CAL POLY WUI Fire Institute | GORDON AND BETTY MOORE FOUNDATION | HAZARD REDUCTION & RECOVERY CENTER TEXAS A&M UNIVERSITY

Tools and Data Frequently Used by FEMA

Region 9 | Data Analytics Branch | December 5, 2024

Michael Commons

FEMA

- National Risk Index (NRI)
- Climate and Economic Justice Screening Tool (CEJST)
- Social Vulnerability Index (SVI)
- Community Resilience Estimates (CRE)
- ★ Community Disaster Resilience Zones (CDRZ)

FEMA

National Risk Index (NRI)

Expected Annual Loss
is a *natural hazards component* that represents the average economic loss in dollars resulting from natural hazards each year.

×

Community Risk Factor
is a scaling factor that incorporates Social Vulnerability and Community Resilience into the National Risk Index

=

NRI Risk Index
represents the potential for negative impacts resulting from natural hazards.

Community Risk Factor

Social Vulnerability
is a *consequence enhancing risk component and community risk factor* that represents the susceptibility of social groups to the adverse impacts of natural hazards.

÷

Community Resilience
is a *consequence reduction risk component and community risk factor* that represents the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Natural Hazards (2022) 114:2331–2355
https://doi.org/10.1007/s11069-022-05474-w

ORIGINAL PAPER

Check for updates

The national risk index: establishing a nationwide baseline for natural hazard risk in the US

Casey Zuzak[1] · Matthew Mowrer[2] · Emily Goodenough[3] · Jordan Burns[1] · Nicholas Ranalli[4] · Jesse Rozelle[1]

ELSEVIER

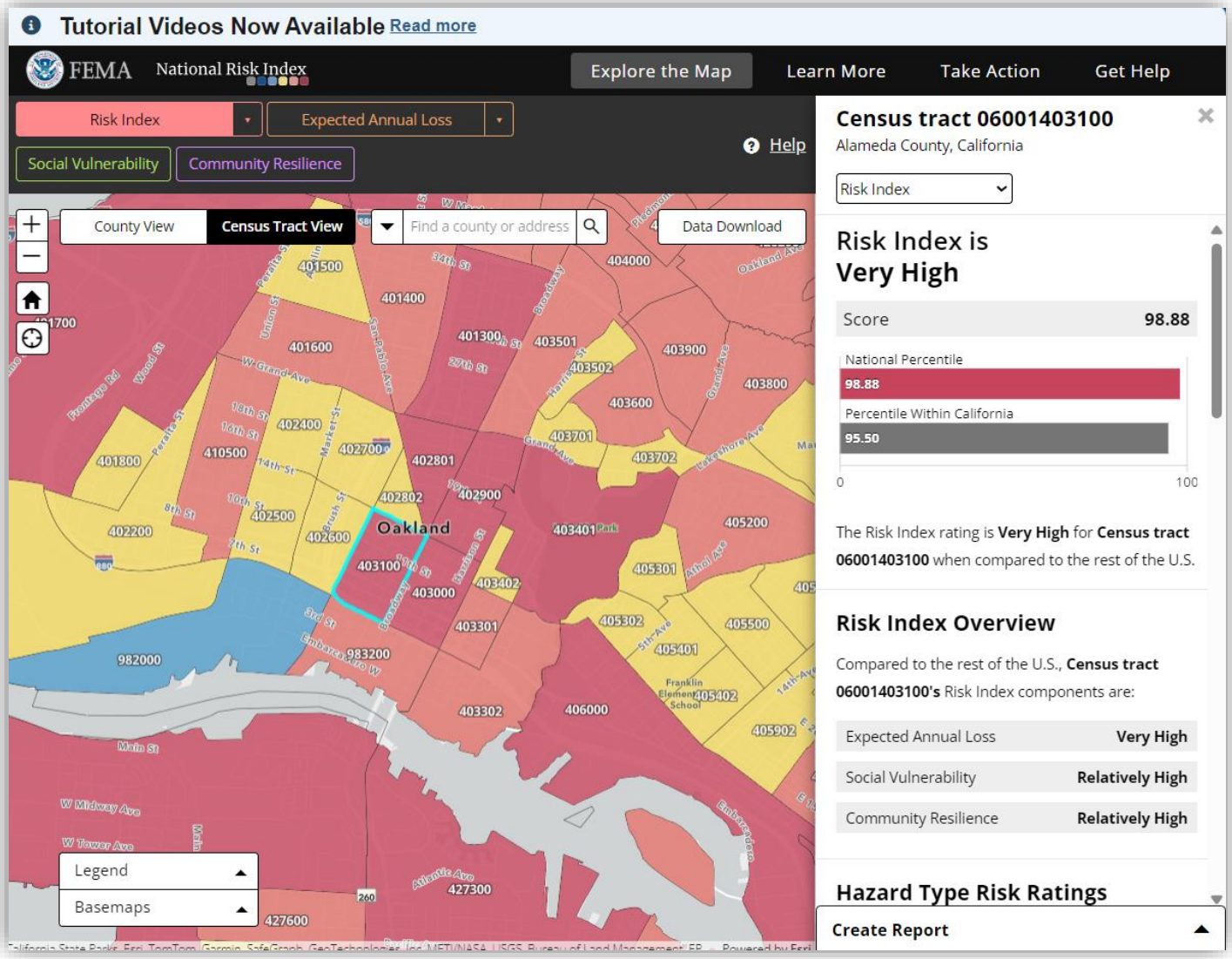
Global Environmental Change
Volume 29, November 2014, Pages 65-77

The geographies of community disaster resilience ☆

Susan L. Cutter, Kevin D. Ash, Christopher T. Emrich

UNIVERSITY OF South Carolina

National Risk Index (NRI)



The 18 natural hazards included in the National Risk Index are:

Avalanche	Heat Wave	Strong Wind
Coastal Flooding	Hurricane	Tornado
Cold Wave	Ice Storm	Tsunami
Drought	Landslide	Volcanic Activity
Earthquake	Lightning	Wildfire
Hail	Riverine Flooding	Winter Weather

Expected Annual Loss is Very High

Score 98.68

National Percentile
98.68
Percentile Within California
95.50
0
100

In **Census tract 06001403100**, expected loss each year due to natural hazards is **Very High** when compared to the rest of the U.S.

Expected Annual Loss Overview

Composite Expected Annual Loss	**$5,502,622.24**
Building EAL	**$2,892,105.86**
Building EAL Rate	**$1 per $315.87 of building value**
Population EAL	**0.23** fatalities
Population EAL Rate	**1 per 7.51K people**
Population Equivalence EAL	**$2,610,516.38**
Agriculture EAL	**$0.00**
Agriculture EAL Rate	--

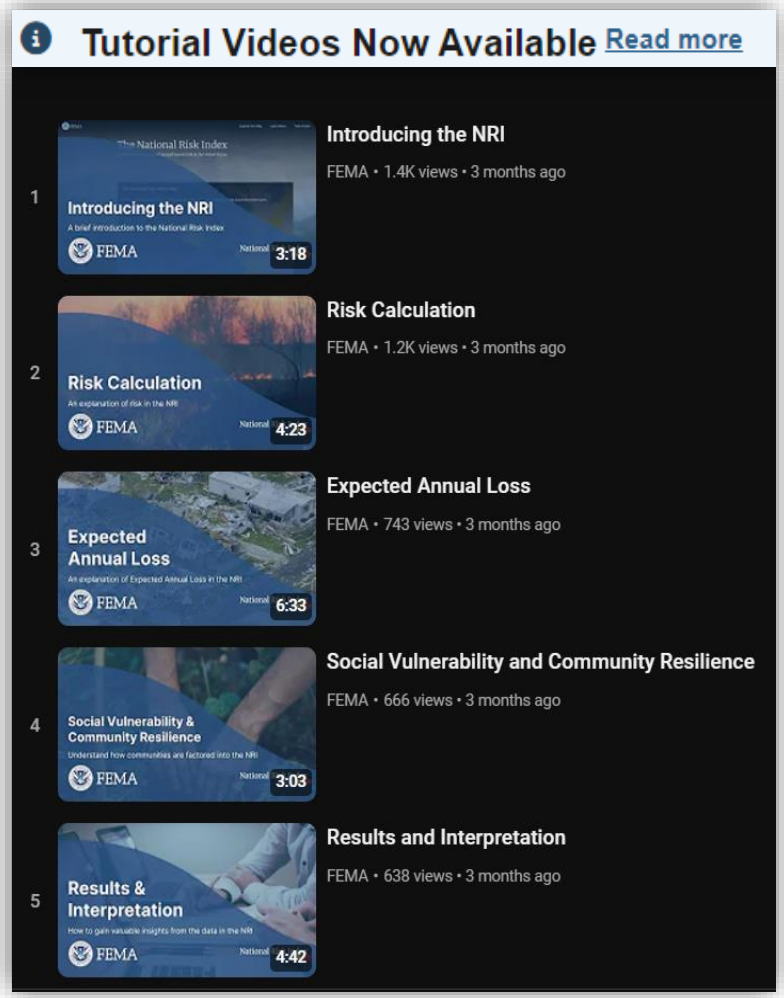
[Map | National Risk Index]

National Risk Index (NRI)

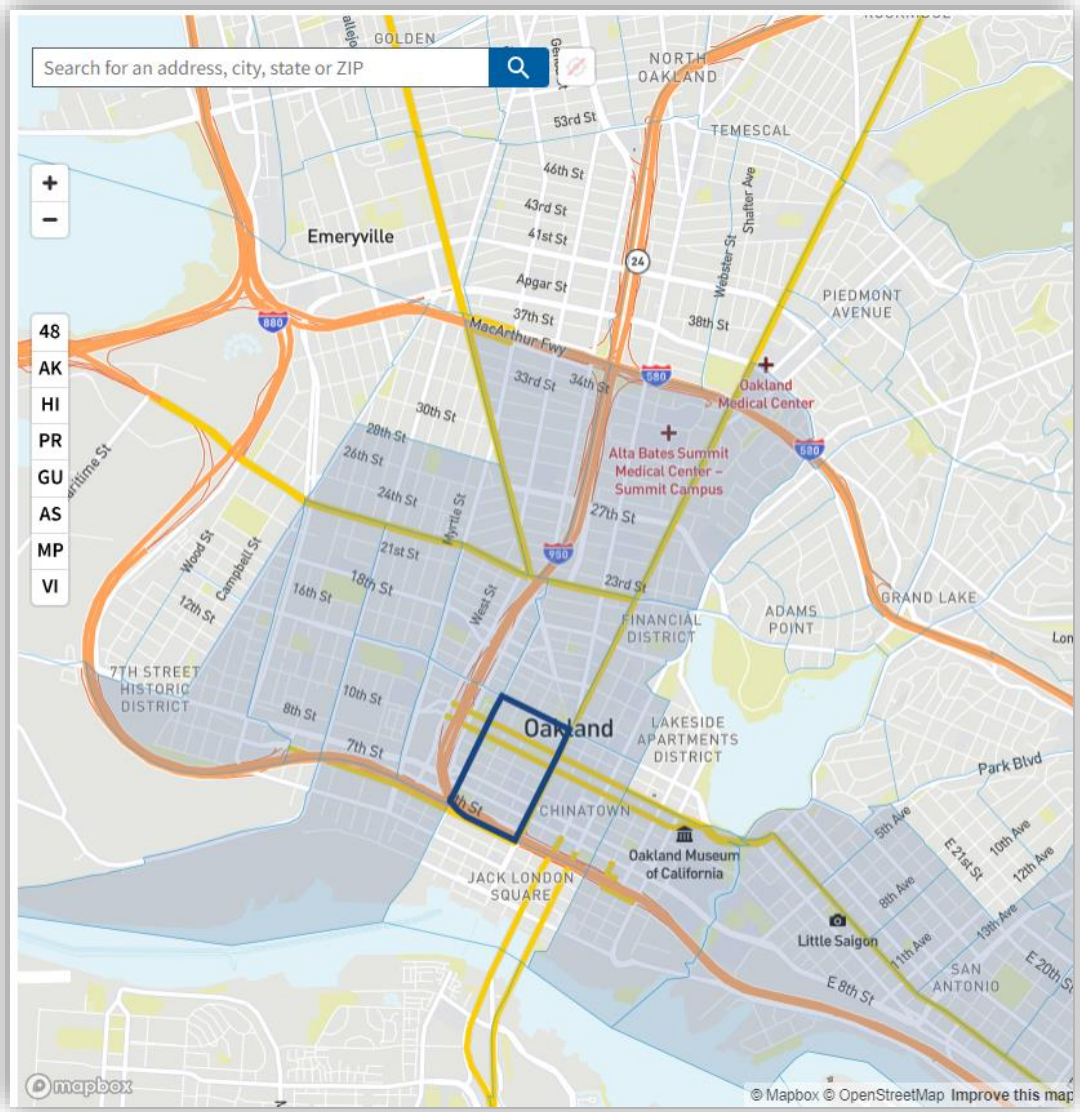
Intended users of the National Risk Index include planners and emergency managers at the local, regional, state, and federal levels, as well as other decision makers and interested members of the general public. With improved understanding of natural hazard risk, communities can take action to reduce the risk specific to that community.

Specifically, the National Risk Index can help with:

Enhancing hazard mitigation plans	Encouraging community-level risk communication and engagement	Supporting the development or enhancement of codes and standards
Informing long-term community recovery	Educating new homeowners and renters	Prioritizing and allocating resources
Identifying the need for more refined risk assessments	Informing the insurance and mortgage industries	Updating emergency operations plans



Climate and Economic Justice Screening Tool (CEJST)



Climate and Economic Justice Screening Tool

- Climate change +
- Energy +
- Health +
- Housing +
- Legacy pollution +
- Transportation +
- Water and wastewater +
- Workforce development +

[Explore the map - Climate & Economic Justice Screening Tool]

Housing −

Housing cost — 79th (not above 90th percentile)
Share of households making less than 80% of the area median family income and spending more than 30% of income on housing

Lack of green space — 97th (above 90th percentile)
Amount of land, not including crop land, that is covered with artificial materials like concrete or pavement

Lack of indoor plumbing — 99th (above 90th percentile)
Share of homes without indoor kitchens or plumbing

Lead paint — 43rd (not above 90th percentile)
Share of homes that are likely to have lead paint

AND

Low income — 69th (above 65th percentile)
People in households where income is less than or equal to twice the federal poverty level, not including students enrolled in higher ed

Social Vulnerability Index (SVI)

AT A GLANCE

Social vulnerability refers to the demographic and socioeconomic factors (such as poverty, lack of access to transportation, and crowded housing) that adversely affect communities that encounter hazards and other community-level stressors. These stressors can include natural or human-caused disasters (such as tornadoes or chemical spills) or disease outbreaks (such as COVID-19).

Social Vulnerability Index | Place and Health - Geospatial Research, Analysis, and Services Program (GRASP) | ATSDR

Journal of Homeland Security and Emergency Management

Volume 8, *Issue* 1 2011 *Article* 3

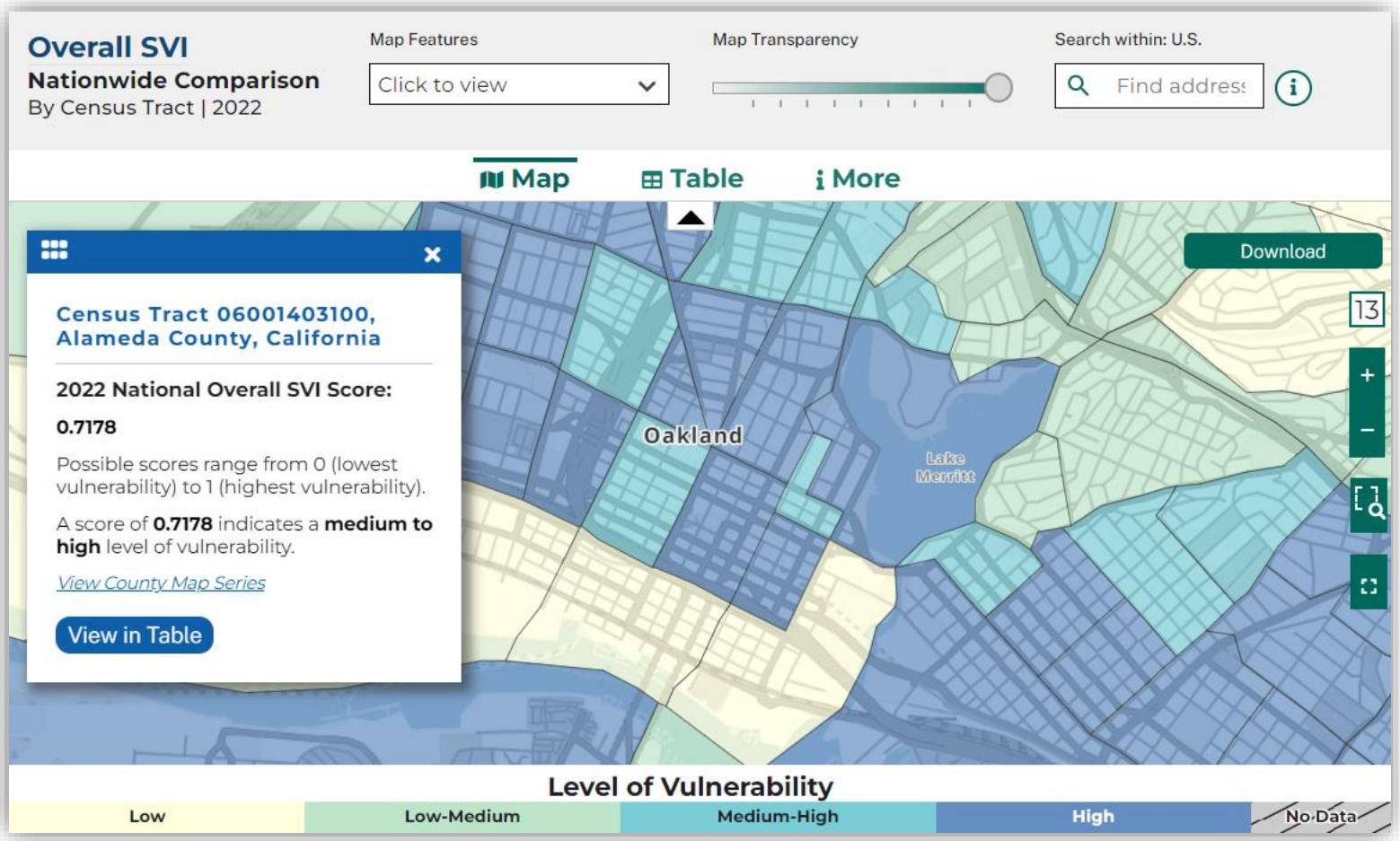
A Social Vulnerability Index for Disaster Management

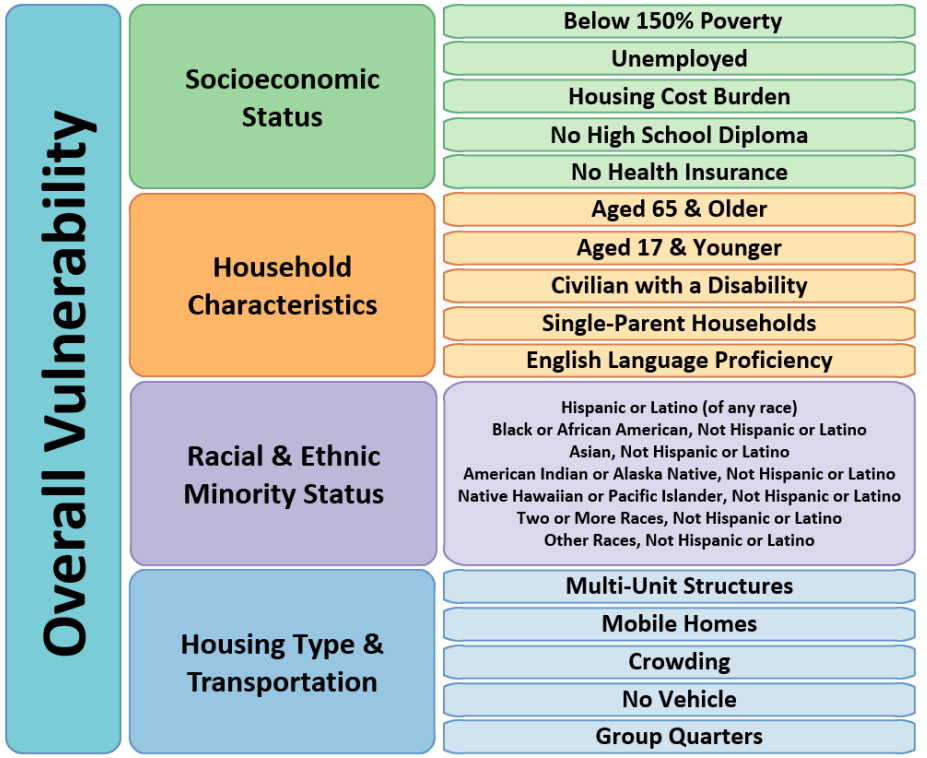
Barry E. Flanagan, *CDC/ATSDR*
Edward W. Gregory, *CDC/ATSDR*
Elaine J. Hallisey, *CDC/ATSDR*
Janet L. Heitgerd, *CDC/NCHHSTP*
Brian Lewis, *CDC/ATSDR*

Abstract

Social vulnerability refers to the socioeconomic and demographic factors that affect the resilience of communities. Studies have shown that in disaster events the socially vulnerable are more likely to be adversely affected, i.e. they are less likely to recover and more likely to die. Effectively addressing social vulnerability decreases both human suffering and the economic loss related to providing social services and public assistance after a disaster. This paper describes the development of a social vulnerability index (SVI), from 15 census variables at the census tract level, for use in emergency management. It also examines the potential value of the SVI by exploring the impact of Hurricane Katrina on local populations.

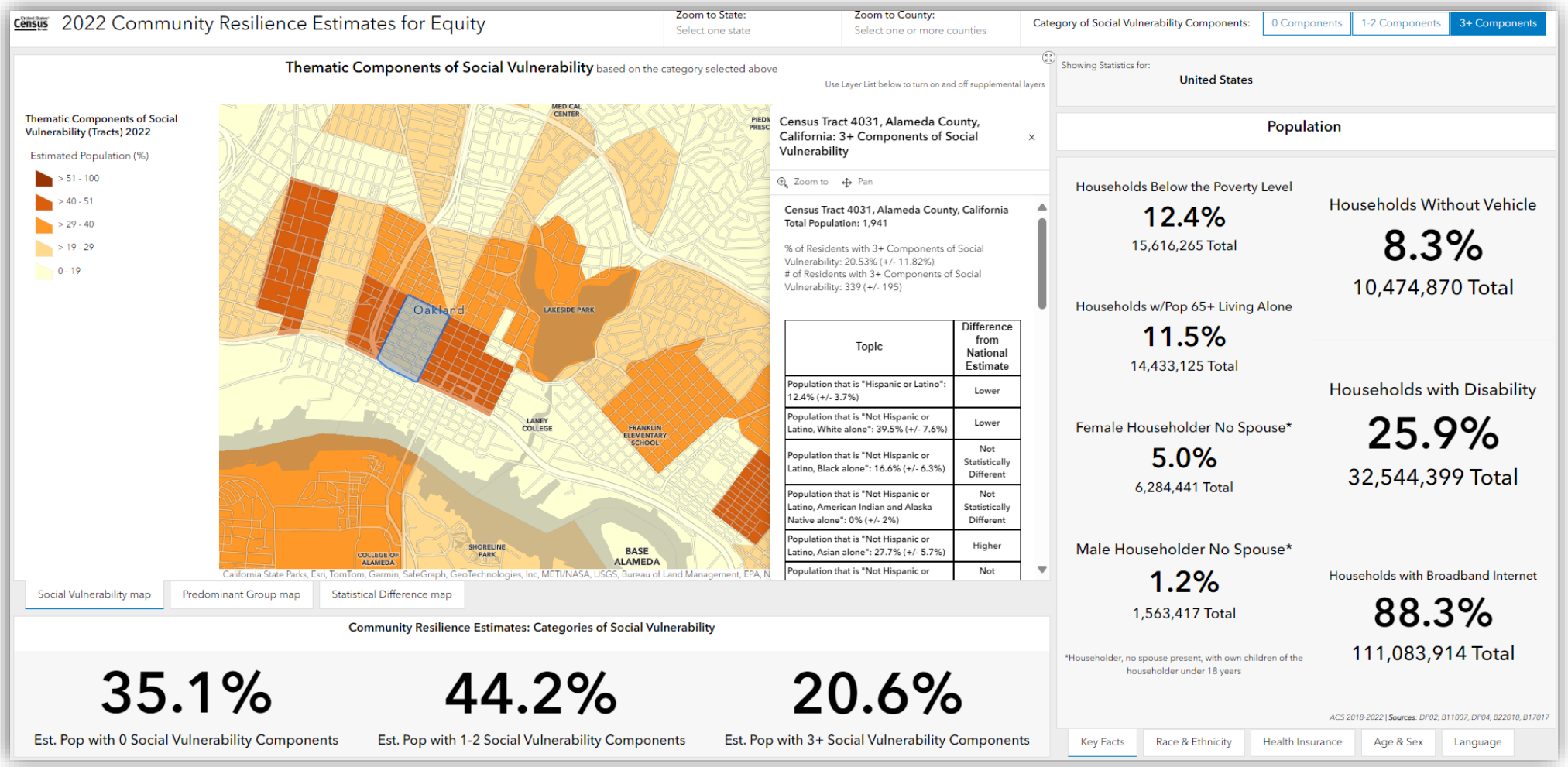
Social Vulnerability Index (SVI)





Social Vulnerability Index | Place and Health - Geospatial Research, Analysis, and Services Program (GRASP) | ATSDR

Community Resilience Estimates (CRE)



[Community Resilience Estimates]

Community Resilience Estimates (CRE)

United States® Census Bureau

Community Resilience Estimates (CRE) for Heat

July 16, 2024

The CRE for Heat identifies the specific areas across the country most socially vulnerable to the effects of heat exposure.

Visualization

Community Resilience Estimates for Equity Profiles

February 20, 2024

The CRE for Equity dataset and profiles provides information about social vulnerability and equity the nation, states, counties, and neighborhood census tracts.

CRE Interactive Tool

CRE Interactive Tool

Community Resilience Estimates Datasets

View and download the Community Resilience Estimates datasets and supporting documentation.

Components of Social Vulnerability (SV) for Households (HH) and Individuals (I)

- SV 1 (HH): Financial hardship defined as:
  - Income-to-Poverty Ratio (IPR) < 130 percent or
  - 50% < for housing/rental costs (HH).
- SV 2 (HH): Single or zero caregiver household - only one or no individuals living in the household who are 18-64.
- SV 3 (HH): Housing quality described as:
  - Unit-level crowding with > 0.75 persons per room or
  - Live in mobile home, boat, RV, Van, or other.
- SV 4 (HH): Communication barrier defined as either:
  - Limited English-speaking households[3] or
  - No one in the household has a high school diploma.
- SV 5 (HH): No one in the household is employed full-time, year-round. The flag is not applied if all residents of the household are aged 65 years or older.
- SV 6 (I): Disability posing constraint to significant life activity, defined as:
  - Persons who report having any one of the six disability types: hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty.
- SV 7 (I): No health insurance coverage.
- SV 8 (I): Being aged 65 years or older.
- SV 9: Transportation exposure described as:
  - No vehicle access (HH) or
  - Work commuting methods with increased exposure to heat (e.g., public transportation, bicycle, walking) (I).
- SV 10 (HH): Households without broadband Internet access).
- SV 11 (HH): Households that potentially lack air conditioning.

Community Disaster Resilience Zones (CDRZ)

Summary: CDRZ Designation

The initial 483 Community Disaster Resilience Zones (CDRZ) designations are intended to prioritize resources and technical support to areas that are most in-need and most at-risk from climate change and natural hazards

Refresh: What is a Community Disaster Resilience Zone?

The Community Disaster Resilience Zones (CDRZ) Act requires FEMA to utilize a natural hazard risk assessment product to identify census tracts which are most at risk from the effects of natural hazards based on intersection with high social vulnerability ratings and low community resilience ratings and other factors. The **initial 483 census tracts** designated as CDRZs represent more than two million Americans in the most at-risk and in-need communities across every state.

Focus: Community-centered

"CDRZ designations focus every sector -- from private to social and public -- to invest in and support a holistic, community-driven approach to building a more sustainable and resilient future for resilience zones."

Benefits: What does this mean for CDRZ communities?

Designation immediately qualifies CDRZ communities to be eligible for access to additional funding and technical assistance for resilience and mitigation projects:

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**: Increased federal cost share, Direct Technical Assistance, additional points on application, and Benefit Cost Analysis (BCA) Technical Assistance
- **FEMA Flood Mitigation Assistance (FMA)**: Additional points on application and Benefit Cost Analysis (BCA) Technical Assistance

And as CDRZ grows, the benefits will expand:

- **Other federal agencies** may be reaching out through their regional networks to share additional dimensions of support
- **Increased access** to resources and resilience stakeholder network - coming soon!

1. FEMA: https://www.fema.gov/CDRZ
2. Community Disaster Resilience Zones Act of 2022

[Community Disaster Resilience Zones | FEMA.gov]

Community Disaster Resilience Zones (CDRZ)

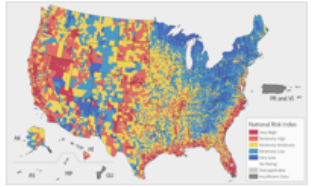
FEMA made CDRZ designations based on widely known, transparent, and understood measures of natural hazard risk and vulnerability

In September 2023, FEMA announced the first 483 Community Disaster Resilience Zones (CDRZ) across all 50 states and D.C.

Initial Tribal Nation and territorial designations were announced in August 2024. Further designations coming November 2024 and in the coming months.

Census tracts were designated CDRZ based on the following criteria[1]:

- ✓ **A composite National Risk Index (NRI)[2]:** Risk Index Scores that rank in the top 50 nationally *or* is in the top 1% within their state



- ✓ **A disadvantaged community** based on the **Climate & Economic Justice Screening Tool**

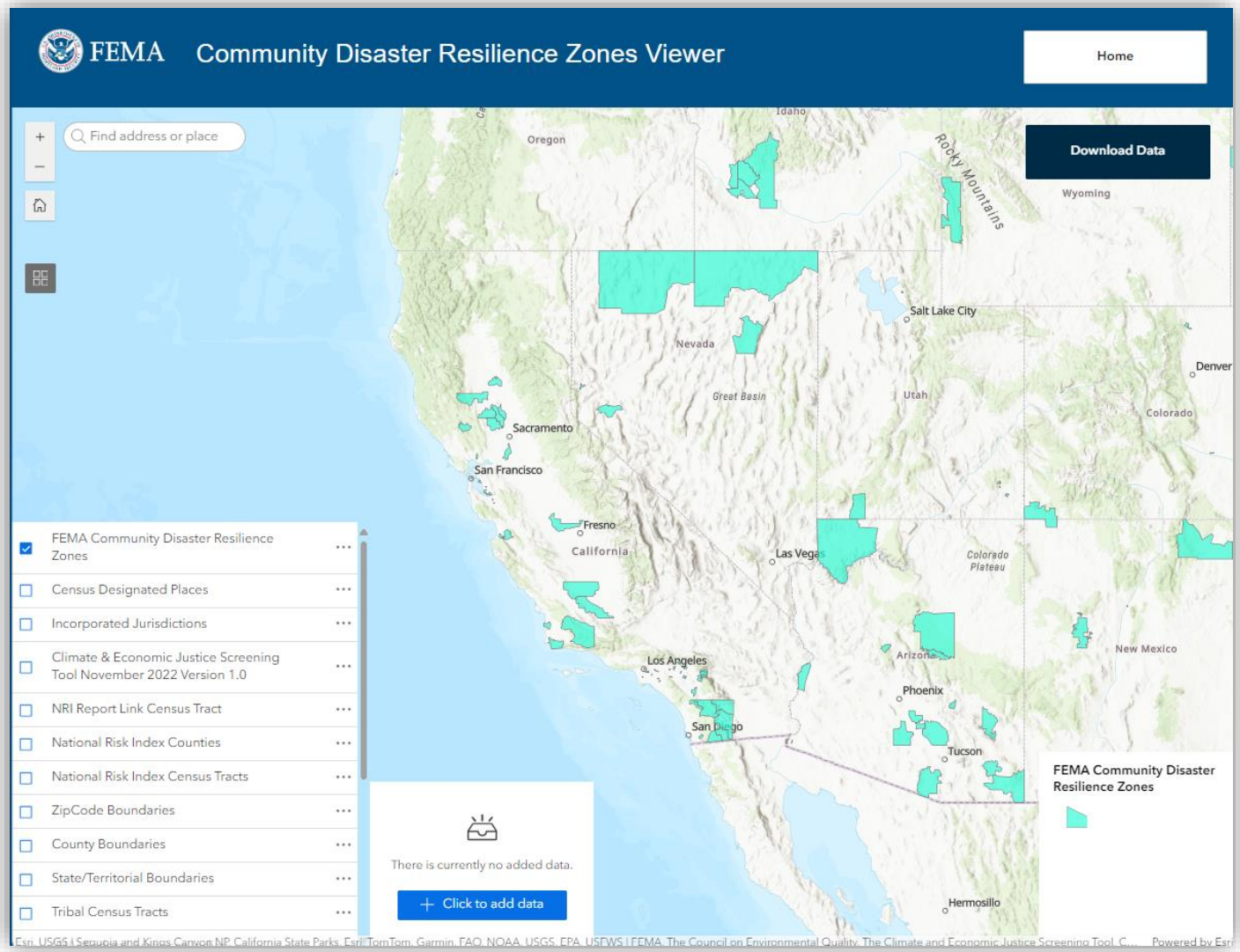
All designations underwent peer review by subject matter experts in a Methodology Data Working Group with support from the FEMA Mitigation Framework Leadership Group (MitFLG)

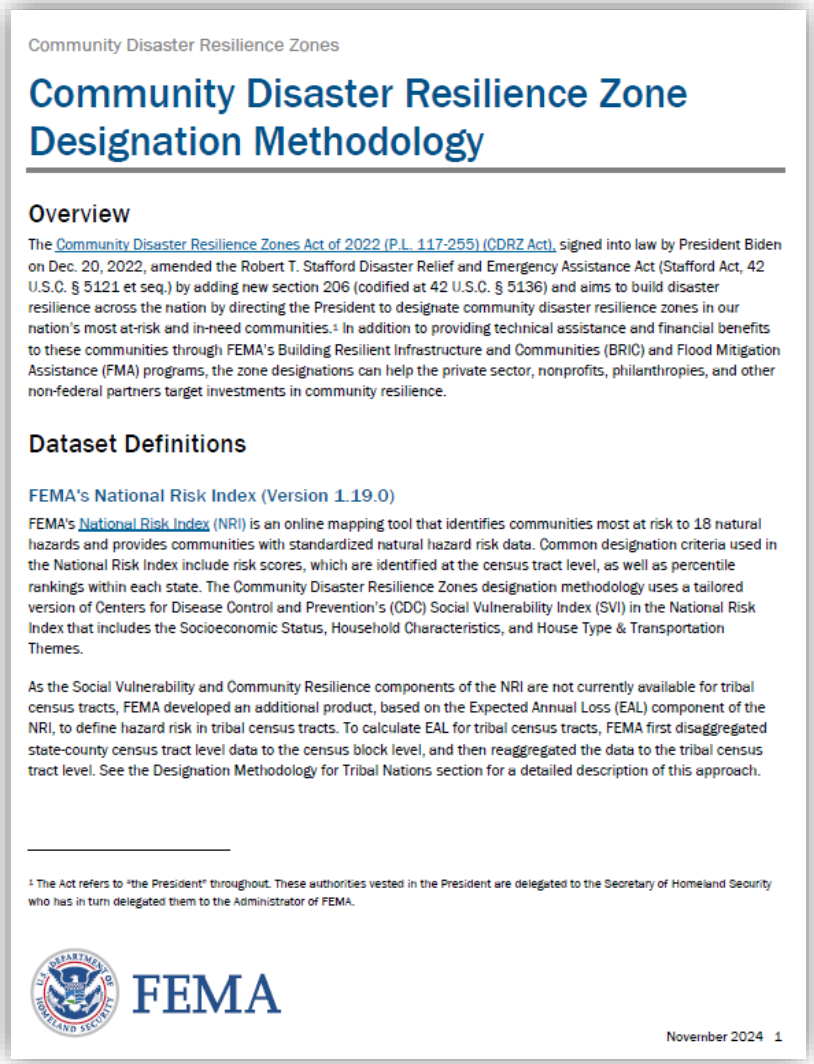
FEMA

1. FEMA CDRZ Methodology, August 28, 2023
2. 91 entities contributed to the creation of the NRI: https://hazards.fema.gov/nri/contributors

Community Disaster Resilience Zones | FEMA.gov

Community Disaster Resilience Zones (CDRZ)





Community Disaster Resilience Zones

Community Disaster Resilience Zone Designation Methodology

Overview

The Community Disaster Resilience Zones Act of 2022 (P.L. 117-255) (CDRZ Act), signed into law by President Biden on Dec. 20, 2022, amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act, 42 U.S.C. § 5121 et seq.) by adding new section 206 (codified at 42 U.S.C. § 5136) and aims to build disaster resilience across the nation by directing the President to designate community disaster resilience zones in our nation's most at-risk and in-need communities.[1] In addition to providing technical assistance and financial benefits to these communities through FEMA's Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) programs, the zone designations can help the private sector, nonprofits, philanthropies, and other non-federal partners target investments in community resilience.

Dataset Definitions

FEMA's National Risk Index (Version 1.19.0)

FEMA's National Risk Index (NRI) is an online mapping tool that identifies communities most at risk to 18 natural hazards and provides communities with standardized natural hazard risk data. Common designation criteria used in the National Risk Index include risk scores, which are identified at the census tract level, as well as percentile rankings within each state. The Community Disaster Resilience Zones designation methodology uses a tailored version of Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) in the National Risk Index that includes the Socioeconomic Status, Household Characteristics, and House Type & Transportation Themes.

As the Social Vulnerability and Community Resilience components of the NRI are not currently available for tribal census tracts, FEMA developed an additional product, based on the Expected Annual Loss (EAL) component of the NRI, to define hazard risk in tribal census tracts. To calculate EAL for tribal census tracts, FEMA first disaggregated state-county census tract level data to the census block level, and then reaggregated the data to the tribal census tract level. See the Designation Methodology for Tribal Nations section for a detailed description of this approach.

[1] The Act refers to "the President" throughout. These authorities vested in the President are delegated to the Secretary of Homeland Security who has in turn delegated them to the Administrator of FEMA.

FEMA

Web Links

National Risk Index:
https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/index.php/bric
https://www.sciencedirect.com/science/article/abs/pii/S0959378014001459
https://link.springer.com/article/10.1007/s11069-022-05474-w
https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf
https://hazards.fema.gov/nri/map
https://www.youtube.com/playlist?list=PL720Kw_OojIlf1fJQTJordprDDtfScEN7

Climate and Economic Justice Screening Tool:
https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5

Social Vulnerability Index:
https://www.atsdr.cdc.gov/place-health/php/svi/index.html

Community Resilience Estimates:
https://www.census.gov/programs-surveys/community-resilience-estimates.html

Community Disaster Resilience Zones:
https://www.fema.gov/partnerships/community-disaster-resilience-zones
https://experience.arcgis.com/experience/e3bb8cb79d124a0ca38a05e48afb6fd6/page/Community-Disaster-Resilience-Zone-Viewer/

Thank You!

Michael Commons, FEMA Region 9

michael.commons@fema.dhs.gov

FEMA

Cal OES Hazard Risk & Social Vulnerability Tool

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

Hazard Mitigation Assessment Unit

Presentation Roadmap

- Introduction
- Cal OES and the SVI & NRI
- The OES Hazard Risk Tool
- Example 1: SF International
- Example 2: Merced, California

Cal OES and the NRI and SVI Indices

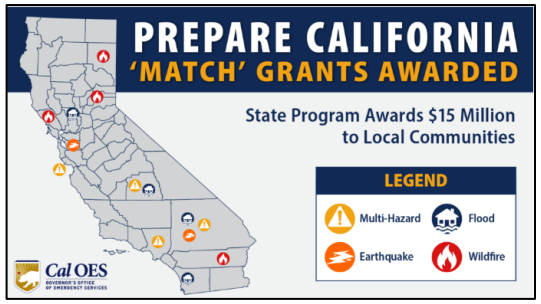
The SVI is used to prioritize communities for FEMA's Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) grants, emphasizing equitable resource allocation to socially vulnerable areas.

California also uses the SVI to evaluate the impact of Hazard Mitigation Grant Program (HMGP) projects, ensuring mitigation efforts address areas of greatest vulnerability

BRIC
Building Resilient Infrastructure and Communities

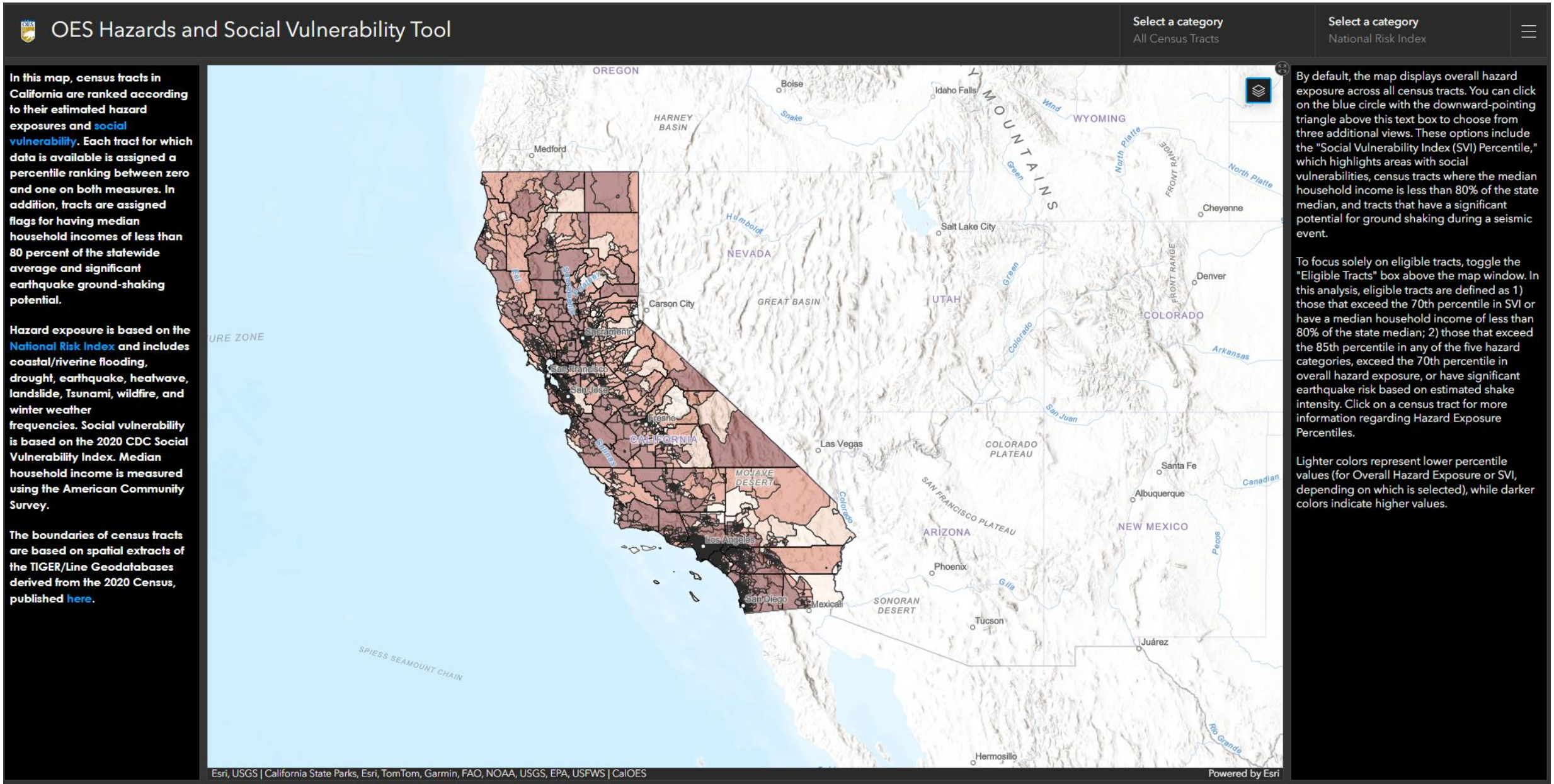
FMA
Flood Mitigation Assistance

HMGP
Hazard Mitigation Grant Program

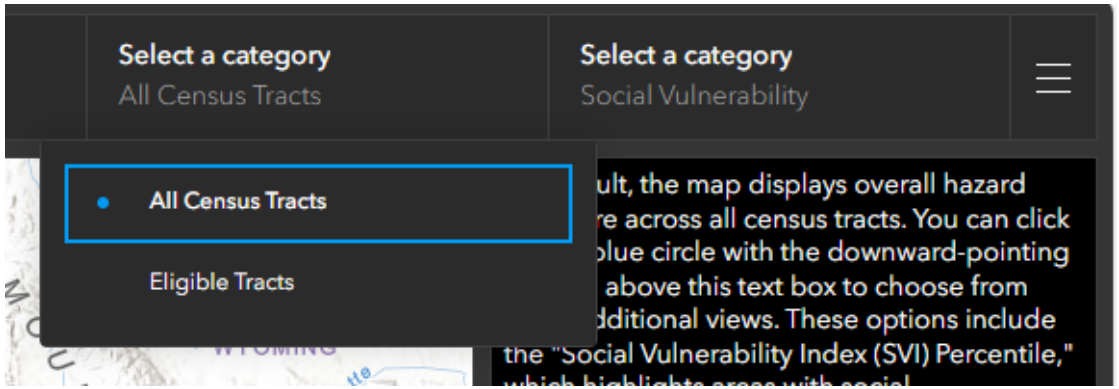


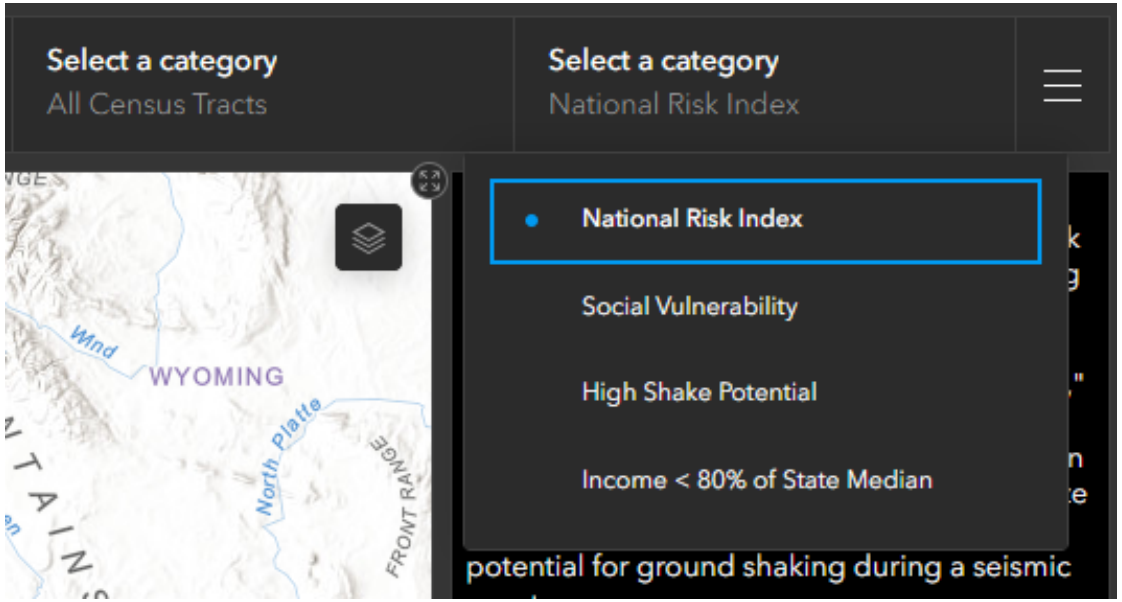
The SVI was also a key factor in awarding applicants over $15 million in Prepare California Match grants. Cal OES used the SVI to prioritize communities that are both socially vulnerable and at high risk for natural hazards.

2024 OES Hazards and Social Vulnerability Tool



Toggle between All tracts and Eligible Tracts

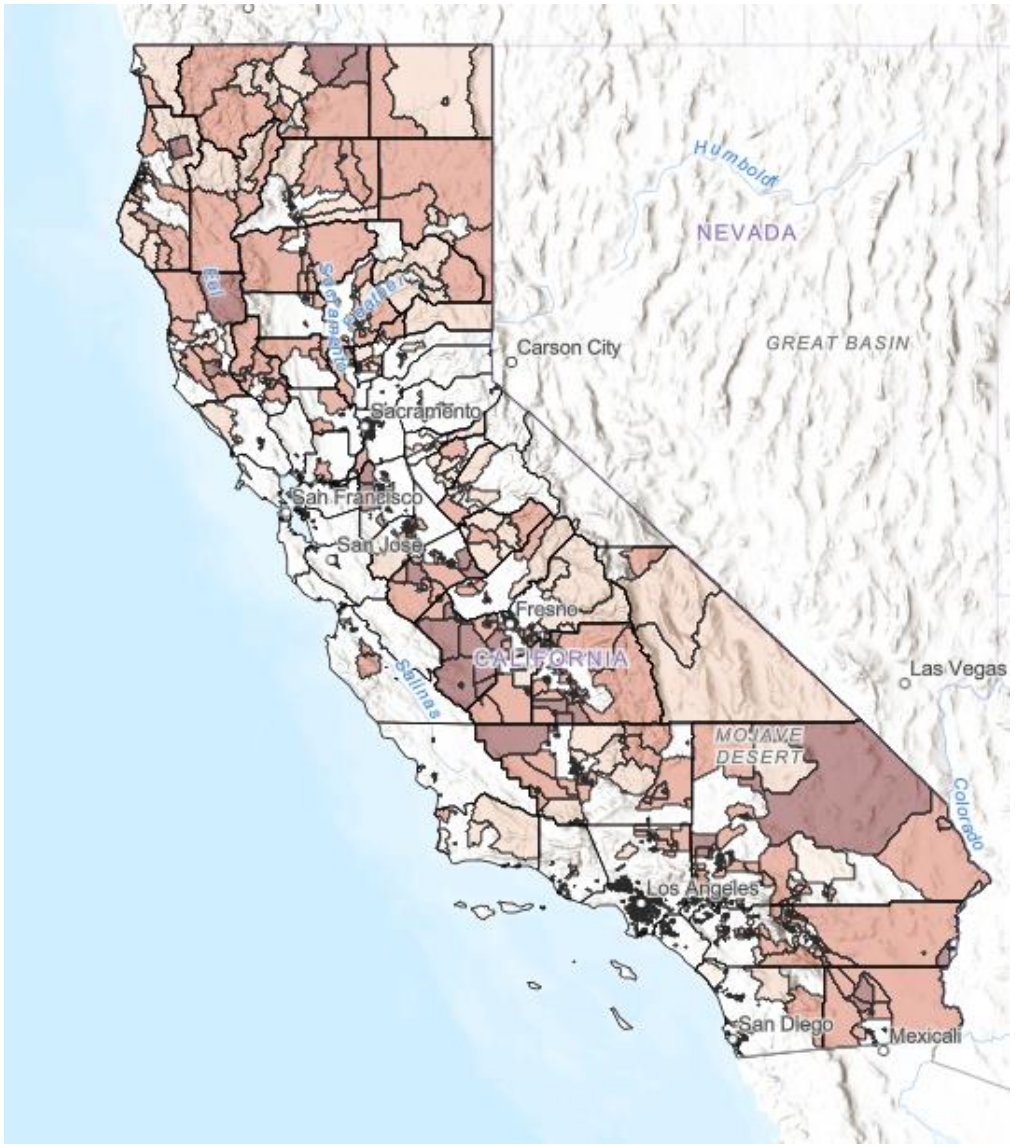




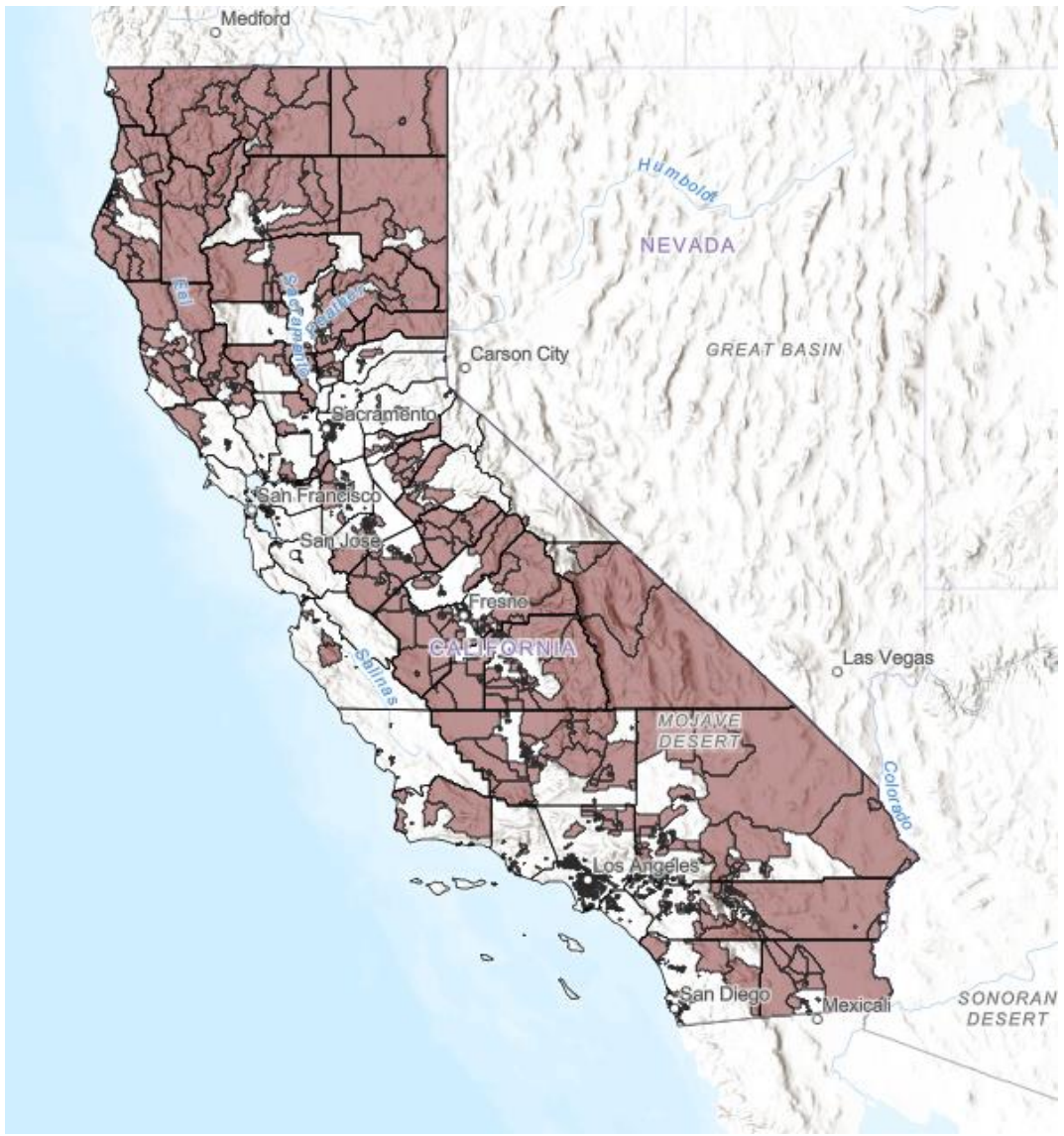
Select between the different criteria for eligibility

Criteria for eligibility:
SVI > 70 or Income < 80% of state median
&
NRI > 85th percentile in any hazard, or > 70th percentile total hazard risk or high shake potential

Visualize different eligibility criteria

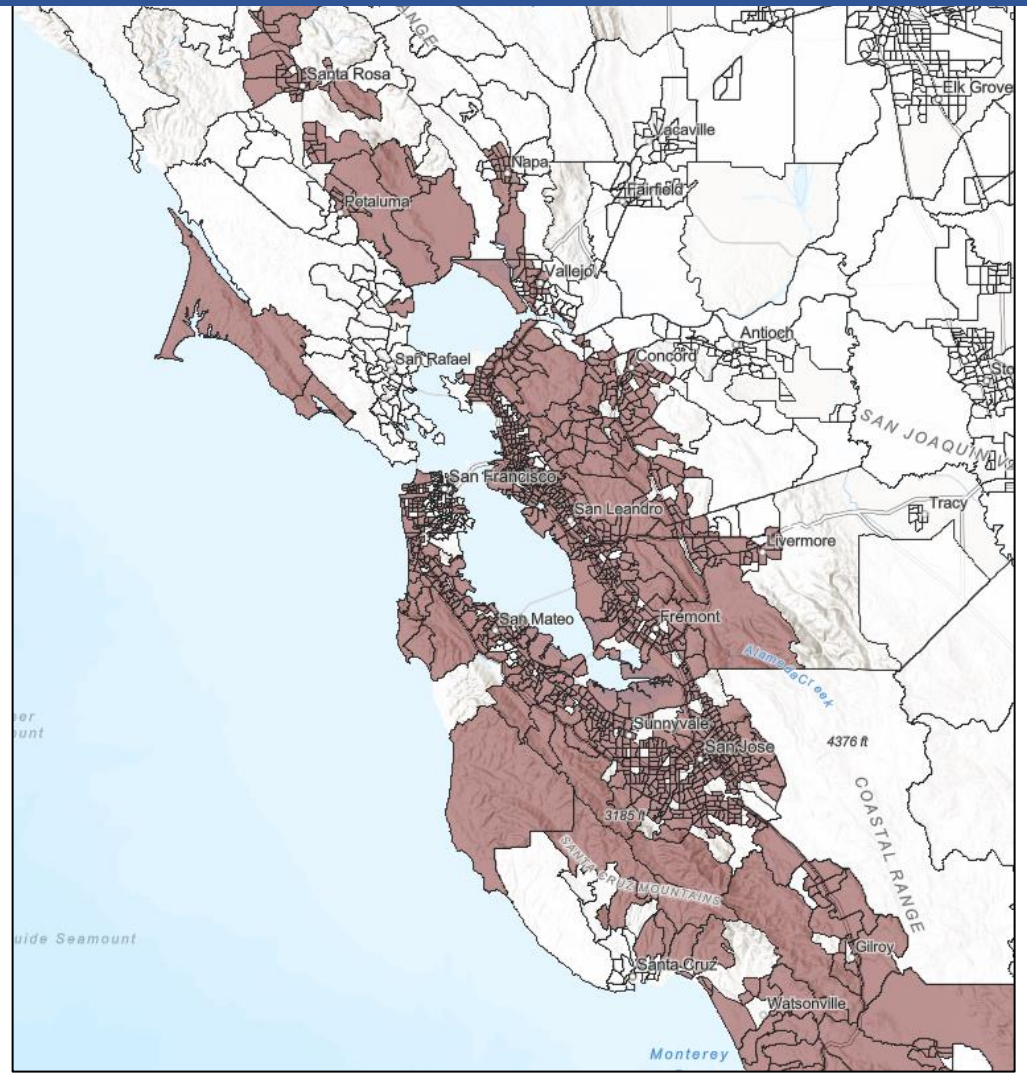


Social Vulnerability (Eligible Tracts)

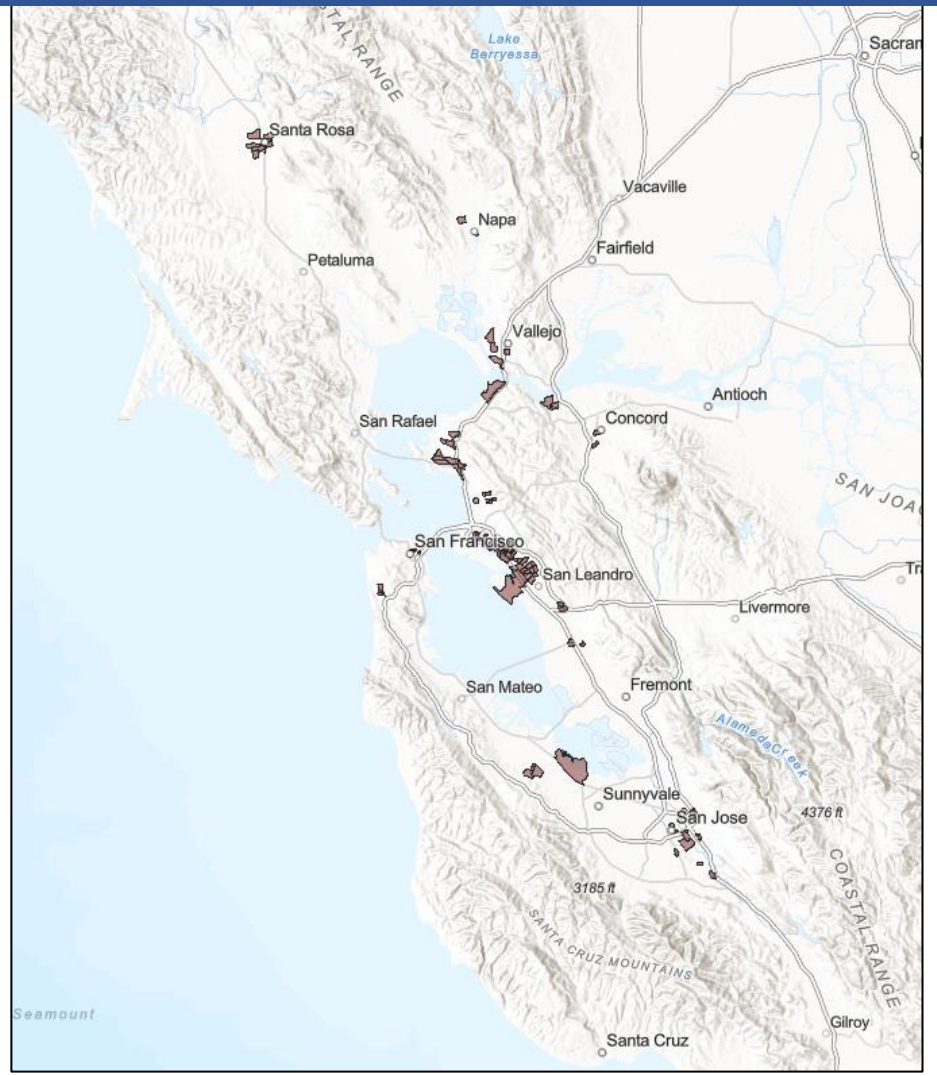


Income < 80% of state median(Eligible Tracts)

Compare high risk tracts to eligible tracts



All "High Shake Potential" Areas in SF and the surrounding area (red)



Eligible High Shake Areas (red)

Example 1: SF International

This is an example of the 2022 OES Hazards dashboard. When selecting a census tract from the map, this is what you'd see. This is the SF International Airport, Tract 9843.

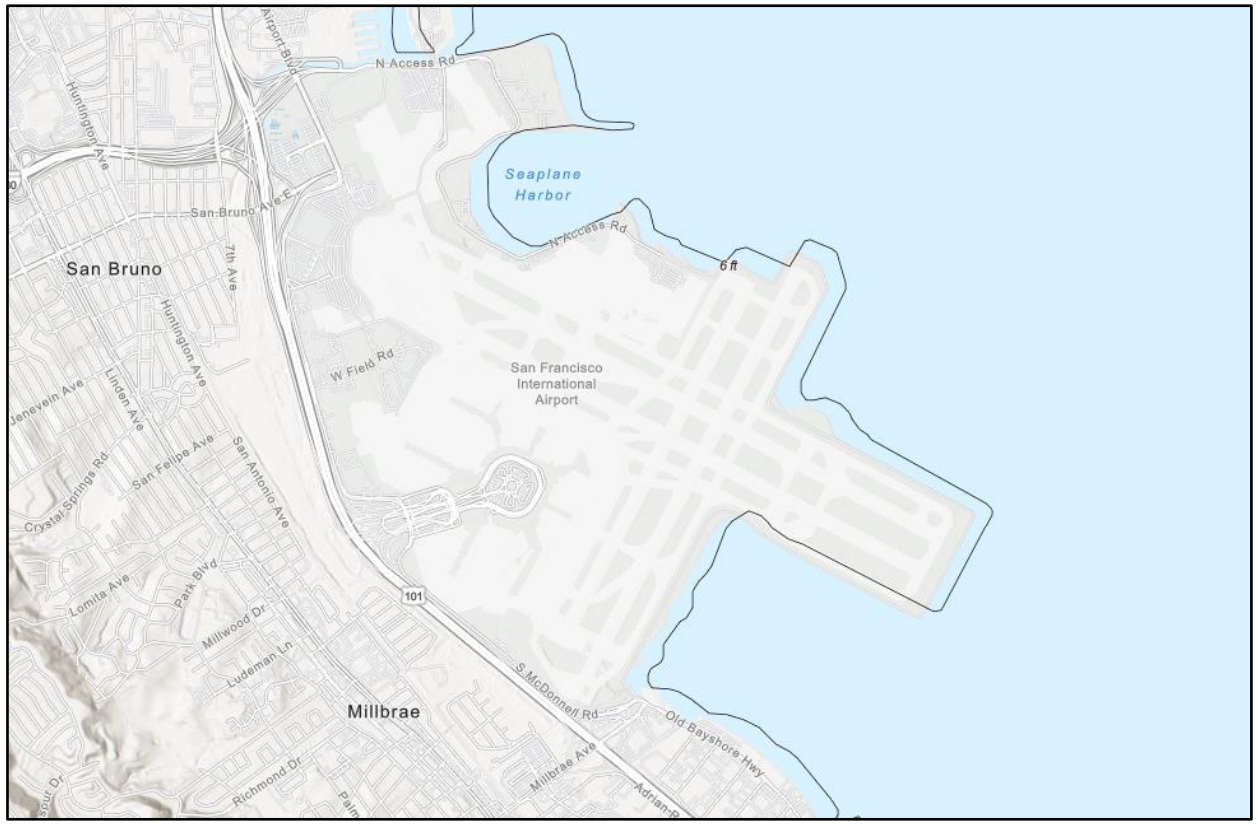
GEOID	Census Tract 9843, San Mateo County, California
Fire percentile	0.53
Flood percentile	0.98
Drought percentile	0.11
Heat percentile	0.05
Earthquake percentile	0.95
Total hazard percentile	0.65
SVI percentile	-999.00
Shake potential flag	1
Ratio of median household income to state median	-999.00

2022 Total Hazard Risk (State Percentile): 65th Percentile
Not socially vulnerable
High shake potential

"Highlighting change between SVI years"

The 2024 Hazard Overview

County Name	San Mateo
Census Tract	984300
Urban Area Designation	Urban Area
High Shake Potential?	Yes
Income < 80% of state median	No
Social Vulnerability Index (SVI) Percentile	0.000000
National Risk Index (NRI) Percentile	40.83
Overall Hazard Risk (Top 5 Hazards)	66.61
Top Hazard #1	Riverine Flood: 85.48
Top Hazard #2	Coastal Flood: 72
Top Hazard #3	Tsunami: 69.43
Top Hazard #4	Landslide: 62.35
Top Hazard #5	Earthquake: 40.79
Other Hazards Percentile	Wildfire: 0 Drought: 0 Heatwave: 0.66 Winter Weather: 0



2024 Total Hazard Risk (State Percentile): 66th Percentile
Not socially vulnerable
High shake potential

Comparing the "Map" and "Tool"

2022 OES Hazards Map

GEOID	Census Tract 9843, San Mateo County, California
Fire percentile	0.53
Flood percentile	0.98
Drought percentile	0.11
Heat percentile	0.05
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Shake potential flag	1
Ratio of median household income to state median	-999.00

- Reports on five hazard types relevant to CA
- Combines coastal and riverine flood risk
- Based on data products that are developed from the 2010 Census, including the 2018 SVI and 2022 NRI

2024 OES Hazards Tool

Census Tract 9843; San Mateo County; California

Table | Edit | Get directions | Zoom to

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Census Tract	984300
Urban Area Designation	Urban Area
High Shake Potential?	Yes
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Social Vulnerability Index (SVI) Percentile	0.000000
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Other Hazards Percentile	Wildfire: 0 Drought: 0 Heatwave: 0.66 Winter Weather: 0

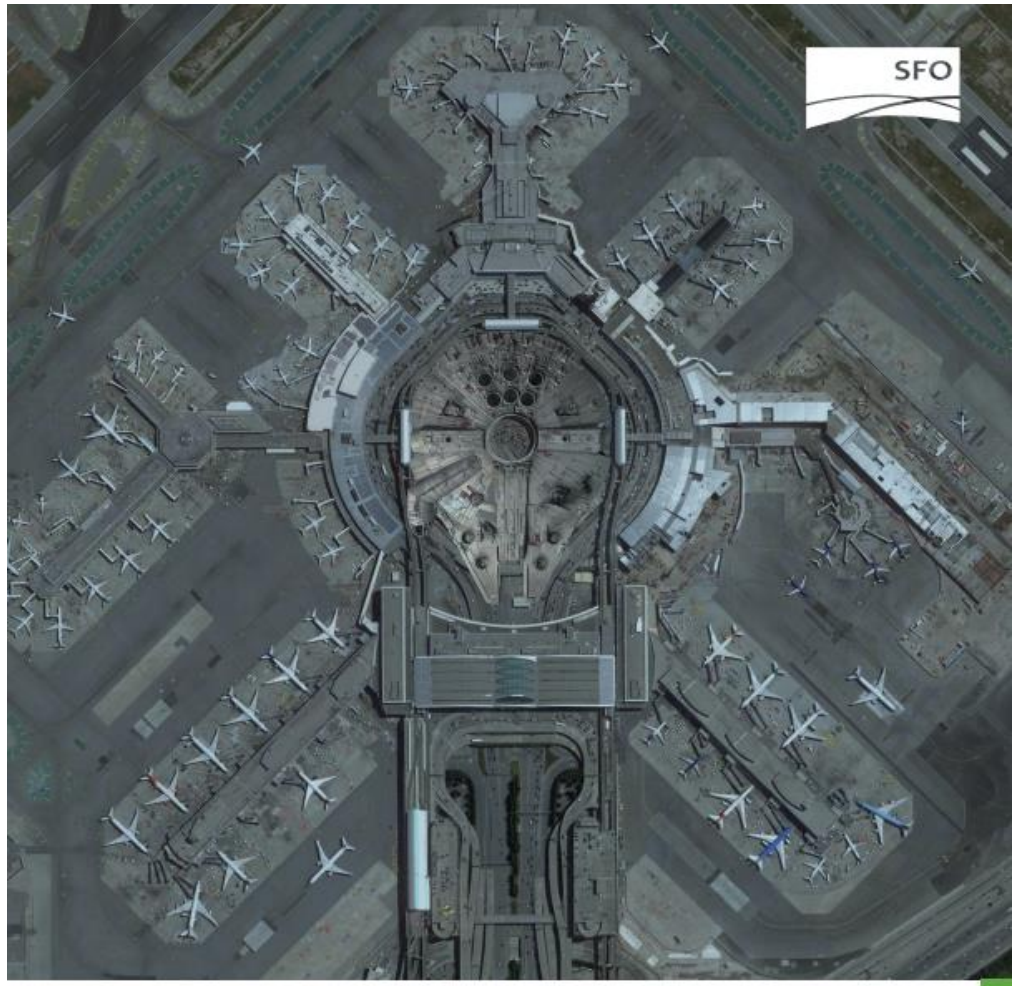
- Reports on nine hazards types relevant to CA
- Distinguishes coastal from riverine flooding
- Based on data products that are developed from the 2020 Census, including the 2022 SVI and the 2023 NRI
- Includes over 1000 new census tracts formed since 2010
- Incorporates drought and winter storms

Criteria for eligibility:
SVI > 70th percentile or Income < 80% of state median

&

NRI > 85th percentile in any hazard, or > 70th percentile total hazard risk

"Are the data different because we're more or less accurate, or did they improve their resilience?"



SFO Infrastructure Resilience Framework

September 2022

NOW 2023: In-House

Finalize Resilience Strategy & Pilots

- Build IRF into IMP SOW & KPIs
- Integrate IRF into BCP Updates
- Convene Working Group to map & assess condition & utility services for all Critical Facilities & assets
- Resolve infrastructure failure tracking & staffing support for AEP

NEAR 1-3 YEARS: Consultant-Supported

Develop Long-Term Infrastructure Resilience Plan

- Activate IMP SOW, IRF services
- Confirm current condition, vulnerabilities to shocks & stressors in on/offsite critical assets
- Plan and activate demonstration projects to grow adaptative capacity
- Resolve D&C service gaps through launch of fault tool, recovery library, and incident response staffing plan
- Define, design & launch Resilience by Design Guidelines, Fund, and CIPs

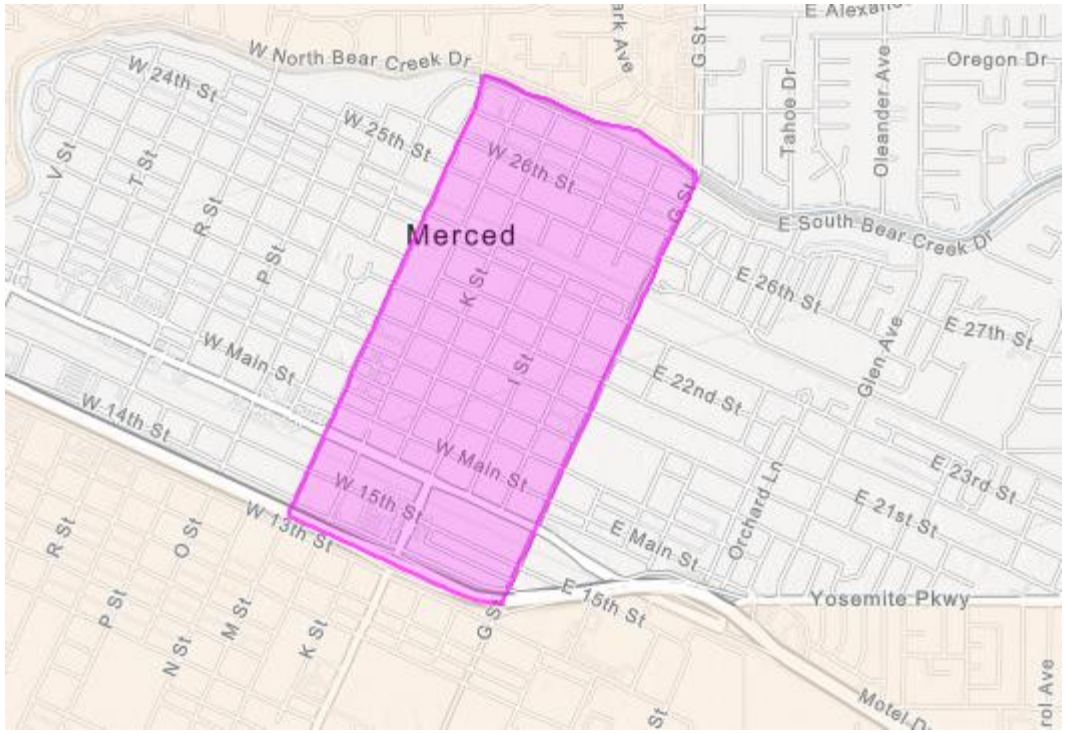
NEXT 5-10 YEARS: Capital Improvement Projects

Update Long-Term Infrastructure Resilience Plan

- Update IRF to include implemented projects
- Renew hazard assumptions and vulnerability assessment
- Renew Resilience CIP Fund, audit project performance, update KPIs
- Form Airport-wide resilience team

This is certainly a step in the right direction…

Example 2: Merced, California (2022 OES Tool)

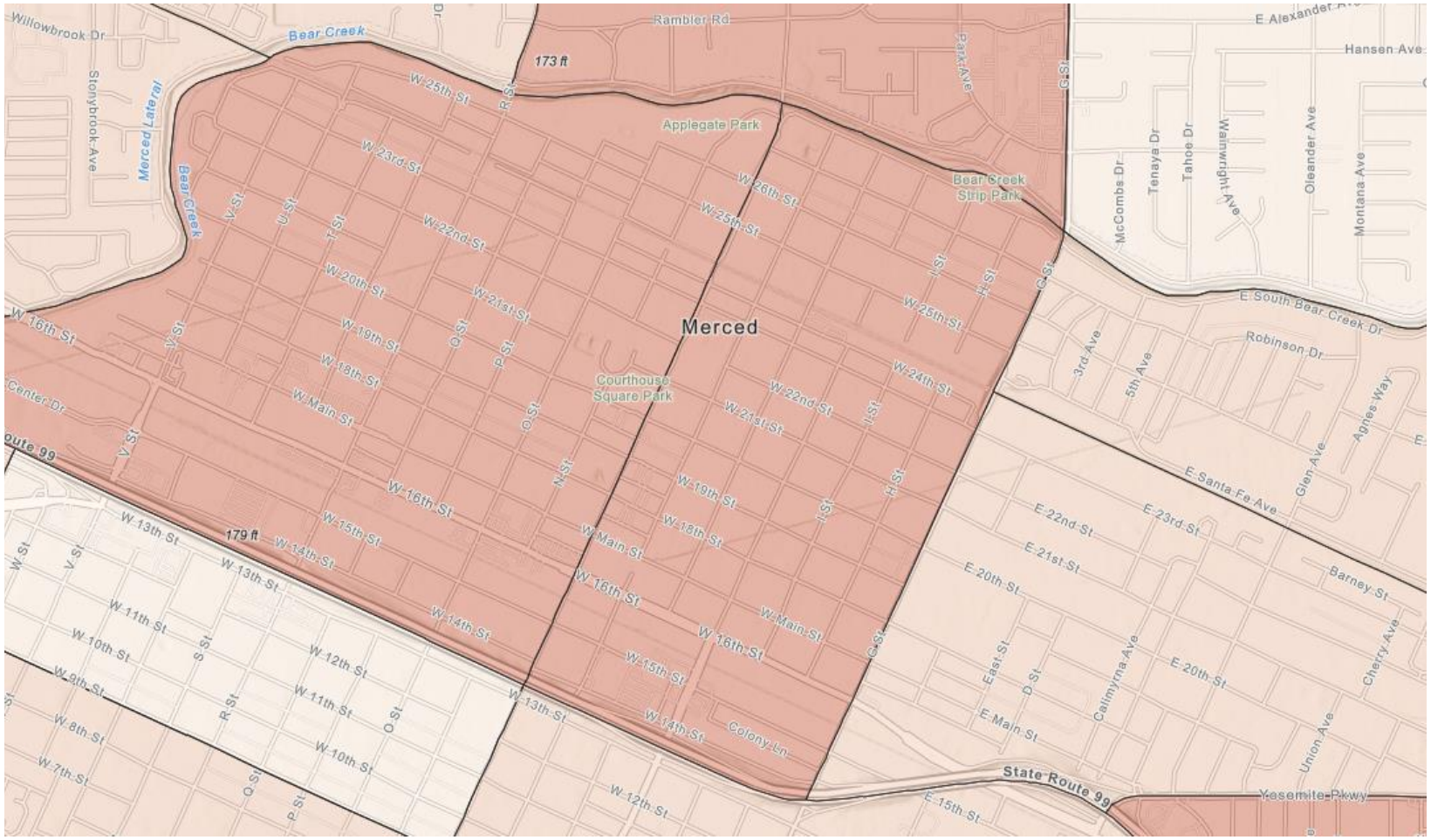


GEOID	Census Tract 13.02, Merced County, California
Fire percentile	0.63
Flood percentile	0.80
Drought percentile	0.40
Heat percentile	0.74
Earthquake percentile	0.14
Total hazard percentile	0.65
SVI percentile	0.88
Shake potential flag	0
Ratio of median household income to state median	0.31

Anecdotally, summer temperatures often reached 117-120F, Bear Creek floods ever year, and the area is particularly vulnerable to power outages.

Revisiting Example 2: Merced, California (2024 Update)

County Name	Merced
Census Tract	001302
Urban Area Designation	Urban Area
High Shake Potential?	No
Income < 80% of state median	Yes
Social Vulnerability Index (SVI) Percentile	94.870000
National Risk Index (NRI) Percentile	63.84
Overall Hazard Risk (Top 5 Hazards)	72.27
Top Hazard #1	Riverine Flood: 98.2
Top Hazard #2	Heatwave: 97.05
Top Hazard #3	Wildfire: 60.86
Top Hazard #4	Earthquake: 45.07
Top Hazard #5	Drought: 0
Other Hazards Percentile	Coastal Flood: 0 Landslide: 0 Tsunami: 0 Winter Weather: 0



Our understanding of Merced's risks and vulnerabilities have improved

CA Hazard Mitigation Summit 2024
Cal OES Resilience Branch

Welcome, please take your seats.
The presentation will begin shortly.

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

RAPT & GETT Overview

Cal OES – Resilience Branch
Hazard Mitigation Summit

December 5, 2024

Cal OES HMA Website

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

Agenda:

RAPT Overview

GETT Overview

FEMA Resilience Analysis and Planning Tool (RAPT)

RAPT gives **everyone** easy access to important community data and analysis tools

RAPT demographic indicators are pulled from U.S. Census American Community Survey (ACS) 2018–2022 five-year estimates. For more information on data sources, visit the RAPT Resource Center

Other Resources:

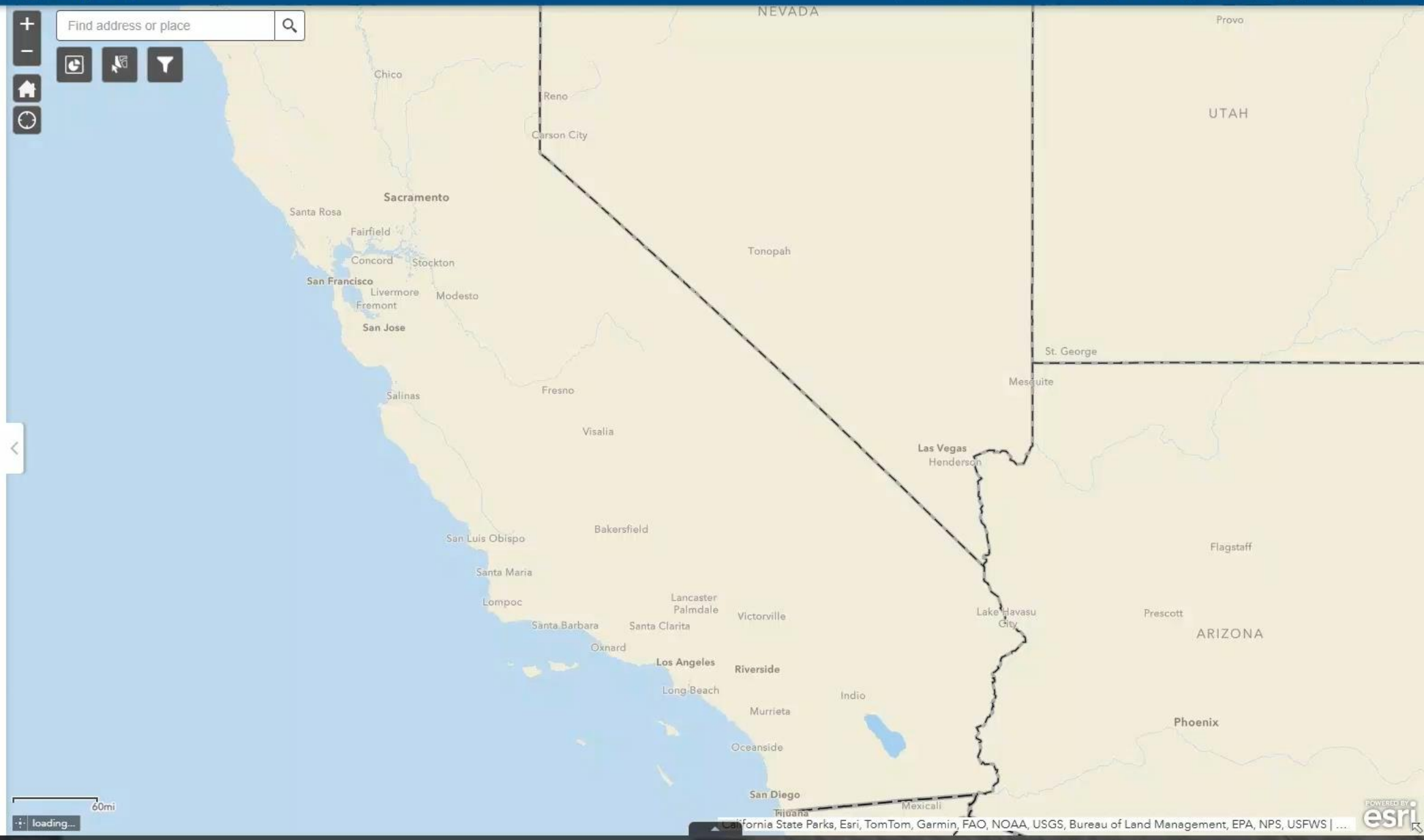
- RAPT Overview and Quick Start
- RAPT User Guide
- Grant Equity Threshold Tool (GETT)
- Future RAPT

To share how you use RAPT, or to send questions or comments, please contact: FEMA-TARequest@fema.dhs.gov

Other GIS Resources

- *Climate Risk and Resilience Portal (ClimRR) - ClimRR provides GIS data layers of future climate conditions. Adding these layers into RAPT allows users to examine how current community populations and infrastructure may be affected.*
- *FEMA Content Gallery - FEMA maintains a list of data layers that can be added to RAPT for analysis, including data on lifelines and hazards.*
- *FEMA Disaster Data - FEMA provides public data on specific incidents, Including Geospatial Damage Assessments. Some layers are not public.*

To close this window, click on the tab with the left facing arrow [<].



Resilience Analysis and Plannin

fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6

Error

FEMA Resilience Analysis and Planning Tool (RAPT)

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To close this window, click on the tab with the left facing arrow [<].

Find address or place

Infrastructure

Layers

- Fire Stations
- Local Law Enforcement Locations
- Prison Boundaries
- Mobile Home Parks
- Public Schools
- Private Schools
- Colleges and Universities
- SNAP Authorized Retailers (zoom in to activate)
- Hospitals
- Nursing Homes
- Urgent Care Facilities
- Dialysis Centers (RxOpen)
- Pharmacies (RxOpen)
- All Places Of Worship
- Public Health Departments
- Wastewater Treatment Plants (FRS)
- Power Plants
- Transmission Lines
- 911 Service Area Boundaries
- Principal Ports
- NID - High Hazard Potential Dam Lines

Bay Point
Martinez
Pittsburg
Hercules
Pinole
San Rafael
Concord
San Pablo
Richmond
Pleasant Hill
Clayton
CONTRA COSTA
Larkspur
Mill Valley
El Campo
Tamalpais-Homestead Valley
Walnut Creek
Lafayette
Albany
Berkeley
Moraga
Canyon
Emeryville
Danville
Oakland
San Francisco
San Ramon
Mission
Bayview
SAN FRANCISCO BAY OAKLAND INTERNATIONAL AIRPORT
San Leandro
CAMP PARKS
Dublin
Castro Valley
Daly City
Fairview
Hayward
Pleasanton
South San Francisco
San Bruno
Pacifica
Millbrae
Burlingame
Union City
ALAMEDA
Hillsborough
Foster City
Verona

4mi

loading...

California State Parks, Esri, TomTom, Garmin, SafeGraph, METI/NASA,

Agenda:

RAPT Overview

GETT Overview

GETT Dashboard | Resilience Analysis and Plannin

fema.maps.arcgis.com/apps/webappviewer/index.html?id=d1f3c8801ac2403781fd44160e18aa6f

Follow along to use the Grant Equity Threshold Tool (GETT)

The Grant Equity Threshold Tool (GETT) allows users to quickly **calculate the percentage of the population within a selected area** that live in the following three designated census tract types:

- The Climate and Economic Justice Screening Tool (CEJST) Disadvantaged
- FEMA's Community Disaster Resilience Zones (CDRZ)
- FEMA's Community Resilience Challenges Index (CRCI) bins

GETT also allows users to download spreadsheet and geospatial files for these findings.

GETT Quick Start Steps

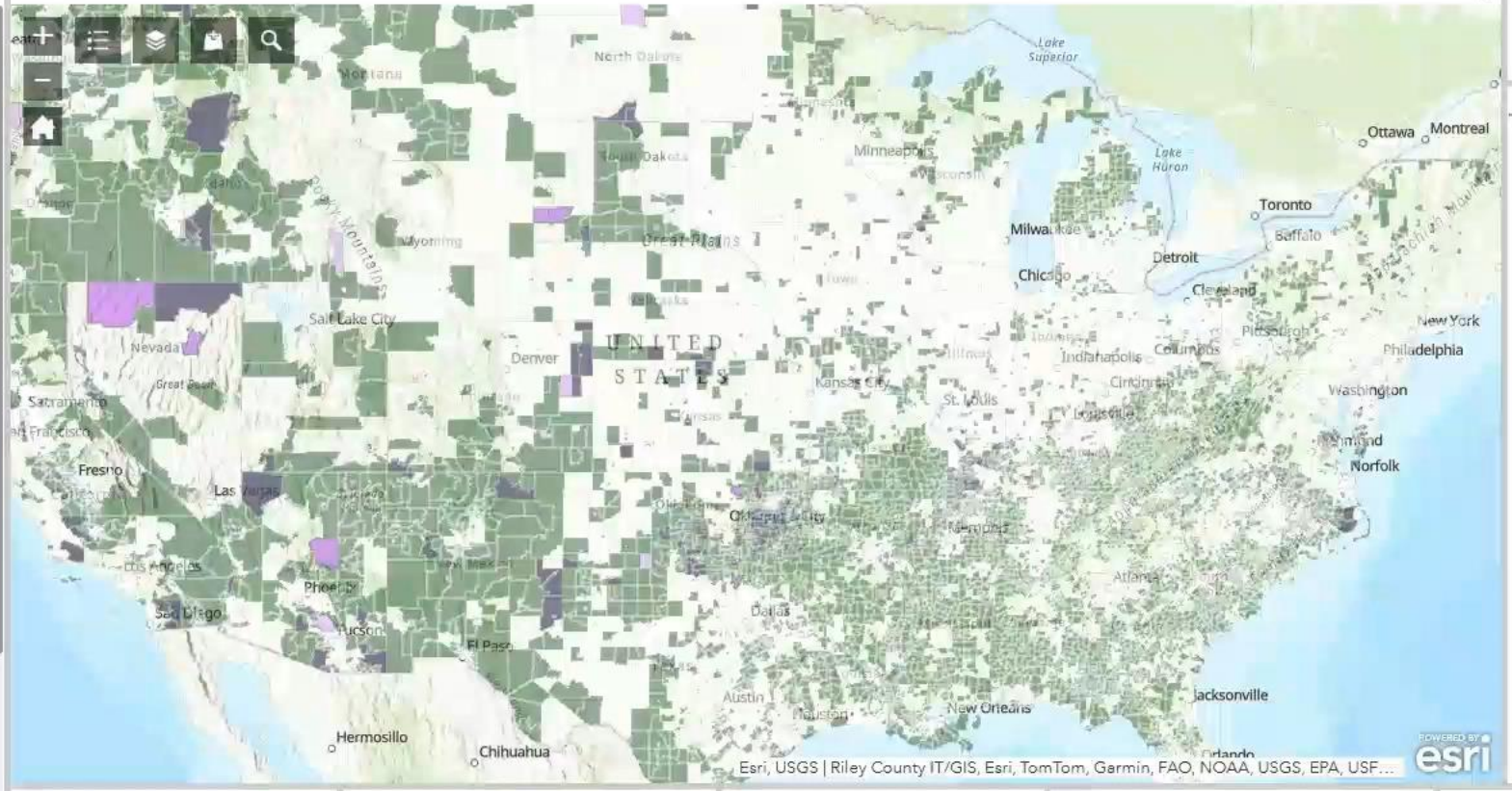
Step 1: Zoom in to your area of interest.

Step 2: Either draw, upload, or select a community boundary to identify your area of interest. This will become your "selected area".

To draw: Use the drawing tools found in the **Input** tab of the GETT to draw on the map. Select the shape and follow the pop-up tips.

To upload:
1. Use the Add Data button and select "file" to upload an area of interest.
2. Click on the map area that is displayed in blue on the screen.
3. Click on the small arrow at the top of the pop-up box to so that the blue area you uploaded is highlighted.
4. Click on the three dots in the bottom right of the pop-up box and select "Set as input of Grant Equity Threshold Tool".

Step 3: Once your selected area displayed on the map, click the **Run** button in the Input tab and the data will populate in the data boxes.



Take me to RAPT

Back to RAPT

Grant Equity Threshold Tool - GETT

Input | Output

Input Selected Area*

Help

Run

1	2	3	4	5
% of population in selected area living in CEJST disadvantaged census tract	Population in selected area living in CEJST disadvantaged census tract	Total population living in selected area	% of population in selected area living in CDRZ census tract	% of the selected area population that falls within each CRCI Percentile Bin (toggle on CRCI layer and legend for bin colors and details)
No data	No data	No data	No data	No data
Note: 2010 population data	Note: 2010 population data	Note: 2010 population data	Note: ACS 5-year 2018-2022	

12:58 PM
11/22/2024