



**TOWARDS A NEW CLIMATE URBANISM:
WILDFIRES, MICROGRIDS
AND HOLISTIC
COMMUNITIES**

11.14.23 | 12P -1P
1 LU/HSW
(PENDING APPROVAL)

2023

**CREDIT
CRAM**

Get on track with education requirements!

AIA California

MODERATOR:

**ISMAR ENRIQUEZ, AIA, LFA,
LEED AP**

DIRECTOR OF SUSTAINABLE HOUSING
DESIGN, STEINBERG HART



CASEY CASTOR, ASSOC. AIA
BUILDING SCIENCE ANALYST,
GGA+

**GREG KOCHANOWSKI, AIA,
ASLA**
PARTNER & DESIGN PRINCIPAL,
GGA+
FOUNDER, THE WILD: A
RESEARCH LAB

Learning Objectives

Towards a New Climate Urbanism: Wildfires, Microgrids and Holistic Communities



Review the history of fire in the Continental United States (with an emphasis on California and the West) and the policies and practices that have shaped our current environment.



Explore strategies, tactics, and technologies embedded into current sustainable fire-wise landscape policies, fire suppression infrastructures, and cultural fire practices.

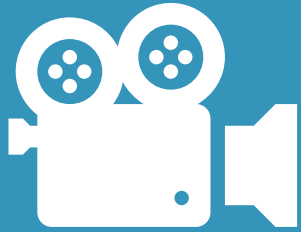


Describe existing energy management technologies that support resiliency and emergency electrical loading during wildfire events.



Explain how microgrids and building electrification are used to reduce fire risk and increase homeowner/building owner savings through clean operational energy and carbon reductions.

Housekeeping Reminders



A recording of today's presentation will be made available on our website



Today's session qualifies for 1 AIA HSW/LU



Please use the Q&A function to ask questions for today's presenters



Cultivate a positive learning environment

MODERATOR



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HOUSING DESIGN, STEINBERG
HART



SPEAKER



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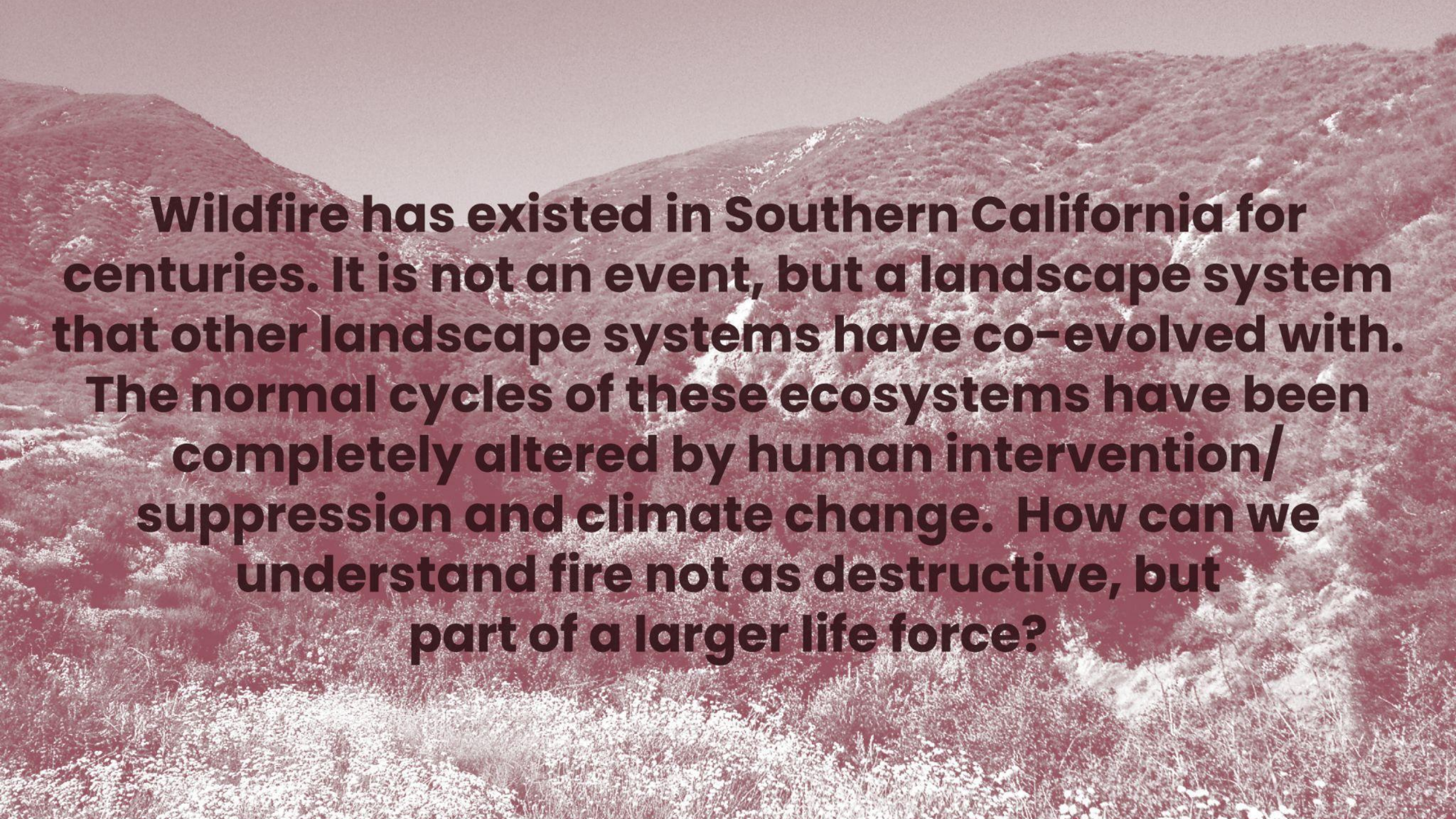




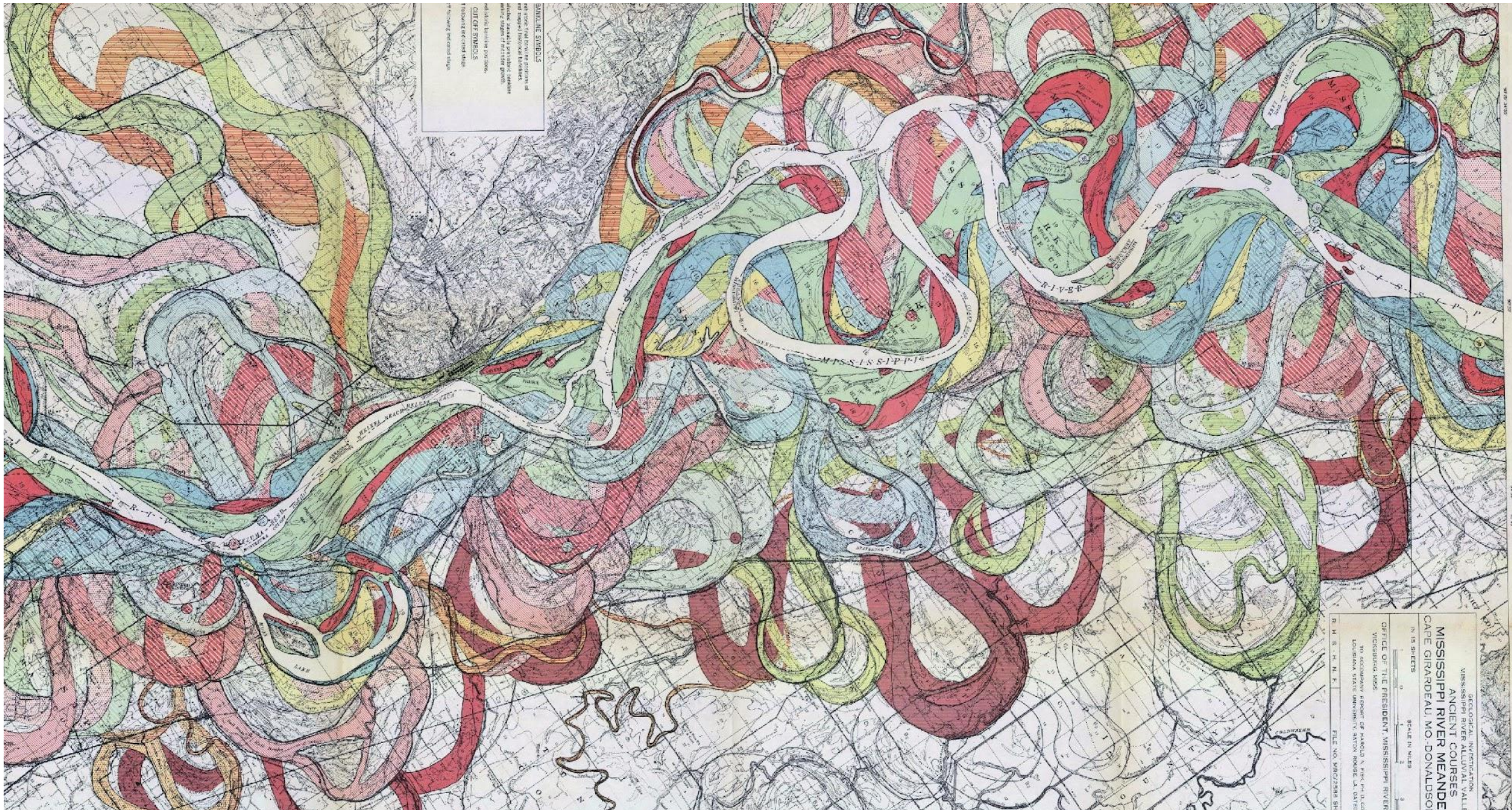
Towards a New Climate Urbanism: Wildfires, Microgrids and Holistic Communities



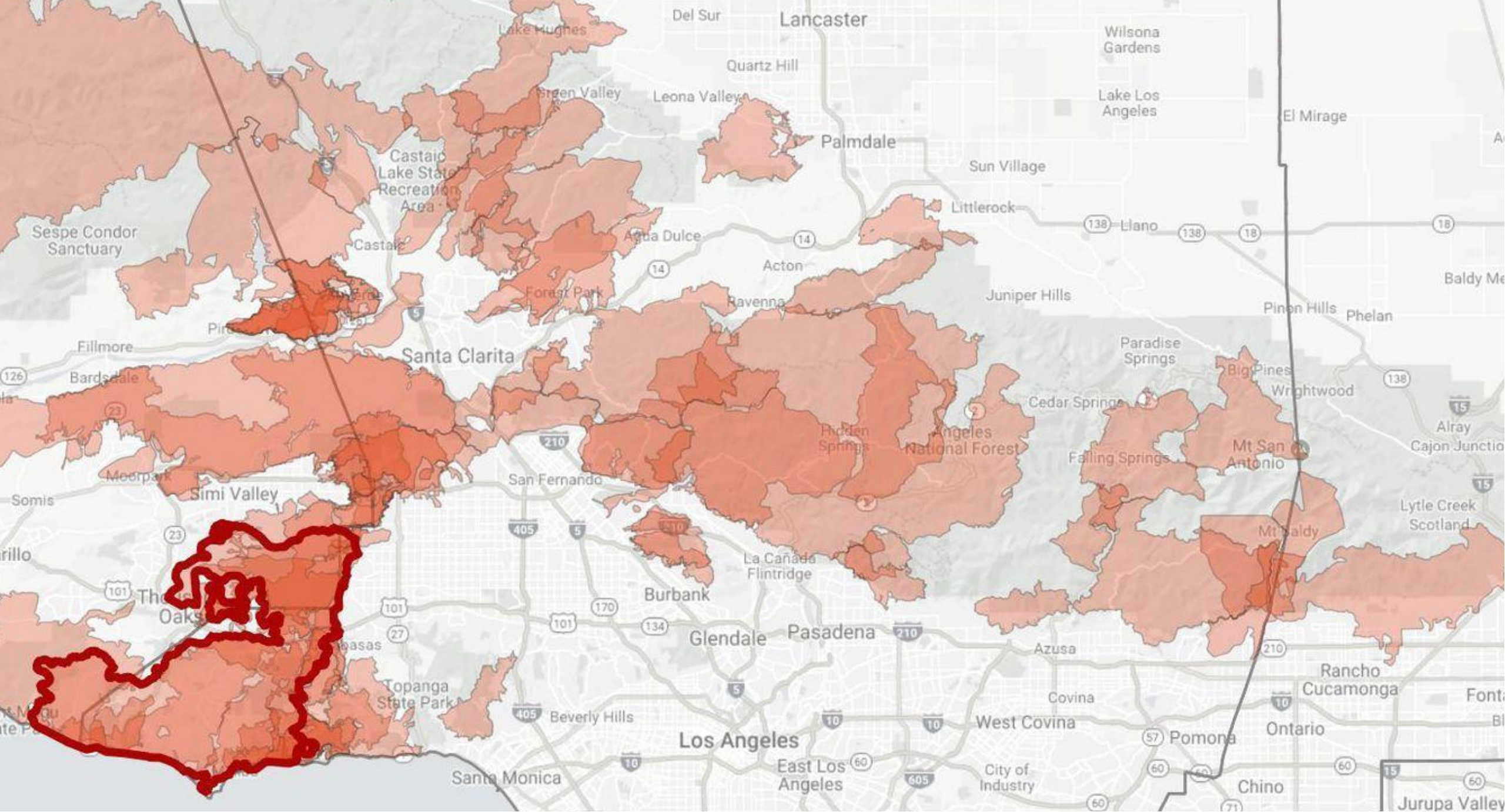
Wildlands in the Expanded Field



Wildfire has existed in Southern California for centuries. It is not an event, but a landscape system that other landscape systems have co-evolved with. The normal cycles of these ecosystems have been completely altered by human intervention/suppression and climate change. How can we understand fire not as destructive, but part of a larger life force?

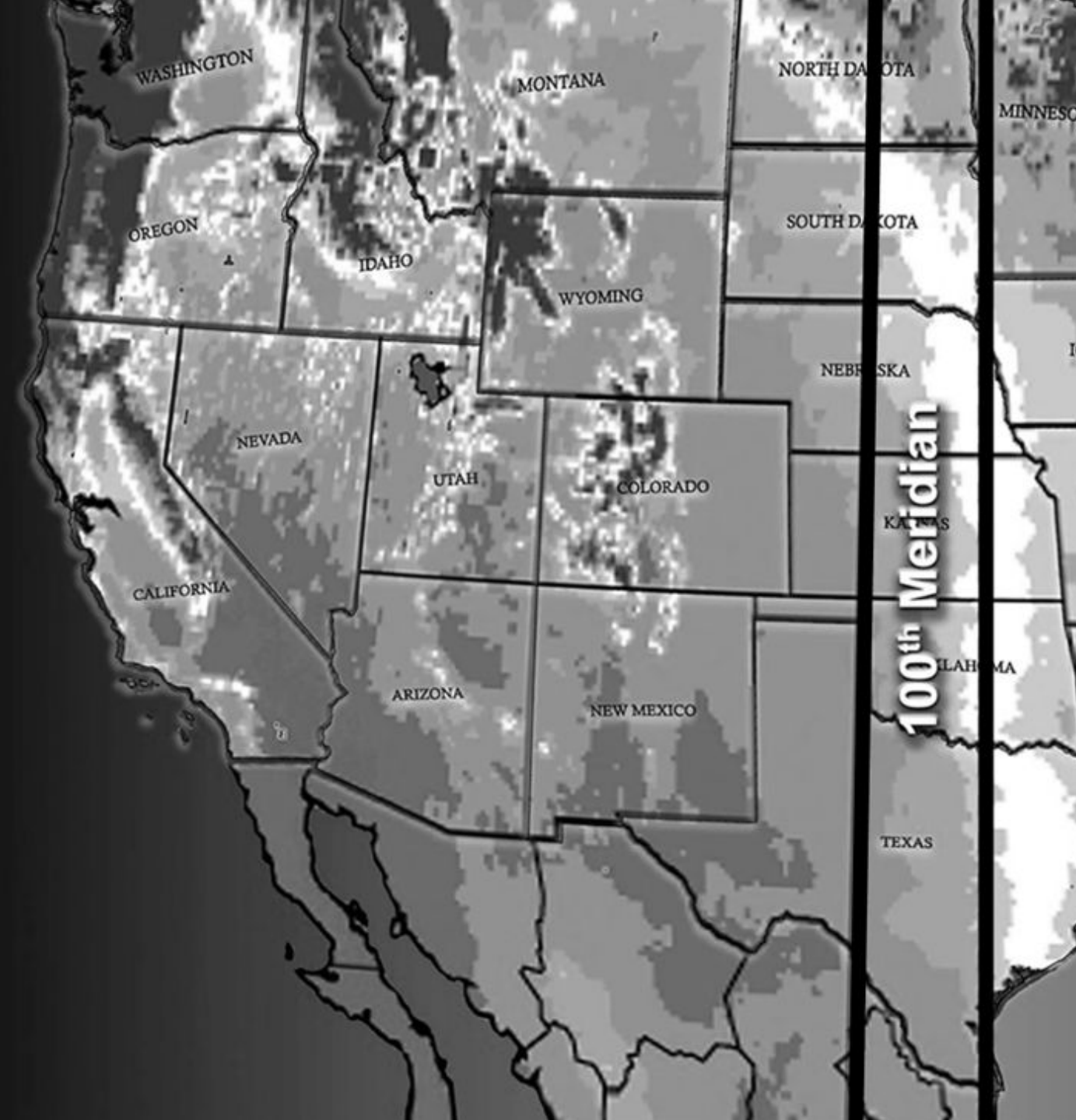


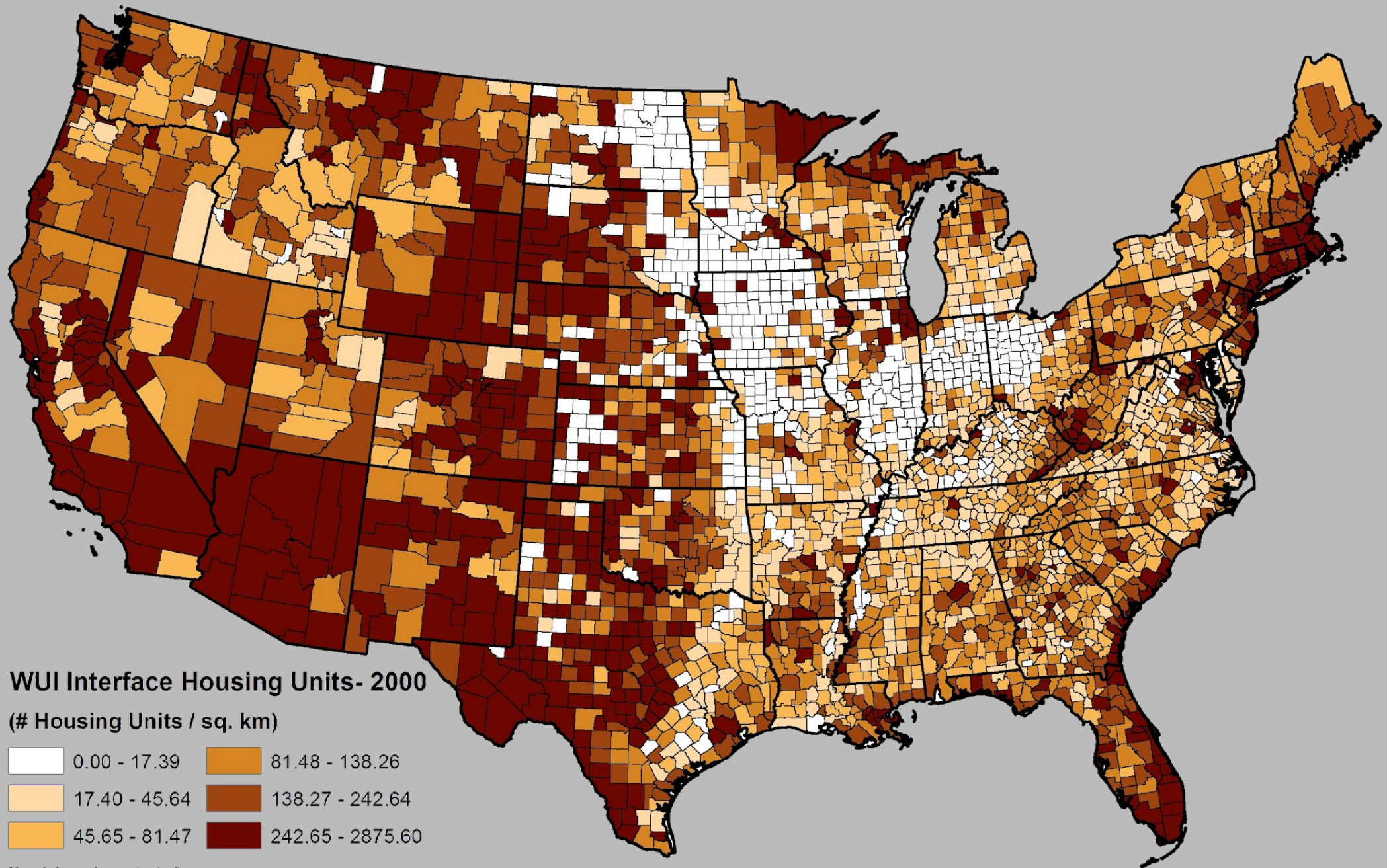
Mississippi River Trajectories / Robert Fisk, Army Corp of Engineers (1944)





ARID REGION OF THE UNITED STATES Showing Drainage Districts. Scale 1:500,000





More Information: cohesivewfire.nemac.org
Source: SILVIS Lab, University of Wisconsin



Seminole Springs, Cornell, CA November 2018

The National Interagency Fire Center (NIFC) statistics show that as of Aug. 10, 2022, **40,775 fires have already burned a total of 5,883,577 acres.** This is above the 10-year average of 36,050 fires and the average acreage of 4,083,859 acres

U.S. Fires Quadrupled in Size, Tripled in Frequency in 20 Years



1984-1999



2005-2018



HOUSE

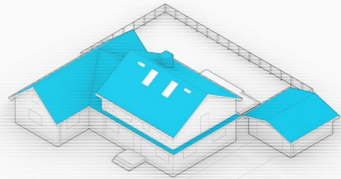
NEW UPGRADE MAINTAIN

< Roof Eaves, Overhangs, Soffits Gutters Vents Windows & Sky Lights >

The roof is the most vulnerable component of your home. During a wildfire it must be able to resist wind-blown embers and other wildfire exposures. Complex roofs, where the roof meets vertical walls and/or includes dormers present additional vulnerabilities.

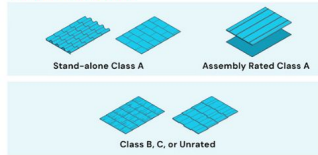


ENLARGE THE CHART



ENLARGE THE CHART

Roof Covering & Assemblies:
Install Class A Roof



Roof covering fire ratings are Class A, B, C, or unrated; with Class A providing the best performance. Common Class A roof coverings include asphalt fiberglass composition shingles, concrete and flat/barrel-shaped tiles. A roof can achieve a Class A rating on its own (stand-alone Class A) or when combined with other fire-resistant elements (assembly-rated Class A).

1 - STAND-ALONE CLASS A

- Common stand-alone Class A roof coverings include:
- Clay tiles
 - Slate
 - Asphalt fiberglass composition shingles
 - Concrete and flat/barrel-shaped tiles

2 - ASSEMBLY-RATED CLASS A

Some materials have a "by assembly" Class A fire rating which means, additional materials must be used between the roof covering and sheathing to attain that rating.

Examples of roof coverings with a "by assembly" fire rating include aluminum:

- Aluminum (metal) roofs
- Fire-retardant treated wood shakes (with Class B fire rating, approved by the California Office of the State Fire Marshal as a result of passing the required natural weathering test).
- Some recycled rubber and/or plastic composite materials.

Block Gaps between Covering & Sheathing



The following roof types are subject to gaps between roof covering and sheathing which typically occur at the ridge and edge of roofs:

- Flat and barrel-shaped tiles
- Metal and cement roof coverings

These openings can allow birds and rodents to build nests with materials that are easily ignited by embers. Flames from this type of ignited debris can spread to the structural support members, bypassing the protection offered by a Class A stand-alone roof covering. Plugging these openings between the roof covering and the roof deck is commonly called "bird stopping". Regularly inspect and maintain these areas.

Check Installation Instruction for Class A rating



It can be difficult to determine if the fire rating of a given product has a stand-alone or assembly-rated rating, since a published Class A rating could refer to either. If you aren't sure, obtain a copy of the installation instructions for the roofing materials.

If the installation instructions call for Dens Deck, a Type 72 capsheet material, or other materials in addition to Type 15 or 30 roofing felt and structural sheathing (plywood or oriented strand board), you have an assembly-rated Class A covering.

LANDSCAPE

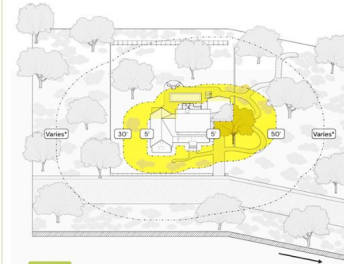
NEW UPGRADE MAINTAIN

House Zone 1 Zone 2 Surrounding Wildland

What is the Lean and Green Zone?

The Lean and Green Zone should be designed to create and maintain a landscape that, if ignited, will not readily transmit fire to the home. Depending upon the type of wildland vegetation in the area and the steepness of the slope, this zone should have an area at least 30 feet wide (50 feet for slopes above 20%) that is "lean, clean, and green."

The Lean and Green Zone should be designed to promote fire-wise landscaping and water conservation. It is a recommended minimum planting zone starting with low-density planting to medium-density as you move outward from the house. The goal is to create a low-ignition landscape capable of slowing down fire spread. Plants that are green and lush give better protection. If regularly watered and pruned to remove dead or unhealthy material, these plants will be far less likely to carry fire to your home. While all plants will eventually burn, healthy ones with a high moisture content are more difficult to ignite



ENLARGE

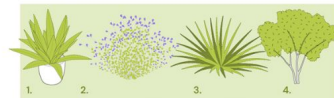
*The size of the zones shown below have been supported over and over again by research into home losses in wildfires. Based on this evidence we recommend a maximum distance for vegetation modification of 100' from the house. However, some local regulations may require greater fuel modification distances. Native vegetation may also be protected by regulations as well. Contact your local fire department for specific requirements. links to pub briefs Who to contact re: protected vegetation

Recommendations:

1. Plant primarily native species within Zone 1 and 2. Native plant species support local ecosystems and wildlife. [Click here for NATIVE PLANTS.](#)
2. Non-native plant species that are not invasive may be allowed, although we recommend using primarily native species. [Click here to check invasive status of plant species.](#) Remove invasive plants. [Click here for list of invasive species.](#)
3. Plant species used within this zone should be consistent with Fire Department requirements.
4. Prefer ground covers and shrubs with occasional small tree.
5. Plant tree that do not exhibit flammable characteristics [Click here for flammable characteristics in PLANTS.](#)
6. Create a drip irrigation system to promote water conservation and promote well maintained plants. [Click here for IRRIGATION.](#)

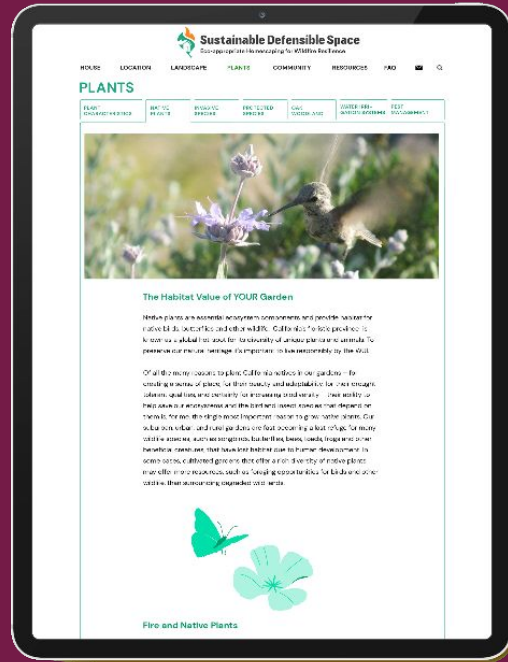
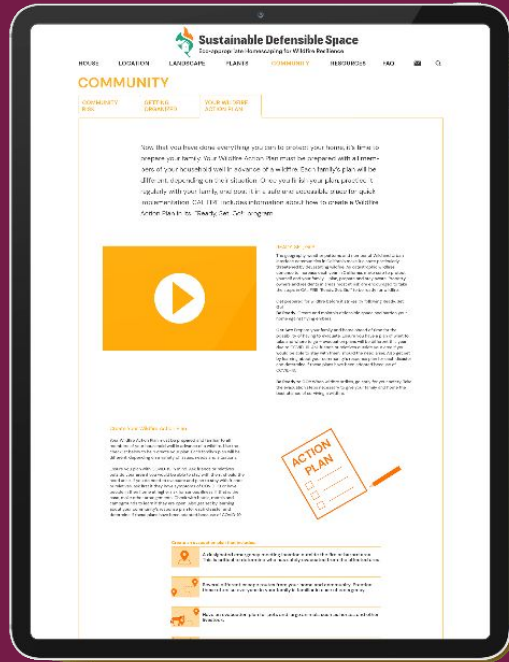
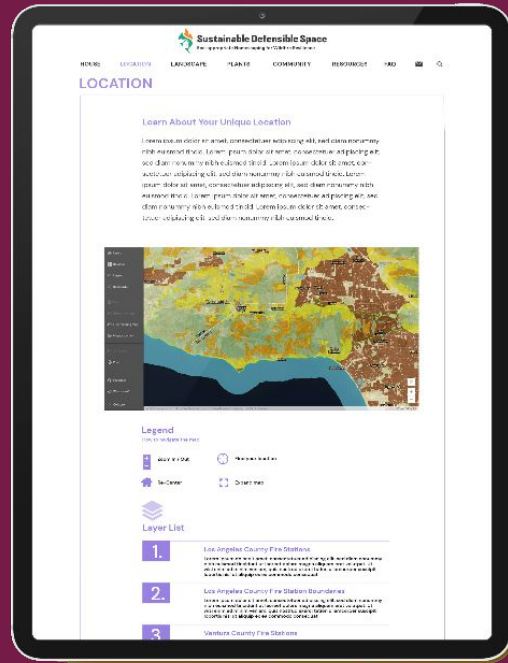
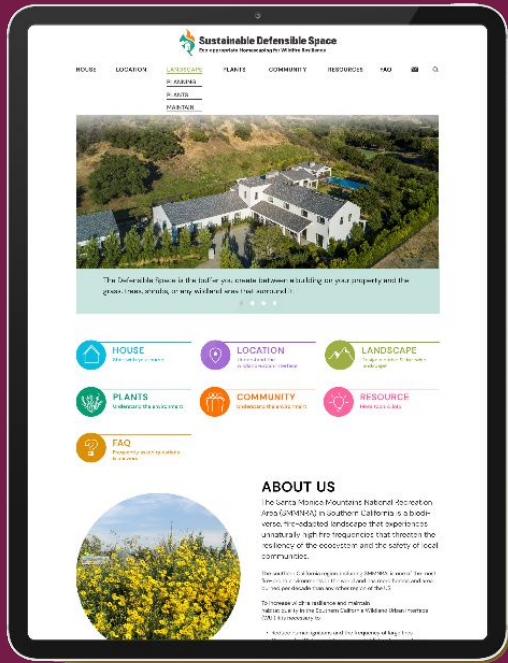
Plant Selection

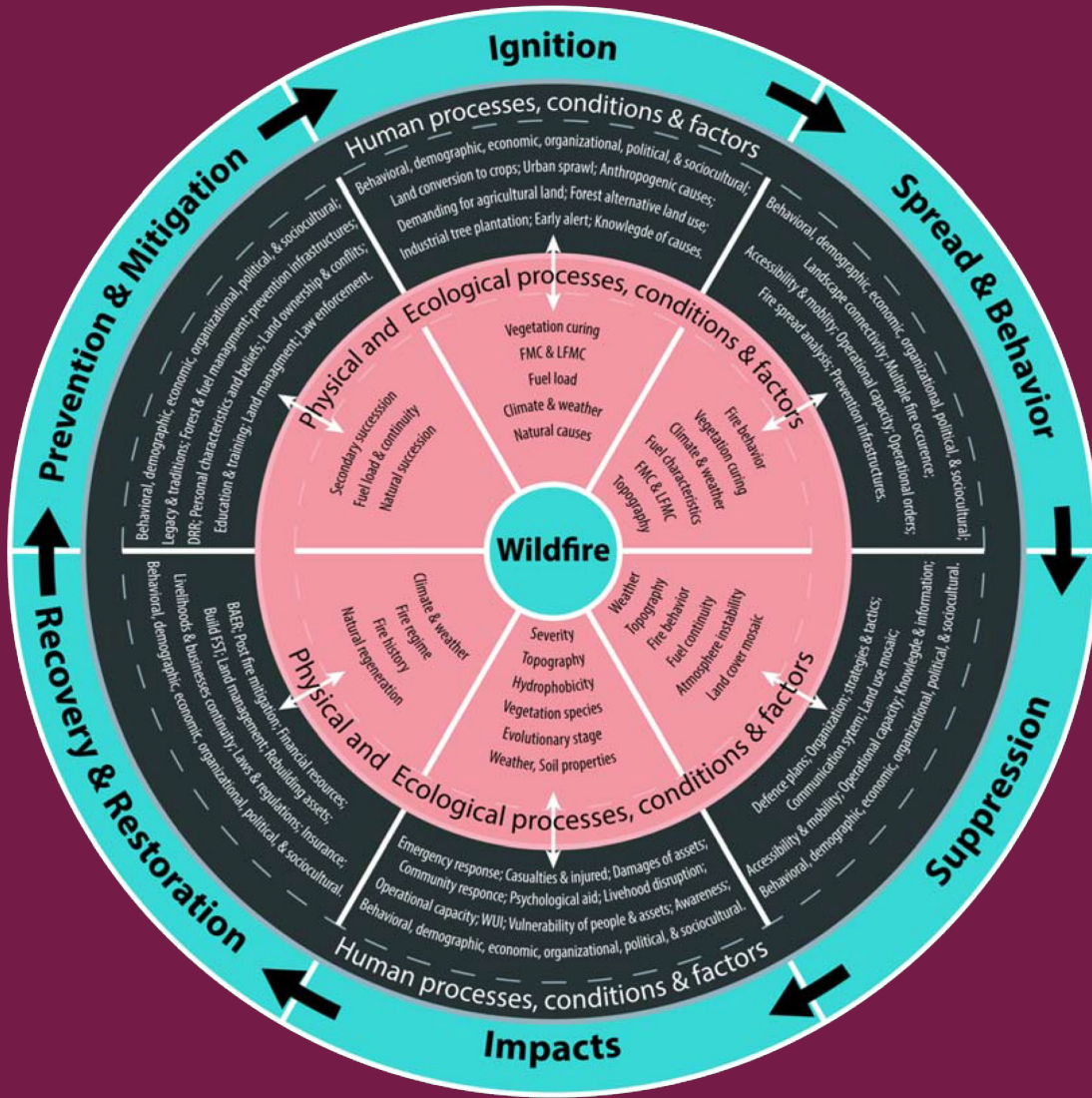
Climate-appropriate Leaf Characteristics



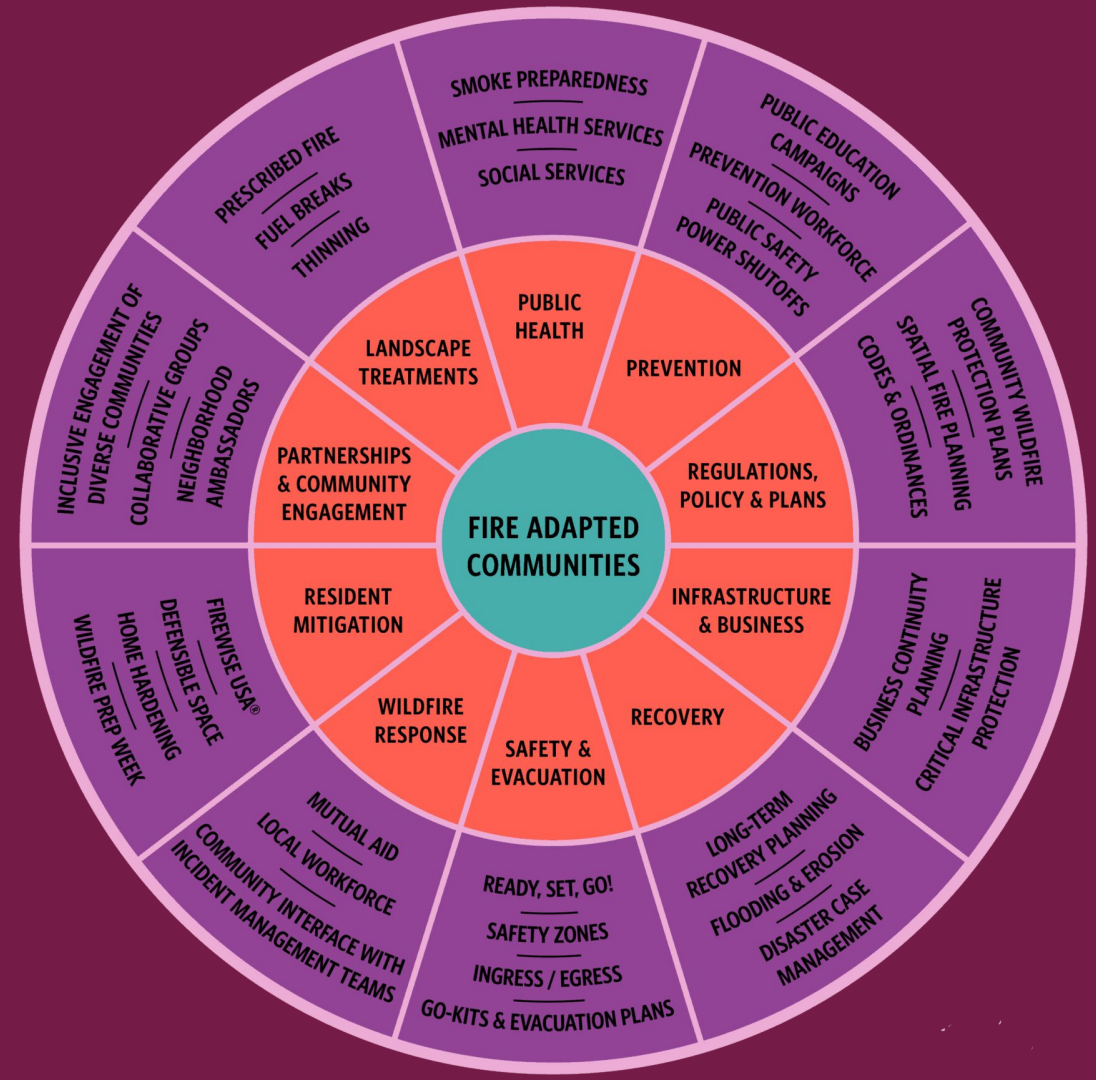
California native plants have evolved over time to thrive in our unique and varied climate conditions. By learning to recognize their adaptation tricks, you can identify climate-appropriate plants wherever you are. These four characteristics will allow you to find climate-appropriate plants in a crowded nursery.

1. **Stiff, Leathery:** These leaves hold on to water and stay evergreen for most of the year.

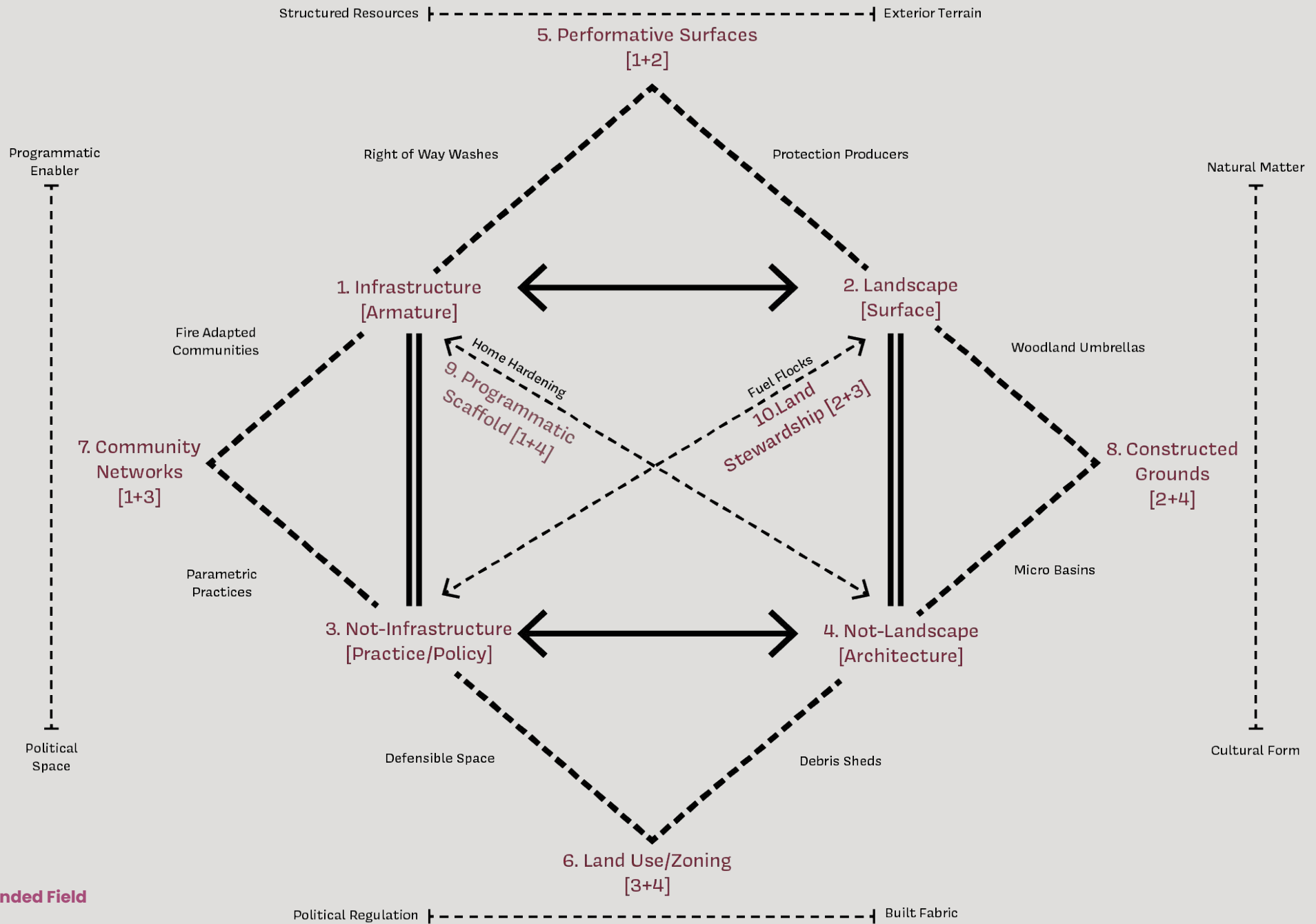




Human vs Nature
Processes, Conditions, & Factors



Socio-Ecological Adaptation



Wildlands in the Expanded Field

Structured Resources |-----| Exterior Terrain

5. Performative Surfaces

[1+2]

Programmatic
Enabler

Right of Way Washes

Protection Producers

Natural Matter

1. Infrastructure
[Armature]

2. Landscape
[Surface]

Fire Adapted
Communities

9. Programmatic
Scaffold [1+4]

10. Land
Stewardship [2+3]

Woodland Umbrellas

7. Community
Networks
[1+3]

8. Constructed
Grounds
[2+4]

Parametric
Practices

Micro Basins

3. Not-Infrastructure
[Practice/Policy]

4. Not-Landscape
[Architecture]

Political
Space

Defensible Space

Debris Sheds

Cultural Form

6. Land Use/Zoning
[3+4]

Political Regulation |-----| Built Fabric



Clouds

noun
/ˈklaʊd/

1. A visible mass of condensed water vapor floating in the atmosphere, typically high above the ground.
2. An indistinct or billowing mass, especially of smoke or dust.
3. A vague patch of color in or on a liquid or transparent surface.



Transects

noun
/ˈtrænsɛkt/

1. A straight line or narrow section through an object or natural feature or across the earth's surface, along which observations are made or measurements taken.



Fields

noun
/fi:ld/

1. An area of open land, especially one planted with crops or pasture, typically bounded by hedges or fences.
2. A place where a subject of scientific study or of artistic representation can be observed in its natural location or context.
3. A space or range within which objects are visible from a particular viewpoint or through a piece of apparatus.



Blankets

noun
/ˈblæŋkɛt/

1. A thick mass or layer of a specified material that covers something completely.
2. Covering all cases or instances; total and inclusive.
3. Cover completely with a thick layer of something.



Clouds

Rethinking Infrastructure

Marrying Risk, Consequence & Protection



Pink Rain

As electrical infrastructure expands across wildland–urban interface, susceptible to high winds, it exponentially increases the risk of transformer or transmission line failure. These incidents occur in remote areas, typically too far from developed areas to allow for quick notification and response by fire departments. To combat this, fire retardant canisters, equipped with heat sensors, or sensors triggered by a failure in the electrical line, propel pink clouds to cover adjacent vegetation and mitigate the potential for ignition. In turn, they trigger alarms to the fire department who then tracks them using a GIS marker. Airborne patrols can spot the pink spray on the ground to locate the point of failure and origin of any wildfire event.



Transects

Wildfire Risk Reduction Buffer Zones

Recreational areas (golf courses, playgrounds, agriculture, etc)

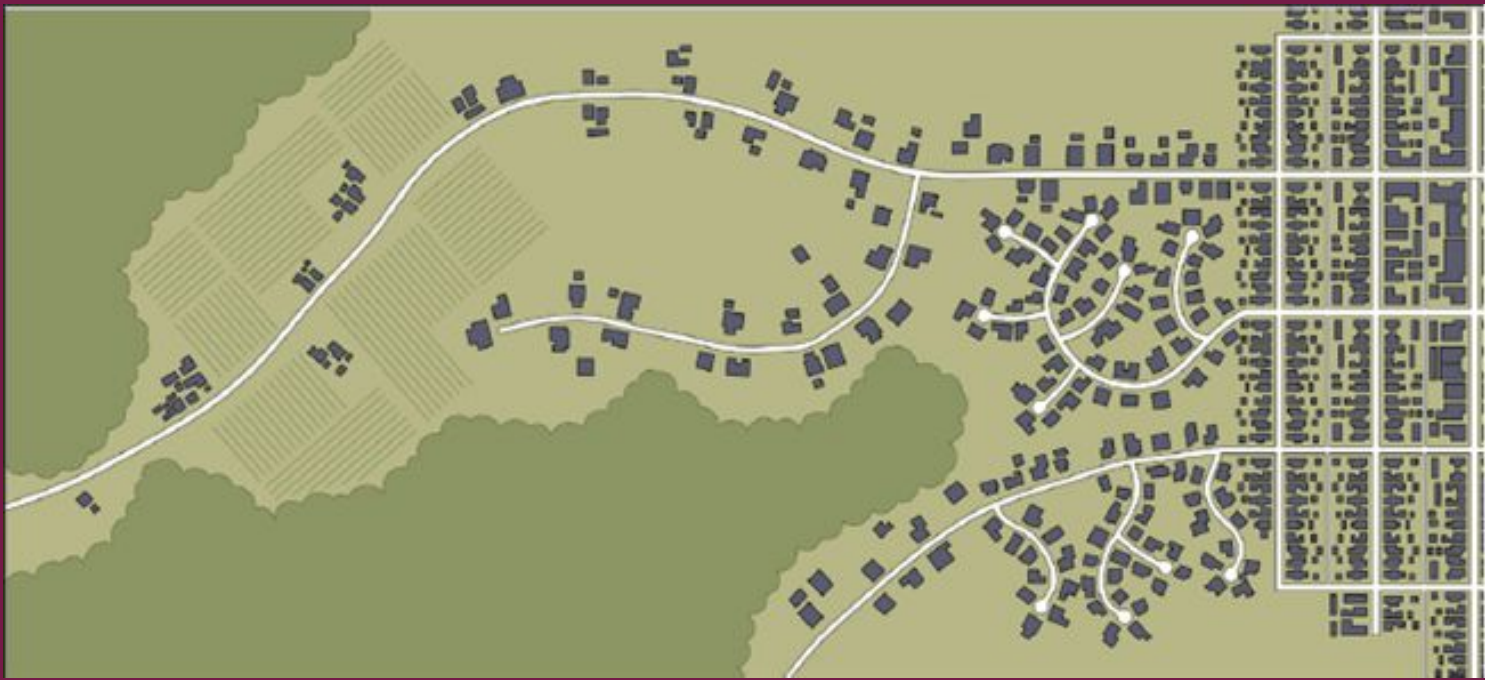
Areas of Refuge

Firefighter Staging

Shaded Fuel Breaks

Potential buffer for debris flows

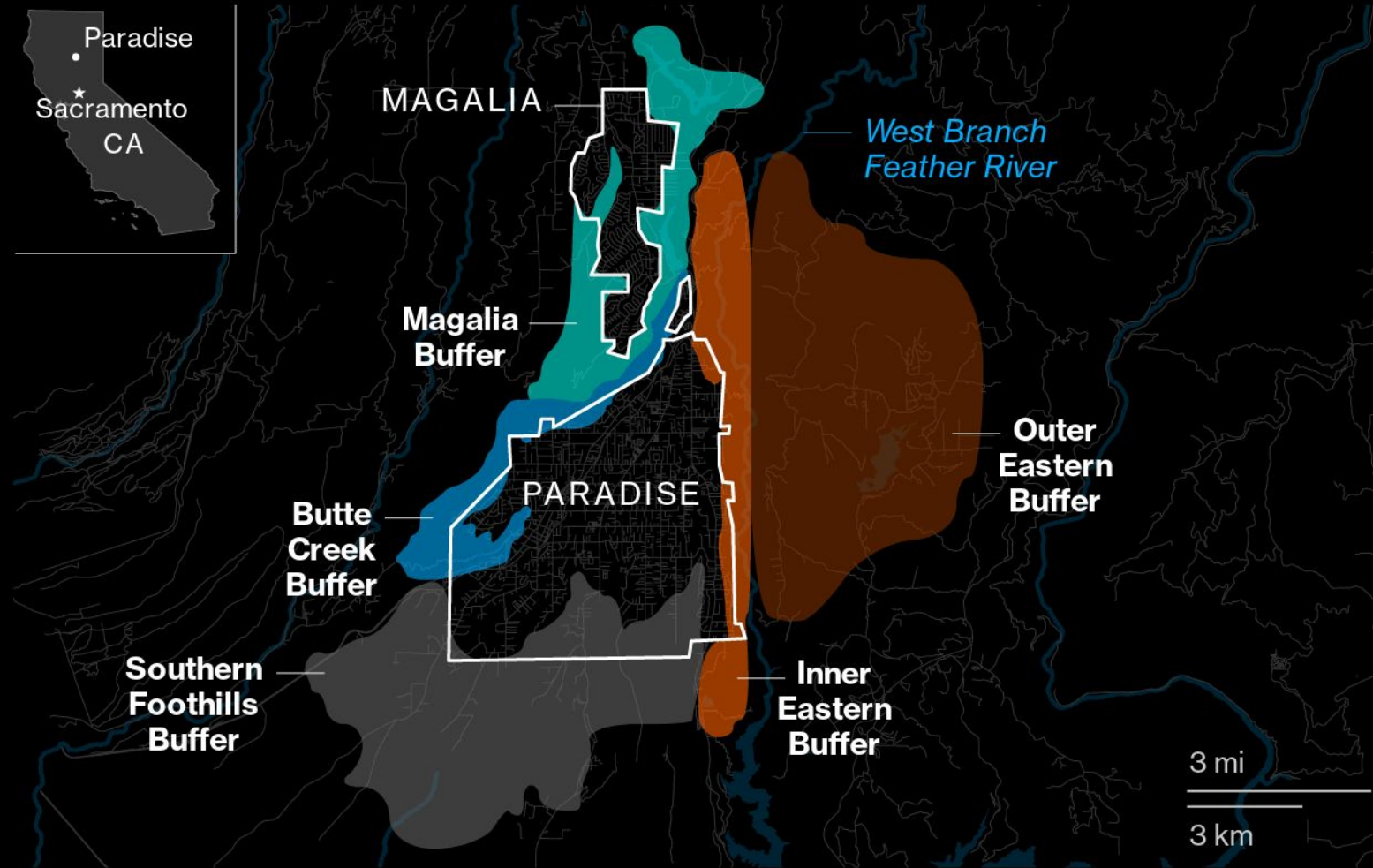
Modified to the specifics of the Ecosystems



Source: Max Moritz

Where Greenbelt Buffers Could Protect Paradise

Scientists identified five zones to reduce wildfire risk



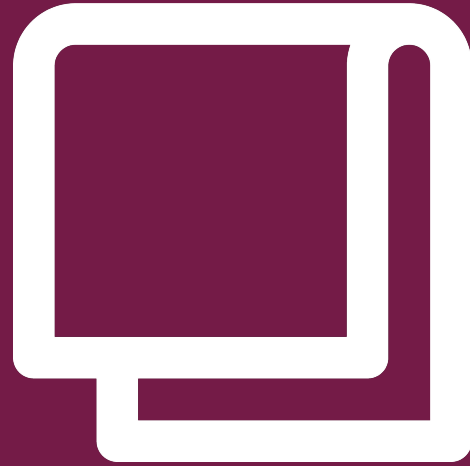
Source: Paradise Nature-Based Fire Resilience Project, Conservation Biology Institute, The Nature Conservancy, and Paradise Recreation & Parks District

Note: Buffer areas are approximate



Protection Producers

Urban organic waste is used to create compost which helps to mend arid soil for agriculture. This process also increases its capacity to absorb and retain water, which greatly aids the effectiveness of the fire breaks. Strips of agriculture, falling along east/west transit corridors as well as vacant and publicly owned lands, create vegetated fuel breaks. The scrub matrix in these areas is transferred into a sustainable agriculture that provides habitat connectivity and organic soil matter while reducing wildfire fuel load. This nuanced approach would promote restorative practices within fire adapted ecosystems to prevent the impact of habitat fragmentation. These areas would also reduce heat island effects and aid in stormwater capture, promote soil health and rehabilitation, maintain moisture – and establish new ecological corridors.



Blankets

Reinventing Insurance

Community Enabled Stewardship & Protection



FUND

Santa Monica Mountains Wildlands Management Trust (SMMWMT)

A

Pay for science, stewardship, restoration, and maintenance that ensures the health of the wildland ecosystems.

Partners:

- Fire Safe Councils
- Local Non-Profits
- SMM Conservancy
- RCDSMM
- Tree People
- LA County Flood Control

B

Pays premium to buy a parametric insurance policy on a designated area of the mountains/community.

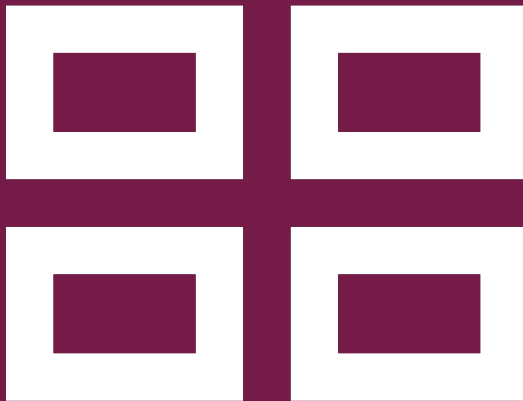
Pays out quickly in the event of a major wildfire or debris flow event to rehabilitate the landscape and ecosystems.

C

Acts as "self-insurance" when the mountains are damaged by a smaller event or extreme drought, but the policy trigger is not met and there is no payment.

Parametric Policies

The controversy of rebuilding versus ceding land to the government is central to a re-envisioning of the wildland-urban interface zones. Central to this revisioning is the notion of individual and collective responsibility. There is an argument that people residing in these areas should not be "bailed out". Nor should the general public be paying for the enormous fire suppression infrastructure and manpower needed to fight these ever-increasing fires. These issues gets to the heart of the matter, highlighting the need to form an argument around personal responsibility that is not punitive, but rather catalytic. Through new public-private partnerships between the State, conservancies, fire-safe councils, and local businesses/municipalities, land management practices can be funded and incentivized to help maintain at risk landscapes so vital to the protection of life and property.



Fields

MicroGrids



Microgrids

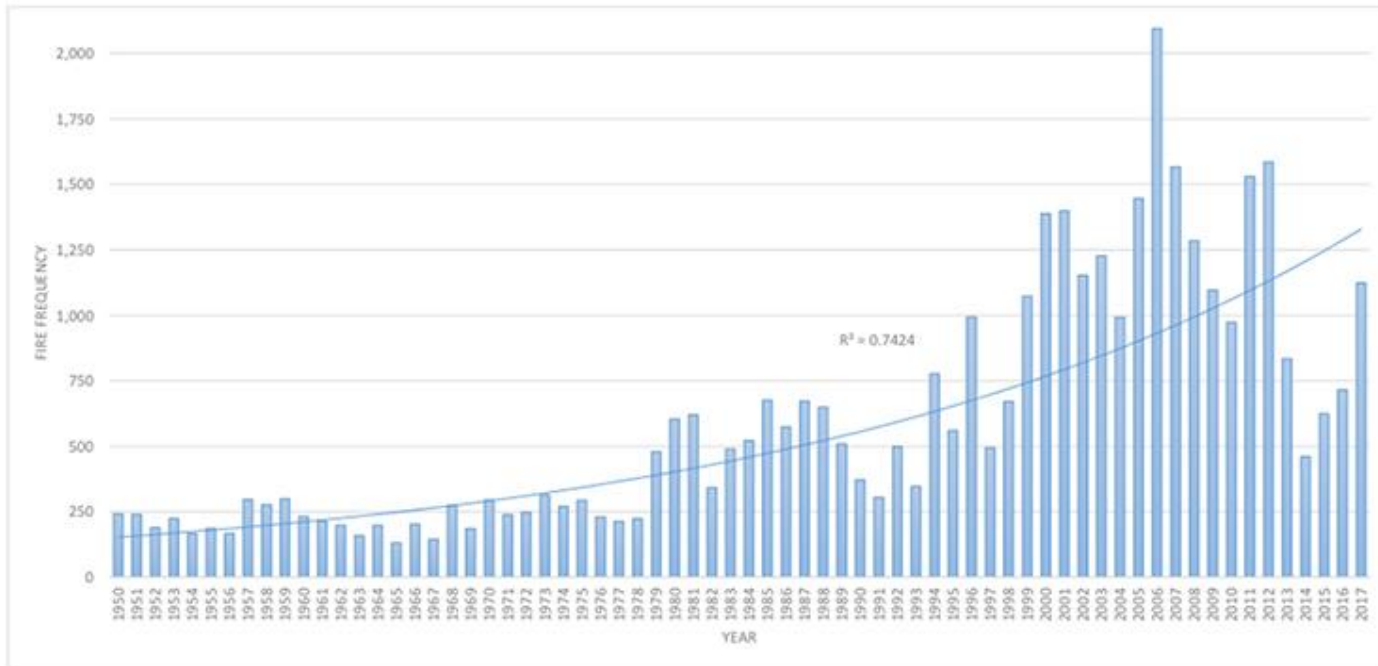
The infrastructure and enormous amount of energy required for transporting water and power over vast distances is unsustainable. Not only does it reinforce the city's dependency on resources outside of its border, but it also creates dangerous overlays within the wildland-urban interface which, through the failure of power infrastructure (transformers, downed powerlines) have created some of the largest wildfires in the history of California. Utility companies have answered with widespread imposed blackouts, impacting tens of thousands of people at a given time, with vulnerable communities, such as the poor and elderly, disproportionately feeling the effects. What is needed is a radical restructuring of our centralized utility systems, breaking them up, instead, into self-sustaining localized communities that can operate independently before, during, and after a disaster. The establishment of micro grids to support self-sustaining communities, based on alternative 'closed loop' electricity and water resources, provides increased security and equity in the event of wildfires or other natural disasters.

A photograph showing a wildfire on a hillside. Thick white smoke billows from the fire, partially obscuring the trees. In the foreground, a residential neighborhood with several houses is visible. The houses have dark roofs and light-colored siding. The overall scene is hazy and smoky.

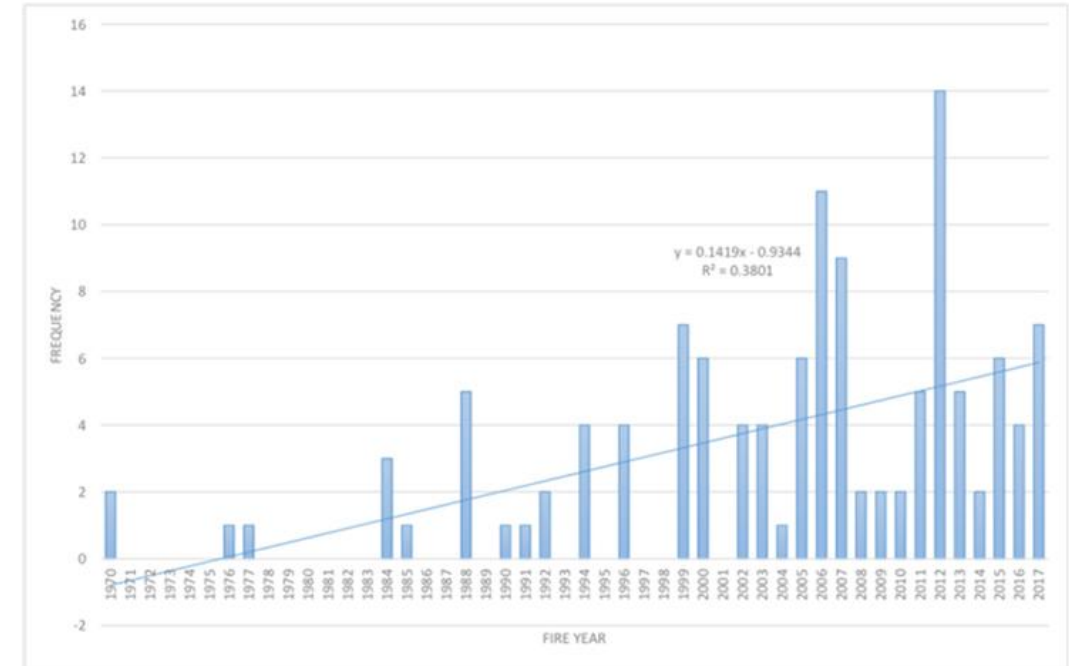
Wildfire Events



California Wildfires Data



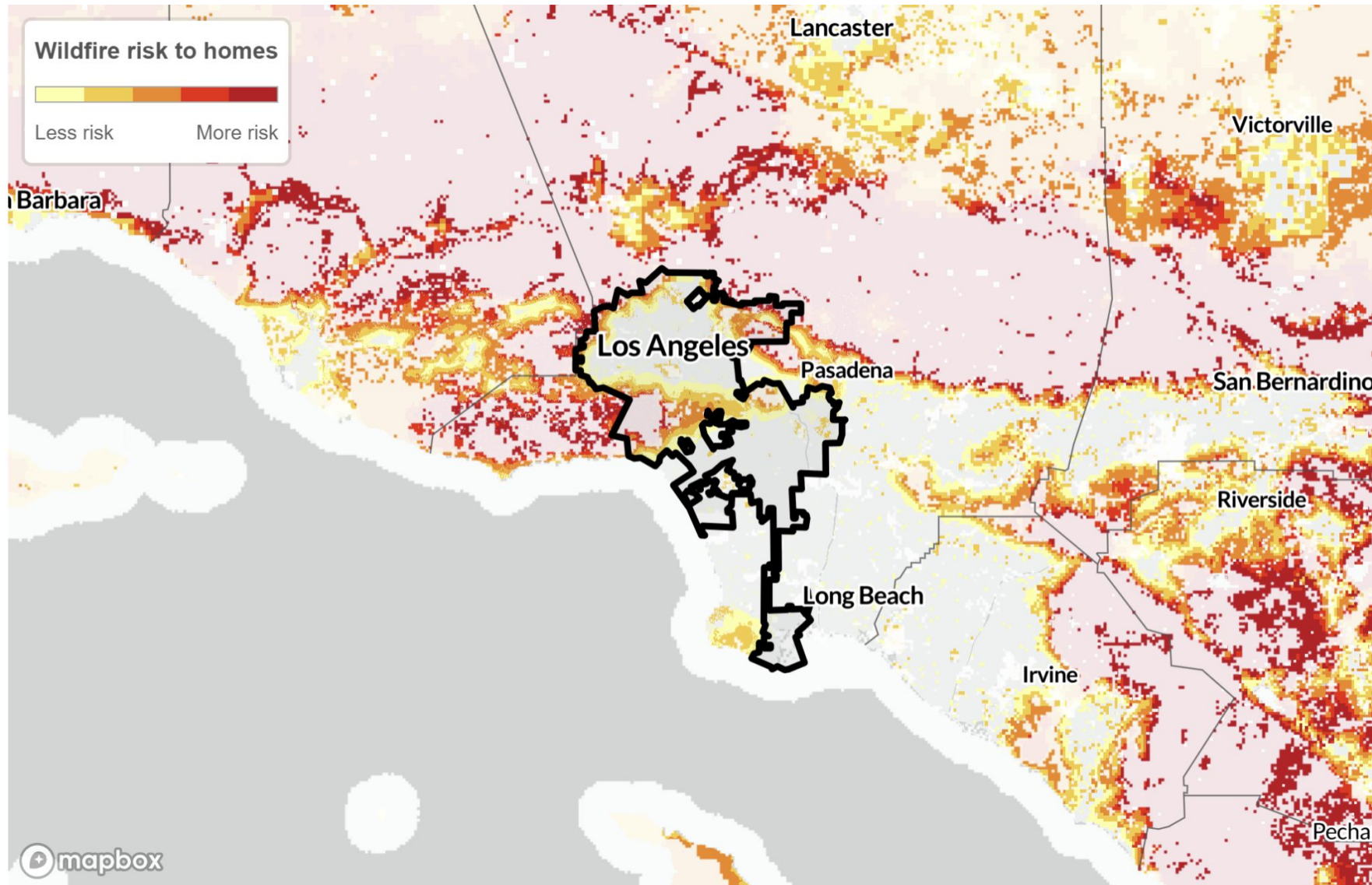
Fire Frequency over Time



Fire Intensity over Time

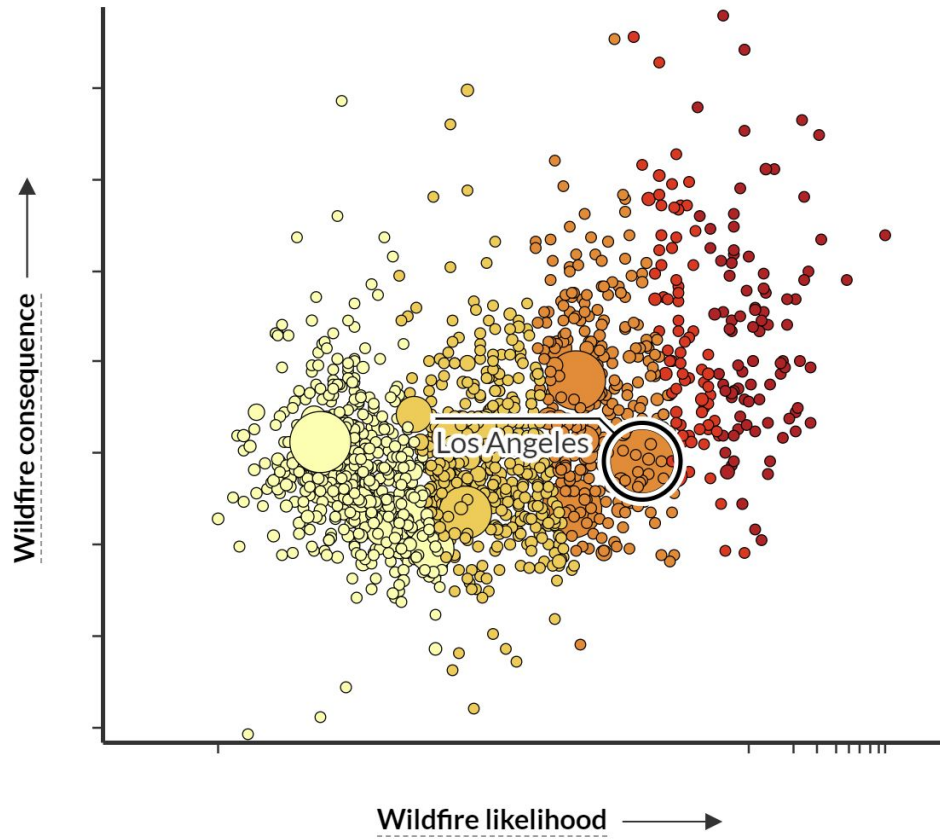


IMAGE: Eric Corey Freed – Founding Principal, organicARCHITECT

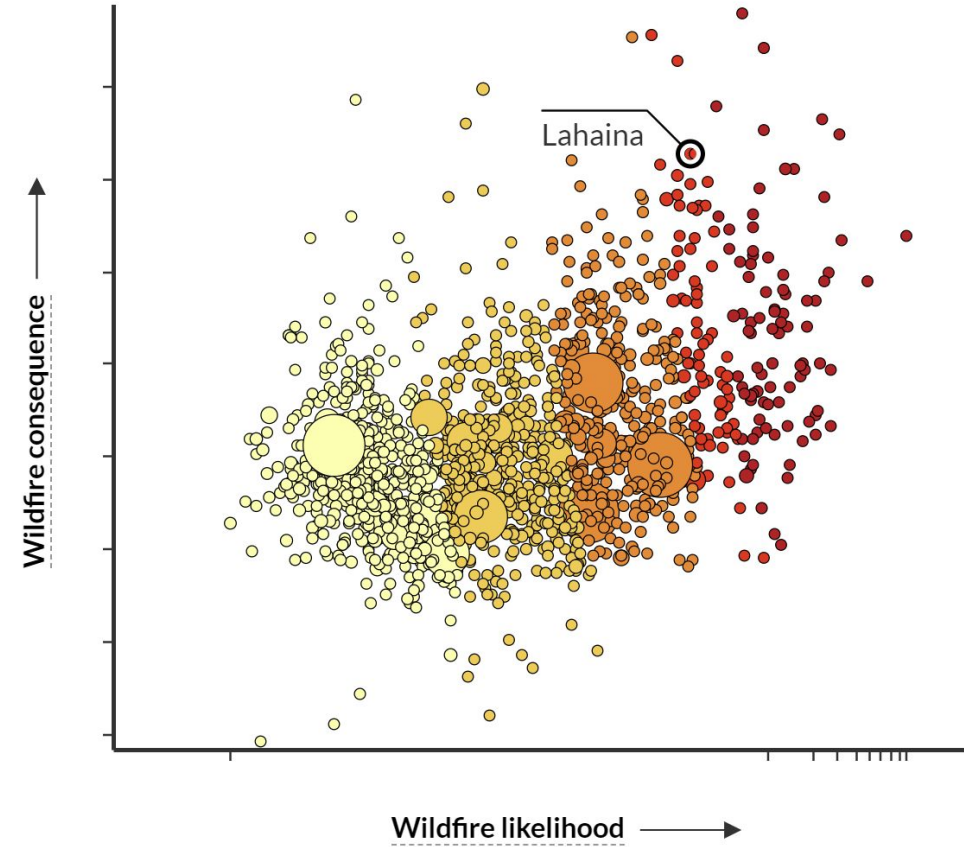


Wildfire risk to homes in your local community can be reviewed looking with wildfirerisk.org provided by the US Forest Service.

<https://wildfirerisk.org/explore/risk-to-homes>



Los Angeles, CA - Risk Percentile **87%**



Lahaina, HI - Risk Percentile **92%**

Lahaina, HI - Fires August 2023



Image originally published by The Maui News

Wind Turbines



Substation



Natural Gas Generation



Grid Switch

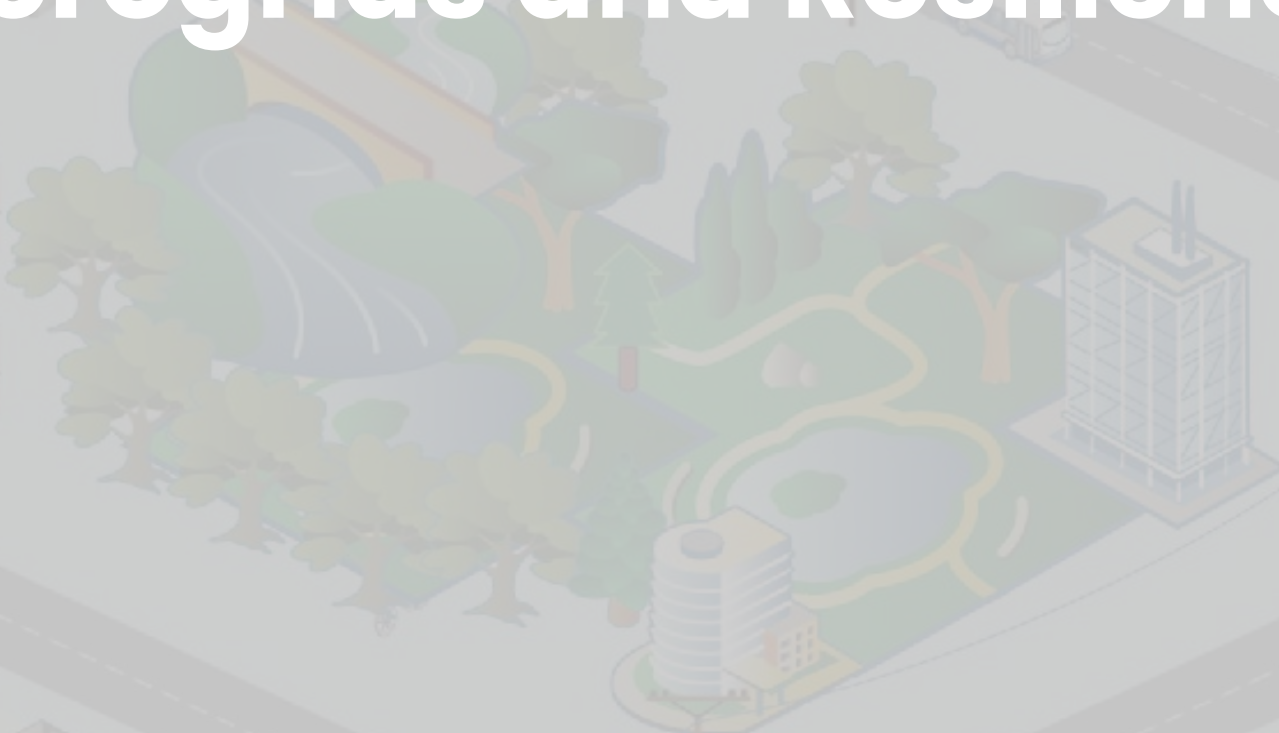


ESS



Microgrids and Resiliency

Fuel Cell Energy



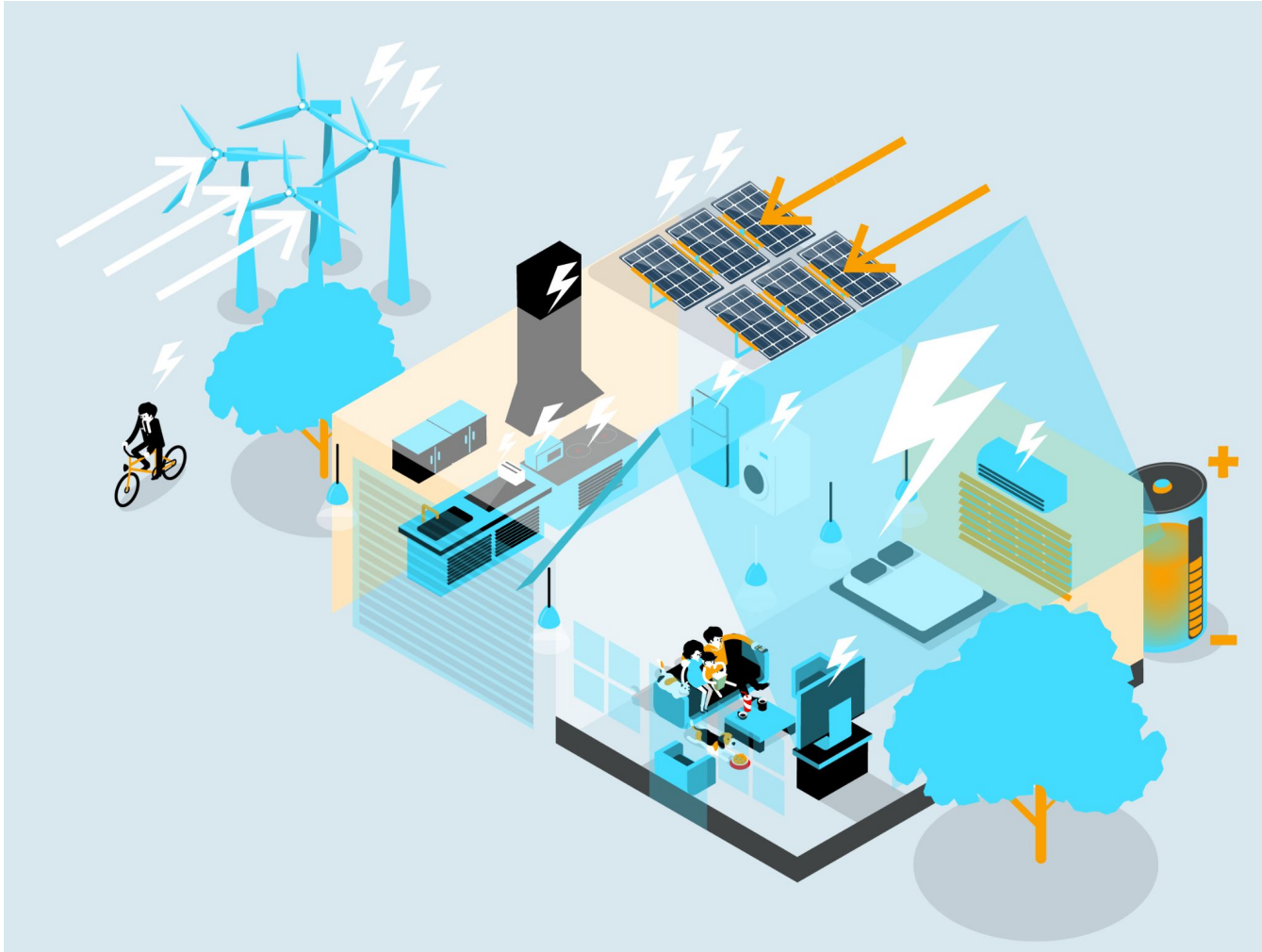


Image originally published by Pacific Data Integrators

A **microgrid** is a local electrical grid with defined electrical boundaries, acting as a single and controllable entity. It is able to operate in grid-connected and in island mode.

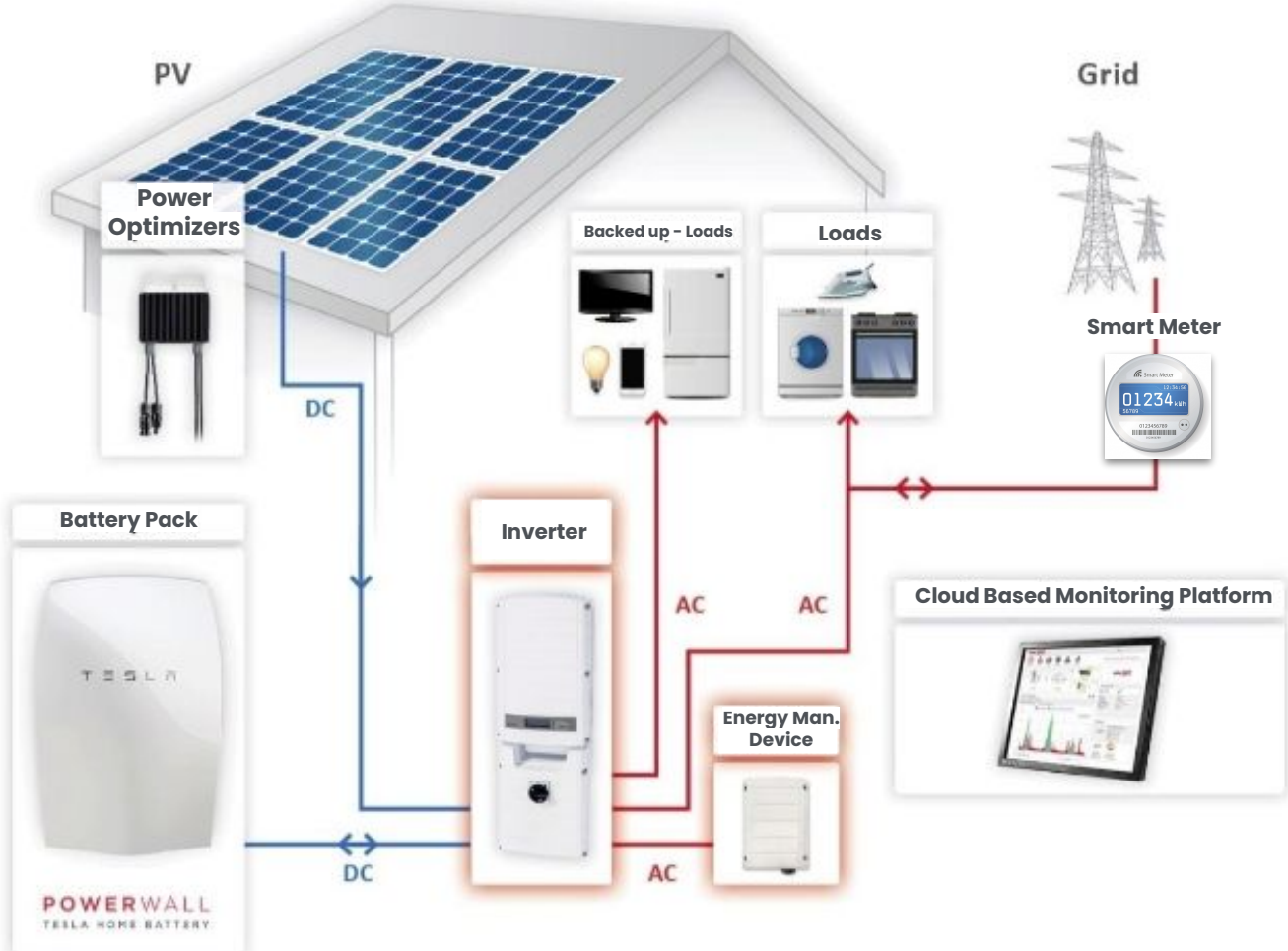


Image originally published by Solar Energy Management LLC

A **microgrid** in a single family home condition typically is a series of elements that allow the home to operate with or without pulling energy from the electrical grid.

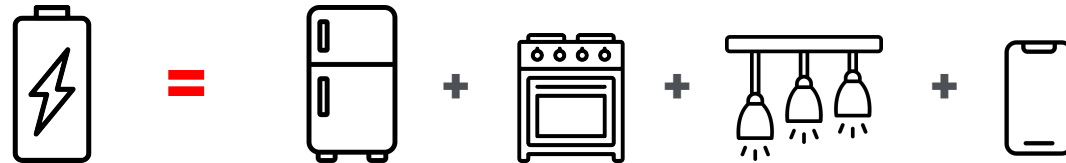




Images originally published by Sun Valley Solar

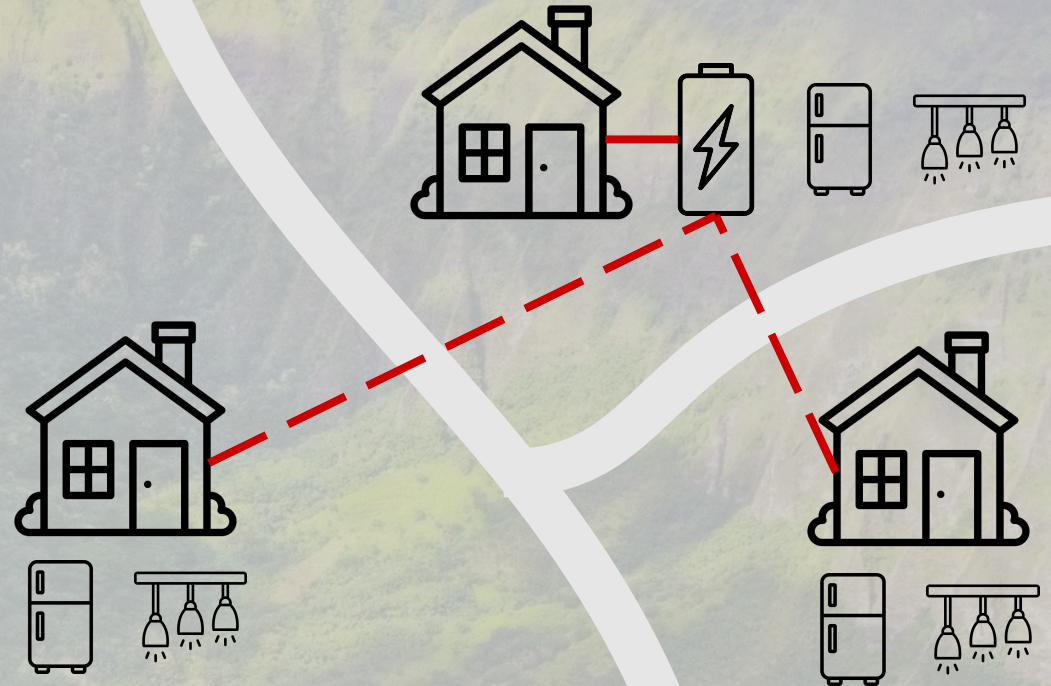
Evening Battery Backup/Peak Load Support

Evening + Emergency Battery Backup



Community Planning and Microgrid Interoperability

During Lahaina fire a community member connected his microgrid to two other homes to support emergency loads. Should batteries be required in WUI zones?

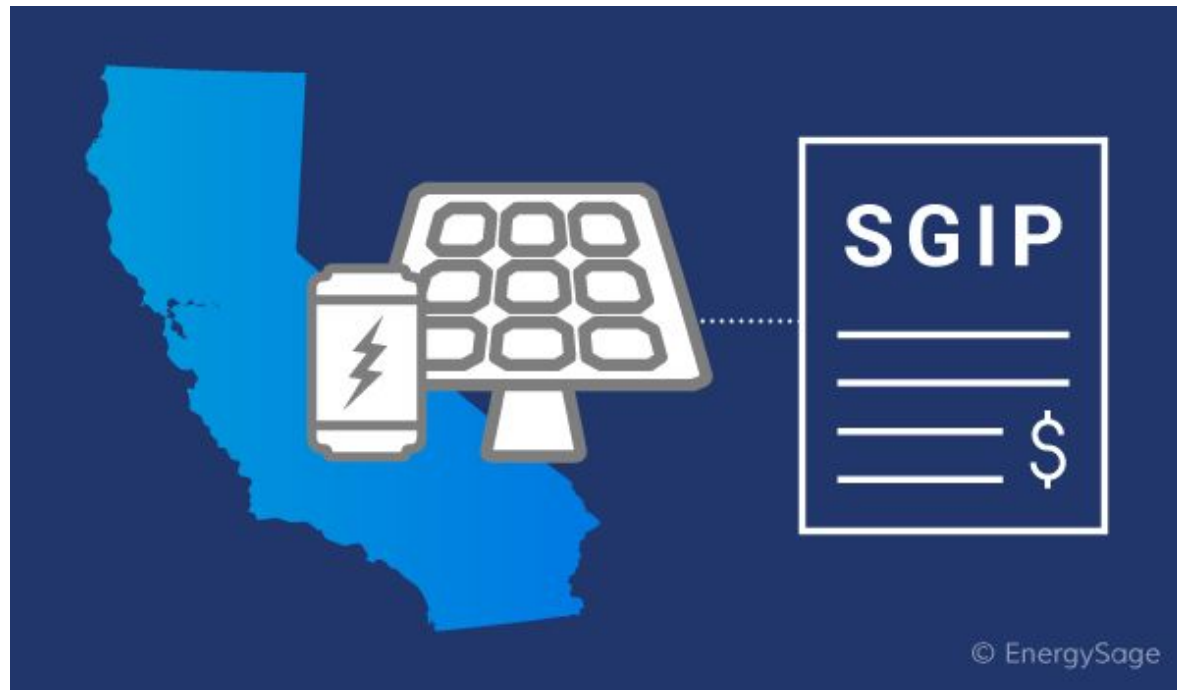




Policy and Funding for Microgrids

The Self-Generation Incentive Program (SGIP)

California Public Utilities Commission (CPUC) program



https://www.cpuc.ca.gov/-/media/cpuc-website/files/uploadedfiles/cpucwebsite/content/news_room/newsupdates/2020/sgip-residential-web-120420.pdf

EQUITY RESILIENCY

Rebate Rate: \$1,000/kilowatt-hour

Rebate covers **close to 100 percent of the cost** of an average energy storage system.

To be eligible you must meet the following criteria:

- You have experienced two or more utility Public Safety Power Shut-offs (PSPSs) OR live in a Tier 2 or 3 High Fire Threat District (HFTD).[†]

Possible future allocation (in process):

- 2024-25: \$125 million
- 2025-26: \$225 million

Inflation Reduction Act – Solar + Batteries

Federal Tax Credit (ITC)



<https://www.energy.gov/eere/solar/articles/should-i-get-battery-storage-my-solar-energy-system>

Summary of Clean Energy Tax Credits

Item	Discount Type	Discount	Start Date
Solar Rooftop Installation	Tax Credit (ITC)	30%	Now
Small-Scale Wind Energy	Tax Credit (PTC)	30%	Now
Battery Storage	Tax Credit	30%	2023

Additional Add-on Incentives

- 10% Domestic Content
- 10% for Energy Communities (Brownfield...mining..etc.)
- 10% Low-income Community or Indian Land
- 20% Qualified Low-income Project or Economic Benefit Proj.

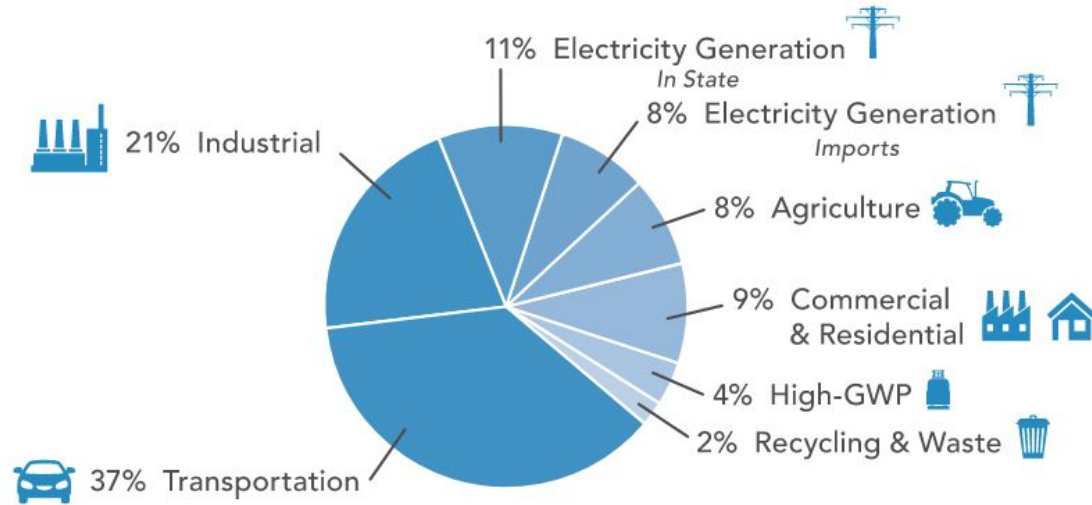
Credit availability and timeline:

- 2022-30: 30% tax credit
- 2030-31: 26% tax credit
- 2031-32: 22% tax credit

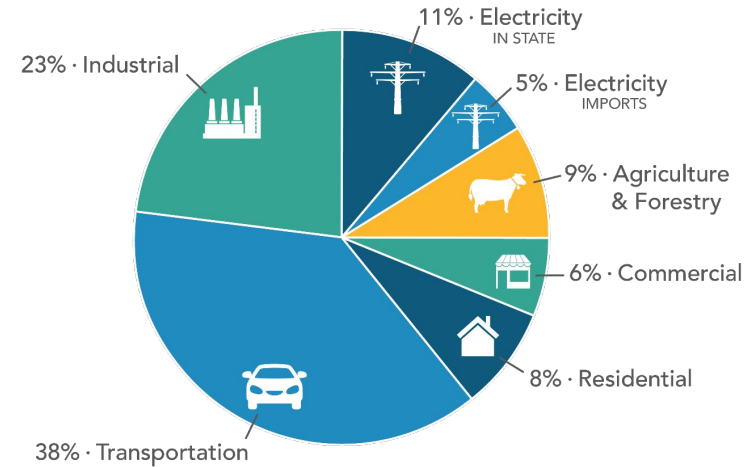


Greenhouse Gas Effects of Wildfires

California GHG Emissions by Sector (2015 + 2020)



2015 Total Emissions
440.4 MMTCO₂e



369.2 MMT CO₂e
2020 TOTAL CA EMISSIONS

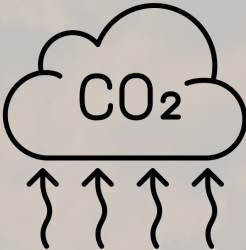
92.3 MMT associated to Building Operations

Images originally published by CARB

Residential and commercial buildings are responsible for roughly **25%** of California's greenhouse gas (GHG) emissions when accounting for fossil fuels consumed onsite and electricity demand.

MMT CO₂?

= 1 million metric tons



222,530 gas vehicle driven for one year

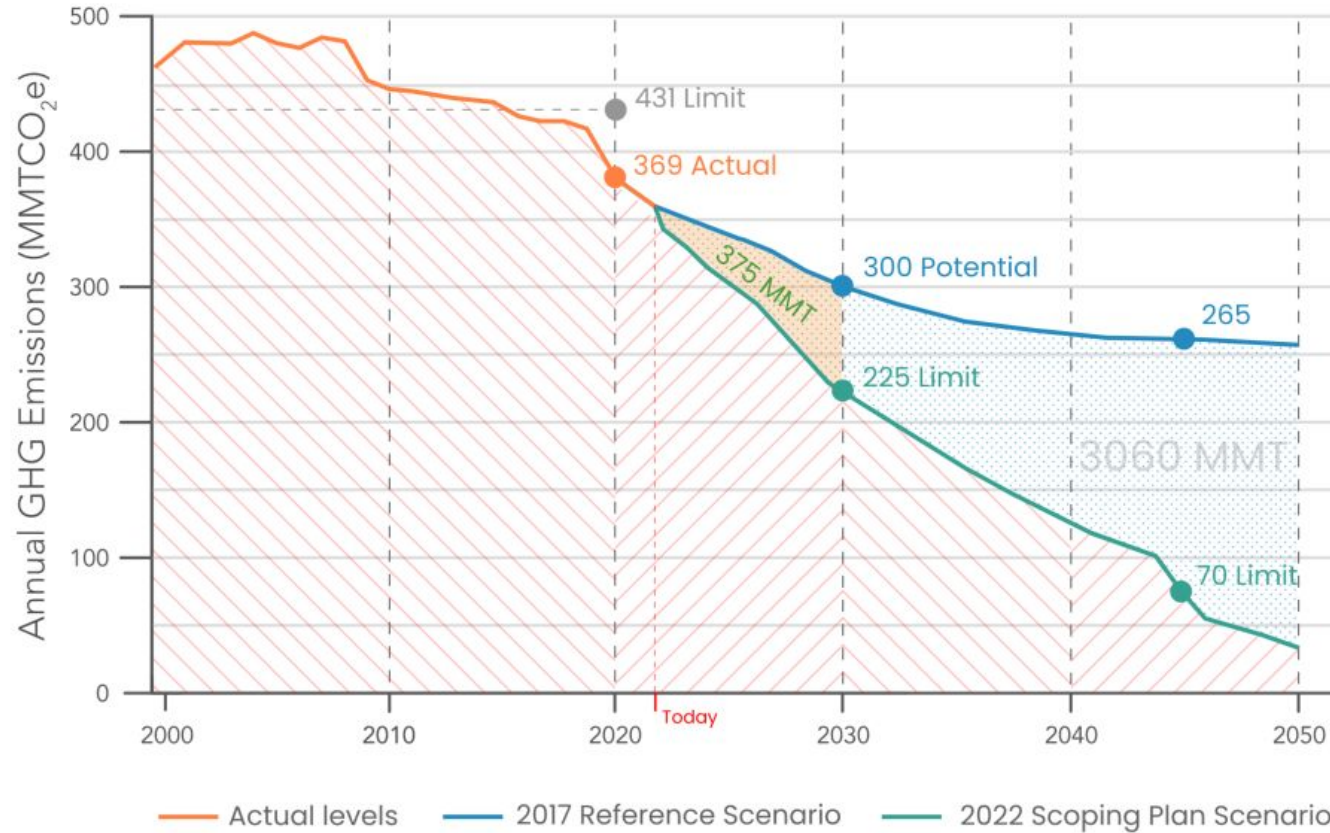


1,120,153,437 pounds of coal burned



1,192,518 acres of forest sequestering carbon
(1,863 square miles)

Plotting California's Path Forward - CARB GHG Potentials

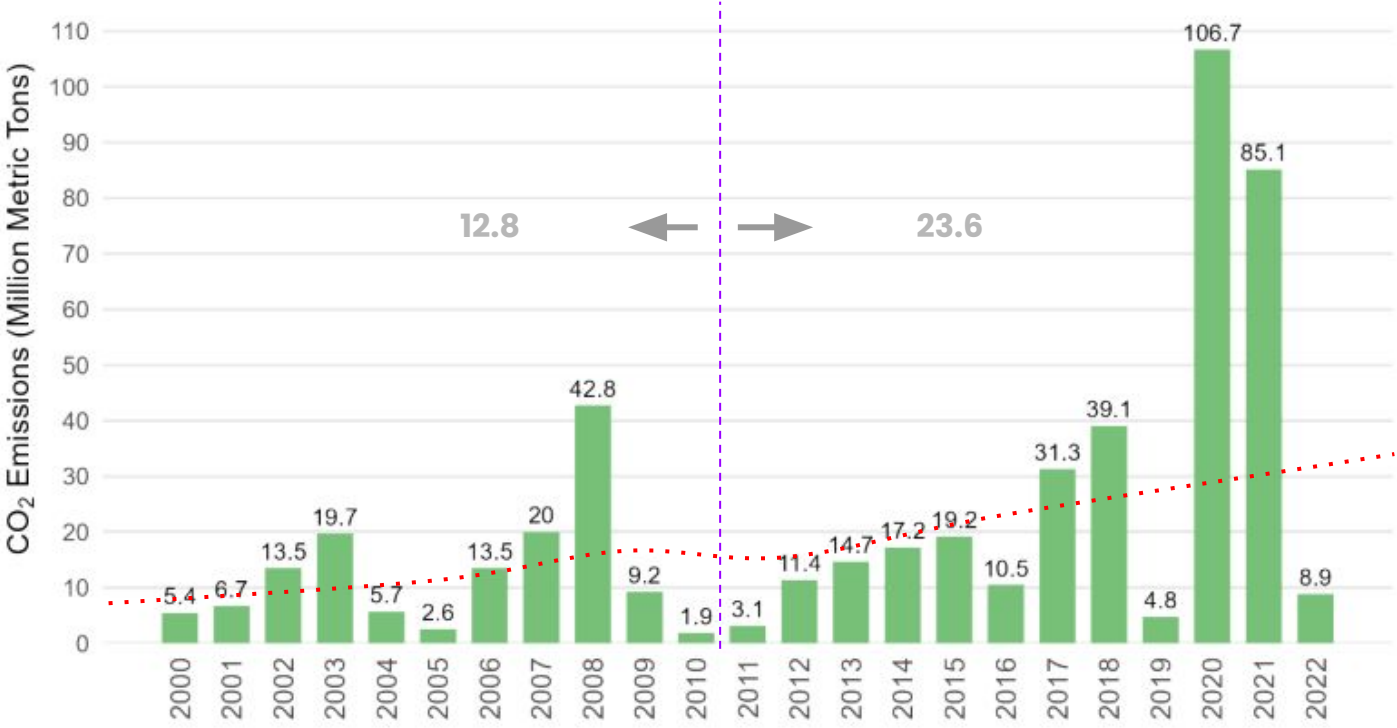


Potential GHG Savings for the California Scoping Plan Scenario:

375 MMT from 2020 - 2030

Image originally published by CARB and adjusted for reference

California Annual Wildfire Emissions (CO2)

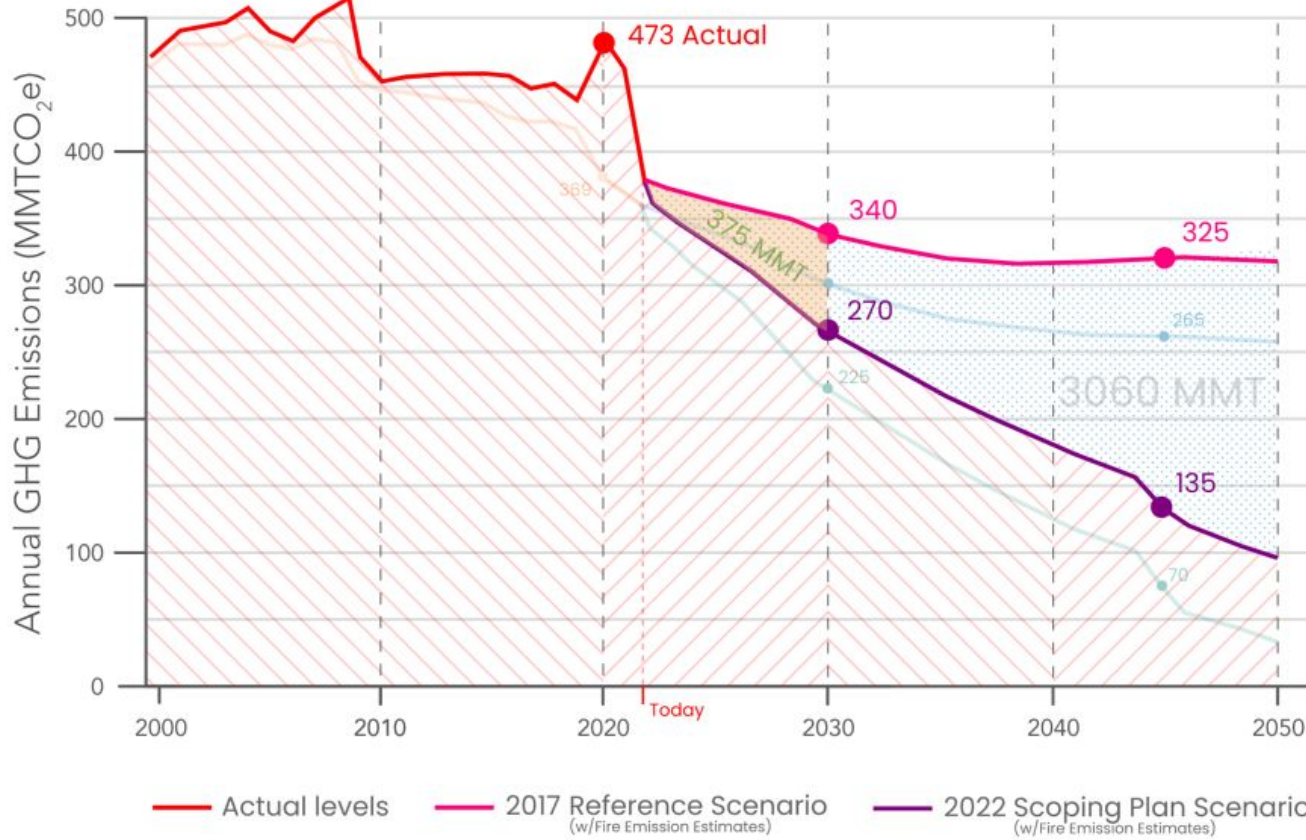


Average Wildfire Emissions:

12.8 MMT/yr @ 2000-2010
to
23.6 MMT/yr @ 2010-2020

Graph originally published by CARB

Plotting California's Path Forward - CARB GHG w/Wildfires

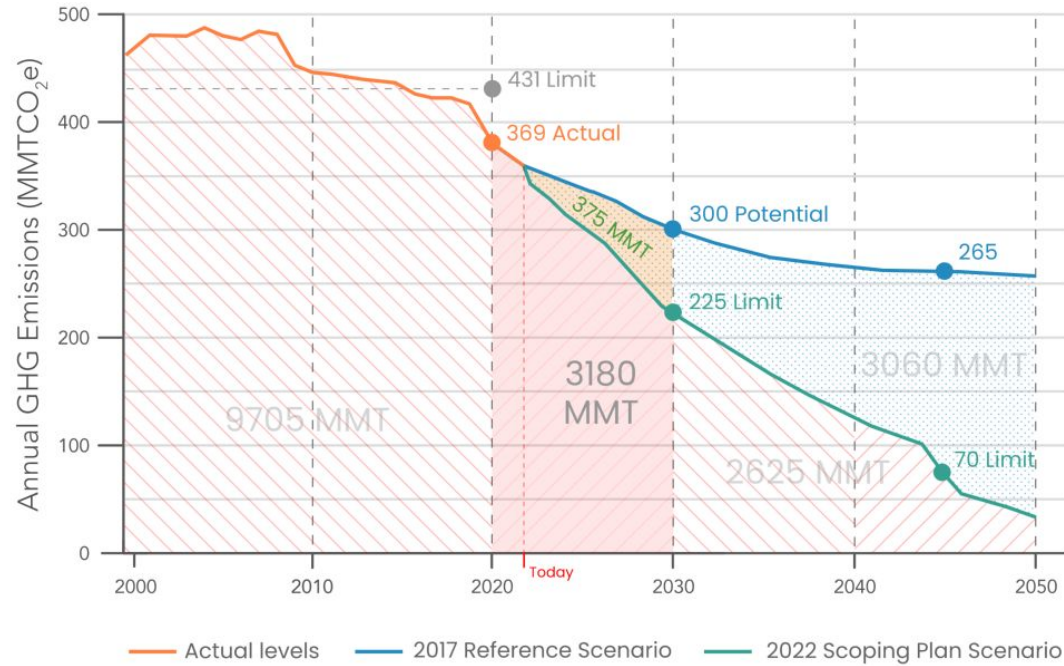


Estimated Exponential Growth Potential of Wildfires from:

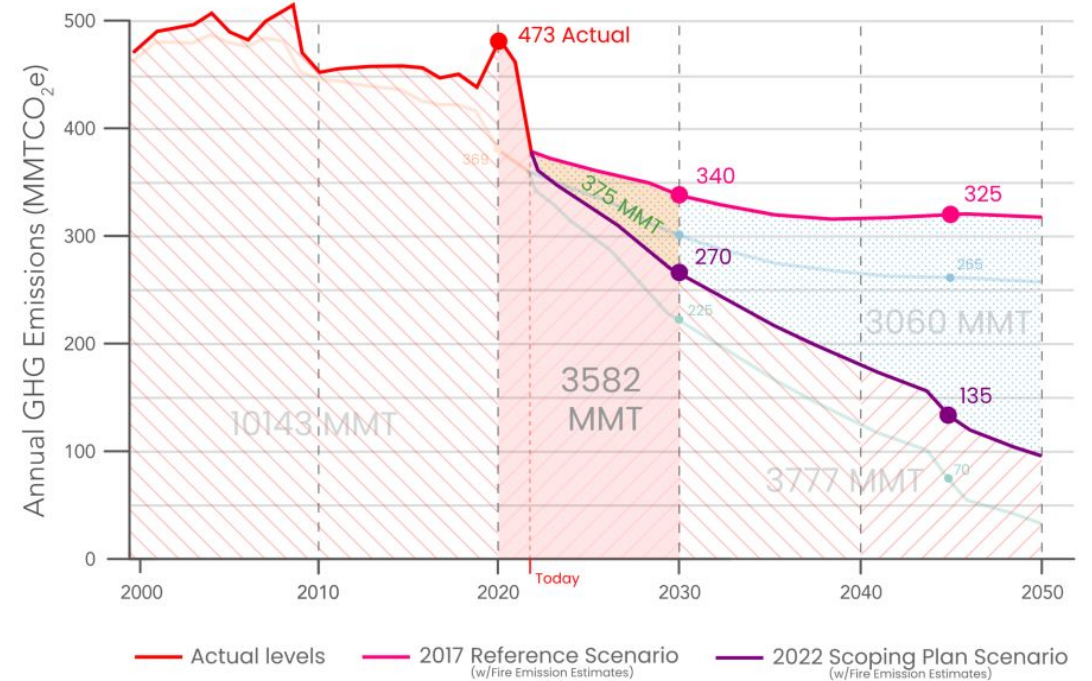
12.8 MMT/yr @ 2000-2010
to
23.6 MMT/yr @ 2010-2020
to
70 MMT/yr @ 2040-2050?

Image originally published by CARB and adjusted for reference

Plotting California's Path Forward - CARB GHG Potentials



Plotting California's Path Forward - CARB GHG w/Wildfires



2000 - 2020 CA Fire Emissions Actual = 438 MMT (20 years)

2020 - 2030 CA Fire Emission Estimates = 402 MMT (10 years)

Policy Funding for Wildfire Mitigation



The Bipartisan Infrastructure Law (**BIL**) and Inflation Reduction Act (**IRA**) are providing **\$490 million** to 11 key national forest landscapes across the western United States.



The Forest Service 2022 Impact Plan for 10 landscape project areas with investment of **\$930 million** across 45 million acres.



This work spans **134 of the 250** high-risk “firesheds” identified in the Wildfire Crisis Strategy.



THANK YOU!

that's all!

let's do our part to help the planet!

GGN