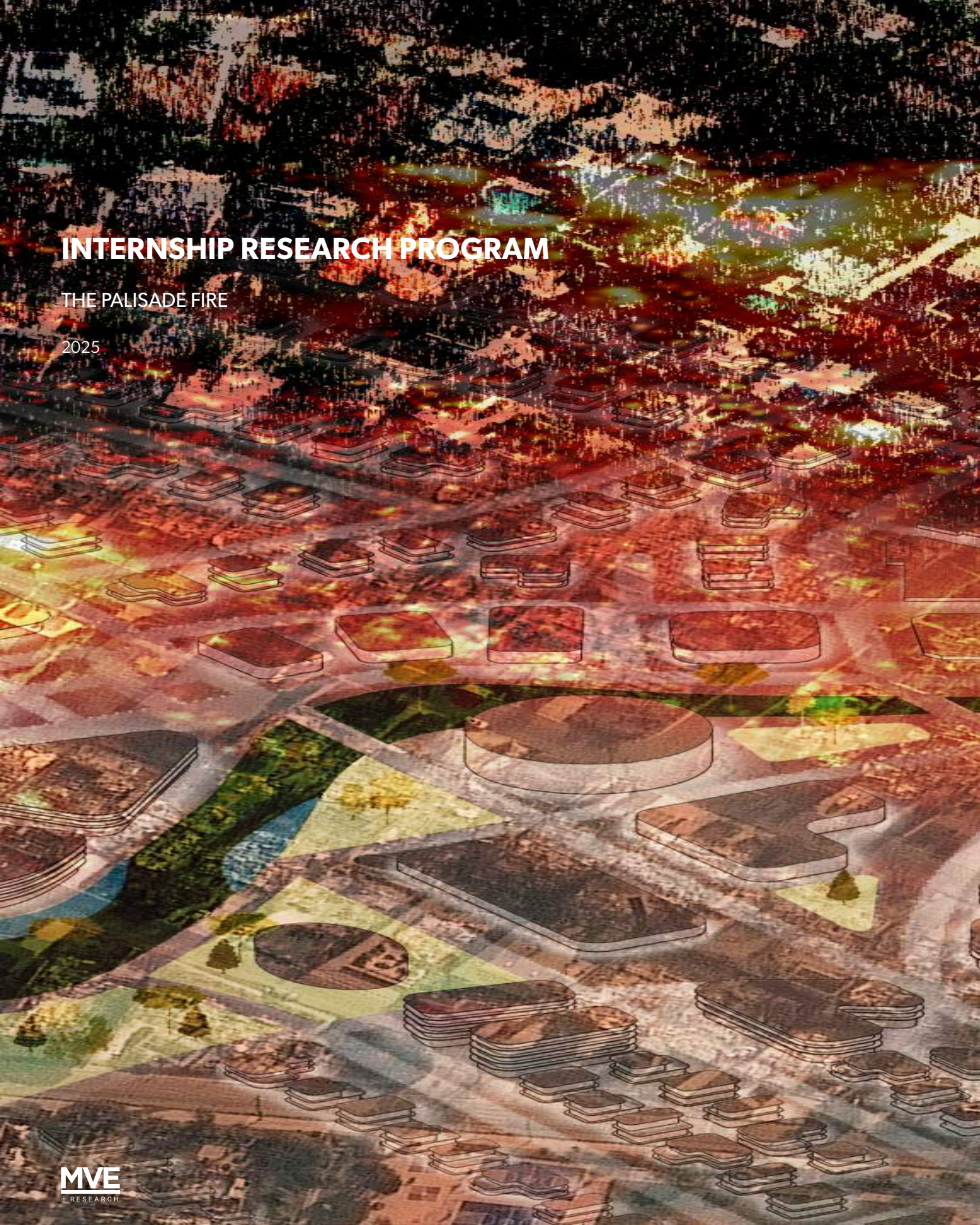


INTERNSHIP RESEARCH PROGRAM

THE PALISADE FIRE

2025

MVE + RESEARCH

INTERNSHIP RESEARCH PROGRAM

THE PALISADE FIRE

2025

MVE
+ RESEARCH

TABLE OF CONTENTS

Research

THE PALISADES

BEFORE THE FIRE

DEMOGRAPHICS

Population: 23,717

Median Income: $192,476

Median Age: 47

81% White

94% Educated beyond High School

AREA

Area: 23,431 Acres

Coastline: 3 Miles

Total Homes: 9,400

Median Year Built: 1962

Median Value: $2 million

77% Owner Occupied

THE PALISADES

BEFORE THE FIRE

THE VISION

- The Palisades was a tight-knit community, a hub for young families, with easy access to nature trails and the coast line, as well as an intimate pedestrian friendly downtown area. It was quiet, safe, and private.
- Topanga State Park and the Riviera Country Club were the two main recreational green spaces.

THE VILLAGE

- Developed in the 2010's by Rick Caruso to revitalize the commercial district.

- Demolition work began in June 2016, construction cost $200 million.

- Grand opening of Palisades Village on September 20, 2018.

- To mimic longstanding downtown shopping districts, each building in the Village was designed by a different architect.

- The first LEED Gold certified ground-up business district in California.

- The Village Green is composed of 120,000 cubic yards of soil that was displaced from nearby areas during the Village construction.

- A bio-filtration system purifies and stores storm-water under the Green.

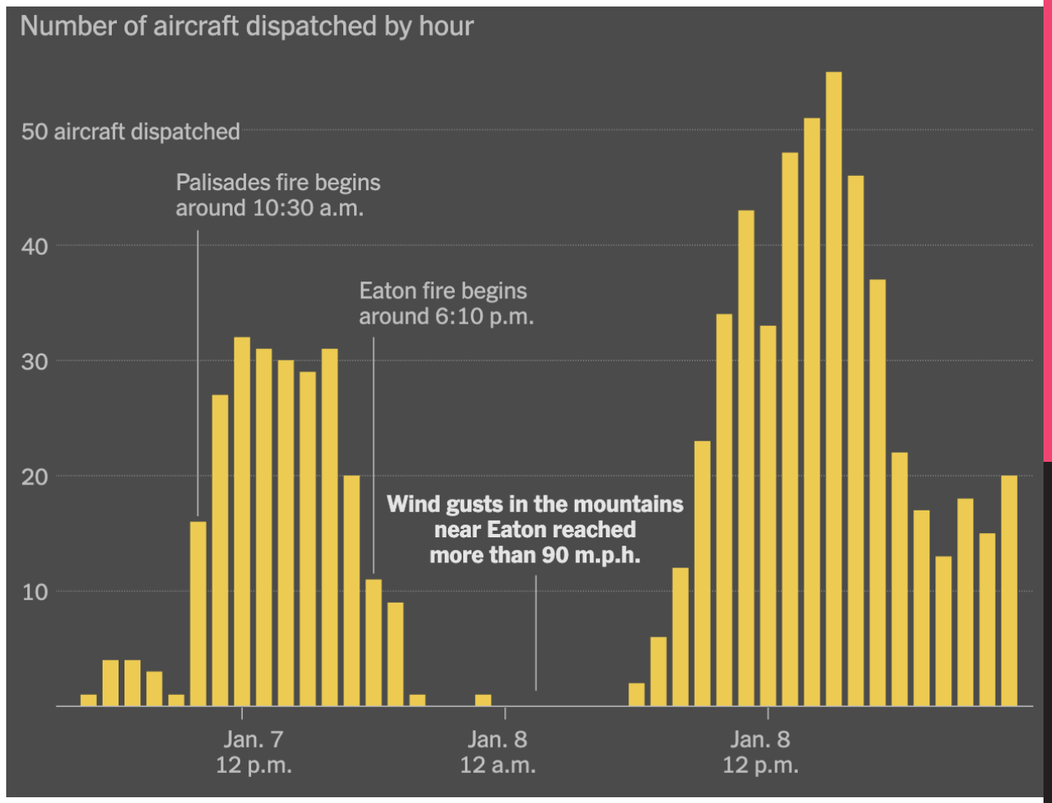
- Closed since the Palisades Fire in January 2025.

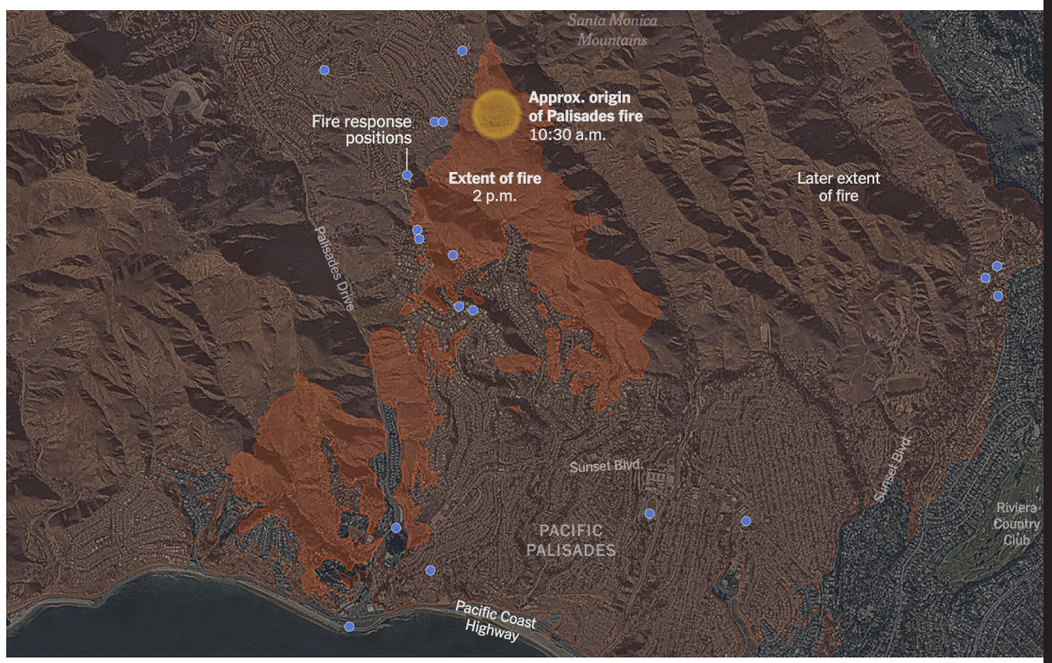
THE PALISADES

THE FIRE

TIMELINE

JAN 7, 2025	10:30AM:	First Report (911 Call) of Palisades Fire Evacuation Warnings (Voluntary) Issued Fire spread of 10 Acres
	12:30PM:	Mandatory Evacuation Orders First Traffic Gridlocks Fire spread of 200 Acres
	3:30PM:	Fire spread of 1,262 Acres
	6:18PM:	First Report of Eaton Fire
	7:30PM:	Firefighting aircraft grounded due to high winds Fire spread of 3,000 Acres
JAN 10, 2025	11:24AM:	Fire spread of 20,000 Acres, 6% containment
JAN 11, 2025	8:41AM:	Fire spread of 21,000 Acres, 11% containment
		7 other simultaneous fires in the next two weeks: Lidia, Archer, Woodley, Sunset, Kenneth, Hurst, Auto
JAN 27, 2025	10:13AM:	Fire spread of 23,000 Acres, 94% containment
JAN 31, 2025	5:35PM:	Palisades Fire is 100% contained





THE PALISADES

THE FIRE

PRIVATE FIREFIGHTERS

Containment: Establishing natural or man-made control lines to prevent fire spread (trenches, rivers, roads, etc)

Around 45% of all firefighters in the US are private.
Most work as government contractors or for insurance companies
Cost up to $20,000 for a 12-hour shift

Caruso hired a team to protect Palisades Village.
Controversial because private teams hook up to public waterlines

DESTRUCTION

12 Deaths and 4 Injuries

6,837 Structures Destroyed

Including 5,546 Private Residences

Topanga State Park Destroyed

Insured Losses of $20 Billion

Total Economic Losses of $50 Billion

SITE VISIT

Property values have dropped by 40%
Standard Lot Sizes of 6500 sqft - 7000 sqft - 7500 sqft
Standard Plan method to avoid repeated plan checking during permit applications
30 days to get a permit to rebuild up to 110% of original size
It will take 3 to 5 years to rebuild a viable downtown area
Burying the power lines is the only infrastructural initiative that the city is considering

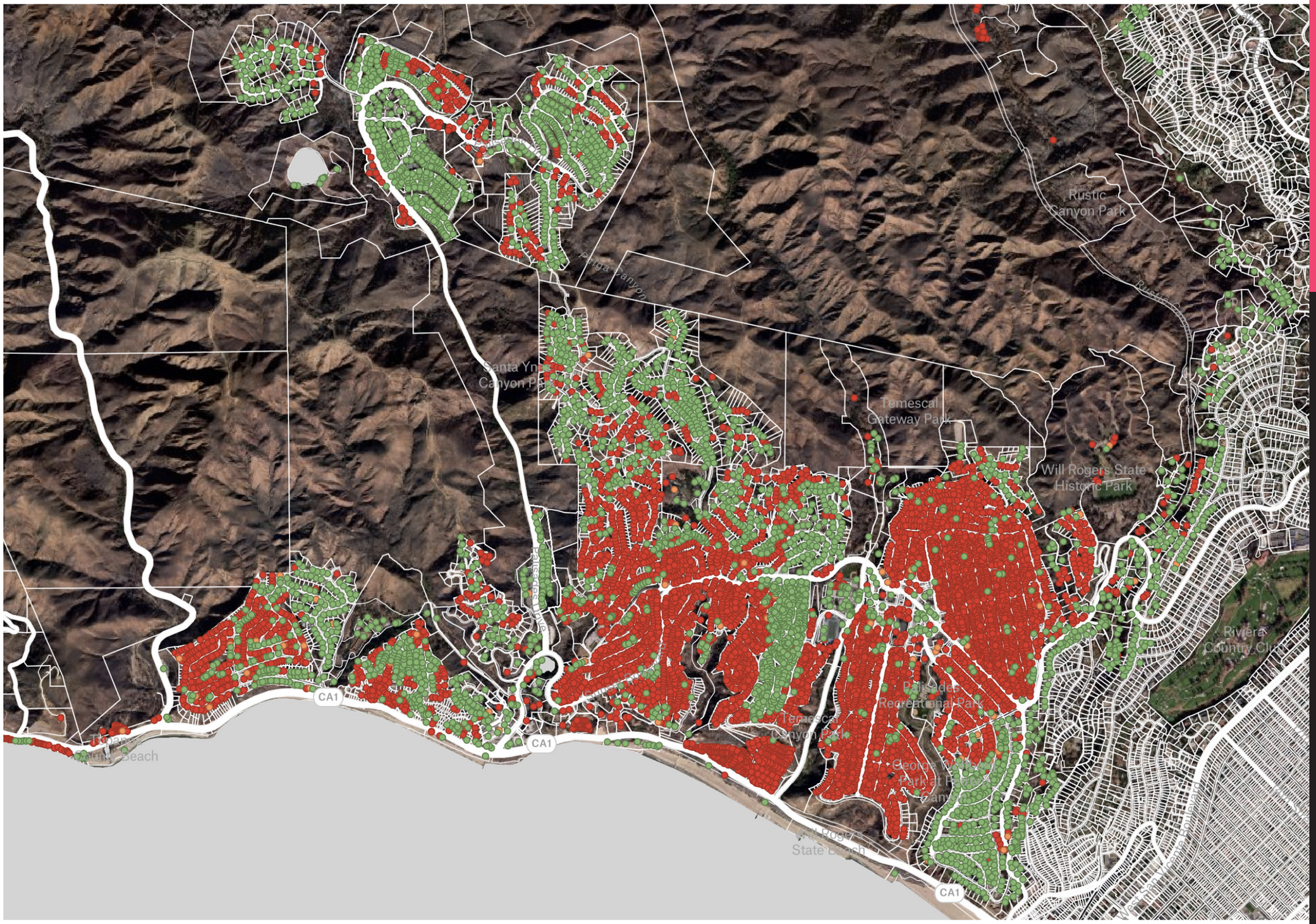
Previous efforts near Topanga State Park were halted in 2020 due to damage to an endangered plant, LADWP payed $1.9 million fine.

DESTROYED

DAMAGED

NO DAMAGE

THE VILLAGE



POST DISASTER

DISASTER PREPAREDNESS

Community Engagement and Education pre-disaster

Inclusive Emergency Response Training to address language barriers and ensure accessibility

Install Temporary Clean **Water, Power** (Solar Microgrids), and **Air** Filtration Systems

Assist Displaced Families with Social Services, Health Services,and Financial Support

SOCIAL DISPLACEMENT, FRAGMENTATION, AND ECONOMIC INSECURITY

Disruption of Community: Rebuilding is slow and isolating, lost connections with neighbors and routines

Loss of Property: Homes, Personal Mementos, Pets, and Community Members lost

Recovery Costs: Even with state aid, rebuilding is costly and excludes costs like mental health treatment

Insurance Gaps and Disputes: Delayed claims and rising premiums may in-debt or force property abandonment

POST DISASTER

SHELTER

EMERGENCY SHELTER FEATURES

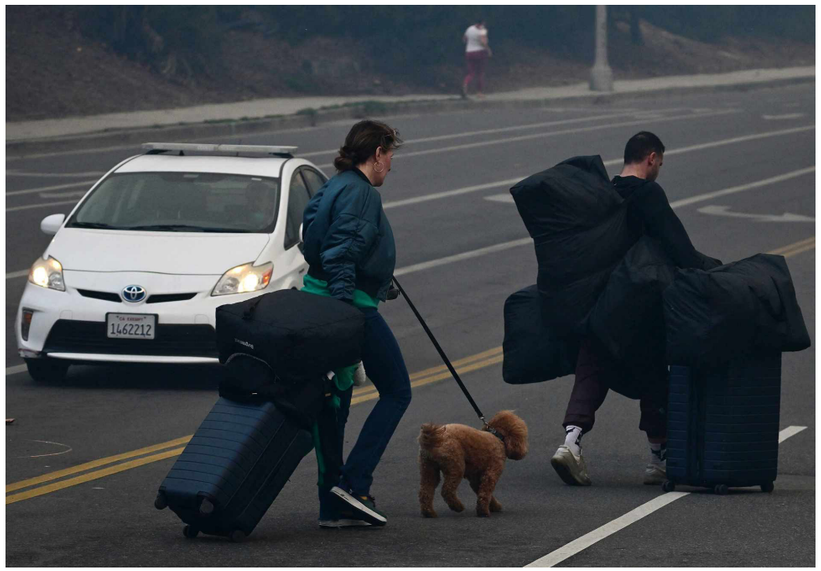
Equitable Shelter Access: Accessible locations to those without a vehicle, including seniors, low-income families, and people with disabilities

In Safe Zones: On the periphery of the affected area but outside of debris and ash fall

Medical Stations: Paramedics and mental health professionals to treat burns, smoke inhalation, dehydration, and stress-related conditions

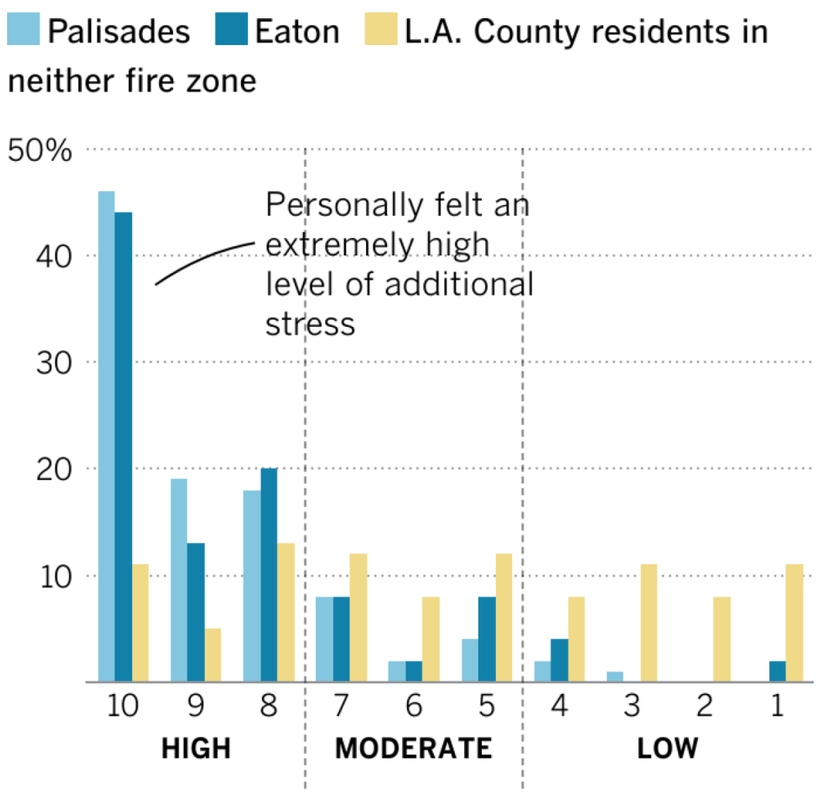
Responder Relief Space: to rest and recover

Power and Water Supply: Generators or solar power as well as potable water sources



Fires created a heavy emotional toll on Palisades and Eaton burn zone residents

Levels of additional stress caused by the fires



Berkeley IGS poll of 5,184 Los Angeles County registered voters, 565 of which lived in the fire zones, conducted online in English and Spanish from Feb. 17-26. Estimated margin of error is + / - 2 percentage points overall and + / - 4 percentage points for fire zones.

Hanna Sender LOS ANGELES TIMES

POST DISASTER

SHELTER

TEMPORARY HOUSING STRATEGIES

Immediate Shelter: Tents, Temporary Shelters, Hotels

Conversion of Existing Public Buildings: Schools,
Gyms, Religious Centers, and Community Halls often have existing utilities, reduced setup time, can be partitioned for privacy, and are adapted for accessibility.

Short-Term Housing: Prefab Units, Container Homes, Mobile Homes

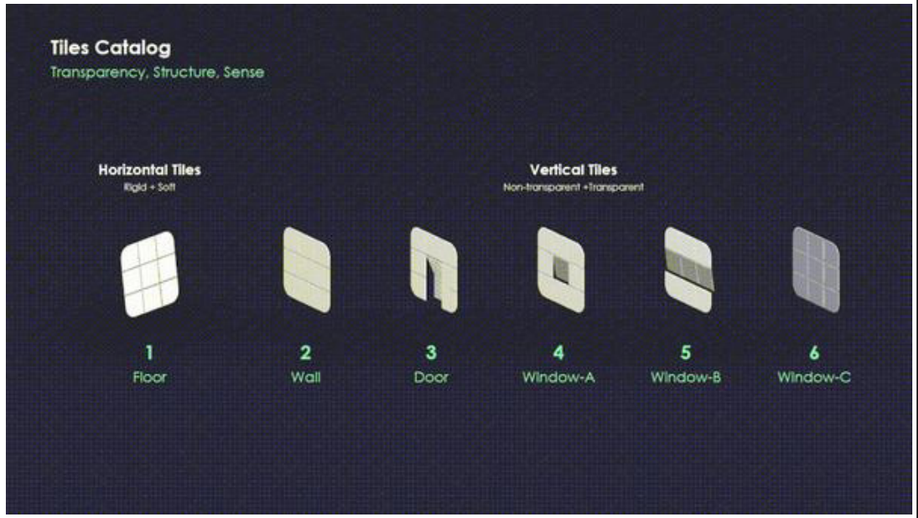
MOBILE SHELTER UNITS

On-Site Self Assembly Tensile Fabric Tents

Mobile Robotic Units

Post-Disaster Autonomous Shelter Systems

Rapidly Deployable Modular Shelters such as Shipping Container Homes, Inflatable Pods, etc



LOGISTICS

IMPACTS

LOCAL COMMUNITY AND BEYOND

Destruction of Commercial Properties: 67 retail stores, 26 offices, multiple warehouses, and other facilities

Business Interruptions and Closures: particularly consumer facing and labor-intensive businesses, faced disruptions due to evacuations, power outages, and damage

Supply Chain Disruptions: access to and between the ports of Long Beach and Los Angeles and LAX airport

Repercussions on other Industries: Retail trade, healthcare, professional services, construction, and educational services.

2 elementary schools were completely destroyed. 30% of Palisades Charter High School was damaged.

One UCLA Health clinic was destroyed, and others had operational challenges due to evacuations, loss of power and utility shutdowns.

INFRASTRUCTURE

The Palisades Fire caused **$350 million in damages** to public infrastructure.

The Department of Water and Power: $76 million in damages.
Buried drinking water infrastructure was physically or chemically damaged during wildfires, especially from VOCs. The fire destroyed or damaged thousands of structures and utility poles and power lines.

The Department of Sanitation and Environment: $48 million in damages. Pumping plants and sanitation infrastructure were rendered unusable by the flames.

The Pacific Palisades Public Library: $55 million in damages.

LOGISTICS

IMPACTS

TRANSPORTATION

Roads: Interstate 80 and portions of Highway 101 were closed temporarily causing reliance on longer, less efficient routes, increasing delivery times and fuel costs. **State Route 1 (PCH) and State Route 27 (Topanga Canyon Boulevard/SR-27) were closed for several months** due to the damage.

Mudslides and Debris Flow: The fire was followed by mudslides and debris flows, which further impacted roadways and buildings.

Rail: Fire damage to tracks and surrounding areas disrupted the transportation of bulk goods like grain and building materials.

Narrow Streets and Traffic: The Palisades area featured narrow streets, posing a challenge for moving construction materials and vehicles during the rebuilding phase.

MANUFACTURERS

Impact on Warehousing: Several warehouses suffered significant damage and thus loss of inventory and inability to meet customer demands. Rebuilding and recovering functional warehouses will be crucial to anticipate the surge in demand for building materials and services.

Hazardous Conditions: Poor air quality slowed down warehouse operations.

LOGISTICS

CLEAN-UP PROCESS

1 HAZARDOUS HOUSEHOLD WASTE

Considered the first phase of the clean up process, many visible hazards are removed: such as burned electric car batteries and home battery systems.

To reduce public and recovery workers' toxic exposure, visible household hazardous waste and bulk asbestos are removed from burned properties.

2 SITE ASSESSMENT & DOCUMENTATION

Assessment Teams Document:
- Debris piles
- Fire-damaged vehicles
- Wells & septic tanks
- Nearby streambeds & water sources
- Nesting birds & endangered species habitats
- Historical & cultural artifacts
- Standing chimneys, walls, or fire-damaged trees
- Safe property access

To maximize program safety and operational efficiency, state staff, along with environmental and archaeological professionals, visit each property to identify and document characteristics and conditions.

3 ASBESTOS ASSESSMENT & REMOVAL

For safety of crew members and the community, asbestos must be removed by specialized subcontractors before any debris removal can begin.

Asbestos is usually found in debris from homes built before 1985 (and after) including: stucco & exterior home siding, roofing, floor tile, linoleum, fireplaces, furnaces, and vent insulation, sheetrock, joint compound, cement pipe, concrete & mortar.

4 DEBRIS REMOVAL

Crews divide debris into four categories and haul to the correct disposal or recycling facility:
1. Concrete, including foundations
2. Metal, including any vehicles
3. Ash and debris
4. The top 3-6" of contaminated soil

To ensure maximum public and community safety, crews cordon off the ash footprint, permitting entry only to workers wearing full protective gear from head to toe.

5 SOIL TESTING & REMOVAL

Crews remove contaminated debris and soil to make properties safe for families, pets, and the environment. This process is guided by independent testing to ensure toxins are reduced to safe levels.

Toxins from burned materials can settle in the top few inches of soil after a fire. Crews remove foundations and the top 3–6 inches of soil, guided by cleanup goals set from testing in non-burned areas. Scientists flag a grid on each property, take soil samples for lab testing, and remove more soil if needed. Work continues until all sections meet safety standards. Independent teams and pay-per-site contracts help ensure the process is safe, fair, and protective of people, wildlife, water, and air.

6 HAZARDOUS TREE REMOVAL

Tree Eligibility Criteria:
- Trunk at least 6" in diameter when measured at chest height
- Located on a property with a submitted Right of Entry form
- Poses a risk of falling on public property
- Evaluated by an arborist holding a Tree Risk Assessment Qualification (TRAQ) from the International Society of Arboriculture (ISA)

CalRecycle removes fire-damaged trees that may fall on public infrastructure, including roadways and schools, as well as trees that endanger the safety of debris removal crews.

7 EROSION CONTROL

Erosion control prevents soil from washing away after cleanup and may be applied once soil tests confirm the property is safe.

After contaminated soil is removed, crews may apply hydramulch—a non-sprouting, wood-based mulch—to cover ash-contaminated areas. Other erosion control measures include compost socks that trap sediment, fiber rolls and seed-tree tubes that protect perimeters, and leaving fire-damaged retaining walls in place to reduce further erosion. Homeowners can choose to keep, move, or remove these measures, but should consult the local environmental health department first.

8 FINAL INSPECTION

State supervisors review site records and inspect each property to confirm debris removal is complete, hazard trees are cleared, no equipment is left behind, and environmental protections—such as erosion control—are in place. Contractors are only paid after the property passes inspection and meets all program requirements.

After state approval, the county conducts its own review. Homeowners then receive a letter confirming debris removal is complete, along with any county guidance for beginning the rebuilding process.

LOGISTICS

CLEAN-UP

UTILITIES

City-Wide Flushing: Multiple areas were put under Do Not Drink or Do Not Use water advisories. Pipe flushing moves air and sediment out of the system, which can enter during the high-water demand of fire-fighting, and brings in fresh water and a low amount of disinfectant to prevent bacterial growth.

Residential Flushing: At homes that are still standing, flush outside plumbing with cold water and hot water. Clean aerators and screens and reattach to faucets, shower heads, and fixtures. Run a cycle of the washing machine, dishwasher, and refrigerator/ ice maker.

Water Testing: for volatile organic compounds or "VOCs". Check for proper levels of disinfectant, the carcinogen benzene, and bacterial contaminants.

SOLUTIONS

Aerial & Satellite Mapping: Assess smoldering materials, burn severity, debris over large areas. Drones and satellites use infrared and multi-spectral imaging to estimate soil erosion and water contamination risk.

AI-Powered Analytics and Imaging: Classify structures (destroyed, damaged, safe), Tag downed power lines, unstable trees, or hazardous materials and estimate cleanup costs and time.

Robotics: reduce risk to human workers in toxic or unstable areas, and remove hard-to-reach debris. Detect and neutralize hazardous materials.

Smart Water & Soil Monitoring through IoT sensors deployed in streams or soil: Monitor for heavy metals, ash, and chemical run off, and send real-time alerts to teams and public health officials.

Mobile Air Quality Sensors and Hazard Detection Networks on drones, vehicles, or wearable devices track particles like PM2.5, VOCs, CO2, and smoke plumes and toxic gases from smoldering ruins.

Blockchain & Digital Logistics: Ensure transparency in cleanup efforts. They track the Movement of hazardous waste, Cleanup milestones and contractor activities, and Insurance claims and aid disbursements.

Solar Drones & Off-Grid Cleanup Tech: Help in remote, infra structure-poor wildfire zones. Solar-powered drones can monitor fire lines for days. Off-grid cleanup stations with portable solar panels and water purifiers aid early response.

LOGISTICS

STRATEGIES

DIVERSIFY TRANSPORTATION METHODS

Combine **road, rail, and sea transport** to reduce reliance on a single mode and provide alternatives during emergencies. Using rail transport for non-urgent goods can free up road resources for critical shipments.

LEVERAGE TECHNOLOGY

AI and real-time tracking systems can help businesses to reroute shipments, optimize fuel usage, and predict disruptions before they occur.

ON-SITE WORKFORCE

Crews can live on-site to minimize traffic flow, accelerate the construction progress, and be aware of evolving site conditions.

TEMPORARY MATERIAL STAGING SITES

Setting up **temporary batch plants** and material staging sites within the canyon area may reduce travel time for materials.

STREAMLINED PERMITTING AND CHECKS

The City of LA and the State of California have streamlined the permitting and inspection process for fire victims, it takes 30 days for all permits to be issued and the use of a Standard Plan bypasses the need for a plan check.

UTILIZE RECYCLED MATERIALS

The Army Corps of Engineers is recycling concrete and metal from destroyed homes, which will **re-enter the supply chain** and reduce the demand for new materials.

COLLABORATION

Collaboration **between authorities, contractors, and residents** is crucial to manage access to the site area, ensure efficient material delivery and debris removal, and keep costs low by avoiding miscommunications.

LOGISTICS

REBUILDING

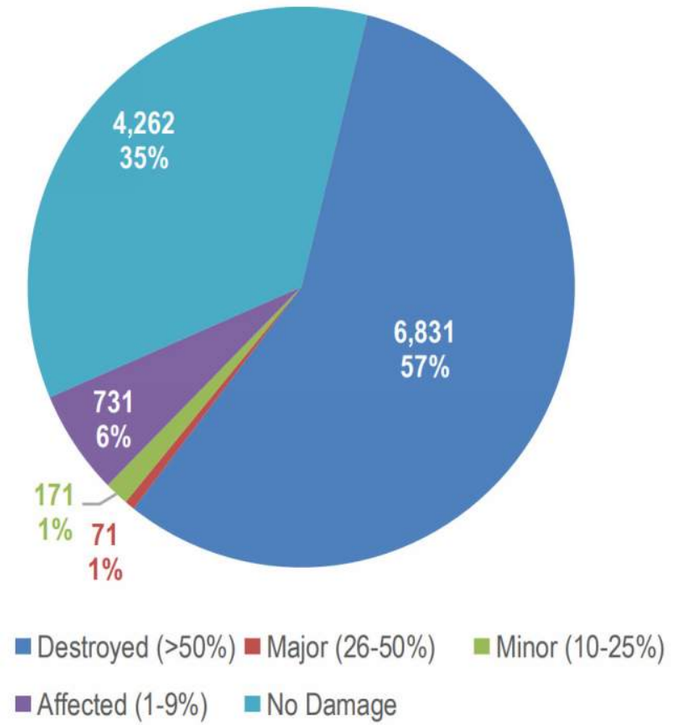
STEADFAST LA

Steadfast LA is a **civic nonprofit organization** dedicated to the rebuilding of LA after the wildfires by bringing together top industry leaders and bold initiatives, founded by Rick Caruso.

Steadfast LA partnered with **Samsara**, a modular housing company, to deliver up to 100 fully funded factory-built homes to low- and moderate- income homeowners from the Palisades who lost their home and lacked sufficient insurance. The homes will take 5-6 months to build and only weeks to install.

Steadfast LA facilitated the adoption of the **Archistar**'s AI-powered plan review software, which can analyze building plans for code compliance in hours rather than months. This tool was offered **at no cost** to LA City, LA County, Malibu, and Pasadena, as part of a public-private initiative.

ASSESSED STRUCTURES BY EXTENT OF DAMAGE FROM THE PALISADES FIRE



TECHNOLOGY

ARTIFICIAL INTELLIGENCE

AI can predict fire risk zones based on weather, fire incident history, and vegetation density. Virtual models can simulate fire direction and forecast smoke movement, like Google AI's **FireSat**.

CONCEPT DESIGN

MidJourney and Stable Diffusion are generative AI image tools that can rapidly showcase project concepts integrating defensible space. Their accelerated visual storytelling increases stakeholder engagement.

URBAN DESIGN

Hypar is a cloud platform that automates building and site work flows, integrating zoning, energy modeling, and code compliance. Along with **CityPlain**, it can simulate fire spread at neighborhood scale and analyze scenarios based on population density and infrastructure resilience.

PARAMETRIC PLANNING

Finch 3D is a parametric design tool that generates adaptive building forms to optimize material use and spacing for fire resistance, automatically adjusting massing for wind direction and fire exposure.

FIRE DYNAMIC SIMULATOR

PyroSim simulates fire growth, smoke movement, and heat transfer. It can be used to evaluate sprinkler system effectiveness, predict time to flashover, and plan safe egress routes.

EVACUATION MODELING

PathFinder simulates pedestrian evacuation and general crowd movement in stadiums, hospitals, public transit, and more.

AIR FLOW AND SMOKE CONTROL

Ventus is a 3D visualization tool for wind and airflow data, to simulate how ventilation and wind influences smoke movement and fire spread both inside a building and in outdoor environments.

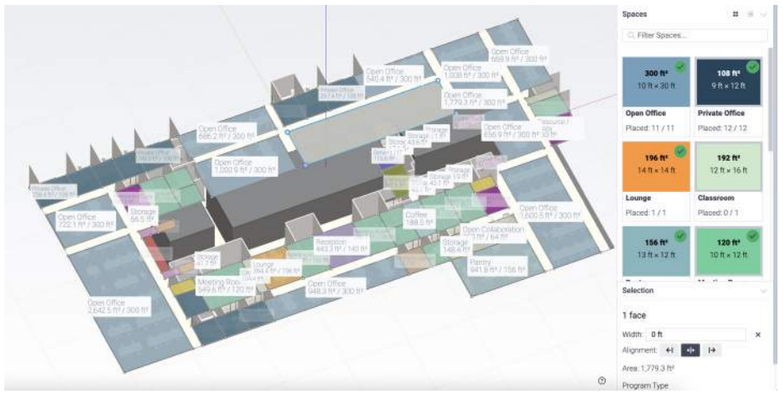
TECHNOLOGY


Ventus


Pathfinder


FireSat
Able to detect fires 1/400th the size of early detection satellites, roughly 5x5 meters or the size of a classroom.
Early Detection Satellites
Able to detect fires 2-3 acres in size, roughly the size of two football fields.


CITYPLAIN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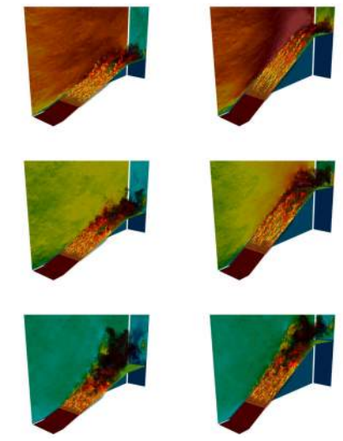

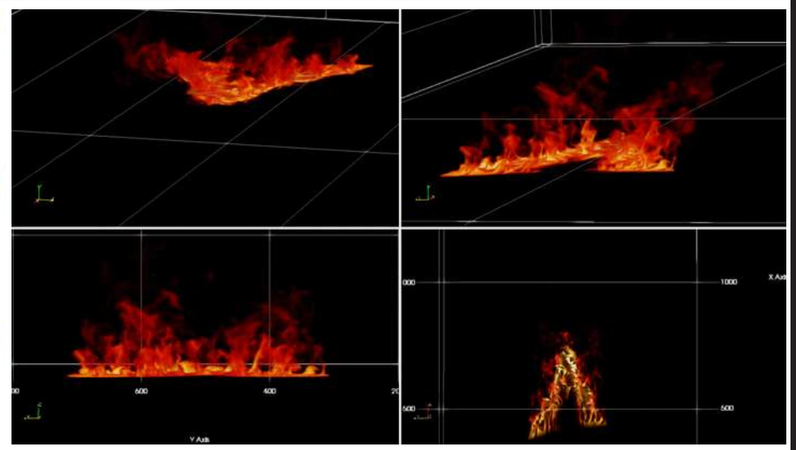
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CODES

BUILDING FIRE CODES

KEY CODE AREAS

California Residential Code (CRC) 2022:
Framing, foundations, plumbing, mechanical, and electrical systems.
CalGreen (mandatory green building standards):
Water efficiency, low-VOC materials, waste diversion.
Title 24 Energy Code:
High-efficiency windows, insulation and HVAC requirements, solar panel installation readiness.

LOS ANGELES MUNICIPAL CODE (LAMC)

Pacific Palisades: ZI Ordinance No. 1321
Floor Area Ratio (FAR) limits (e.g., 2:1 FAR in C2 Commercial zones), Large parts of Palisades are designated Hillside Areas under LAMC, **California Chapter 7A** and LAMC revisions emphasize that all rebuilding must adhere to these Rebuilding Standards:

- Class A roofing (metal, tile, fire-rated shingles)
- Non-combustible cladding
- Ember-resistant vents, screened eaves
- Defensible space landscaping, Zone 0 compliance
- Tempered glass, fire-rated doors
- Solid foundation ties, bracing and bolting

FIRE SAFETY AND SPRINKLER CODES

Automatic fire sprinkler systems are **required** in:
New homes or additions over a certain size threshold (usually 1,000+sq.ft).
Hard-wired smoke and carbon monoxide detectors.
Egress window sizing and placement (for bedrooms).
Accessible escape routes per CRC and LAFD guidelines.

CODES

BUILDING AND FIRE CODES

CODE EXCEPTIONS

EO N-4-25 (January 12, 2025): CEQA and Coastal Act Suspension
Suspended the California Environmental Quality Act (CEQA) and California Coastal Act (CCA) for all rebuilds in wildfire-impacted areas, provided the structures remain within 110% of their original footprint and height.

Required state agencies to issue permits within 30 days.

Ensured the Coastal Commission avoids issuing guidance or taking actions that could conflict with their expedited rebuilding framework.

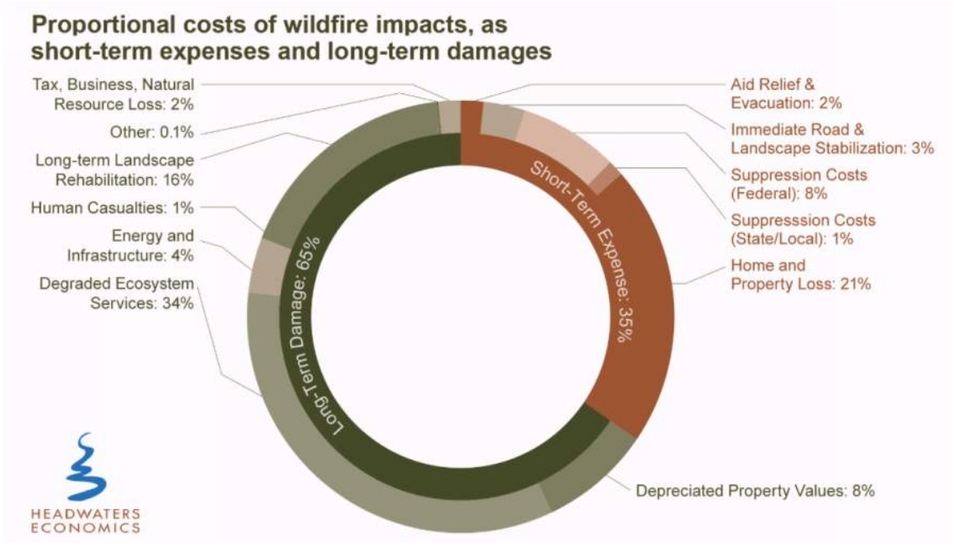
EO N-29-25 (July 7, 2025): 6 Months After the Fires
Expanded suspensions of the Coastal Act and CEQA in the city of LA.
Expanded exemptions to streamline rebuilding public schools to get kids back in their neighborhoods' public schools faster.

Exempted residents rebuilding homes from the requirement to install rooftop solar and battery storage systems to reduce up-front costs, while retaining the "Solar Ready" requirement to ensure these structures can support future installation of solar energy systems.

Suspended changes to the building codes that would go into effect on January 1, 2026, when not all homeowners will have finalized their plans to rebuild, to avoid changing plans while retaining updated fire safety requirements.

LIKE-FOR-LIKE REBUILDS

Eligibility criteria:
Same building footprint and location.
≤ 110% of original size (in area and height).
No change of use (e.g., no single-family to multi-family).
No major floor plan or foundation changes.



CODE

ZONING

WILD-LAND URBAN INTERFACE (WUI)

The WUI covers nearly **10 percent** of the country's land area, but roughly one-third of the U.S. population **(44 million houses)** is located in it. The WUI is where suburban homes meet undeveloped, flammable land. Backyards meet dense areas of vegetation and open space areas. LA County has some of the highest concentrations of WUI homes in the country, including the entire neighborhood of the Pacific Palisades.

The WUI area continues to grow by around **2 million acres** per year.

Key Requirements of the WUI Fire Codes include:

- Fire-resistant exterior wall assemblies and finishes Class A roofing.
- Non-combustible or ignition-resistant siding (e.g., stucco, fiber cement).
- Tempered glass windows.
- Vents must have ember-resistant screens (1/8" metal mesh).
- Decks and fences must be made of ignition-resistant materials.
- Defensible space clearance around structures (typically 100ft).

Figure 10. The spatial relationship between vegetation and development changes along a continuum from wildland to urban. Intermix, interface, and occluded/urban forest WUI often have the highest wildfire hazard (Image courtesy of Community Wildfire Planning Center).

SINGLE FAMILY ZONING

Single-family zoning requires large lots and low-density development. This pushes development outward into wildland areas, which are more fire-prone (forests, grasslands,chaparral).

Fires in WUI areas spread quickly and are harder to contain due to terrain, wind, and fuel load.

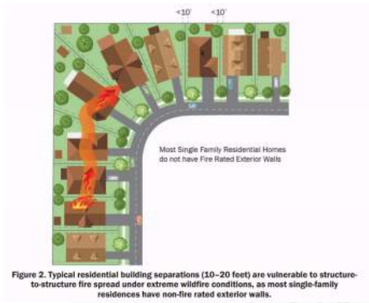


Figure 2. Typical residential building separations (10–20 feet) are vulnerable to structure-to-structure fire spread under extreme wildfire conditions, as most single-family residences have non-fire rated exterior walls.

CODES

COMMUNITY PLANNING ASSISTANCE FOR WILDFIRE (CPAW)

Land Use Planning Strategies to Reduce Wildfire Risk

Community Initiatives

Voluntary Property Assessment	Complementary to regulations, communities can initiate voluntary assessment programs that assist homeowners in the mitigation process. *Wildfire Partners is a unique public-private collaboration.*	• **Boulder County, Colorado's** Wildfire Partners program helps property owners prepare for future wildfires by conducting property assessments with a trained mitigation specialist, identifying wildfire vulnerabilities, and other forms of assistance. Property owners who complete their required mitigation earn a certificate, which is accepted by local insurance companies to maintain or receive coverage. *To read more, see page 23.*
Partnerships and Coalitions	Collaboration between diverse stakeholders can facilitate proactive and transboundary risk planning.  *A GFFP public workshop in Flagstaff, AZ.*	• In **Austin, Texas**, the fire department collaborates with other city staff to conduct prescribed burns within the city limits, reducing hazardous vegetation. *To read more, see page 15.* • The Greater Flagstaff Forest Partnership (GFFP) was formed in **Flagstaff, Arizona**, as a collaborative effort to enhance community awareness on issues related to forest health and wildfire impacts. *To read more, see page 28.*
	 *CAL FIRE launched "Cal-Adapt," an online resource illustrating areas of high wildfire severity throughout California, such as the map above for San Diego County.*	• In California, CAL FIRE works closely with the City of **San Diego** to pursue specific goals, policies, and land use planning practices to reduce wildfire risk. Examples include defensible space standards, open space management, post-fire safety and maintenance, among other wildfire-related topics. *To read more, see page 39.*

Land Use Regulations and Building Codes

Overlay Zoning	Overlay zoning provides a set of standards that apply to properties within a defined area, often superseding the underlying base standards of a given zoning district.  *Santa Fe's escarpment area is protected by an overlay district.*	• To avoid potential conflicts between resource protection (e.g. tree preservation) and hazardous fire-prone vegetation, the City of **Flagstaff, Arizona** prioritized within its regulatory and planning documents that Flagstaff's Wildland-Urban Interface (WUI) code applies *before* the application of resource protection standards within their Resource Protection Overlay Zone. This ensures that all future developments appropriately reduce wildfire risk prior to the development application process. *To read more, see page 32.* • The escarpment area in **Santa Fe, New Mexico** is covered by an overlay district aimed at protecting viewsheds and the surrounding foothills. Development within the overlay district is subject to heightened development regulations and landscape wildfire mitigation compliance measures. *To read more, see page 45.*
Site Plan Review Procedures	Wildfire mitigation can be incorporated into site plan review procedures to ensure safe development within the WUI.  *Boulder, CO has integrated wildfire protection into the development review process.*	• In **Boulder, Colorado**, a site plan can be requested with each submitted development proposal prior to a building permit being issued—allowing for added wildfire mitigation measures, such as defensible space standards, adequate water supply, and multiple entry/egress options. *To read more, see page 22.*

Site Plan Review Procedures (Cont.)	 *The 2011 Pinnacle Fire in Austin, Texas destroyed 10 homes and threatened dozens of more structures situated within the city's WUI.*	• The City of **Austin, Texas**, works closely with Travis County in a joint design review process for proposed developments, ensuring that the city inherits a better planned WUI for wildfire mitigation. *To read more, see page 13.*
Development Standards	Development standards are the section of land use regulations that generally determine the quality of development. For wildfire, these can include specific requirements for adequate water supply, defensible space, resource protection, and ongoing maintenance.	• **Austin, Texas** is undergoing an initiative called CodeNEXT, which promotes compact development by directing new growth to existing areas rather than on "greenfield" sites. *To read more, see page 15.* • Development requirements for fire protection are part of the **Boulder County, Colorado** Land Use Code which requires appropriate water systems and other precautionary measures for homes rated high for wildfire exposure. *To read more, see page 22.*
Subdivision Regulations	Subdivision regulations determine how lots are created and divided, as well as site layout standards for new subdivision developments. Related to wildfire, subdivision review can include components such as adequate access, water supply, and other wildfire risk reduction features.	• The City of **San Diego, California** enforces a comprehensive brush management policy for any property containing a habitable structure *and* native vegetation. Homes that do not comply with the multiple-zone management requirements are billed the amount it costs to hire a private contractor to complete the brush thinning. *To read more, see page 38.*
Wildland-Urban Interface (WUI) Code	WUI codes provide a set of wildfire mitigation development standards, including structure density and location, building materials, and other fire protection requirements.  *Flagstaff, Arizona's WUI code requires removal of snags and other potential hazard trees.*	• Well in advance of adopting a WUI code, the City of **Flagstaff, Arizona** required hazard mitigation on all properties prior to development, such as requiring non-combustible roof coverings. The early regulations laid the groundwork for the more stringent wildfire risk reduction measures outlined in the official WUI code. *To read more, see page 31.*
Preservation of Open Space	Preserving open space between developed lands and the WUI provides a buffer between the built environment and encroaching wildfires. Parks, public lands, agricultural fields, and other undeveloped lands are considered open space.	• **Austin, Texas** has designated more than 30% of city land as conversation areas, limiting the number of future structures at risk to wildfires. *To read more, see page 15.* • In **Boulder, Colorado**, the county's Open Space and Recreation Department manages more than 100,000 acres of open space, which prevents further development within the WUI and lands prone to wildfire. *To read more, see page 21.*

Planning Policies

Comprehensive Plan	Wildfire mitigation can be integrated into comprehensive plans, which are overarching policy documents that provide guidance for future land use decisions at the local level.	• In updating its Comprehensive Plan, **Boulder, Colorado** addressed several different policies for wildfire risk reduction and dedicated an entire chapter to the hazards posed by wildfire. *To read more, see page 21.*
Community Wildfire Protection Plan (CWPP)	CWPP's are local plans designed to specifically address a community's unique conditions, values, and priorities related to wildfire risk reduction and resilience. CWPPs vary in scope, scale, and detail, but there are minimum requirements for their development and adoption.	• The City of **Austin, Texas** partnered with Travis County to form the Austin Travis County Wildfire Coalition. Their first major undertaking was the development of a joint city-county CWPP. *To read more, see page 13.* • The City of **Boulder, Colorado** extensively collaborated with public and private stakeholders in the development of its CWPP, which includes 45 different maps, video links, and resources for property owners regarding wildfire risk reduction strategies. *To read more, see page 21.*
Hazard Mitigation Plan	Hazard mitigation plans are local plans that are often multijurisdictional and identify risk, vulnerability, and mitigation actions for various natural hazards, including wildfire.	• In its Hazard Mitigation Plan, **Boulder, Colorado** identified wildfire-related risks and proposed actions to reduce these threats, such as creating fuel breaks along roadways, installing information kiosks and wildfire danger signage, and ensuring sufficient water supply to neighborhood hydrants. *To read more, see page 21.*
Planning for Climate Change	In managing for climate change impacts, including prolonged droughts, variable precipitation patterns, and other environmental stresses, community officials can identify key risks, implement mitigation measures, and develop approaches for long-term adaptation to climate change.  *San Diego, California's WUI*	• In 2014, **Austin, Texas** adopted a Community Climate Plan, providing guidance for the city to achieve net-zero communitywide greenhouse gas emissions by 2050. *To read more, see page 16.* • In recognizing the inevitable challenges climate change poses, **Boulder, Colorado** developed a Climate Change Preparedness Plan and addressed the need to protect crucial water supply infrastructure. *To read more, see page 24.* • In **San Diego, California**, the State of California maintains Cal-Adapt, a website providing updated climate data to help users understand local climate change impacts. *To read more, see page 39.*
Watershed Management	Watershed Management plans and policies help communities protect their water supplies from catastrophic wildfire through forest management and agency partnerships.  *Santa Fe, New Mexico funds a public-private collaborative effort to reduce fuel loading in nearby watersheds.*	• Following several significant fires near **Flagstaff, Arizona**, city residents approved a $10 million bond in 2012 to implement wildfire risk reduction measures and mitigate post-fire flooding impacts in nearby watersheds. *To read more, see page 30.* • Following the Cerro Grande Fire in 2002, **Santa Fe, New Mexico** established a forest treatment program in the Santa Fe National Forest to reduce the fuel load in portions of the watershed, requiring a concerted private-public partnership. Since the program began, the U.S. Forest Service has treated more than 5,500 acres within the watershed. *To read more, see page 46.*

The CPAW team reviews the Comprehensive Plan and Land Use Development Code and compiles recommendations as to how they may be integrated with other documents such as a Community Wildfire
Protection Plan or Hazard Mitigation Plan.

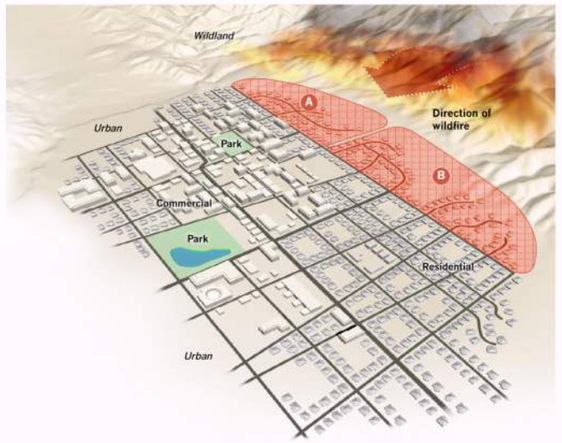
The goal is to reduce regulatory conflicts, address development,and ensure wildfire is considered alongside other community planning priorities.

INTRODUCTION

BUFFER ZONES

The LA Times created a map showing a hypothetical Southern California city beside the mountains and asked experts to offer their wish list of fire-risk prevention measures.

Each map diagrams a different solution for how the city could be reconfigured and how existing areas could be used to defend against the next major wildfire.



Perimeter buffers

A Agricultural land can serve as one type of buffer between wilderness and homes.

B A golf course or large park with low landscaping and parking lot can also be a shield.

Interior buffers

C Strip malls and other nonresidential land can be converted to open spaces such as tennis and basketball courts that slow a fire's spread and provide emergency refuge.

Interior fire breaks

D A network of bicycle and walking paths – made of pavement or decomposed granite – can give firefighters a line of defense. They can also be escape routes and should be designed to displace as few homes as possible.

Send-receive zones

F Homeowners who cannot rebuild in perimeter and interior buffer zones can work with city offcials to exchange development rights, allowing them to rebuild in safer neighborhoods.

Command and control centers

E First responders can use large parking lots at malls, schools, parks and libraries to stage fire trucks and crews.

CODES

OVERVIEW OF CALIFORNIA'S WILDLIFE MITIGATION MEASURE

VEGETATION AND FUEL MANAGEMENT

Defensible Space Requirements: 100 feet of defensible space around structures (Zone 0: 0–5 ft, Zone 1: 5–30 ft, Zone 2: 30–100 ft). Remove dead vegetation, thin trees, and maintain clearances between shrubs.
Controlled Burns (Prescribed Fires): Used to reduce fuel loads in high-risk forests. Mechanical Thinning: Removal of dense underbrush and dead trees using machinery or hand crews.

BUILDING AND CONSTRUCTION REGULATIONS

Wildland-Urban Interface (WUI) Building Code (Chapter 7A): Fire-resistant materials for roofs, siding, vents, and windows. Ember-resistant vents and non-combustible decking.
Fire-Resistant Landscaping: Use of drought-tolerant and non-combustible plants.

UTILITY AND INFRASTRUCTURE HARDENING

Undergrounding Power Lines: Reduces risk of power line sparks.
Public Safety Power Shutoffs (PSPS): Utility companies (e.g., PG&E) cut power during extreme fire weather.
Pole Replacement & Line Spacers: Replace wooden poles with steel or composite.

COMMUNITY-LEVEL PLANNING

Fire Hazard Severity Zones Mapping: State maps classify areas into Moderate, High, and Very High Fire Hazard Severity ones.
Firewise Communities: Neighborhood-level fire safety programs.
Evacuation Route Planning: Clearly marked and maintained escape routes.

EMERGENCY PREPAREDNESS

Early Warning Systems: Wireless alerts, sirens, and evacuation apps.
Community Drills & Education: Public education campaigns on wildfire safety.

INSURANCE AND FINANCIAL INCENTIVES

California FAIR Plan: Last-resort fire insurance. Also offer discounts for homeowners implementing mitigation measures.

CLIMATE AND FOREST MANAGEMENT

Forest Health Programs: Collaborative projects with CAL FIRE, USFS, and NGOs.
Carbon Reduction Goals: Linking wildfire risk to climate adaptation.

CODES

PLANNING STRATEGIES

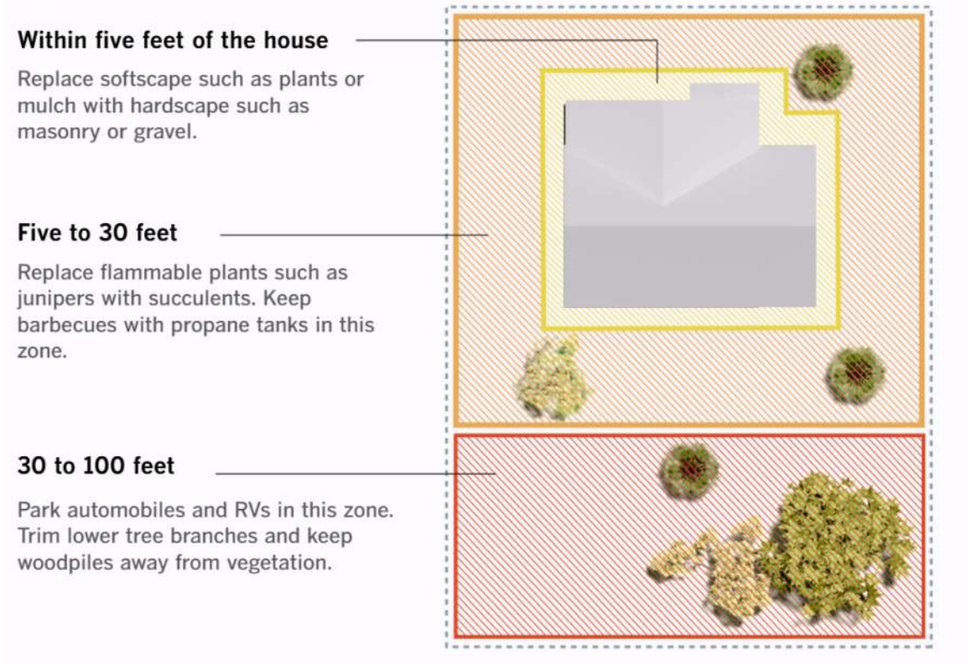
PLANNING STRATEGIES

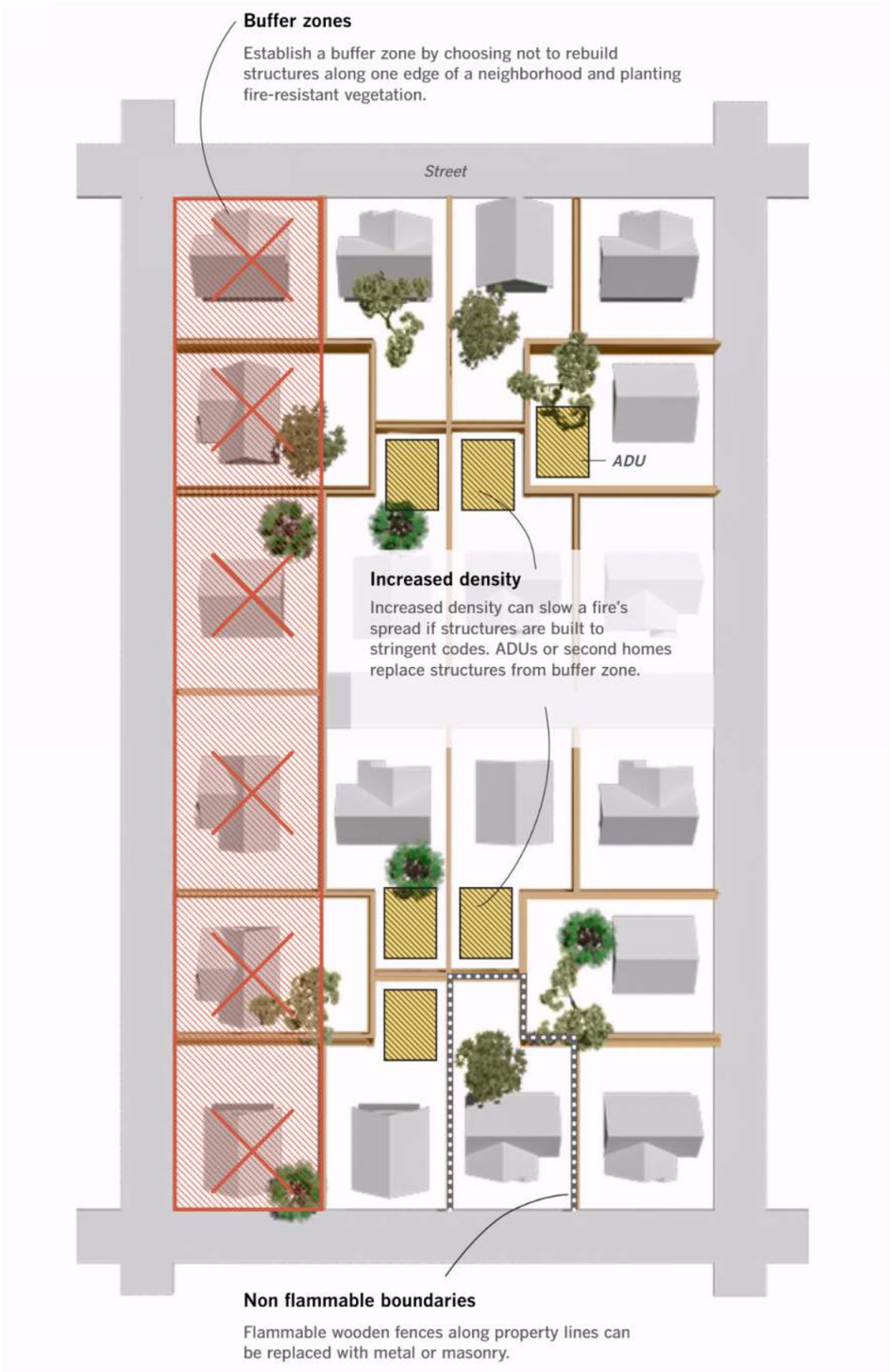
The Palisades' **canyon-like terrain** and ridgelines amplify wind speeds and fire intensity. Mid-slope sites, ridgelines, and steep slopes dramatically increase wildfire spread due to wind acceleration and ember lofting.

In wind-driven wildfires, structure-to-structure ignition is common, especially in neighborhoods with 5–10 ft setbacks and combustible siding. Rebuilding historic homes as-is will reintroduce **collective risk**.

Fatalities in wildfires often result from **evacuation failure**, not burns. Single-entry roads or narrow lanes will function as wind tunnels during fire events, and reduce egress capacity.

Unmanaged greenbelts, creekbeds, and medians accelerated fire spread. Conversely, irrigated and fire-adapted zones slowed it down. The Palisades' mix of ornamental and native vegetation, much of it unmanaged functions as fuel corridors rather than buffers.





CODES

ACTION ITEMS

RETHINK RISK AS A SPATIAL SYSTEM

- **Prohibit** new development on slopes >30% or in fire-funneling topographies (saddles, canyons, ridgelines).
- Apply a minimum 100–200 ft setback from downslope vegetation or unmanaged land.
- Require site-specific wildfire behavior modeling during planning (not just use of state maps).

MOVE BEYOND PARCEL-BASED THINKING

- **Mandate block-scale fire planning** in new subdivisions.
- Enforce **minimum 15–30 ft building separation** or require 1-hour fire-rated walls and non-combustible siding <10 ft.
- Promote **clustered development** with shared buffer zones and perimeter fuel breaks.

TREAT EVACUATION AS A DESIGN CONSTRAINT

- **Require dual-access roads** for all subdivisions >30 units, separated by ≥½ the site's diagonal length.
- Upgrade local streets to a **minimum 20-ft fire apparatus access width.**
- **Mandate evacuation simulation studies** for all new developments (e.g., Pathfinder software).

MANAGE LANDSCAPING AS FIRE INFRASTRUCTURE

- Classify greenbelts and open spaces as **"shared ignition zones."**
- Prohibit high-flammability plants (e.g., Italian cypress, juniper) **within 30 ft of structures.**
- Require seasonal vegetation inspections and HOA-managed **fuel reduction plans.**
- Mandate **fire-resilient landscape design** per UCANR and CAL FIRE Zone 0 guidelines.

HARDEN AND DEFEND CRITICAL INFRASTRUCTURE

- Bury power lines where feasible; **enforce 10-ft vegetation clearances** around all above ground infrastructure.
- Require a 30-ft defensible zone around **water tanks, pump houses, fuel lines, and communication towers.**
- Site critical equipment outside of slopes and vegetation and **away from evacuation routes.**

ALIGN POLICY WITH A DYNAMIC FIRE LANDSCAPE

- I**ntegrate climate-informed wildfire models** (e.g., PyroSim, FlamMap) into planning review processes.
- Require wildfire risk and evacuation impact assessments during environmental review (CEQA).
- Create Wildfire Overlay Zones that evolve **every 3–5 years** based on fire risk and new data.

GOVERNMENTAL FACTORS

KEY AGENCIES

LADBS (Los Angeles Department of Building and Safety)
Permitting, Inspections, Code Compliance

Los Angeles City Planning
Zoning, Land Use, Height, FAR Review

County Public Works
Soil, Grading, Debris, Geotech

LAFD (Los Angeles Fire Department)
WUI, Fire Safety, Defensible Space

California Coastal Commission
Permits for Coastal Zone properties

Cal Fire
Fire-safe building code enforcement

AQMD
Air quality and Asbestos regulation

LADWP & SoCalGas
Utility disconnection and restoration

County Regional Planning
Land use for edge and unincorporated areas

ONE-STOP REBUILD CENTER

The City of Los Angeles created a **centralized** permitting and support **hub** in response to the 2025 wildfires, to speed up the rebuilding process for affected homeowners in places like Pacific Palisades, Topanga, and Brentwood. Multiple agencies are collaborating under one roof to streamline:

- Permit approvals
- Plan check routing
- Agency coordination
- Fee waivers
- Code guidance

GOVERNMENTAL FACTORS

APPROVAL PROCESS

City Level: Los Angeles Department of Building and Safety (LADBS) issues permits and enforces building codes. The **Department of City Planning** reviews conformance with zoning and Specific Plans (e.g., the Brentwood-Pacific Palisades Community Plan).

County and State Level: Cal Fire enforces defensible space and vegetation management standards in **Very High Fire Hazard Severity Zones.** California Coastal Commission may also require permits if your property is in the Coastal Zone.

Federal Level: FEMA is involved in disaster recovery funding if federal disaster declarations apply.

In order to approve a rebuilding project, the typical steps are:
Assessment of Damage: Determine if repairs or full reconstruction are needed.
Debris Removal Compliance: Clearance certified by agencies (e.g., LA County Fire Department).
Pre-Submittal Meeting: Review rebuilding requirements with LADBS and Planning.
Permit Submittal: Submit plans showing compliance with fire-resistant construction.
Plan Check & Environmental Review: Evaluate CEQA exemptions or necessary studies.
Permit Issuance & Inspections: Inspections at milestones, including fire-resistant details.

RED TAPE

Lengthy Permit Approvals: Although Mayor Bass issued Emergency Executive Order No. 1 on January 13, 2025, to expedite permit reviews,many are delayed. While city officials targeted a 30-day turnaround, in practice the permit approvals take an average of **55 days** and planning processes average **108 days** or longer.

Fewer than 200 out of 800 applicants for like-for-like rebuilds have been approved in all of LA, and only about **50 approved** in the Palisades.

Changing Rules: Policies have changed mid-stream—like whether basements count toward size limits—creating confusion over whether or when to submit plans.

Lack of Multi-Agency Coordination: Many applications stall due to hold-ups in supporting agencies (e.g., Public Works, Coastal Commission, regional departments). If any single agency stalls, the entire permit is delayed, even if others have signed off.

Insurance, Debris, and Soil Hazards: Lots must be cleared of debris and certified as safe. Soil toxicity testing and geological reports are required and remain mandatory despite official claims of waivers.

Insurance disputes delay owners from even submitting paperwork.

Limited Scope of Fast-Track Rules: Only eligible “like-for-like” reconstructions qualify for expedited review and waived fees. New expansions, design alterations, or larger homes fall under full discretionary review. Power upgrades or transit improvements like utilities burial still often require full BOE reviews or separate permits.

Building Code and Fire Safety Compliance: All rebuilt homes must incorporate California Wildland-Urban Interface codes (fire-resistant materials, tempered windows, ember screens, sprinkler systems), which causes building delays.

ENVIRONMENTAL FACTORS

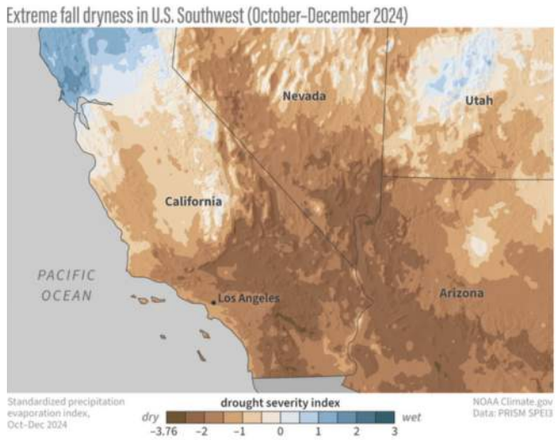
CLIMATE

The Pacific Palisades has a Mediterranean climate, with only 35 days of measurable precipitation annually. Snowfall and freezing temperatures are extremely rare.

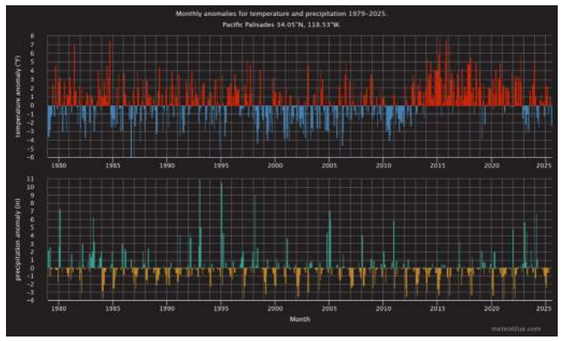
Around 11% of California is in extreme drought. 33% of the state is in severe drought, including Los Angeles County where the Pacific Palisades is located.

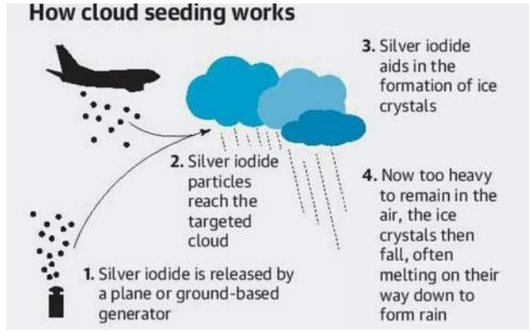
Drought impacts agriculture and farming, recreation, and the capacity to respond to wildfires. The four months that preceded the Palisades Fire were exceptionally dry, but followed a decade-long period of record high temperatures.

The heat caused the vegetation that bordered the entire Pacific Palisades neighborhood to dry and become extremely flammable. The wind then spread the dried vegetation into backyards, on roofs, and on porches, leading to fuel accumulation.



October–December 2024 was exceptionally dry across the U.S. Southwest. The balance between precipitation and evaporation (the Standardized Precipitation Evaporation Index) was strongly negative (brown colors) around Los Angeles. NOAA Climate.gov map, based on PRISM data.





FIRE PRONE ZONES

The **Fire Hazard Severity Zone** map issued by the **State Fire Marshall** classifies lands within state responsibility areas into “Moderate”, “High”, and “Very High” hazard zones.
The **state responsibility area (SRA)** is the area where the state has financial responsibility for wildland fire protection and prevention.
Incorporated cities and federal ownership are not included.
The SRA in California is currently more than **31 million acres**, with an estimated 1.7 million residents in 800,000 existing homes.
The map was most recently updated in December of 2024.

CLOUD SEEDING

Cloud Seeding is a weather modification technique that enhances precipitation by dispersing **silver iodide** into clouds via aircrafts to accelerate condensation and form ice crystals that later become rainfall.
The right amount of moisture and humidity must already be present in the air, with sufficient clouds, for cloud seeding to work. While California has used the technique since the 1950’s to increase **snowpack** on high mountain ranges, cloud seeding has not proven effective in dry areas like the Pacific Palisades, and therefore cannot improve fire-prone conditions in that area.

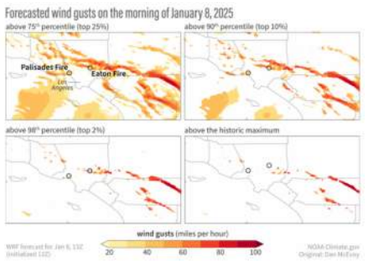
ENVIRONMENTAL FACTORS

SANTA ANA WINDS

The Santa Ana Winds are dry, warm, and gusty northeast wind gusts that blow from areas of high pressure over the Great Basin into Southern California, where humidity plunges to single-digit percentages.

The Pacific Palisades region sees around **10 wind events** per year, typically occurring from fall to January. The Palisades fire occurred at the tail end of the windy season, when the area was at its driest.

The winds destroy crops, knock down electrical poles, overturn vehicles, and damage homes. Gusts of up to **100mph** spread fire faster than firefighters are able to contain it, but their predictability allows evacuation zones to be determined faster.



On the morning of January 8, 2025, forecasts were calling for a rare wind event for the mountains surrounding Los Angeles. These maps show forecasts for wind gusts at 13Z (5 a.m. local time) for different thresholds. Wind gusts above the 75th percentile were forecasted for a large area (top left). A more limited, but still significant area was forecasted to have winds above the 90th percentile (top right). Directly over the location of the Palisades and Eaton Fires, winds were forecasted to gust above the 98th percentile (bottom left), and in the surrounding mountains, some gusts were forecast to exceed the historic maximum (bottom right). NOAA Climate.gov graphic, adapted form original by Dan McEvoy.

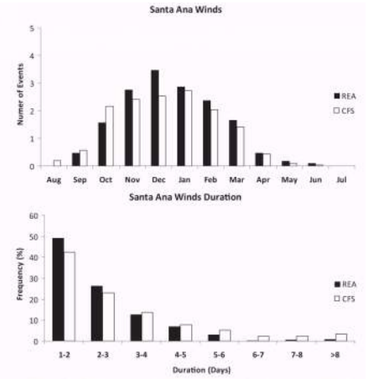
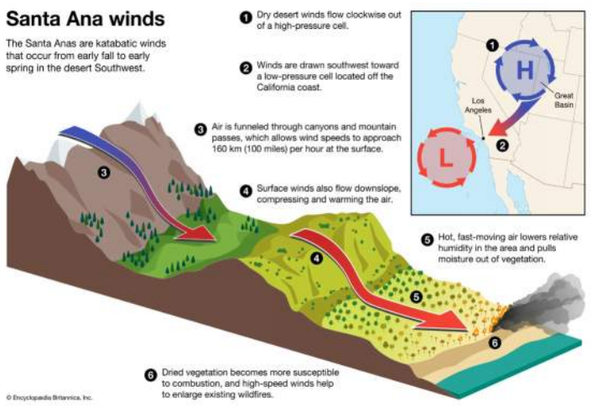
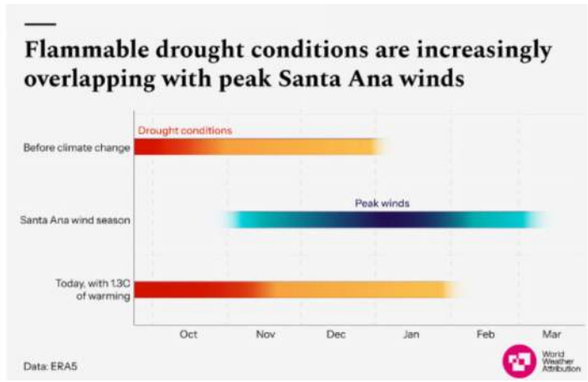
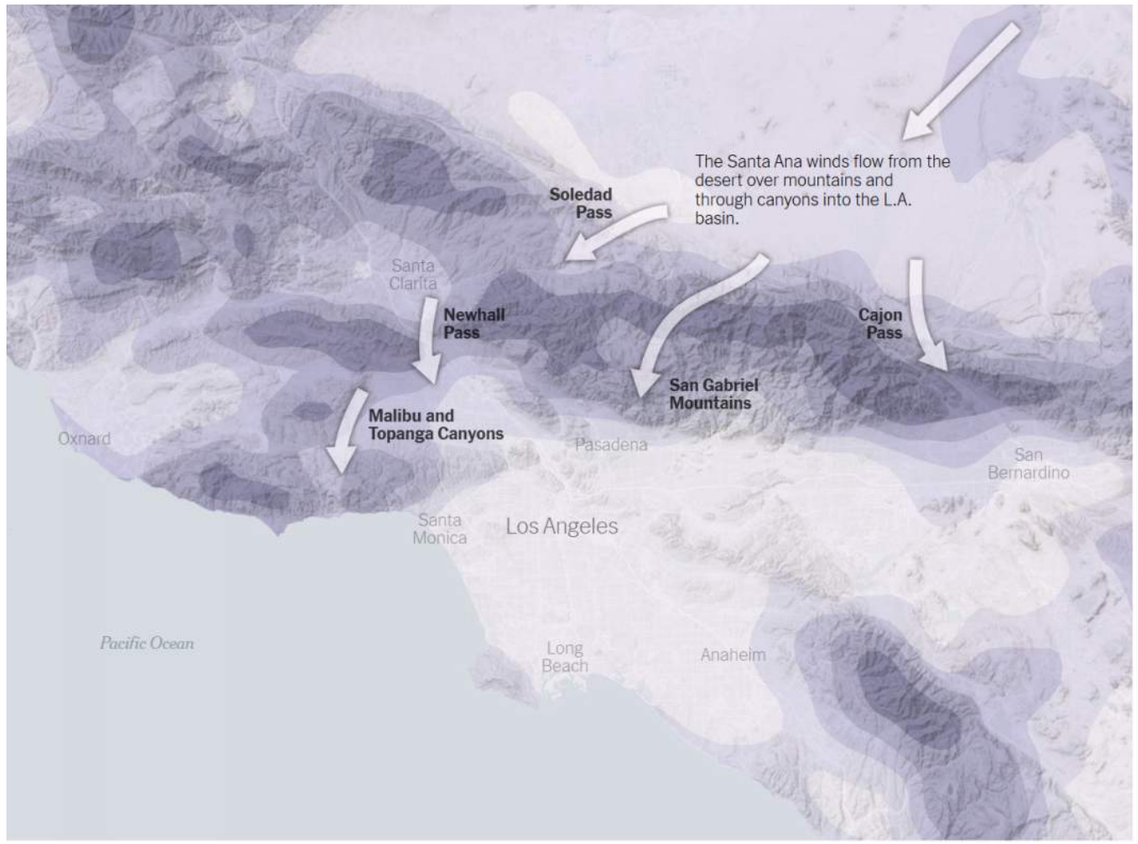


FIG. 4. (top) Mean number of Santa Ana wind events per month. (bottom) Frequency distribution of duration of events. The dark bars refer to NCEP–DOE reanalysis and the clear bars refer to the CFS climate run.







Topography shapes which places are windiest

Average number of days with high wind speeds between October and March, since 2011

0 20 30 40 50+ days

ENVIRONMENTAL FACTORS

VEGETATION MANAGEMENT

SLOPE

The intensity of wildfires increases as the ground slope increases. Because heat and smoke naturally rises, steep slopes can act like chimneys. The flames get closer to the unburnt vegetation above. For every **10-degree** increase in slope, a fire can double its rate of spread.

While the law determines how far homes should be setback from the tops and toes of slopes, there are no additional fire-resistance requirements for homes built near slopes. Other countries like **Australia** have adopted stricter building codes for slope-adjacent homes and could perhaps serve as an example for California to follow.

LANDSCAPING TECHNIQUES

Fire intensity can be greatly reduced when there is little to no available fuel for burning. However, reduction of fuel does not require removal of all vegetation, which would cause **environmental damage**. Trees and plants can provide fire protection from strong winds, intense heat, and flying embers. Ground cover also prevents soil erosion. Fuels can be controlled by:

Raking and removing fine fuels: Fallen leaves, small twigs, and bark should be removed on a regular basis. Fine fuels burn quickly and increase fire intensity.

Mowing or grazing grass: Grass should be kept short and green. Dry grass spreads fire much faster than a well watered lawn.

Pruning trees, shrubs, and understorey: Any continuous tree canopy should be broken up with gaps of **6 to 15 feet**, and no canopy should overhang within 6 feet of a dwelling. Native trees and shrubs should be retained as clumps or islands and maintain a covering of no more than 20% of a home's surrounding area.

Follow pruning standards: Use sharp tools to enable clean cuts, just beyond the bark ridges, so as to minimize the size of the tree scar which will take longer to callus over. The scar provides an opening to the trunk's core in the case of fire.

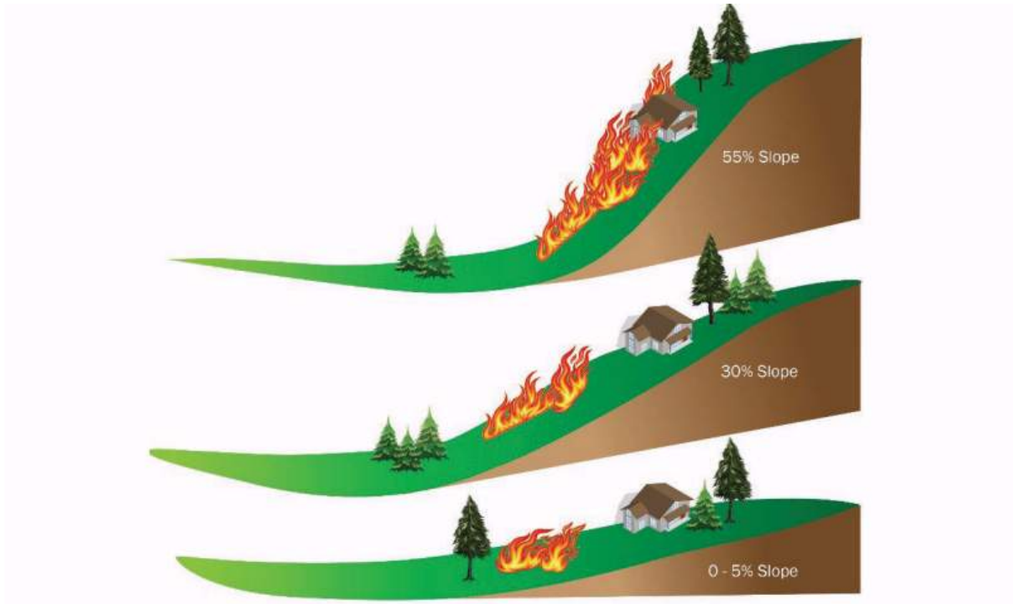
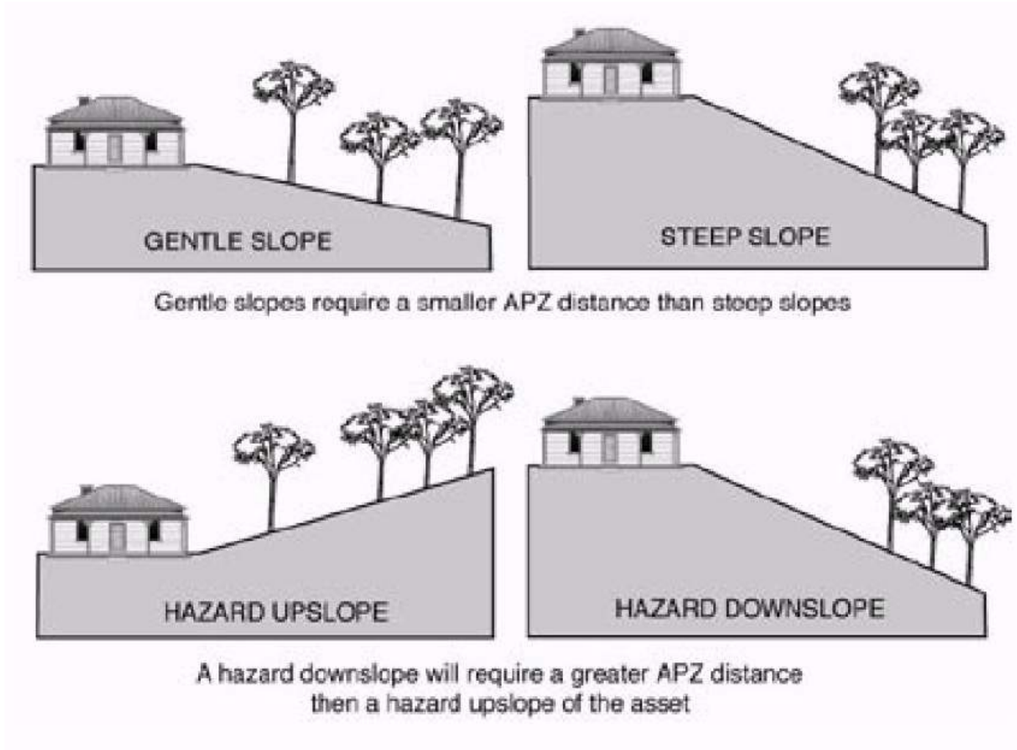


Figure 1. Wildfire intensity and rate-of-spread increases as slope increases.



ENVIRONMENTAL FACTORS

VEGETATION MANAGEMENT

FIVE CATEGORIES OF MANAGEMENT

According to the Santa Barbara Community Wildfire Protection Plan Update

Road Clearance
Routine City maintenance of vegetation adjacent to roadways

Defensible Space
Area adjacent to buildings or structures managed by landowners

City Vegetation Management Units
Vegetation in areas outside of defensible space where vegetation management occurs in cooperation with the affected landowners

Community Fuels Treatment Network
Area along the northern City limits providing a fuel break and a strategic last line to protect more highly populated areas

Neighboring Jurisdictions Vegetation Management Areas
Vegetation management areas adjacent to the City limits and within the Montecito Fire District and Santa Barbara County Fire District boundaries

ENVIRONMENTAL FACTORS

THE FIRE CYCLE

CAUSES OF HOME DESTRUCTION DURING THE PALISADES FIRE

CLIMATE & WEATHER

- Multi-year drought
- High fuel loads
- Santa Ana winds
- Low humidity, dry air

VEGETATION & LANDSCAPING

- Flammable plants
- Lack of defensible space
- Wooden fences connected to houses
- No fuel reduction zone

ARCHITECTURE & MATERIALS

- Vented eaves
- Flammable roofing
- Wood siding and decks
- Complex roof lines
- Lack of retrofitting in older homes

ZONING & LAND USE

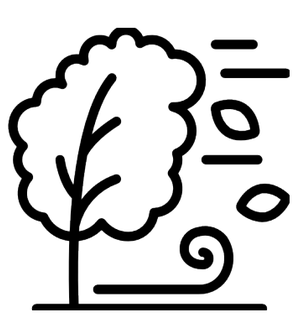
- Sprawl into WUI
- Single-family near fire zones
- No incentive to densify safer urban areas
- Inaccessible terrain for fire crews

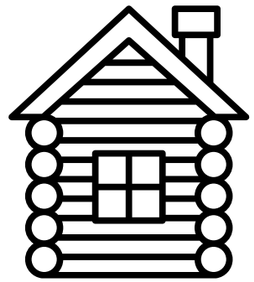
POLICY & CODE GAPS

- Weak enforcement of Ch. 7A building codes
- No retrofit mandates for old homes
- Local codes not aligned with climate science
- Fire hazard maps outdated or underused

INFRASTRUCTURE & RESPONSE

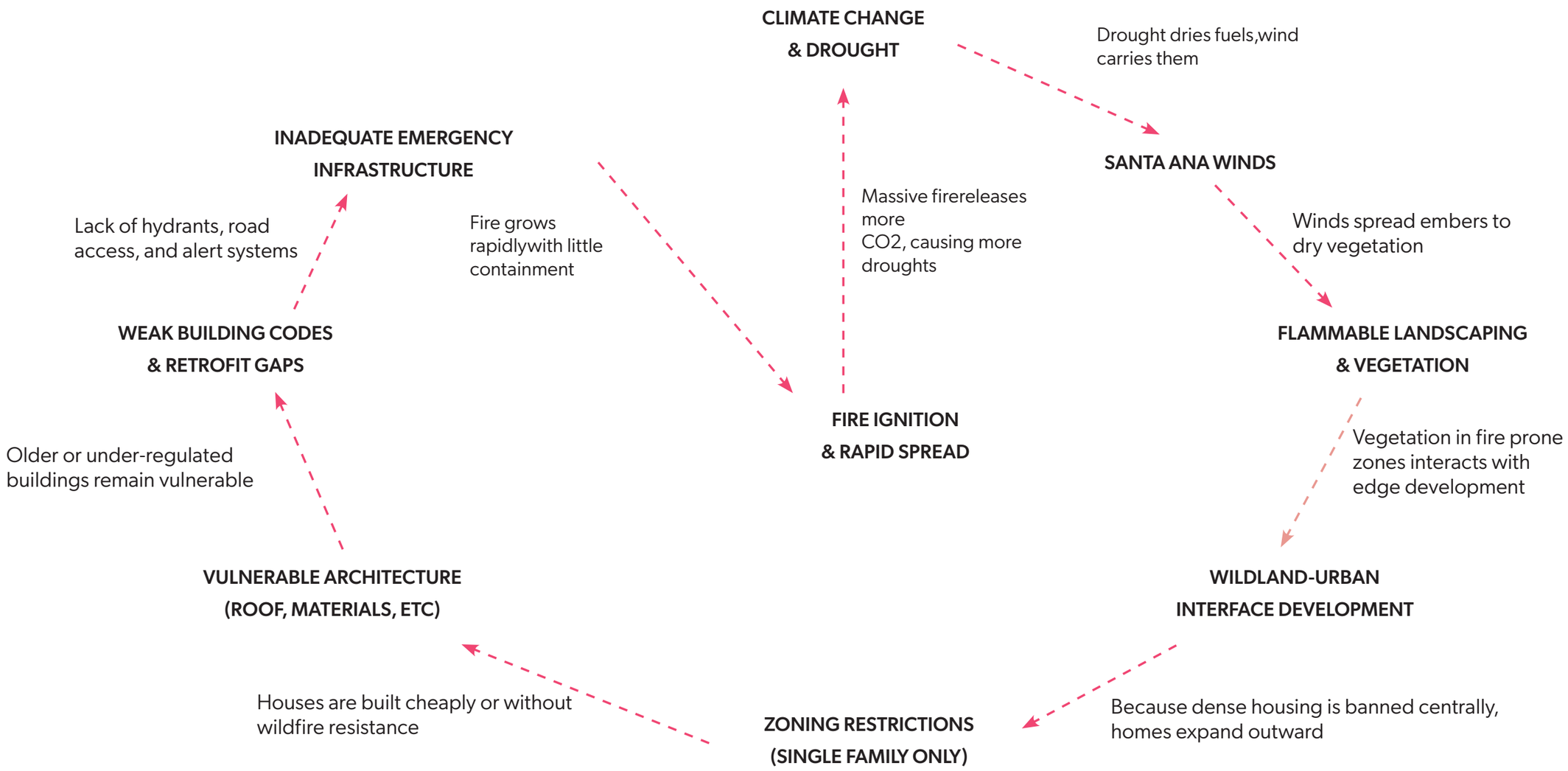
- Hydrants with no pressure
- Limited road access for firetrucks
- No early alerts
- Powerline ignition





ENVIRONMENTAL FACTORS

THE FIRE CYCLE



ENVIRONMENTAL FACTORS

FIRE SPREAD

COMMUNITY IMMUNITY

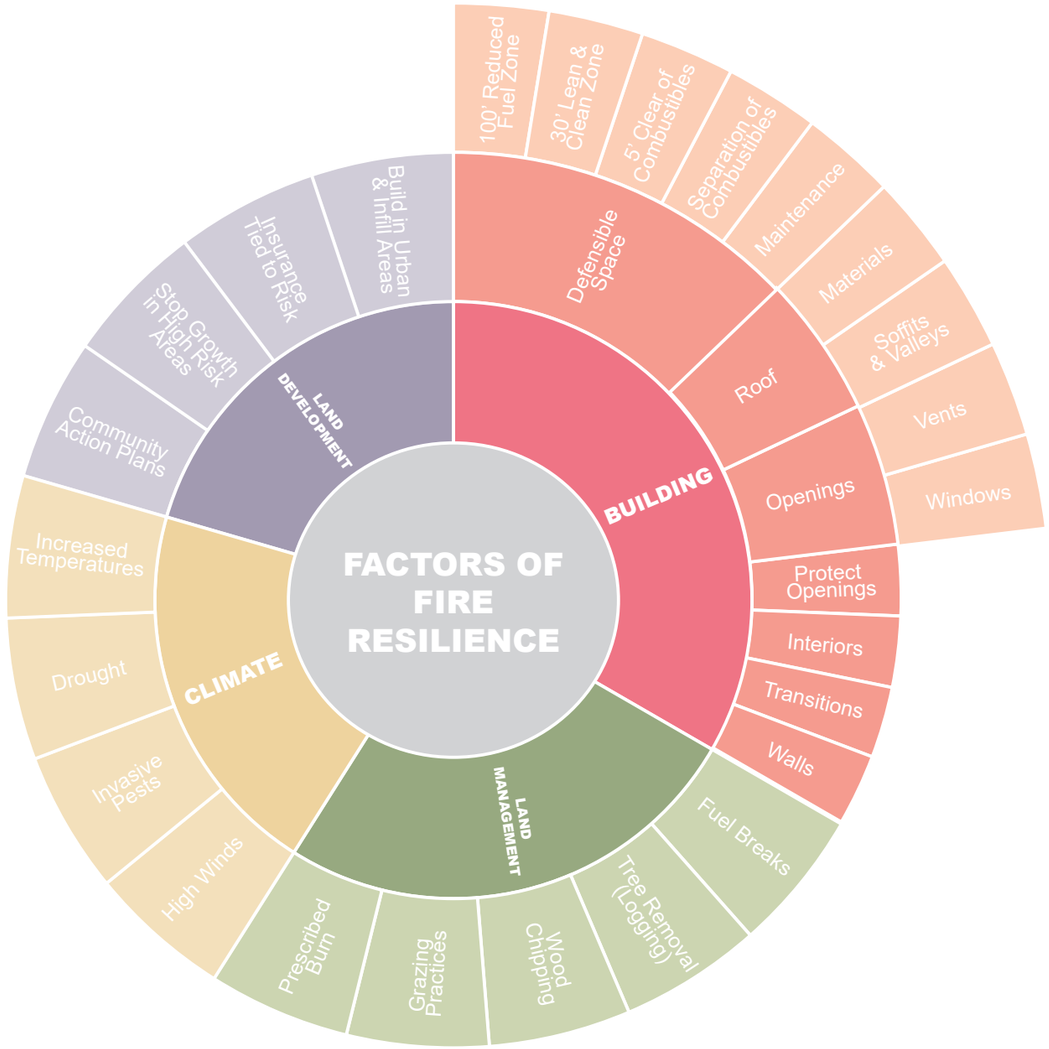
The least fire-resistant home on a block is the weakest link and can cause an entire neighborhood to burn. While all homes should be built according to today's fire-resistance standards, those dwellings built on the **perimeter** of neighborhoods and wildland adjacent should be held to an even higher standard.

This higher standard can be upheld for example by building to the **maximum** of code requirements, not the minimum. When faced with the choice between fire-rated walls and low-flame-spread finishes to meet code, choose to implement **both.**

EMBERS

Fire spreads onto a house via:
Embers on the Roof Material
Embers in the Air Vents
Embers landing at the Base of the house where it meets the ground and igniting the floor.

If all rebuilt homes can at minimum include fire-resistant roof materials, enclosed air vents, and encased floor to foundation assemblies, the entire community will be less likely to ignite in case on dwelling were to catch fire.



SUMMARY OF FACTORS

STRUCTURAL SYSTEMS

FIRE RISK CONTEXT

The Palisades sits within **Very High Fire Hazard Severity Zones** (VHFHSZ) designated by CAL FIRE, which is the most hazardous designation.
This is due to its proximity to the wildland-urban interface, the Santa Ana winds, and the dry warm climate.

KEY REQUIREMENTS

The CBC Chapter 7A Wildland-Urban Interface regulations are in effect here, and require:
Exterior walls: Non-combustible or ignition-resistant.
Roofs: Class A fire-rated.
Defensible space: 100 feet minimum vegetation management.
Openings: Ember-resistant design (vents, windows).
Fire Separation: Required rated walls/floors between dwelling units.
Egress & Fire Sprinklers: Enhanced egress pathways and sprinkler systems are mandatory for most residential and all commercial buildings.

STRUCTURAL SYSTEMS

FIRE-RESISTIVE STRUCTURAL DESIGN

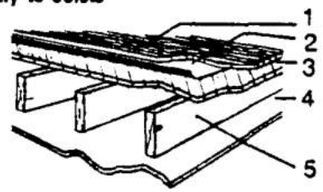
Structures should be designed to slow fire spread, protect occupants, and maintain structural integrity during fire exposure.
A fire-resistant assembly limits damage to property, buys time for evacuation and firefighting, and prevents collapse or fire jumping to nearby buildings. This design involves:

Compartmentalization: Divide the building into fire-resistant zones and limit fire to its area of origin, using fire-rated walls, floors, ceilings.
Fire-Rated Assemblies & Materials: Use assemblies tested to resist fire (ASTM E119) with common ratings of 1–2 hours, such as Gypsum board layers, Fire-retardant-treated wood, and Noncombustible cladding.
Heavy Timber Construction: Large wood members char slowly and maintain strength, the minimum dimensions (e.g., 6×10″ floor framing) improve endurance.
Fire & Draft Stopping: Build barriers in concealed spaces (attics, floor cavities) to block hidden fire spread with gypsum board or plywood panels.
Flame-Spread Control: Use interior finishes regulated by ASTM E84. Use treated surfaces which can reduce flame spread below 75 or even 25.
Fire-Retardant Treatments: Pressure-impregnated chemicals (salts, resins) and Intumescent coatings that expand into insulating layers delay fire spread.

Benefits to Homeowners:
Safer evacuation
Lower insurance costs
Longer building life
Compliance with modern codes

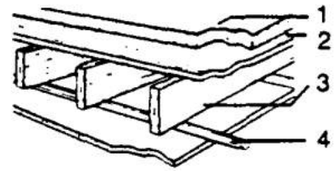
TYPICAL ONE-HOUR FLOOR-CEILING ASSEMBLIES

Double Lumber Floor; Ceiling Nailed Directly to Joists



(1) 1" wood flooring; (2) building paper: (3) 1x6 T&G boards or ½" standard grade plywood with ext. glue; (4) 5/8" type X gypsum board ceiling or ½" special fire-resistive gypsum board ceiling (may be attached to resilient acoustical channels or nailed directly to joists); (5) joists 16" o.c.**

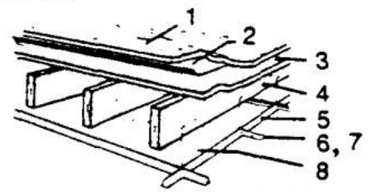
Gypsum Underlayment Compound on Plywood Subfloor; Ceiling Resilient Acoustical Channels



(1) gypsum underlayment compound; (2) ½" T&G underlayment grade plywood; (3) joists 16" o.c**; (4) 5/8" type X or ½" fire-resistive type gypsum board ceiling on resilient acoustical channels.

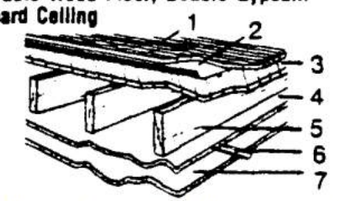
TYPICAL TWO-HOUR FLOOR-CEILING ASSEMBLIES

Double Plywood Floor; Ceiling Suspended in T-Bar Grid



(1) 5/8" T&G underlayment grade plywood; (2) building paper; (3) ½" standard grade plywood with ext. glue: (4) joists 16" o.c.**; (5) T-bar grid ceiling system: (6) main runners 48" o.c.; (7) cross-tees 24" o.c.; (6) ½"x48"x24" mineral acoustical ceiling panels (install with hold-down clips).

Double Wood Floor; Double Gypsum Board Ceiling



(1) 1" wood flooring; (2) building paper: (3) 1x6 T&G boards: (4) 5/8" type X gypsum board nailed directly to joists; (5) joists 16" o.c.**; (6) resilient acoustical channels; (7) 5/8" type X gypsum board, second layer applied on channels.

**Fire tests conducted with 2"x10" joists.

STRUCTURAL SYSTEM

PERFORMANCE

HEAVY TIMBER CONSTRUCTION (TYPE IV)

Strengths: Large timber members char on the outside, slowing combustion and preserving structural integrity.
Consideration: Must still comply with strict ignition-resistant exterior requirements, meaning that the timber is covered.
Use: Increasingly adopted for larger buildings with fire-rated assemblies.

REINFORCED CONCRETE (TYPE I)

Strengths: Highly fire-resistant, non-combustible, excellent for retaining load-bearing capacity under extreme heat.
Consideration: Heavier structure, higher cost, slower construction.
Use: Ideal for critical infrastructure and multi-story buildings.

STEEL FRAMING (TYPE I OR II)

Strengths: Non-combustible, structurally efficient.
Challenge: Loses strength rapidly under high temperatures; requires intumescent coatings or fireproofing.
Use: Common for commercial or institutional buildings.

ORDINARY CONSTRUCTION (TYPE III)

Strengths: Exterior wall resilience, Design flexibility, Reduced material and construction costs.
Challenge: Prevalent in older buildings which may have air leaks, construction assembly between combustible and non-combustible must be more careful.
Use: Older buildings, commercial spaces, and mid-rise residential

LIGHTWEIGHT WOOD FRAME (TYPE V)

Strengths: Economical, widely used in residential projects.
Challenge: Vulnerable to ignition due to combustible materials used throughout which rapidly disintegrate and collapse.
Use: Single-family homes and low-rise multifamily, most at risk in Palisades fire conditions.

STRUCTURAL SYSTEM

TRENDS IN PALISADES CONSTRUCTION

Recent rebuilds after fire events favor:

Hybrid Systems: Concrete podium with light-gauge steel or heavy timber above
Exterior Cladding Upgrades: Cement board siding, stucco over non-combustible sheathing

FIG. 1: Cement Board Siding and Stucco over Insulation
FIG. 2: Fiber Cement Siding Over Non-Combustible Sheathing

Decks and Overhangs: Non-combustible construction

FIG. 3: Upgraded Class-3 Deck
Pros: Sheet metal flashing along wall connections, Noncombustible siding, Wood posts set on concrete footings
Cons: Still primarily wood framing, vulnerable if embers accumulate below or between boards

FIG. 4: Traditionally framed Class-1 and Class-2 Deck
Pros: Fire-retardant-treated framing lumber, Aluminum decking and flashing, Noncombustible walking surface
Cons: Joists and structural framing still rely on combustible material even if it's treated

FIG. 5: Class-1 Deck is nearly Fireproof
Pros: Noncombustible concrete topping or paves on steel framing, Reinforced concrete or noncombustible blocks as walking surface, Steel or fire-rated columns and beams, ember-resistant detailing, metal flashing and drainage.
Cons: Higher cost, Heavier structural load on foundations

FIG. 1

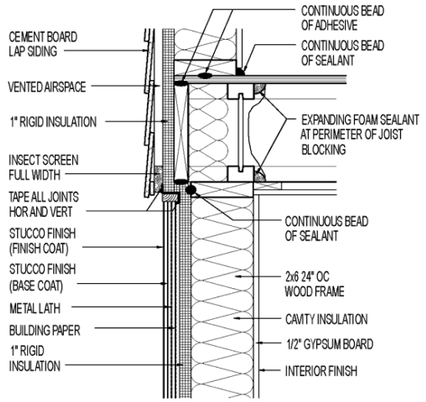


FIG. 2

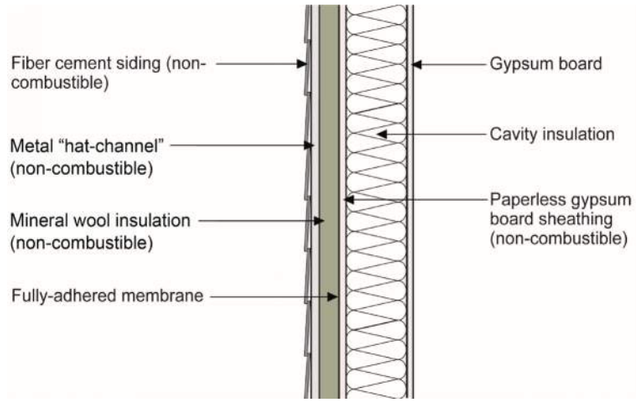


FIG. 3

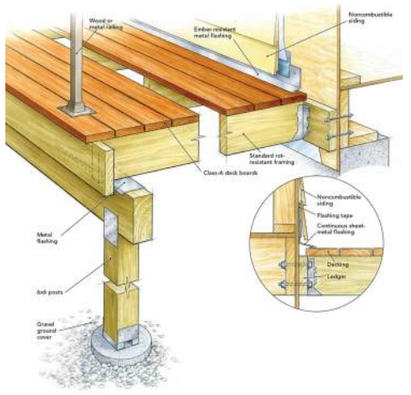


FIG. 4

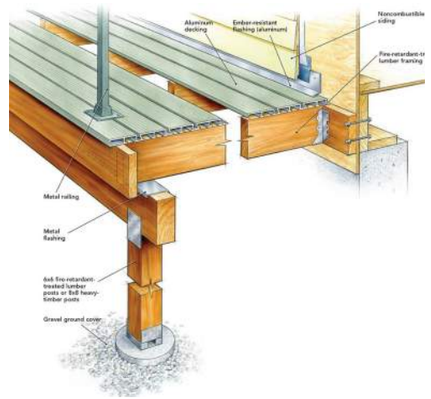
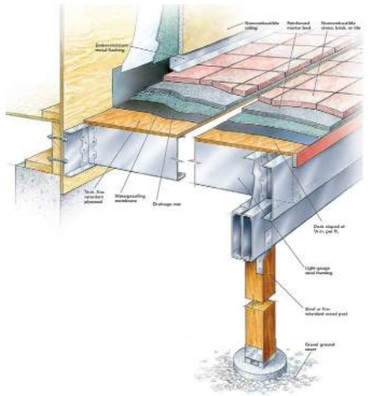


FIG. 5



CONSTRUCTION METHODOLOGIES AND MATERIAL

PREFERRED MATERIAL

Concrete and Concrete Panels: Extremely robust and inherently fire-resistant, ideal for walls, floors, and roofs. Pre-cast concrete panels, manufactured off-site, ensure consistent quality and create continuous fire-resistant envelopes.
Metal Panels and Roofing: Steel framing and metal exteriors are non-combustible and increasingly popular for homes. Steel panels come in various profiles, colors, and textures, offering both fire protection and architectural appeal.
Prefabricated steel frames may cost less than on-site-cut framing and speed up assembly.
Brick, Gypsum, and Fire-Resistant Windows: Brick is highly fire-resistant though labor-intensive to install. Gypsum board (drywall) contains water which turns to steam when heated, slowing fire spread, though it is prone to cracking or moisture damage.
Fire-resistant windows use double-layer tempered or laminated lass with heat-reflective coatings to withstand high temperatures and prevent breakthrough.
Fiber Cement and Advanced Composite Siding: Modern fiber-cement and composite sidings, incorporating materials like rice husks and mineral oil. These materials mimic natural wood, are durable, cost-effective, and easier to install, though they may char under extreme heat.
Fire-Retardant Gels and Coatings: Fire-retardant coatings chemically modify surfaces to resist ignition, offering long-term protection. Fire-retardant gels temporarily shield structures by blocking embers and heat but need to be reapplied.
External Sprinklers: These wet building exteriors and surroundings to reduce ember driven ignition risk, though this is not effective against direct flames.

CONSTRUCTION METHODOLOGIES AND MATERIAL

RESTRICT MATERIALS

Untreated Dimensional Lumber: Rapidly ignites and collapses, not allowed in exterior walls in WUI.
Vinyl Siding: Combustible, melts quickly under heat.
Plastic-based Insulation: Can melt, burn, and release toxic gases if exposed to fire, must be encapsulated.
Combustible Roof Materials (e.g. wood shingles): Banned in WUI Zones, must be Class A rated.
Exposed Foam Insulation: Not code-compliant unless covered by thermal barrier (e.g. gypsum).
Aluminum Framing (unprotected): Loses strength quickly in fire unless detailed properly.
OSB/Plywood on Exteriors (untreated): Burns easily unless protected behind non-combustible cladding.

SPECIAL CASES

Light-gauge Steel Framing: Allowed, but requires proper fire-rated sheathing and insulation.
Engineered Wood (LVL, NLT): Allowed with fire-retardant treatment or encapsulation.
Wood Decks: Must be built from ignition-resistant or fire-retardant-treated wood, or be fully non-combustible.
Soffits, Vents, Eaves: Must be enclosed and ember-resistant.

CONSTRUCTION METHODOLOGIES AND MATERIAL

BY COMPONENT

EXTERIOR WALLS

Use:
Stucco: Traditional 3-coat or cement plaster is non-combustible and performs well
Fiber-Cement Ceiling: Durable, ember-resistant, low maintenance
Masonry: Brick, Stone, and Concrete Block have high fire resistance

Avoid: Vinyl siding melts easily, untreated wood siding burns quickly

ROOFING

Use:
Asphalt Composition Shingles (Class A): Widely used and cost-effective
Clay or Concrete Tiles: Very fire resistant naturally
Metal Roofing (Steel, Aluminum): Non-combustible, Lightweight

Avoid: Gaps between tiles must be sealed to prevent ember intrusion

WINDOW AND GLAZING

Use:
Dual-Pane Tempered Glazing: 60% more file-resistant than single-pane
Metal Frames (Aluminum or Steel): Less flammable then wood frames

Avoid: Large windows or unprotected glass which can shatter under heat

VENTS AND OPENINGS

Use:
Ember-Resistant Vents: use 1/8" or finer metal mesh (NOT plastic) or **Any ember-resistant vent system tested per ASTM E2886**

DECKING

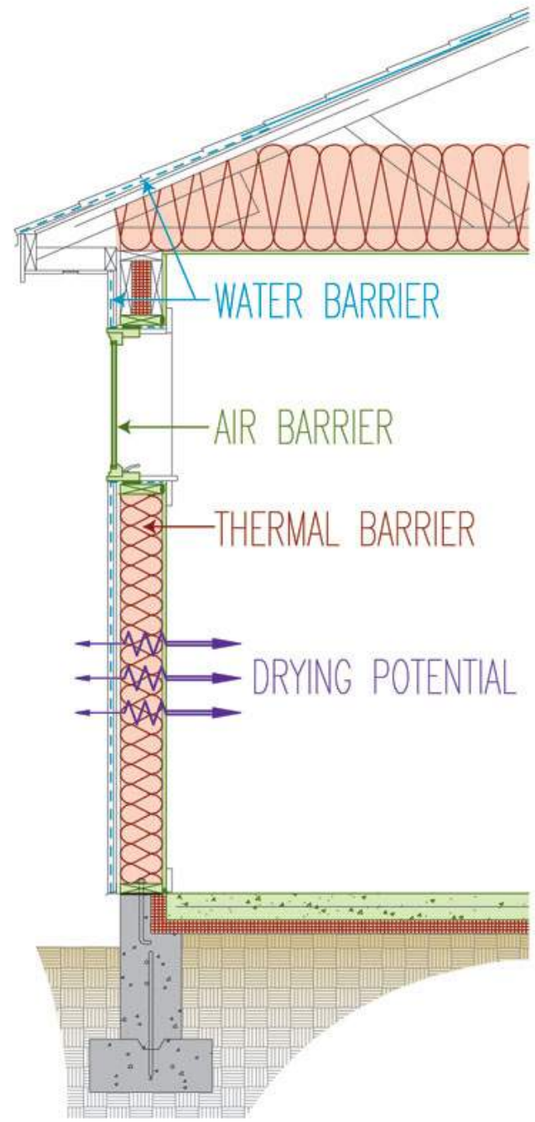
Use:
Ember-Resistant Vents: use 1/8" or finer metal mesh (NOT plastic) or **Any ember-resistant vent system tested per ASTM E2886**

EAVES, SOFFITS, AND FASCIA

Use:
Enclosed Eaves and Soffits: Use non-combustible and ignition-resistant material
Fascia: Fiber-cement or metal

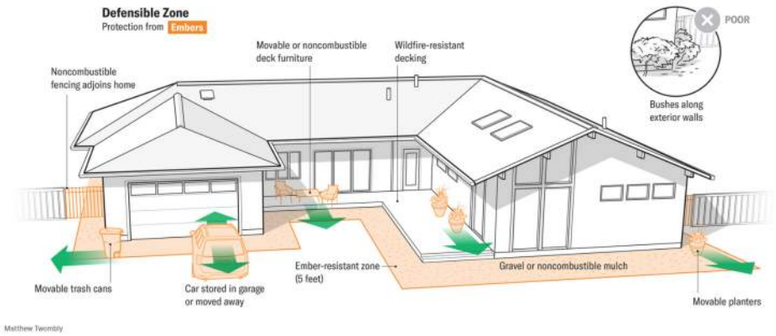
STRUCTURAL FRAME

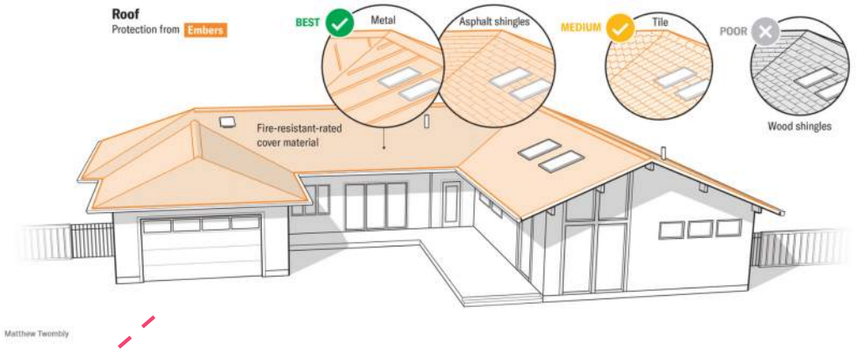
Use:
Common: Wood interior framing with fire-resistant sheathing and gypsum board
Advanced: Insulated Concrete Forms (ICF) or Structural Insulated Panels (SIPs)

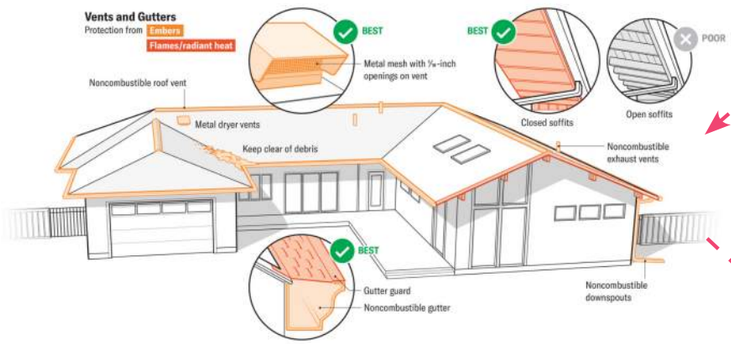


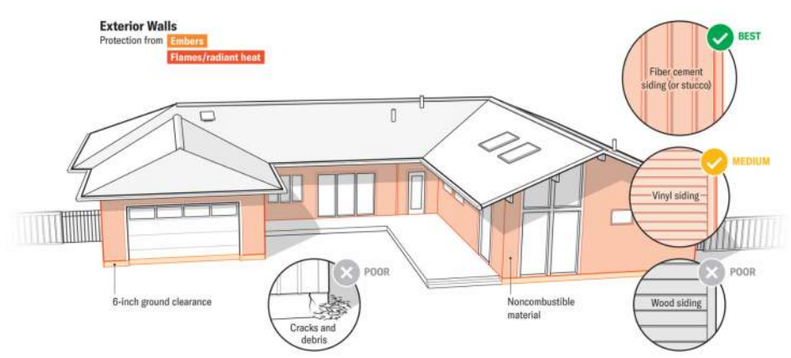
CONSTRUCTION METHODOLOGIES AND MATERIAL

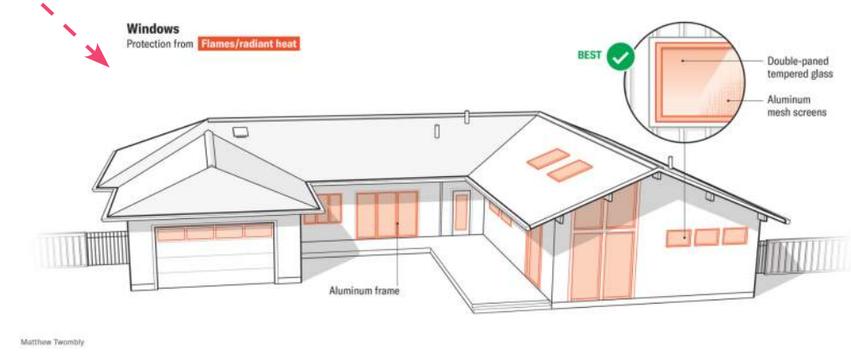
STRATEGIES











CONSTRUCTION METHODOLOGIES AND MATERIAL

OPPORTUNITIES

Titanium Cladding is corrosion resistant, durable, low maintenance, and fire resistant.

CMU has a high thermal mass which delays heat transfers during fires, is low maintenance, corrosion resistant, and noncombustible.

Adobe is a low carbon natural material, durable and long-lasting, fire resistant and slow to transfer heat.

Rammed Earth has high thermal mass, low embodied carbon, thick mass walls, and is non combustible.

Stone is fire-resistant, low maintenance, has high thermal mass and corrosion resistance.

ADOBE

TITANIUM CLADDING

RAMMED EARTH

CONCRETE MASONRY UNIT (CMU)

STONE

CONSTRUCTION METHODOLOGIES AND MATERIAL

WOOD

FIRE SAFETY OF WOOD CONSTRUCTION

Building construction Types III, IV, and V allow for varying amounts of wood to make up the structure. In 2019, the ICC (International Code Council) approved new tall mass timber types IV-A (strictest fire safety, no exposed timber) and IV-C (most exposed timber permitted), where fire-retardant treated wood may substitute for noncombustible materials in limited cases.

Fire resistance ratings of wood members are defined by the ASTM E119 are based on time to failure under standard fire exposure. Ratings are critical for compartmentalization.

In light-frame assemblies, gypsum board is critical for protection. Type X gypsum contributes around 40 minutes of resistance. Proper detailing of penetrations and joints is also essential.

MASS TIMBER CONSTRUCTION

Mass timber members create a self-protective char layer around their cores when ignited, and the thickness of this layer is taken into account during construction so that the structural integrity of a mass timber building is not jeopardized in case of fire. Timber types including CLT (Cross-Laminated Timber), the most common type, burn at predictable char rates.

The NDS (National Design Specification) for Wood Construction provides guidelines on how to calculate the fire resistance rating of mass timber elements, which can be rated up to 3 hours.

Mass timber construction has quickly become popular thanks to its many benefits: It's lightweight, reducing seismic loads and foundation sizing, and provides an aesthetic biophilic design.
Mass timber members sequester carbon, are cost-effective, and are prefabricated leading to shorter construction timelines.

CONSTRUCTION METHODOLOGIES AND MATERIAL

INNOVATION

PRE-FAB CONSTRUCTION

Prefabricated construction involves fabrication of assemblies off-site for them to be assembled on site, leading to **faster build times** and **minimizes on-site labor exposure.** It's especially effective in terrains with limited accessibility such as the steep slopes of the Pacific Palisades, and may accelerate post-fire construction if multiple adjacent plots get built up simultaneously.

Flat components like walls, floors, and roofs are prebuilt in a factory, shipped flat on a truckbed, and then assembled on-site like a puzzle. The pieces connect via Slide-and-Lock interlocks with Fire Stops. The panels slide into place with self-aligning joints and **integrated firestop membranes**.

Alternatively, Intumescent Joint Systems expand significantly when exposed to heat and react, forming a stable and insulating char layer.

Thermal Break Connectors are connection points that stop the transfer of heat where steel or concrete could create **continuous heat paths.** The most common fire-resilient panel type is MgO SIPs (Magnesium Oxide Structural Insulated Panels), which is **non-combustible and mold-resistant.**

Mineral-fiber Core Panels (Knauf, Rockwool) provide high melting point insulation, and are paired with **airtight joints** sealed with fire-rated tapes and gaskets, and **interstitial space** for utilities and additional fire barriers.

MODULAR CONSTRUCTION

Modular units containing structural systems, building envelopes, and fully integrated interiors are **fabricated off-site** and transported to the construction site for rapid assembly.

They use **inter-module locking systems**, air-tight connections resistant to the wind loads and heat of wildfires, whose locking/unlocking features allow for easy disassembly, relocation, and adaptation.

They feature **interior fire barriers** through the incorporation of Type X fire-rated gypsum board or MgO sheathing within all walls and ceilings.
Modular units also offer non-combustible facade options, utilizing fiber cement panels, perforated metal skins, or terracotta rainscreens, all with Class A fire ratings and the ability to support rainscreen ventilation strategies.

CONSTRUCTION METHODOLOGIES AND MATERIAL

INNOVATION

3D-PRINTED CONSTRUCTION

3D-printing builds objects layer by layer as opposed to the traditional building method of piecing materials together with joints and sealants. This method translates to a rapid build time. On average one-story walls can be printed in **under 48 hours.**

Elements can either be **prefabricated** on **printed on-site,** depending on the material. CybeMortar, an earthquake-resistant concrete specifically formulated for 3D printing, combines high-strength aggregates and fibers in order to withstand seismic forces.

To prepare a site for 3d-printed construction, the terrain must be leveled or terraced foundations created on sloped sites like those in the Palisades. Next, pour a non-reinforced geopolymer concrete slab or fiber-reinforced piers and position the 3D printer (track- or gantry-based).

The most common material for 3d-printing in construction right now is geo-polymer concrete (fly ash or slag-based), which is fire-resistant up to 1,400°C and doesn't crack or spall under fire. In order to accommodate for the lack of steel rebar, the concrete is mixed **with basalt fiber reinforcement**.

Dual-wall printing creates a void between interior and exterior shells. The printer extrudes the walls layer by layer, including pre-set openings for windows, doors, and utilities. Human technicians must be able to design the entire structure digitally off-site, which requires training.

The upfront costs for 3D printing equipment, materials and training can be steep, but it's the trade-off for quick and **100% custom** construction.

SUSTAINABILITY

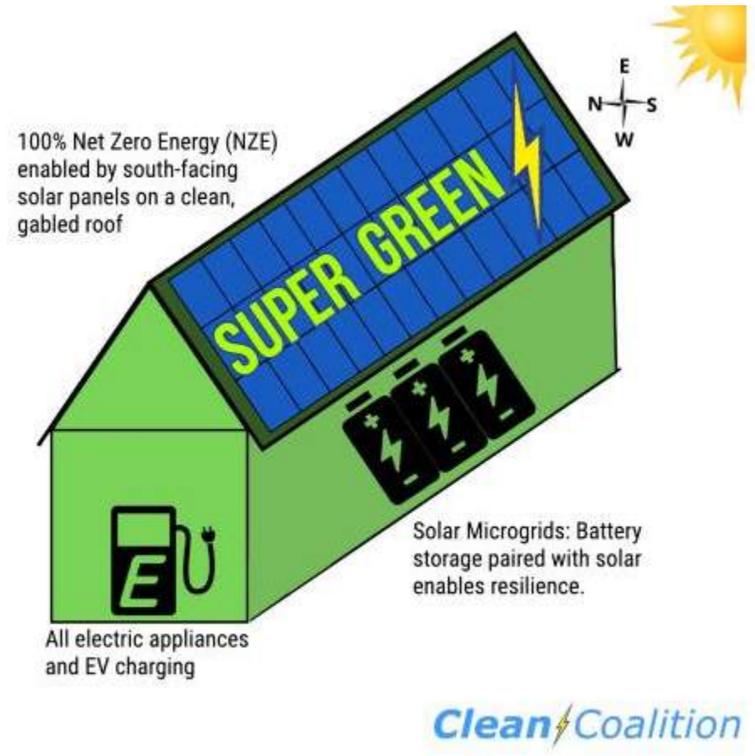
GREEN REBUILD INITIATIVE

The Green Rebuild Initiative (GRI) supports wildfire-impacted homeowners to rebuild sustainably and resiliently with fully electric, **net-zero energy** home designs powered by solar microgrids, emphasizing energy optimization, carbon reduction, and resilience to extreme weather. These super green home designs can serve as templates for **100% electric** (no gas) homes, potentially with all-EV integration, that generate as much energy annually as they consume.

Equipped with solar + battery microgrids for backup during out rages, and built with low-toxicity materials, there's a unique opportunity in the Palisades to built entire energy efficient neighborhoods from the **ground up**.

Energy efficient building is tax incentivized and leads to lower energy costs for homeowners. GRI provides design specs and showcases built **templates** to homeowners, architects, and suppliers, through public outreach, webinars, and media engagement.

GRI has built strategic partnerships with influential decision-makers, such as Mayor Karen Bass, Steadfast LA, and the USGBC, to facilitate adoption of the "Super Green" rebuild model. The aim is to replicate efficient neighborhood developments beyond Palisades and Altadena if they prove successful.



SUSTAINABILITY

UCLA RESEARCH ON ENERGY IMPACT

Finding 1: Electric Technology Adoption in Recent Construction
Electric appliance adoption is increasing in fire-affected areas. Over 50% of newly built or renovated homes use electric technologies.

Finding 2: Benefits of Improved Building Performance
Post-fire homes are expected to use less energy than pre-fire homes, due to: **Improved thermal building envelopes** (better insulation and sealing), and More efficient modern appliances used in new construction.

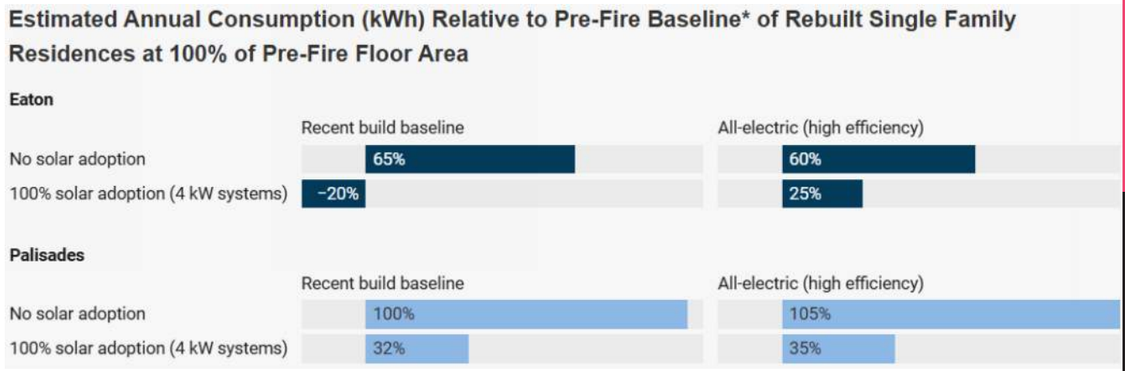
Finding 3: Commonsense Electrification
High-efficiency all-electric homes offer major climate and public health benefits. However, compared to pre-fire levels, Palisades region electricity use may increase to the point of **straining the power grid** if the homes are not self-generating part of their energy needs.

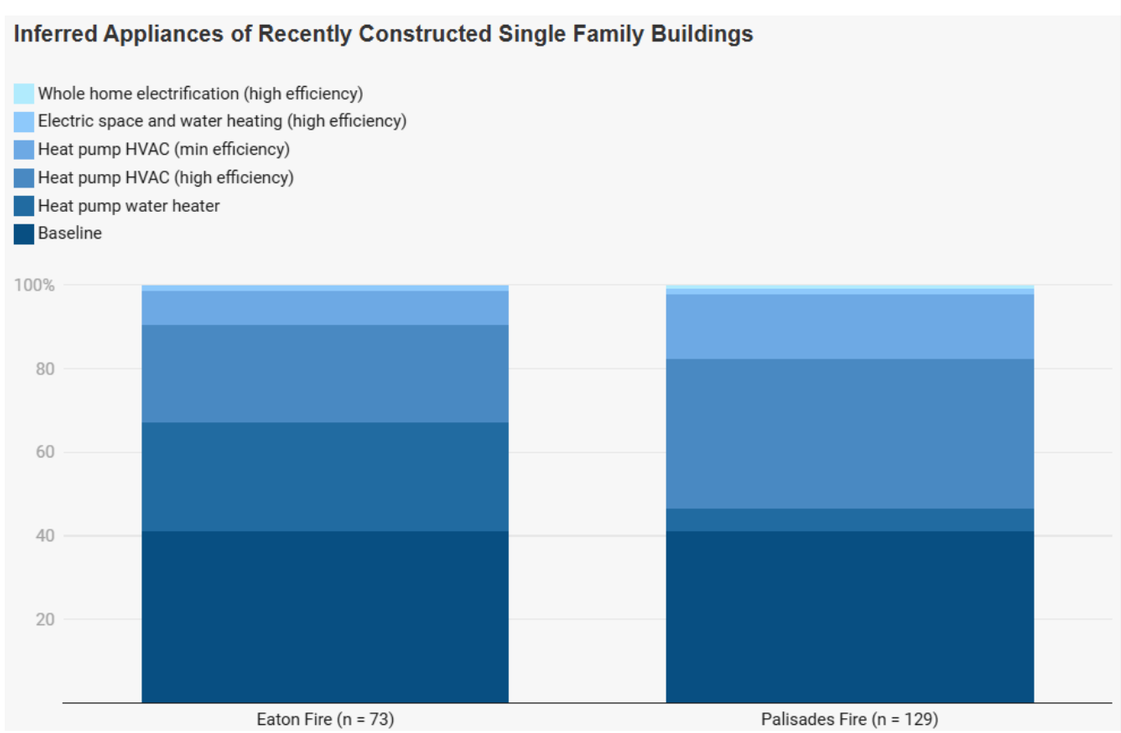
Finding 4: Building Size Growth Considerations
Efficiency gains alone cannot fully offset increased energy use from larger buildings. Building energy consumption in California has increased over the past decades as **buildings have trended larger** especially in high income neighborhoods.

Finding 5: Electric Infrastructure Buildout to Support New Construction
New construction as part of the recovery will likely represent a significant growth in Los Angeles' distributed electricity generation. Larger per-building solar system sizes in the Palisades than Altadena are expected in order to offset consumption due to larger average electricity consumption per building.

Finding 6: Gas Infrastructure Buildout to Support New Construction
Appliance electrification and efficiency will drastically decrease the amount of gas that will be consumed. There remains a need for a **transition plan** for the surviving homes to move away from gas as their primary energy source.

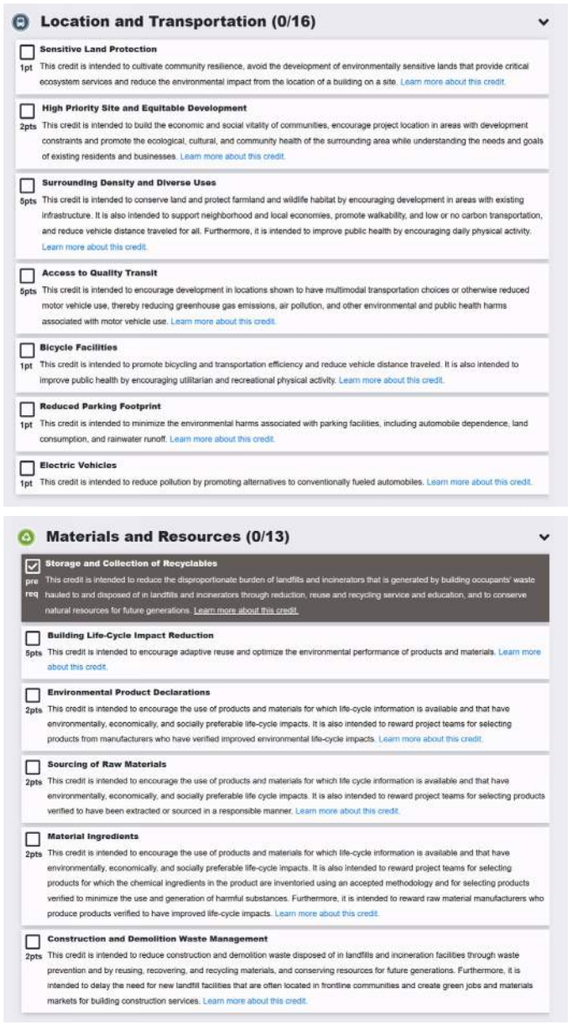
UCLA Institute of the Environment & Sustainability

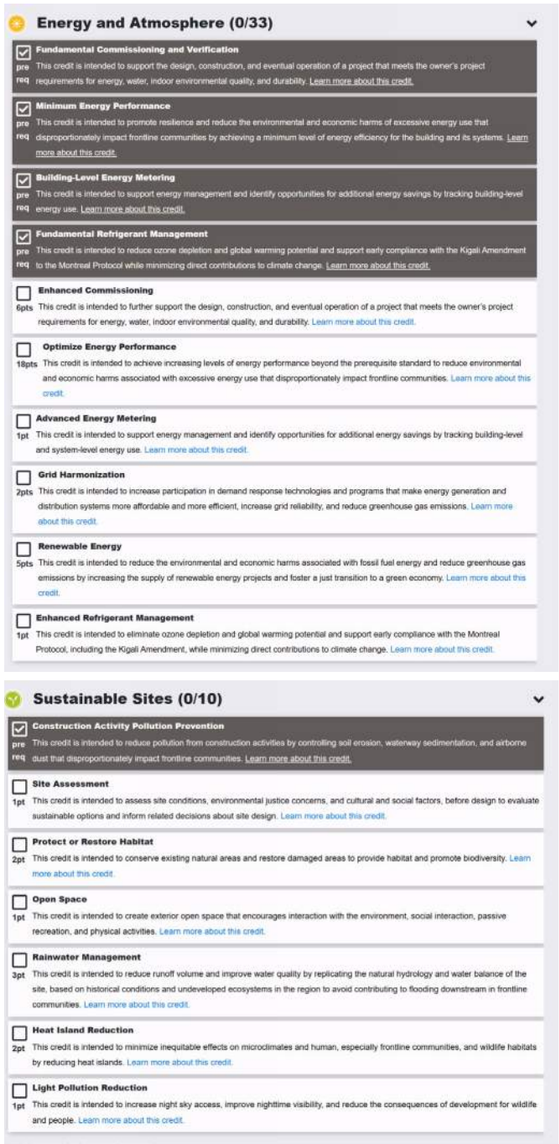


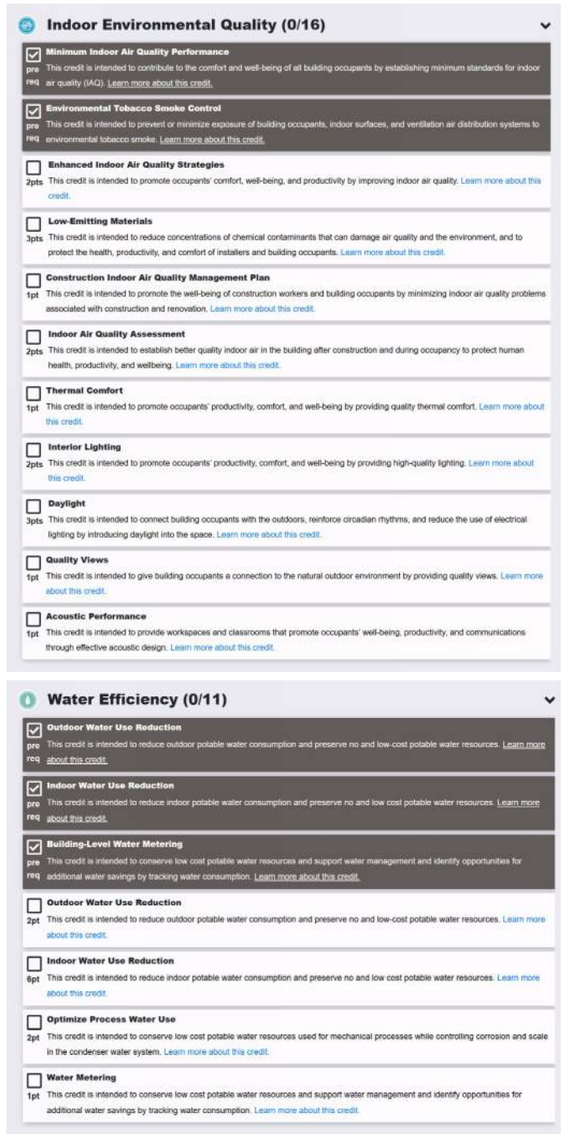


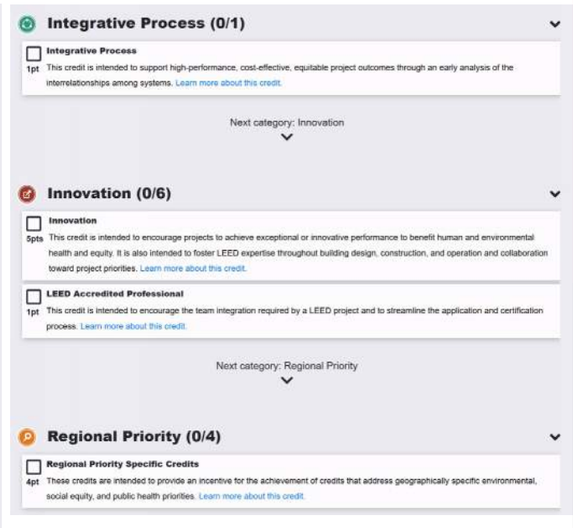
SUSTAINABILITY

LEED GUIDELINES









LEED, or Leadership in Energy and Environmental Design, is the most widely used green building rating system in the world, developed by the non-profit U.S. Green Building Council (USGBC).

LEED certification is awarded at four levels: Certified, Silver, Gold, and Platinum. A different framework is provided for:

Building Design and Construction

Interior Design and Construction

Operations and Maintenance

Neighborhood Development

Homes

HEALTH AND WELLNESS

ENVIRONMENTAL HEALTH HAZARDS

Toxic Airborne Compounds
Policyclic Aromatic Hydrocarbons (PAHs) and Volatile Organic Compounds (VOCs) are released when **synthetic materials**, plastics, household products, and building components burn. These compounds are **carcinogenic** and endocrine-disrupting, posing risks to respiratory, neurological, and reproductive health.

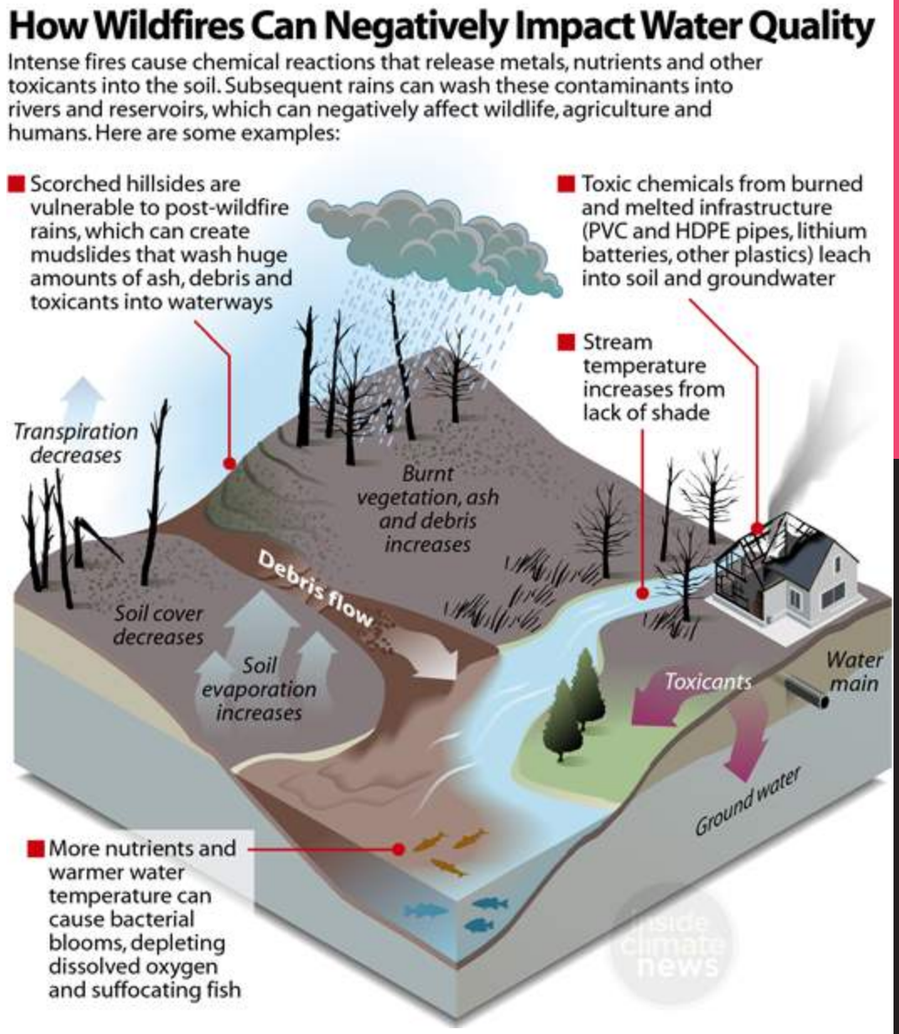
PAHs and VOCs can **linger** in the air long after flames are extinguished, especially in valleys or areas with poor ventilation.

Airborne Ash and Smoke Exposure
Ash particles composed of a mixture of organic and inorganic materials, including: **Heavy metals** from burned infrastructure and electronics (e.g. lead, arsenic, mercury), **Asbestos fibers** from older homes and insulation, and **Fine particulate matter** (PM2.5 and PM10) that penetrates deep into the lungs.

When cleaning, a N95 mask, gloves, long sleeves, pants, and goggles are highly advised to protect from exposure. It's highly advised to avoid sweeping dry ash, **wet it down** first to prevent inhalation.

Food and Water Safety
Soil and Crop contamination occurs when ash settles onto crops, especially leafy vegetables and herbs which are difficult to clean. Soil absorbs ash including its toxic heavy metals (lead, arsenic, cadmium, nickel, and mercury) that **bio accumulate** in root vegetables.

Water contamination occurs when ash and debris infiltrate groundwater systems and increase risk of waterborne illnesses. LADWP issued advisories post fire to the residents of the Pacific Palisades to avoid drinking any tap water.



HEALTH AND WELLNESS

WELL BUILDING STANDARD

HUMAN HEALTH

The WELL Building Standard is a healthy building certification program, that was developed to increase human well-being in the built environment. Many of the guidelines overlap with those prescribed for LEED certification, making **both** certifications attainable for a single project.

Natural light exposure can boost human **productivity** up to 20%, and good air quality can improve it up to 15%. The air and water quality in the Pacific Palisades was poor for many months after the fire, and as it these begin to be cleaned and improved, additional measures can be implemented in the neighborhood to improve quality of life.

Acoustics and lighting conditions also have a significant impact on human comfort, and in re-thinking the design of the Palisades' infrastructure, the quality of the individual pedestrian experience will determine the traction that the rebuilt neighborhood will get.

More **walkable** streets and sidewalks will not only improve physical fitness, but also the ability to evacuate outside of vehicles in case of emergencies and to access a wider radius of the neighborhood on foot.

WELL BUILDING STANDARD® FEATURES MATRIX

This table shows which features are Preconditions and Optimizations for the different typologies of the standard for commercial and institutional offices. Refer to the tables in the beginning of each concept for details about the applicability of specific parts.

		Core and Shell	New and Existing Interiors	New and Existing Buildings
Air				
01	Air quality standards	P	P	P
02	Smoking ban	P	P	P
03	Ventilation effectiveness	P	P	P
04	VOC reduction	P	P	P
05	Air filtration	P	P	P
06	Microbe and mold control	P	P	P
07	Construction pollution management	P	P	P
08	Healthy entrance	P	O	P
09	Cleaning protocol		P	P
10	Pesticide management	P		P
11	Fundamental material safety	P	P	P
12	Moisture management	P		P
13	Air flush		O	O
14	Air infiltration management	O	O	O
15	Increased ventilation	O	O	O
16	Humidity control		O	O
17	Direct source ventilation	O	O	O
18	Air quality monitoring and feedback		O	O
19	Operable windows	O	O	O
20	Outdoor air systems	O	O	O
21	Displacement ventilation		O	O
22	Pest control		O	O
23	Advanced air purification	O	O	O
24	Combustion minimization	O	O	O
25	Toxic material reduction		O	O
26	Enhanced material safety		O	O
27	Antimicrobial activity for surfaces		O	O
28	Cleanable environment		O	O
29	Cleaning equipment		O	O
Water				
30	Fundamental water quality	P	P	P
31	Inorganic contaminants	P	P	P
32	Organic contaminants	P	P	P
33	Agricultural contaminants	P	P	P
34	Public water additives	P	P	P
35	Periodic water quality testing		O	O
36	Water treatment	O	O	O
37	Drinking water promotion	O	O	O
Mind				
84	Health and wellness awareness	P	P	P
85	Integrative design	P	P	P
86	Post-occupancy surveys		P	P
87	Beauty and design I	P	P	P
88	Biophilia I - qualitative	O	P	P
89	Adaptable spaces		O	O
90	Healthy sleep policy		O	O
91	Business travel		O	O
92	Building health policy		O	O
93	Workplace family support		O	O
94	Self-monitoring		O	O
95	Stress and addiction treatment		O	O
96	Altruism		O	O
97	Material transparency	O	O	O
98	Organizational transparency		O	O
99	Beauty and design II	O	O	O
100	Biophilia II - quantitative	O	O	O

		Core and Shell	New and Existing Interiors	New and Existing Buildings
Nourishment				
38	Fruits and vegetables		P	P
39	Processed foods	P	P	P
40	Food allergies	P	P	P
41	Hand washing		P	P
42	Food contamination		P	P
43	Artificial ingredients	O	P	P
44	Nutritional information	O	P	P
45	Food advertising	O	P	P
46	Safe food preparation materials		O	O
47	Serving sizes		O	O
48	Special diets		O	O
49	Responsible food production		O	O
50	Food storage		O	O
51	Food production	O	O	O
52	Mindful eating	O	O	O
Light				
53	Visual lighting design		P	P
54	Circadian lighting design		P	P
55	Electric light glare control	P	P	P
56	Solar glare control	O	P	P
57	Low-glare workstation design		O	O
58	Color quality		O	O
59	Surface design		O	O
60	Automated shading and dimming controls		O	O
61	Right to light	O	O	O
62	Daylight modeling	O	O	O
63	Daylighting fenestration	O	O	O
Fitness				
64	Interior fitness circulation	P	O	P
65	Activity incentive programs		P	P
66	Structured fitness opportunities		O	O
67	Exterior active design	O	O	O
68	Physical activity spaces	O	O	O
69	Active transportation support	O	O	O
70	Fitness equipment	O	O	O
71	Active furnishings		O	O
Comfort				
72	ADA accessible design standards	P	P	P
73	Ergonomics: visual and physical		P	P
74	Exterior noise intrusion	P	O	P
75	Internally generated noise	O	P	P
76	Thermal comfort	P	P	P
77	Olfactory comfort		O	O
78	Reverberation time		O	O
79	Sound masking		O	O
80	Sound reducing surfaces		O	O
81	Sound barriers		O	O
82	Individual thermal control		O	O
83	Radiant thermal comfort		O	O
Innovation				
101	Innovation I	O	O	O
102	Innovation II	O	O	O
103	Innovation III	O	O	O
104	Innovation IV	O	O	O
105	Innovation V	O	O	O

CASE STUDIES

GREC CHASEN'S HOUSE

Built in the heart of the Pacific Palisades in 2024, Greg Chasen's House was the sole surviving structure over multiple blocks. Chasen is an architect who had prior fire experience and proactively fire-proofed his property. Even when his neighbor's car melted at the edge of his property line, his house **blocked** the radiant heat.

Outside the home, the yard had no vegetation; landscaping was a **sparse** Mediterranean desert style. Cast-in-place **concrete garden walls** blocked heat and embers. All loose items (e.g., trash cans) were removed from the perimeter.

The home itself featured a metal roof with fire-resistant underlayment. Tempered glass windows resisted heat and breakage, while the heat-treated wood facade was protected by overhangs. A Class A floor deck (wood rated to be as fire-resistant as steel or concrete) and one-hour fire-rated exterior walls.

There were no eaves, overhangs, or attic vents, **eliminating** all possible ember entry points. The simply form minimized vulnerable details.

MICHAEL ELIASON'S PASSIVE HOUSE

The architect and ecodistrict planner Michael Eliason offered expert insight into the design features that make a passive house both environmentally conscious and fire resistant.

Super-compact, airtight forms with a gabled roof and without dormers or complex pop-outs, reduce fire and smoke infiltration. **Triple glazing** and vacuum insulation help keep smoke out, while airtight construction without vents protects the indoor air from fire-related particles.

A Passive House is not always expensive, usually costing a **1-5%** premium on multifamily projects, and slightly more for single-family homes. The additional benefit for homeowners is that an airtight envelope with efficient materials dramatically reduces the energy required to heat and cool the home, thus lowering energy bills.

CASE STUDIES

CLIVE DAWSON'S REMODELS

Clive Dawson specializes in custom retrofit strategies for residential and commercial projects, to bring older homes up to modern code with metal roofs, eaves, and roofing to prevent **attic ignition.**

To comply with Chapter 7A, renovations include fire-resilient materials and reoriented layouts based on known fire behavior. Dawson's designs consider prevailing fire direction and wind patterns when orienting buildings and making changes to existing cladding and vents.

Metal roofs and non-combustible materials help prevent ignition, while interior finishes are specified to protect older structural assemblies that may be combustible.

Dawson has worked with a variety of architectural styles, including Spanish Colonial, Georgian, International Style, proving that style **does not** limit resilience.

MICHAEL DIXON'S DEVELOPMENT

Dixon Trail is a development of 64 single-family homes in Escondido California that completed construction in April 2025.

It's the first instance of fire-resilience being developed at a community scale. All homes are built to resist the three major sources of conflagration: f**lying embers, flames, and radiant heat**.

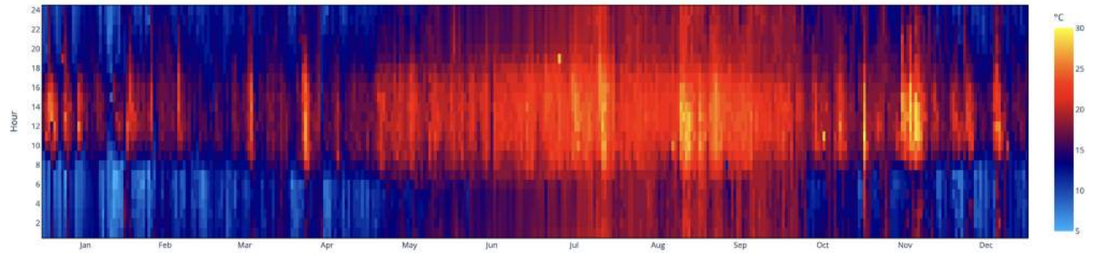
Dixon used noncombustible siding such as stucco and fiber cement, dual-tempered-glass windows, noncombustible patios, doors, and roofing. Homes are spaced 10 feet apart to slow a fire, with a 5-to-30-foot **"defensible space zone"** around every side of the house. The underside of eaves is enclosed and gutters are covered, so embers and smoke can't work their way into homes.

As one-third of all homes built in the U.S. are constructed in wildfire-prone areas, and **1 in 7 homeowners** goes without insurance due to soaring premiums, Dixon's development appeals to homeowners by bypassing any insurance- or fire-related costs.

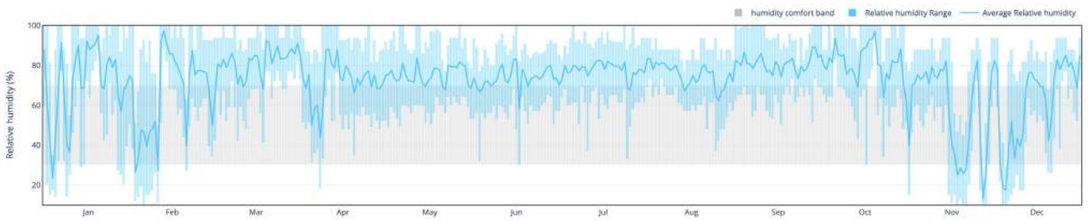
Site Analysis

ENVIRONMENTAL DIAGRAM

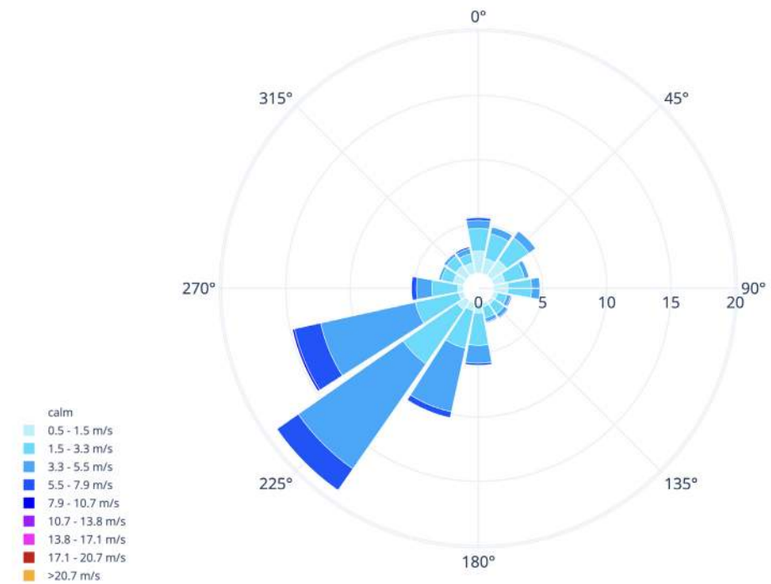
TEMPERATURE



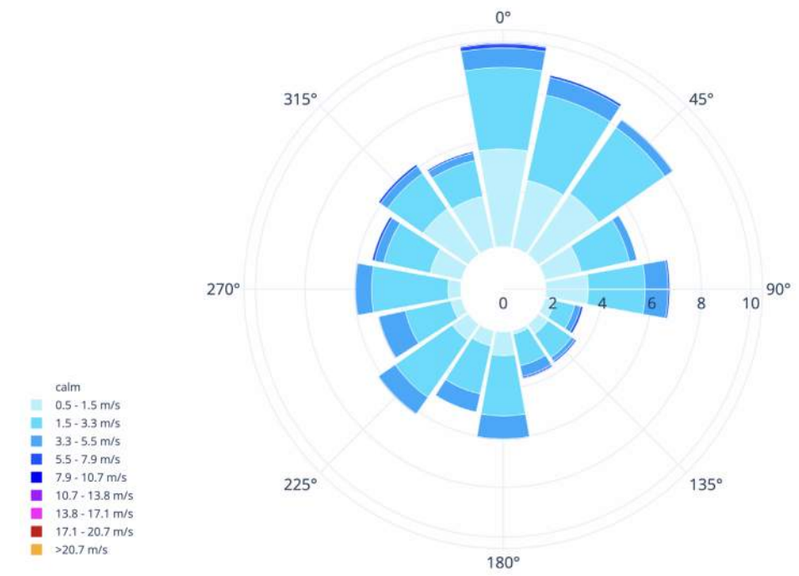
HUMIDITY



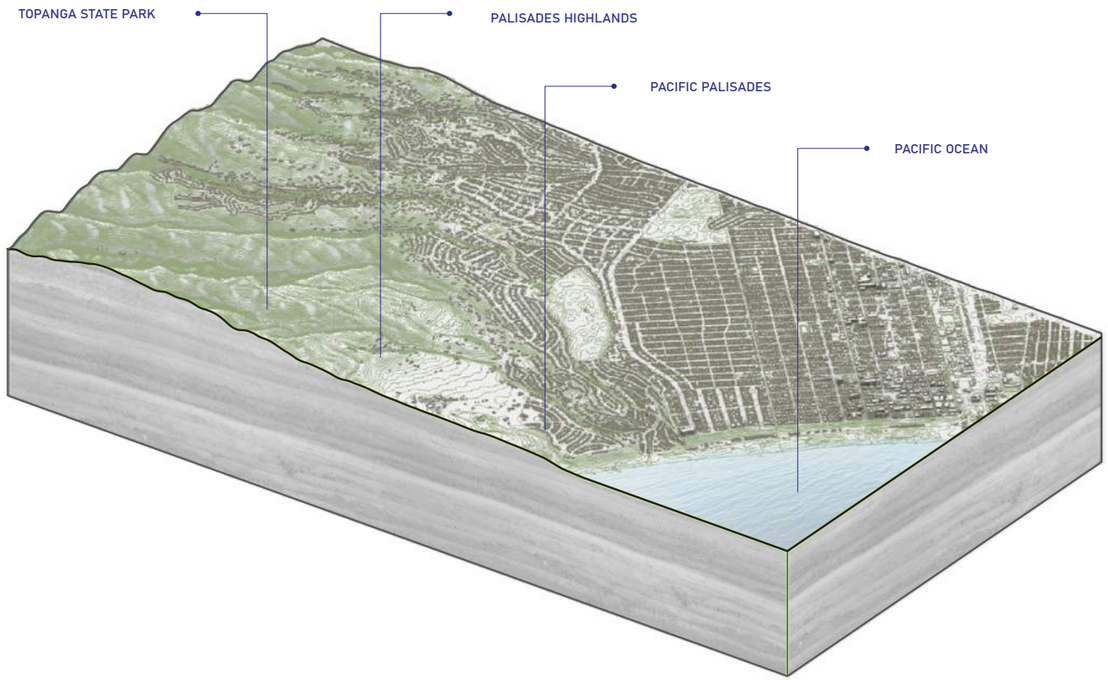
ANNUAL WIND ROSE



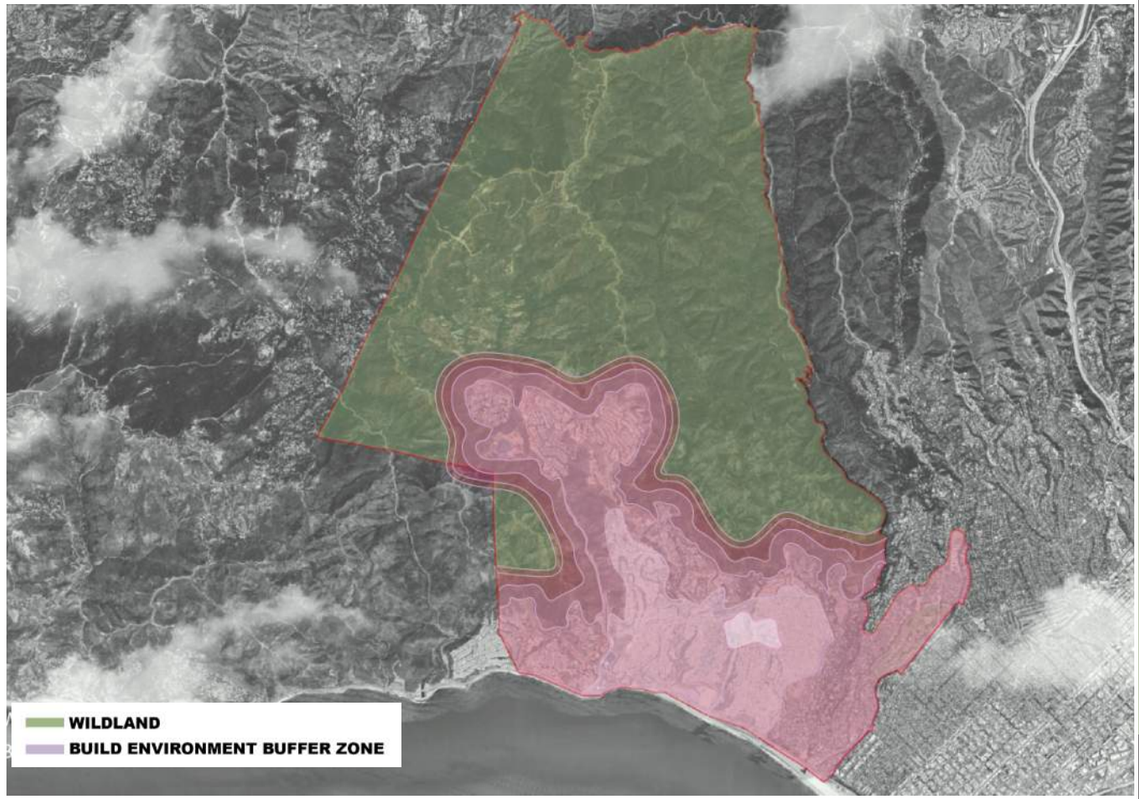
WIND ROSE ON SANTA ANA WIND DAYS



TOPOGRAPHY DIAGRAM



BUFFER ZONE



EXISTING INFRASTRUCTURE

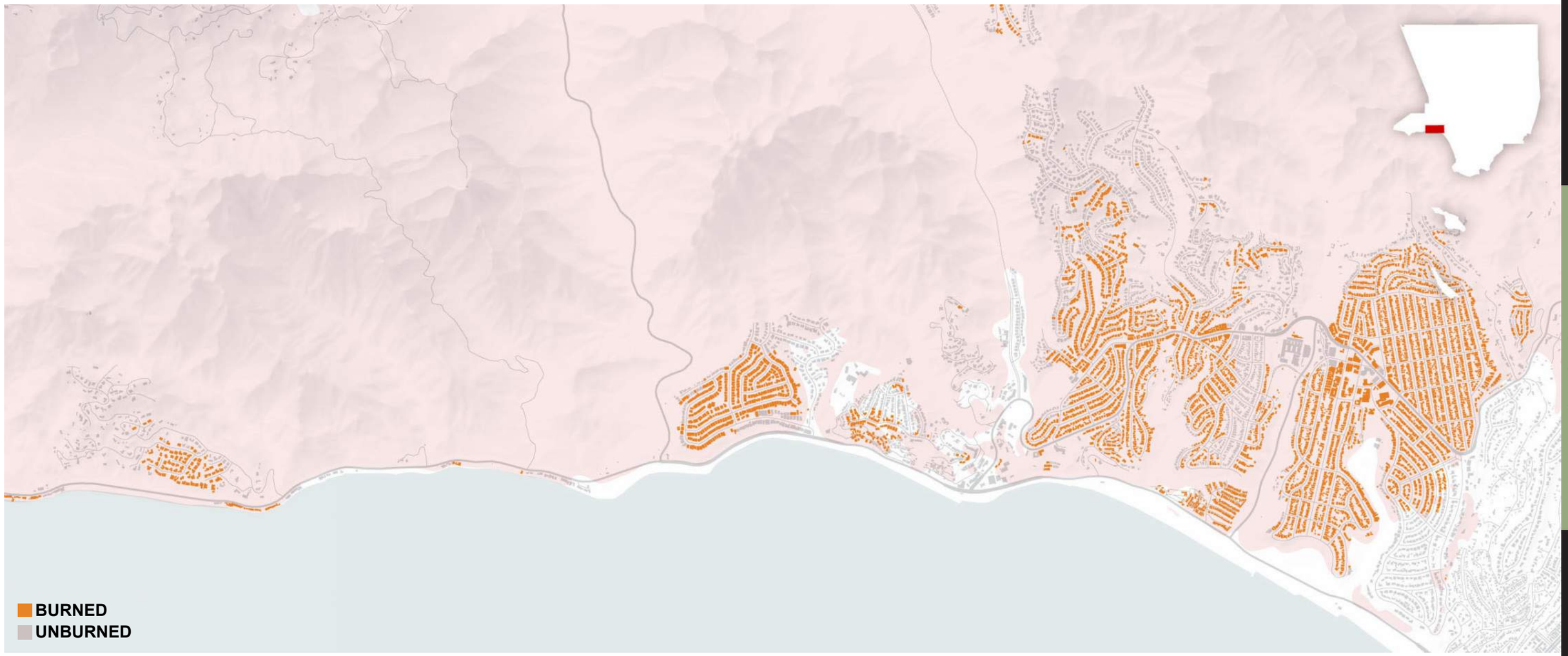
GREEN SPACE

EVACUATION

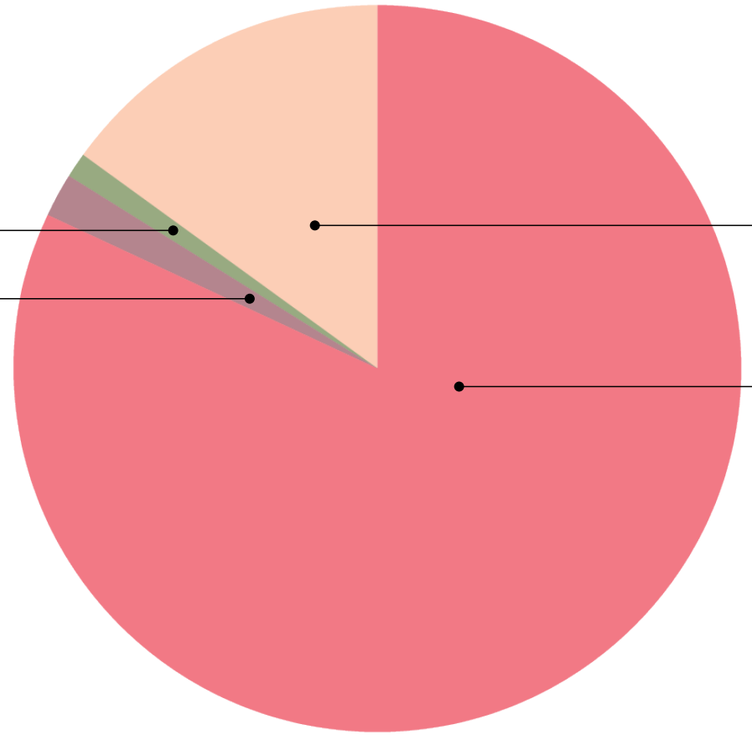
WATER

ROADS

BURNT VS INTACT



BURNT VS INTACT

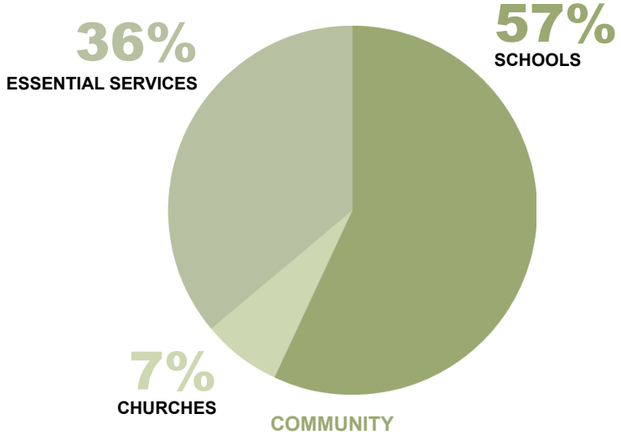


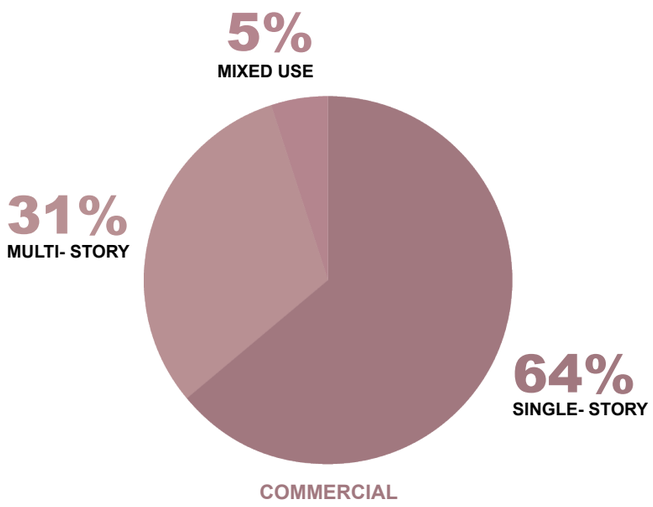
1%
COMMUNITY
Community buildings include schools, churches, libraries, theaters, and historic community landmarks.

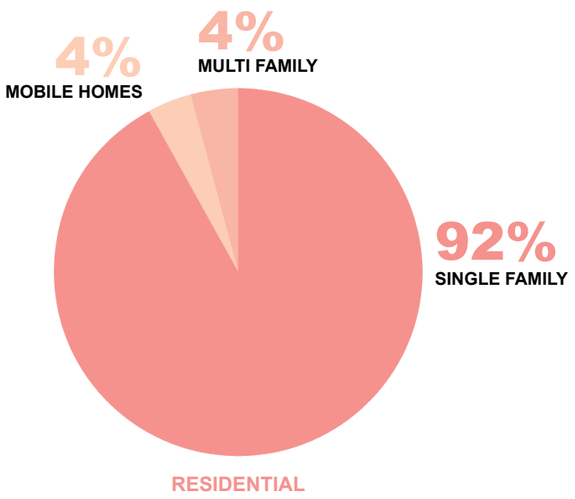
16%
UTILITY
Utility structures are under 120 sqft. Includes smaller, non-livable buildings such as garages, sheds, barns, well houses, storage buildings, and carports.

2%
COMMERCIAL
Commercial buildings include single- and multi-story commerical buildings (encompassing retail, office, hospitality, healthcare, and restaurant spaces) and mixed commerical/ residential buildings.

82%
RESIDENTIAL
Residential buildings include single- and multi-story single-family homes, single- and multi-story multi-family buildings, and mobile or motor homes in single-, double-, and triple-wide configurations.

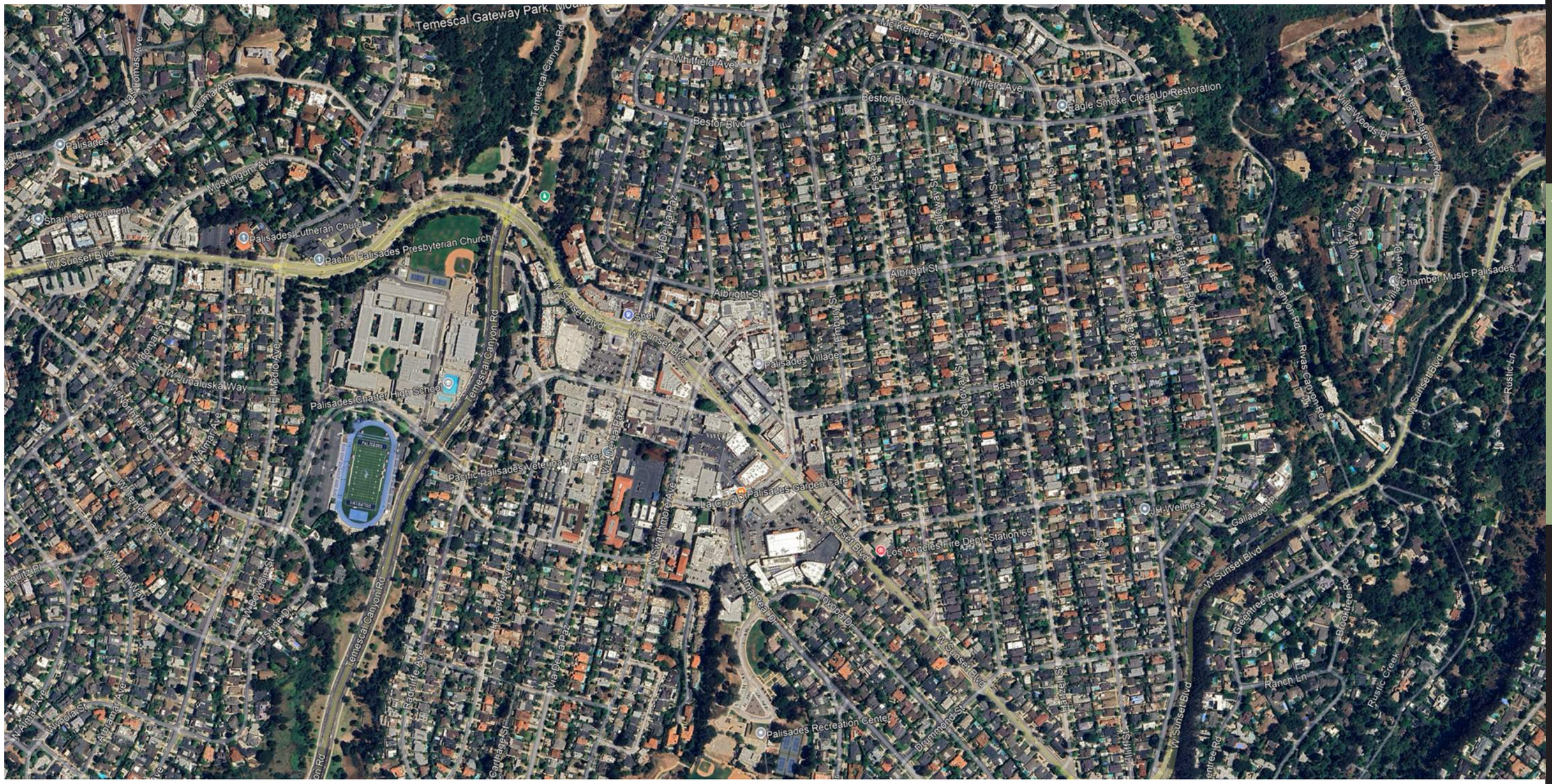






BURNT VS INTACT

PRE-FIRE



BURNT VS INTACT

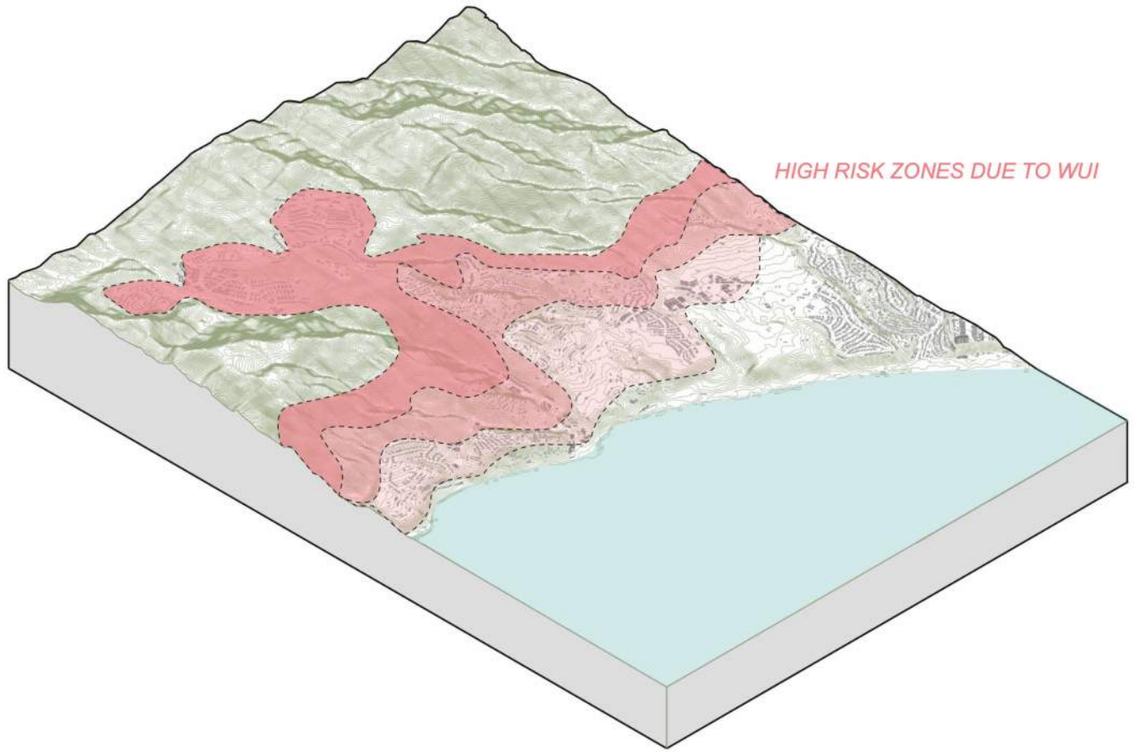
POST-FIRE

KEY ISSUES

UNPROTECTED HILLSIDES IN THE WUI

The northeastern Palisades hillsides are highly exposed to wildfire spread due to dense vegetation and steep slopes.

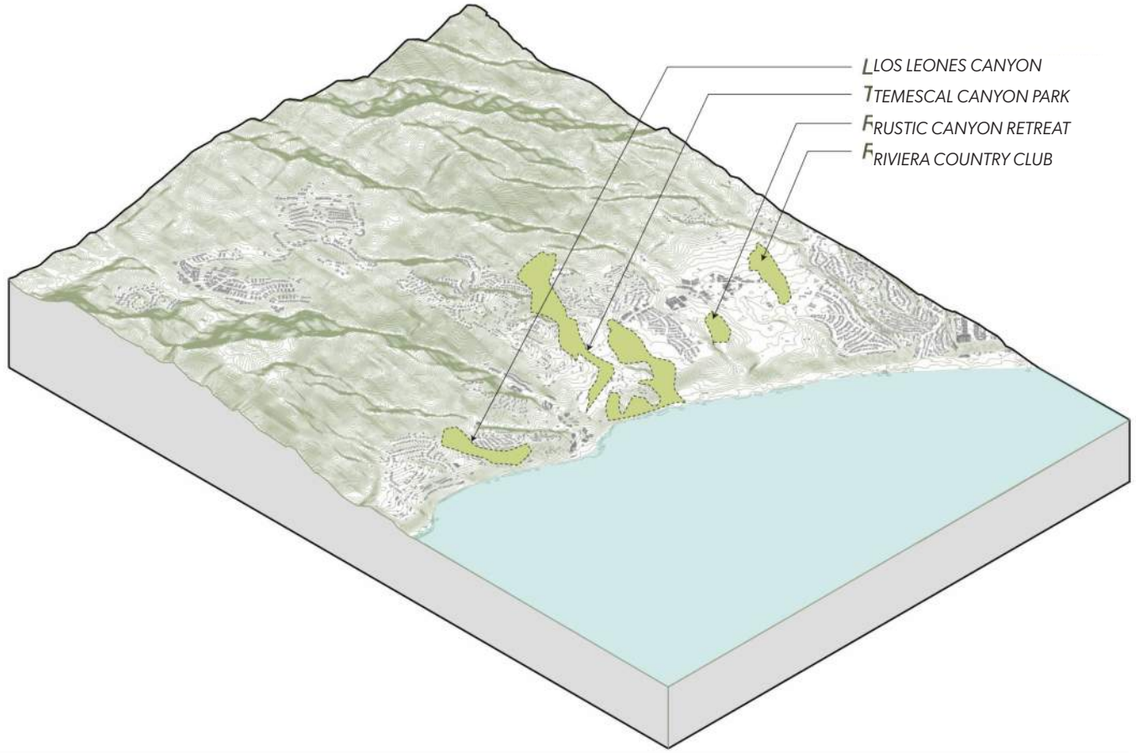
The lack of maintained buffer zones increases ignition risk and hampers firefighting efforts.



LACK OF INTERIOR BUFFERS

The Palisades urban layout lacks sufficient interior buffer zones such as parks, open spaces, or wide roads within residential clusters.

This absence allows fires and embers to easily leap from one structure to the next, facilitating rapid fire spread deep into neighborhoods.

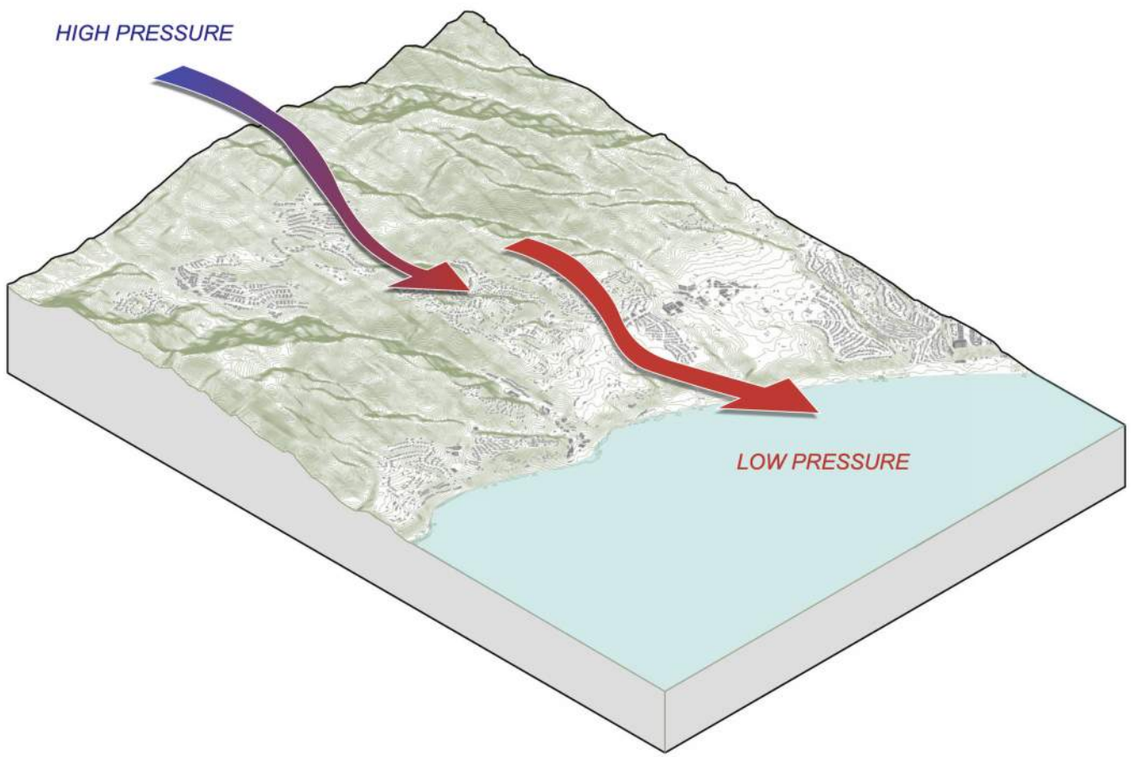


KEY ISSUES

HILLS THAT FUNNEL WINDS

Steep slopes and canyon formations intensify Santa Ana winds, channeling them directly toward developed areas.

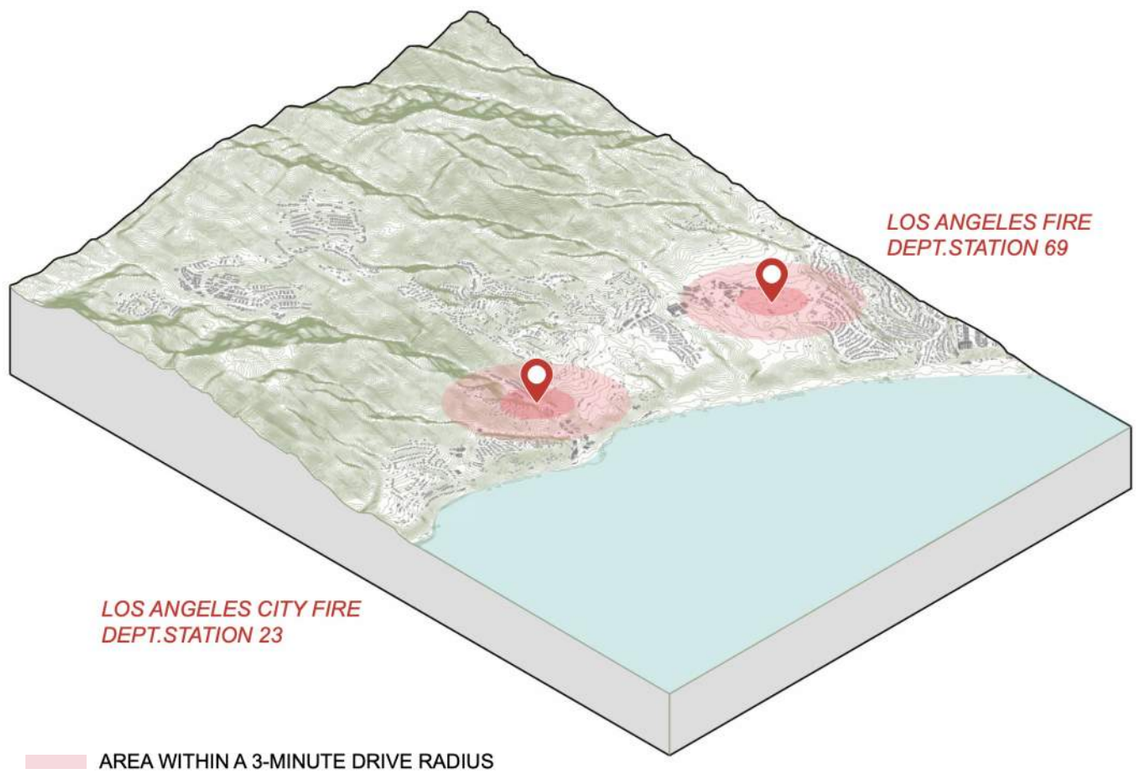
Accelerated wind flow increases ember travel distance, igniting structures and vegetation well ahead of the fire front.



INSUFFICIENT STAGING AND COORDINATION SITES

Few pre-identified large parking or gathering areas for fire crews and emergency coordination.

Current options (e.g., Palisades Village Mall, Library, Fire Station #69) are not fully equipped for staging heavy equipment.

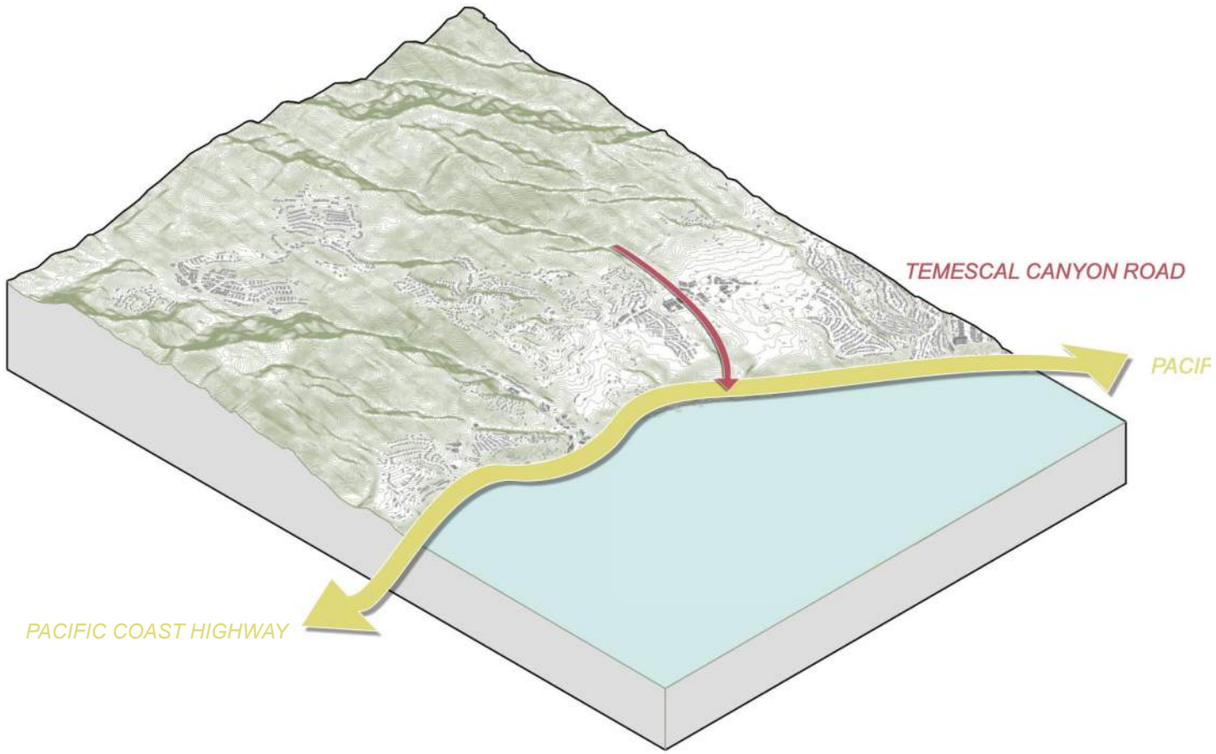


KEY ISSUES

LIMITED EVACUATION ROUTES

Steep, winding streets in hillside areas create choke points during evacuations.

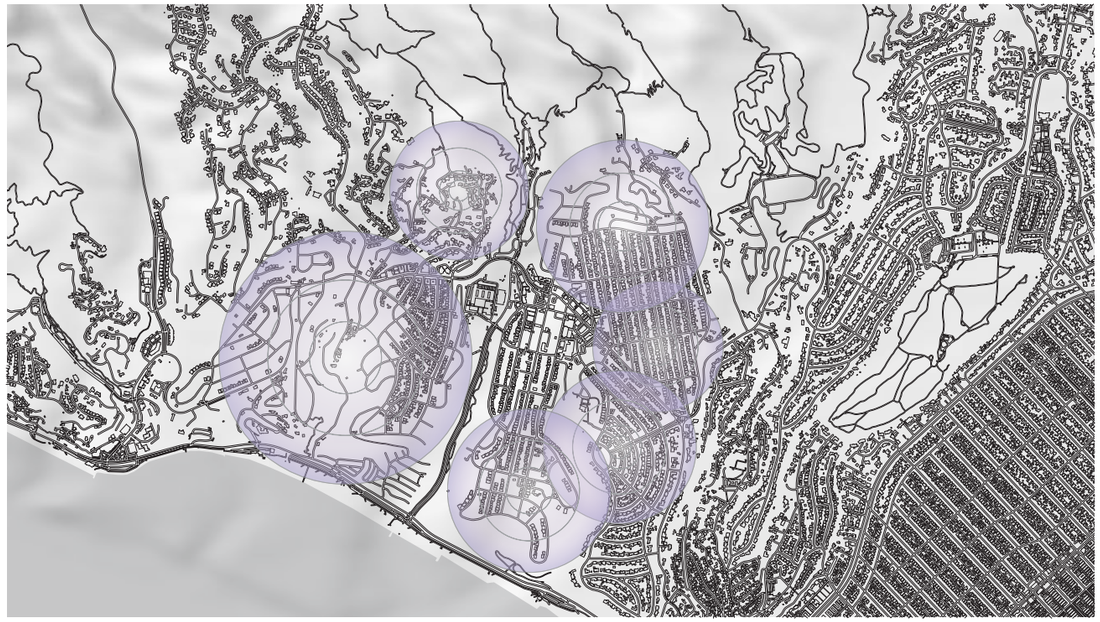
Firefighters and emergency vehicles face delays navigating the narrow, heavily trafficked route.



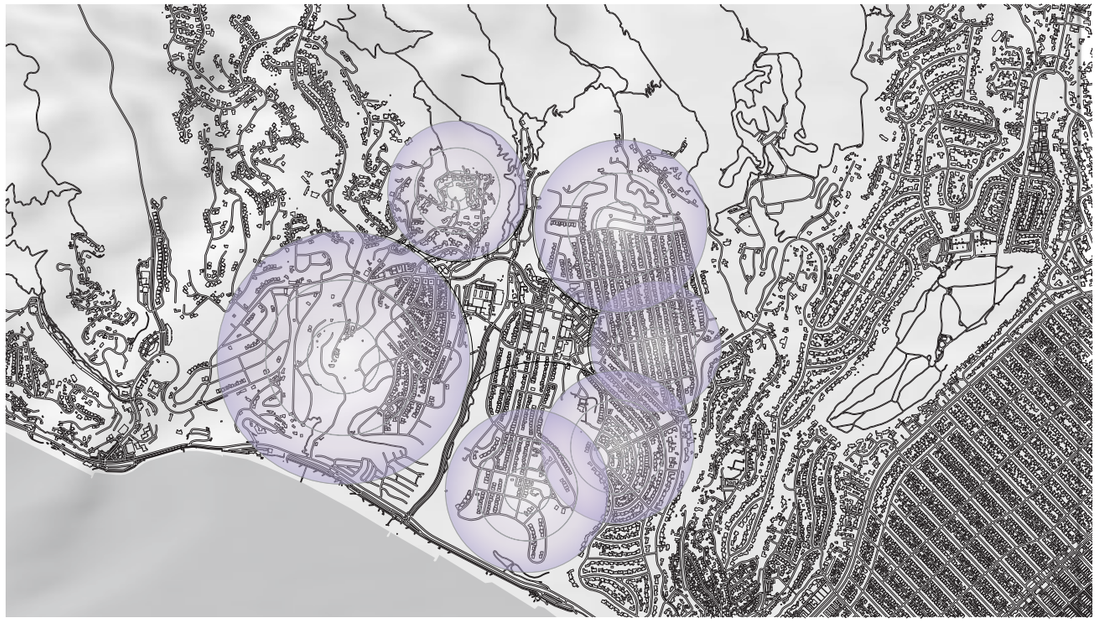
Implementation

IDEATION

PRIMARY BUFFER ZONES

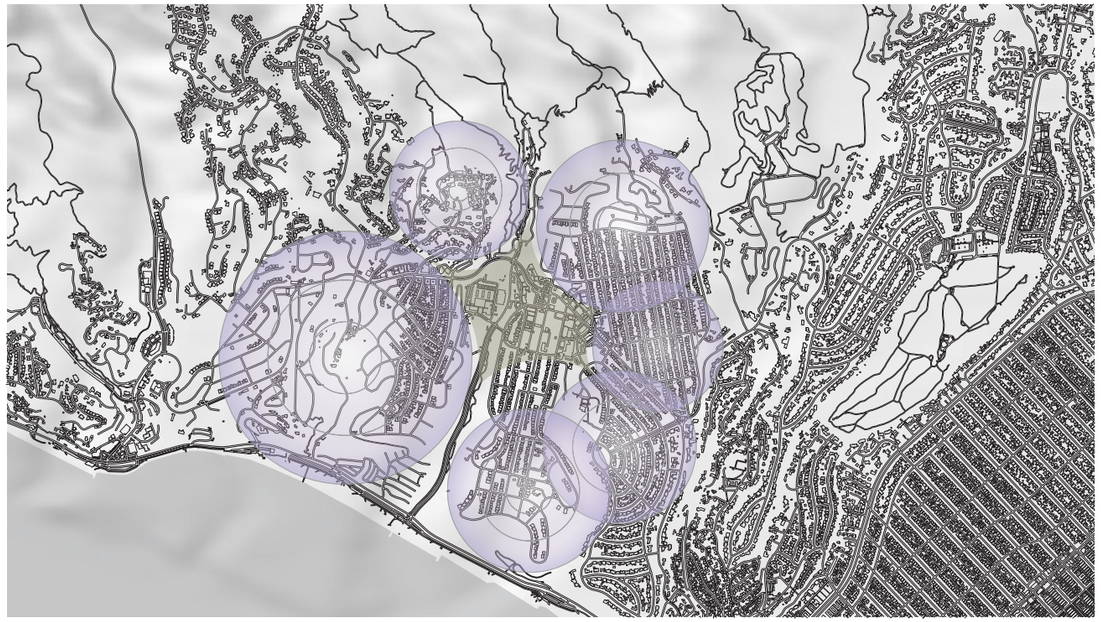


SHAPING THE FOCUS ZONE

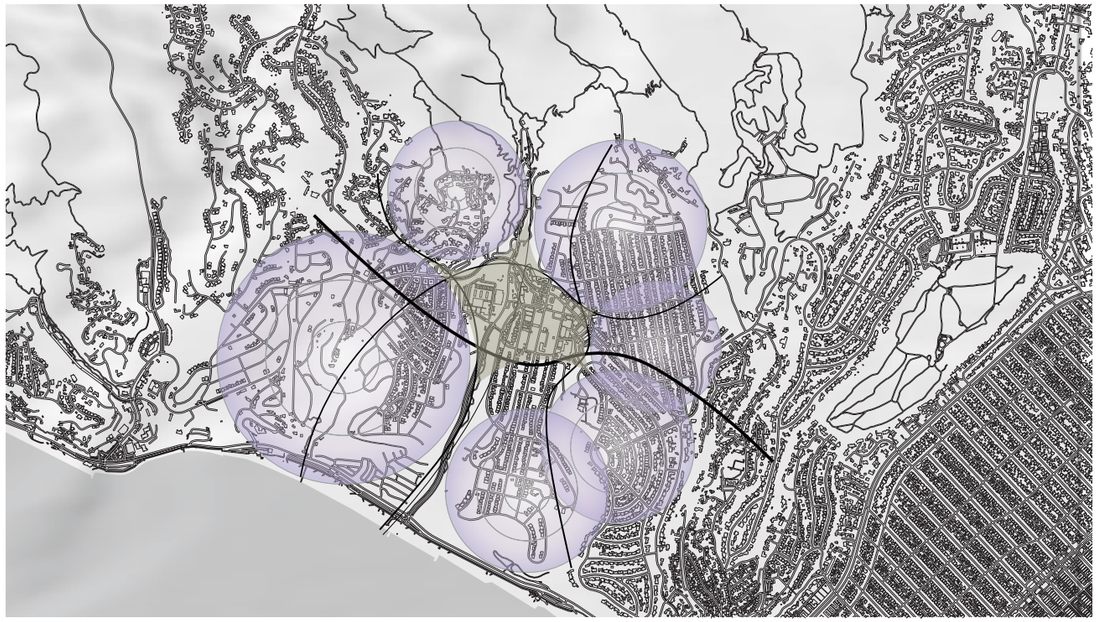


IDEATION

HIGHLIGHTING THE FOCUS ZONE



REDEFINING TRAVEL PATHS



IDEATION

ZOOM IN

SECONDARY BUFFER ZONES

IDEATION

SHAPING NEW PATHWAYS

CONNECTING TO THE STREET GRID

IDEATION

GREEN BELT AND GREEN SPACE

DESIGN STRATEGIES

WATER AND VEGETATION AS FIREBREAK NETWORKS

Landscape and water infrastructure will be integrated into the urban plan as active fire prevention and suppression systems.

Waterways as Firebreaks: Create interconnected canals, ponds, and reservoirs that divide zones and double as **firefighting** water sources.

Low-Flammability Green Belts: Plant fire-resistant vegetation (succulents, hardwoods, and irrigated lawns) along major roads, around neighborhoods, and at city boundaries.

Moisture-Retention Systems: Use **underground irrigation** in green belts to maintain plant moisture even in hot, dry conditions.

Dual-Use Public Spaces: Parks, plazas, and lakes double as safe **gathering points** in evacuations.

ZONING FOR FIRE RISK MANAGEMENT

The city layout will be deliberately organized to minimize the spread of fire by controlling where different activities and building types are located, divided into low-risk, high-risk, and buffer **zones**.

Risk-Based Zoning: Separate high-risk **industrial and storage facilities** from residential and commercial areas **by at least 1650 ft** and position them downwind of the prevailing winds.

Buffer Zones: Place parks, water channels, or wide roadways between high-risk and low-risk zones to act as **natural firebreaks.** Within **5 ft** of each building, replace softscape like plants and mulch with **hardscape** such as masonry and gravel.

Cluster Planning: Group buildings of similar fire risk categories together to simplify targeted **suppression systems** and reduce cross-contamination risk.

Fire Services Accessibility: Ensure every district is within 3 minutes travel time for emergency vehicles via **multiple access routes**.

BUILDING HEIGHT AND SEPARATION

Urban form will be physically shaped to stop fire spread through controlled spacing and **vertical planning.**

Mandatory Building Setbacks: Minimum **25 ft** of clear space between adjacent buildings in dense areas and **50 ft** in high-risk zones.

Staggered Building Heights: Avoid long corridors of tall buildings (“wind tunnels”) that could funnel flames and embers: instead, alternate the buildings’ heights to **break vertical fire pathways** and prevent the “canyon effect”.

Non-Combustible Barriers: Fill separation gaps with fire-resistant walls, open courtyards, or landscaped strips.

Height Restrictions by Zone: Lower structures in outer residential areas to allow easier **aerial firefighting access** and reduce collapse risk during fires.

ADDITIONAL STRATEGIES

FOR FIRE RESILIENCE

STREET GRID AS A FIREBREAK SYSTEM

Design the **primary buffer belt at least 100 ft wide** to act as firebreaks (according to USDA Forest Service).

Fire truck access roads must be **at least 20 ft wide all-weather roads** with a clear vertical height of at least 13'6"(according to Section 403.3 of the 2024 International WUI Code)

Include alternating "open corridors" with plazas, water features, or parks to block flame spread. There should be a defensible fuel break **every 100 ft**, while pocket parks and plazas can be placed every **2-4 blocks (500 to 1000 ft).**

Larger parks and open spaces can act as significant fuel breaks every 1500 to 3000 ft, with water features based on topography and water management needs (according to the ULI 2015, NRPA).

In areas with steep slopes or high fuel amounts, a buffer of 50 to 100 ft should surround every corridor.

UTILITY PLACEMENT AND REDUNDANCY

All power, gas, and communication lines should be routed underground in fireproof conduits. Enforce 10 ft **vegetation clearances** around all above-ground infrastructure (according to FEMA).

Require a **30 ft defensible zone** around water tanks, pump houses, fuel lines, and communication towers.

Install **backup microgrids** in each district to power firefighting systems if the main grid fails (according to FEMA).

All **load-bearing structures** must use reinforced concrete, steel, or engineered non-flammable composites.

Exterior cladding and roofing materials must have Class A fire ratings (ASTM E108) and withstand temperatures **over 1000°C for at least 2 hours.**

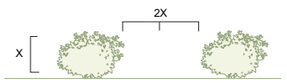
Clearly marked, illuminated escape routes on every street leading to designated "**safe nodes",** with no dead ends longer than **150 ft** (according to ICC 403.2.2).

Provide **multiple access points** in and out of communities, and provide enough space along roadsides to leave cars without creating obstacles in case of on-foot evacuation.

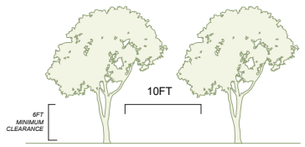
WATER AND VEGETATION

AS FIREBREAK NETWORKS

FLAT OR MILD SLOPE (LESS THAN 20%)

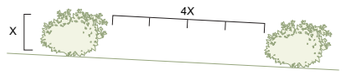


Space between shrubs should be **two times** the height of the shrub.

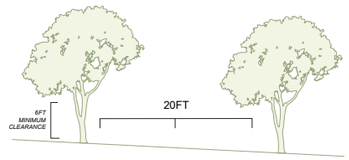


Space between trees should be **10ft.**

MILD TO MODERATE SLOPE (20-40%)



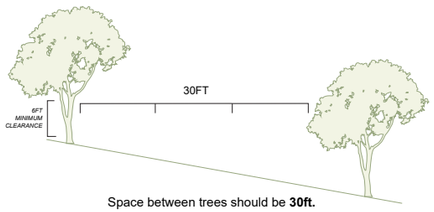
Space between shrubs should be **four times** the height of the shrub.



Space between trees should be **20ft.**

MODERATE TO STEEP SLOPE (GREATER THAN 40%)

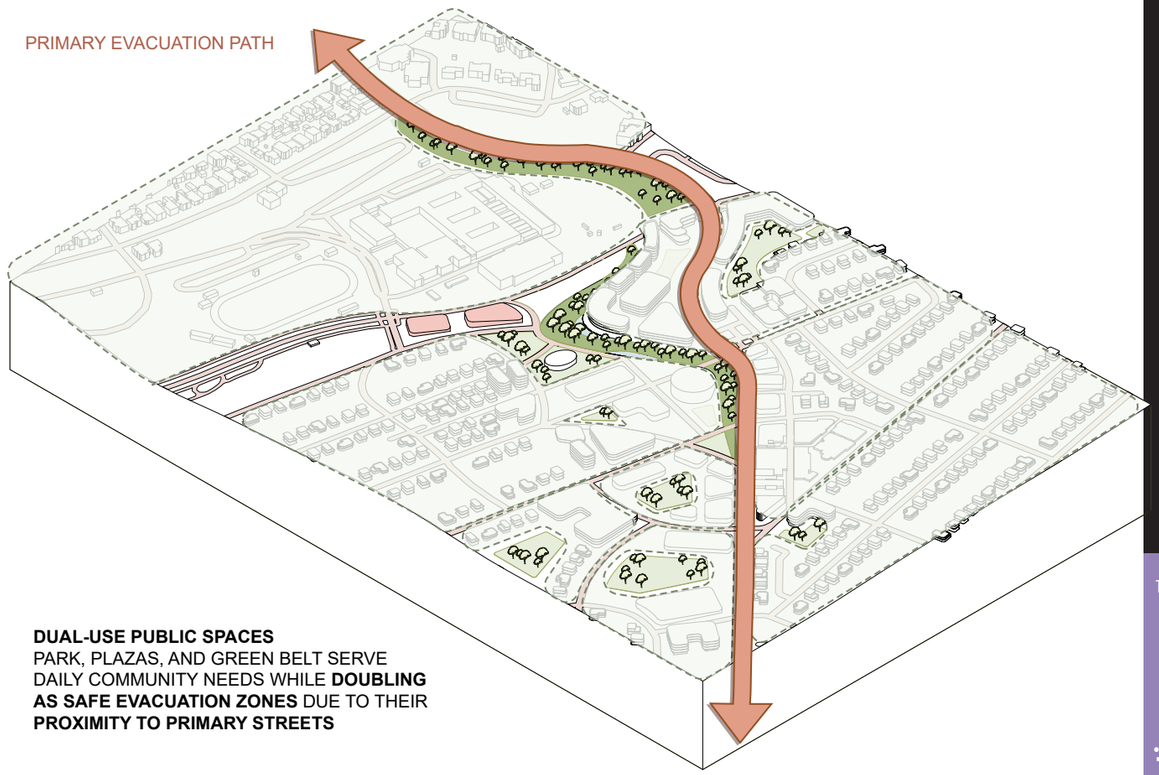
Space between shrubs should be **six times** the height of the shrub.



Space between trees should be **30ft.**

HIGHER HAZARD

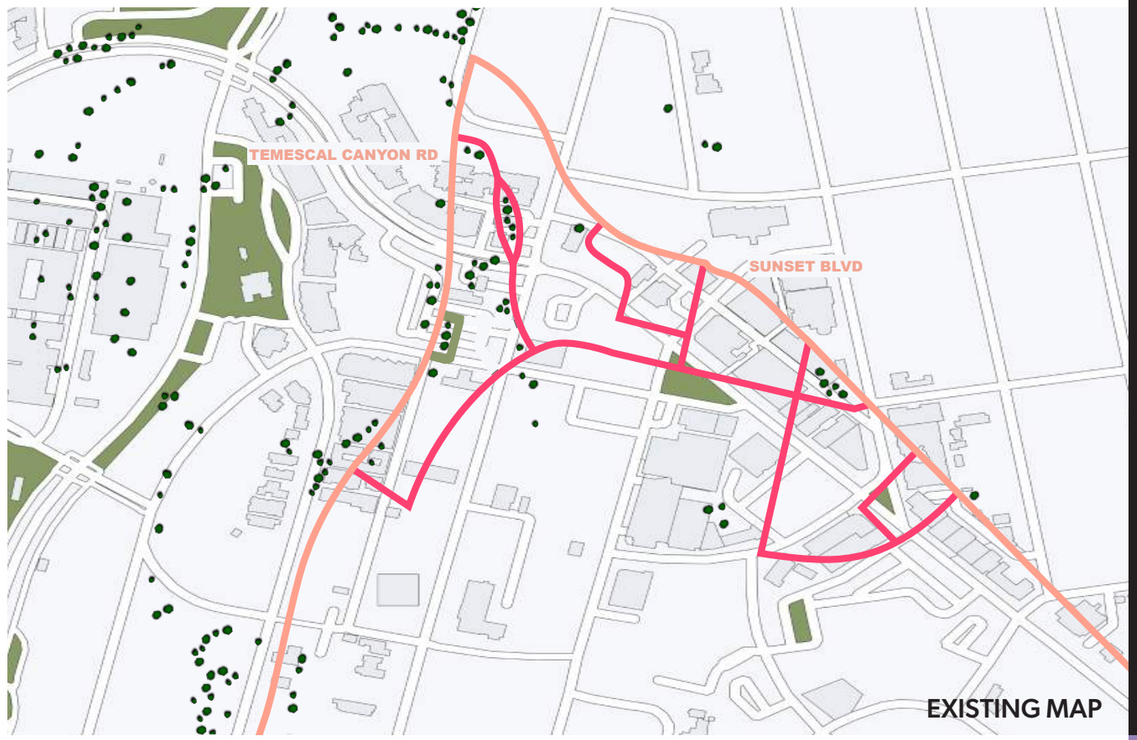
LOWER HAZARD



DUAL-USE PUBLIC SPACES
PARK, PLAZAS, AND GREEN BELT SERVE DAILY COMMUNITY NEEDS WHILE **DOUBLING AS SAFE EVACUATION ZONES** DUE TO THEIR **PROXIMITY TO PRIMARY STREETS**

WATER AND VEGETATION

AS FIREBREAK NETWORKS



WATER AND VEGETATION

AS FIREBREAK NETWORKS

WATER AND VEGETATION

AS FIREBREAK NETWORKS

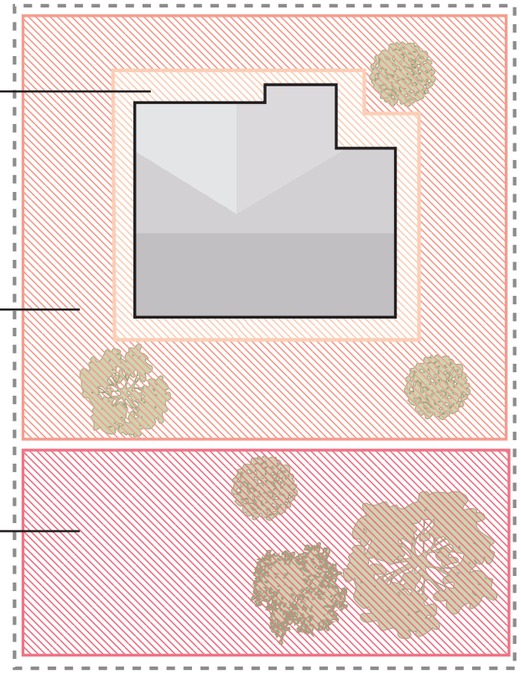
ZONING

FOR FIRE RISK MANAGEMENT

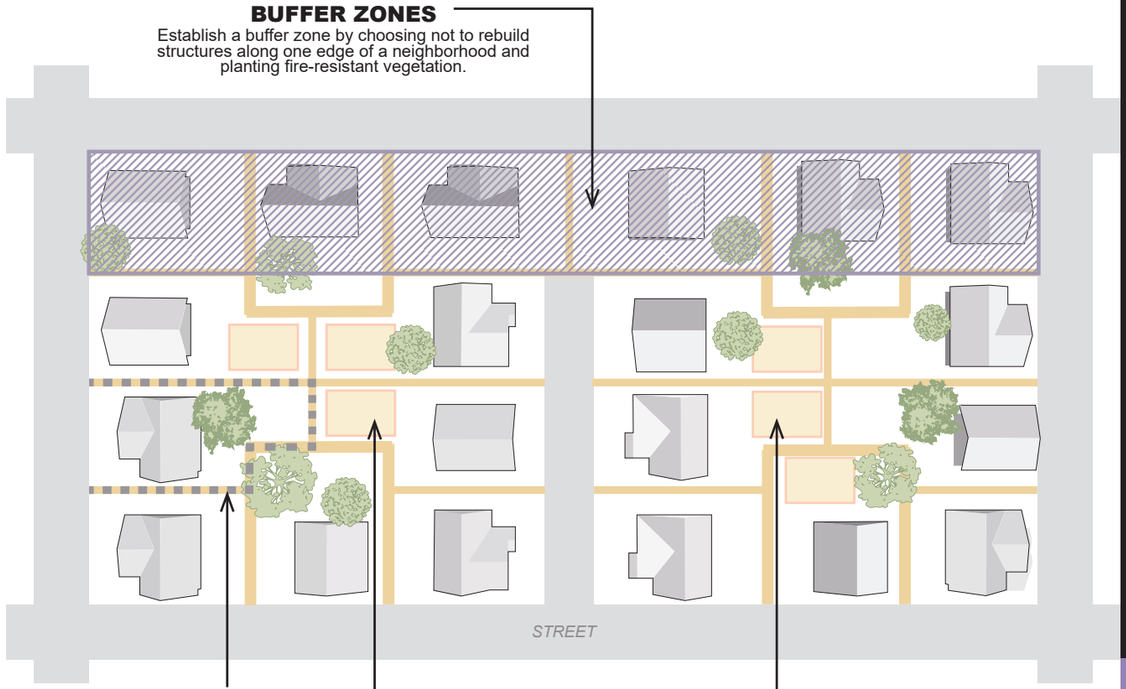
0’-5’ OF THE HOUSE
Replace softscape such as plants or mulch with hardscape such as masonry or gravel.

5’-30’ OF THE HOUSE
Replace flammable plants such as junipers with succulents. Keep barbecues with propane tanks in this zone.

30’ - 100’ OF THE HOUSE
Park automobiles and RVs in this zone. Trim lower tree branches and keep woodpiles away from vegetation.



BUFFER ZONES
Establish a buffer zone by choosing not to rebuild structures along one edge of a neighborhood and planting fire-resistant vegetation.



NON FLAMMABLE BOUNDARIES
Flammable wooden fences along property lines can be replaced with metal or masonry.

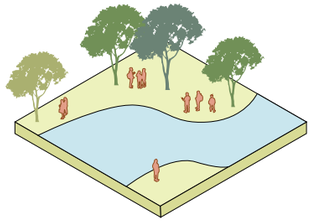
INCREASED DENSITY
Increased density can slow a fire’s spread if structures are built to stringent codes. ADUs or second homes replace structures from buffer zone.

ZONING

FOR FIRE RISK MANAGEMENT

ZONING

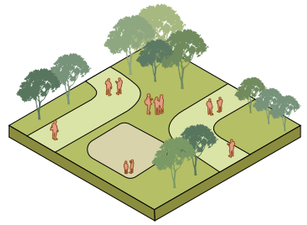
FOR FIRE RISK MANAGEMENT



WATER CHANNELS

WHY
Function as permanent fire barriers while also cooling adjacent microclimates, slowing flame intensity.

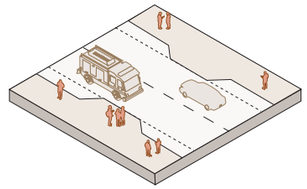
BEST USED
Along canyon corridors or downwind fire paths where natural drainage already exists.



GREEN BELT

WHY
Their open fields and managed vegetation interrupt continuous fuel paths and create safe congregation zones for the community.

BEST USED
Between residential areas and wildland edges or high-risk zones and and in dense neighborhoods where they double as community evacuation assembly points.



WIDE ROADWAYS

WHY
Break up dense development, limit radiant heat transfer, and provide dual-use evacuation capacity.

BEST USED
As boundaries between districts or on the edge of commercial/residential zones.

STREET GRID

Primary and secondary streets are deliberately **widened to act as protective firebreaks**, slowing the spread of flames across neighborhoods. Their scale provides **clear separation between building clusters** while also serving as **reliable evacuation corridors during emergencies.**

GREEN CORRIDORS

Continuous green corridors, plazas, and parks weave through the urban fabric, **creating natural fire buffers that separate dense development clusters.** These open areas **reduce fuel loads, provide staging grounds for emergency response**, and serve as flexible gathering points for community use during normal times and as safe refuge zones during evacuations.

WATER RESERVES

Integrated throughout the neighborhood, ponds and pools serve as **localized water reserves** that can be tapped during fire emergencies, supporting suppression efforts and helping limit flame spread. Beyond their safety role, they **provide cooling effects in hot weather, enhance ecological diversity, and function as recreational amenities for residents**, blending resilience with daily quality of life.

ZONING

FOR FIRE RISK MANAGEMENT

PROTECTED/BUFFERED

LOW RISK

HIGH RISK

UNPROTECTED/EXPOSED

WHAT TO PUT HERE
Residential neighborhoods
Schools, hospitals, and care facilities
Community centers, cultural facilities, small parks

WHY
These are population-heavy and vulnerable uses that must be shielded from hazards.
Easy access to evacuation routes and nearby green open space increases safety.

WHAT TO PUT HERE
Industrial facilities (factories, warehouses)
Fuel storage, power plants, utilities
Transit depots, waste management sites

WHY
These uses are hazardous by nature (combustibles, chemicals, heavy machinery).
They can stay in the city only if separated by wide buffers and sited downwind from homes.

WHAT TO PUT HERE (CONDITIONALLY)
Commercial districts (shops, mixed-use housing above retail)
Entertainment/cultural venues
Small offices and service businesses

WHY
On their own, these uses aren't high hazard, but they become very vulnerable if fire buffers are missing.
Streets lined with shops or apartments with no setback are common in dense areas → highly exposed to flame spread.

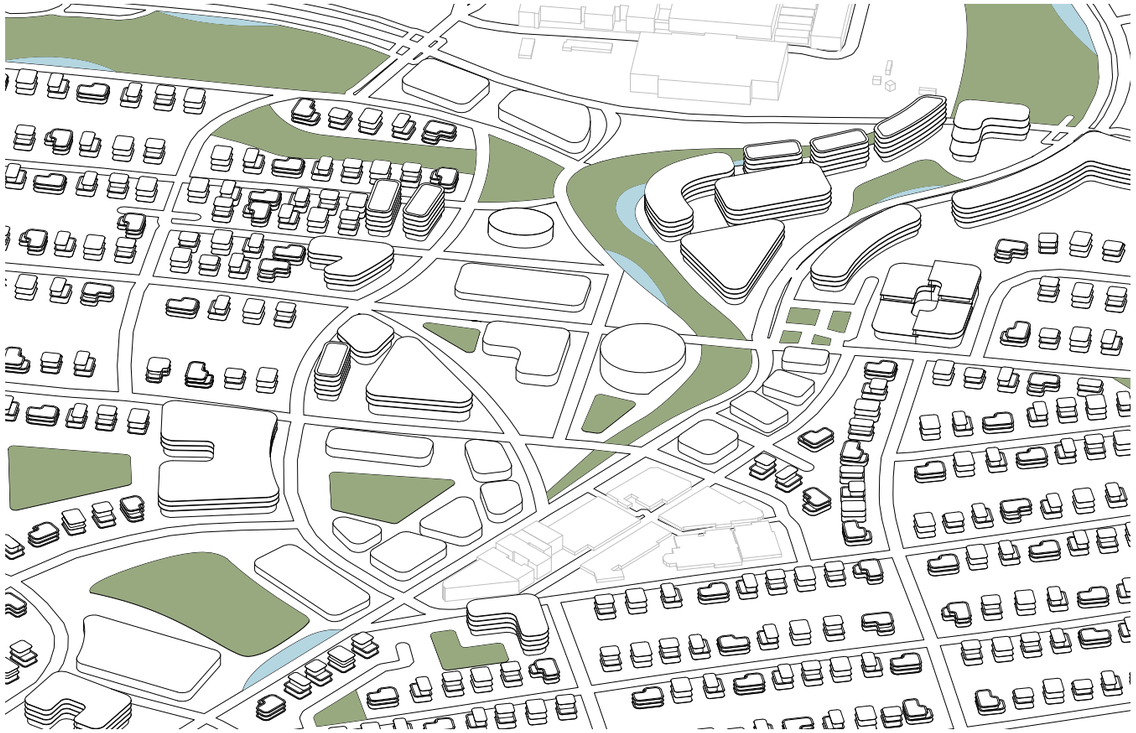
WHAT NOT TO PUT HERE
Industrial sites next to residential
Fuel storage near schools or hospitals
Large warehouses with flammable goods in dense districts

WHY
Increases ignition risk, reduces evacuation time, and concentrates exposure.
Urban planning goal = avoid this zone entirely through zoning laws and buffers.

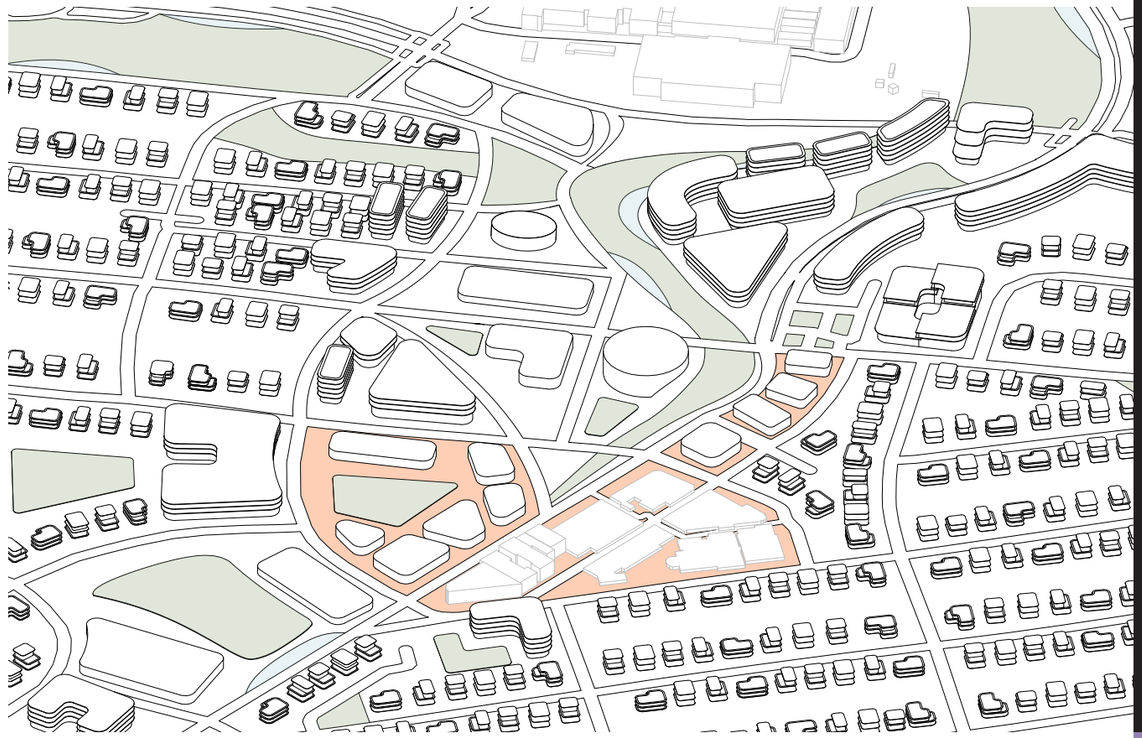
ZONING

FOR FIRE RISK MANAGEMENT

GREEN CORRIDORS AND WATER BREAKS



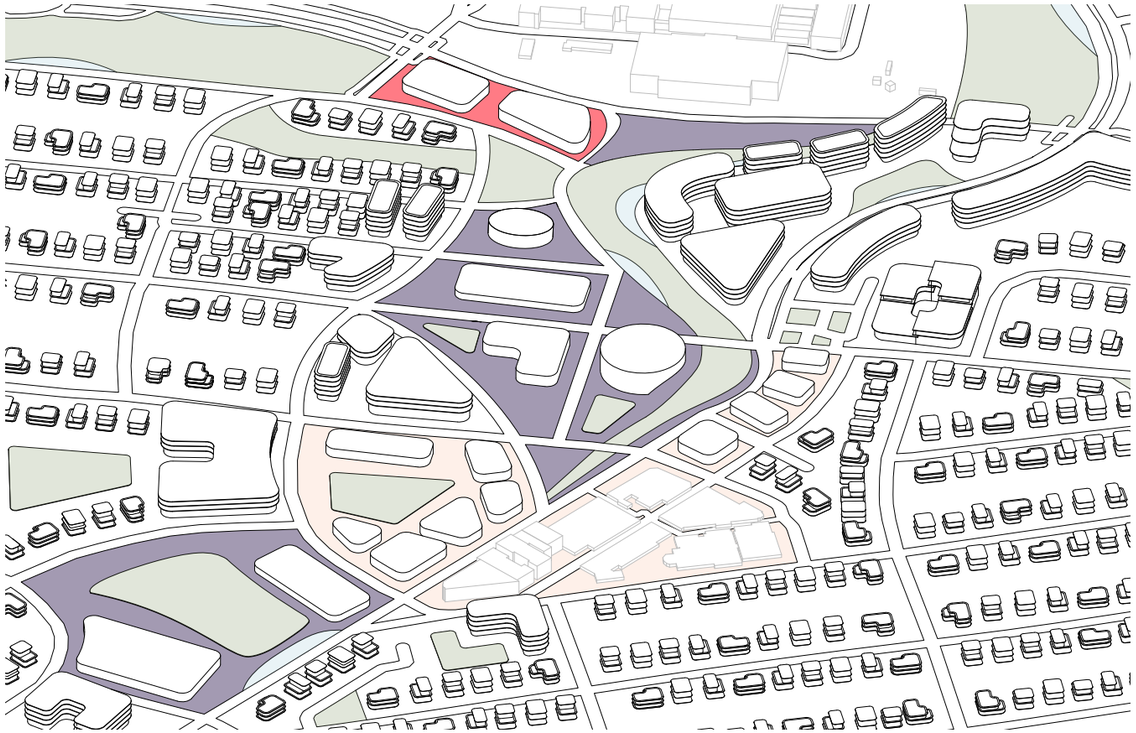
RETAIL AND COMMERCIAL SPACES



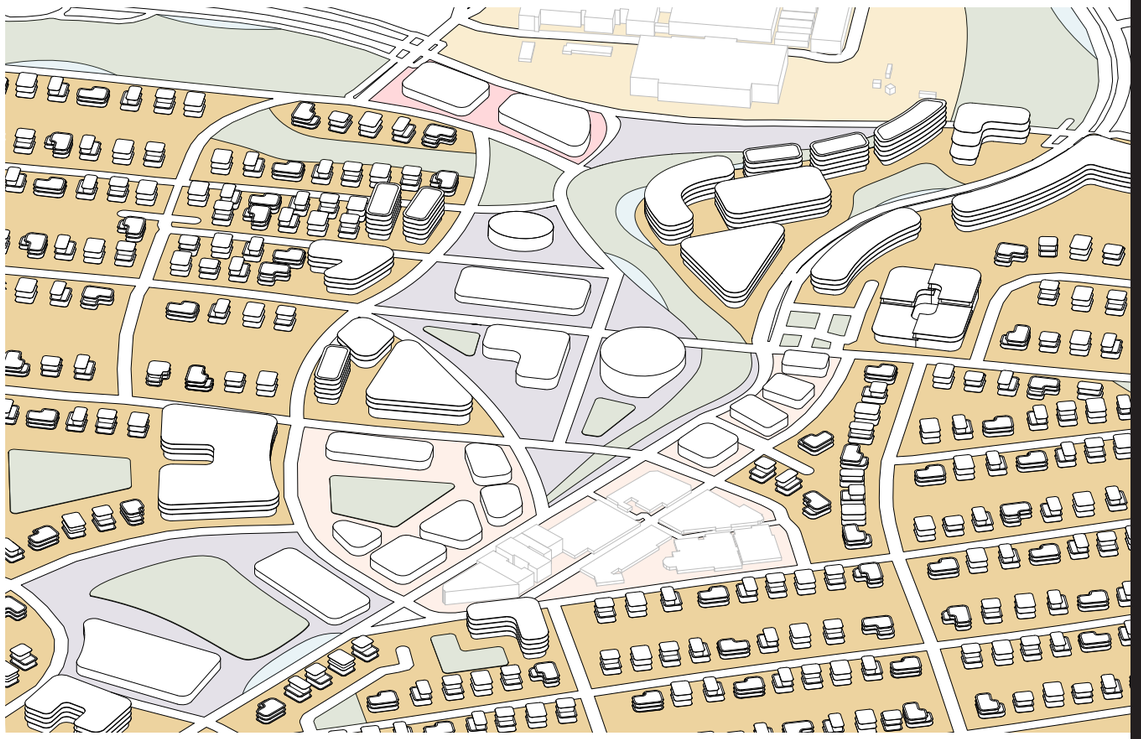
ZONING

FOR FIRE RISK MANAGEMENT

COMMUNITY AMENITIES AND EMERGENCY SERVICES



COMMUNITY AMENITIES AND EMERGENCY SERVICES

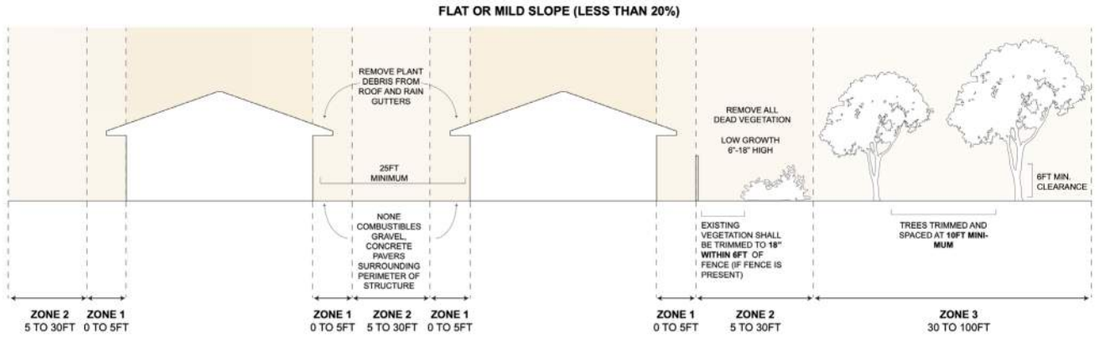


ZONING

FOR FIRE RISK MANAGEMENT

BUILDING HEIGHT AND SEPARATION

FLAT OR MILD SLOPE (LESS THAN 20%)



ZONE 1 (0 TO 5FT)
IGNITION ZONE

FIRE RESISTIVE PLANTS
NO TREES OR SHRUBS
IRRIGATED
NO SOLID FUEL FIRE PITS OR FIREPLACES
ONLY NONCOMBUSTIBLE PATIO COVER

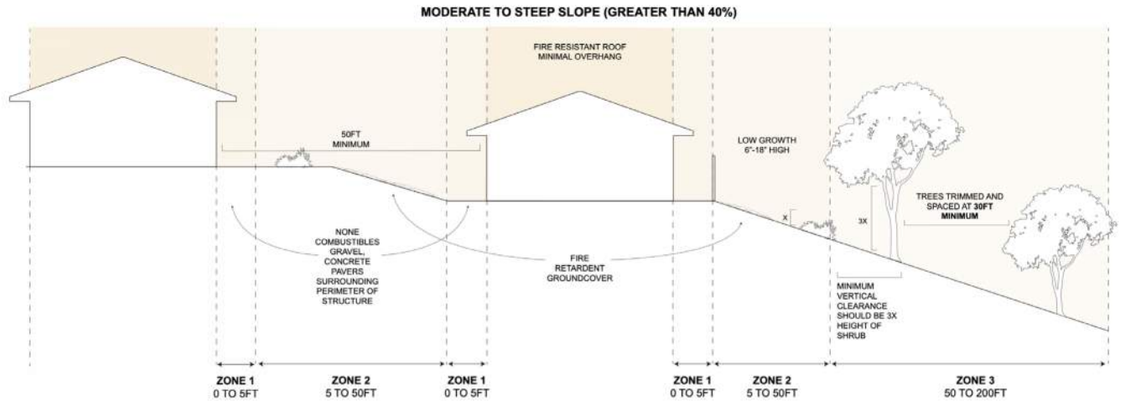
ZONE 2 (5 TO 30FT)
LEAN & CLEAN ZONE

SLOW BURNING/LOW FUEL PLANTS
REMOVE ALL DEAD VEGETATION
NO TREES
IRRIGATED

ZONE 3 (30 TO 100FT)
REDUCED FUEL ZONE

SLOW BURNING/LOW FUEL PLANTS
TREE CANOPIES SPACED 10FR APART
IRRIGATED

MODERATE TO STEEP SLOPE (GREATER THAN 40%)



ZONE 1 (0 TO 5FT)
IGNITION ZONE

FIRE RESISTIVE PLANTS
NO TREES OR SHRUBS
IRRIGATED
NO SOLID FUEL FIRE PITS OR FIREPLACES
ONLY NONCOMBUSTIBLE PATIO COVER

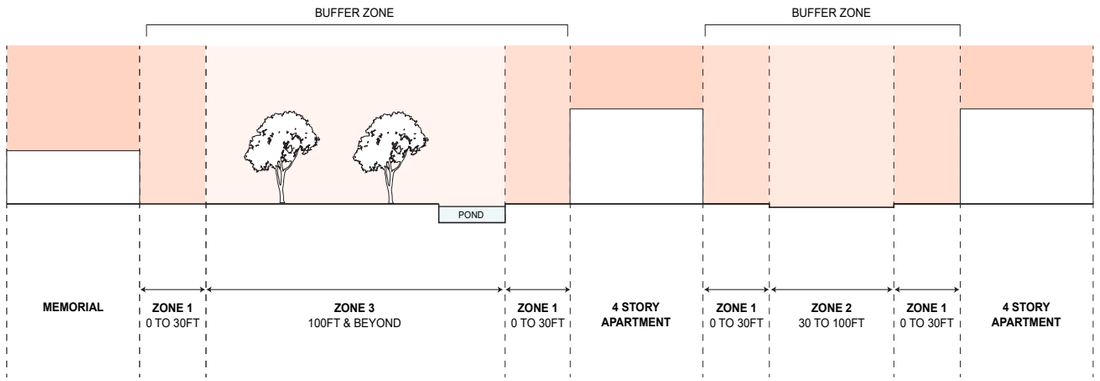
ZONE 2 (5 TO 50FT)
LEAN & CLEAN ZONE

SLOW BURNING/LOW FUEL PLANTS
REMOVE ALL DEAD VEGETATION
NO TREES
IRRIGATED

ZONE 3 (50 TO 200FT)
REDUCED FUEL ZONE

INCREASE BUFFER TO 200FT RADIUS
SLOW BURNING/LOW FUEL PLANTS
TREE CANOPIES SPACED 10FR APART
IRRIGATED

BUILDING HEIGHT AND SEPARATION



ZONE 1 (0 TO 30FT)
IMMEDIATE IGNITION RESISTANCE

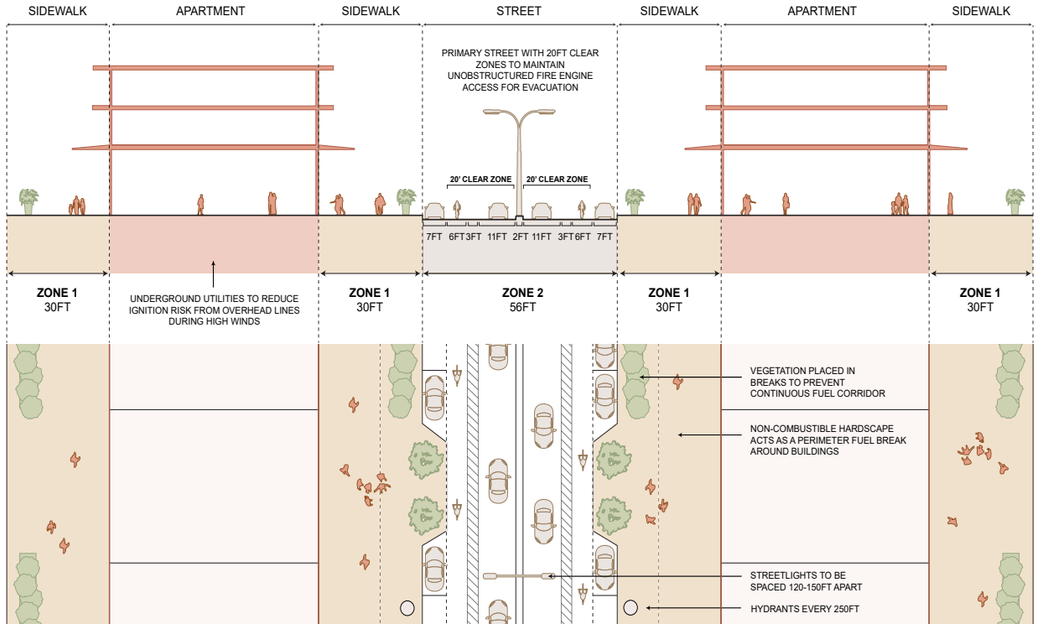
NON-COMBUSTIBLE HARDSCAPE
MINIMAL PLANTINGS & IF USED SHOULD BE IRRIGATED, LOW PROFILE AND HIGH MOISTURE
FLAME RESISTANT FURNITURE
NO STORAGE OF PALLETS OR DUMPSTERS

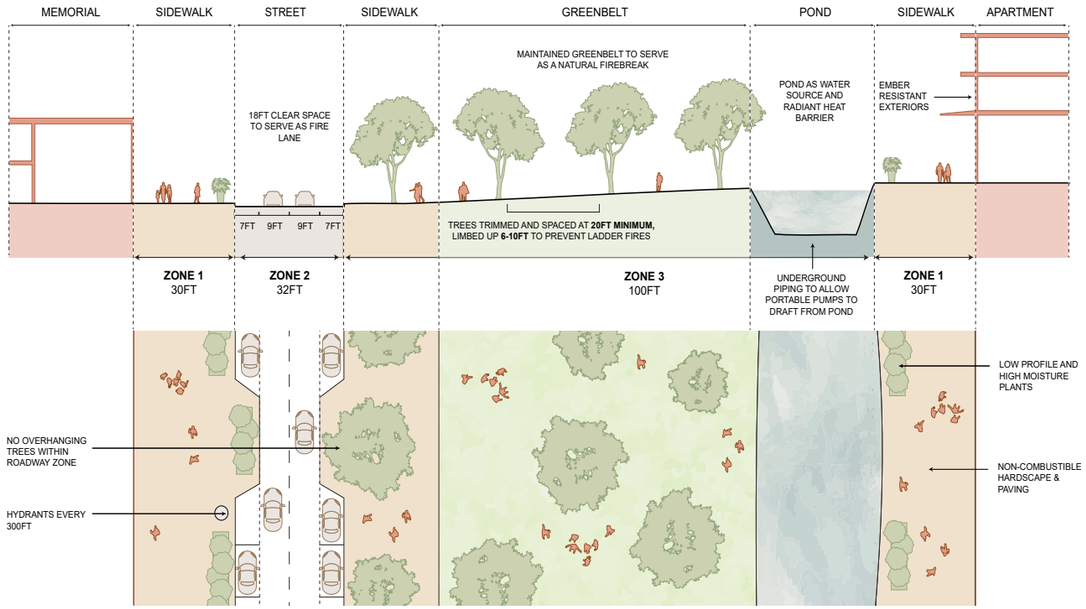
ZONE 2 (30 TO 100FT)
BUFFER & CIRCULATION SPACE FOR EMERGENCY

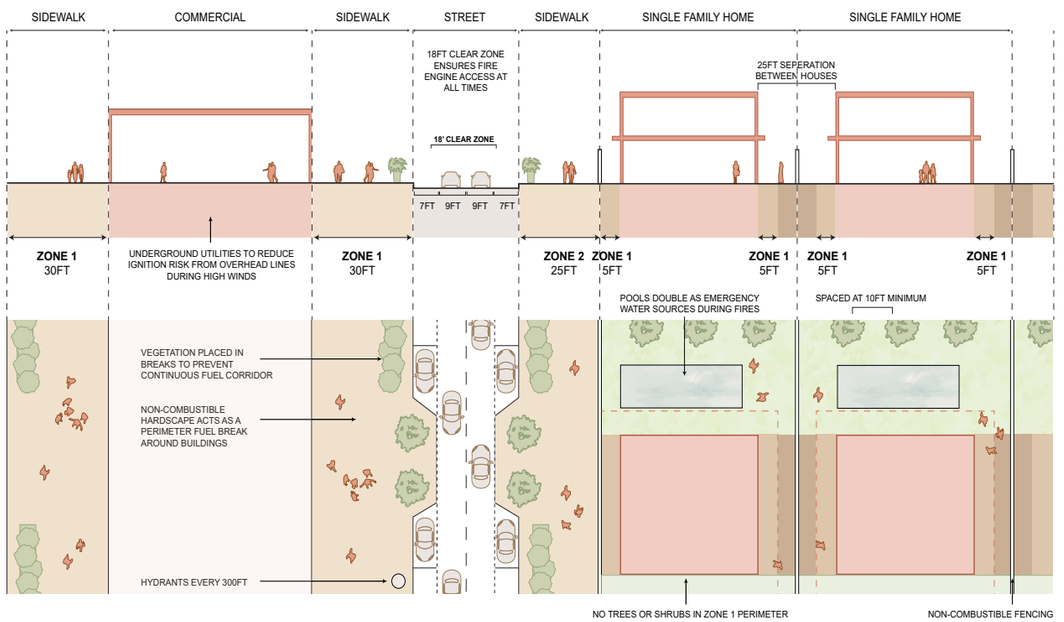
PARKING LOTS WITH FIRE LANE INTEGRATION
LOADING BAYS ORIENTED SO VEHICLES DO NOT BLOCK FIRE LANES
INTERMITTENT LOW-FUEL LANDSCAPING
ISLANDS TO BREAK UP HEAT TRANSFER

ZONE 3 (100FT & BEYOND)
LARGE SCALE FIREREAK & COMMUNITY SEPERATION

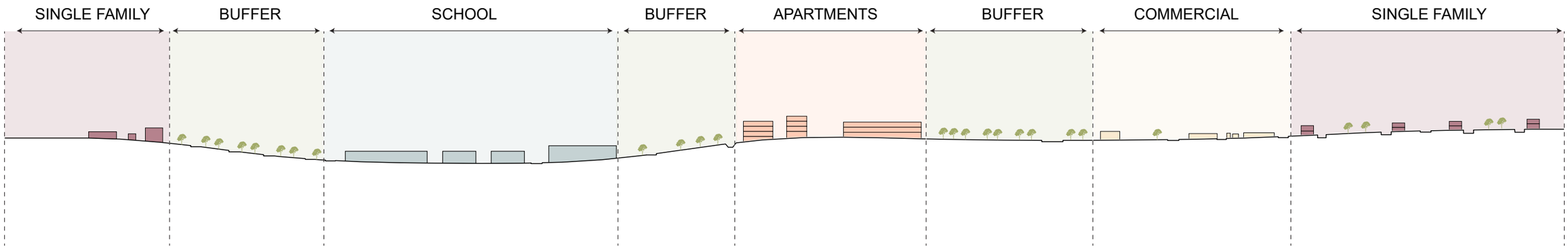
OPEN PLAZAS, WIDE ROADS, OR LANDSCAPED STORMWATER BASINS
SPORTS FIELDS, GREENBELTS OR GOLF COURSES CAN INTEGRAT SOLAR CARPORTS OR COVERED WALKWAYS DESIGNED IN COMBUSTIBLE MATERIALS







BUILDING HEIGHT AND SEPARATION



SINGLE FAMILY

Reasoning: Positioned on higher slopes where lower density reduces evacuation pressure.

Height Relation: Homes kept low (1–2 stories) to step with slope topography.

Fire Safety: Spacing between units and edge location create a safer transition to open space or wildland areas.

BUFFER

Reasoning: Vegetated break in development, doubling as a firebreak.

Height Relation: No buildings, slope allows natural drainage.

Fire Safety: Open space interrupts potential “wind tunnels” between zones with different ignition risks and prevents slope-to-slope fire jump by interrupting density.

SCHOOL

Reasoning: Located on flatter slope for safety, large footprint, and evacuation ease.

Height Relation: Single-story or low-rise (1–2 stories) with wide spacing.

Fire Safety: Large grounds and low buildings prevent vertical wind corridors; grounds serve as safe refuge area.

APARTMENTS

Reasoning: Mid-density housing placed on flatter ground where infrastructure and evacuation routes are strongest.

Height Relation: Taller (3–4 stories), but massing is broken into clusters.

Fire Safety: Clustered layout avoids long, canyon-like corridors; alternating heights disrupt wind flow and ember travel.

COMMERCIAL

Reasoning: Sited on flatter central slope for parking, deliveries, and fire response access.

Height Relation: Low-to-mid rise (1–2 stories), wide footprints.

Fire Safety: Central placement with buffers prevents corridors of tall massing; layout disperses wind instead of channeling it**.**

FINAL DESIGN

FOCUS ZONE

FINAL DESIGN

PROGRAMMATIC LAYOUT

- Palisades Village
- Retail
- Grocery
- Residential - Multi-family
- Residential - Single family
- Cultural Center
- Library
- Memorial Center
- Church
- Emergency Shelter
- Fire Station
- Green Belt
- Green Space
- Water

FINAL DESIGN

COMMERCIAL SPACE

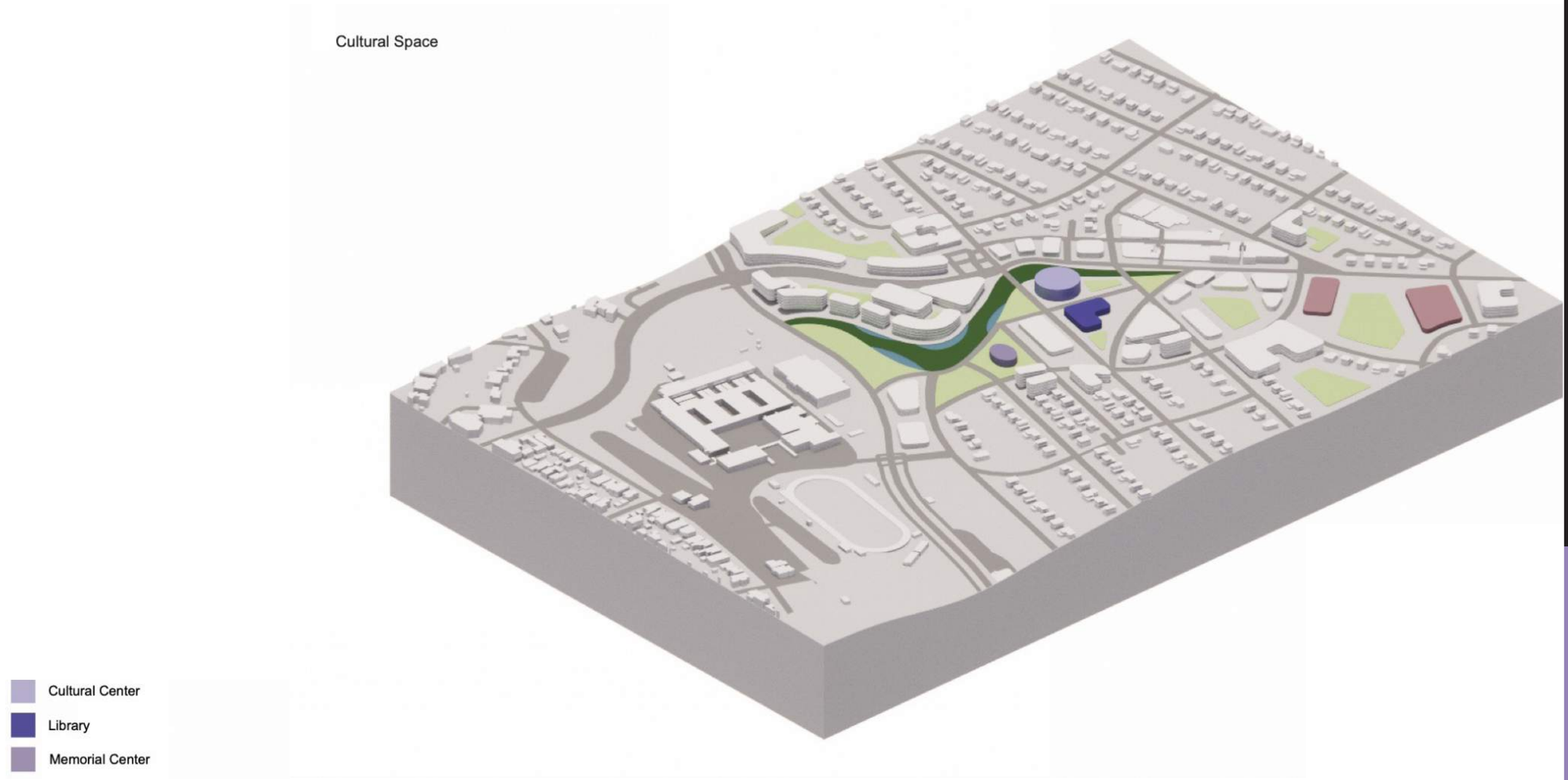
Palisades Village

Retail

Grocery

FINAL DESIGN

CULTURAL SPACE



FINAL DESIGN

EMERGENCY SERVICES

Emergency Shelter

Fire Station

FINAL DESIGN

RESIDENTIAL SPACE

FINAL DESIGN

FINAL DESIGN

FINAL DESIGN

FINAL DESIGN

THE PALISADES FIRE

2025

Leadership

Matthew Mclarand, AIA
Kap Malik, FAIA
Mark Kim, AIA
Tim Beuchat

Mentors

Kap Malik, FAIA
Asmaa Abu Assaf
Ana Loza
Adam Rodriguez
Eddye Traverso
Abhishek Vaidya

Interns

Natalie Darakjian
Annie Xuan
Ari Delay
Grace Li
Makenna Pollema

Firmwide Support

Linda Moreno
Katrina Gorgy


MVE
RESEARCH