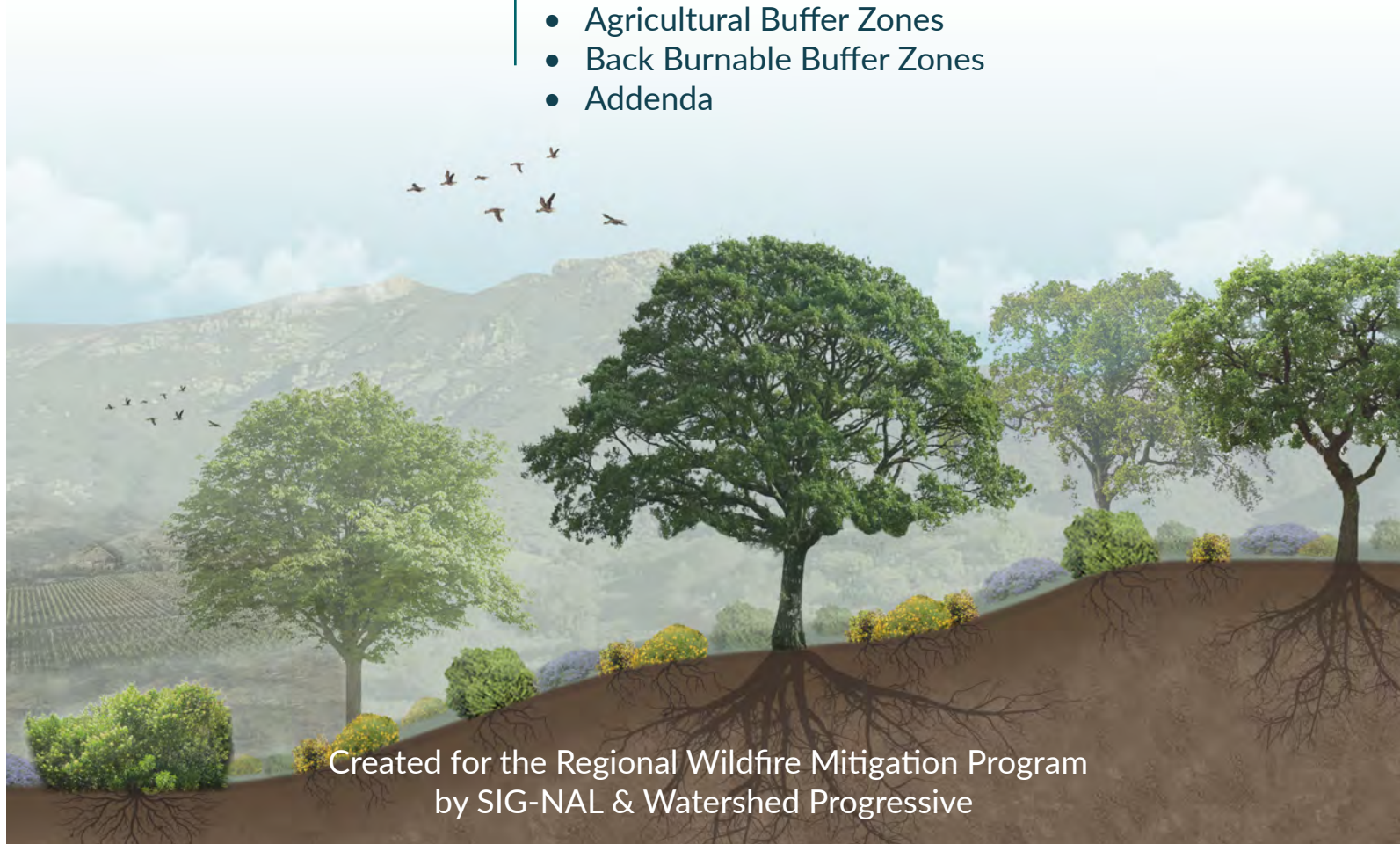




Design Templates for Wildfire Mitigation & Landscape Resilience

Vegetation Management Strategies for the Wildland Urban Interface in Coastal Central & Southern California

- Introduction
- Native Oak Shaded Fuel Break
- Post Eucalyptus Native Woodland Restoration
- Riparian Corridor & Drainage Restoration
- Agricultural Buffer Zones
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- Addenda



Design Templates for Wildfire Mitigation & Landscape Resilience

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The goal of this manual is to outline landscape management strategies, or design templates, for wildfire hazard mitigation in coastal California. Its target audience is the general public interested in how to take proactive land management steps to reduce physical wildfire hazards and risks. The design templates describe concept plans for native vegetation planting, restoration, and agricultural working lands conservation projects. When carried out in boundary areas between communities and wildland environments, such projects can expand areas of green, hydrated vegetation cover as protective buffers against future wildfires, with additional landscape benefits for native habitat and water conservation.

This manual is the fruit of an 18-month collaboration over 2022-2023 between Spatial Informatics Group-Natural Assets Laboratory (SIG-NAL) scientists, conservationists, and Watershed Progressive landscape architects, designers, and engineers. SIG-NAL led the Santa Barbara Regional Wildfire Mitigation Program (RWMP)'s Landscape Domain between 2021-2024, with funding from the National Fish and Wildlife Foundation (NFWF) Emergency Coastal Resilience Fund, granted through the California Fire Safe Council between 2021-2024. Watershed Progressive was a lead contractor with SIG-NAL to design and implement landscape projects for the RWMP. Watershed Progressive is a consulting and design-build collaborative, focused on connecting communities to their watersheds through integrated strategies for a healthy, resilient future. The design templates draw upon research, ecosystem science and landscaping project expertise across both organizations.

The authorship team hopes this manual will catalyze landscape projects that help communities mitigate wildfire risks.



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Wildfire Mitigation

How to adapt landscapes to mitigate wildfire hazards and enhance community resilience to wildfire events

Regional Wildfire Mitigation Plan

The wildfire hazard mitigation strategies in this toolkit have been developed as part of the Santa Barbara Regional Wildfire Mitigation Program (RWMP)'s Landscape Domain.

The RWMP's goals are to decrease the risk of wildfire impacts to communities and infrastructure, promote wildfire resistant green spaces, working lands, and habitats, and develop community capacity to adapt and recover from wildfire-related natural disasters (1).

Within the RWMP, the Landscape Domain promotes land management strategies in the wildland-urban interface (WUI) that mitigate wildfire hazards by cultivating perennially-

green, high-moisture native plant communities, hydrated plants in agricultural lands, and disturbance-adapted, thinned native shrub and grassland zones.

Such landscape management strategies include expanding or enhancing shaded fuel breaks with native trees, riparian corridors, landscaped greenbelts, agricultural zones, and back-burnable native vegetation in strategic locations. Across wildfire-prone communities, the strategies above can create improved protective buffers between communities and wildland fires, while also achieving conservation benefits for native ecosystems, water, and working lands.

Working with the RWMP can help you establish a long-term plan for incorporating various wildfire mitigation strategies throughout your landscape that are dependent on the conditions of each site. An integrated approach takes into consideration the uses of the land, goals for wildfire mitigation and habitat restoration, and other possible coordination factors with neighbors and community members.

Practices in the **Built Environment** include infrastructure retrofits, home hardening, improved access and evacuation routes, and regenerative approaches like onsite water re-use and water storage.

Practices in the **Community Domain** include education about wildfire behaviors, risks, and mitigation strategies. Social connections help communities work together to implement resilience practices.

Practices in the **Landscape Domain** include a mosaic of greenbelts including shaded fuel breaks, agricultural buffer zones, invasive plant removal, and native habitat and riparian restoration. Neighbors sharing parcel boundaries can work together to implement and maintain fire resilient buffer zones.



Wildfire Mitigation

Understanding wildfire in the chaparral biome

Understanding the Chaparral Biome

California chaparral is a plant community characterized by drought tolerant, woody shrubs and a Mediterranean type climate that includes hot, dry summers and mild, wet winters. It is one of the most biodiverse and threatened habitats in the world (10).

Fire is an important variable in chaparral ecosystems. Chaparral can sustain fire return intervals, or frequencies, that range between 30-200 years with high variability (11) (12). However, due to the rise of people living in the WUI and more human-caused ignitions, fire frequencies have increased in California to a rate that is untenable for chaparral habitat to recover from, thus, damaging critical habitat, and endangering WUI communities (13)(14).

Increased fire frequency impedes shrub recovery and exacerbates the threat of vegetation type conversion from woody shrubs to grasslands (15). Chaparral habitat loss and the spread of non-native annual grasslands has increased the vulnerability of the landscape to wildfire. Annual grasses hold less moisture than most chaparral plants, creating highly ignitable fuels that are difficult to manage (16)(17).

The wildfire mitigation strategies in this toolkit are designed to serve as buffers between sensitive wildland habitat and the built environment. Strategically placed fuel breaks and buffers in the WUI can protect human lives and infrastructure when wildfires occur, and reduce the risk of increased fire frequencies that are detrimental to chaparral ecosystems.

Wildfire Mitigation Strategies in the Landscape

The design templates included in this document are created for use in Southern and Central CA coastal chaparral communities at the Wildland-Urban Interface.

The vegetation management strategies covered include Native Oak Shaded Fuel Breaks, Post-Eucalyptus Native Woodland Restoration, Riparian Corridor and Drainage Restoration, Agricultural Buffer Zones and Backburnable Buffer Zones. These strategies are meant to work as parts of an integrated approach to wildfire resilience.

Native vegetation community protection and restoration, invasive plant removal, landscape rehydration, and fuel load reductions are all landscape management strategies that create safer spaces from which firefighters can defend WUI communities in wildfire incidents. When combined across landscapes, these landscape management strategies increase community and landscape resiliency to wildfire. These templates consider approaches at the landscape scale, and therefore assume a long-term commitment to the removal of invasive plant species, and the preservation, maintenance and restoration of chaparral habitat.



PHOTO (via californiachaparral.org) show vegetation type conversion to grassland in chaparral habitat since the 1970's.

Plant Palettes for Wildfire Mitigation Strategies

The plant palettes in the following design templates include native and some non-native, climate-appropriate plants that work best for their respective tools. All plants in this toolkit are considered *fire resistant*: plants that can “retain moisture even during dry periods, and don’t ignite easily” (18).

Plants selected and listed are most fire resistant when used according to the spacing and implementation guidelines suggested. Plants that are fire resistant but require regular maintenance are marked.

Chaparral plant communities provide habitat for hundreds of rare and endangered species, and effective pollination of chaparral plants is dependent on the health of surrounding chaparral and native vegetation.

Wildfire Mitigation

Drawbacks of single benefit approaches for wildfire preparedness in the landscape domain

Traditional single-benefit approaches for wildfire mitigation focus narrowly on actions to reduce wildfire hazards. These approaches cannot address larger community hazards, risks, and vulnerabilities when they don't consider social, environmental, and ecological impacts. Traditional strategies generally focus on fuel reduction and fuel removal from the landscape and the use of non-flammable construction materials in the built environment. While effective in mitigating immediate wildfire hazards, implemented alone, these strategies can have unintended, negative consequences such as increasing landscape heat retention, habitat loss, and the spread of invasive species.

A holistic approach focused on nature-based solutions for wildfire hazard mitigation is needed to address the complex socio-ecological problems facing WUI communities in wildfire prone areas. Multiple-benefit design practices look holistically at opportunities on-site to mitigate wildfire risk while also improving soil health and water retention, providing shade, creating habitat for pollinators and birds, and working with wildfire to protect and restore native fire-adapted habitats. This multiple benefit approach is needed both at the individual parcel-level and community-wide scale.



Habitat Loss

When wildfire preparedness is narrowly defined, there are few opportunities to integrate wildlife habitat into the fabric of our built environment.



Extreme Heat Impacts

Without vegetation, extreme heat impacts can degrade air quality, harm human health, and increase energy bills for cooling in summer months.



Water Scarcity

Without water re-use tools like greywater, rainwater, A/C condensate water and blackwater re-use, irrigated buffer strips pull from municipal and groundwater sources, depleting already dwindling water sources.



Erosion

Simply removing vegetation without replacing it leaves soil vulnerable to erosion, potentially causing mudslides, degrading water quality and wildlife habitat.



Energy Intensity

Manual tree and vegetation removal is labor and energy intensive, and removes biomass that could otherwise build healthy soil.

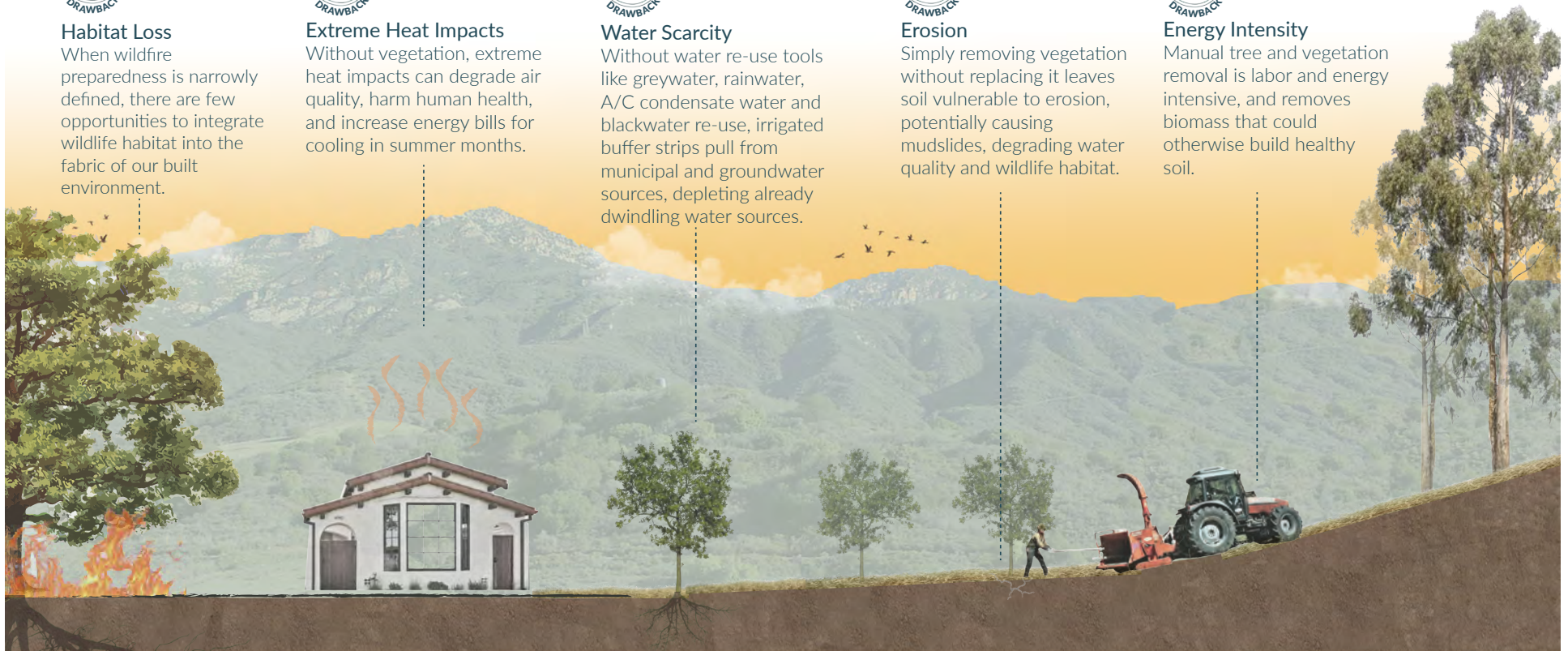


ILLUSTRATION: Drawbacks of Single-Benefit Design Approaches

Wildfire mitigation strategies that focus on single benefits exacerbate conditions that contribute to wildfire spread and intensity.

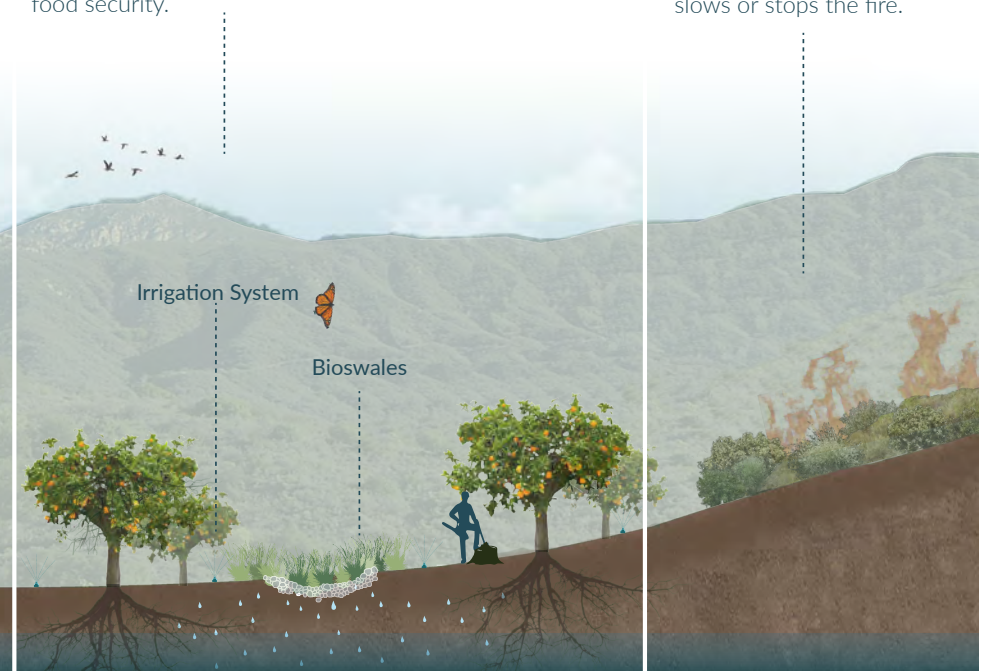
Greenbelts such as agricultural lands, shaded fuel breaks and other open spaces in the WUI can play a significant role in reducing wildfire hazards and damages to homes and communities by serving as strategic locations that help slow and decrease wildfire intensity. While these spaces in the WUI do burn, they serve as natural fuel breaks where wildfire intensity and speed are decreased by reduced fuel loads and increased soil moisture (19). We can increase resilience to wildfire through land management and land-use planning by creating buffers throughout the landscape that separate structures and wildlands, and by preserving the open space and agricultural buffers that already exist.

Native Oak Shaded Fuel Breaks reduce combustible fuel loads at parcel boundaries and provide additional shade that cools the landscape. **Riparian Corridor and Drainage Restoration Zones** capture and infiltrate stormwater, hydrating landscapes and recharging groundwater supplies. **Agricultural Buffer Zones** with fire-resistant crops build healthy soils and buffer nearby communities from elevated wildfire intensity. **Back Burnable Buffer Zones** can be used by firefighters as a safe space to counter approaching wildfires.

Native Oak Shaded Fuel Breaks placed strategically around the property keep the soil moist and cool. **Riparian and Drainage Zone Restoration** protects and restores natural hydrological function to the local landscape.



Rainwater/Greywater irrigated Agricultural Buffer Zones planted with fire-resistant trees create a fire buffer by keeping soil and plants moisture levels high, while providing food security.



Backburnable Zones provide firefighters with a safe space to start a "backfire" against wildfire, creating a firebelt that slows or stops the fire.

ILLUSTRATION: Multiple Benefits of Integrated, Holistic Wildfire Mitigation Strategies

Wildfire mitigation strategies that incorporate an integrated approach enhance climate resilience in landscapes and communities.

Wildfire Mitigation

Multiple benefits of integrated vegetation management strategies, and glossary of terms

Multiple Benefits



Shaded fuel breaks and buffer zones keep soils cool and moist, and when properly maintained help slow or stop approaching wildfires.



The restoration and maintenance of chaparral and coastal scrub habitat for wildfire resilience protects essential habitat for wildlife, increasing biodiversity.



Native plants, mulching and irrigating with gently reused or harvested water increase soil moisture and provide nutrients that increase soil health.



Many plants native to chaparral habitat attract pollinators like bees, and other insects and small animals that help sustain plant and ecosystem health.



Planted bioswales and restored riparian corridors and drainage zones capture and infiltrate stormwater, recharging precious groundwater supplies and rehydrating the landscape.



Fire-resistant fruit orchards provide food security, and production may help offset landscape maintenance costs.

Bioswale - A vegetated channel that collects, conveys, filters and infiltrates stormwater.

Climate Appropriate Plantings - Native and drought tolerant plant species which need low or no additional irrigation to survive.

Defensible Space - Buffers created between infrastructure on property and surrounding wildlands.

Fuel Break - A block of land in which flammable vegetation has been reduced or modified so that approaching fires can be readily and safely controlled.

Fuel Load - The amount of combustible material within a defined space.

Greywater Reuse - Gently used water from bathroom sinks, showers, and washing machines that can be used to irrigate plants.

Fire Home Hardening - Measures taken to reduce the vulnerability of homes and infrastructure to fire storms.

Rain Garden - A depressed area planted with native plants that captures, holds, and infiltrates stormwater.

Rainwater Harvesting - The collection and storage of rainwater for domestic use, irrigation, agriculture, and environmental management.

Targeted Grazing - Also known as Prescribed Herbivory, a wildfire management strategy that involves using livestock to graze on vegetation in targeted areas to reduce fuel loads.

Wildland Urban Interface (WUI) - An area where undeveloped forests, woodlands, and shrublands meet the built environment.

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