

2022 Summer Student Program

CALIFORNIA BURNING DESIGNING WITH FIRE

swa



California has become the epicenter of one of today's most critical climate change challenges — wildfire. As designers and planners of the built and natural environment, we are instrumental in protecting disaster-weary communities, recovering sites following wildfires, and designing new models for living in the state's increasingly fire-prone landscapes.

SWA's 2022 Summer Student Program gathered a select group of students in our Sausalito studio to closely investigate California's escalating wildfire crisis and design solutions for frontline communities. As we confront a new era of anthropogenic-driven megafires, new disciplinary approaches—both technical and ideological—are necessary to address this challenge.



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Introduction

Due to climate change and a complex legacy of misguided land management policies, catastrophic wildfire events have become one of the most significant resilience challenges in the western United States. In California, which has emerged as the epicenter of today's wildfire crisis, these perennial blazes have become an all-consuming dilemma.

California's ecosystems have co-evolved over millions of years with regular, periodic, low-intensity fires, which are critical to their long-term health and viability. However, beginning in the mid-19th century and continuing today, federal and state suppression policies aimed at excluding fire from these ecosystems have inadvertently created an artificial surplus of unburnt fuels in today's landscapes. For decades, scientific research has suggested that the risk of catastrophic wildfire events can be effectively reduced by restoring pre-colonial fire regimes to landscapes. However, given the degree to which these modern landscapes have been transfigured by human settlement, this is often impossible—especially in areas where the built environment comes into direct contact with wildfire-prone ecosystems.

Today, California's wildfire problem has been compounded by an ongoing development boom along the state's outermost metropolitan peripheries, where risk of exposure is highest. Much of this suburban, exurban, and rural development has been driven by a severe statewide housing shortage. This scarcity has pushed low-income communities further and further from urban cores into unincorporated zones where land values and housing costs are less prohibitive, but where access to employment and social services is often more limited. Since the start of the COVID-19 pandemic, these pressures have been further compounded by fear of exposure and the rapid adoption of remote work scenarios, which have triggered yet another wave of urban out-migration.

In order to meet the wildfire resilience challenges of today's edge communities, landscape architects, urban designers, and urban planners will have to develop new, hybrid approaches to fire that allow for its benefits while mitigating its risks. Unfortunately, unlike other major resilience

imperatives related to climate change, like coastal flooding and urban heat, there are relatively few examples of built projects that focus specifically on the challenges of wildfire. This is especially true at the community scale, since most of today's wildfire planning and design guidance is meant to either inform large-scale land use and resource management initiatives or guide parcel-scale architectural and landscape hardening design. This leaves a significant gap for innovative wildfire mitigation approaches at the scale of master plans for subdivisions, neighborhoods, campuses, resorts, and parks.

At SWA, our master plan projects within California's wildland-urban interface have been increasingly challenged by the risk and recovery from major wildfire events. These project sites require us to navigate a complex and quickly changing context of wildfire risk factors, legislation, and public response, all while still aiming to design highly livable and resilient settings. While SWA has continued to push the edge of wildfire design and planning, our projects, clients, and communities remain in critical need of bold and innovative proposals that challenge expected standards and create new paradigms for living with fire.

SWA Summer Student Program

For the past 50 years, SWA's summer student program has gathered emerging designers to explore critical contemporary design questions. Many participants have become leaders within the firm and the discipline.

Students exchange fresh ideas, knowledge, and perspectives. They collaborate and challenge each other. In many ways, SWA learns as much from the students as they learn from SWA.



Each year, SWA's summer student program introduces a talented group of landscape architecture, planning, and urban design students to the firm and practice. Led by SWA leaders throughout the firm, the students tackle issues of significant importance to SWA and our local communities.

The summer program affords students a world-class opportunity to engage on a project with individuals ranging from distinguished design professionals to public officials, local stakeholders, and community members.

In 2022, students spent four weeks in the Sausalito studio focused on the collective design problem of wildfire planning and design. Following the four-week studio, each student dispersed to one of the seven SWA studios for an office-based internship focused on ongoing client projects.

2022 Summer Studio Project Brief

Through this intensive four-week studio program, students were asked to propose **research-driven, community-scale design and planning strategies to address critical development challenges while simultaneously mitigating wildfire risks.**

Projects were informed by (and negotiated the tensions between) a web of connected issues and topics, including land use planning, affordable housing, environmental conservation, indigenous sovereignty, climate change, and more.

While the design and planning proposals were focused on the project site of the Sonoma Developmental Center, the underlying approaches are transferable to other fire-prone communities throughout California and beyond.

WEEK 1: RESEARCH
JUNE 6 - 10
THEMES & GOALS

- Visit a range of sites along a transect of wildfire conditions and consequences, including the studio site at the Sonoma Developmental Center
- Establish a baseline understanding of key issues, ideas, and resources related to wildfire design and planning

WEEK 2: SITE
JUNE 13 - 17
THEMES & GOALS

- Establish a baseline understanding of the Sonoma Developmental Center's existing community context and site conditions
- Propose a site plan to address the site's major wildfire planning and design needs and challenges

WEEK 3: DETAIL
JUNE 20 - 24
THEMES & GOALS

- Develop detailed and innovative wildfire design and planning proposals—at the human scale—based on the central themes and narratives you developed **with your site plan**

WEEK 4: DEPTH
JUNE 27 - JULY 1
THEMES & GOALS

- Layer, add, improve, and expand upon your proposal and deliverables developed in the first three weeks of the program
- Collectively develop a final group presentation





2022 Summer Students

Eight students from eight universities, each with their own distinct story and approach to landscape thinking and design, bringing together diverse backgrounds in architecture, economics, geographic information systems, horticulture, land management, and landscape architecture.

Their collective knowledge formed a collage of local understanding and global perspectives; of specialist expertise and generalist methodology; and of design creation and planning analysis. Together, they collaborated in a concentrated effort to investigate the intersection of landscape design and the problem of wildfire.

2022 Summer Students



Harrison Raine
University of California, Berkeley
I grew up on the outskirts of Los Angeles County, a place where development occurs everywhere it can and open space only finds refuge in the city's rugged fringes. I fell hard for the Santa Monica Mountains' steep slopes and the gradients of natural and urban systems. When they sporadically burned during fire season, it was always chaos. Impressed by those scary moments, I started working as a wildland firefighter for the US Forest Service during my first year at Colorado College. I continued this work while pursuing a BA in Organismal Biology and Ecology, where I emphasized in fire ecology. Following graduation, I received a Thomas J. Watson Fellowship and studied social and ecological systems around wildfire in seven countries. I traveled to Canada, Greece, Spain, Portugal, the UK, South Africa, and Australia to understand proactive approaches to wildfire complexities. The findings from this experience led me to pursue dual master's degrees in city planning and landscape architecture and environmental planning at UC Berkeley.

The summer program at SWA was truly exciting to me, as it signaled an entire discipline's interest in addressing one of the most complex resilience problems of our time and region.



Jin Zhang
University of California, Los Angeles
Having studied labor and capital structures at UC Davis, I graduated with degrees in economics and international relations with the intent to work in the entrepreneurship and economic development space. A few years into my tenure, however, I became more and more drawn towards spaces that center local and spatial decision making, as unjust institutions and climate hazards wreaked increasing havoc on communities I care about. I explored ways to serve these communities more directly, by helping local organizing groups build coalitions and advising city tenants on their housing rights amid moratorium expiration dates and fears of displacement.

Today, I attend UCLA's Master of Urban and Regional Planning program with dual concentrations in environmental analysis and policy and urban design. Both challenging and inspiring, SWA's Summer Burning Program has furthered my a sense of urgency around the work that needs to be done around climate change, land use, and affordable housing, and greatly affirmed my choice to become a professional who plans and designs for climate change and social equity.



Luis Mota
University of Southern California
I am a Master of Landscape Architecture + Urbanism student and research associate at the University of Southern California's School of Architecture. Prior to my time at USC, I received my B.A. from the University of Pennsylvania and worked as a Research Associate at the Huntington-USC Institute on California and the West. I currently hold research positions at USC's Institute for Creative Technologies, Spatial Sciences Institute & Landscape Futures Lab. In 2022, I was an invited scholar to Dumbarton Oaks' Summer Graduate Workshop in Washington DC and was awarded the Landscape Architecture Foundation's Daniel Zwier Innovation Scholarship.

A native Angeleno, I seek to understand how nuanced and complex spaces across scales of inquiry can be designed to be more inclusive places through a praxis comprised of critical spatial and ethnographic methodologies, participatory design strategies, historic archival research, and the development of robust geospatial models to drive design and spur creative imagination.



Michele Totoy
Politecnico di Milano
Being born in the middle of the world in Quito, Ecuador surrounded by the scenery and colorful architectural patrimony of the Andes, I have always been passionate about landscape and design. After moving to the US, I obtained a Bachelor of Architecture at the University of Houston. During my time studying abroad, I was inspired by beautiful French gardens and continued my education at the École Nationale Supérieure de Paysage. After completing my first master's degree, I learned how to read and understand landscape in a more sensible way. I spent time working and living in France, which allowed to appreciate the importance of historical landscapes, patrimony, and a walkable city. Still hungry for more knowledge, I moved to Milan to pursue a new Master of Sustainable Architecture and Landscape Design degree at the Politecnico di Milano. This degree has finally allowed me to combine my passion for architecture with landscape. By living in Italy, once again I have been exposed to different scenery and a landscape that is a source of local pride. I am able to admire the deep connection of people to their land, and their deep-rooted landscape history.

I am very excited to be part of SWA and learn from the firm's many projects, which continue to shape cities and lives around the world.



Slide Kelly
Harvard University
Growing up in Morrison, Colorado, I developed a love and interest in natural places like Red Rocks Amphitheater, which had been made meaningful and habitable through thoughtful planning and design. I first translated that interest into career as a GIS Specialist and Cartographer for the Continental Divide Trail Coalition, the managing partner organization of the Continental Divide National Scenic Trail. Working with federal, local, and private partners on a 3,100-mile trail from Mexico to Canada, I witnessed how landscape strategies at large scales could have an impact in shaping how disparate communities across the Rocky Mountains come together around issues of identity, recreation, and environmental challenges.

This experience led me to pursue a graduate degree in design research focused on integrating my GIS and design skills to tackle issues of environmental risk and resilience. Through design research, I gained an appreciation of the ability of physical design to address the issues I was interested in. The SWA Summer Student Program's emphasis on living with wildfire was the perfect opportunity for me to connect my research interests with tactical design, and produce meaningful proposals for impacted communities.



Tejas Saiyya
University of Michigan
After graduating with a Professional Bachelors in Architecture from India, I practiced, taught, and researched for three years. I realized the strength of paradigms in interdisciplinary sustainable theories and practices of urbanism, landscape, and architecture. This coaxed me towards my Masters of Urban Design at the University of Michigan. Here, I engage in various forms of resilient investigation, and contribute to exploring varied contexts beyond the studios, probing the broader context, and drawing new narratives to advance my research interests. I am passionate about fostering pathways that synergize a thoughtful and provocative design process to challenge concepts of sustainability within the built environment.

The experience at SWA has helped me to ground problems into reality, form trajectories, and create gestures across landscape and allied disciplines for an alternative future, ranging across scales. Furthermore, it allowed me to explore how these discussions constructively address the infrastructural, technological, social, cultural, political, and economic aspects of planning and design.



Xinyi (Sydnie) Zhang
University of Pennsylvania
As a designer, I always seem to lean towards nostalgia, hoping to find a homeland where memory retains, and people could rest in reassurance. My undergraduate studies at Beijing Forestry University laid a solid foundation in botany, ecology, and architectural design while strengthening my determination to continue exploration in this field. During my undergraduate education, I joined several academic projects and I worked with professors and communities to solve practical design issues. These experiences allowed me to look at things more deeply and dialectically, and supported my communication and cooperation abilities. My studies at UPenn offer me a new perspective on landscape architecture, enabling me to understand the nature of design in a multi-disciplinary manner and to uncover the possibilities of landscape development in different fields, such as politics, humanities, and ecology.

SWA Group impressed upon me the possibility of landscape architecture becoming the core of projects at all scales and the responsibility of a landscape architect. It has become a meta-discipline that guides other disciplines.



Yuanqing Su
University of Illinois at Urbana-Champaign
I was born and raised in China and received my bachelor's degree in horticulture in 2019 from Southwest University in Chongqing. Currently, I am enrolled in a two-year Master of Landscape Architecture program at the University of Illinois at Urbana-Champaign. I am interested in solutions for our communities and cities through landscape architecture methodologies. Our cities are complex aggregates of ecology, culture, human history, and politics, and I continue to be amazed by their interrelated functionalities and by innovative responses to their challenges.

During the SWA Summer Student Program, I learned a lot from my peers and tutors in SWA. I was impressed by the firm's both practical and advanced processes and now have a deeper understanding of SWA's slogan: "Designing for a Livable World."



Research

How does wildfire spatially interact with social, environmental, economic, and infrastructural systems? How can leading research be translated into spatial strategies applicable to designers and planners? What were the major innovations, successes, challenges, and lessons learned from significant wildfire planning and design projects?

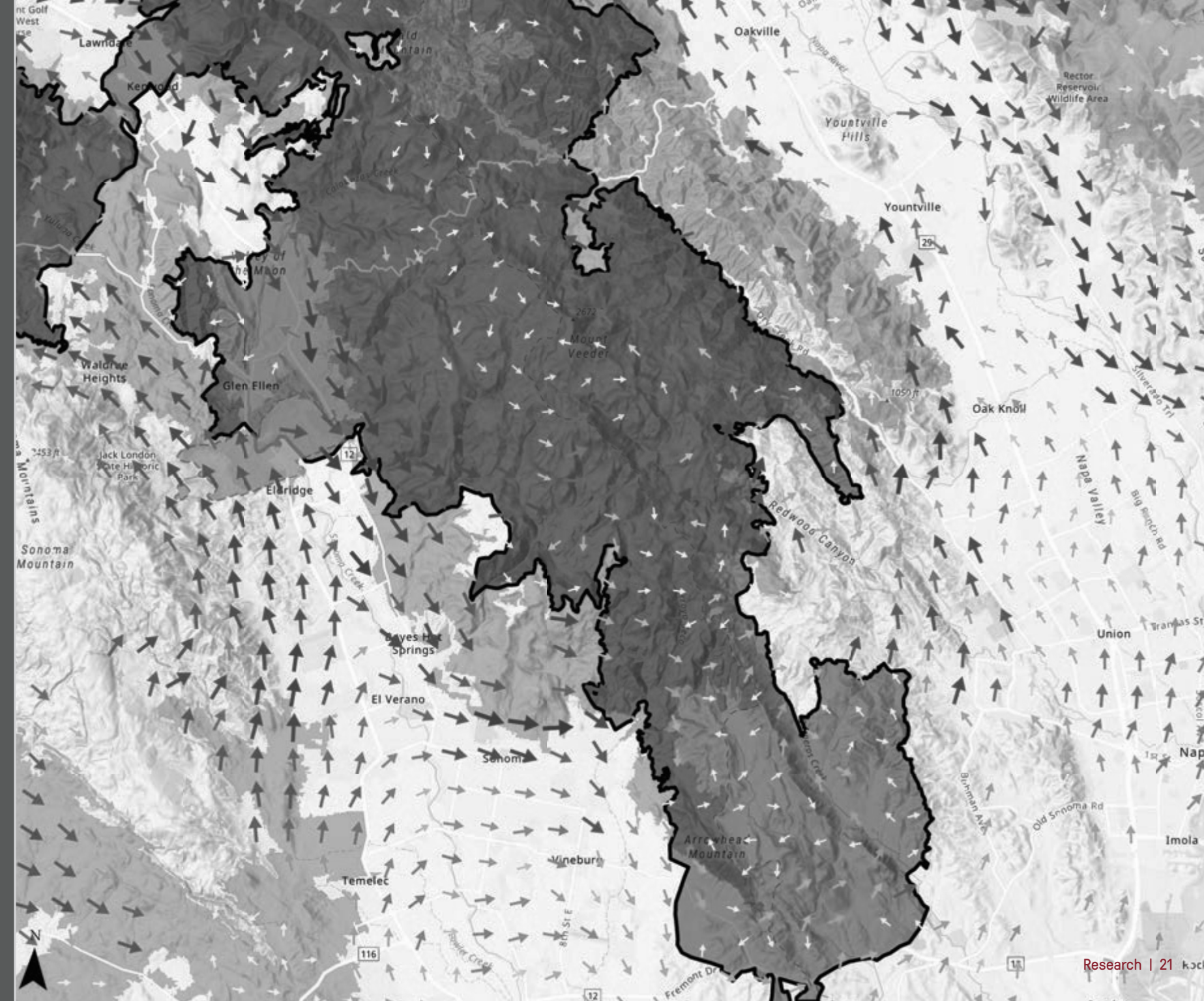
The program posed these and other research questions in order to quickly and collectively establish a baseline understanding of key issues, ideas, and resources related to wildfire planning and design.



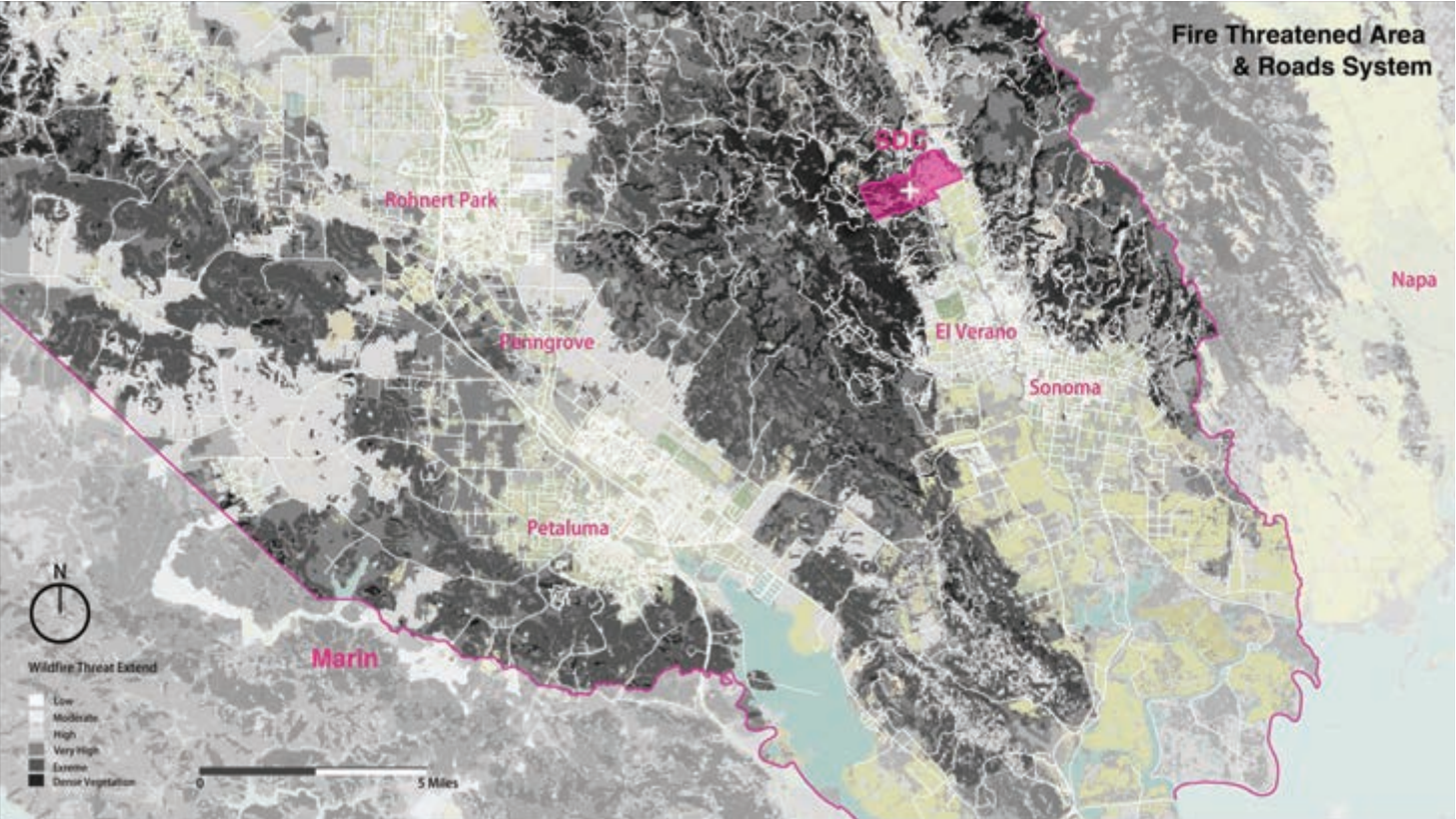
Mapping the Wildfire Dilemma

Wildfires do not occur in a vacuum; their impacts reverberate throughout social, environmental, economic, and infrastructural systems. Many of these intersections occur at landscape, community, or even regional scales. Maps and overlays of wildfires can illuminate spatial relationships or patterns that disappear at ground-level.

In this exercise, students combed historic archives and GIS databases to reveal coupled interactions between wildfire and another contextual system. Working at multiple scales, students diagnosed potential problems or opportunities and leveraged their findings into initial design considerations.

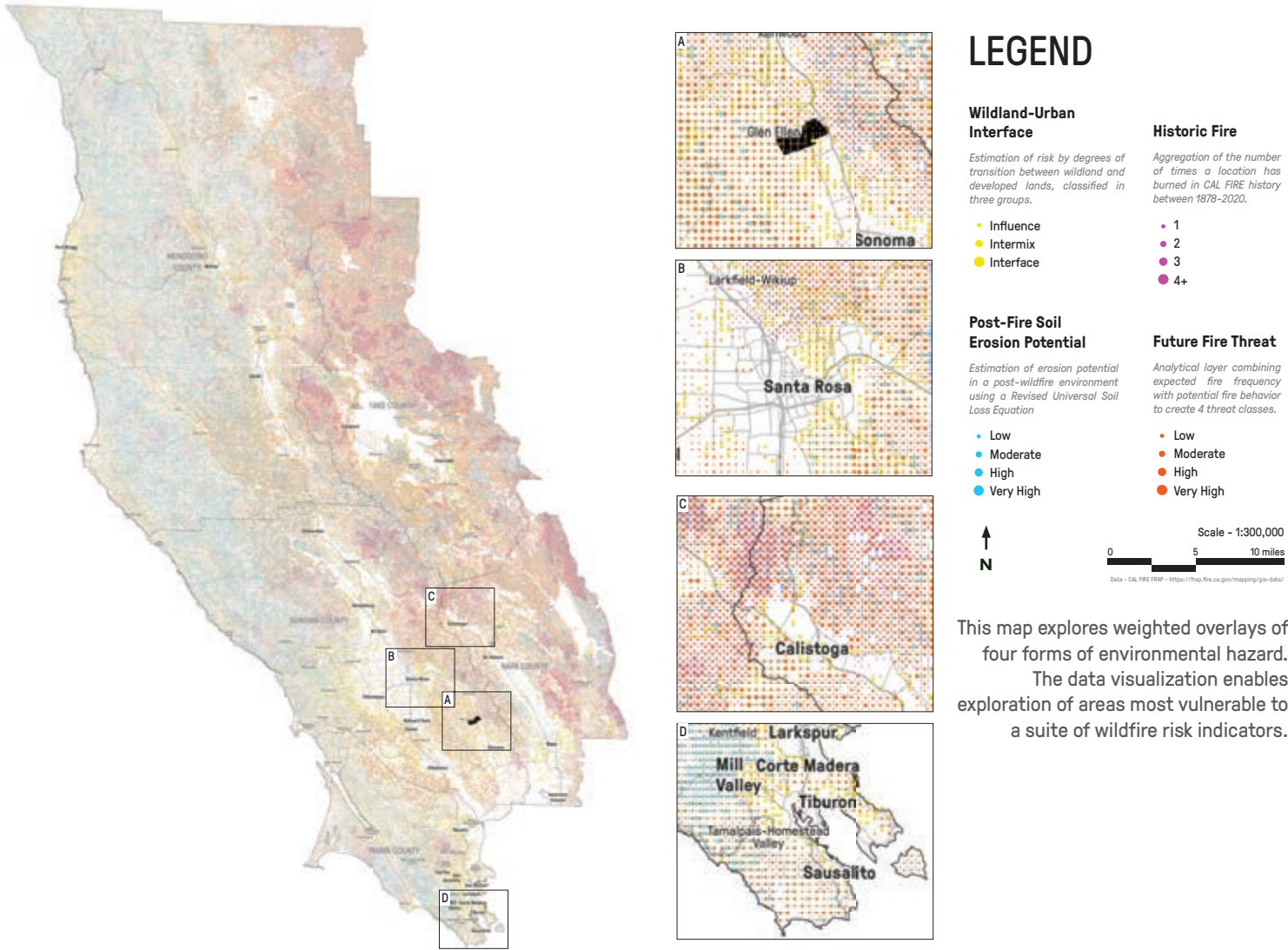


Fire Threatened Areas and Road Systems
Yuanqing Su



Roads are critical infrastructure for fighting wildfires. This map overlays Sonoma County’s road system with mapped fire hazard severity zones. Areas of high fire hazard severity and low road continuity signal potentially dangerous areas.

Interpreting Vulnerability Profiles from Multiple Indicators of Wildfire Risk
Slide Kelly



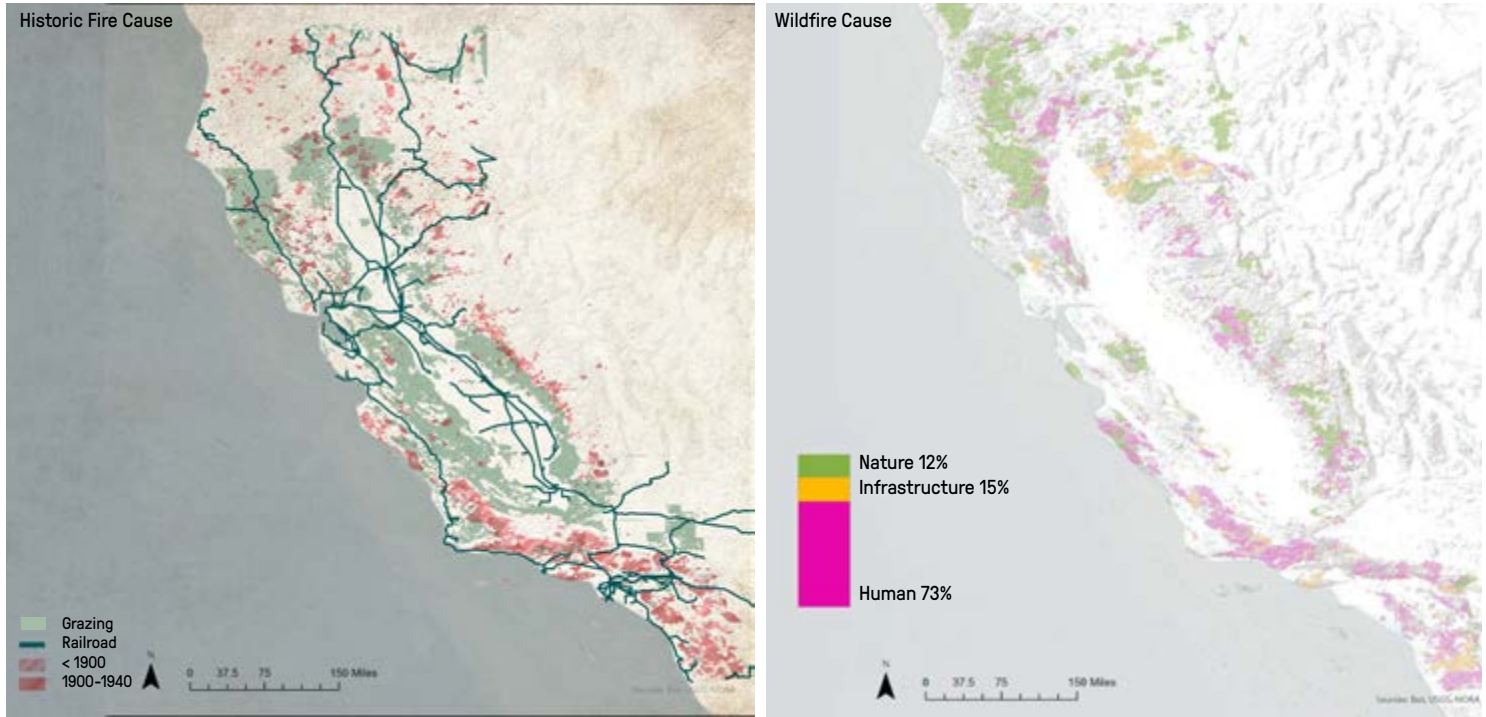
This map explores weighted overlays of four forms of environmental hazard. The data visualization enables exploration of areas most vulnerable to a suite of wildfire risk indicators.

Historic Landscape
Michele Totoy



Suppression of indigenous land stewardship removed fire from the landscape and drastically altered ecosystems. To understand this change, historical maps and depictions of Sonoma mountain ranges and landscapes were overlaid on a current aerial plan.

What Causes Wildfire?
Xinyi Zhang



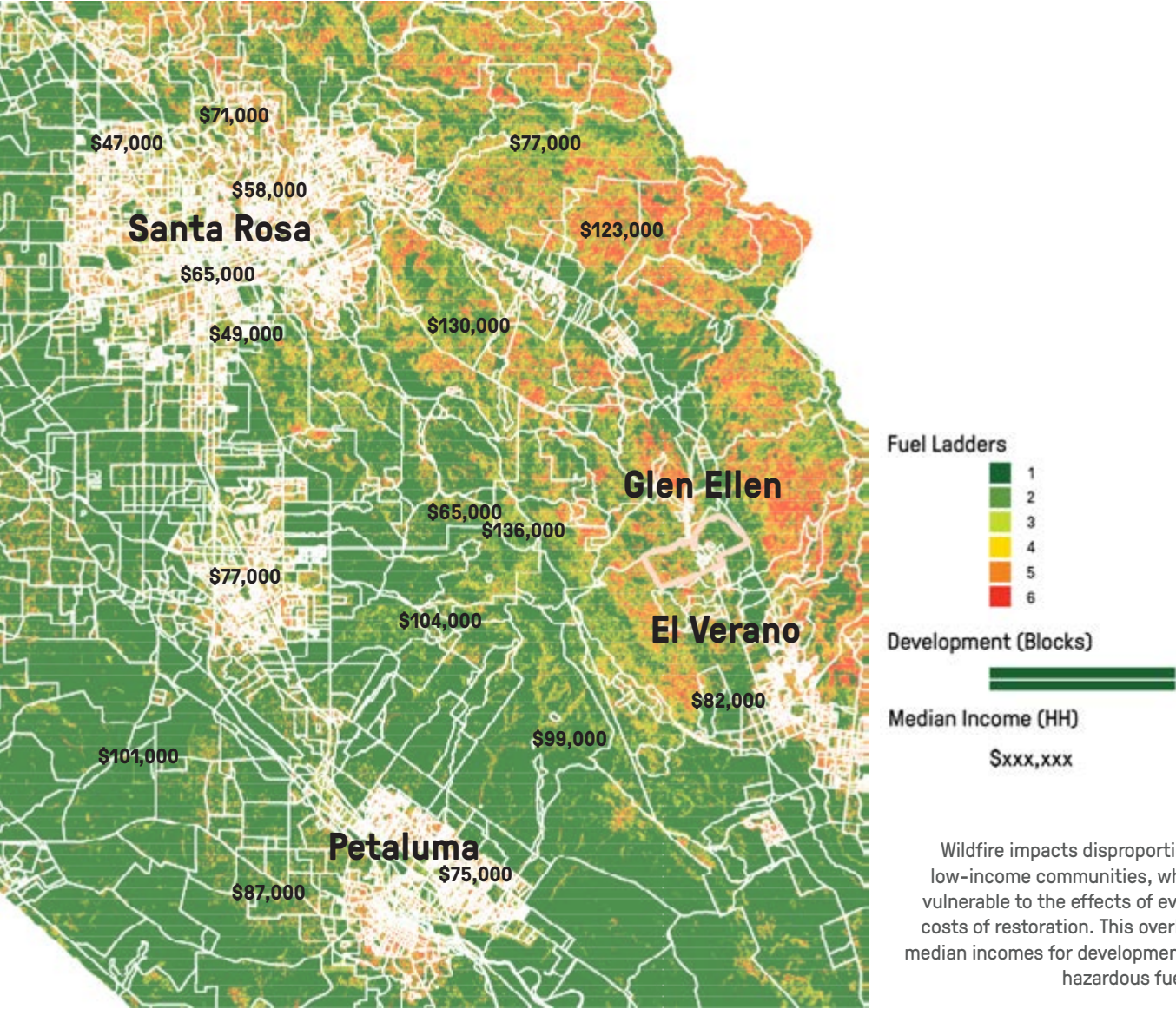
These two maps illustrate two different contributors to current wildfire trends. The first identifies areas of historic fires and grazing, which may contribute to decreased heterogeneity of vegetation across the landscape. The second communicates the high proportion of human-caused ignitions.

Wildfire & Contextual Ecologies
Tejas Saiyya



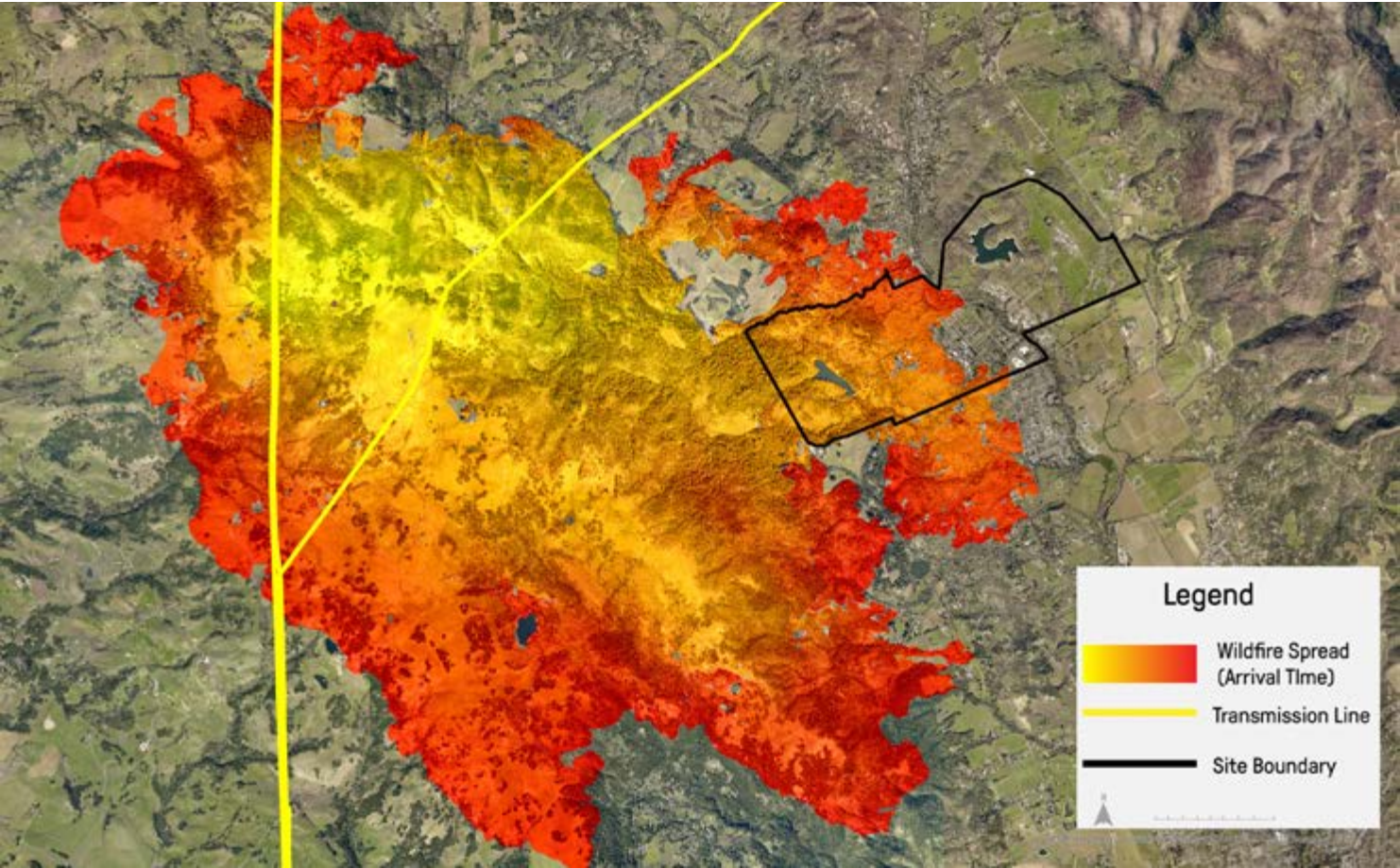
Severely burnt landscapes can take decades to recover, and wildfires move without regard for intrinsically valuable areas. This map overlays sensitive habitat and scenic landscapes to visualize where values are already impacted, and where opportunities are located.

Examining Environmental & Social Vulnerabilities
Jin Zhang



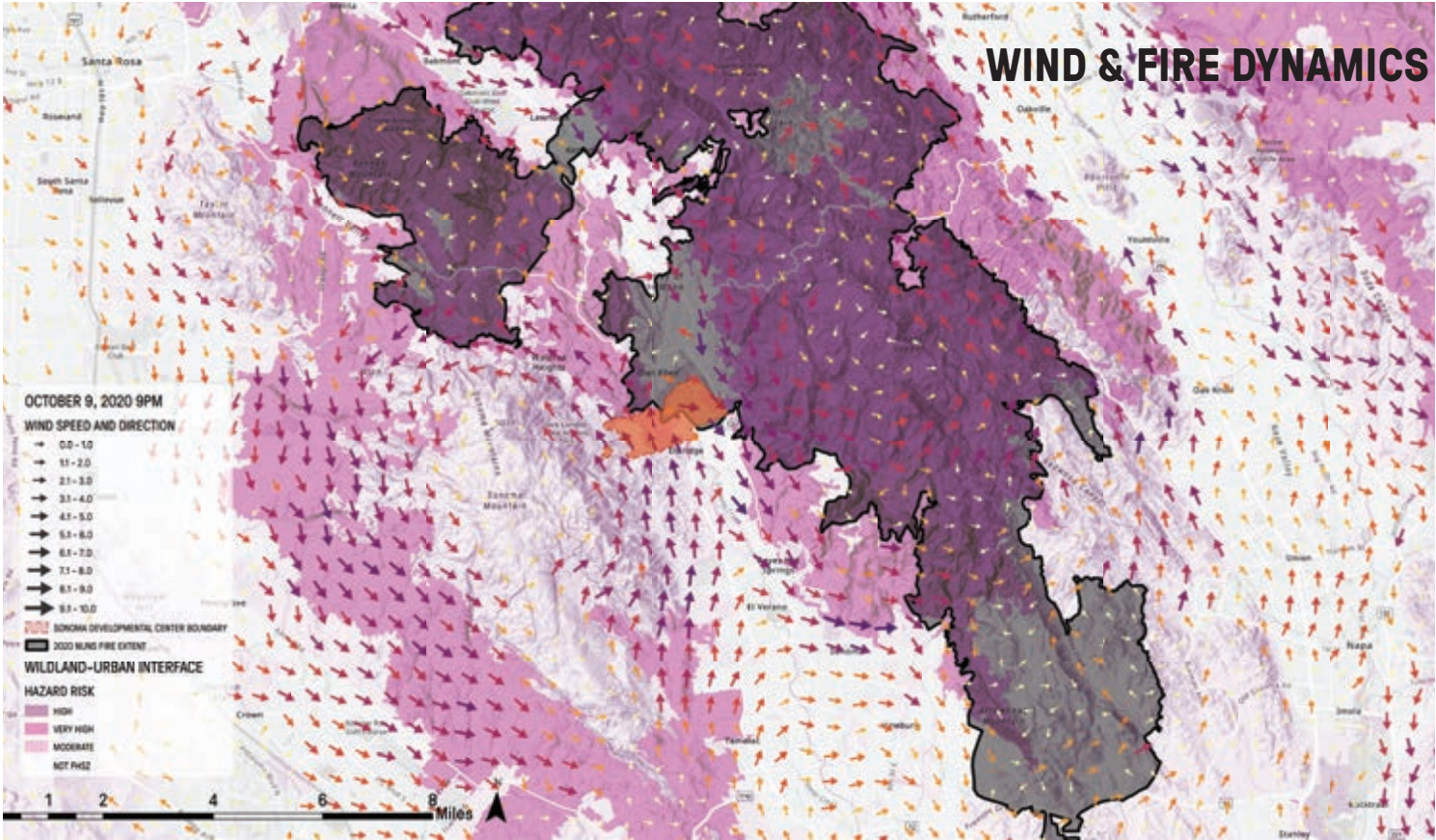
Wildfire impacts disproportionately harm low-income communities, which are more vulnerable to the effects of evacuation and costs of restoration. This overlay compares median incomes for development blocks with hazardous fuel conditions.

Modeling A Transmission Line Induced Wildfire
Harrison Raine



The combination of outdated transmission lines and extreme wind events create the potential for extremely dangerous fire conditions. This map uses FlamMap, a modeling software, to simulate how a downed transmission line might spread to the Sonoma Developmental Center.

Understanding Fire and Wind Dynamics
Luis Mota



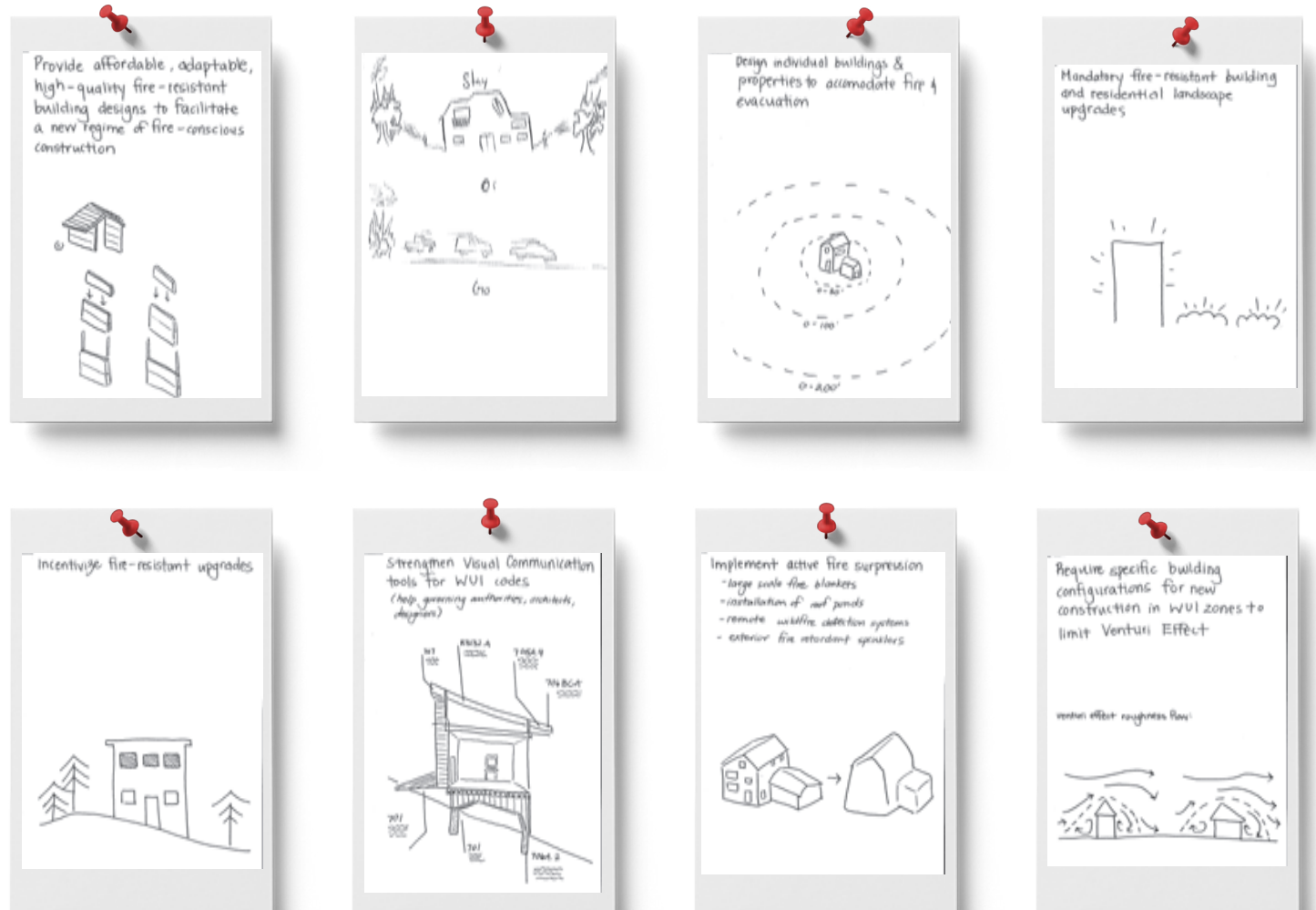
Wind drives wildfire spread and carries smoke from prescribed fire. Understanding wind conditions on site is important to predicting risk and management opportunities. This map uses WindNinja to visualize wind conditions from the 2017 Nuns Fire.

Catalog of Spatial Wildfire Strategies

As wildfires have exploded, so have the resources and research regarding their solutions. However, there is little consolidation this information's applicability to design and planning practice. Most of the existing guidance heavily emphasizes parcel-level action and generally omits wildfire strategies at neighborhood scales.

In this exercise, students canvassed existing wildfire resources—scientific publications, planning reports, landscaping guidelines, critical commentary, and professional presentations—to derive a list of applicable strategies for landscape designers and planners across multiple scales.

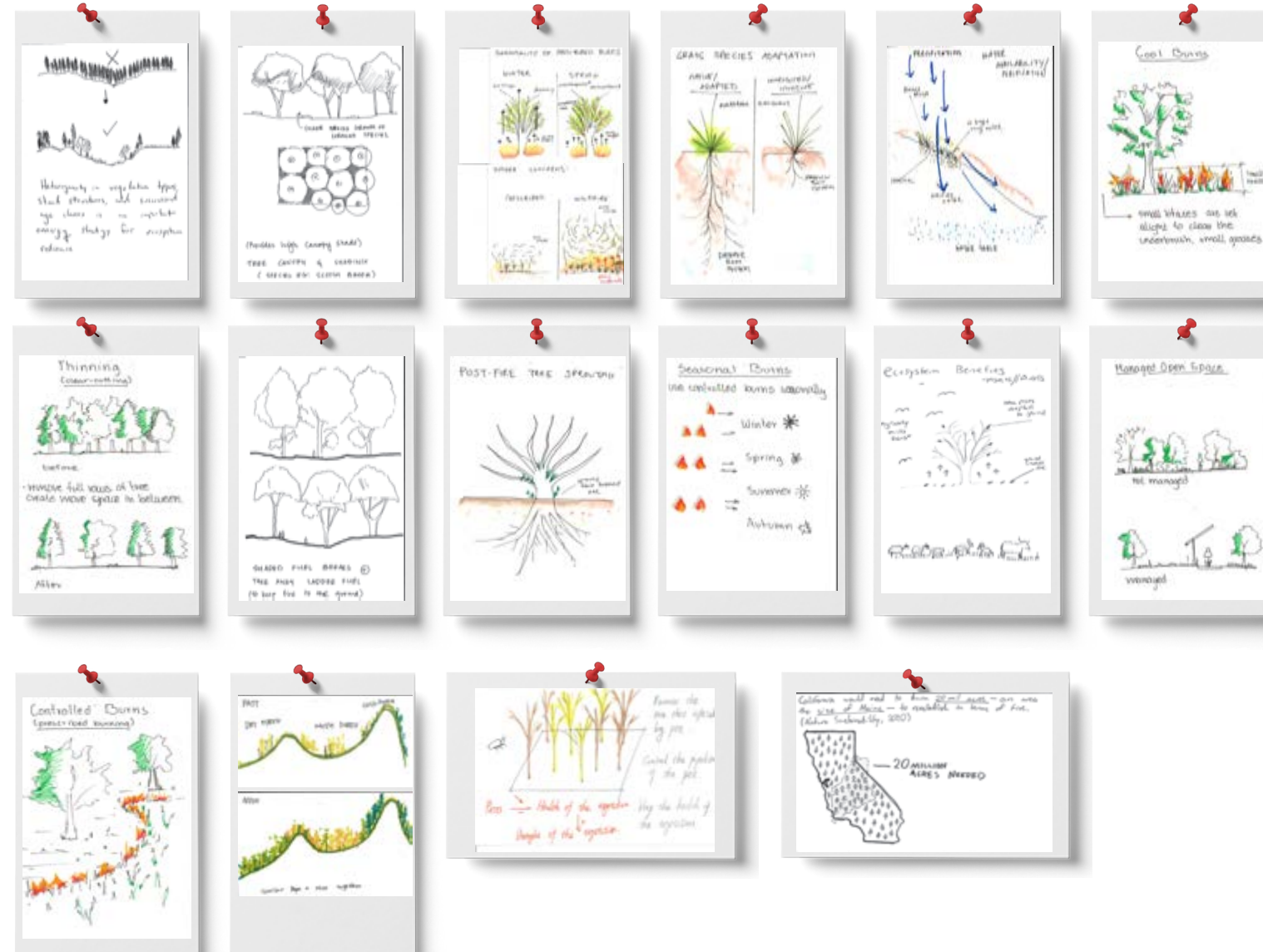
PARCEL SCALE



NEIGHBORHOOD SCALE



LANDSCAPE SCALE



Community-Scale Case Studies

Across California, designers and planners are employing a range of strategies to protect people and homes against the possibility of wildfire.

In this exercise, students interviewed managers from eight different development projects to understand the realities of wildfire design. Aimed at unearthing the intricacies of strategic decision-making, students' questions ranged from state-level regulation down to processes of site-specific fire ecology.

Following distillation of their conversations, students presented on major findings such as primary challenges, client influence, and major lessons learned.



Site: **Kenwood Ranch**
Firm: **SWA Group**
Strategy: **Defensible space and planting design**



Site: **Esencia**
Firm: **SWA Group**
Strategy: **Wildfire buffers and community design**



Site: **Maha Guenoc Valley**
Firm: **SWA Group**
Strategy: **Landscape management and emergency preparedness**



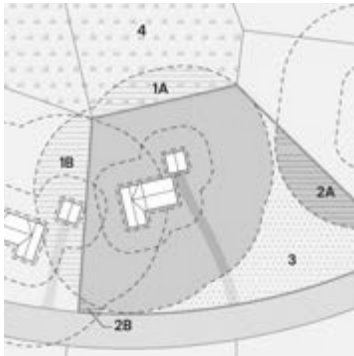
Site: **Thousand Oaks Urban Forestry Plan**
Firm: **SWA Group**
Strategy: **Resilient living infrastructure**



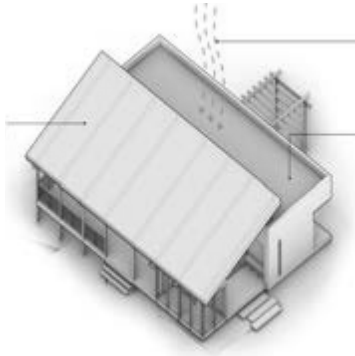
Site: **Mariposa County Resilience Plan**
Firm: **DesignWorkshop**
Strategy: **Dual recreation and resilience trail system**



Site: **Turkey Mountain Master Plan**
Firm: **Michael Van Valkenburgh Associates**
Strategy: **Ecological mosaic**



Site: **Sustainable Defensible Space**
Firm: **RIOS**
Strategy: **Homeowner engagement tools**



Site: **Pepperwood Preserve**
Firm: **Mithun**
Strategy: **Resilient rebuild and prescribed fire**

Site





The Sonoma Developmental Center (SDC) predates development in most of Sonoma County. The diverse and beautiful landscape, relatively large quantities of water, and accessible location made this site attractive for one of the area’s first large institutions; it remains a highly desirable site today.

The main campus center includes nearly 300 buildings—now almost entirely empty—that were once used as housing, schools, stores, barns, and more. The surrounding open space included recreational fields and trails as well as agricultural pastures and gardens. Two reservoirs provide on-site water needs. The more natural areas are characterized by a mix of riparian corridors, grassy oak woodlands, and conifer pine forests. In many ways, the site is a small city unto itself.

The 2017 Northern California Firestorm burned portions of the site, resulting in a mass evacuation of its few remaining staff and patients. The following year, in 2018, the State of California closed the SDC and partnered with Sonoma County to create a new vision for the campus and its landscape: one that acknowledges its history, the pressures of the present, and the climatic challenges of the future.

The vision of the State and County is to create a vibrant, mixed-use community that emphasizes local history, open space, sense of place, and climate resilience. The development of a reinvigorated community represents a multitude of opportunities. Preservation of certain historical assets recognizes the struggles of those afflicted by the site’s legacy. Construction of a range of housing types helps alleviate the region’s rising housing pressure. Maintenance of open space secures the Sonoma Valley Wildlife Corridor and

recreation. Fostering a sense of place redefines the community’s connection to the site. Design for climate resilience will showcase the site as a transformative community.

These goals will be captured in a Specific Plan—expected to be completed in late 2022—that defines the future of the site. This plan will address the SDC’s key issues, including housing and building uses, land uses, transportation, economic viability, historic preservation, and conservation of the site’s important natural resources. Although this plan will create a framework for future development, the exact layout, designs, and program for the site are still to be determined.

However the site is redesigned and redeveloped, the community aspires to an overall goal of transforming the former institution into a community hub for all of Sonoma Valley’s residents.

Site Visit



History

The site of the Sonoma Developmental Center has been inhabited by humans for over 11,000 years. Before California incursion, the Wappo, Pomo, and Miwok people have all at some time claimed or controlled this site. Suppression of indigenous people by Europeans transitioned the site’s land use from stewardship practices to resource extraction.

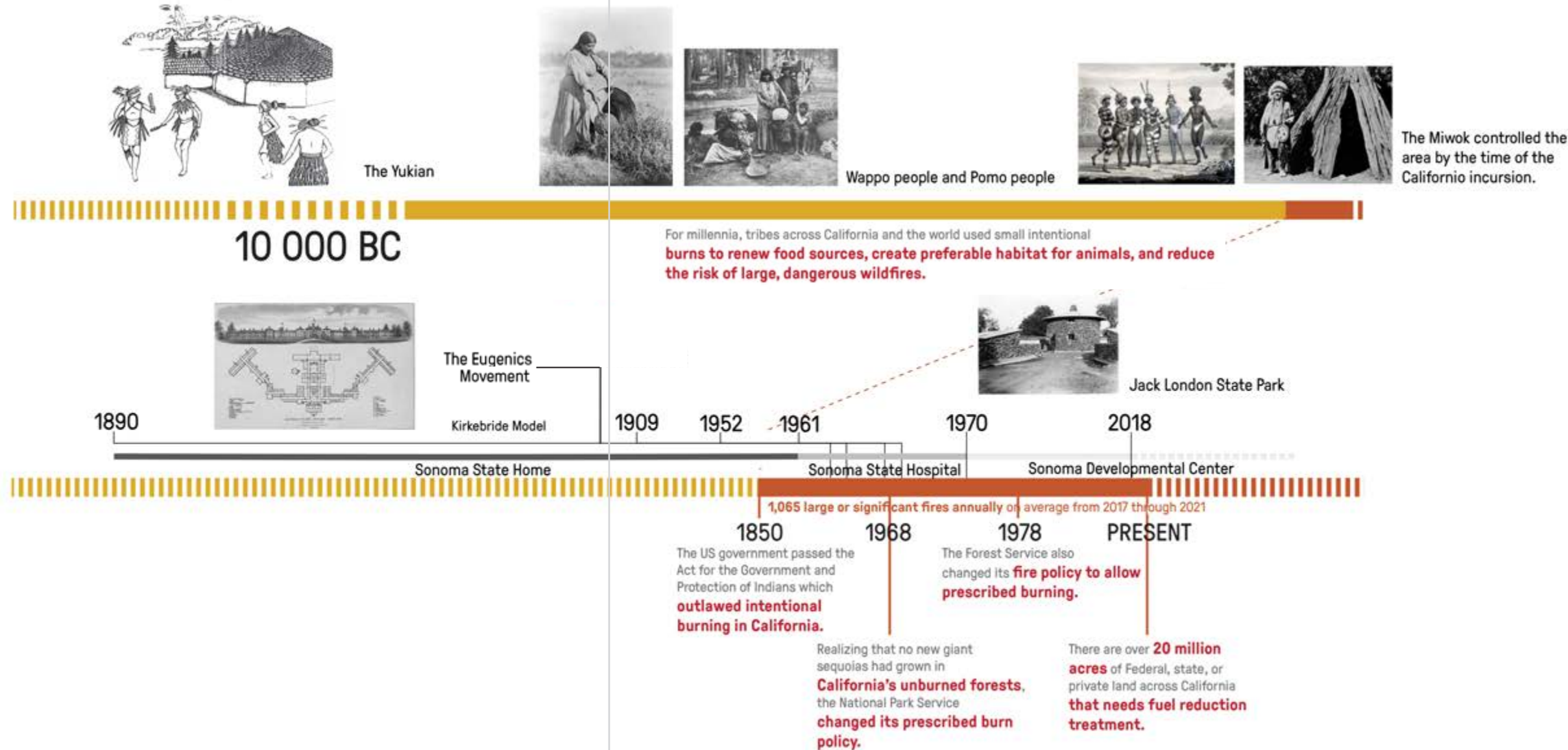
In 1889, the State of California purchased the land in Sonoma Valley and opened a school for children with developmental disabilities. The institution soon began to also serve adults with developmental disabilities and also physically expanded to include facilities for housing, schooling, and training.

The eugenics movement in the early 1900s significantly impacted the institution. A total of 5,530 residents were involuntarily sterilized between 1909 and 1952.

The institution was renamed as Sonoma State Hospital in 1961 and, along with that name change, became more focused on medicinal care, with more hospital-oriented buildings and trainings.

The facility was renamed the Sonoma Developmental Center in 1986. It provided housing and eduction to residents until the State of California closed the SDC in 2018.

SDC & Fire History Timeline



Regional Setting

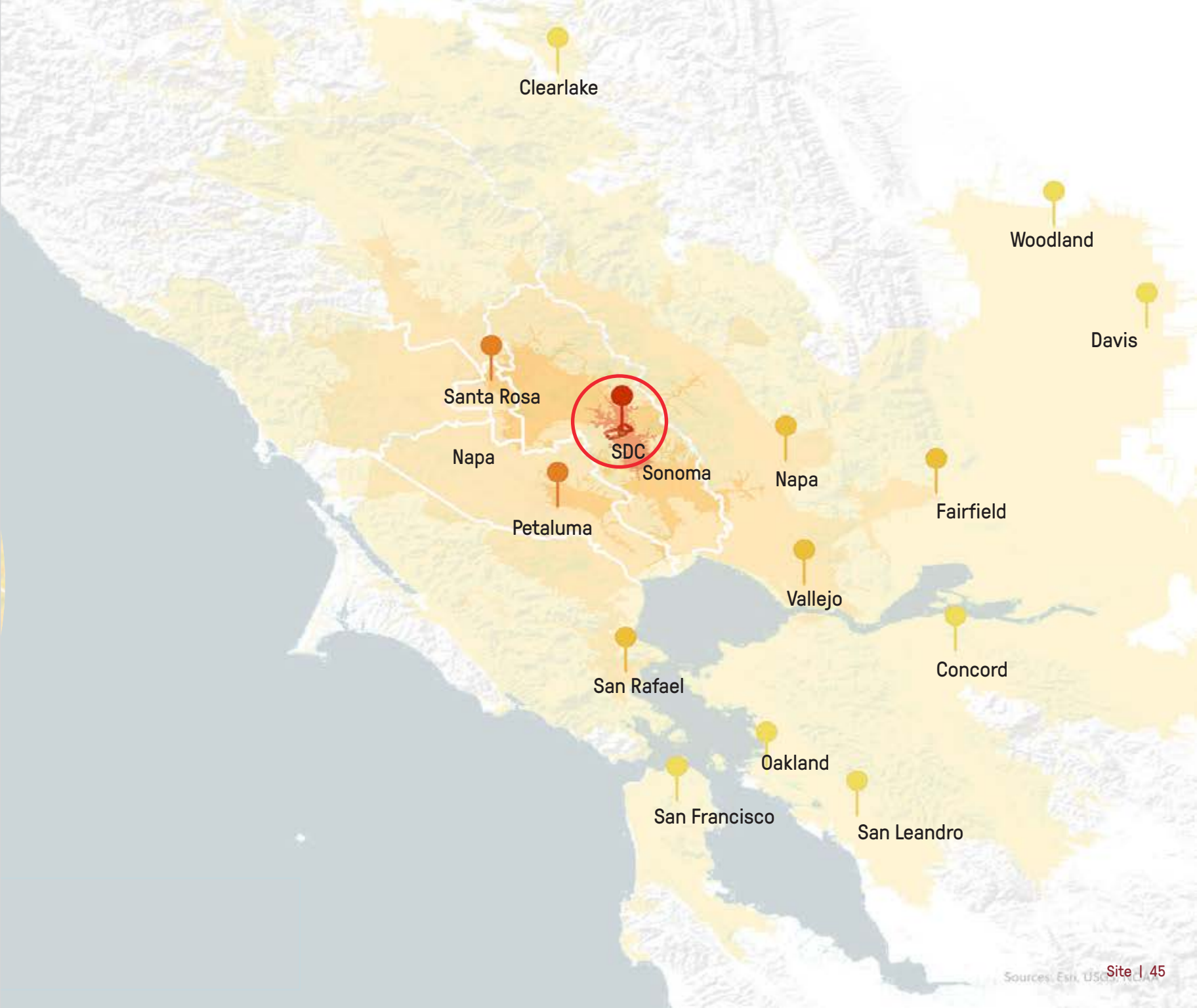
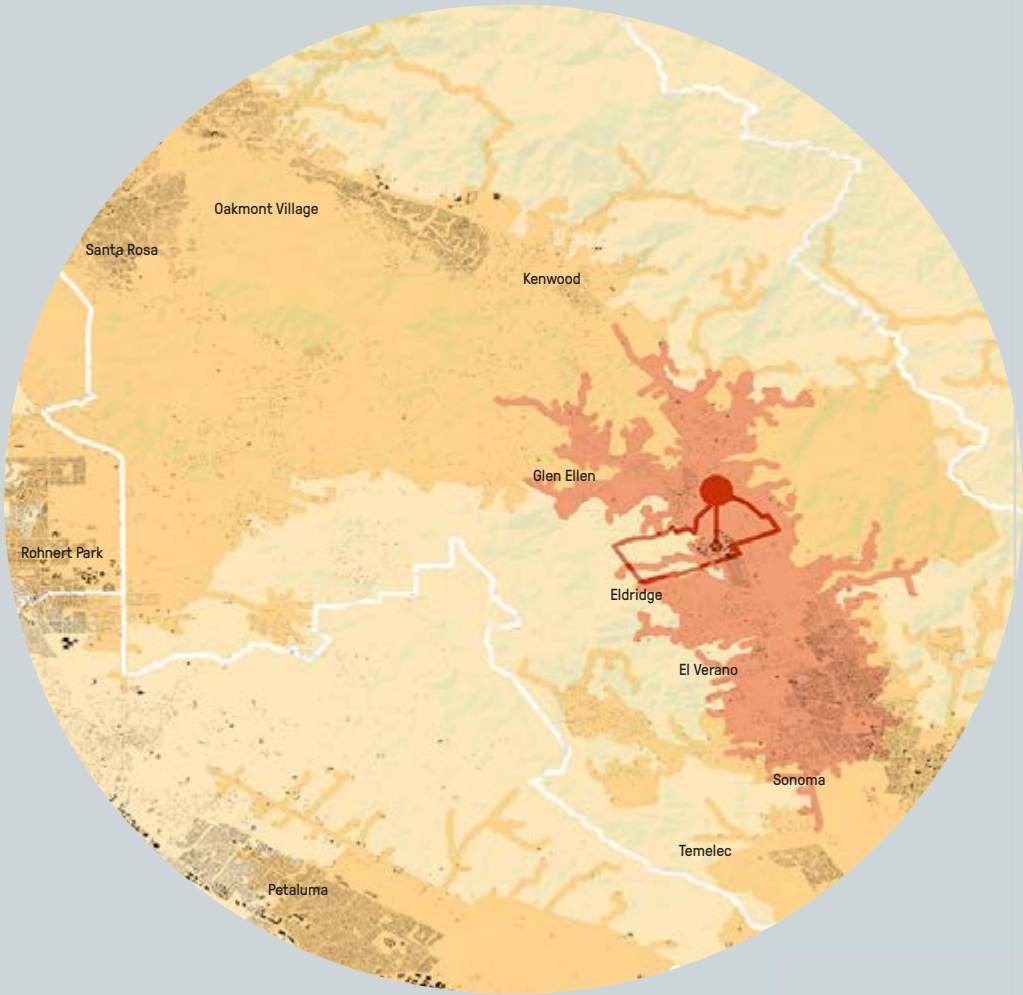
The SDC site is located in the heart of the Sonoma Valley region of southern Sonoma County, between the unincorporated communities of Glen Ellen and Eldridge.

Sonoma Valley, renowned for its wine making, is situated between the Mayacamas Mountains to the east and the Sonoma Range to the west. The Valley is bookended by the historic City of Sonoma to the south and the rapidly growing City of Santa Rosa to the north. These urban centers accent the Valley’s historic character and tourism as well as provide the majority of the agricultural workforce behind its many wineries and vineyards.

The Valley’s wide diversity of landscapes and microclimates make it a highly attractive destination to live and retire. Small rural communities and hamlets define the stretch of the Valley between Sonoma and Santa Rosa. The SDC site predates many of the existing development and occupies one of the most beautiful and centrally located settings in the Valley.

Legend

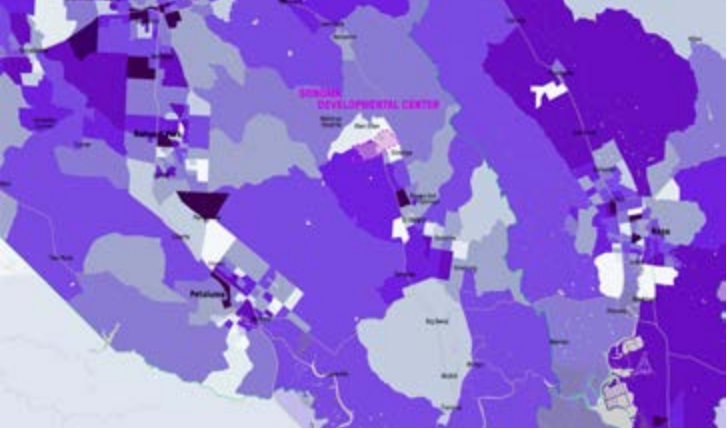
- Community
- 120 min drive distance
- 60 min drive distance
- 30 min drive distance
- 10 min drive distance
- Site Boundary
- Building



Community Context

The area surrounding the SDC site presents a diversity of communities and needs. While some neighborhoods are predominately White, with higher incomes and property values, other neighborhoods are more likely to include significant Hispanic populations that are rent-burdened and social vulnerable.

Across many of these communities, a common aspiration for the SDC site is to transform the former institution into a community hub for all of Sonoma Valley’s residents.



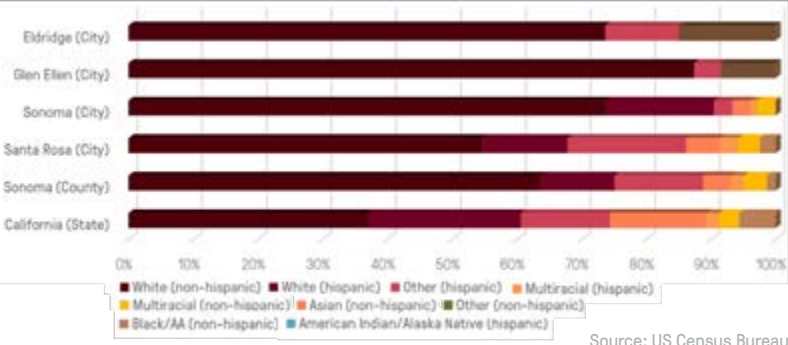
Disabilities

There are over 10,000 people living with developmental disabilities in Sonoma County. Lack of affordable housing is a key barrier to people with developmental disabilities that prefer independent or supported living settings.

Source: US Census Bureau, Bay Conservation and Development Commission

Racial Composition

The areas surrounding the SDC site are predominately White, but with significant populations of Hispanic communities.

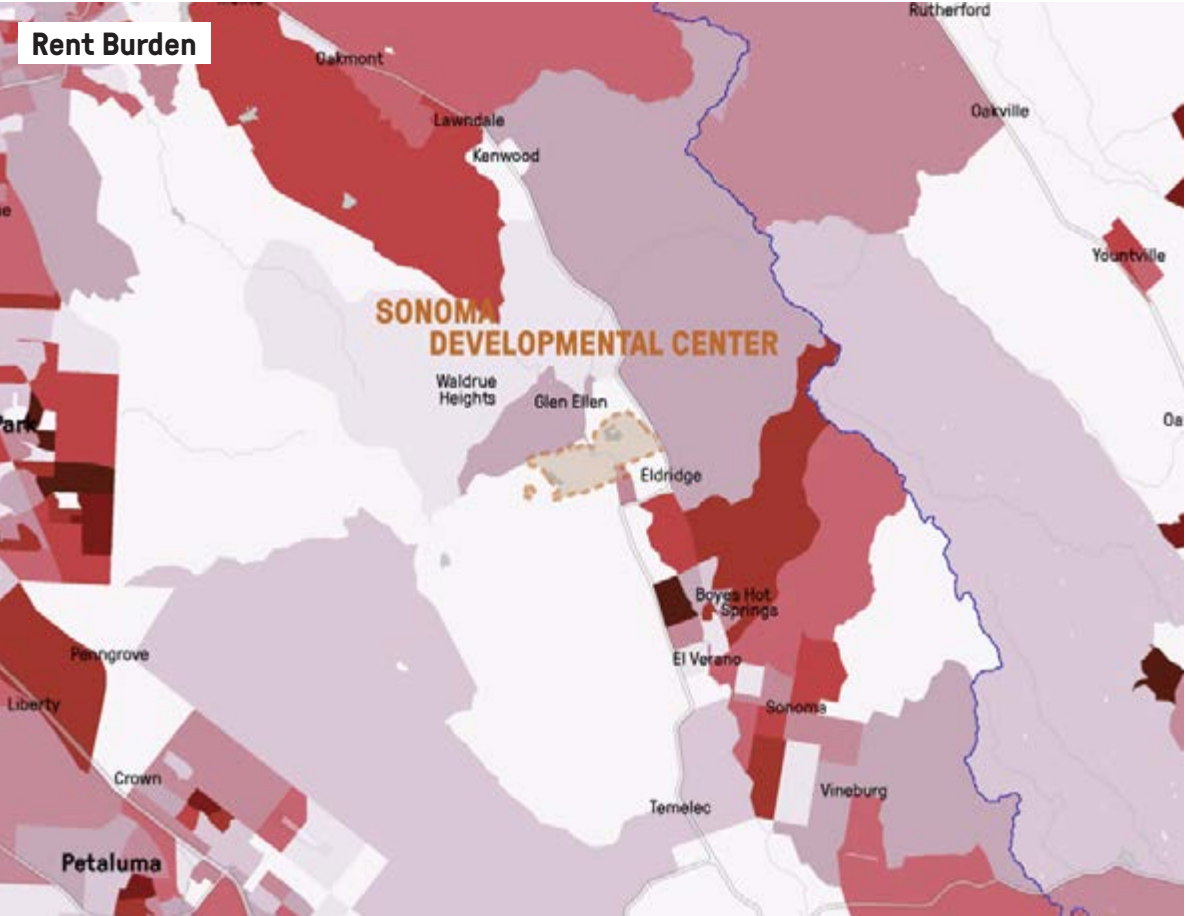


Social Vulnerability

People with higher social vulnerability may be less able to prepare for, respond to, or recover from a disaster. Areas with moderate to the highest social vulnerability exist within close proximity to the SDC site.

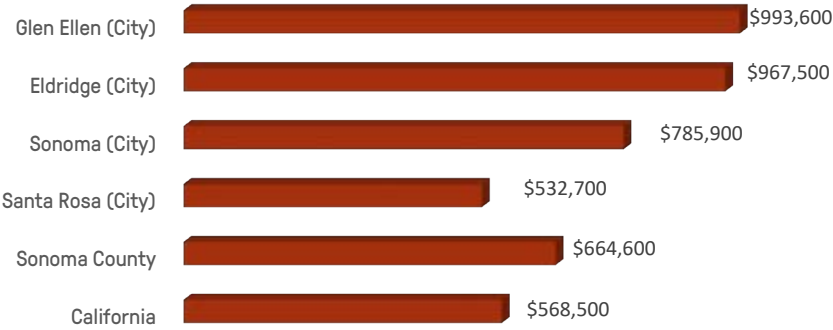
Source: Bay Conservation and Development Commission
Indicators of social vulnerability include: Renters, Under 5, Very low income, Non-U.S. citizens, People with disability, Communities of color, 65 and over living alone, Low English proficiency, No high school degree, and single parents.

Rent Burden



Source: US Census Bureau, Bay Conservation and Development Commission

Median Value of Owner-Occupied Units



Housing

Rising housing prices are key barrier for many of Sonoma County’s low-income communities. In the immediate vicinity of SDC, between 25 to 100 percent of households are rent-burdened, with median property values at nearly \$1 million. As of 2019, Sonoma County was experiencing a housing gap of over 5,400 units; this number is expected to rise to 7,400 units by 2024. Additionally, there were 26,000 applicants on the waitlist for Sonoma County’s Housing Choice Voucher Program in 2019. Development of the SDC site is a key strategic opportunity to ease the County’s housing pressure.

Sources:
Tyler Silvy. 2022. "Sonoma State University-owned Marina Crossing Apartments sat mostly empty for years." *Argus-Courier*, January 6, 2022
Will Schmitt. 2019. "Sonoma County to reform low-income housing voucher system after critical federal review." *The Press Democrat*, May 4, 2019

Buildings & Uses

At approximately 150 acres, the core campus comprises approximately 15 percent of the entire site. The area includes a majority of the site’s nearly 300 buildings—now almost entirely empty—that primarily include residential buildings, with medical, educational, recreational, and administrative uses interspersed. Today, the main building still in use is the Sonoma Ecology Center.

The remaining approximately 800 acres (or 85 percent of the site) is dedicated to open space. This area includes trails as well as a variety of recreational fields and uses. Pastures, fields, and barns supported agricultural operations on the eastern portion of the site, including the former Sunrise Industries Farm, which was heavily impacted in the 2017 Nuns Fire. Two reservoirs—one on the west side and one on the east—provide on-site water needs.

In many ways, the site was a small city unto itself.



NATIVE VEGETATION	77.6%
NATIVE RIPARIAN	3.6%
WATER	3.6%
BARREN	0.1%
URBAN	5.0%
URBAN - COMMERCIAL	1.4%
URBAN - INDUSTRIAL	0.1%
URBAN - LANDSCAPE	2.7%
URBAN - RESIDENTIAL	1.2%
URBAN - VACANT (ROADWAYS)	2.5%
SEMI-AGRICULTURAL	2.1%
INCIDENTAL TO AGRICULTURE	
TOTAL % VEGETATED	81.2%
TOTAL % URBAN	10.1%

Source:
Sonoma County GIS



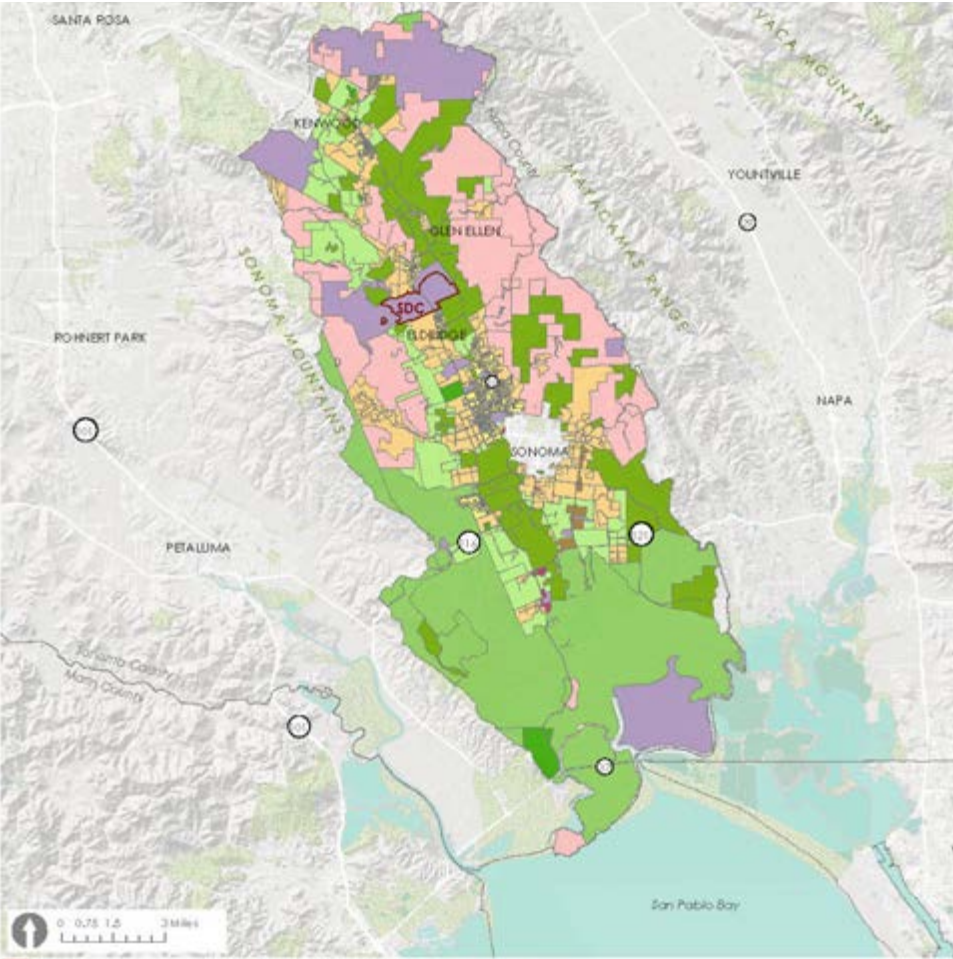
Land Use & Zoning

The Sonoma County General Plan designates the SDC site as a Public/Quasi-Public land use, defined as “sites that serve the community or public need and are owned or operated by government agencies, non profit entities, or public utilities.” Examples of permitted uses include schools, parks, libraries, and hospitals. Sonoma County zoning regulations additionally define the site as a Public Facility (PF), which is similarly defined as sites that “serve the community or public need.” The plan also sets specific development standards for such sites. A series of zoning overlays further define environmental, historic, and scenic goals and regulations.

The SDC site is bordered to the east and west by publicly protected lands. Jack London State Historic Park, Sonoma Valley Regional Park, Bouverie Wildflower Preserve, and North Sonoma Mountain Regional Park create an extensive area of open space adjacent to the site. Many of these parks, as well as portions of the site, are designated community separators and cannot be developed.

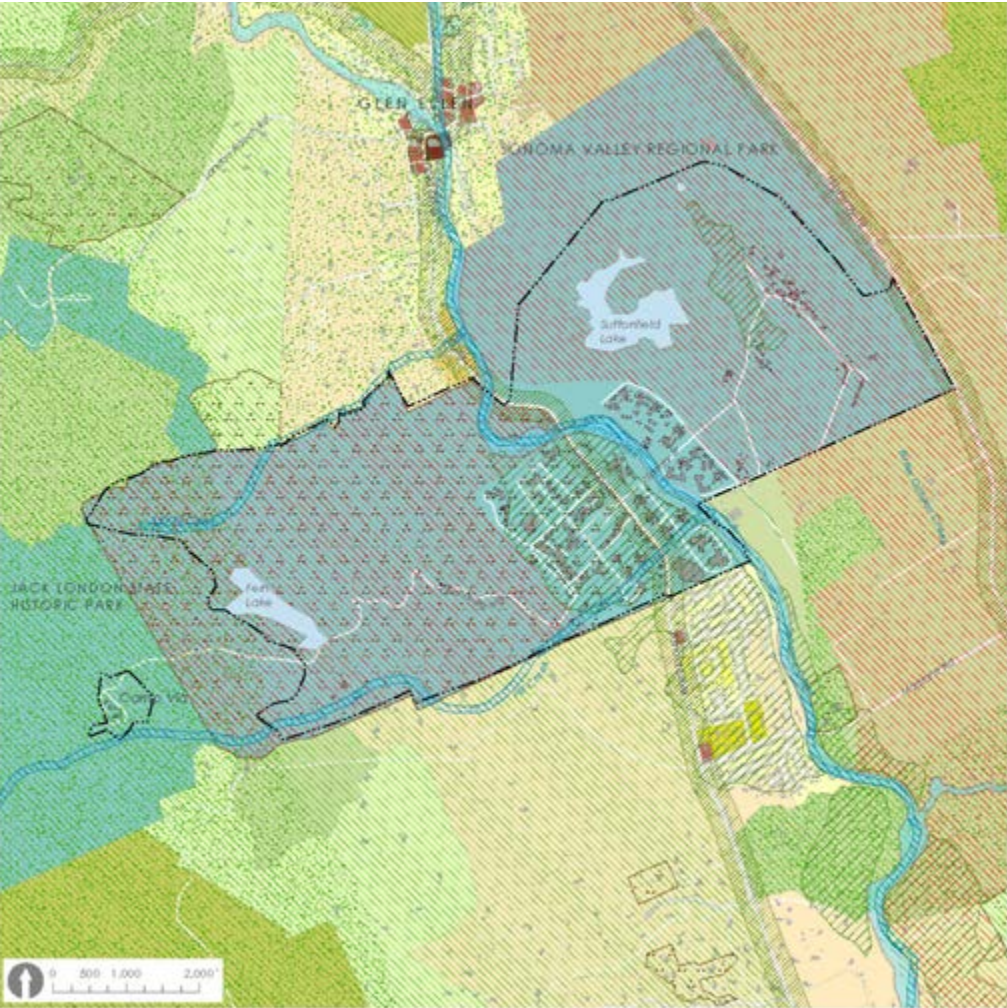
The small unincorporated residential communities of Glen Ellen and Eldridge lie to the north and south of the SDC site. They are primarily characterized by low and medium density residential development, with single-family detached homes and some multi-family units along primary roads.

Land Use



Source
Sonoma Developmental Center Existing Conditions
Assessment (WRT, August 2018)

Zoning



Zoning Overlays



Source
Sonoma Developmental Center Existing Conditions
Assessment (WRT, August 2018)

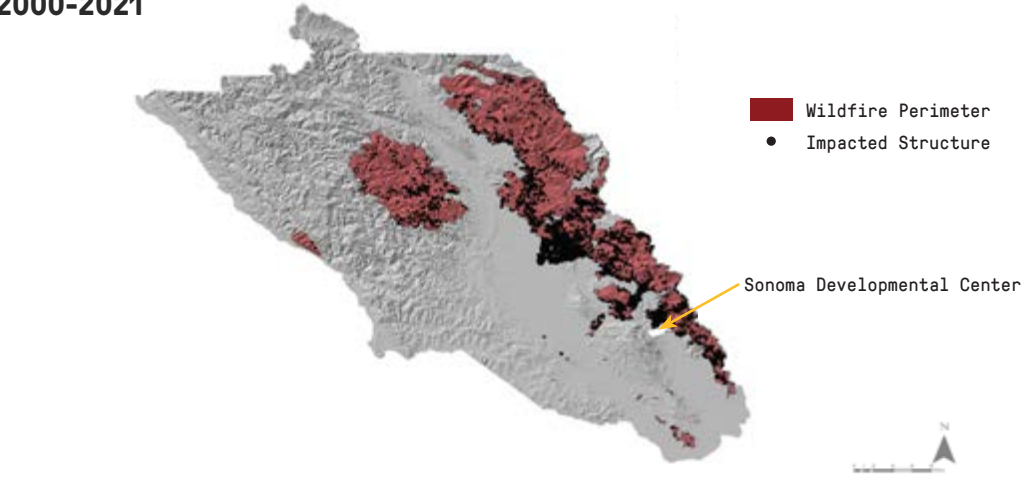
Wildfire History

Sonoma County is a region with a long and complex relationship with wildfire. Recent catastrophic wildfire events, such as the 2017 Northern California Firestorm, claimed dozens of lives, destroyed thousands of structures, and forced evacuations of hundreds of thousands within the County. For many Sonoma County residents, fire season is associated with trauma and anxiety.

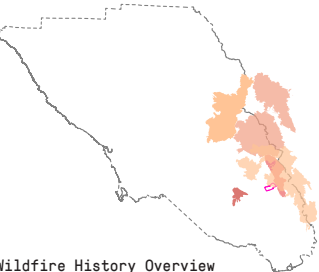
Many of the significant wildfire events in Sonoma County occur in late fall, when vegetation is at its driest, and during extreme wind events, known as Diablo Winds. Extremely destructive wildfires, such as the Tubbs Fire (2017) and Glass Fire (2020), often move from east to west as a result of these wind patterns. Climate change is forecasted to make Diablo Wind events more frequent and severe.

In the range of SDC and its surrounding area, several large wildfires occurred between the 1960s and the 2020s. One extreme wildfire, The Nuns Fire (2017) directly impacted the SDC site and burned several historic buildings on its eastern edge. Conversely, the western slope of the site—as well as the greater Sonoma Valley—has not experienced a wildfire since the SDC’s inception in 1891. However, this overgrown hillside, with its potential to burn, is a cause of concern for residents throughout the Valley.

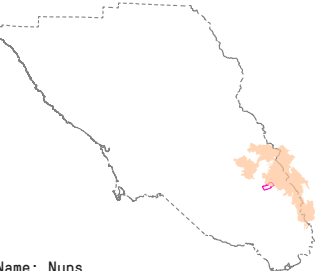
Sonoma County Wildfire Impact 2000-2021



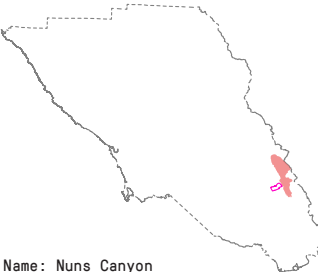
Sonoma Valley Fire History



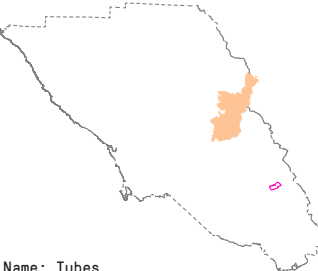
Wildfire History Overview from 1964 to 2020



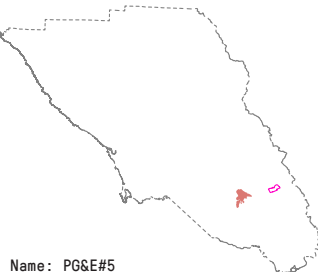
Name: Nuns
Date: 2017
Duration: 23 days
Damage: 56,556 acres



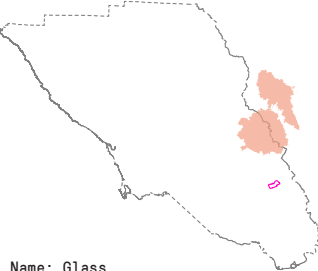
Name: Nuns Canyon
Date: 1964
Duration: 3 days
Damage: More than 10,000 acres



Name: Tubes
Date: 2017
Duration: 24 days
Damage: 36,810 acres



Name: PG&E#5
Date: 1965
Duration: Unknown
Damage: 3,250 acres



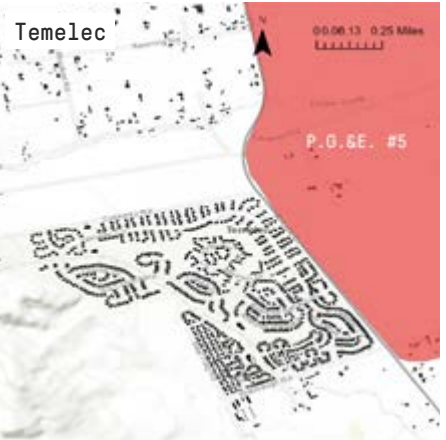
Name: Glass
Date: 2020
Duration: 23 days
Damage: 67,484 acres

Fire in Sonoma Valley Communities



Area: 2.1 square miles
Population: 992

Glen Ellen is the location of Jack London State Historic Park (including the Wolf House), Sonoma Valley Regional Park, and the former home of Hunter S. Thompson. **Glen Ellen** was significantly impacted by the **Nuns Fire** during the October 2017 Northern California wildfires.



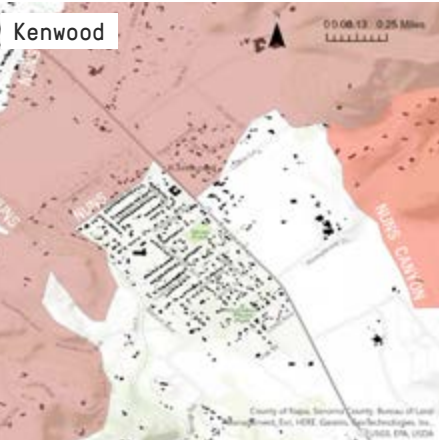
Area: 1.6 square miles
Population: 1,441

Temelec is the site of Temelec Hall, built in 1858 and a Sonoma County Historic Landmark. **The P.G.&E. #5 Fire (1961)** burned the community's periphery.



Area: 1.1 square miles
Population: 4,123

Resorts in El Verano—as well as the nearby communities of Boyes Hot Springs, Fetters Hot Springs, and Agua Caliente—were popular health retreats for tourists from San Francisco. **The Nuns Canyon (1964) and Nuns (2017)** burned within the community boundary.



Area: 5.2 square miles
Population: 1,028

The Kenwood area is known for vineyards, wineries, restaurants, and a resort. **The Nuns Canyon (1964), Nuns (2017), and Glass (2020)** fires caused heavy structure losses within the community.



Area: 2.7 miles
Population: 10,648

Sonoma is one of the principal cities of California's Wine Country and the center of the Sonoma Valley AVA. **The Dream Fire (2021)** resulted in large evacuations.



Area: 1.3 square miles
Population: 4,500

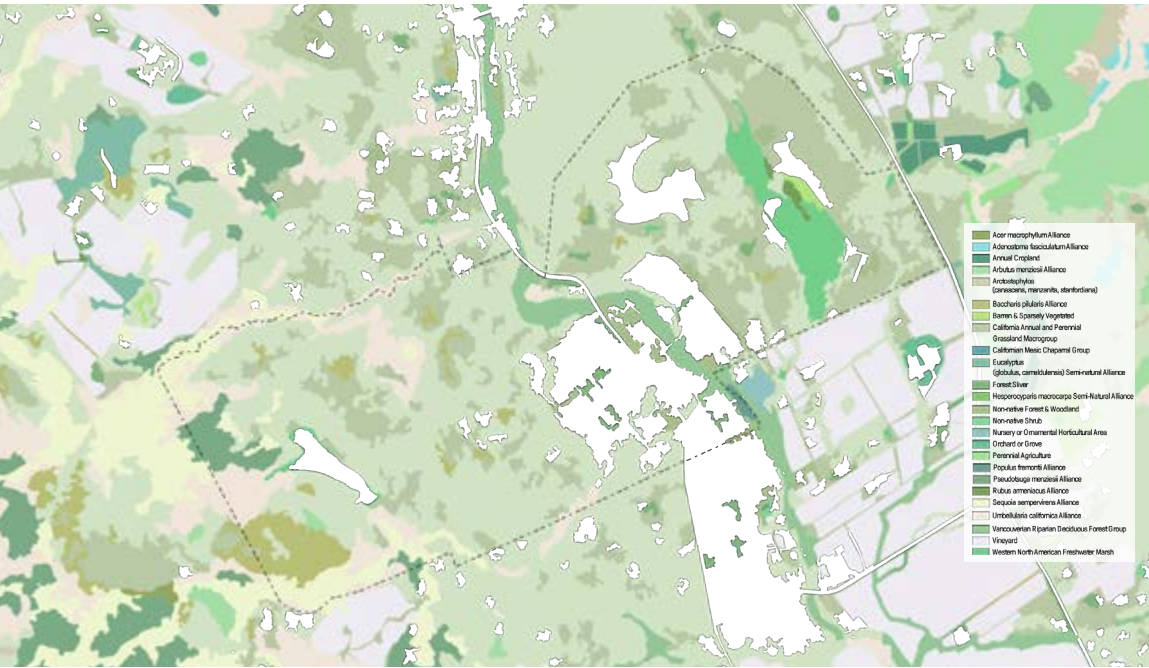
Oakmont Village is a 55+ community set in the middle of the beautiful wine country of Sonoma County. **As the Glass (2020) and Nuns (2017) fire** burned to the community's edges, thousands were evacuated.

Ecology

The variety of microclimates and landscapes on the SDC site support numerous vegetation habitats in a condensed area, including grasslands, woodlands, wetlands, and mixed hardwood and conifer forests.

Along the site’s eastern portion, oak woodlands dominate subtle rolling hills. Sonoma Creek, with adjacent riparian vegetation, transect the site’s core. Transitioning further to the west, sharply rising hillsides support tree habitats of redwood and ash trees interspersed with oaks. Across the site, invasive species such as veldt, eucalyptus, and tamarisk appear sporadically.

Vegetation Habitat



SDC Eastern Slope



SDC Western Slope

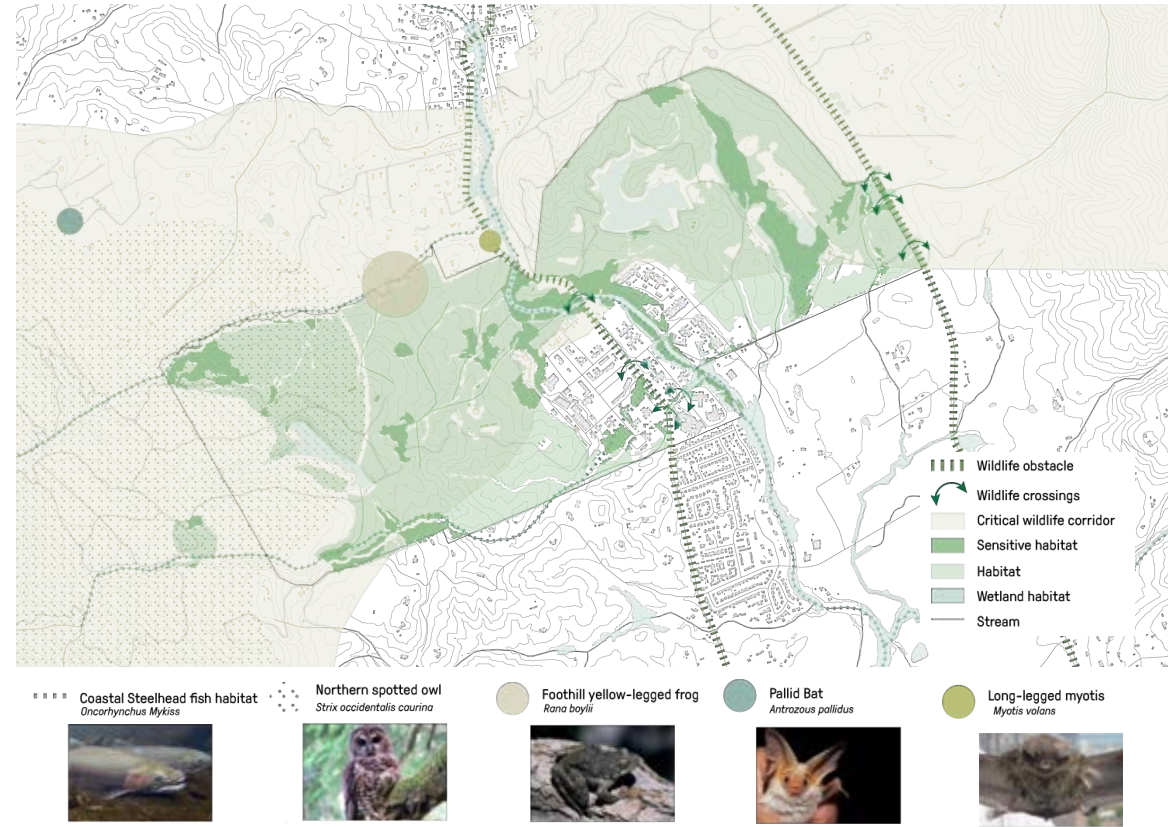
The site’s high level of ecological integrity, as well as its significant size, makes it a key linkage in the Sonoma Valley Wildlife Corridor. Few undisturbed links exist between the Mayacamas Mountains on the valley’s east and the Sonoma Mountain Range on its west. The continuity of the SDC between Jack London State Park and Sonoma Valley Regional Park make it an exceptionally rare connection for wildlife movement.

Special-status wildlife species can often be found inhabiting or migrating through the site. This includes species such as the northern spotted owl, California giant salamander, western pond turtle, American badger, foothill yellow-legged frog, pallid bat, and Townsend’s big-eared bat. Preservation of habitat for wildlife is among the community’s key values; numerous development considerations will ensure its continuation.



Sonoma Creek

Wildlife Habitat



Suttonfield Lake



Fern Lake

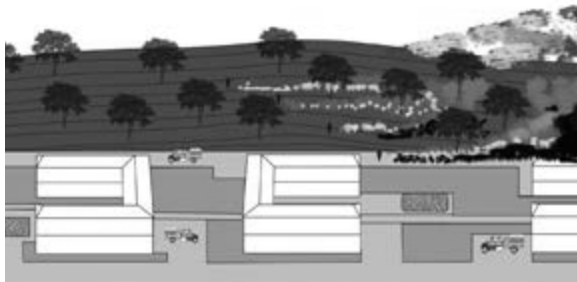
Designing with Fire

Based upon weeks of research and design iteration, students presented their final wildfire planning innovations and site design proposals to the entire SWA firm.

Given broad flexibility to develop their ideas, each student brought pieces of their own backgrounds into their designs as well as the strengths they shared and learned from one another. Wildfire mitigation proposals were embedded with deeply-held interests for recreation, food, wildlife, ecology, local heritage, and more.



Wildfire Resilience Strategies



[1] Arranging Wildfire

Harrison Raine

Strategy: Rethinking spatial density and development patterns for wildfire resilience



[2] Agroforestry

Jin Zhang

Strategy: Use of alley cropping, forest farming, and silvopasture for community and landscape health



[3] Embracing Local Flare

Luis Mota

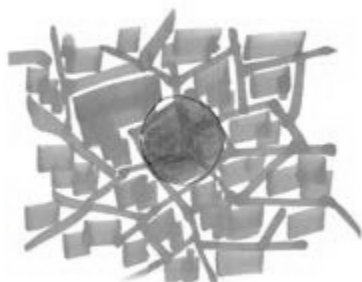
Strategy: Merging landscape design and management to create ecological mosaics



[4] Living with Fire

Michele Totoy

Strategy: Recognition of Indigenous land stewardship and culture burning practices



[5] Defensible Network

Slide Kelly

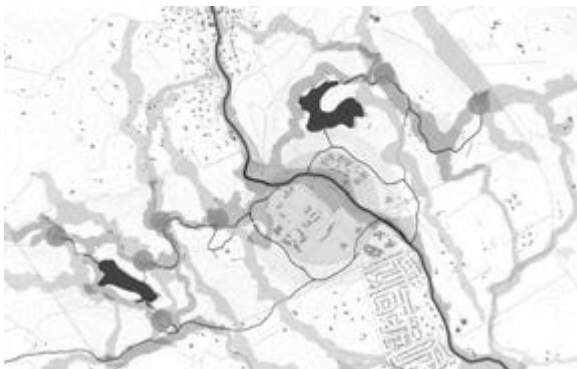
Strategy: Dual-purpose trails system for recreation and wildfire resilience corridors



[6] Layered Scapes

Tejas Saiyya

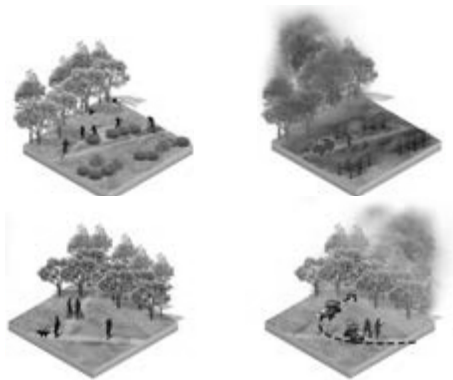
Strategy: Layer buffers against wildfires by joining intrinsic and extrinsic systems



[7] The Oasis

Xinyi (Sydney) Zhang

Strategy: Water management system coordinated with wildlife corridors and grazing programs



[8] Road/Recreation/Resilience

Yuanqing Su

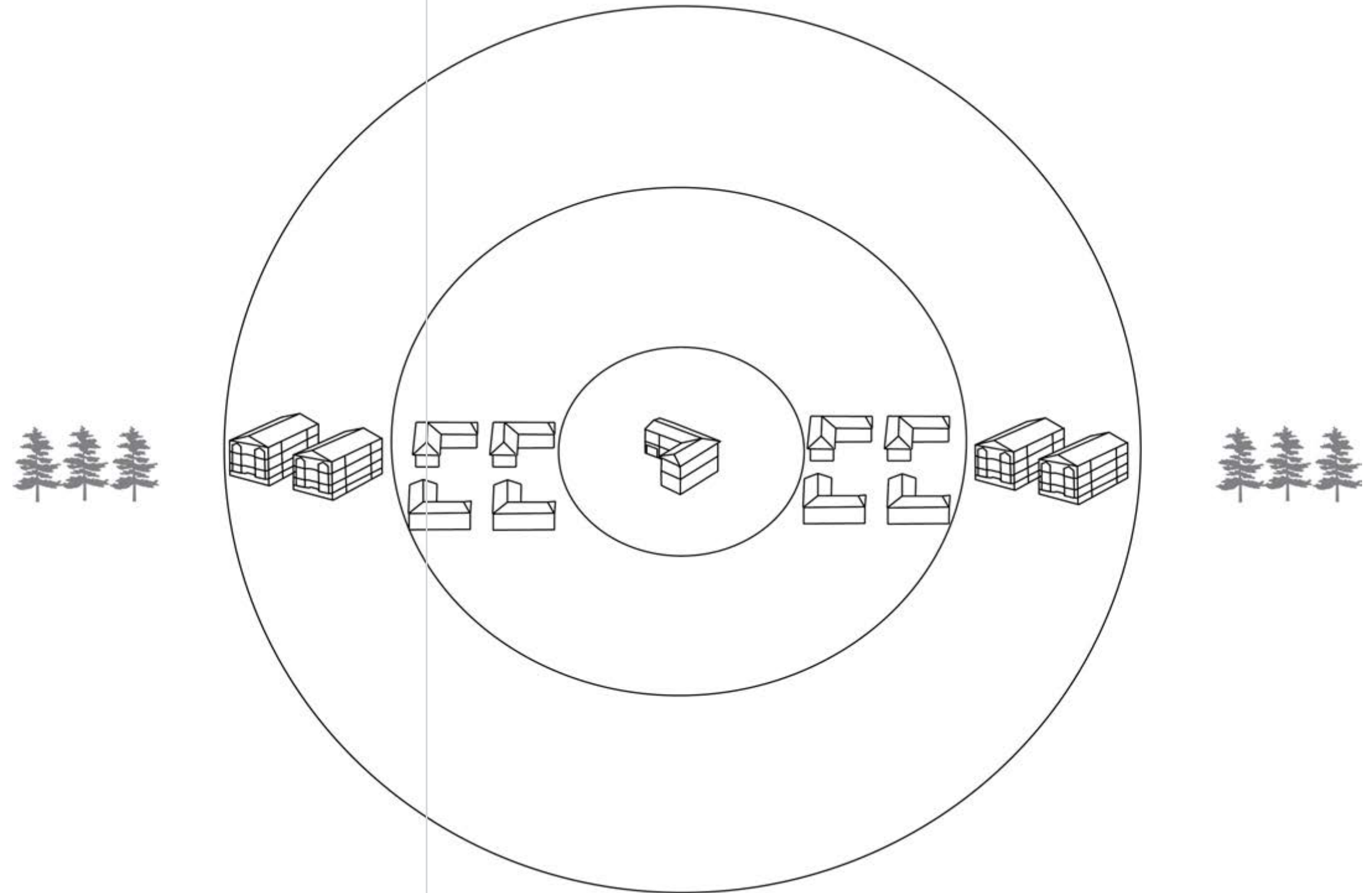
Strategy: Redevelopment of existing roads and trails for dual recreation and firefighting purposes

Arranging Wildfire



Harrison Raine
University of California,
Berkeley

Strategy:
**Rethinking spatial density
and development patterns
for wildfire resilience**



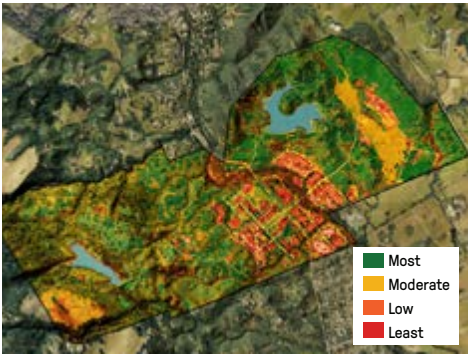
Site Design

To best understand how to design and plan for the increasing threat of wildfire, I modeled potential wildfires on both the east and west slopes of the site. The goal was to find approximate areas of weakness and strength within the core development.

Iterative wildfire scenarios identified five major areas on the site that drove my development and circulation design:

- #1 Threatened from both directions
- #2 Primarily impacted by eastern fire
- #3 Primarily impacted by western fire
- #4 Relatively protected by roads
- #5 Low risk if riparian corridor is wet

These points reflect areas for wildfire hardening or insulation of susceptible resources. They may serve as anchor points from which prescribed fire or wildfire burn operations can occur.



Prescribed Fire Suitability

Repeated Wildfire Scenarios

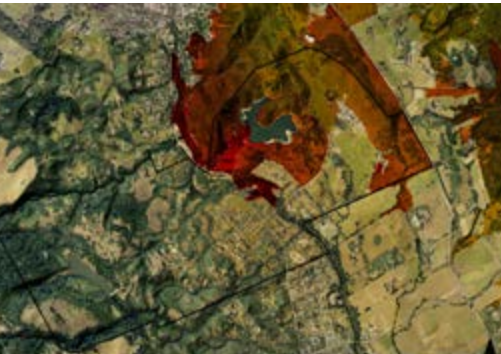


Points #1-3 represent corners of high susceptibility, as fire may enter from two directions as opposed to one, and will require more defensible development typologies. Point #4 exhibits relative protection, making

it an ideal location for a centralized gathering area. Point #5 is buffered by surrounding infrastructure and can support the least defensible housing typologies.

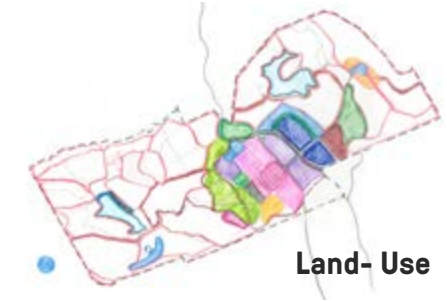


Wildfire From West

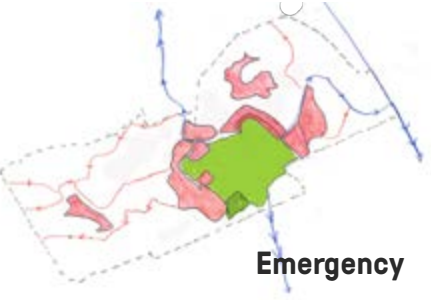


Wildfire From East

Site Plan



Land- Use



Emergency



Connectivity

Wildfire Innovation

Emerging research identifies housing arrangement, location, and density as key spatial development patterns that determine wildfire loss.¹ Structures in low to intermediate densities are lost most frequently, but an ignition within a high-density community can be the most catastrophic. However, very high-density, hardened housing exhibits strong resistance to wildfire penetration within a community.

Low- to intermediate-density housing is susceptible to wildfire due to its proclivity to ignite from proximate vegetation or structures. Moreover, during a wildfire event, complicated road systems and dispersed housing can lead to triage decision-making for firefighters. In contrast, very high-density housing is more defensible, as one large structure is easier to protect than many small structures. Additionally, high-density structures have more intrinsically fire-protective features: more pavement, less vegetation, and, sometimes, accessible water supply such as ponds or pools.

Integrating this research into design suggests a new conception of density arrangement to best protect proposed communities. Placement of the most defensible high-density housing types in the most exposed areas, and the most susceptible low-density housing types in insulated areas, offers an opportunity to harden an entire development.

¹Source: Syphard et al. 2013, 2019

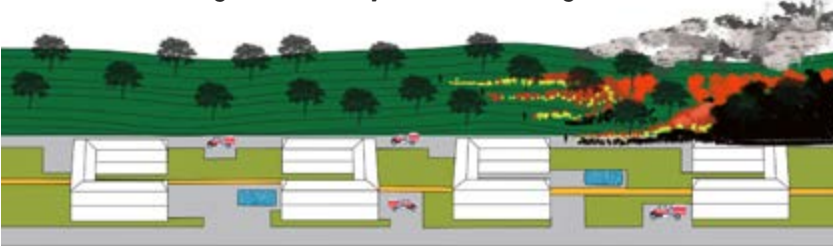
Traditional Development Pattern



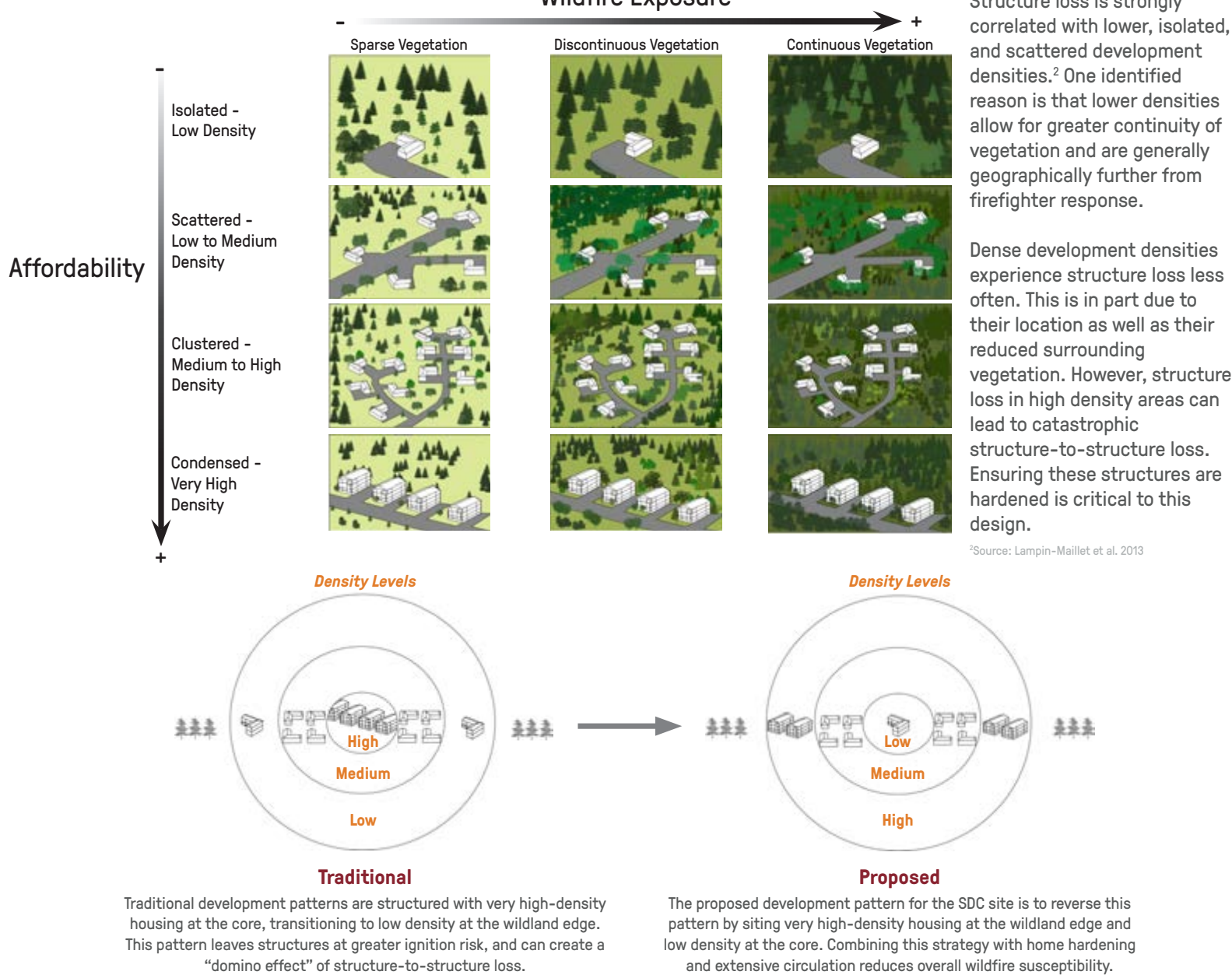
Fire in the Traditional Interface



Proposed Interface
Higher Density + Defined Edge



Wildland-Urban Interface Typologies



Development

This concept proposes to rethink density arrangement to balance wildfire resiliency and livability. In many ways, the conceptual model for this development strategy is based on Italian and Spanish hill towns or similarly protected rural settlements.

Arrangement of lower-density single-family homes in the interior reduces the possibility of an urban fire conflagration, while placement of high-density multiplexes at the corners of the development offers increased defensibility for the entire community. These high-density corners are further buffered through the presence of green spaces, recreation fields, and swimming pools, all of which serve as dual-purpose amenities and protection.

Enhanced circulation supports this unconventional density arrangement while maintaining walkability to the community's core and open space. Low-density development along the main axis of Arnold Drive maintains the continuity of single-family homes along Sonoma Creek that tie Glen Ellen and Eldridge together.

An increased riparian setback reduces encroachment on the creek, and allows for a creekside running trail. In the site's southeast corner, the firehouse commons is a community gathering space—or, in the event of an emergency, an operational command post.



Wildfire Features

- Evacuation Route
- Contingency Fireline
- Hardened Zone
- Operations Center
- Animal Evacuation Point

Circulation

- Arnold Dr.
- Existing Two-way Road
- Existing One-way Road
- Proposed Two-way Road
- Proposed Ring Trail
- Proposed Connection Trail

Community Amenities

- Community Center/ Firehouse
- Historic SDC
- Commercial/Retail
- Husbandry Center
- Maker Space
- Utilities
- Community Pool
- Recreation Fields



Single Family Detached: 74 Units



Duplex: 104 Units



Live-work: 80 Units



Multiplex: 535 Units



Agroforestry



Jin Zhang
University of California,
Los Angeles

Strategy:
**Use of alley cropping,
forest farming, and
silvopasture for
community and
landscape health**



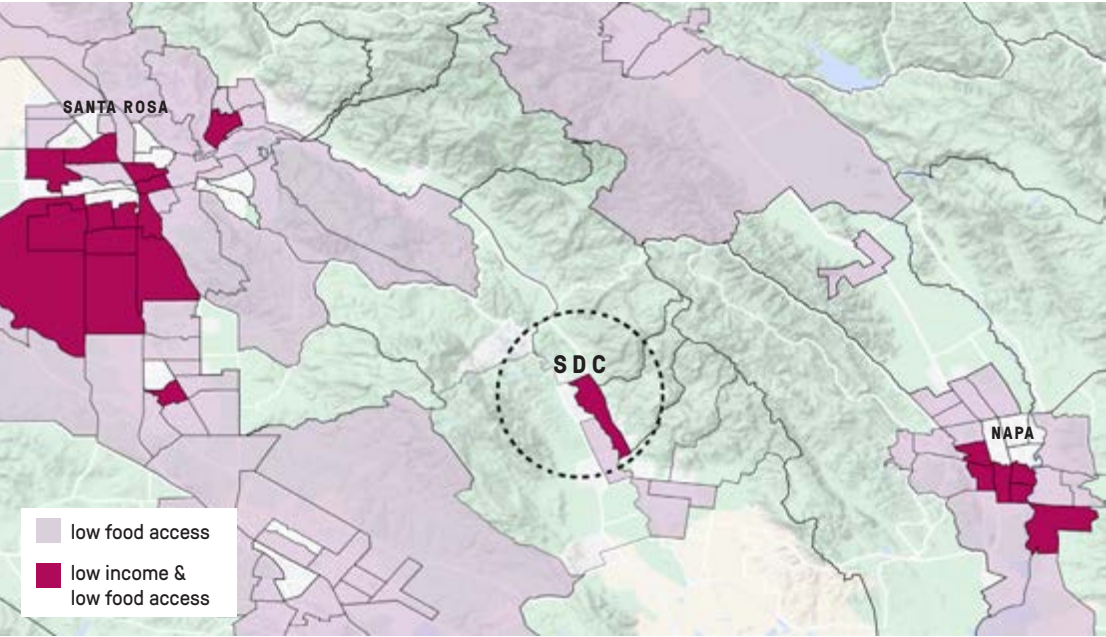
Site Design

Despite California being the largest food producer in the entire United States, regions across the state still experience significant low and affordable food access. The SDC is located in a region with certain areas experiencing low food access, defined by more than a third of all households living farther than 0.5 miles (urban households) or 10 miles (rural households) away from a grocery store.

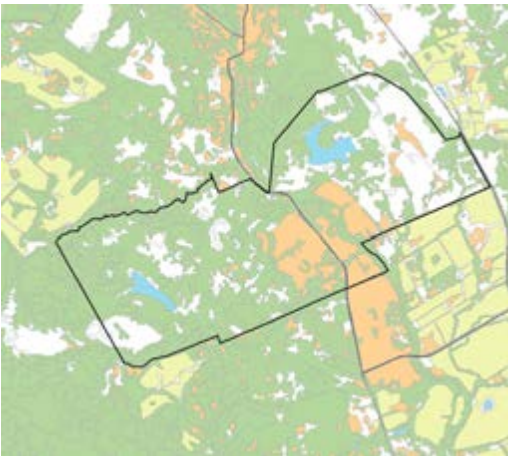
This site design concept centers agroforestry in order to both create an hub for healthy, affordable food production and consumption and address needs for vegetation management to mitigate wildfire risk. This approach raise levels of social equity for both the region and on-site residential community.

An evaluation of site conditions determined spatial suitability for specific forms of agroforestry. Analysis specifically focused on land use cover to minimize environmental impact on existing trees; soil quality to understand the location of prime agricultural zones; and canopy density to gauge sun and shade levels and forest thinning potential. The subsequent overlay of these conditions highlights general spatial allocations for which parcels of land maximize the benefits of each agroforestry intervention.

Regional Need: Food Access



Opportunity 1: Land Use Cover



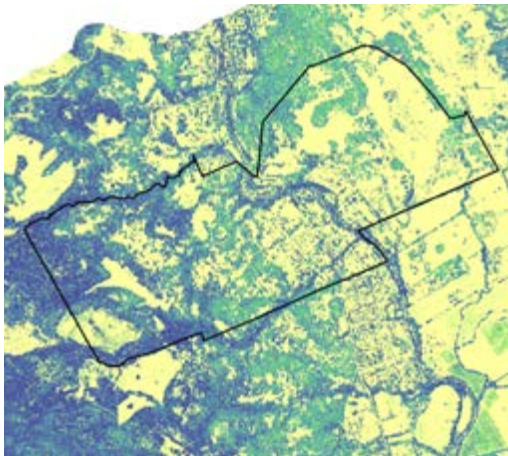
- Development
- Trees: native oak, forest silver, non-native oak woodland
- Barren, shrubs, herbaceous
- Agriculture: vineyards, perennial agriculture, annual cropland

Opportunity 2: Soil Quality



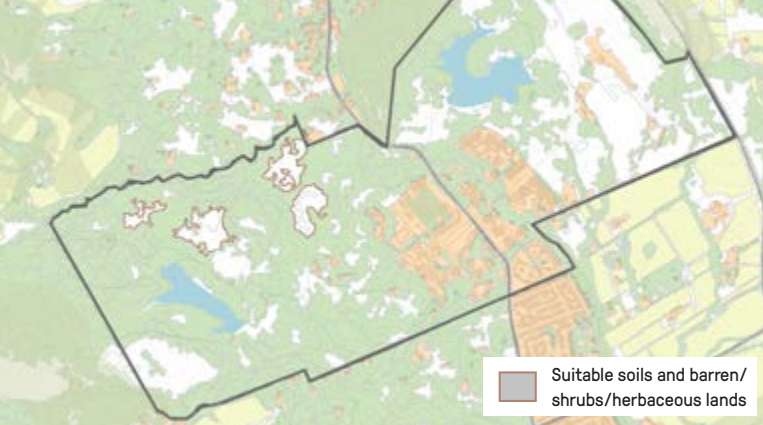
- Secondary Agriculture Opportunity Zones
 - Spreckles Loam (15-30%)
 - Goulding Clay Loam (15-30%)
 - Red Hill Clay Loam (15-30%)
- Prime Agriculture Opportunity Zones
 - Clough Gravelly (2-9%)
 - Spreckles Loam (2-9%)
 - Goulding Clay Loam (5-15%)
 - Red Hill Clay Loam (2-15%)

Opportunity 3: Canopy Density

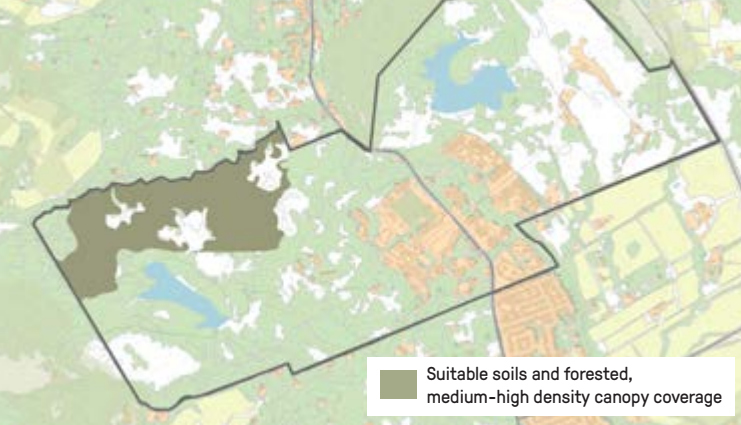


- Low density
- High density

Alley Cropping



Forest Farming



Wildfire Innovation

Alley Cropping

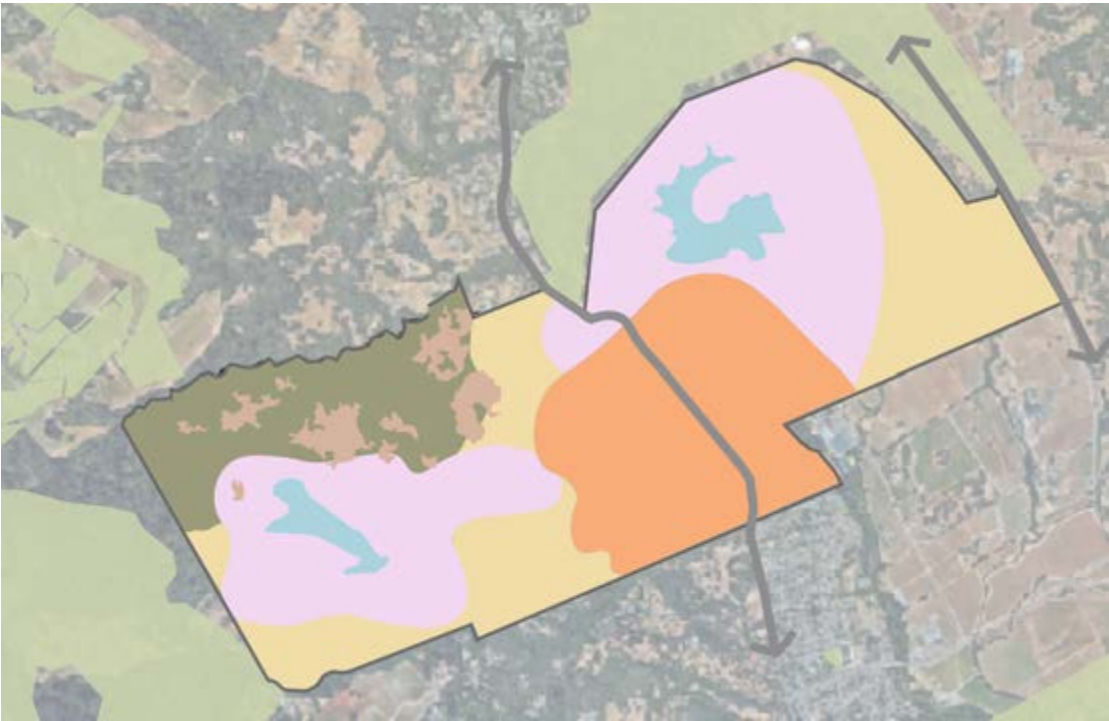
Alley cropping is the practice of planting agricultural crops between rows of trees and shrubs. By intentionally growing a variety of crops in close proximity to one another and within neighboring trees and shrubs, alley cropping improves crop production, microclimate conditions, soil health, and more. The versatile nature of this practice also makes farms flexible during economic market fluctuations, labor limitations, and changing goals. The irrigated landscape can also perform as a buffer during wildfires.

Forest Farming

Forest farming is the practice of cultivating crops (typically those of high value) below managed tree canopies. Typical crops include mushrooms, truffles, ramps, ginseng, and wild yams, among many others. Forest farming maintenance practices, especially the thinning of competing shrubs and vegetation, act as effective vegetation management strategies to reduce wildfire risk.

Silvopasture

Silvopasture is the practice of integrating grazing livestock operations with existing forest conditions. Canopies reduce heat stress while livestock such as cattle, sheep, goats, horses, and more graze on tall grasses and shrubs that are hazardous wildfire ladder fuels.



The site land use plan designates large amounts of space for actively managed open space to maintain current passive recreational uses and a more developed urban core that centers a community-based, generative agricultural design element.

- Development
- Open Space - Actively Managed
- Silvopasture
- Forest Farm
- Alley Crop



Silvopasture

Combine trees with foraging material and livestock production



Alley Cropping

Agricultural crops grown simultaneously alongside long-term tree (crops)

Development

The urban core is where living space joins the ethos of surrounding agroforestry interventions, creating a development center that fosters community, respect for land and wildlife, awareness of climate risks, and appreciation for food systems.

Residential development includes low-medium density levels, with 700-800 units of single-family, duplex, and town home housing structures at various clusters within the urban area.

Traditional buildings with historic value are preserved, retrofitted, and converted into public amenity buildings, such as a large public library and a sister learning center. The learning center focuses on the history of the site and greater Sonoma County. Educational programs and workshops on climate change and environmental hazard mitigation strategies are regularly conducted.

On the northwest corner of the urban core is a farmer’s market that is supplied by harvests from the on-site agroforestry systems and highlights speciality food products. This farmer’s market will become a hub for local food access and attract foot traffic from neighboring urban areas.

Central to this urban core proposal are community gardens that are surrounded by residential development, allowing residents and neighbors to grow food and plants at their discretion and cultivate a sense of spatial, social, and environmental caretaking beyond typical private residential landscaping. Proposed gardens will conform to current regulations around defensible spaces as designated by CalFire.

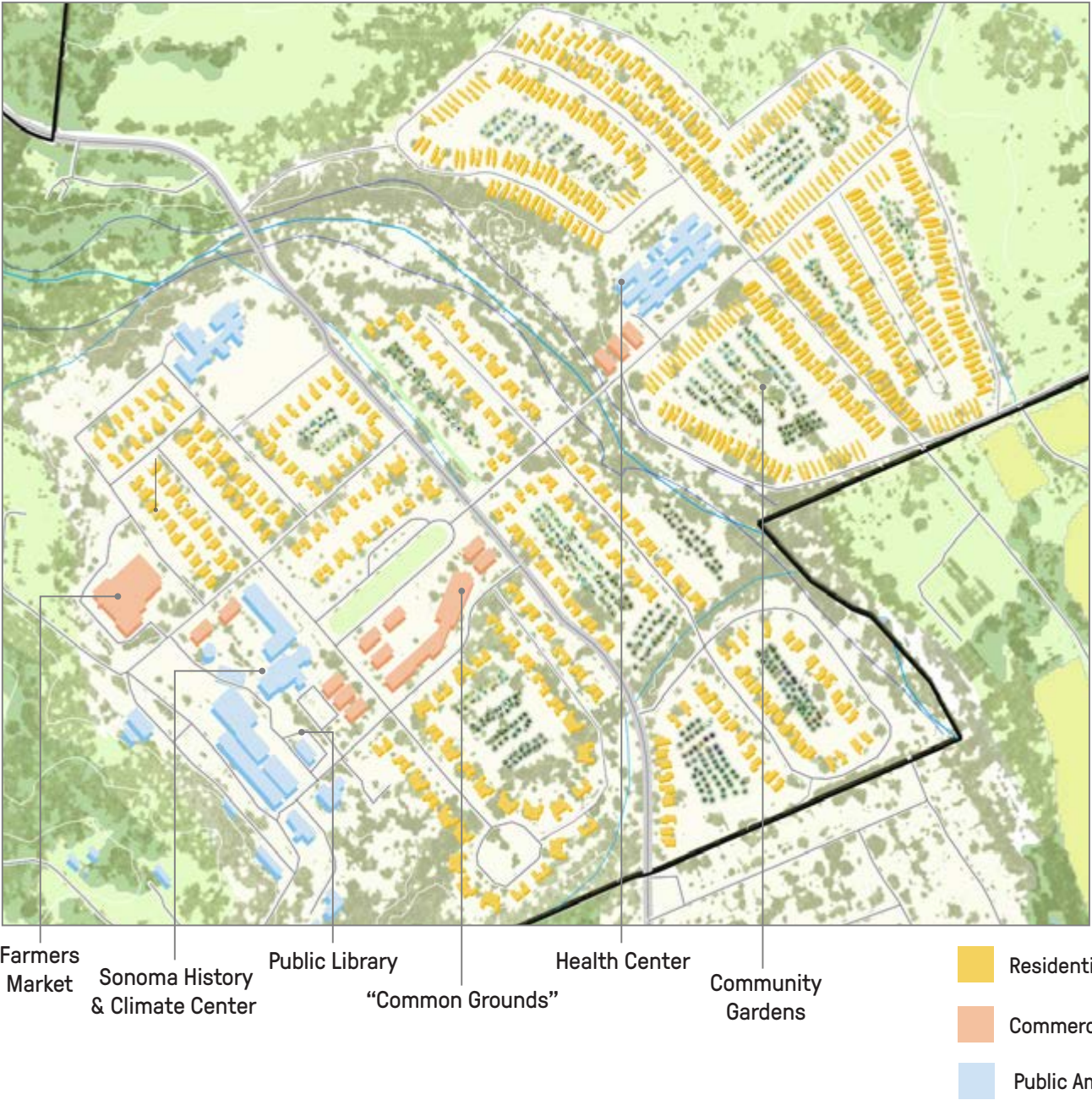
Agroforestry Strategy	Social Benefits	Wildfire Benefits
Alley Cropping	Healthy Food Access & Production	Irrigated Community Defensible Space
Forest Farming	Local Economic Development	Active Fuel management
Silvopasturing	Idyllic, Aesthetic Living Conditions	Improved Biodiversity

One Third of California is Forested

Forests are critical for air quality, climate, and recreation, but they face a number of threats, the largest of which is large-scale wildfire

One Quarter of California Land Cover is for Food Production

California is the largest contributor of foods for the US; Sonoma County is especially known for its grapes, vineyards, and wines



Embracing Local Flare



Luis Mota
University of Southern
California

Strategy:
**Merging landscape
design and
management to create
ecological mosaics**



Site Design

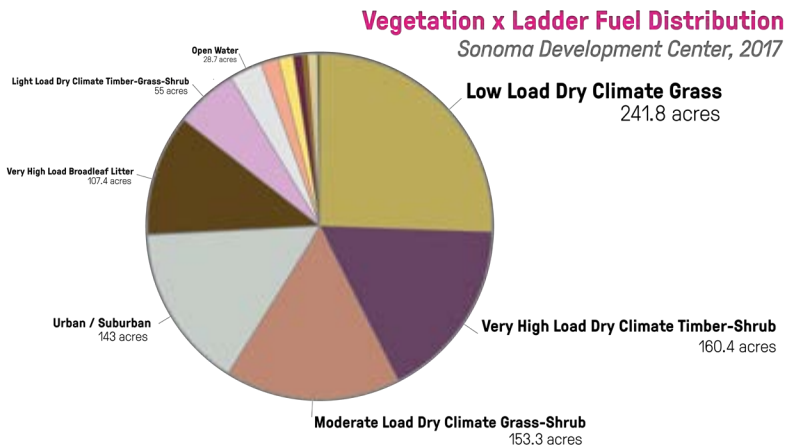
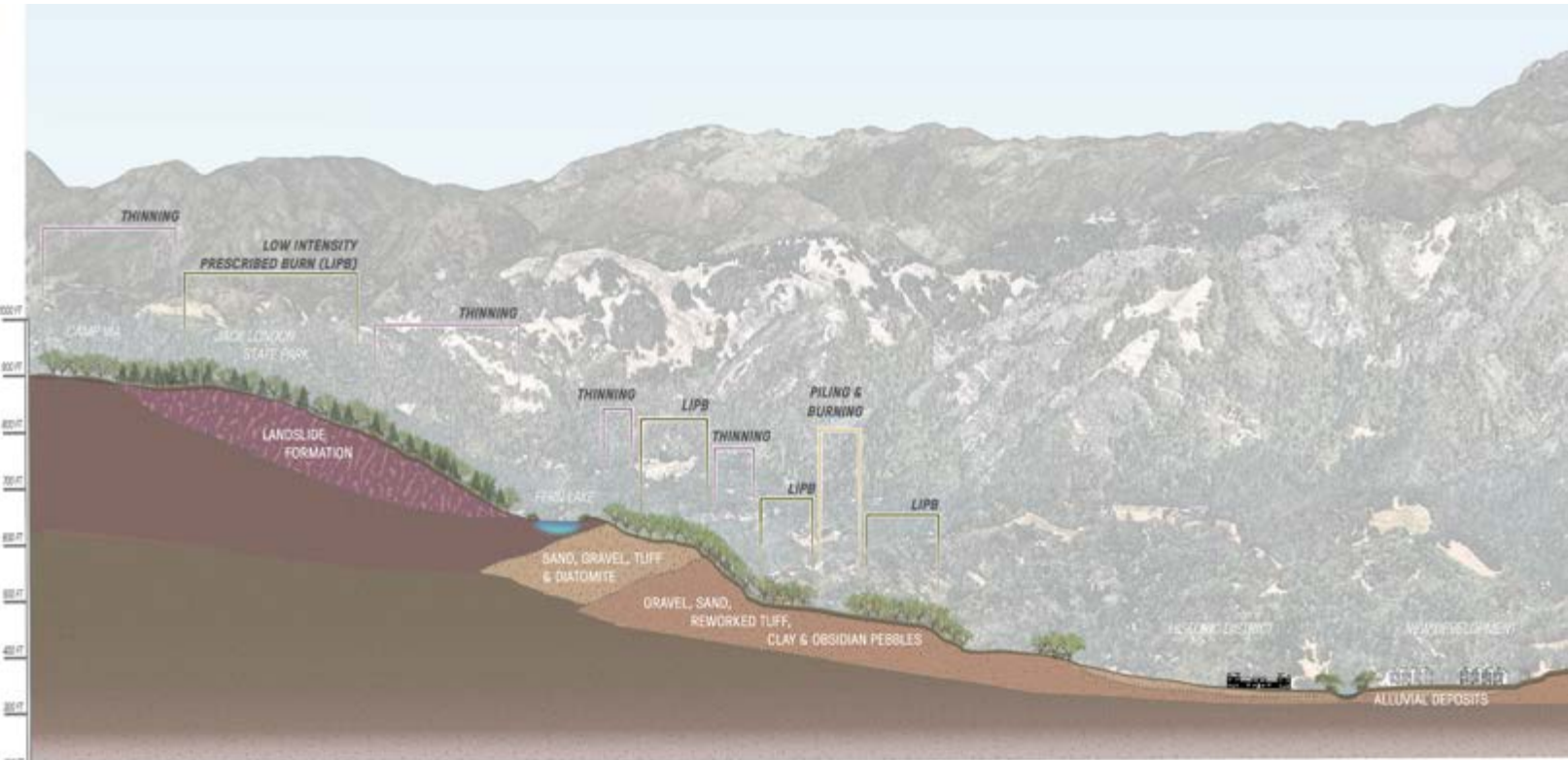
Embracing prescribed fire at the SDC site requires analyzing the dynamic factors driving vulnerability. Fire ecology is neither innately destructive nor constructive, but must rather be viewed as a process of change within the landscape. The increasing wildfire issues afflicting California can take advantage of prescribed fire, but not without in-depth review of vegetative fuel loads and the deepened role that thermodynamic climatic variables can offer when burns are located alongside community.

Analysis and design of the SDC’s open space was determined by study of the site’s topography as well as the category and severity of vegetative fuel load.

Mosaic Ecologies



Conceptual Design



Pile Burning



Prescribed Fire



Mechanical Clearing



Grazing



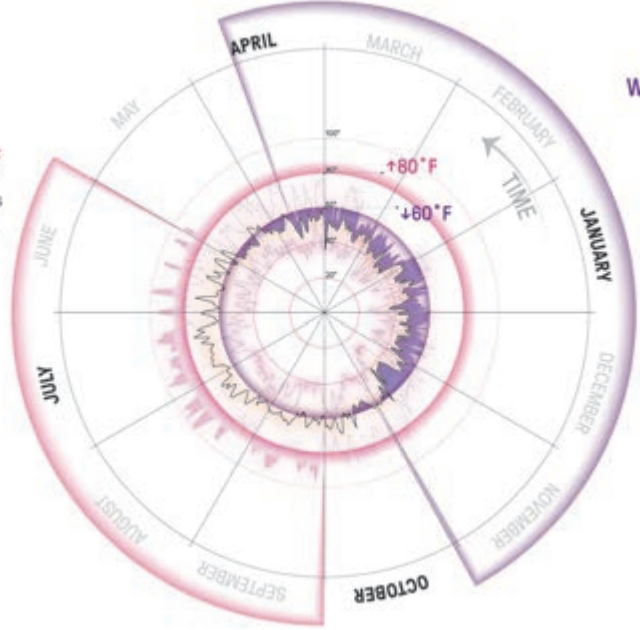
Wildfire Innovation

Air temperature and vegetation coverage at the time of burning are critical factors when evaluating when and where to implement the use of prescribed burns.

TEMPERATURE

SUMMER BURNS +80°F

- Higher ambient heat means easier ignition of vegetation
 - Increased chance fire will reach lethal temp.
 - Hot air temps disperse smoke better than normal days.
- BEST USE:**
Invasive Plant Species
Low Load Vegetation
Piles in Cleared Areas

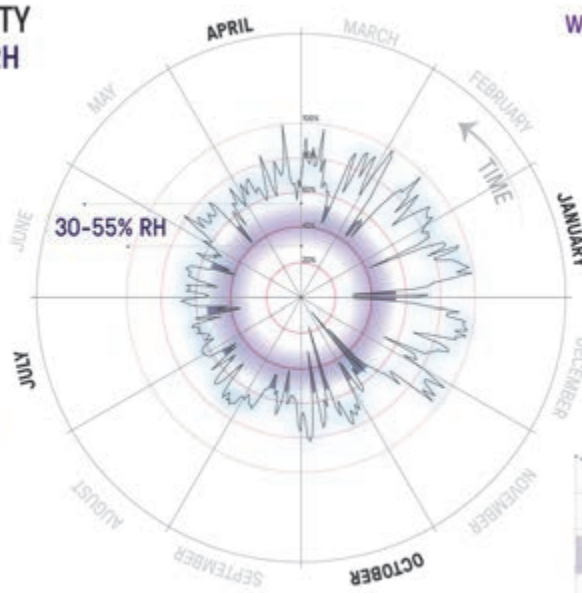


WINTER BURNS +60°F

- Lower ambient temp makes ignition of vegetation to lethal level harder to reach
- BEST USE:**
Understories
Higher Load Vegetation

RELATIVE HUMIDITY 30-55% RH

SUMMER Average 60%



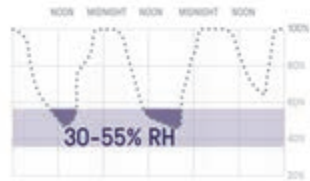
WINTER Average 75%

- Often results in unburned islands of vegetation.
- Harder to Burn

DAILY

 **MIDNIGHT TO NOON:**
Colder and More Moisture/Dew

 **NOON TO MIDNIGHT:**
Hotter and Drier



Year 1



Year 1.5



Year 2



Year 2.5



Year 3



A mosaic of burned and unburned areas maximizes the “edge effect,” which promotes a large and varied ecology within the site. Through the selective burning and mechanical thinning of areas within the forest mosaic, openings are created for wildlife feeding and migration. These practices also stimulate fruit and seed production, yield, and germination.

The steep portions of the site were selected for mechanical thinning; the use of prescribed fires could prove too dangerous in these areas due to the potential for spread into adjacent development or areas with high fuel loads.

Selecting the proper size, frequency, and timing of burns is crucial for the successful use of fire to improve wildlife habitat and preserve the sanctity of the surrounding landscapes.

Development

This development strives to have it all. A combination of multi-family and single family homes create 1,500 residential units on top of a robust non-residential sector. Homes are available in the forms of a Paseo Village, Cottage Courts, and an Agrihood, providing a variety of housing styles and themes. A significant portion of housing is dedicated as affordable. Both market-rate and affordable housings aims to support senior living.

To support those who live in the new community, several opportunities for employment will sustain economic vitality. A climate-focused institution, central hotel, and extensive retail compose the community’s core. These spaces are integrated with the site’s historic core and are easily accessible to surrounding residents.

RESIDENTIAL

Market Rate	New Construction	Adaptive Reuse
	Units/SF	Units/SF
Single Family Detached	350	5
Single Family Attached	250	-
MultiFamily	230	15
MultiFamily - Senior	270	46
TOTAL MKT RATE	1100	66
Affordable / Inclusionary		
Single Family Detached	70	1
Single Family Attached	70	-
MultiFamily	165	28
Senior	-	-
TOTAL AFFORDABLE	305	29
SUBTOTAL	1405	95
TOTAL UNITS	1500	

NON RESIDENTIAL

Non Residential	New Construction	Adaptive Reuse
	Approximate Building Area	Approximate Building Area
Commercial	50,000	19,000
Hotel	75,000	16,000
Office	-	40,000
Public/Institutional	30,000	20,000
Utility	25,000	32,000
R&D	152,000	90,500
Community Facilities	68,000	39,000
TOTAL NON RESIDENTIAL	400,000	256,500
TOTAL (Square Feet)		
		656,500

MISSING MIDDLE - PASEO VILLAGE



COTTAGE COURTS



AGRIHOOD



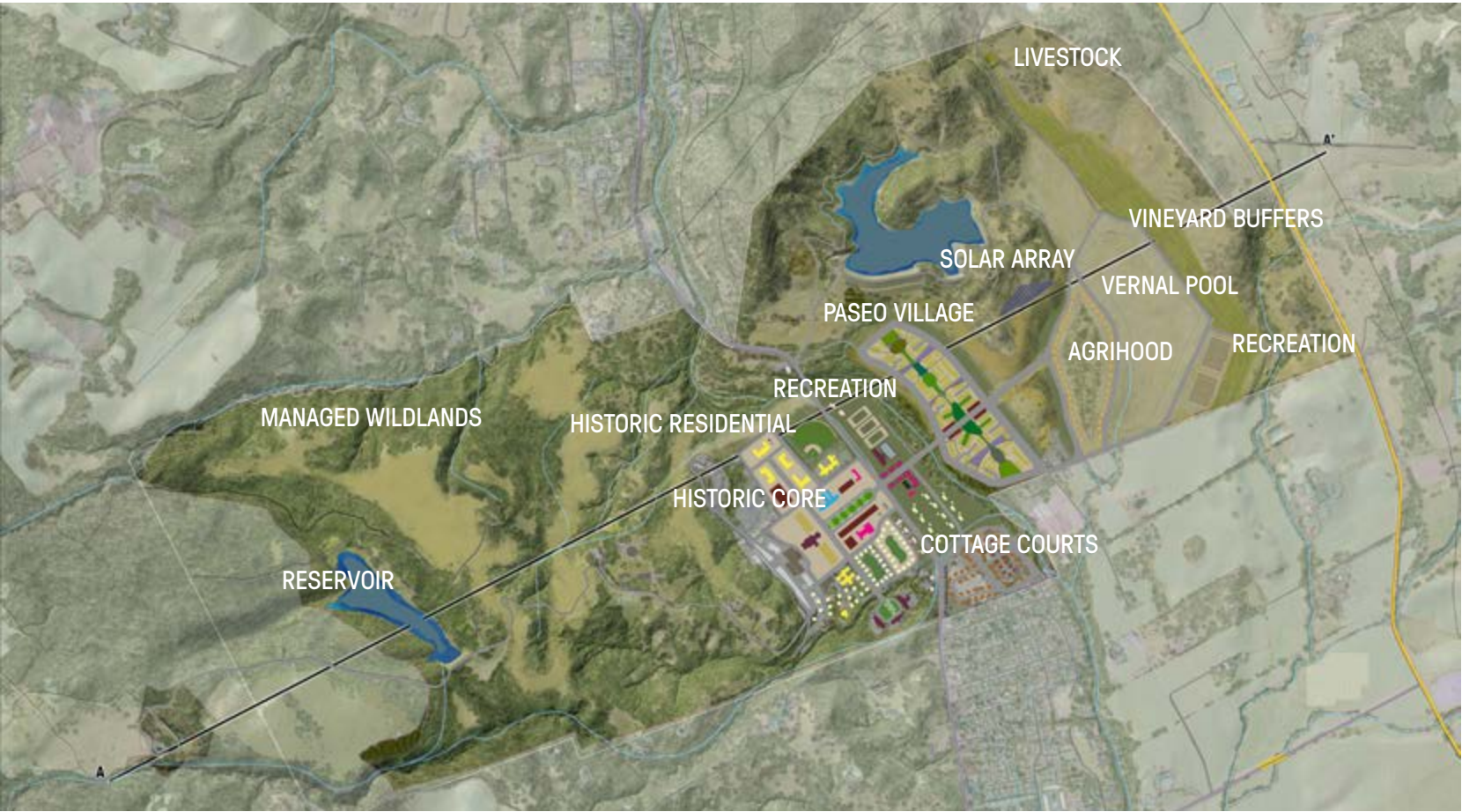
PUBLIC/INSTITUTIONAL



HOTEL



RETAIL



To best blend the developed core with the surrounding open space, several strategies are employed to maximize human and environmental health. Along the core’s west end, residential areas border managed woodlands, allowing for natural aesthetics and recreational access. Wildlands are managed to slow fire spread if it were to move towards the developed core. A series of trails link the historic residential area to the upslope reservoir.

Along the developed core’s eastern edge, a paseo village and agrihood facilitate a slower transition to open space, as larger family homes allow for greater integration rather than an abrupt urban-natural edge. A vernal pool is maintained to create a degree of seasonality adjacent to the agrihood. A solar array along a south-facing slope supports the site’s energy needs.

Along the site’s easternmost edge, recreation fields, vineyards, and grazing areas support a wildfire buffer, as well as a noise buffer from the state highway. All of these entities combine to form a cohesive community that exhibits adaptation to climate change.

Living with Fire



Michele Totoy
Politecnico di Milano

Strategy:
**Recognition of
Indigenous land
stewardship and
cultural burning
practices**

“Fire can be positive and not just a tool
to avoid worse fires, it’s transformative”

-Christopher Adlam (Volunteer)

**“Seeing fire used for
can be healing”**

-Christopher Adlam (Volunteer)



“It’s healing not just for the land, but for the
people, too”

- Irene Vasquez (Secretary for the American Indian Council)

**“For many indigenous people, fire is
medicine”**

- Frank Lake (Ecologist, US Forest Service)

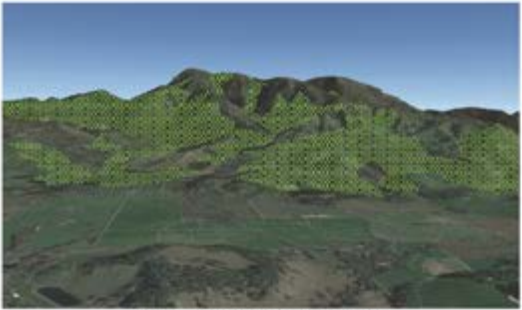
Site Design

In order for people to welcome fire back into their lives, they must heal the broken relationship with fire's essential nature and learn how to use it as a valuable tool. Community participation in cultural burning allows residents to experience firsthand the benefits of fire for nature and for ourselves. A cultural burning trail, traversing the entire site through the different forests and grasslands, can provide opportunities for the community to safely interact with fire.

As seen in the drawings from the “Sonoma County Atlas” from 1877, the Sonoma landscape—specifically its mountainous areas—appear very different than the landscape we see today. The mountains are depicted with smaller and spotted groups of forest combined with wide grasslands. However, today we see forests covering entire hillsides and very few grasslands. Consequently, these forests contribute to an increased risk of fire due to their high amounts of unmanaged fuel. The Sonoma Development Center site follows this pattern, with the west and east sides of the site mainly covered with oaks and other hardwoods. The area and paths for the cultural burning trail is based upon distribution of existing vegetation and topography.



"Fossville" Res of Clark Foss, Mt Saint Helena, Sonoma County, California. Sonoma County Atlas, 1877



Mt Saint Helena, Sonoma County, California. Google Earth, 2022



FIRE PROTECTION

Use **cultural burning** to treat the landscape and to appreciate the benefits of **fire as a natural resource**.

FIRE RECREATION

Create a **cultural fire trail** to participate in cultural burning and to **interact with the fire landscape**.

FIRE LEARNING

Create **cultural burning centers** and **fire gardens** to learn from Native American cultural fire practices and incorporate fire into the site's landscapes.

Fire for protection, recreation, and learning.

Performance of cultural burns around the site removes potential fuels and creates a protective belt around the development. If a fire ignites from either side, the belt will contribute to diminishing it once it arrives at the treated area.

The cultural burning trail allows people to participate in periodic cultural burning activities and to admire the regrowth of the dynamic fire landscape between each burn.

Cultural burning centers are dispersed throughout the landscape as learning tools to allow the community to gather around fire and to absorb the knowledge of Native American communities. Within the development, fire gardens are used as landscape features to familiarize and bring fire closer to the daily lives of residents and visitors.

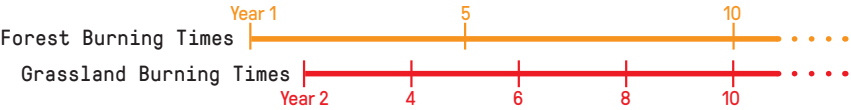
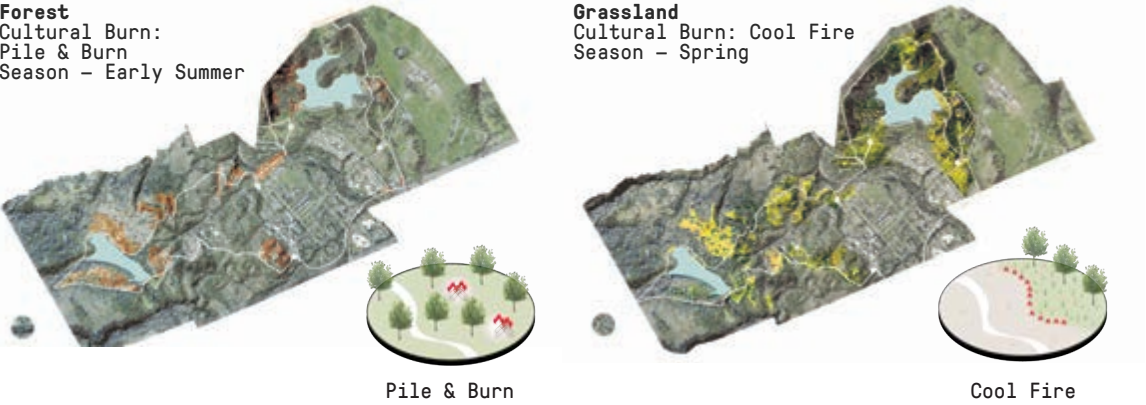
Wildfire Innovation

The landscape of the Sonoma Development Center is a mix of forests and grasslands. Each vegetation type is treated with different techniques in order for it to be effective in preventing wildfires.

In the landscape, fire treatment is completed in two different phases and techniques: one for the forest and one for the grassland. Since the forest is denser, it must be treated by piling loose branches, dead grasses, and burnt debris in small piles. This technique is performed at least every five years in the early summer, depending on the growth conditions of the new vegetation. Due to its more rapid growth, the grassland is treated every two years. “Cool fires” are applied in the spring to remove dry, dead vegetation and to allow new species to be reborn.

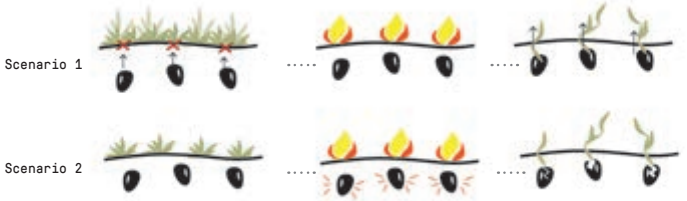
Within the development, the fire gardens are planted with vegetation that benefits from and grows after fire. These gardens are periodically treated in order to allow for different species to continue their life cycles and to improve their growth patterns.

Fire Treatment on the Landscape



Fire Treatment in the Development

Growth Patterns Benefiting from Fire

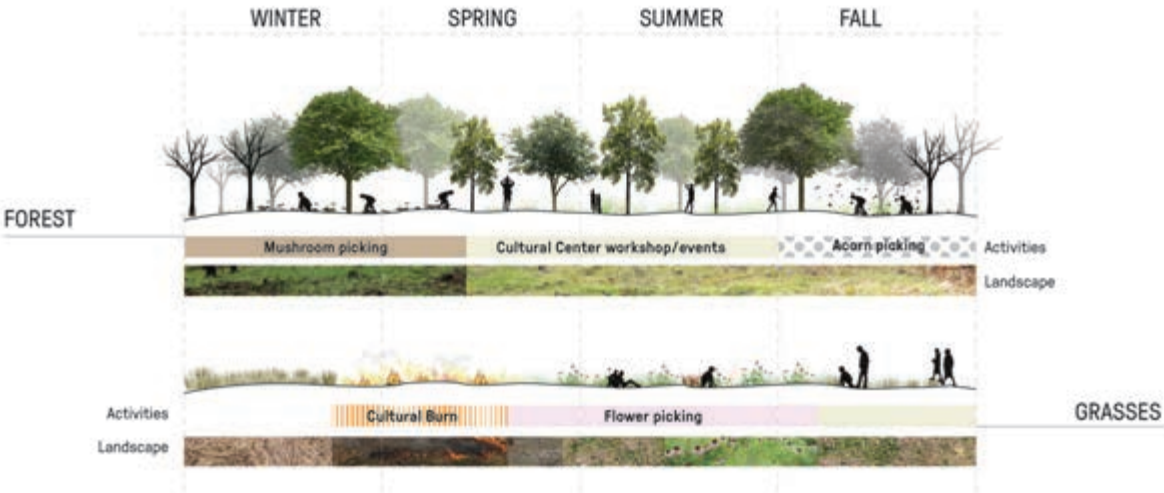


Vegetation Benefiting from Fire



Cultural Burning Landscape & Activities

The landscape of cultural burning is beneficial for nature and can also provide opportunities for many activities.



Cultural Burning Cycles

The different cultural burns performed for each vegetation type can also allow the landscape to become more dynamic and create visibility for fire benefits at different times of the year and in between each burn.



Development

The site already offers many advantages for future development. The core area contains the original street layout and some architecturally significant historic buildings. The site's history provides a certain degree of nostalgia for the public and nearby residents.

The development plan focuses on maintaining the most emblematic architectural buildings within the core and improving the original street layout. The plan focuses on densifying the city center to create a highly active and walkable environment. Green spaces in the core will become historic parks to embrace the history of the site.

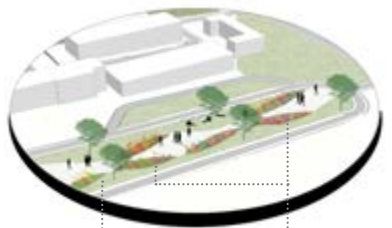
The historic park and other public spaces will incorporate fire gardens visible to the public. The Sonoma Creek corridor will become a rich ecological wildlife park and promenade that connects with the cultural burning trail. The main axis on Arnold Drive will support mixed-use buildings to create a vibrant boulevard full of commerce. As development expands towards the east, the compact city begins to spread outwards, creating more spacious areas until it meets the historical farms and farmland.



	Units	Sqft	Total sqft
High density	203	1742	353 626
Mixed use	46	4139	190 394
Medium high density	208	1700	353 600
Medium density	103	4700	484 100
Low density	17	5450	92 650
Residential Building Area			1 474 370
Residential Building Units			577

The development is composed of five different density typologies. High-density areas include a mix of multi-family low-rises and town homes with residential green spaces. Medium-to-high density areas are composed of single-family attached homes with private and shared green spaces. Medium-density areas with single-family detached homes offer more private green space for each unit. Finally, low density areas on the far east side are composed of single-family homes and farms on large parcels.

Fire Landscapes
Public Spaces

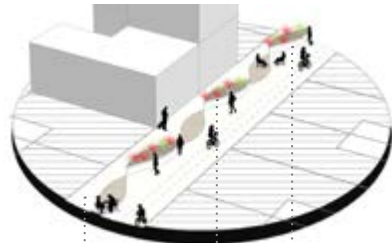


Historical park green-way and city center attraction point

Fire treated planting zones

Fire gardens

Mixed-use | Residential areas



Promenades between building densities

Bike paths

Fire gardens

Cultural Burning



Forest fire treatment: Pile and burning

Cultural burning celebration to attract visitors

Forest fire grassland: Cool burning

Interpretive educational landscape to explain the process and use of fire



Vegetation growth following fire treatment

Pedestrian path to admire fire treated vegetation

Vegetation growth from fire treatment



Multipurpose open space

Elevated gardens to be treated with fire to promote vegetation

Fire Landscapes

Located in historic parks and public spaces, these landscapes are fire-treated planting zones. Such areas provide the opportunity to view vegetation growth following fire treatment, and provide interpretative educational opportunities to better understand the life cycles of plants that require fire.

Fire Gardens

These are elevated planters located in mixed-use and residential public spaces. These planters contain flowers and plants that require fire in order to complete their life cycle. They are treated periodically with small fires to showcase their dynamic qualities.

Cultural Burning

The trail allows the community to gather and participate in cultural burning. The trail also hosts educational events that allow everyone to learn from Native American practices.



Opportunity to teach and train new volunteers

Community effort and celebration

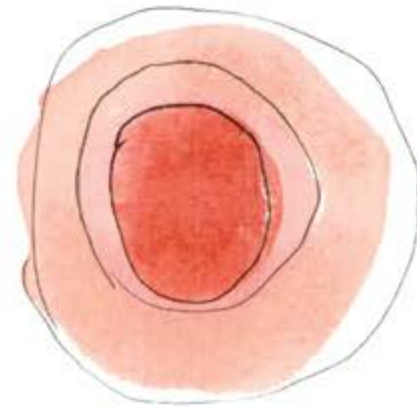
Educational event to learn from historic Native American practices

Defensible Networks

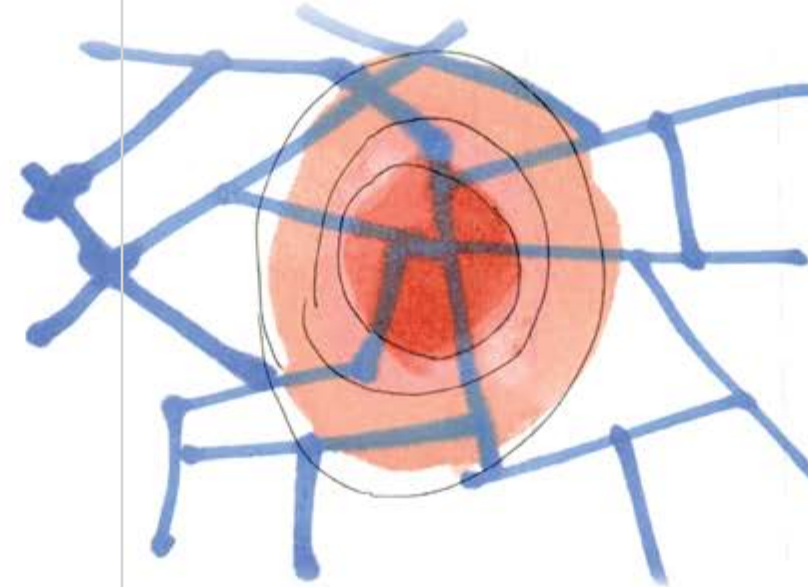


Slide Kelly
Harvard University

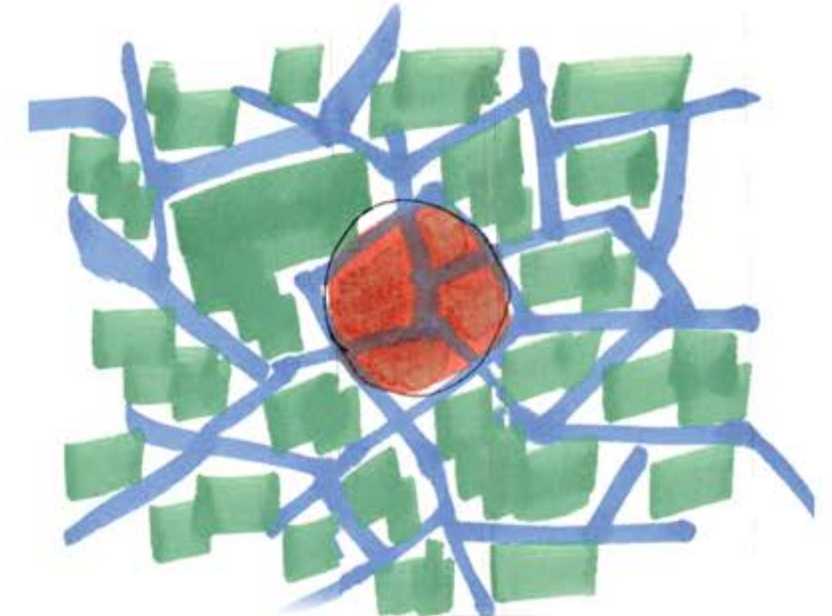
Strategy:
Dual-purpose trails system for recreation and wildfire resilience corridors



Typical Defensible Space



+ Network



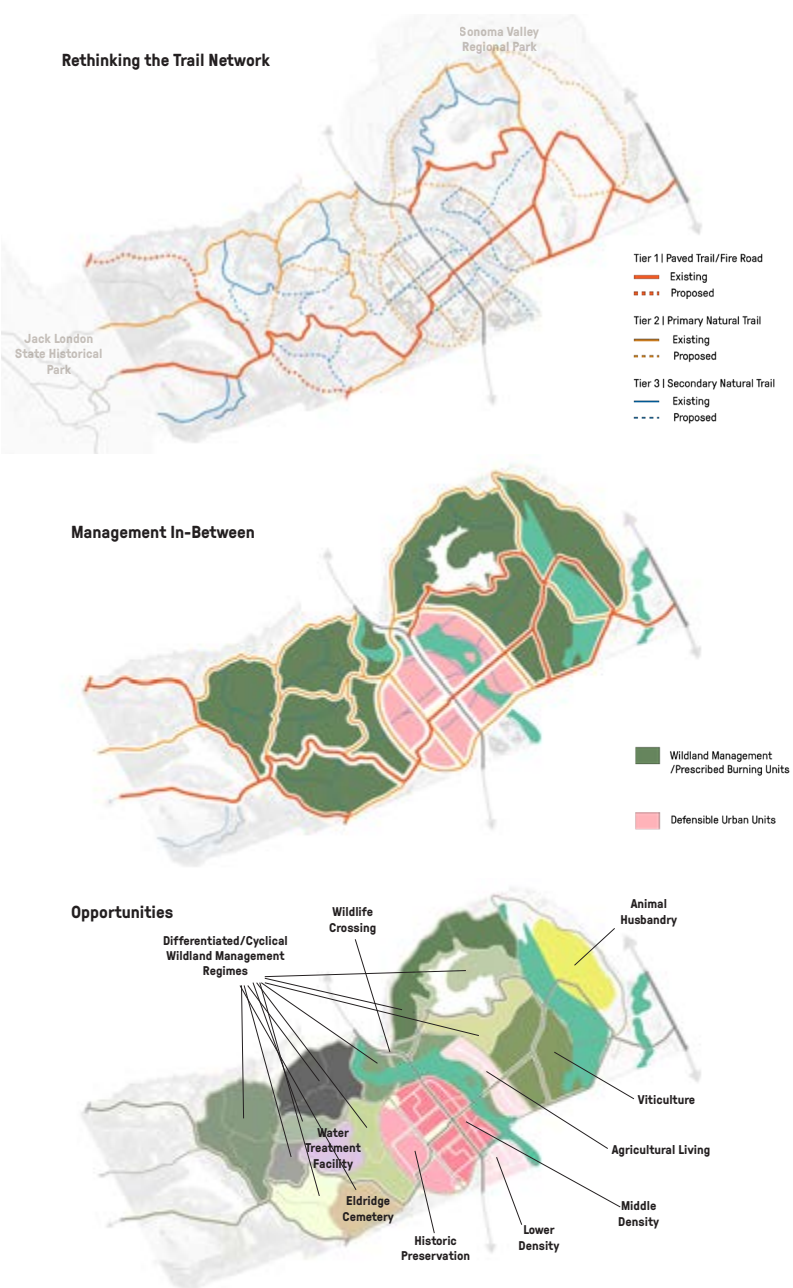
= **Mosaic of opportunities for Prescribed Fire, Fuel Treatment, and Fire Control Access.**

Site Design

The design of the site began with the recognition of the existing trail network as a primary asset. Key existing trails were retained and proposed trails were introduced to create a consolidated and coherent plan that further delineated 25- to 100-acre units that could be maintained and defended from wildfire.

These units then become opportunities for diverse strategies of wildfire management—from prescribed burning to grazing to mechanical fuel thinning. Various strategies recognize the dominance of the site’s oak woodland character and the potential for beneficial use of fire. The plan highlights opportunities for agricultural uses linked to the identity of Sonoma Valley, such as livestock husbandry or viticulture. The development core offers agricultural living, low- to mid-density mixed-use neighborhoods, and a historic district that maintains the axial layout and historic buildings of the original Sonoma Developmental Center site.

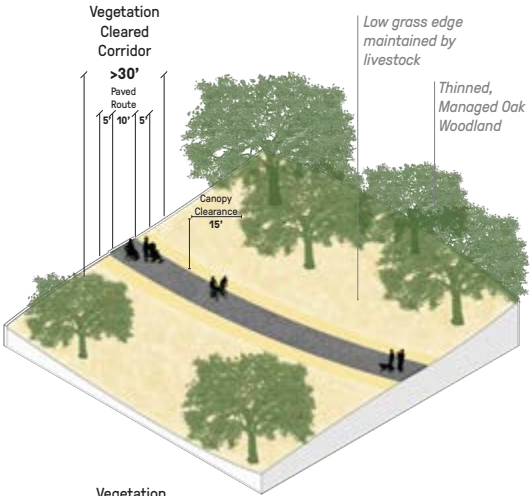
The resulting site plan prioritizes trail corridors as key organizing features in both the open space and urban portions of the site that further accommodates connectivity for recreation, wildlife, and wildfire response needs.



Wildfire Innovation

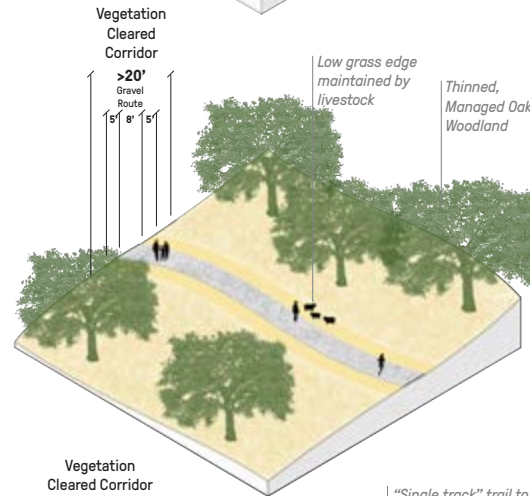
The proposed trail network is classified into a hierarchy of three trail typologies to create a network of defensible corridors. Trunk paved trails are developed from existing roads and fire routes, allowing road-based recreation and creating strategic pathways for fire response teams to respond to fire events and access major water resources on the site. Primary natural trails are slightly narrower, with an aggregate or natural surface, and linked to the trunk routes to provide a mosaic of access for firefighting engines to control prescribed burns or fight fires. Finally, a secondary wildland trail network allows community members the single-track character trail experience while providing a jumping-off point for fire crews to clear vegetation and build a foot line when needed.

The vegetation management of each of these corridors is key to its function, and will be performed on a regular basis by livestock from the on-site “trail grazers farm.” With well-managed trail corridors, fire teams have access to respond to a number of different fire scenarios— including prescribed burns, small wildland fires, and extreme destructive events.



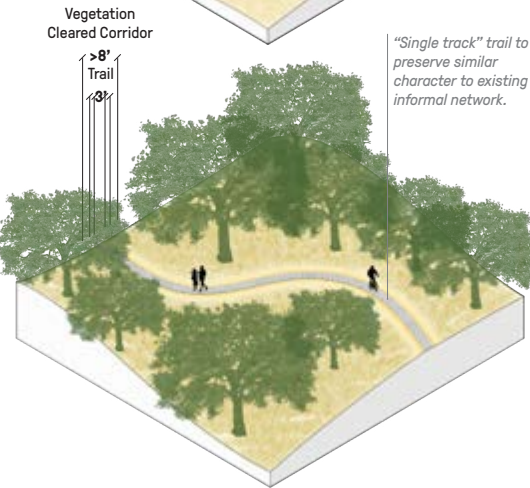
Tier 1 | Trunk Paved Trail Network

- Width: 10'
- Primary Uses: Road Biking, sit biking, walking the dog, strolling, equestrian.
- Material: Paved (gravel)
- Vegetation Management:
- Groundcover: 5' either side plant material and debris cleared.
 - Vegetation: 30' min corridor width cleared of brush, ladder fuels.
 - Canopy: 15' min canopy clearance at edge of corridor.



Tier 2 | Primary Natural Trail Network

- Width: 6-8'
- Primary Uses: hiking, dog walking, gravel biking, running, equestrian
- Material: Crushed aggregate (gravel)
- Vegetation Management:
- Groundcover: 5' either side plant material and debris cleared.
 - Vegetation: 20' min corridor width cleared of brush, ladder fuels.
 - Canopy: 15' min canopy clearance.



Tier 3 | Secondary wildland trail network

- Width: 3-4'
- Primary Uses: hiking, mountain biking, equestrian
- Material: Natural (hardpack)
- Vegetation Management:
- Groundcover: 1' either side plant material and debris cleared.
 - Vegetation: 8' min corridor width cleared of brush, ladder fuels.
 - Canopy: 10' min canopy clear



Adaptability | Prescribed Fire



Primary trails give fire crews access to manage prescribed burns for 25-to 100-acre units of wildland.

Adaptability | Major Wildland Fire



Defensible network gives fire crews access to contain small wildland fires, turn around, and connect to water sources on either side of the site.

Secondary network trails in defensive positions (e.g. near surface water) provide access for foot lines to widen corridors and reduce fuel in attempts to defend residential space.

Development

With trails as an organizing agent, the urban core of the site is redeveloped to reflect the priorities of historic preservation, housing density, and agricultural living. A civic corridor includes the redeveloped Eldridge Fire Station, a recreation center, and a Sonoma Valley Fire Education Center. The latter will engage the community in the traditional role of fire in Sonoma's ecology and introduce some of the strategies possible to reintroduce fire into the landscape or to respond to extreme events. On the eastern side of the site, an "Agrihood" provides residents with mid-density agricultural living that is surrounded by well-irrigated crops, such as vineyards and community vegetable gardens.

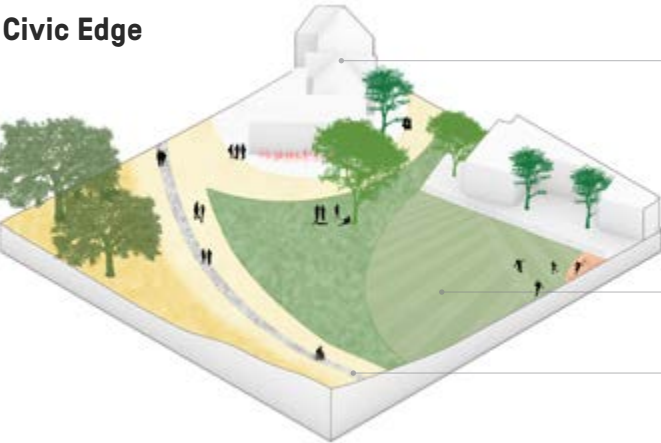
Spaces located along defensible corridors can become activated to support prescribed burning or defend the community against natural wildfires, allowing spaces for community gathering, fire response staging, or engine access for fire defense.

- "Agrihood" - Cooperative Agricultural Community
- Low-Density Residential
- Mid-Density Residential
- Mixed Commercial/Mid-Density Residential
- Civic/Institutional
- Office/Commercial
- Utility

- Sonoma Valley Fire Education Center
- SDC Recreation Center
- SDC Historical Center
- Eldridge Fire Station



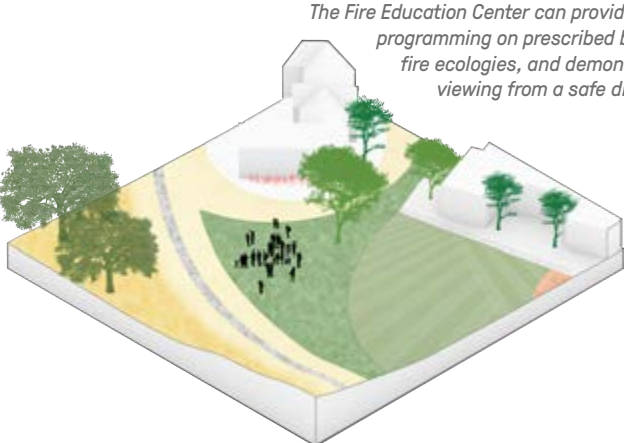
Civic Edge



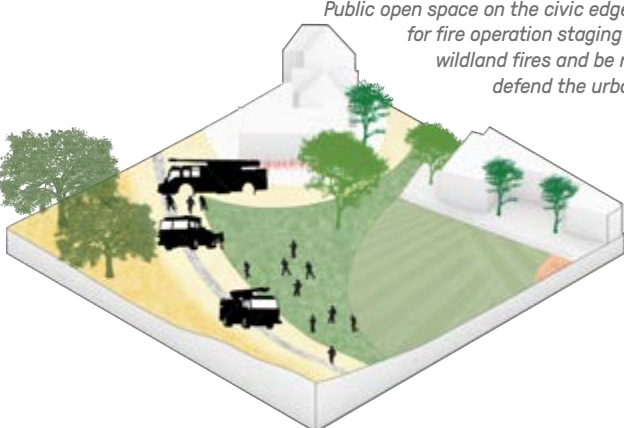
Sonoma Valley Fire Education Center

Baseball Fields and Irrigated Open Space

Perimeter Multi-Use Trail connecting to Shared Wildlife Bridge

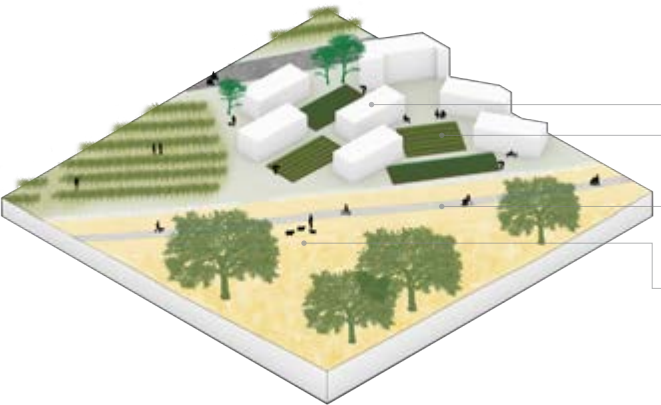


The Fire Education Center can provide public programming on prescribed burning, fire ecologies, and demonstration viewing from a safe distance.



Public open space on the civic edge allows for fire operation staging to fight wildland fires and be ready to defend the urban core.

Agrihood

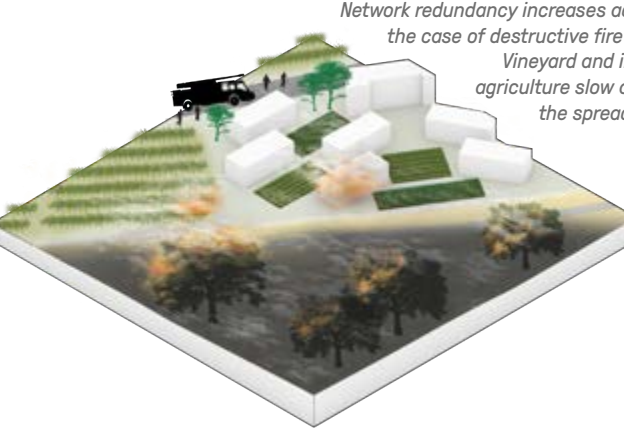


Viticulture Occupational Training and Vineyard Cooperative

Community Garden Plots

Existing Road Transformed into Multi-Use Trail

Trail Corridor Grazed by Sheep and Goats



Network redundancy increases access in the case of destructive fire events. Vineyard and irrigated agriculture slow and cool the spread of fire.

Layered Scapes



Tejas Saiyya
University of Michigan

Strategy:
Layer buffers against
wildfires by joining
intrinsic and extrinsic
systems



Site Design

The site at the former Sonoma Developmental Center is lush in its ecologies, experiences, and economic outlooks, all of which mix to form opportunities for wildfire mitigation. Layering these internal attributes with adjacent threads provides an approach to create a holistic, transformative community. These layers take four main forms:

1. Extending (economy)
2. Restoring (ecologies)
3. Developing (core)
4. Preserving (landscape)

Individual layers facilitate specific programming, but are stitched together along their edges to form a seamless, generative place.

Layer 1 (Extending) includes irrigated vineyards that connect to existing, external vineyards to the site's south. Animal husbandry within this area offers grazed reduction of fuels.

Layer 2 (Ecologies) encompasses a well-managed forest of historic black oaks. It serves as a shaded fuel break, park, and occasionally as a prescribed fire demonstration.

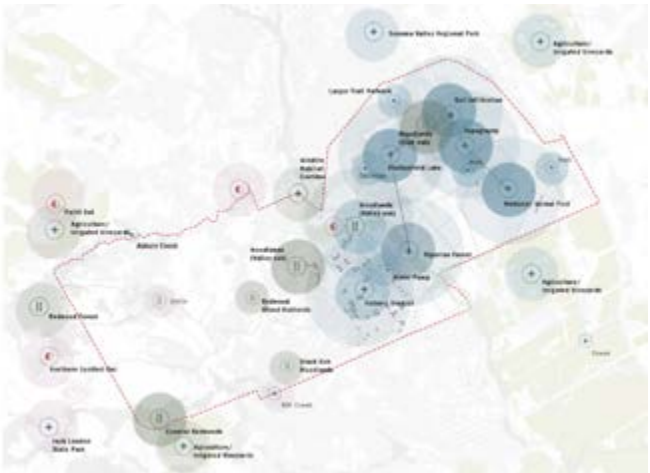
Layer 3 (Core) is a vibrant, walkable urban core that features mixed-use development and a range of housing types.

Layer 4 (Landscape) preserves the rich woodlands for open space and recreation.

Approach



External & Internal Opportunities



Layering economy, ecology, and experience to mitigate the threat of wildfires.

A deep understanding of the site's many constraints and opportunities reveals these selected layers. Stitched together, the layers form a seamless continuation of human and ecological values to foster a transformative community in Sonoma Valley.

Site Plan



Wildfire Innovation

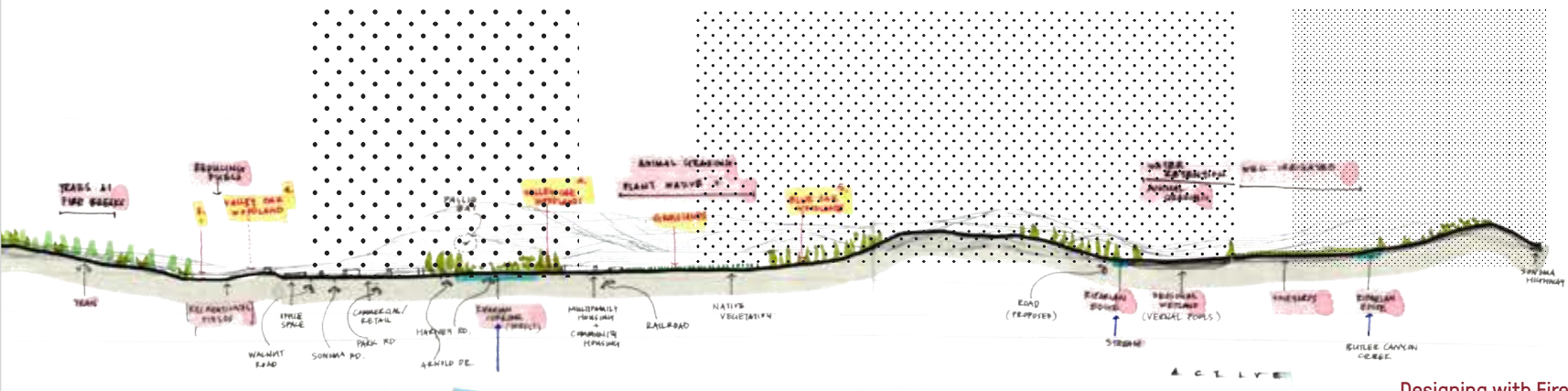
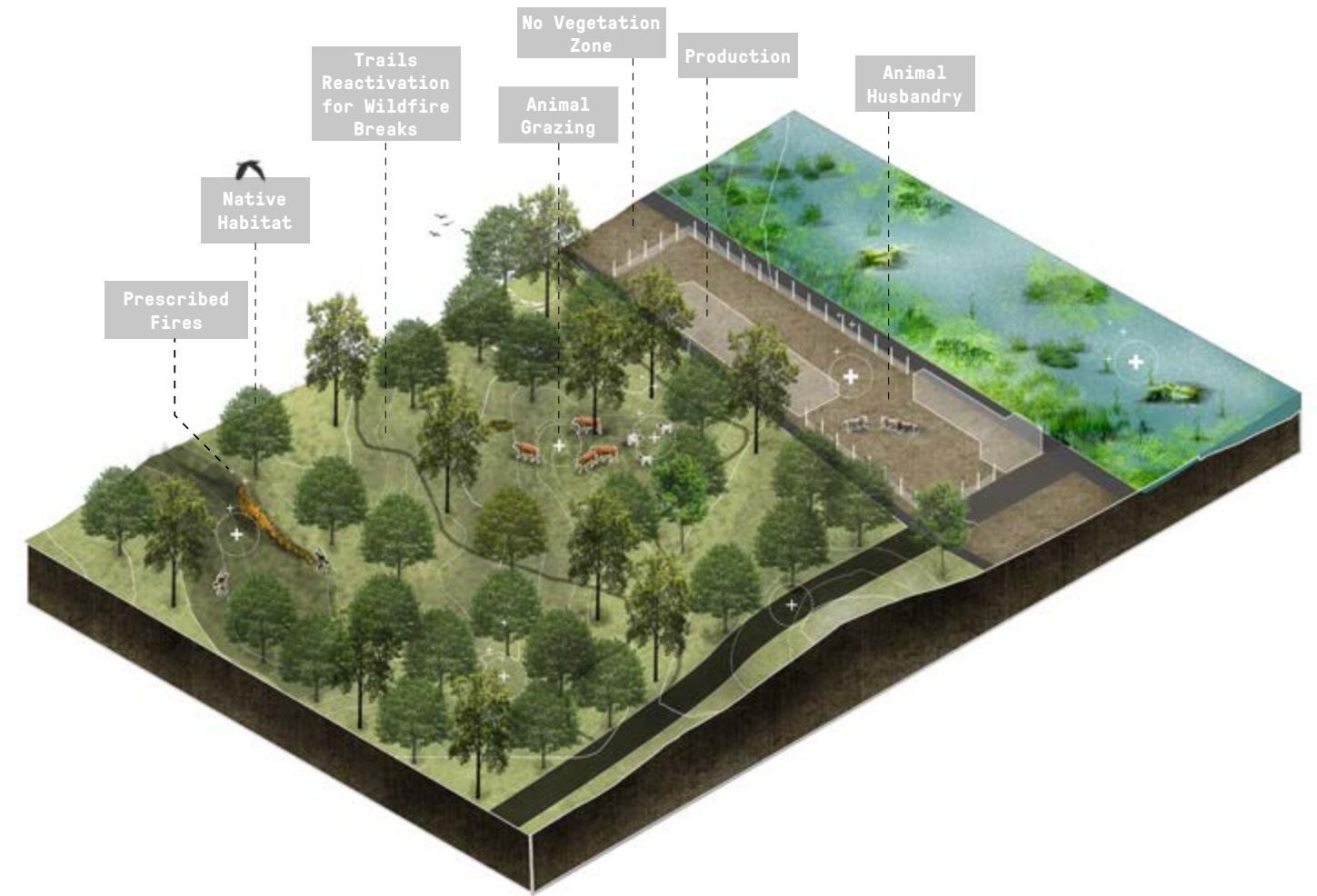
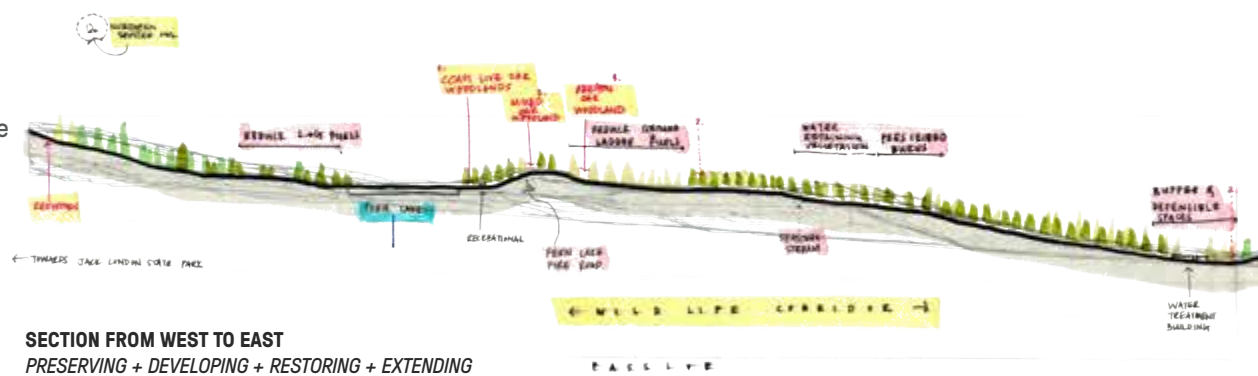
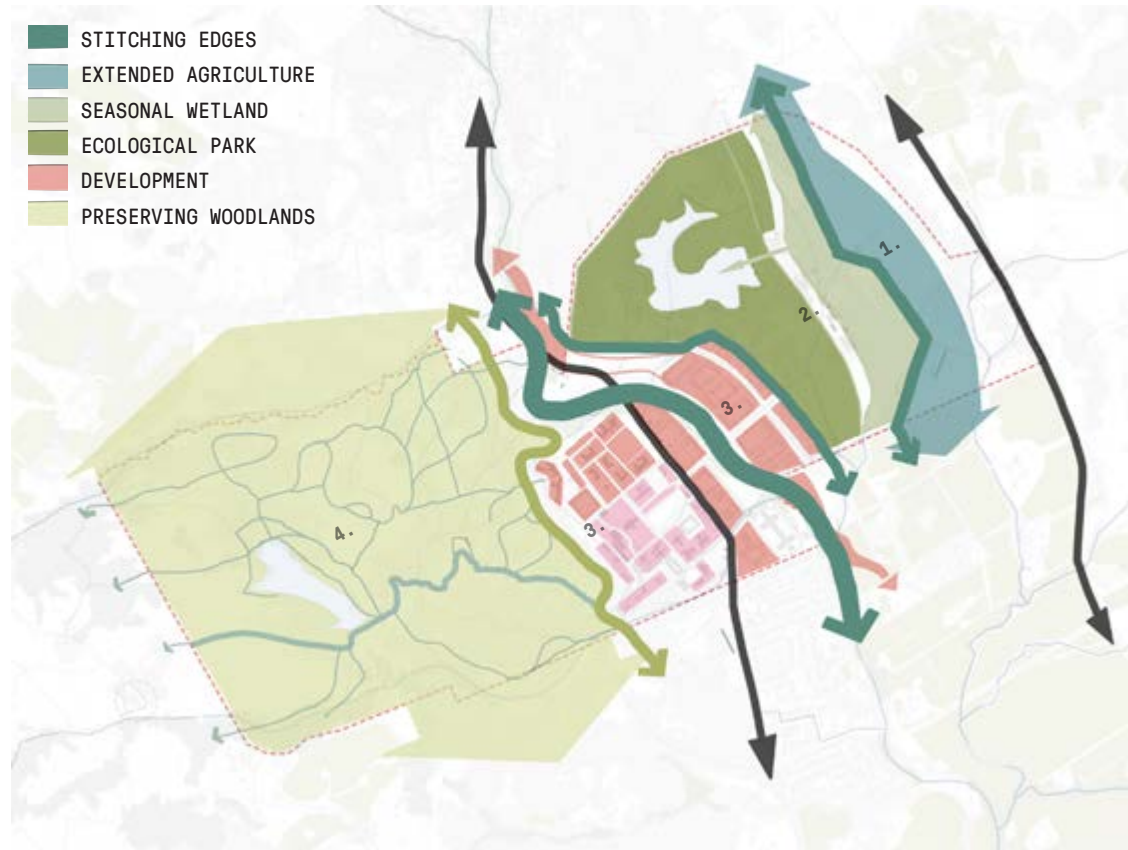
This design addresses wildfire risk by weaving the site's existing and potential strengths to insulate the core development from wildfire. Irrigated vineyards, grazed landscapes, shaded fuel breaks, recreational fields, and parking areas are stitched together to put distance between values and hazards.

Irrigated vineyards and grazed areas reduce fuel loads and flammability along the site's eastern boundary, where fire is most likely to originate due to prevailing winds.

Ecological buffers of riparian and managed oak woodlands maintain sensitive habitat and a sense of nature with lower levels of flammability.

Adjacent to development, parking lots, roads, and trails decrease flammable vegetation and provide immediate defensible space for firefighters. Within the core, home hardening methods are utilized to decrease the flammability of the home ignition zone.

Lastly, an Ecology Center helps engage residents on the topics related to wildfires, and can serve as a crisis center during emergencies.



Development

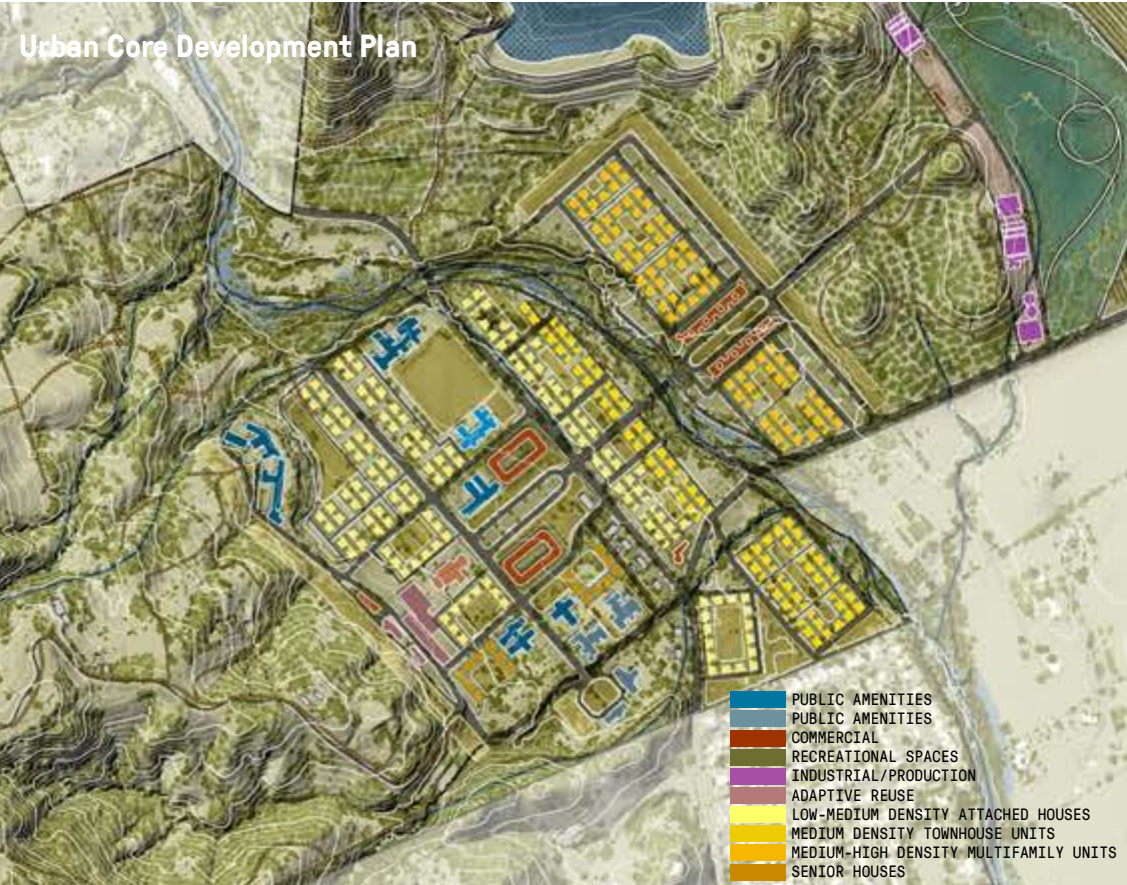
At the center of the layered scapes is a mixed-use, pedestrian-oriented urban core. An array of housing choices are available to people of varying socioeconomic backgrounds. The community's numerous institutions provide opportunities for research, innovation, and culture.

The development builds upon the site's rich historic legacy of care as it strives to meet future requirements for housing while balancing sustainable building practices.

High-density multi-family housing on the development's periphery transitions to mid-density duplexes and triplexes along the central Arnold Drive. Setbacks along Sonoma Creek preserve the riparian forest. Within residential housing areas, community gardens create communal space.

Mobility is emphasized through numerous bike routes, roads, and trails that circumnavigate and lattice the site.

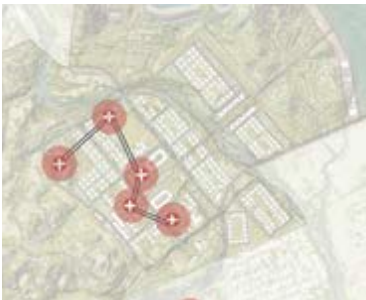
Selected historic buildings are preserved within a historic cultural district within the old campus. Commercial and housing uses of these buildings achieve a true mixed-use core.



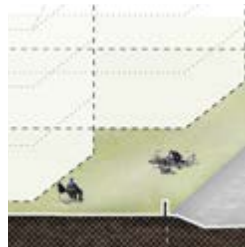
Stacking Land Use



Extending Narratives



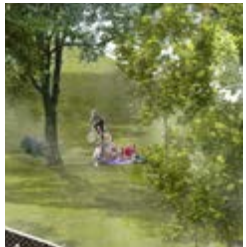
Preserving Culture



Home Hardening with Defensible Spaces



Road and Trail networks as buffers



Access to Riparian Forest



Oak Preservation along the Riparian Forest



Community Participation through Planting



Clearing Ground Fuels along Riparian Forest through Grazing

Distilling context and adjacencies to create layers for wildfire mitigation.

Along Sonoma Creek, ecology and development are interwoven to form an exchange between people and environment. Here, the ecosystem is restored to reduce fire risk, and accompanied by

trails and seating areas to facilitate circulation and recreation throughout the riparian forest. Potential wildfire spread through the riparian corridor is reduced through protected

buffers formed by adjacent roads and parking lots, as well as by nearby hardened homes.

The Oasis



Xinyi (Sydney) Zhang
University of Pennsylvania

Strategy:
Water management
system coordinated
with wildlife corridors
and grazing programs



Site Design

The SDC site is unique, as it sustains several large bodies of water in a region known for its heat and aridity. Sonoma Creek, Suttonfield Lake, and Fern Lake, along with numerous seasonal streams, permeate the site. Enhancing the existing water management system can create an oasis within Sonoma Valley that provides not just for human beings, but also for wild and domestic animals.

The proposed system builds upon existing infrastructure through a series of wells, gravity flow transmission, and lake-fed streams to create a system of oasis nodes. Distributed throughout the site, these nodes collect flows, irrigate plants, and create a more humid environment.

The Oasis efficiently maximizes available water supply to provide for wildlife, agriculture, and people in a concerted effort to reduce wildfire risk. Oasis nodes raise humidity in suitable areas for sensitive habitat, provide drinking water for grazing livestock, and foster an attractive green space for visitors and residents. These activities act in unison to reduce the flammability of the landscape through greater soil moisture, fuels reduction, and irrigated defensible space. The Oasis becomes a sanctuary for all beings.

The Oasis



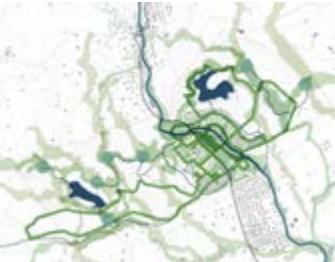
Wildlife Oasis

The SDC site is transected by the Sonoma Valley Wildlife Corridor, a rare passage for wildlife moving between protected open spaces. The Oasis supports this corridor by maintaining habitat during anticipated future droughts.



Livestock Oasis

Oasis nodes support agricultural and pastoral activities on the site by providing drinking water. Livestock are an essential component of this design, in generating sustainable jobs and reducing fire risk.



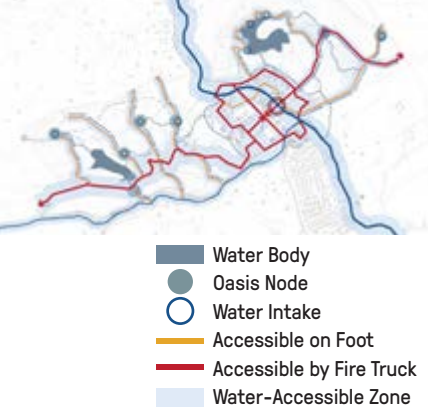
Human Oasis

At the site's core is the main oasis, a residential and wine institution accented by green space. This core becomes an attractive center of vibrant life, surrounded by agriculture, animals, and vegetation.

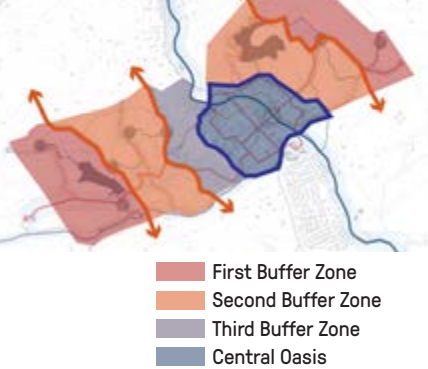
Site Plan



Water Management Plan



Wildfire Buffer Plan



Wildfire coming from the east and west will gradually be extinguished before it reaches the center oasis. The oasis nodes turn into water intakes for firefighters during wildfire events.

Wildfire Innovation

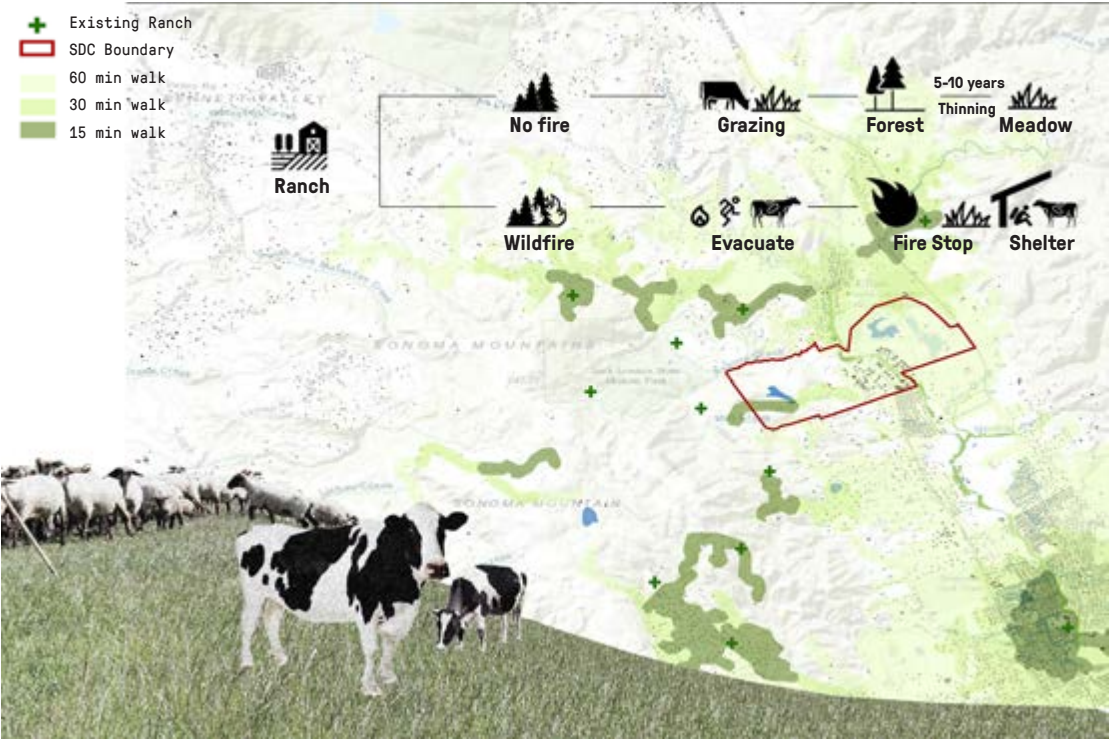
The greater Sonoma-Napa region possesses an extensive grazing legacy that persists today. One opportunity to benefit local ranches and the planned community at SDC is a mutual grazing agreement, in which ranches bring their livestock to the site and create fuel break belts. This program both supports local business and protects residents. During a wildfire, this protected area can serve as holding space for ranchers and their animals.

The intersections where planned grazing belts overlap with the wildlife corridor form an oasis node. Here, humidity and water provide habitat for wildlife and shade for livestock, with terrain used to separate the two. Fruit trees at the node serve to guide wildlife through the corridor, whereas grazing is temporary and targeted through movable fencing. When a fire occurs, all creatures can access escape routes without significant interference with one another.

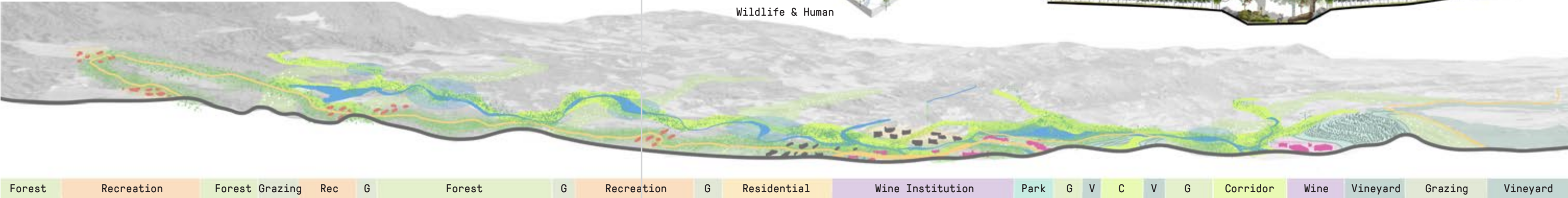
Along the creek park, height differences in vegetation are used to stratify human and wildlife areas. Ha-ha walls provide proper distance and allow observation of wildlife without interference.

Vineyards support animal relationships and wildfire, with opportunities for grazing and hunting for species such as sheep and bats.

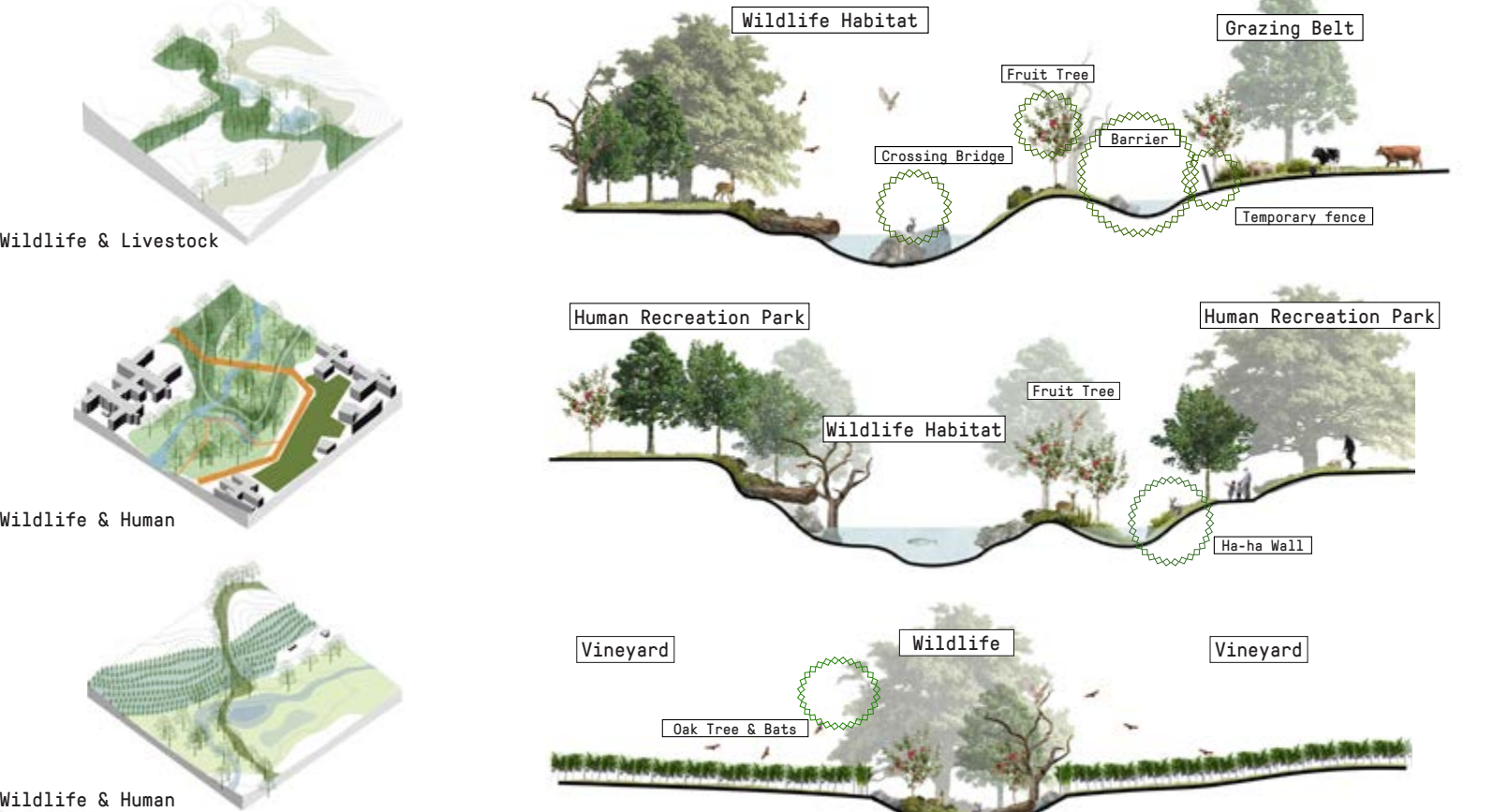
Grazing Program



Site Section



Innovation Sections



Development

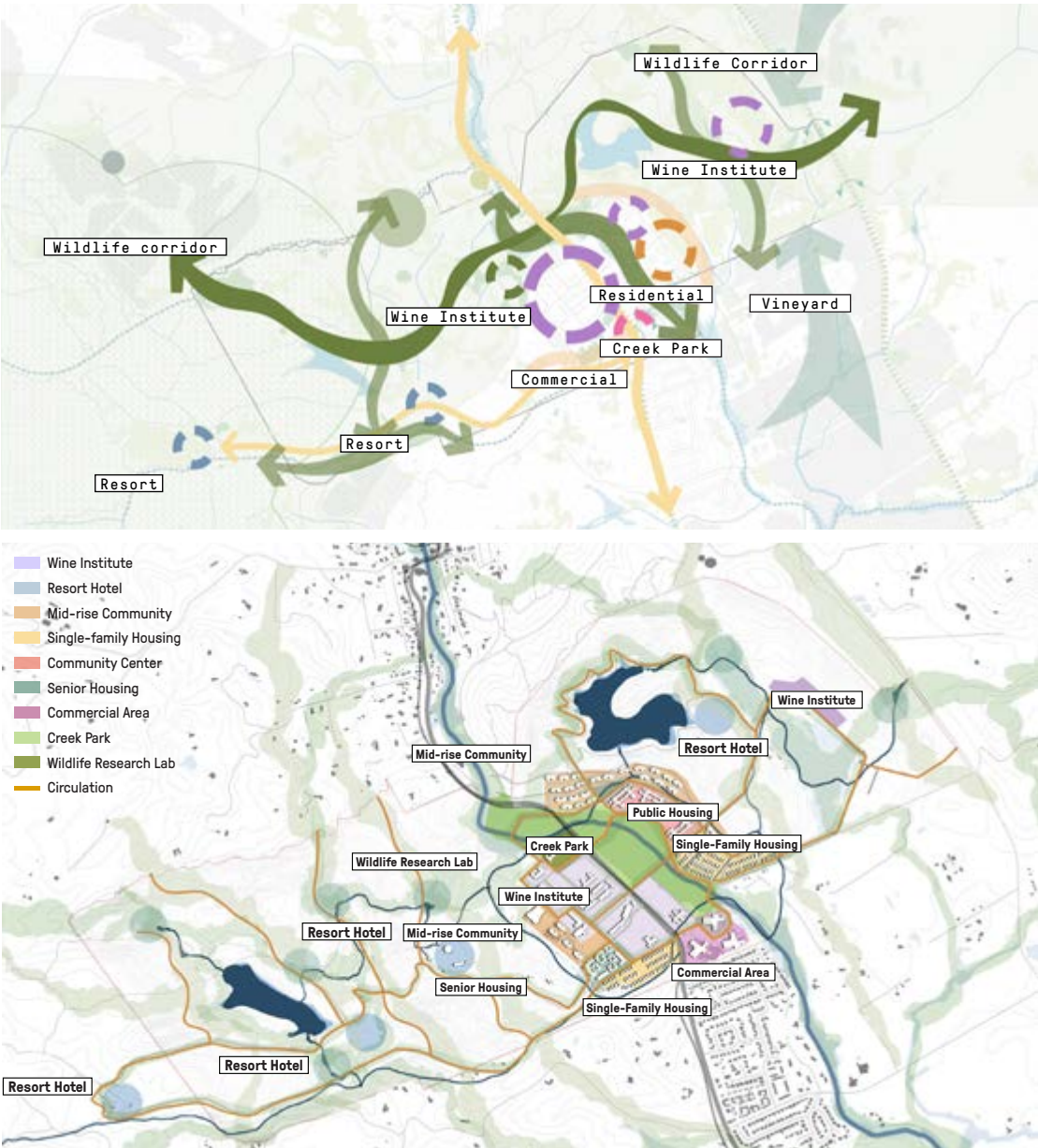
The Oasis development will strive for an equitable balance among benefits for wildlife, agriculture, and people.

Various protected ecological areas create the basic framework for the site. Preservation of the Sonoma Creek Park for wildlife and recreation establishes a centrally located natural corridor. The protection of the east-to-west wildlife corridor additionally constrains development within the site's core. To monitor conditions of this area, a wildlife research lab is situated adjacent to the corridor.

A mid-rise community, senior housing, single-family homes, and a community center are placed to best support livability and the ecological integrity of open space. Development will incorporate existing buildings to maintain the historic nature of the site.

To serve both local people and visitors, the Oasis exercises its central location to become a learning center for the entire Sonoma wine industry. The vineyards and wineries orbiting the site are linked with a unifying wine institute.

Various areas are connected with a new circulation system. A large roadway loop connects areas dedicated to recreation, agriculture, and tourism.



EXPERIENCE	MARKETING
Wine Tasting	Wine Conference
Wine Industry Touring	Wine sales
LEARNING	Student life
Wine Brewing	Sports field
Vineyard Growing	Dormitory
Research Lab	Playful Campus

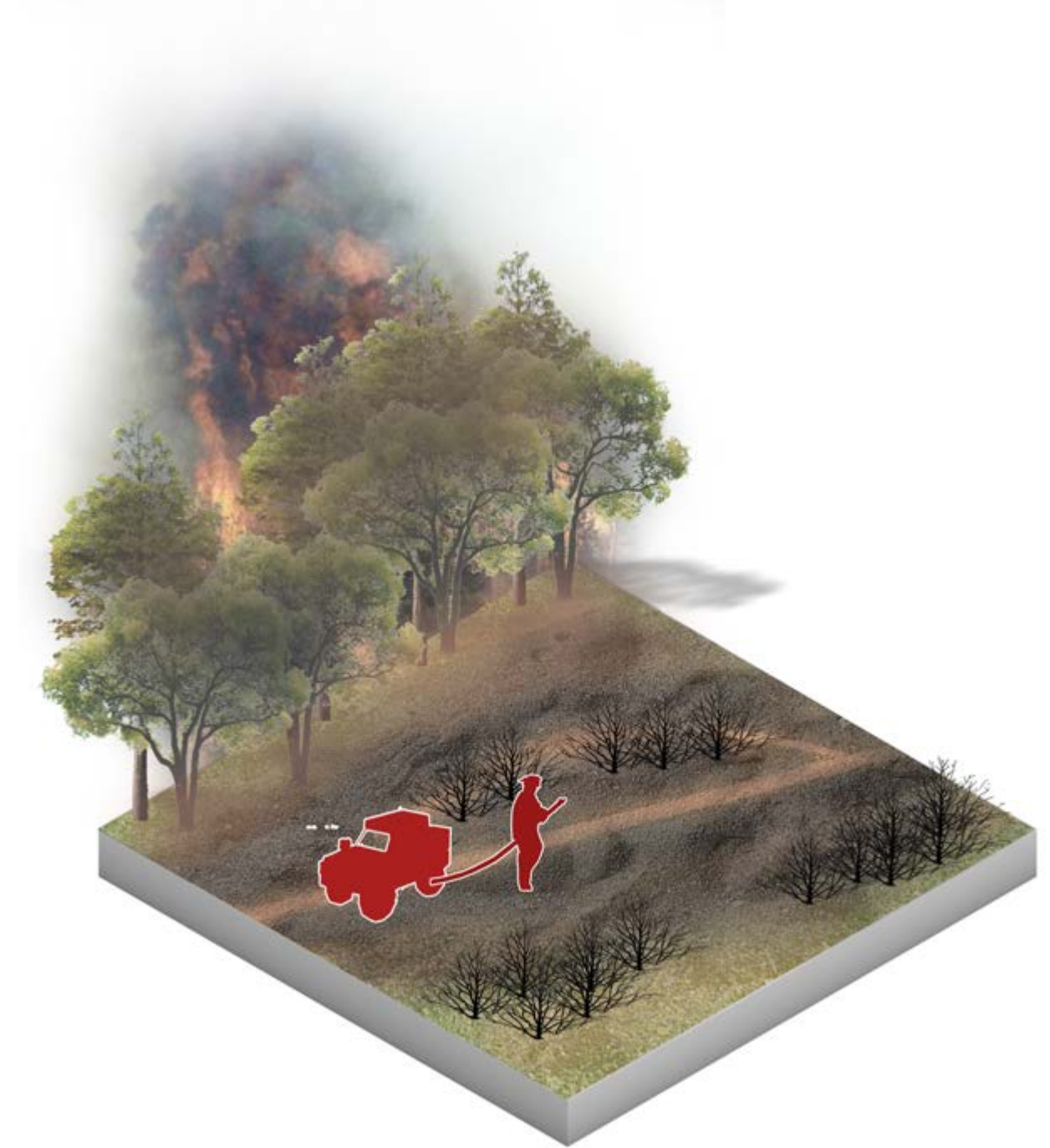
The on-site system of vineyards and wineries support a centralized wine institute. Within the wine institute, visitors can experience wine tasting, winemaking, harvesting and cultivation processes, and emerging wine research. The institute will also provide space for wine conferences, sales, and marketing.

Roads/ Recreation/ Resilience



Yuanqing Su
University of Illinois,
Urbana-Champaign

Strategy:
**Redevelopment of
existing roads
and trails
networks for dual
recreation and
firefighting
purposes**



Site Design

Designs that promote attachment to open space are essential to the creation of a sustainable, climate resilient community. Recreation is key to this outcome, and is a beneficial resource within Sonoma Valley communities and for the SDC site. Open space attachment through recreation is dependent on a well-connected road and trail system that allows for circulation with minimal environmental impact. While a current network exists, this design aims to greatly improve varying types of circulation.

Various trails and roads typologies support a range of programming, from hiking and biking to scenic drives. Suitably located lookouts points, ADA-accessible areas, and picnic areas support outdoor recreation for all people.

During a wildfire event, this recreation system transforms into a firefighting network. Roads become fuel breaks; trails become ingress routes; and picnic areas become command posts. Analysis of previous wildfire spread patterns reveals that roads and trails may often slow or stop wildfire.

Expansion of the existing road and trail network serves to benefit both recreation and resilience opportunities.

Existing Conditions



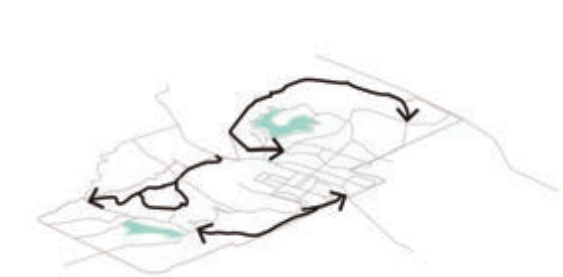
Existing Roads
Existing Trails



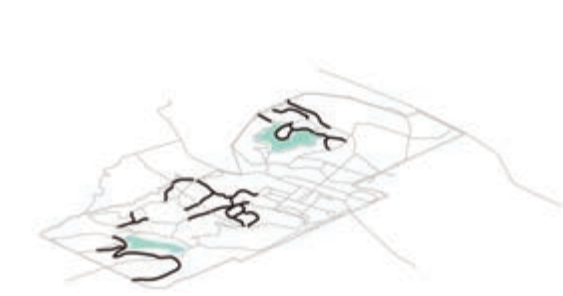
High-Density Vegetation
Medium-Density Vegetation



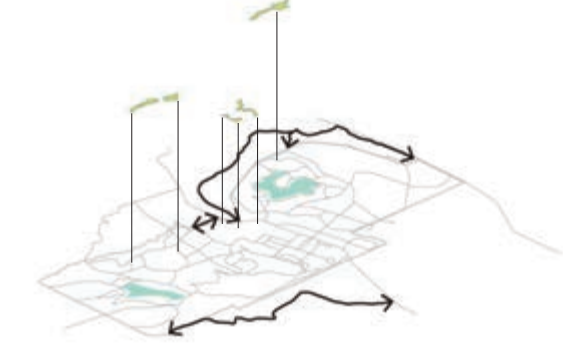
Landscape Resources



Main Trail System



Trail Branches



Buffer Landscape and External Connection



As wildfires do not occur every day, the road and trails network serves the recreational needs of the SDC community and the surrounding community the vast majority of the time. Proposed trails link with existing roads and trails. The networks rings provide concentric access to the site's robust open space.



In an emergency, the corridors that formerly served as recreational thoroughfares become firefighting access routes, holding features, and staging areas. The concentric rings of the network become a layers of protection.

Wildfire Innovation

Recreation Function



Wildfire Function



Built upon the site's existing trail and road network, a dual-purpose trail network blends a traditional form of programming with an additional system suited for fighting and preventing wildfire spread.

Paths of differing surfaces—such as dirt, gravel, and pavement—at varying widths create a hierarchical typology of trails to support various recreational activities. Subsequently, these typologies lend themselves to different firefighting operations. Wider paved trails can be used for walking, scenic drives, or road biking; these same trails can also be used for large fuel breaks or firefighter staging. Smaller

Innovation 01 Wildfire Command Center



Recreation Function



Wildfire Function

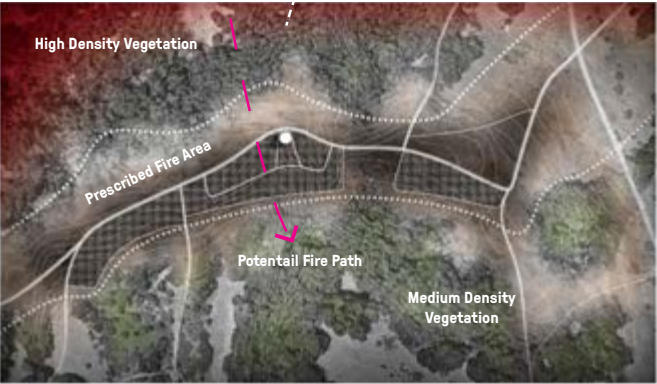
gravel trails can be used for running or gravel biking, and then used as ingress routes for firefighters. Lastly, single-track dirt trails can be used for mountain biking or trail running, as well as handlines for firefighters.

This network connects recreational activities including picnic areas, scenic areas, gathering plazas, and recreational fields. The network will also connect to a Wildfire Education Center; during a wildfire, this center can become a Wildfire Command Center.

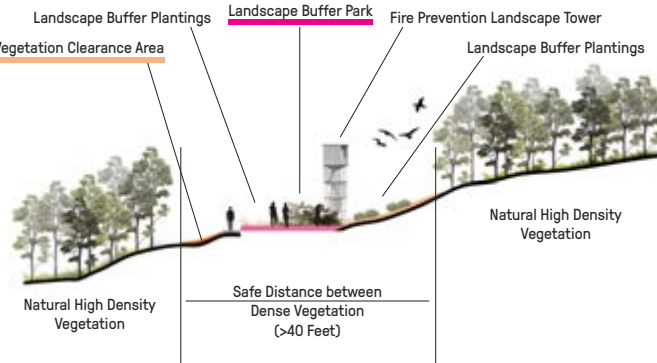
Innovation 02 Fire-prevention Trail-Landscape System



Recreation Function



Wildfire Function



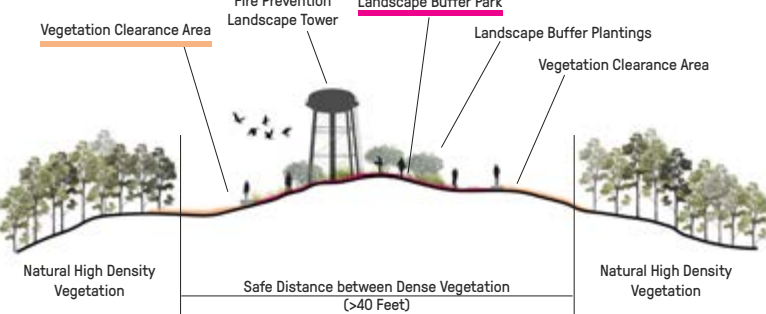
Innovation 03 Ridge Trail Lanscape Buffer Park



Recreation Function



Wildfire Function



Development

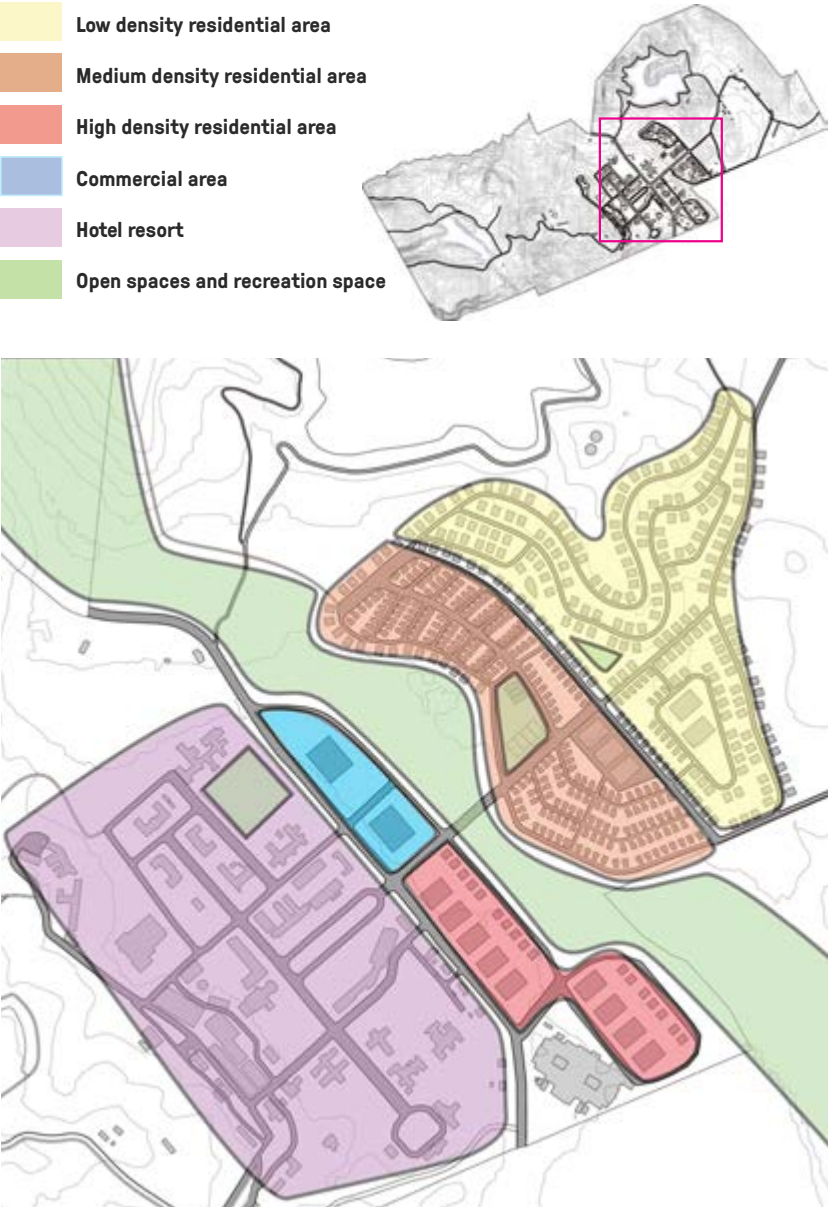
The site's core development prioritizes mixed uses, with significant area dedicated to commercial and residential use. Greater emphasis on commercial use within the site's core decreases the amount of daily travel to-and-from the site for residents, and brings a sustainable source of revenue to the community.

At the heart of these economic benefits is a hotel resort district that capitalizes on the site's natural and historic beauty. The resort occupies much of the historic campus core and retains many of its former buildings.

Along the site's main thoroughfare (Arnold Drive), commercial and high-density residential areas define the site's main streets. This approach also allows businesses to service not only those within the community, but anyone from adjacent towns, as well as out-of-town visitors touring the scenic drive.

Sonoma Creek is maintained as an open space park to preserve its recreational and ecological value. Further to the east, medium- and low-density residential uses fan out in traditional patterns.

In total, this development plan supports approximately 1,175 units.



Lower-Density Single-Family House
Units: 243
Area: 726,100 SF



Higher-Density Single-Family House
Units: 232
Area: 370,000 SF



Multi-Family Low-Rise (Five Floors)
Units: 700
Area: 350,000 SF

Total:
Units: 1,175
Area: 1,446,100 SF



Conclusion

Fire season is quickly becoming synonymous with life in the American West. The smell of smoky skies and the sight of a scarlet sun are altering the experience of what it means to live west of the hundredth parallel. Rapid environmental change is pushing everyone to adjust and adapt.

Landscape architecture is a discipline relatively new to the challenge of wildfire, but it carries a wealth of knowledge imperative to its untangling. With the Summer Student Program, we sought to integrate and apply this disciplinary expertise to the increasingly pressing questions of wildfire resilience. Through four weeks of research, design, and critical thinking, we developed insights that suggest transformative changes for Sonoma Valley as well as for the many fire-prone communities throughout California and beyond. Our explorations demonstrate how wildfire solutions do not exist as singular pursuits, but must be deeply integrated with critical social and environmental movements such as affordable housing, natural habitat restoration, healthy food access, indigenous cultural recognition, water sustainability, and equitable recreational opportunities.

Living with fire means designing for fire.

Acknowledgements



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