

Environmental, Social Sustainability, and Resiliency in Napa



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Introduction

The county of Napa was established in 1850, and has grown from an agricultural center into the heart of California's wine industry. As the center of a county with close ties to agriculture and nature, the City of Napa faces multiple environmental risks, from flooding to earthquakes to fire, making the question of planning a resilient and environmentally as well as socially sustainable city of particular importance. The City of Napa has already made huge strides in the fields of flooding mitigation and environmental protectionism, as well as runs a number of social and public health programs for its residents. This proposal seeks to build upon existing initiatives and suggest further interventions and priorities to promote environmental and social sustainability in Napa. This proposal addresses 3 major concerns: emergency response protocol, future development, and social sustainability.

We begin with an overview of the environmental risks of fire, flooding and earthquake in Napa, and make suggestions for preventative measures. This includes considering new data collection techniques and the use of technology to monitor and respond quickly to threats, as well as to model and predict future risks.

In addition to ensuring effective response to natural disasters, it is vital to recognize the importance of building and developing in areas that are less prone to environmental risk. We identify areas that are less susceptible to fire and flooding risk to consider for future development, as well as factor in social determinants, such as ensuring affordability and preventing displacement of Napa residents. We suggest densification in low-risk, inefficiently used spaces in the city of Napa, as well as discuss the effectiveness of land trusts in Napa and the potential future of community land trusts in Napa.

After highlighting environmental sustainability, we seek to address social sustainability by prioritizing mental health and maintaining a sense of community in Napa. To us, a socially sustainable vision will ensure the promotion of happiness, health, wellbeing and equity through ensuring that institutions work in the public's interest. We believe that environmental sustainability cannot be separated from social sustainability and ensuring the longevity of community wellbeing in Napa. We suggest design interventions such as ensuring access to green and recreational spaces, as well as make broader public health policy suggestions.

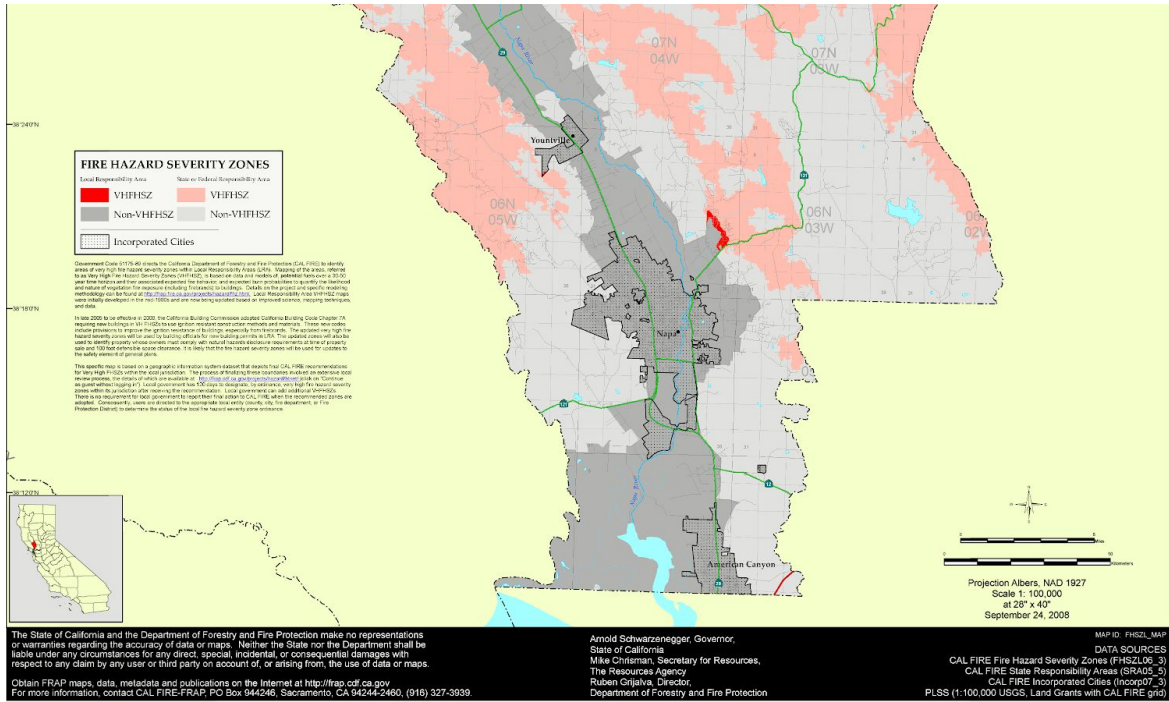
Environmental Risk Analysis

1. Wildfire

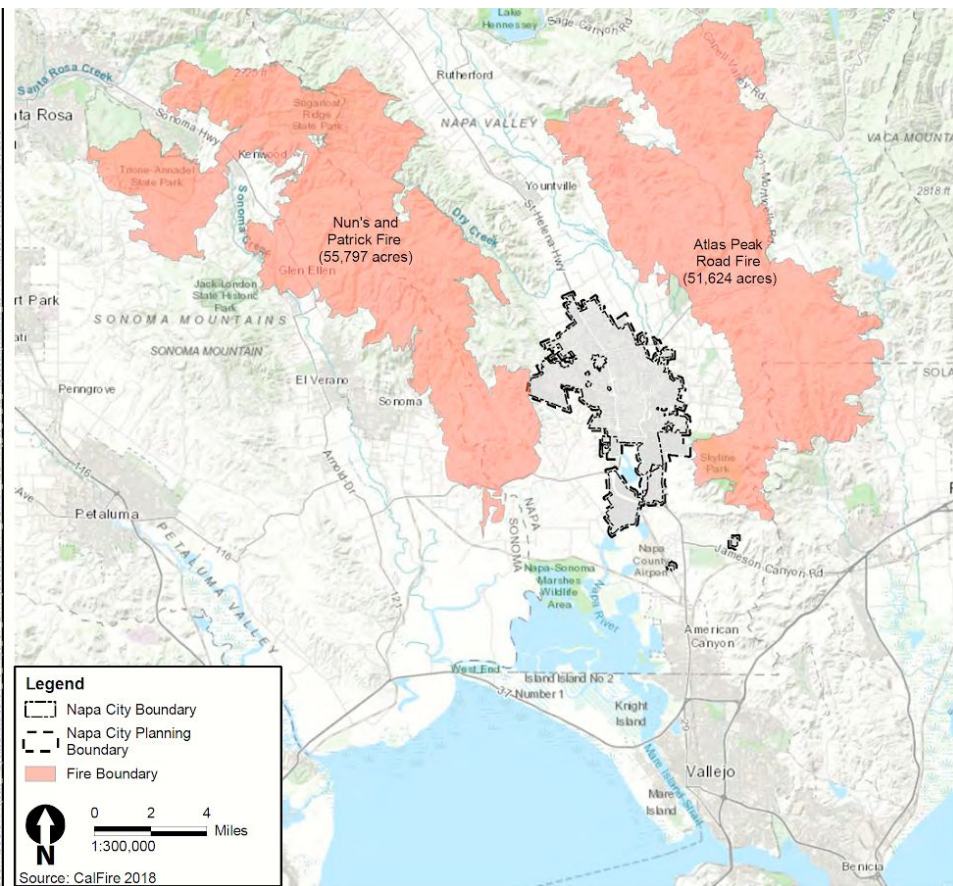
Where things stand today

In the past, the City of Napa is considered to be less impacted by the effects of wildfire. According to Cal FIRE's Fire Hazard Severity Zones map, the entirety of the city is considered "Non-VHFHSZ", or "not very high fire hazard severity zone" (Cal Fire). The map did not indicate the level of fire threat inside the city (since Napa is its own local fire jurisdiction), but it does indicate that hills surrounding Napa has only "moderate" level of fire threat, the lowest level in Napa County. According to a White Paper on Wildland Urban Interface published by ABAG and MTC in 2018, Cal FIRE's map is reasonably accurate in its categorizations so that a large portion of fires in the past 65 years indeed occurred more likely in zones designated as "very high threat" than others (ABAG & MTC). In 2013, the County of Napa produced an assessment of the three main natural disaster threats as part of its updated Hazard Mitigation Plan, and "wildfire" was the top concern due to its "high risk" and "widespread potential impact" (Hazard Mitigation Plan, 75). They attributed this conclusion mostly due to wildfire's frequent occurrences and lack of response time. Still, given that the assessment was done in regard to the whole County and not just the City, it seems as if there is reason to trust Cal FIRE's assessment that Napa will be spared from the threat of burning forests in the near future.

Notwithstanding the designation, two large fires, Nun's/Patrick and Atlas Peak, ravaged the wildland left and right of Napa during the 2017 wildfire seasons, causing significant damages and considerable panic among residents. At their maximums, both fires' perimeters reached the city boundary. The sheer extent of destruction (1,475 structures destroyed by Nuns and Atlas) left many in Napa shaken from the experience (Cal FIRE), and the nightmare still lingers nowadays as each fire season always threatens to repeat the past. One could place the blame on the model prediction that seems to have failed to account for the gradual increase of risk posed by accelerating climate change, but that is only part of the equation. In concluding the assessment in its Hazard Mitigation Plan, the County is confident that the threat from wildfire has been reduced "due to adoption of the 2010 Uniform Fire Code, the Firewise program, and the Fuel Reduction (Chipping Program)", and in particular, risk from the power lines is reduced thanks to PG&E's "aggressive line clearing program"(Hazard Mitigation Plan, 77), but that is far from the truth. After a two-year investigation and a chapter 11 bankruptcy, PG&E is determined to be the primary source at fault for almost all major fires between 2017 and 2019, seriously putting in doubt its capability as a utility company to keep the community safe. Of course, this has major implication on wildfire threat to Napa, and, as we have seen this past fall with the numerous "Public Safety Power Shutoffs", the proper strategy to address this concern hasn't been formulated.



Cal FIRE Fire Hazard Severity Zones. Source: Cal FIRE



Extent of 2017 Fire Season around Napa. Source: Existing Condition Report, 5-22

What is in place now to mitigate the hazard?

On the county level, the Hazard Mitigation Plan is the most comprehensive mitigation strategy that Napa has, and the plan provides some very high-level action items, such as fuel reduction and defensible space implementation. Currently, the City of Napa has implemented Community Wildfire Protection Plan (CWPP) in several localities, but not such plan on a city level. Finally, City of Napa is a participant of the national Firewise community program, with its chapter administering chipping and landscape design services to individuals (Firewise).

What could be different in 2040?

Alleviating the risks of wildfire to Napa County in 2040 would probably require a mix of coordinated and localized strategies and technological innovations. The intervention should be involved in every level of disaster planning from prevention and mitigation to detection and adaptation. Here are a few strategies that could help combat wildfire in 2040:

Establish a city-level, comprehensive wildfire coordination plan: A centralized document that covers from home fire prevention methods to evacuation routes makes it much easier for citizens and localities alike to prepare for disaster. To fill in the current lack of city-level plans, City of Napa should prepare a document that details all its wildfire mitigation strategies and the coordination needed between it and the County, Cal FIRE, and other responsible agencies. This will ensure the most efficient response to all wildfire related incidents while improving accountability for long-term planning goals.

Continue implementing existing mitigation strategies: Failures to prevent past devastating fires do not necessarily translate to failures in the current level of mitigation strategies. City of Napa should still take every possible precaution in implementing all the current programs like free chippings and defensible space design. Continuously updating its building code up to the most advanced stringencies could help a long way to reduce structural damage and potential loss of life. The key is to not regard each effort as a standalone work but rather integrated efforts. The best strategy is the one that would cover the whole process from end to end, from fire prevention (e.g. establish fire breaks, remove flammable vegetation) to post-disaster recovery (e.g. comprehensive insurance coverage, post-fire rehabilitation of habitats). This would be achieved not by any means alone, so the City needs to incorporate both current and future thinking into its general planning process.

Explore more adaptation strategies: Certain truth remains that extreme weather events would only grow in the next few decades provided with current trend, and longer, more frequent fire seasons are now being accepted as almost inevitable. Thus, our focus should not be limited to mitigating the damage but also adapting to the new reality. City of Napa should actively research existing adaptation strategies like retreating valuable properties from the wildland-urban interface to reduce exposure, holding fire evacuation drills for at-risk neighborhoods, and encouraging companies to provide more flexible work schedules to account for more potential

power outage. Future adaptation strategies would certainly come along, and City of Napa should be leading the region in adapting them as well.

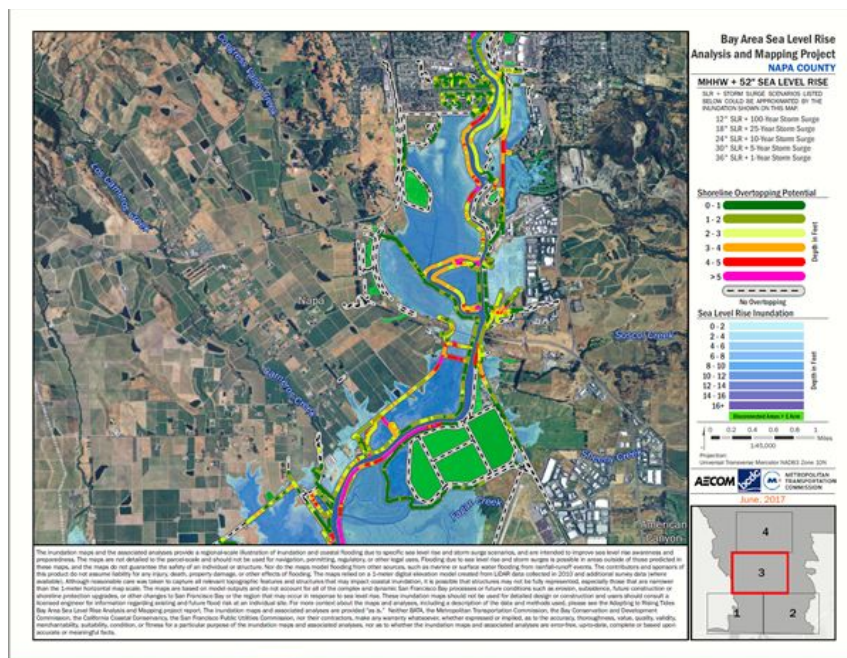
Deployment of more sophisticated firefighting technologies: as the importance of better firefighting techniques surge up in recent years, there is hope that better technologies would emerge that would greatly improve our capacity to extinguish small fire fast or contain large fires effectively. Here are a few ideas that might be worth exploring:

- ***Advanced fire surveillance network:*** early detection of wildfire is one of the most important factors in successfully containing a dangerous fire in its cradle. ALERTWildfire is a vast network of wildfire surveillance camera network first devised in universities that provides real-time camera footage on strategic locations in the wildland. Now a few hundred strong and in operation in three states, these camera eyes act like digital firewatchers across vast areas and have already helped distributed firefighting resources in the past few fire seasons (ALERTWildfire). By 2040, there can be good hope that the network will grow mature, employing thousands of infrared cameras on the ground or autonomous drones that provide high density, high definition all-weather surveillance. The City of Napa could certainly be a part of this effort to incorporate new technological advancements to benefit firefighting efforts.
- ***Development of more fire-retardant materials:*** breakthroughs in fire-retardant material science could bring fruitful results in firefighting in 2040. If building materials or firefighting equipment can become more fire-resisting and less expensive than it is today, the rollout of large-scale fire-resisting neighborhoods could become reality. It could especially be helpful for communities that are unable to retreat from wildfire-prone areas by establishing a “Firewall” of structures that resists invading fire and protecting the communities behind it. More advanced, efficient, and cheaper fire retardant would also speed up firefighting efforts as agencies would be able to use more of them at a lower cost.
- ***Fire-resilient Power Transmission:*** the well-documented failure of PG&E’s aging power transmission lines prompts renewed interest in innovating our electricity infrastructures. In 2040, we may be able to see a much different power landscape that may consist of more localized, micro-grids to reduce transmission distance and improve regional power independence. Power lines may be re-planted with more fire-resisting coating on the poles and wires and re-routed to areas with lower-risk vegetations. More complex prediction algorithms in the future may even accurately predict infrastructure failures and thereby encourage pre-emptive repairs to be done. There is a lot of potential for City of Napa and the region at large to end up implementing a few of these ideas with the help of regional partners, thus making our power infrastructure more fire-resistant and less “fire-existent”.

2. Flooding

Where things stand today

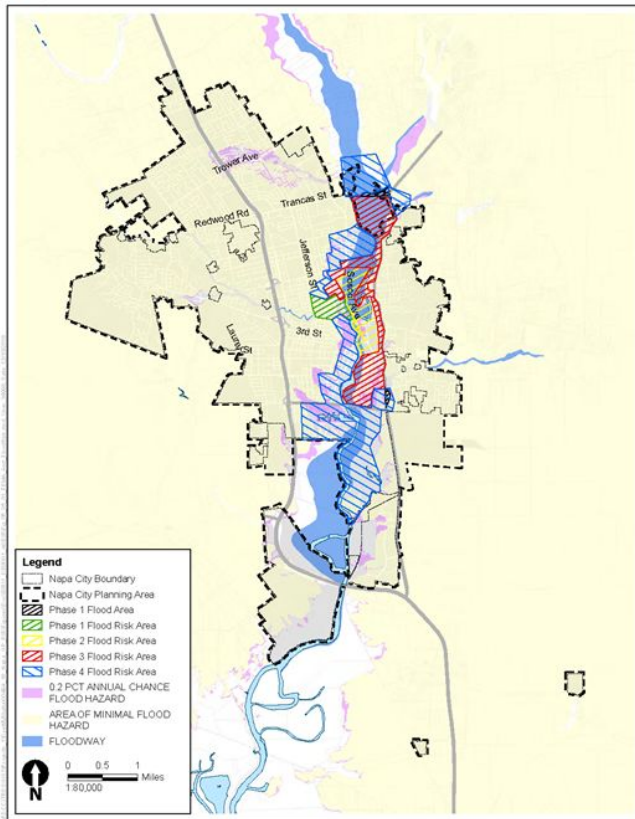
Flooding is listed as the second most important risk in the Napa County Hazard Mitigation Plan after wildfire. The assessment attributed its threat mostly to the vast extent of damage that would occur in the event of severe flooding. Historically, the most significant flooding event in Napa was in 1986, which destroyed 250 homes and \$100 million in property loss. In recent years, multiple reports and studies in recent years have reaffirmed this threat to the City of Napa. For example, the City has maintained a four-phase flood zone map that details in which order parts of the cities would flood, with the phase 1 zones most vulnerable to flooding. This flooding map closely aligns with other maps produced from both the Hazard Mitigation Plan and the official FEMA flood zone designation, which indicates a similar band of land near the banks of the Napa River being very susceptible to a 100-year-flood or more severe event. Additionally, the San Francisco Bay Conservation and Development Commission (BCDC) developed an interactive scenario mapping tool as part of its Adaptation to Rising Tides program in 2017, which aims to explore the impact of global sea level rise (SLR) and rising storm surge on local flooding. The interactive tool produces alarming results, like this one under the assumption of a 52” MHHW+ sea level rise, which could be either a 12” SLR plus a 100-year-flood or a 36” SLR plus a 1-year-flood. The result indicated vast inundation of land south of the downtown Napa proper and large overflow of near the river bank area. Given the plurality of results, there is little doubt that although not as threatening as wildfire, flooding will become a more and more frequent recurrence in Napa.



Projected Inundation Extent with Sea Level Rise. Source: Bay Area Conservation and Development Commission



Figure 5-8
City of Napa and FEMA Flood Zone Map



City of Napa and FEMA Flood Zone Map. Source: Existing Condition Report, Figure 5-8

What is in place now to mitigate the hazard?

The Napa County Flood Control and Water Conservation District is the primate agency for flood management in Napa County. The most comprehensive plan against flooding is again listed in the 2013 Napa County Hazard Mitigation Plan. Chief among the few suggested actions include maintaining an active flood surveillance network, elevating 100 most flood-prone houses, and clearing local river channels of debris buildups (Hazard Mitigation Plan, 88).

The most significant effort to improve flood resilience in Napa region came from the Napa River and Creek Flood Protection Project. Funded by voter measure in 1998 after decades of failures to provide a satisfactory design by the Army Corps of Engineers, the project ambitiously implemented a large variety of improvements including new levees and floodwalls and marshland restoration, but its biggest success is the Oxbow Common bypass along the Napa River portion near downtown Napa (Existing Condition Report, 5-26). The common acts essentially as a floodable public green space. It is used by residents for recreation and gathering just like other open spaces except when the river floods when it becomes safely inundated and

allows the flood to pass through the oxbow smoothly without damaging the nearby public market. Since completed in 2015, the bypass has been successful during storm events (ABC7).

What could be different in 2040?

With rising tides come rising challenges. For now, Napa is better protected from severe river flooding thanks to the river protection project, but the future under climate change remains treacherous. Here are a few ideas for flood protection in 2040:

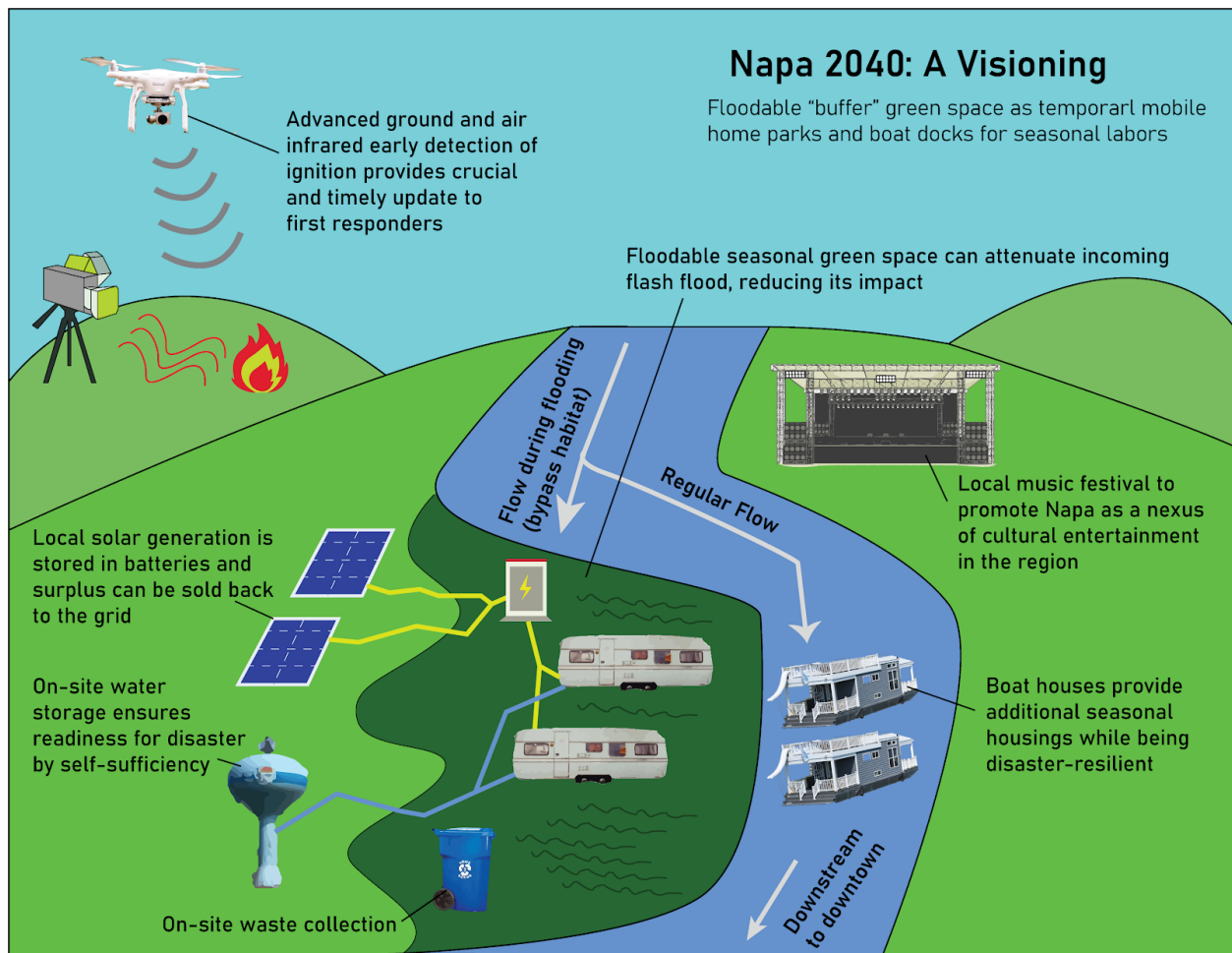
Establish a city-level, comprehensive flood coordination plan: this item is a mirror of the wildfire plan, and its function remains roughly the same: to provide high-level integration of flood mitigation efforts. With an established and regularly updated flood coordination plan, the City of Napa can better organize its effort with regional partners as well as the county.

Implement existing flood mitigation plan: This means that the City of Napa should work diligently to implement all of its current action items in the Hazard Mitigation Plan. River channel clearing and restoration is an important mitigation strategy that could significantly reduce local flooding; comprehensive and sufficient flood insurance could help speed up post-disaster recovery and “bounce back” to normal; elevating flood-prone homes is a great adaptation strategy that could protect vulnerable households that couldn’t relocate, and better surveillance network could attain similar benefits as that of ALERTWildfire: early detection and real-time monitoring. All these are viable strategies that should be continuously implemented.

Explore more flood adaptation strategies: plenty of novel models already exist for flood-resilient communities. From the Dutch model of floating houses along the river to elevating houses to “retreating” properties from flood zone to establishing river bypasses like Oxbow Commons, there are many practical and contextual ways to adapt our built environment with water. City of Napa should actively research into some of these ideas based on local context and implement a few of these at once to achieve a balanced strategy composition against future flooding. Combined with other local context, here is a possible combination:

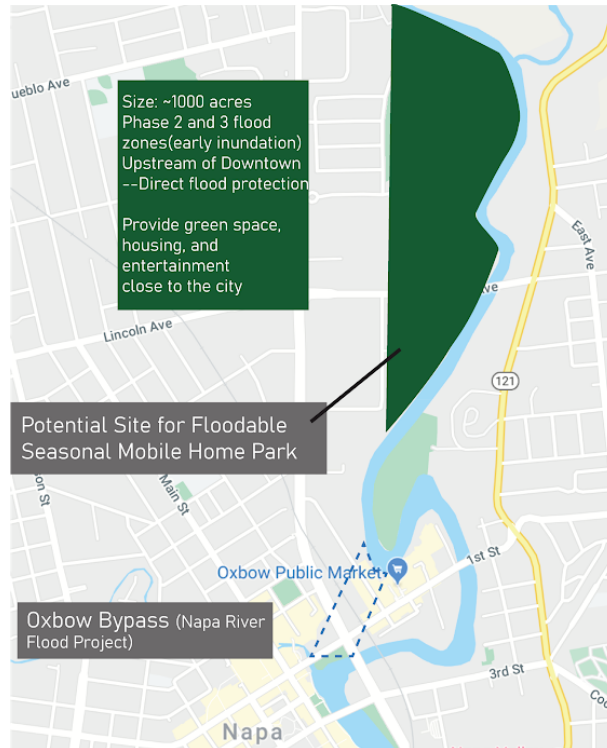
- ***Example: establish long-term mixed-use mobile home parks near seasonal marshlands in flood-prone regions.*** Napa has recently seen a surge of mobile homes within the city boundary partially due to a lack of affordable housing and partly due to the seasonal work patterns of its most attractive employment type as a winery worker. Influx of workers come into Napa during Harvest season as temporary labors, creating spikes of demands for housing. As a potential flood-adaptation strategy that also responds to this acute challenge, the City of Napa should consider potential flood-prone sites that could be established as mobile home parks during harvest season (August-October) and natural habitats, wetland, or marshland for rest of the year (flood season is between December and February based on historical data). When occupied, the site will be supplied with flexible basic infrastructures for water and electricity and waste collection. The site should be built as a temporary open surface to maximize creative space utilization by the mobile homeowners, who can also organize small communal spaces and even set up local

events like music festivals and food market in line with Napa’s cultural context. Surrounding the site will be marshland or other natural habitats that act as a buffer zone for flooding events while providing additional ecological and psychological benefits to the occupants. When seasonal labor moves out, the site will be vacated and left as a naturally floodable space or even temporary flood basin, increasing Napa River’s flood absorption capacity. This site should ideally be placed near upstream of Napa to maximize the flood attenuation benefit. Such is but one example of combining a few of the adaptation strategies mentioned above while considering other unique local challenges that Napa faces. With more research, better and more practical proposals could be devised as well, but this example suits the visionary goal of the 2040 plan.



- **Hypothetical Site Selection:** One of the potential sites for this multi-use mobile home park is what is now the Vineyard Terrace. This site is approximately 1,000 acres and can therefore accommodate a large number of mobile homes and auxiliary infrastructures. Its status as a city-designated Phase 2/3 flood risk area and its location just upstream of Downtown Napa makes it ideal for adaptation. The proposed green space will both buffer

Downtown Napa from flash flooding of the River while remaining close to to job and entertainment opportunities.



3. Earthquake

Where things stand today

Californians have long feared the “Big One”, and Napa is no exception. In fact, they have withstood a close call to a mega-quake when a M6.0 shake emanated from the West Napa Fault, striking the city with extreme vicinity. It was the largest quake in California since 1989’s Loma Prieta, and extensive damage was done throughout: a conservative estimate suggested \$362 million were lost to the earthquake, and many historic buildings, including the Uptown Theater, were severely rattled (The Press Democrat). It was a test of Napa’s readiness against a long dormant but real threat, and the city seemed to withstand well, recovering quickly afterwards.

However, the bigger threat is yet to come. The USGS estimated a 72% chance of a major, M6.7 or greater quake to occur between 2014 and 2044, and with multiple major faults, including but not limited to the West Napa fault, in its vicinity, the City of Napa will stand to lose even more in a larger quake (Existing Condition Report, 5-13). A seismic hazard map included in the Existing Condition Report shows an extensive area of the city at high risk of liquefaction, especially the already flood-prone area along the river (Existing Condition Report, Figure 5.4). This adds extra challenge to existing communities along the river bank as they have yet another concern to address. Considering all these, current planning efforts seem inadequate to address the challenge posed by earthquakes. The Hazard Mitigation Plan provides details on its earthquake simulation model, revealing the amount of damage and loss of life at stake with great

accuracy (the model predicts a \$1 billion economic loss for a M6.5 quake on the West Napa Fault, and a year later the M6.0 quake costs somewhere under \$1 billion damage in real life)(Hazard Mitigation Plan, Figure 3-4). However, the plan does not list any major action for the city, confident that the recently updated building codes and emergency facilities would be enough to “provide immediate & sustained response” (Hazard Mitigation Plan, 47).

What is in place now to mitigate the hazard?

The Seismic Retrofit Ordinance and 2010 California Uniform Building & Fire Codes are two of the main policy guidance that help the efforts to retrofit seismically unsafe buildings, and for facilities built within the last 15 years at least, the codes are deemed sufficient to handle a major earthquake. Besides these, the Hazard Mitigation Plan only suggests policy-wise initiatives to raise public readiness.

What could be different in 2040?

Out of the three major disasters, earthquake is the hardest to notice and therefore hardest to plan for. Nevertheless, proper cautions beforehand could save lives. Here are a few ideas for earthquake readiness in 2040:

Further Retrograde of older structures: While newly built structures are able to withstand a major quake, old buildings are far more likely to sustain severe damage and are in need of an upgrade. Continue and expand current efforts to retrofit seismically unsafe structures like unreinforced masonry buildings can be life-saving and prevent heavy property loss.

Actively promote advanced early warning system: seismologists have been working for years to perfect the early warning system for earthquakes, and in 2040 we just might have a sophisticated one in place that could alert thousands to safety. City of Napa should be up to date with these technologies and find opportunities to promote their adoption among residents.

Experiment with river boathouses: while this one may be a stretch, boat communities have already existed in the bay area for years. These boat houses can usually create a unique atmosphere of community that is not unlike Napa’s, and they are a natural adaptation strategy against both flooding and earthquakes—why duck and cover when you can ride the wave out? By promoting this kind of alternative living styles, it might even provide a relief on the housing market while furthering Bay Area’s great hydrophilic culture. Plus, it is the least difficult to fully implement before 2040 since infrastructure requirement is minimal.

Explore emergency preparation strategies for mobile home parks: one of the most vulnerable groups during and after an earthquake is those who live mobile. While they won’t suffer much of structural damage, it is very likely that their basic supplies will be cut off, especially power and water. To truly sustain a large mobile home community in Napa, the city needs to explore Options to provide self-sufficiency for mobile home sites. Potential solutions include on-site solar generation and battery storage for electricity and on-site water tank. The benefits of these added infrastructure will last well beyond an earthquake as well as they can be part of the city’s microgrid network and emergency water supplies in the wake of other disasters.

Areas for Future Development

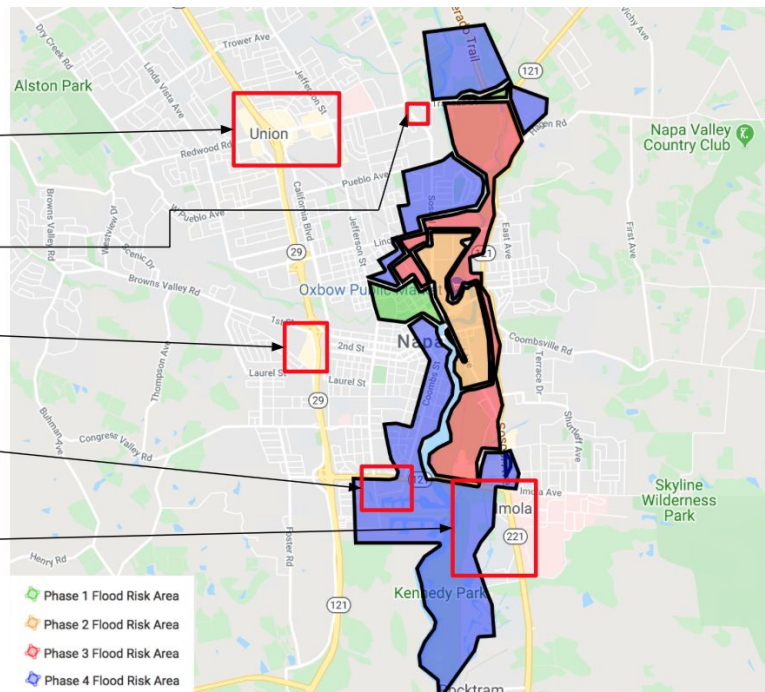
With the environmental concerns outlined above in mind, we suggest future development takes place with the natural environment and the risks outlined above into consideration. Our primary strategies include densifying existing strip malls, as well as establishing a community land trust in the city of Napa to ensure the long-term affordability and stewardship of land in the local community.

Redeveloping and Densifying Strip Malls in Napa

Strip malls and low-density commercial spaces across Napa are primarily located along corridors outside of both fire and flooding risk. As spaces outside of environmental risk, these strip-malls are located on valuable land in Napa, and could be more efficiently used to serve community needs. We propose the redesign of strip-malls in Napa to include multi-story buildings for housing, and the repurposing of large parking lot spaces into more walkable, communal, and green spaces. As spaces where diverse businesses have located, strip malls could serve as centers for business and economic activity, as well as centers for housing and recreation within walking distance of services.

Future Development: Potential Sites for Densification and Development

- Bel Air and Redwood Plazas, Jefferson Square
- Silverado Plaza Shopping Center
- Napa Premium Outlets
- River Park Shopping Center
- The Century Theater and Home Depot Complexes on Soscol and Imola



The map above shows the flooding risk areas as determined by the city of Napa. Phase 1 areas are defined as zones that flood when the Napa Creek overflows its banks, and can be indicators of a larger River flood. Phase 2 areas flood once the Napa River leaves its banks, and then sequentially phases 3 and 4 as flooding progresses and becomes more severe. Highlighted in red are strip-malls and low-density commercial areas, three of which are outside the scope of flooding risk, and two of which are located in zone 4 areas(City of Napa Flooding Maps). These

areas are also located along major junctions throughout the city of Napa, and could serve as hubs that could serve a diversity of residential neighborhoods. A number of steps could be taken to develop these sites into more effective spaces:

Obtain permits to construct stories above existing commercial buildings to create housing:

Densifying these areas would constitute housing development that would not displace existing residents, as well as a development that would make neighborhoods more compact as well as services more easily accessible. Emphasis should be placed on affordable housing and multi-unit buildings that could accommodate a diversity of family sizes and types.

Redesign large, open, parking lot spaces into parks and/or more pedestrian friendly public spaces:

Large parking lots are the center of many strip-malls and commercial areas in Napa, and perpetuate a design that is car-centric and prioritizes automobiles over pedestrians. These spaces could be redesigned to incorporate pedestrian friendly infrastructure and serve as more general public spaces. Areas could be repurposed into parks and centers for social interaction.

Ultimately, these parking lots should be redesigned to be truly usable public spaces, open for public use.

Focus public transportation development on connecting various redesigned strip-mall hubs:

With the densification of strip-mall areas, public transportation expansion could be focused on connecting these areas as hubs. This would increase connectivity between areas of higher commercial and residential activity, and make it possible for people to move around the city. This would also make it possible for residents in these areas to move between service areas without using an automobile.

Land Preservation and Land Trusts in Napa

Where things stand today

Napa has a strong precedent for the protection and preservation of valuable land, and long-term progressive land use planning. In 1968, the Napa County Board of Supervisors and the Napa County Planning Commission established the first ever Agricultural Preserve in the country. The goal of the preserve was to protect agricultural lands in the foothills of Napa county, and prevent suburban sprawl into these areas to maintain the economic and aesthetic character of Napa County(Napa Agricultural Preserve).

Napa is already home to the Napa Valley Land Trust, a community-based nonprofit that permanently protects roughly 15% of Napa County's land for environmental purposes, established in 1976 (Napa Land Trust). The numerous nature preserves managed by the Napa Valley Land Trust are beloved parks in the community, and provide spaces for outdoor recreational activities and engagement with nature for locals and visitors.

What could be different in 2040?

We propose the development of a Community Land Trust in Napa, which would protect the long-term affordability of housing in Napa and assure the long-term stewardship of land in

Napa by its residents. Much like a nature reserve protects valuable environmental resources and spaces, a community land trust could protect Napa residents' ability to access affordable housing in the future, promote owner occupancy, as well as give residents a direct stake in their community.

Considering the growing affordability crisis in the Bay Area and rising housing costs, it is vital that Napa consider how to maintain affordable housing options for people with lower incomes. According to census data, the percent of renter-occupied housing units rose from 39.4% to 42.7% from 2000 to 2010. The majority of units are owner-occupied in Napa, approximately 57.3% as of 2010 (U.S. Census Bureau) . Community Land Trusts could potentially expand homeownership opportunities for lower-income residents, and potentially protect homeownership of residents that may be at risk as affordability in the Bay Area decreases. Further, a Community Land Trust could remove the exchange value of the land on which it is sited, and act as a long-term, sustainable safeguard against rising housing costs.

A CLT could allow for the flexible and adaptive use of land to meet residents' needs, and would be designed in conjunction with the community. A land trust could be the site of development for multiple types of housing (apartment buildings, houses, multi-unit rentals) that would accommodate a number of different family sizes and structures, and could include a plethora of other activities, including gardens or greenhouses, community centers, and local businesses.



The Dudley Greenhouse in the Dudley Neighborhood of Roxbury in Boston.

We can look to examples such as the Dudley Street Neighborhood Initiative in the Roxbury neighborhood of Boston, Massachusetts, which in addition to housing, leases land to a community greenhouse that serves as a food production space year-round to residents (DSNI).

As Napa has already strongly protected lands for agricultural and environmental purposes, we believe the next logical step in line with the City of Napa's planning goals is to establish a community land trust in the city to preserve affordability and protect lower-income residents. For Napa, we envision an engaged community that has control and agency over its land use, and can be assured of the longevity of community power and stability.

Public Health

Where things stand today

As previously mentioned, community land trusts can be a method Napa can implement in their general plan for a prosperous and opportunity-filled city for its residents. In addition to the infrastructural development the city intends to undergo, community land trusts will also serve as an investment to public health and safety. Safer living conditions are already in the radar as included in two of the city's guiding principles: "Foster connections to nature and open space" and "Emphasize environmental sustainability and public safety and health". Furthermore, in using community land trusts as suggested below, not only will the physical health of the community improve but so will the mental health.

It is known that one's environment can deeply affect our health, as well as our mood and interactions with said environment. Although ranked amongst the top 15 most healthy counties in the country, the city of Napa itself has higher rates of obesity, food insecurity, and asthma diagnoses than that of the county (*Napa Existing Conditions Report*). Unlike most of the Bay Area, Napa has not seen the same increase in population in recent years but instead the household size has increased (*City of Napa Economic, Demographic and Real Estate Profile*). One census tract in particular, 2003.01, is currently experiencing these issues much more heavily than others. In introducing new ways for development in terms of environmental hazards, the city will also be tackling its public health challenges.

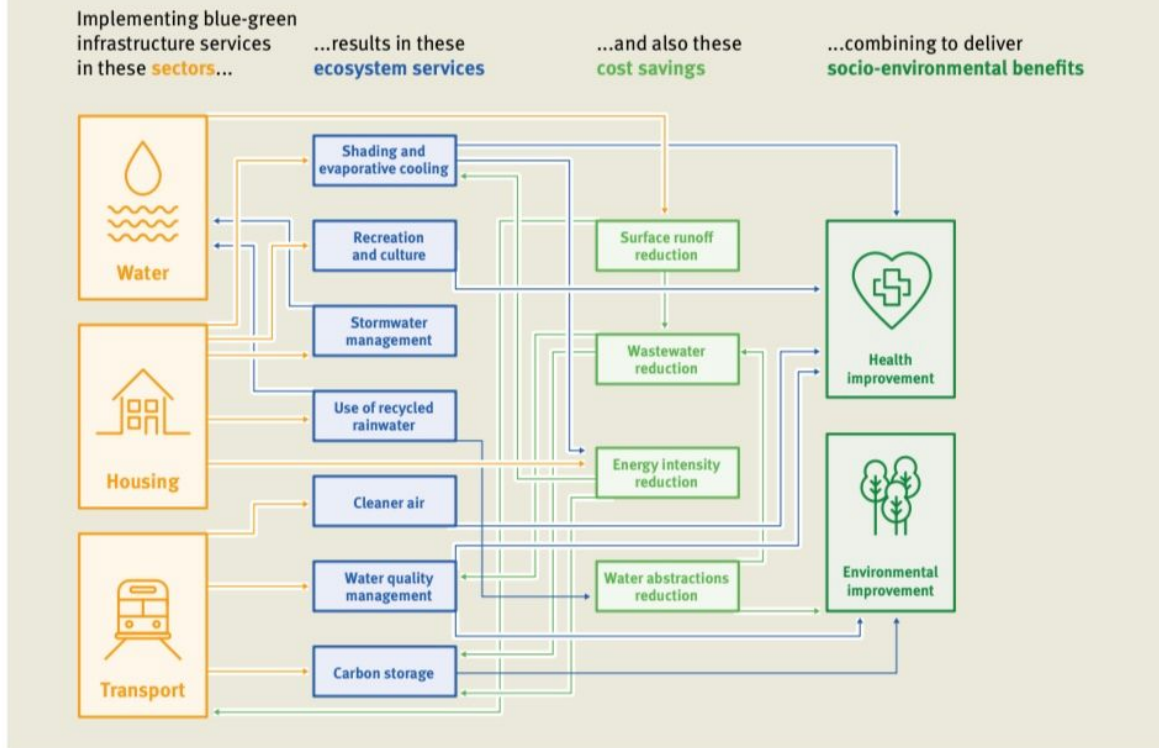
What could be different in 2040?

Green and Blue therapeutic spaces

One of the city's highest priorities is preserving the community's natural environment and open spaces (*Napa Vision and Guiding Principles*). In *Napa's Community Survey Report*, "preserving the natural environment" was ranked very important by 77% of the participants. It is for this reason that aiming to provide the community with "incremental, organic growth" may be equally as effective for their happiness and safety (*Napa General Plan Advisory Committee Meeting #6*). Blue-green infrastructure "is a network of nature-based features situated in built-up areas that form part of the urban landscape" (*Integrating Green and Blue Spaces into our cities: Making it happen*). These include but are not limited to parks, natural grasslands, ponds, and artificial buffer basins. The city of Napa would benefit from blue-green infrastructure as it will improve air quality, the urban heat island effect as well as the accessibility to greenspace and health. These socio-environmental benefits are illustrated in the diagram below, extracted from an Imperial College paper published this summer.

Box 2: Systems mapping of the blue-green infrastructure role in the urban system

Links provide an example of systems thinking with respect to the role of BGI for providing benefits for water, housing and transport sectors. Note that this example does not measure the size or importance of the linkages and therefore the value of the BGI, but this could be done as a follow-on step.



Systems mapping of the blue-green infrastructure role in the urban system. Source: Integrating green and blue spaces into our cities: Making it happen

Accessibility must be for all, able-bodied and ADA—a concern residents expressed in the community survey report. Green and blue therapeutic spaces must also serve educational and recreational opportunities. Their implementation will reduce the cases of nature-deficit disorders: “a way to describe the psychological, physical and cognitive costs of human alienation from nature...” (Louv). Actively learning about our symbiotic relationship with our environment can also ultimately make us—as suggested by a resident for Napa’s Vision and Guiding Principles—happy people.

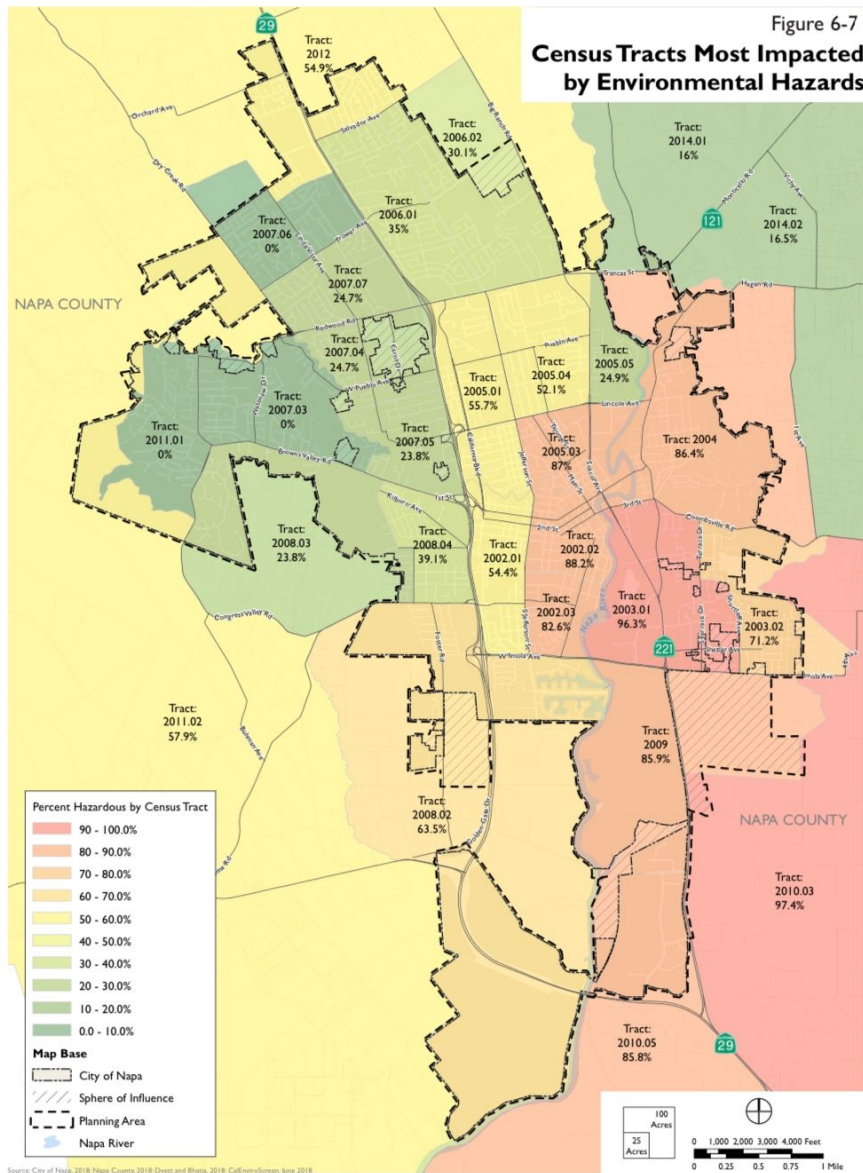
Air Pollutant Mitigation

With blue-green infrastructure accessible by foot, the city will also be improving its air quality. This is due to the fact that vehicles are the prime generators of air pollutant emissions in the city (*Napa Existing Conditions Report*). As a city with higher asthma rates than its pertaining

county, this is a critical way to prevent the number and severity of asthma attacks. Being mindful of the supplies used in the future infrastructure, as the emissions from some can be more harmful than others will definitely help keep the quantity of air pollutants from growing. The place in which the infrastructure will be built is also of high importance as the Existing Conditions Report suggests that schools, day cares, hospitals and retirement homes are sensitive receptors. In order to serve the public as equally as possible, the city must be aware do the vulnerabilities some face that others don't.

Services provided to underserved and vulnerable communities

Census tract 2003.01 has significantly stood out for ranking the highest with a 96.3% in environmental hazards and being amongst the top tracts with health and socioeconomic vulnerabilities. 2003.01 doubles the city's poverty rate with a 16.3% while the city has an 8.1%. The census tract also ranks highly among all California tracts, "due to proximity to toxic cleanup sites, groundwater threats and proximity to solid waste." (*Napa's Existing Conditions Report*). This is alarming as it is located near downtown and development has flourished here in relatively recent years. Identifying the causes of the tract's troubles will prevent it from further being gentrified. Therefore, Napa will include urban agricultural sites and grocery stores as other kinds of facilities within walking distance of tracts like 2003.01 that are lacking the resources others benefit from. Wholesome foods provided to the public will encourage a healthier lifestyle, and nutrition workshops hosted by Napa Valley College will help in that journey. Along with the physical activity the open spaces discussed above will promote, the city can holistically win the battle against obesity.



Census tracts most impacted by environmental hazards. Source: Napa Existing Conditions Report

The City of Napa will also consider mental health as equally important to physical health. Programs like Peer-to-Peer—a National Alliance of Mental Illness program that introduces a safe space for people with mental health challenges to tell their stories in—will be integrated and widespread in the city as they are in the county already (*Napa's Peer-to-Peer program helps participants cope with mental illnesses*). Another way to inspire individuals to make their voices heard, is to incorporate a broader representation of the community in commissions like Napa County Local Food Advisory Council and Community Development Block Grant Citizens' Committee. As studies and cases have shown, resiliency comes from diversification.

Conclusions

Our 2040 vision for Napa is one of environmental resilience against natural disaster risk, the continuation of land-use and development patterns that work in conjunction with the natural environment, and social sustainability and the prioritization of human health and wellbeing.

The three major risks currently facing Napa are wildfires, flooding, and earthquakes. The first two have done significant damage to the city in the past and are expected to worsen as climate change exacerbates, while a major earthquake is predicted in the Bay Area within decades. Current mitigation efforts are a good start and should be maintained, but the city should be eager to explore more innovative options that may emerge in the future. Ideas include an advanced surveillance network to monitor wildfire and flooding, boat communities along the Napa River, and seasonal mobile home park supplied by microgrids that provides additional housing supply during the Harvest Season and functions as a flood bypass/buffer zone. New breakthrough in technologies and planning paradigm that enhance disaster resilience in Napa should also be viewed with open eyes.

With regards to promoting development outside of fire and flood risk, we suggest building upon existing infrastructure, and densifying in the corridors outside of flooding zones while preventing expansion into the surrounding hills of Napa. Specifically, we suggest the strip-mall areas surrounding Union, the Outlets, and the cross-section of Soscol and Imola as ideal locations. These strip malls could be repurposed into denser, mixed housing and business areas, and their parking lots transformed into truly public spaces accessible to pedestrians and designed for public use. With regards to preserving a sense of community and affordability, we see the creation of a Community Land Trust as a method that could effectively preserve affordability as well as build upon Napa's strong foundation of land preservation and protection.

City officials should consider census tract 2003.01 as a potential community to approach regarding the creation of a community land trust in order to promote public health in this neighborhood. A CLT would facilitate the development of green and blue therapeutic spaces, given that they are one of the community's highest priorities and sources of happiness. They will be accessible by foot to the able bodied and ADA while serving as educational and recreational opportunities. Other facilities that will be within walking distance will be urban agricultural sites and grocery stores. Nutrition workshops will also be provided to those on a path to a healthier lifestyle. Mental health will be of equal importance. Programs already present in the county will be sought out in the city as well, such as the National Alliance of Mental Illness Peer-to-Peer program. Lastly, a broader representation of the neighborhoods in the city's commissions will inspire the community in the legislative process for the development of their city, their home.

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